

UTILIZATION OF THE VIRGIN ISLANDS BIOSPHERE RESERVE BY
ARTISANAL FISHERMEN

BIOSPHERE RESERVE

RESEARCH

REPORT NO. 11

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Abstract

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UTILIZATION OF THE VIRGIN ISLANDS BIOSPHERE RESERVE BY ARTISANAL FISHERMEN

Catch and landings on St. John are described for a six-month period (January to June 1981). Methods include port interviews, annual catch reports, informal interviews and questionnaires. Resources taken near or landed on St. John by 28 commercial fishermen were categorized into ten different fishing methods. Landings for the period of study total 16,067 pounds (fish, shellfish and crustaceans) for a total value of \$38,221. West-Indian fish traps represent the greatest proportion of the landings followed by bottom longline and handlines .

The subsistence fishermen were interviewed and were found to set from one to ten fish traps and some handline fishing. Traps are usually hauled on the weekends and yield from six to fifty pounds of fish per month. Fish are used to supplement the diet provided from regular income.

Most, if not all of the commercial fishing activities take place outside of the Biosphere Reserve. The major impact is socio-economic, rather than resource utilization. The primary resource use impact within the Biosphere Reserve comes from subsistence and recreational fishermen. The majority of subsistence level fishing takes place from Rams Head to East End and south of Cruz Bay. Total fish traps observed in Biosphere Reserve waters are less than two dozen. All lobstering in NPS waters is done by hand and is concentrated around Fish and Reef Bays where grassbeds are more abundant. Hook fish taken in NPS waters is mainly limited to bottom fishing and trolling by recreational vessels, both of which are nearly impossible to sample. BVI fishermen do not appear to fish in these water preferring their own waters which are less overfished.

It appears that little intensive fishing takes place within the Biosphere Reserve/National Park. This area may serve as a refuge for many individuals that would be harvested if they were outside the Biosphere Reserve. This protected area may also serve as a recruitment source and emigration base for areas outside the Biosphere Reserve where fishing pressure is greater. Even with little fishing, the numbers, sizes and species composition could be affected by more intensive fishing outside the Biosphere Reserve , thus, creating an external vacuum producing the same effect as overfishing.

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FOREWORD

Virgin Islands National Park was designated as an International Biosphere Reserve by the United Nations Educational, Scientific and Cultural Organization (UNESCO) in June, 1976. However, the formal dedication did not take place until May, 1983. The standardized, single-page description of the area which was issued by UNESCO under the Man and the Biosphere Program, MAB Project 8, in 1976 is entirely inadequate for the purpose of meeting Biosphere Reserve Objectives.

The purpose of the present (VIRMC I) project was to provide more detailed descriptions of the Reserve's physical and biological features as well as certain aspects of human use, such as fishing and boating. Inherent in the concept of the Reserve is the belief that it is intimately related to the nearby British Virgin Islands and that it should also fit within a future multi-site Lesser Antillean Biosphere Reserve.

The following reports are included in the VIRMC I Research Series Reports.

The West Indies Laboratory (Fairleigh Dickinson University) prepared the reports for "Ecological Community Type Maps and Biological Community Descriptions for Buck Island Reef National Monument and Proposed Marine Park Sites in the British Virgin Islands," "Trends in Recreational Boating in the British Virgin Islands, A Preliminary Assessment of Impact from Human Activities on Anchorages and Development of a Monitoring Program for Safe Anchorages," "Geographic Range and Research Plan for Monitoring White Band Disease," and "Marine Ecosystems of the Lesser Antilles - Identification of Representative Sites."

The Division of Fish and Wildlife (Department of Conservation and Cultural Affairs, Government of the U.S. Virgin Islands) prepared, "Map of Fishery Habitats Within the Virgin Islands Biosphere Reserve," "Fisheries Habitat of the Virgin Islands Region of Ecological Importance to the Fishery Resources of the Virgin Islands Biosphere Reserve," "Utilization of the Virgin Islands Biosphere Reserve by Artisanal Fishermen," and "Long-Term Monitoring of Fisheries in the Virgin Islands Biosphere Reserve."

The Caribbean Research Institute (College of the Virgin Islands) prepared, "Marine Community Descriptions and Maps of Bays Within the Virgin Islands National Park/Biosphere Reserve," and "Collection of Common Organisms Within the Virgin Islands National Park/Biosphere Reserve."

The Island Resources Foundation prepared, "Assessment of Fish and Shellfish Stocks Produced in the Virgin Islands Biosphere Reserve," "Socioeconomic and Cultural Role of Fishing and Shellfishing in the Virgin Islands Biosphere Reserve Area," "Characterization of Lesser Antillean Regional Fisheries," as well as the Synopsis and Executive Summary.

Field work for the project was carried out during the period December, 1983, through October, 1984. Copies of the individual reports can be obtained from: The Virgin Islands National Park, Red Hook Headquarters, P.O. Box 7789, St. Thomas, Charlotte Amalie, VI 00801.

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1. INTRODUCTION

Past and recent surveys of the commercial fishery of the Virgin Islands have generally treated the islands as two groups: St. Croix and St. Thomas/St. John. St. John has never been singled out in a quantitative fisheries survey. Fiedler and Jarvis (1932) described the fisheries and problems of marketing on St. John and Idyll and Randall (1959) made a survey of the commercial and sport fisheries of St. John at the request of the National Park Service. All previous work by the Division of Fish and Wildlife, Department of Conservation and Cultural Affairs on fisheries landings for the U.S. Virgin Islands have combined St. John and St. Thomas. The objectives of this report are to present the results of a six-month fishery landings survey on St. John by commercial and subsistence fishermen and attempt to qualitatively determine the impact of fisheries activities on the marine fishery resources of the Virgin Islands Biosphere Reserve.

Virgin Islands marine shelf resources support a small but diverse fishery.

For fishermen reporting year 1982-83, there were four hundred fifty-four (454) licensed fishermen in the U.S. Virgin Islands with a total reported catch of 1,358,785 pounds of fish, shellfish and crustaceans (Clavijo, 1984). These landings represent the use of more than ten different fishing methods with West Indian fish traps being the most commonly used fishing device (Sylvester and Dammann, 1972). It has been reported that greater than 80 percent of all fishermen use fish traps and that nearly 90 percent of all reported catch is taken in fish traps (Olsen, et al., 1975). However, for the period of 1978 to 1983, reported potfish landings represented 68 percent of the total reported landings for all fisheries resources (calculated from Clavijo, 1984). As all commercial record keeping is done for St. Thomas/St. John, it is impossible to obtain accurate values for St. John alone.

The eastern Caribbean Sea in general is known to have quite low primary productivity (phyto-plankton) for a variety of reasons (Hargraves, et al., 1970) and this results in a low potential for any large-scale commercial fisheries activity (Brownell, 1972). Probably due to this, the fisheries in the U.S. Virgin Islands are primarily artisanal in nature using traditional fishing techniques. The supply of fisheries products locally does not meet the public demand. Virgin Islands fishery resources are reported to currently supply approximately 60 percent of local consumption (Dammann, 1969) with the balance being supplied by the United States, Puerto Rico and foreign countries (Swingle, et al., 1969). This figure may be lower now due to increases in population.

The earliest economic fisheries survey of the U.S. Virgin Islands was done in 1930 (Fiedler and Jarvis, 1932). They report an active artisanal fishery of four hundred and five (405) fishermen landing a total catch of 616,000 pounds for 1930. At that time, only one fishing boat was propelled by a motor. The lack of motors to propel large boats limited fishermen both in amount of gear they could tend and distance from shore they could fish. At that time, the fishery was reported to be approximately 50 percent underfished (Fiedler and Jarvis, 1932). Subsequently, in spite of technological advances, the landings in terms of catch-per-unit-effort (calculated by gear) has declined over the last forty-four years (Dammann, 1969). This is not related to a increase in number of fishermen as this has remained nearly constant over this period. Olsen, et al. (1978) suggests that this decrease in CPUE is indicative of potential overfishing.

This decrease in CPUE from traditional fishing methods has led Virgin Islands fishermen to diversification of fishery methods and introduction of technology (depth sounder, hydraulic pot/longline haulers, etc.) at the traditional boat size (16 to 20 feet) (Olsen and LaPlace, 1981). Diversification of methods reduces pressure on any single resource. An example is the development of a deepwater snapper-grouper fishery (Brownell and Rainey, 1971; Sylvester and Dammann, 1979) and investigations into the resource potential of a portunid crab population (Olsen, et al., 1978).

An additional factor that has increased interest in development of alternate fishing methods is the presence of ciguatera producing toxin in many species taken by traditional methods. The ciguatera problem in the Virgin Islands inhibits full utilization of viable and otherwise acceptable resources because of its sporadic and unpredictable nature (Sylvester, et al., 1977). This presents the fishermen with marketing problems (Brownell and Rainey, 1971) that he attempts to negate by fishing for "safe" species, including many of the deepwater

snappers and groupers.

An attempt is made here to survey commercial and subsistence level fishermen on St. John and to report on fishing methods and quantities of fish, shellfish, and crustaceans landed on St. John for use by st. John residents. Resources being harvested within V.I. Biosphere Reserve waters are identified and problem areas to be taken into account when designing a fisherman landings survey program are defined.

2 METHODS

Data on fishermen landings and catch composition on St. John during the period of January through June, 1984 were collected in a variety of ways (Table 1). Commercial potfish fishermen who land their catches on a regular basis at the fish house in the "Creek", Cruz Bay (see Fig. 1) were interviewed at least once a week upon their arrival. Their catches were enumerated by species and weight. Several hookfish fishermen provided us with their catch data on a monthly basis. The operators of the deep-water longline vessel provided access to their catch records for enumeration of their landings by species and weight. Much of the total landings data by fishing type were obtained through the annual catch reports turned in to DCCA by licensed fishermen. Ten subsistence fishermen (generally unlicensed) were interviewed once to obtain landings and catch/effort data. The fish importer provided information on species and weights brought in.

All Virgin Island fishermen are required by law (V.I.C. T 12, Ch. 10) to submit annual catch reports showing landings by gear type per month in order to qualify for commercial fisherman tax and boat registration fee exemptions. Annual catch reports for St. Thomas fishermen were examined to determine if any reported catches were taken within or adjacent to the Virgin Islands Biosphere Reserve, however, exact location was undeterminable. Several St. Thomas boats reported by NPS personnel as fishing with traps within the Virgin Islands Biosphere Reserve could not be sampled since these fishermen did not submit annual catch reports.

TABLE 1.

Numbers of fishermen supplying data on each of the fishing methods or target species on St. John, U.S. Virgin Islands, during the period of January to June, 1984. Information was obtained from twenty-eight commercial and ten subsistence fishermen.

Fishing Method or Target Species	No. Fishermen in Data Base ¹
Pot Fish	6
Hook Fish - Yellow tail -	4
Other -	7
Lobster - Hand -	5
Trap -	5
Conch -	3
Spear Fish -	2
Whelk -	1
Vertical Longline -	1
Surface Longline -	1
Net Fish -	1
Subsistence Fishermen -	10 ²
Fish Importer -	1

¹ An individual fisherman may be included in more than one fishing method or target species category.

² This represents an unknown percentage of the total number of subsistence fishermen but is enough to describe gear and landings.

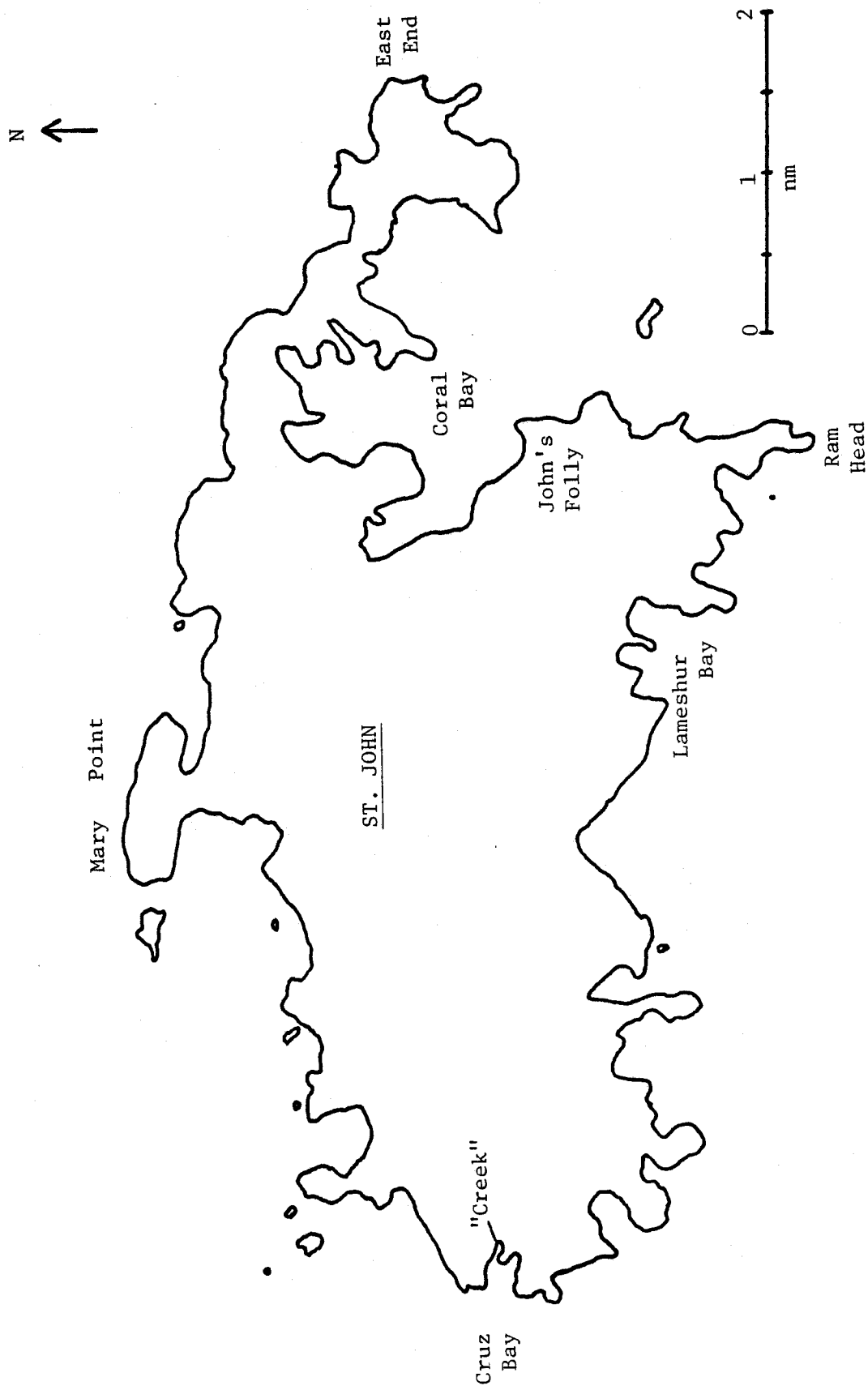


Figure 1. St. John, U.S. Virgin Islands, showing locations discussed in the text.

Since fishermen are generally reluctant to reveal their fishing locations it was usually impossible to determine if the catch came from within or adjacent to the Biosphere Reserve. For this reason all catches are reported as landings on St. John and not as resources being harvested from the Virgin Islands Biosphere Reserve. Where catches are known to have been taken from the Virgin Islands Reserve, it is noted.

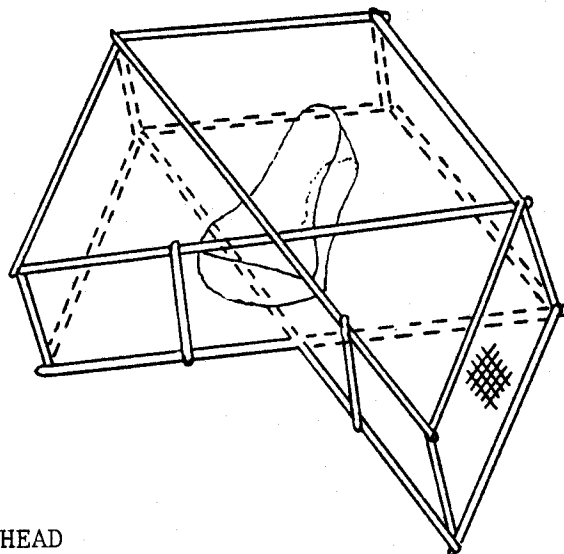
3. RESULTS

3.1 Commercial Fishermen

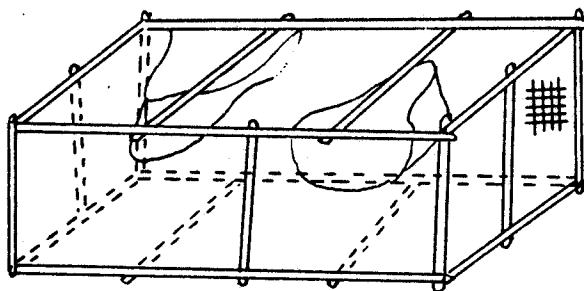
A commercial fisherman is defined as "any person who takes fish (including fin fish, shellfish and crustaceans) by any method or means and sells, exchanges or in any way possesses said fish for profit" (Virgin Islands Code (VIC), Title 12, Chapter 10, Subsection 302, (9), (10), (12), (17)). Under Virgin Islands law (VIC, Title 12, Ch. 10, 312 (c through j) any person engaged in commercial fishing is required to have a license. No license is required for fishing for personal use providing it does not involve pots, traps, set nets or hand seines (VIC Title 12, Ch. 10, 302 (k)). For the period of July 1, 1983 to June 30, 1984, twelve (12) St. John fishermen were licensed as commercial fishermen. These included full-time commercial fishermen to part-time commercial fishermen who catch fish primarily for personal use but sell their excess catch to defray costs.

3.1.1 Pot Fish

Pot fish are any species of fin fish caught in a fish trap (pot) placed on the bottom and generally buoyed at the surface. The conventional West-Indian fish trap (Figure 2) is constructed of 1-1½ to 2 inch mesh chickenwire and supported by wooden braces, usually from tree saplings. One or two funnels are present. Fish traps are the basic unit of gear in the commercial fishery of the Virgin Islands (Sylvester and Dammann, 1972). Fish traps are set in depths from less than a fathom to over 100 fathoms. Traps are baited with a variety of items including trash fish, bread, cactus and animal skins, however, unbaited traps are



ARROWHEAD



RECTANGULAR

Figure 2. Diagram of most popular West Indian fish trap styles. After Sylvester and Dammann (1972).

said to catch at the same rate as baited traps once they have been properly "seasoned" (covered by marine fouling communities).

Commercial fish-trap fishermen sampled in this study use boats from 16 to 20 feet in length, powered by outboard engines from 50 to 80 horsepower. All pull their traps by hand. Commercial fishermen set their traps both within and outside the Virgin Islands Biosphere Reserve. No figure is available for total number of commercial fish traps located within the Virgin Islands Biosphere Reserve as commercial fishing is prohibited in National Park Service waters and most fishermen are reluctant to reveal the location of their traps.

During the period of this study, six commercial fish-trap fishermen reported a total of 5,285 pounds of potfish for a total reported value of \$10,374.00 (Table 2). Three commercial fish-trap fishermen were port sampled on a weekly basis and their catches were enumerated by species and numbers (Table 3). From their catch composition, the twelve most common species caught were determined and ranked (Table 4). A number of individuals of each species were measured and weighed to obtain mean lengths and weights of fish landed (Table 4). The estimated annual income for each of the three fishermen was calculated and represent the range from full-time commercial fishermen to part-time commercial fishermen supplementing their regular job income (Table 5).

The full-time commercial trap fisherman pulls his traps three times a week, usually from 0500 to 1000 hours and sells his catch at the fish house in the "Creek", Cruz Bay, St. John. This fisherman is from St. Thomas and works with a full-time assistant. He sells his catch on St. John due to the demand. The two part-time commercial trap fishermen are from St. John and pull their traps once a week on Saturday mornings. They market their fish also at the fish house in Cruz Bay.

3.1.2 Hook Fish

Hook fish can be subdivided into two main categories: yellowtail snapper and

TABLE 2.

Reported potfish landings and value from January to June, 1984, on St. John, U.S. Virgin Islands. All fish were caught using West Indian fish traps (see text for description).

Month	No. Fishermen Reporting	Total Pounds Reported	Total Value ² Reported
January	5	979	\$ 1,858.00
February	5	1143	2,194.00
March	3	939	1,874.00
April	2	919	1,838.00
May	4	1178	2,356.00
June ¹	2	127	254.00
TOTAL	6	5285	\$ 10,374.00

¹ Most fishermen submit annual catch reports for the period of June to May, so June 1984 will be reported in 1985. However, two annual catch reports did contain June 1984.

² Not all fishermen reporting catch reported sales income.

TABLE 3. (Page 2 of 4)

SPECIES	N	Rel. Abund.	5	N	Rel. Abund.	5	N	Rel. Abund.	5	TOTAL N	Rel. Abund.	5
White Grunt	124	.050		12	.014		8	.015		144	.038	
French Grunt	40	.016		5	.006		3	.006		48	.013	
Spanish Grunt	1	0								1	0	
Porkfish	1	0		1	.001					2	0	
Margate	7	.003		2	.002		1	.002		10	.003	
Cottonwick	6	.002		3	.003		7	.013		16	.004	
Vermilion Snapper							4	.004		4	.001	
Yellowtail Snapper	95	.038		5	.006		21	.040		121	.032	
Lane Snapper	27	.011		10	.012		26	.050		63	.016	
Dog Snapper	9	.004		7	.008					16	.004	
Blackfin Snapper	3	.001					8	.015		11	.003	
Mutton Snapper	1	0		5	.006		7	.013		13	.003	
Mahogany Snapper	3	.001								3	.001	
Schoolmaster Snapper	1	0		3	.003					4	.001	
"Flatfish"	22	.009		9	.011		4	.008		35	.009	
French Angelfish	17	.007		14	.017		6	.011		37	.009	
Gray Angelfish	25	.010		15	.018		16	.030		56	.015	
Rock Beauty	11	.004		12	.014					23	.006	
Queen Angelfish	1	0		1	.001					2	0	
Butterflyfish	15	.006		9	.011		1	.002		25	.007	

TABLE 3. (Page 3 of 4)

SPECIES	N	Rel. 5		N	Rel. 5		N	Rel. 5		TOTAL	Rel. 5
		Abund.	Abund.		Abund.	Abund.		Abund.	Abund.		
Red Hind	432	.173	.033	27	.040	.125	21	.040	.125	480	.125
Coney	75	.030	.035	29	.010	.028	5	.010	.028	109	.028
Nassau Grouper	8	.003	.004	4	.008	.004	4	.008	.004	16	.004
Yellowfin Grouper	8	.003	.008	7	.002	.004	1	.002	.004	16	.004
Graysby	1	0				0			0	1	0
Rock Hind	1	0				0			0	1	0
Tiger Grouper			.003	3		.001			.001	3	.001
"Porgies"	137	.055	.034	28	.074	.053	39	.074	.053	204	.053
Sea Bream			.024	20		.005			.005	20	.005
"Doctors"	67	.027	.062	51	.06	.039	30	.06	.039	148	.039
Doctorfish	52	.021	.024	20	.024	.022	13	.024	.022	85	.022
Blue Tang	137	.055	.075	62	.05	.059	26	.05	.059	225	.059
Ocean Surgeonfish	89	.036	.051	42	.04	.040	21	.04	.040	152	.040
"Goatfish"	10	.004			.02	.005	9	.02	.005	19	.005
Yellow Goatfish	5	.002	.011	9	.004	.004	2	.004	.004	16	.004
Spotted Goatfish			.002	2	.002	.001	1	.002	.001	3	.001
Hogfish	2	.001								2	0
Spanish Hogfish			.001	1	.004	.001	2	.004	.001	3	.001

TABLE 3. (Page 4 of 4)

SPECIES	Rel. 5		Rel. 5		Rel. 5		Rel. 5		TOTAL	Rel. 5
	N	Abund.	N	Abund.	N	Abund.	N	Abund.		
"Goo Too"	78	.031	17	.020	9	.02	104	.027		
Redtail Parrot	94	.038	20	.024	3	.006	117	.031		
Stoplight Parrot	18	.007	10	.012	1	.002	29	.008		
Redband Parrot	6	.002	8	.009	3	.006	17	.004		
Yellowtail Parrot	1	0					1	0		
Queen Parrot	1	0			1	.002	2	0		
Princess Parrot	2	.001	1	.001			3	.001		
Striped Parrot					1	.002	1	0		
"Trunkfish"	292	.117	77	.093	44	.085	413	.108		
Squirrelfish	173	.069	61	.074	50	.095	284	.074		
TOTAL	2493		818		524		3834			

¹ Number of times the fisherman was interviewed as he landed his catch.

² This is an average based on port sample data.

³ Catch Per Unit Effort - pounds per trap.

⁴ Estimated as (No. traps hauled/week) x (No. weeks/year) x (CPUE).

⁵ Relative abundance is calculated on the basis of numbers of fish.

⁶ When the common name for a group is present (e.g., "Grunts") these are individuals that were not identified as to species but simply as to group.

TABLE 4.

Rank listing and mean sizes of the twelve most common fish caught in fish traps. Fish were sampled from 913 traps hauled during the period of January to June, 1984.

RANK	SPECIES ¹	Relative Abundance ²	N ³	Length ⁴		Weight ⁵	
				X	Range	X	Range
1	Red Hind	.125	53	282.5*	240-350	296.5	175-475
2	Queen Triggerfish	.123	82	273	170-380	538.0	125-1475
3	"Trunkfish"	.108	2	212*	175-250	200	175-225
4	Squirrel Fish	.074	5	213	195-235	170	125-225
5	Blue Tang	.059	10	167	135-185	130	50-200
6	"Porgies"	.053	7	226.8	210-280	267.9	200-500
7	Ocean Surgeonfish	.040	6	158	140-165	100	75-125
8	White Grunt	.038	5	270	245-295	375	275-450
9	Blue-Striped Grunt	.032	1	260	---	300	---
10	Yellowtail Snapper	.032	12	286.5	230-365	372.5	200-650
11	Redtail Parrot	.031	15	296*	250-345	463.3	225-725
12	Coney	.028	3	255*	230-270	241.7	150-300

¹ Species groups which do not include all the individuals sampled (e.g., "Doctors") were not ranked.

² Taken from Table 3.

³ Number of individuals measured.

⁴ Fork length in mm.

⁵ Total weight in gm.

* - Species whose fork length is the same as total length.

others. The distinction lies in the use of different fishing methods with different target species.

Yellowtail snapper is a much preferred food species and can be caught at night in large numbers using chum and the floating handline technique. The state of the moon (near full) and the presence of a current are integral to the success of this method. Chum is made of mashed fry (dwarf herring) or other small fish and mixed with sand to carry it towards the bottom. The boat is anchored on an offshore bottom feature having vertical relief. The chum is dispensed over the side and dispersed by the current. Light handlines with very small (less than $\frac{1}{2}$ oz.) sinkers are baited with fry and allowed to "float" out away from the boat with the current along with the chum. The chum attracts the yellowtail snapper towards the boat where the fishermen catch them. Other species of fish also caught with this method include kingfish, black jack and sharks. If the current stops, the chum goes directly to the bottom, greatly reducing the area being affected by the chum and thus, the amount and species of fish which are attracted.

Reported handline landings of yellowtail snapper on St. John during the period of January to June, 1984 range from 50 to 700 lbs. per month (Table 6). It is not uncommon for a fisherman with an assistant to bring home 100 to 300 pounds of yellowtail from one night's fishing. Landings data do not indicate number of fishing trips, only monthly totals.

The other main method of handline fishing is bottom fishing using a weighted line with bait (fry, whelk, soldier crab, etc.). Chum may or may not be used. Fish caught using this method include most of the demersal fin fish species that are also caught in fish traps (Table 3). Reported commercial landings and value are shown in Table 7. This is the most common fishing method utilized by people of the Virgin Islands for recreational and probably subsistence purposes. Due to the number of people utilizing it and the non-reporting requirement it would be very difficult to attempt to estimate the total pounds of fish landed using this method.

TABLE 5.

Estimated annual income of three commercial fishpot fishermen on St. John, U.S. Virgin Islands. Calculated from landings data presented in Table 2.

SPECIES	Price Per lb.	Cleaning Fee(per lb.)	Fisherman		
			1	2	3
Lobster	\$5.00	----	\$ 1,026.00	\$ 205.00	\$ 97.00
Potfish(Quality)	2.00	.25-.50	40,630.00	6,214.00	3,472.00
Potfish(Inferior) ¹	\$1.00/1.50	.25-.50			
ESTIMATED ANNUAL INCOME			\$41,656.00	\$6,419.00	\$3,569.00

¹These are small fish or those of less desirable species.

²The amount earned cleaning fish generally compensates for the amount of fish sold as inferior.

TABLE 6.

Reported handline landings and value of Yellowtail Snapper (*Ocyurus chrysurus*) from January to June, 1984, on St. John, U.S. Virgin Islands. Fish primarily caught using the floating handline technique (see text for description).

MONTH	Number of Fishermen Reporting	Total Pounds Reported	Total Value Reported
January	2	300	\$ 600.00
February	3	515.75	1,031.50
March	2	705	1,410.00
April	2	659.5	1,319.00
May	1	46.75	93.50
June	1	530	1,060.00
TOTAL	4	2757	\$5,514.00

TABLE 7.

Reported handline landings and value of fish other than Yellowtail Snapper from January to June, 1984, on St. John, U.S. Virgin Islands. Fish primarily caught using bottom handline techniques (see text for description).

MONTH	Number of Fishermen Reporting	Total Pounds Reported	Total Value Reported*
January	4	69	\$ 101.00
February	6	274.5	460.50
March	6	314	396.00
April	5	360	403.50
May	4	227	236.00
June	3	99	162.00
TOTAL	7	1343.5	\$ 1,657.50

*Not all fish caught were reported as sold.

TABLE 8.

Reported landings and value of Lobster (Panulirus argus) caught by hand from January to June, 1984. All lobster were caught using snares (see text for description).

MONTH	Number of Fishermen Reporting	Total Pounds Reported	Total Value Reported
January	2	124	\$ 620.00
February	3	245.5	1,227.50
March	2	80	400.00
April	3	219	1,095.00
May	4	144	720.00
June	4	146	730.00
TOTAL	5	958.5	\$ 4,792.50

Note: This estimate includes one fisherman who lands his catch on St. Thomas. Catch reports indicate that the lobster reported herein were caught adjacent to or within Virgin Islands Biosphere Reserve boundaries.

3.1.3 Lobster

The lobsters (Panulirus argus) taken around St. John are taken by diving (hand) or in fish traps as incidental catch. Several fishermen on St. Thomas fish for lobster using New England-type lobster traps but none are believed to be set near St. John. Federal regulation prohibits this type of trap from being set in Park waters.

The majority of lobster landed in St. John are taken by hand (Table 8). All lobstering in NPS waters is done by hand and appears to be concentrated around Fish and Reef Bays on the south side and Johnson's Reef on the North side. They are caught usually under ledges in reefs or on offshore bank pavement using a snare.

A snare is a length of wood or metal having a soft wire or monofilament noose at one end which is used to catch the lobster either around its tail or lower part of the antenna.

Fishermen often catch lobsters in traps set for fish. Table 9 shows reported landings (with estimates from three(3) regularly sampled pot-fish fishermen) of lobsters on St. John for the period of January to June 1984. All lobsters reported here were taken in traditional West-Indian fish traps (Figure 2).

Under Virgin Islands law (VIC, Title 12, Ch. 10, §319) it is prohibited to spear, hook or in any way impale a lobster in order to capture it. Lobsters may only be captured by hand, snare, pot or trap. Egg-bearing lobsters must be released or left in the trap until eggs are naturally released. At the present time it is illegal to take a lobster having a carapace measurement of less than 3 inches. However, starting on December 1, 1984, it will be illegal to take a lobster having a carapace measurement of less than 3.5 inches (Virgin Islands Legislative Act no. 4953, June 1, 1984).

These figures do not include the many lobsters probably taken by recreational snorklers and SCUBA divers. Nor do they include lobsters taken by St. Thomas fishermen (French fishermen have been seen diving for lobster at Fish Bay and

Reef Bay) with the exception of one fisherman who reported his catch as having come from St. John.

3.1.4 Conch

The Queen Conch (Strombus gigas) is a large gastropod mollusc found in grass beds, sand flats and algal plains from 1m in depth to over 20m. The muscular foot is a very preferred food and is in great demand. It is well known that overfishing is depleting the populations as fishermen have to go deeper and deeper to obtain them in any numbers. There are presently no regulations governing size of conch that can be taken.

During the study period, only three fishermen reported catching any conch for a total of 192 pounds landed on St. John (Table 10). This does not include all the recreational take of conch that may be greater than the commercial take. One fisherman who had been regularly catching conch off St. John and selling them on the Cruz Bay public dock stopped fishing in January. This was the major commercial source of conch on St. John. It is impossible to estimate total pounds of conch harvested around St. John due to the recreational and incidental take by both St. John and St. Thomas boaters. Information provided by fishermen does indicate that the majority of conch taken in NPS waters is subsistence/recreational and is mostly confined to the south shore where grass beds are more abundant.

3.1.5 Spear Fish

Although fishing with a speargun is prohibited within National Park waters, a number of people do spearfish outside and adjacent to NPS waters. Many boaters use spearguns to catch fish for their own consumption and are impossible to sample for a study of this sort. During the period of this study, only two fishermen reported commercial landings of spear fish (Table 11). We can conclude that spearfishing is not a commercially feasible or very important fishing technique.

TABLE 9.

Reported landings and value of lobster (Panulirus argus) caught by trap from January to June, 1984. All lobster were caught in West Indian fish traps (see text for description).

MONTH	Number of Fishermen Reporting	Total Pounds Reported ¹	Total Value Reported
January	3	66	\$ 330.00
February	4	81	405.00
March	3	66	330.00
April	5	86	430.00
May	4	82	410.00
June	3	66	330.00
TOTAL	5	447	\$ 2,235.00

¹ Commercial fishermen (3) who did not report lobster landings in their annual catch report had pounds of lobster caught per month estimated from (Total lbs. Lobster Port Sampled during study period ÷ No. Times Port Sampled) x No. Trips per Month.

TABLE 10.

Reported landings and value of conch (Strombus gigas) from January to June, 1984 on St. John, U.S. Virgin Islands. All conch were collected by hand (see text for description).

MONTH	Number of Fishermen Reporting	Total Pounds Reported ¹	Total Value Reported
January	---	---	---
February	1	30	\$ 60.00
March	1	10	20.00
April	1	50	100.00
May	2	42	84.00
June	1	60	120.00
TOTAL	3	192	\$ 384.00

¹ Weight reported in meat weight.

TABLE 11.

Reported spear fish landings and value from January to June, 1984, on St. John, U.S. Virgin Islands.

MONTH	Number of Fishermen Reporting	Total Pounds Reported	Total Value Reported
January	---	--	---
February	1	41	\$ 82.00
March	---	---	---
April	---	---	---
May	---	---	---
June	1	40	80.00
TOTAL	2	81	\$ 162.00

3.1.6 Whelk

The whelk (Cittarium pica) is a small gastropod mollusc found intertidally on rocky coasts. They are good eating and collected primarily for personal use. In the past they were much more abundant and were probably sold more frequently since they could be collected in large numbers. It has become very difficult to find sufficient whelk for even the subsistence fishermen.

During the study period only one fisherman reported taking any whelk. Twenty-eight pounds were reported in March 1984, and since no value was reported, it is assumed they were kept for personal consumption. It is also assumed that the weight reported included shells.

3.1.7 Bottom Longline

During the study period only one vessel was using the deepwater bottom longline technique. To be able to efficiently utilize this method, a large boat is needed with a hydraulic pot hauler. Bottom longlining is done for deepwater snapper/grouper resources along the north or south dropoff in 150 to 200 fathoms of water. A typical bottom longline rig is shown in Figure 3. Usually a fisherman will set three of these at a time and retrieve them in rotation.

The main species of commercial importance caught by this method are misty grouper, queen snapper and silk snapper (Table 12). Wenchman snapper and dogfish sharks are also abundant but are not as easily sold. During the study period this boat fished for four months and landed 4,262 pounds (cleaned weight of fish) on St. John (Table 12) using this method. The entire catch was always sold within a few hours of landing. Even large fish can always be readily sold due to the ciguatera-free nature of these deep-water species.

This method of fishing is very much a hit or miss operation, in spite of numerous technologies such as radar, satellite navigation and others. Numerous lines can be set without catching any fish while a chance hit on a good ledge can produce several hundred pounds on one or two lines. Relocation of exact

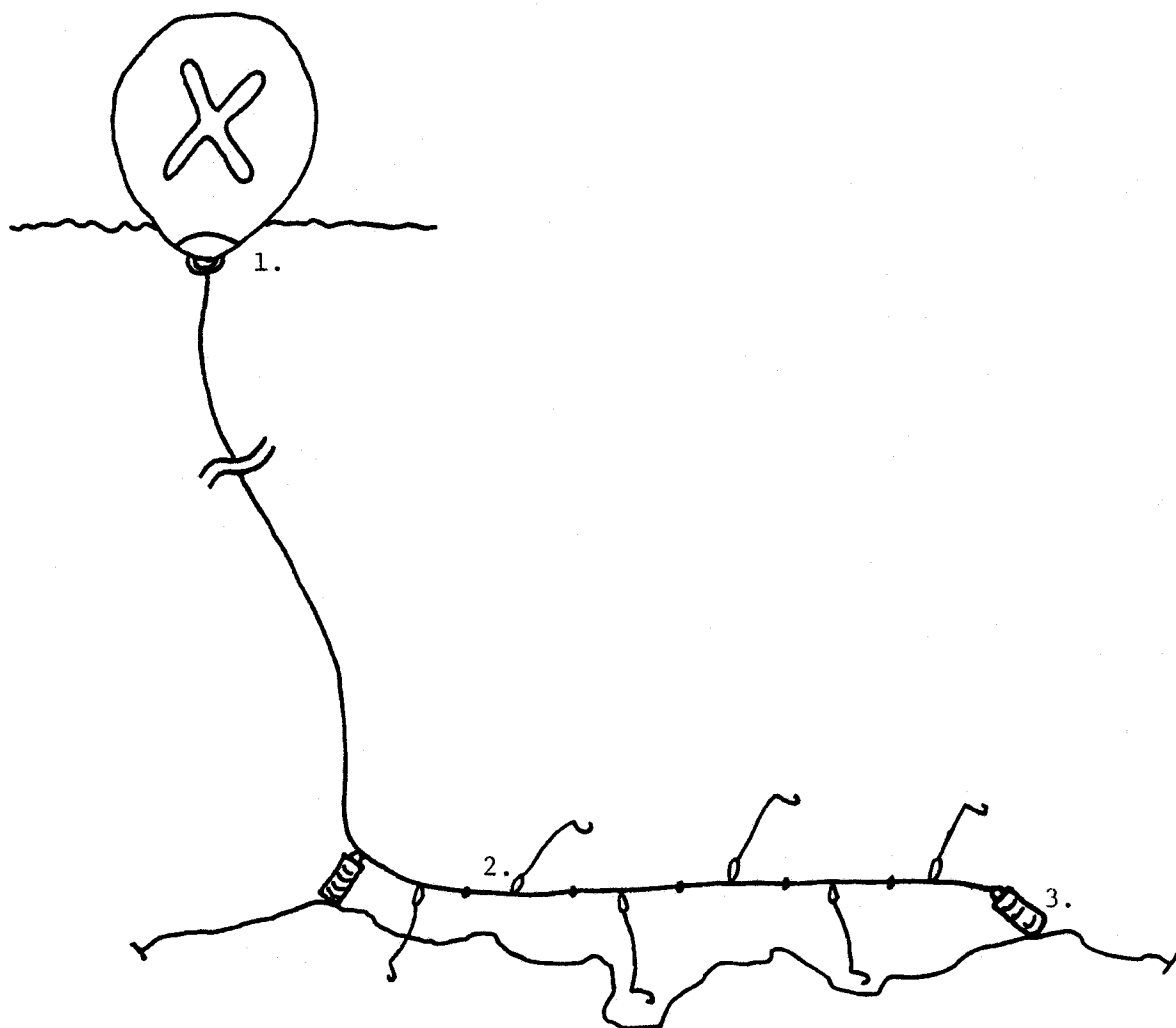


Figure 3. A bottom longline constructed of a float (1) attached to 100-200 fathoms of 0.25 inch polypropylene line. Tuna Gangions with hooks wired on them (2) are placed every fathom between the two 5 lb. weights (3) which keep the hooks near the bottom. Knots between the hooks prevent the gangions from bunching up when big fish are hooked. From 15 to 20 hooks and gangions give the best results (Olsen, et al., 1974).

TABLE 12.

Catch composition of a vessel utilizing the bottom longline technique (see text for description). All weights are cleaned weight. Data are cumulative from 14 fishing trips (February to May, 1984). Relative abundance is calculated on the basis of numbers of fish caught.

SPECIES	NUMBER	TOTAL CLEANED WEIGHT(lbs)	AVERAGE CLEANED WEIGHT(lbs)	RELATIVE ABUNDANCE
Misty Grouper (<u>Epinephelus mystacinus</u>)	118	2780.18	23.56	.27
Queen Snapper (<u>Etelis oculatus</u>)	106	729.95	6.89	.24
Silk Snapper (<u>Lutjanus vivanus</u>)	45	192.9	4.29	.10
Wenchman Snapper (<u>Pristipomoides aquilonaris</u>)	64	83.85	1.31	.15
Yellow-Edge Grouper (<u>Epinephelus flavolimbatus</u>)	5	110.13	22.03	.01
Red Snapper (<u>Lutjanus campechanus</u>)	2	15.25	7.63	.005
Tilefish (<u>Caulolatilus</u> sp.)	1	5	5	.002
Dogfish Sharks (<u>Squalidae</u>)	95	344.73	3.63	.22
TOTALS	436	4,261.99	----	.997

spots is difficult in 200 fathoms of water fifteen miles offshore so the operator continues hoping to hit another ledge or concentration of fish.

One other boat had been using this method out of Coral Bay to provide ciguatera-free fish for a restaurant, but ceased operations about the time this study started. Although all fish caught by this method are caught well outside of Virgin Islands Biosphere boundaries, they are brought back in and sold locally, thus effecting the socioeconomics of the St. John fishing industry.

3.1.8 Surface Longline

The same boat which utilizes the bottom longline method during the day will often remain at sea for the night and set a surface longline. This is constructed of a heavy mono-filament main line up to five miles in length, bouyed at the surface at each end and at intervals in between. This line lies about 10 fathoms below the surface and has tuna gangions (Figure 3) at fixed intervals with drop lines containing a baited hook. The most common baits are squid and small mackerel or bonito. Chemical light sticks are often attached to the bait as an attractor.

The line is set before sunset and retrieved shortly after dawn. The primary target species of this method is the swordfish. Tuna, shark and other pelagics are often caught also. During the period of February to May, 1984, nine surface longline trips were made. Five swordfish were caught for a total of 490.4 pounds (Table 13). Sharks may have been the most abundant fish caught but many were cut loose rather than handle them and many of the smaller ones were given away and therefore, not recorded in the sales records.

3.1.9 Net Fish

A traditional method of catching coastal migratory pelagic species of fish is to set a beach seine, purse seine or gill net. Collectively, any fish caught by any of these methods are referred to as net fish. During the course of this study, one boat was seen twice at the Cruz Bay public dock selling net fish. On

both occasions the three fishermen in the boat would not respond to any questions. It is, therefore, impossible to say where the fish were caught. On both occasions the fish they had included bonito, blue runner (hardnose) and bar jack (carang), the fish most commonly caught in nets.

As the National Park Service prohibits nets greater than twenty feet in length from being used in their waters, it can be assumed that these fish had not come from within the Virgin Islands Biosphere Reserve. As the boat had a U.S. Virgin Islands registration number, it can further be assumed that the fishermen were from St. Thomas, as the boat is not from St. John.

3.1.10 Commercial fisheries summary

During the course of this study, fisheries resources taken near or landed on St. John by ten different fishing methods were sampled. Reported landings for the period of the study total 16,067.37 pounds for a total reported value of \$38,220.96 (Table 14). Pot fish represented the greatest proportion of the landings followed by bottom longline and handline hookfish.

TABLE 13.

Catch composition of a vessel utilizing the surface longline technique (see text for description). All weights are cleaned weight. Data are cumulative from 9 fishing trips (February to May, 1984). Relative abundance is calculated on the basis of numbers of fish caught.

SPECIES	NUMBER	TOTAL CLEANED WEIGHT(lbs)	AVERAGE CLEANED WEIGHT(lbs)	RELATIVE ABUNDANCE
Swordfish (<u>Xiphias gladius</u>)	5	490.4	98.1	.45
Bigeye Tuna (<u>Thunnus obesus</u>)	1	87.13	87.13	.09
Yellowfin Tuna (<u>Thunnus albacares</u>)	4	100.85	25.2	.36
Shark*	1	35.5	35.5	.09
TOTALS	11	713.88	---	.99

*Other sharks caught were discarded or not sold.

TABLE 14.

Total reported commercial landings and value of fisheries resources taken near or landed on St. John, U.S. Virgin Islands during the period of January to June, 1984. Relative abundance is based on landings.

Fishing Method OR Target Species	Total Reported Landings (lbs.)	Reported Value	Relative Abundance
Pot Fish	5,285.00	\$10,374.00	.33
Hook Fish	4,100.50	7,171.50	.25
Lobster	1,405.50	7,027.50	.09
Conch	192.00	384.00	.01
Spear Fish	81.00	162.00	.005
Whelk	28.00	---	.002
Vertical Longline	4,261.99	10,203.00	.27
Surface Longline	713.88	2,898.96	.04
TOTALS	16,067.37	\$38,220.96	1.007

3.2 Subsistence Fishermen

A subsistence fisherman can be defined as a person who fishes strictly to obtain food for personal use and who is required by law to have a fishing license. This type of fisherman is either retired or has other full-time employment. A subsistence trap fisherman sets out from one to ten fish traps and sometimes does some handline fishing (Table 15). Traps are usually hauled every weekend, and yield from six (6) to fifty (50) pounds of fish per month. Some fish may be given away to friends or family members of different households; in general, more than one person benefits from the fish caught.

From species lists provided by the fishermen interviewed, species caught are essentially the same as sampled in commercial fishermen's catches (Table 3). Most of the subsistence fishermen interviewed have their own boats or use friends' boats to haul their traps. Boats are generally small (14 to 18 feet) and usually have a small outboard engine. Some fishermen haul their traps by rowing their boats to where they are set. The majority of subsistence level fishing appears to take place from Rams Head around to East End and south of Cruz Bay, mostly outside of National Park Service waters. This is probably because most subsistence fishermen live in Coral Bay/John's Folly area and some in Cruz Bay, and most subsistence fishermen do not travel very far ($\frac{1}{2}$ to four miles) from port to fish. Within the Park, the most intensively fished bay appears to be the Lameshur Bays with three fishermen reporting a total of seventeen (17) traps set in these bays.

3.3 Fish Importer

One person interviewed on St. John supplements her regular income by importing fish from the British Virgin Islands three times a week. Fish is bought from the British Virgin Islands Fishing Co., LTD. and brought to St. John three times a week on a local ferry. Twice a week the fish brought in is sold directly to several hotels on the island. The third time the fish is sold on the dock to the general public. All fish imported is already cleaned and scaled. Sometimes it is already

TABLE 15.

Gear and landings data on subsistence fishermen on St. John, U.S. Virgin Islands. Ten (10) subsistence fishermen cooperated in the interviews.

FISHERMAN #	# TRAPS	OTHER METHODS	# TIMES FISH/MO.	LBS.FISH PER MO.	USE OF FISH ¹	# PEOPLE BENEFITTING	AREA FISHED
1	7	---	4	30	P	10	Lameshur Bays
2	3	Handline	4	50	P/G	N/A	John's Folly
3	5	Handline	4	40	P	5	East End
4	5	---	4	25-30	P	8-9	East End
5	0	Handline	2	25	P	7	SW St. John
6	0	Speargun	1	10-15	P	4	East End/ S. Cruz Bay
7	1	---	4	6	P	5	SW St. John
8	2	---	4	10	P	4	No. Shore
9	8	---	3-4	20	P	5	Lameshur Bays
10	2	---	4	8	P	4	Lameshur Bays

¹P-Personal, G-Gift

TABLE 16.

Composition and weights of fish imported to St. John, U.S. Virgin Islands from Tortola, British Virgin Islands, by a sole importer during the period of January to June, 1984. All weights are in pounds. All listed here were sold to the general public.

MONTH	NO. SAMPLES	POTFISH	LOBSTER	CONCH	OTHER
January ²	0	---	---	---	---
February	4	790	---	---	---
March	4	980	16	5	50 ¹
April	3	400	---	5	---
May	2	225	8	5	---
June	3	362	8	---	---
TOTAL	16	2,757	32	15	50
Avg. lbs./trip		172.3	2	.95	3.1
Est. lbs./year		8,960	104	49	161

¹Fifty (50) lbs. of Bonito were imported as bait for a commercial longline vessel.

²We did not know of this importer in January.

filleted. On special order, lobster, conch, or other specialty fish will be brought to the individual requesting it.

The majority of fish brought in is pot fish of similar composition to that brought in by local fishermen. Total poundage of all imports for public consumption during the study period are shown in Table 16. Prices are slightly higher than those charged by the local commercial fishermen, however, this is due to the fish being already cleaned and scaled. In all cases where this importer was interviewed, all fish were sold relatively quickly supporting the contention that on St. John, the demand is always equal to or greater than the supply.

4. DISCUSSION

It is quite clear that all fishing done in St. John and adjacent waters uses artisanal West Indian techniques with the exception of the longline vessel and spear fish fishermen. Eight artisanal methods were sampled with trap fishing being the most common.

The majority of all fishing done in Virgin Islands Biosphere Reserve (NPS) waters is subsistence or recreational in nature as commercial fishing is prohibited. In spite of this prohibition, several traps reported as being located in the Park waters have been associated with boats belonging to commercial fishermen (M. Sutton, personal communication). Other boats reported fishing belong to subsistence or recreational fishermen.

While the distinction between commercial and subsistence or recreational fishermen is clear, the difference between subsistence and recreational is not. A distinction can be made on the basis of economic need and fishing methods used, although a large grey area makes the two terms interchangeable.

A number of very real problems exist with attempting to obtain landings data from fishermen and will be described here as problems to be considered when designing a port or fisherman sampling program. Some of these problems are peculiar to St. John and may not apply elsewhere.

- 1) In general, demand is much greater than supply. This makes it difficult to obtain numbers and length/weight data for individual species because of the volume of customers and the speed of sales. Sometimes customers will allow their purchase to be measured and some data can be obtained this way. It is important not to interfere with sales as fishermen's cooperation can be lost.
- 2) When the demand is much greater than the supply, there is no pressure on the fishermen to be the first one back to port to sell their catch. This lack of a competitive market produces extremely variable and irregular port arrival times of the fishermen. The fisherman can always sell his catch. This makes it extremely difficult to sample all fishermen as much time could be spent waiting.
- 3) Non-commercial fishermen go out when they want to and generally return to widely dispersed sites. Data can only be obtained from these fishermen by chance or through an interview system with pre-made sample forms. Fisherman cooperativeness can be enhanced by obtaining the desired information in conversation and filling in your forms later.
- 4) Fishermen, by their very nature, tend to be independent and usually reluctant to discuss their catches or fishing locations with anyone. This suspicion that catch information is wanted for tax purposes or to somehow regulate fishing makes it extremely difficult to obtain reliable data, if any. The other extreme is the fisherman who inflates his catch to make people, usually other fishermen, think he is doing better than he is.

The distribution of landings by catch method on St. John is different than previously reported for the Virgin Islands and St. Thomas/St. John in general. While previous reports for percent of total catch being composed of potfish range from sixty-eight (68) to nearly ninety (90) percent (Clavijo, 1984 and Olsen, et al 1975, respectively), this study shows St. John landings of pot fish to be much lower but still most abundant. This is due to the low number of full-time pot fish fishermen and the disproportional amount of longline landings compared to St. Thomas and St. Croix.

It is concluded that the vast majority of all known fishing activity, both commercial and subsistence/recreational, affecting socioeconomics on St. John takes place outside of the Virgin Islands Biosphere Reserve/National Park Service waters. Seven (7) boats have been reported as tending traps in National Park Service waters. Two (2) boats have been reported as lobstering in NPS waters and one (1) as hand-line fishing. Total traps observed in NPS waters are less than two dozen. All lobstering in NPS waters is done by hand and is concentrated around Fish and Reef bays on the south side and Johnson's Reef on the north side. Conch taken in NPS waters is primarily subsistence/recreational and is mostly confined to the south shore where grass beds are more abundant. Hook fish taken in NPS waters is mainly limited to bottom fishing and trolling by recreational vessels, both of which are next to impossible to sample.

It is apparent from conversations with British Virgin Islands fisheries officers and operators of the British Virgin Islands Fishing Co., LTD. that few, if any British Virgin Islands fishermen fish in NPS waters, preferring their own waters which are less overfished. One fisherman is reported to occasionally fish in St. John waters but it was said to be hard to contact him and that he would be reluctant to admit fishing in U.S. Virgin Islands waters even though it is allowed under the USVI/BVI Reciprocal Fisheries Agreement (1979).

It appears then that little intensive fishing takes place within the Virgin Islands Biosphere Reserve/National Park Service. As such, this area may serve as a refuge for many individuals that would be harvested if they were outside the VIBR/NPS. It would be interesting to compare numbers and sizes of individual species found within the VIBR/NPS with those found outside the VIBR/NPS on St. John and St. Thomas. This might quantitatively demonstrate lesser fishing pressure and possibly more abundant and larger fish found in the VIBR/NPS. This protected area may also be serving as a recruitment source and emigration base for areas outside the VIBR/NPS where fishing pressure is greater.

Another possibility is that the current numbers, sizes and species composition of fishes in the National Park are smaller and different from what they were before

any fishing was done in these waters. Unfortunately, there are no records documenting these statistics nor are there records of whether past fishing in these waters was greater than present. Even with little present fishing, the numbers, sizes and species composition could be affected by more intensive fishing being done outside of National Park waters, thus creating an excess of external available habitat, drawing fish out of the National Park waters. This would produce a similar affect as overfishing within the National Park waters.

5. ACKNOWLEDGEMENTS

This project was funded by the National Park Service, Contract NO. CX-001-2-0048 (Work Order No. PX-0001-3-0885) and administered by Island Resources Foundation in conjunction with the Virgin Islands Resource Management Cooperative (VIRMAC). Thanks go to Marielle Brandon and Ann Swanbeck of the Division of Fish and Wildlife for their assistance in collecting port sample and subsistence fishermen data, respectively. Special thanks go to all the fishermen of St. John who provided information for this project during port sampling and other interviews. Michael Sutton provided information on boats observed fishing around St. John in NPS waters. Dr. Arthur Dammann provided much appreciated advice and technical support. Dr. Robert Brander made possible these projects in the first place and to him go thanks for all his effort. Thanks also go to Kathleen Brown and Charlene Vaughan for typing and retyping this paper.

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Date: _____

[illegible]

Subsistence Fishermen Sampling form
Division of Fish and Wildlife

1. Number of Traps _____
2. Other Fishing Methods _____
3. Approximate location of fishing activity _____
4. Distance from home _____
5. Number of times per month haul traps/other methods _____
6. Approximate pounds of fish per month _____
7. Principal use of fish caught (personal or given away) _____
8. Number of people benefitting from fish caught _____
9. Main species caught (list below)

