COLLECTION OF COMMON ORGANISMS WITHIN THE VIRGIN ISLANDS NATIONAL PARK/BIOSPHERE RESERVE

BIOSPHERE RESERVE

RESEARCH

REPORT NO. 3

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Abstract

REPORT NO.3
Subtask 1.2

COLLECTION OF COMMON ORGANISMS WITHIN THE VIRGIN ISLANDS NATIONAL PARK/BIOSPHERE RESERVE, ST. JOHN, USVI

A scientific collection of the common marine macrofauna and macroflora within the Virgin Islands National Park was prepared to enhance the existing Virgin Islands National Park Marine Specimens Collection. Major emphasis was given to evaluation of the existing collection and preparation of a holdings list of specimens and their relative condition. A general collection was completed for replacement of deteriorated and missing specimens and addition of previously uncollected species. Over 500 specimens were collected, prepared and curated using National Park Service guidelines. Information on collection location, relative abundance, associated species and other relevant data was recorded, listed on note cards and submitted with the collection for reference. Descriptions of proper methods for collection, fixation and preservation methods were prepared for reference.

Additionally, phototransects and quantitative collection/surveys were conducted to provide baseline information for long-term monitoring. The phototransect method is described and results from the quantitative surveys is presented. A list of general observations and recommendations for future collections and adequate curation is included in the report.

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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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ACKNOWLEDGEMENTS

For assistance during our work, we thank the following persons: Ralf Boulon of the Division of Fish and Wildlife for invaluable assistance in the field and all facets of the subtasks; Bob Brander, Vonnie Zullo, Jim Riddle, Caroline Rogers and the rest of the staff of the Virgin Islands National Park for technical and logistic support; Betsy Gladfelter, Miles Anderson and Holly Lund of the West Indies Laboratory for advice and assistance in design and preparation; Arthur Dammann for advice and information on previous work and collections in the Virgin Islands area and Bruce Coblentz of Oregon State University for information and assistance in fish collection.

Additionally, we would like to thank Superintendent Noel Pachta and the Virgin Islands National Park for making available the NOS aerial photographs, the park research boat for field work, laboratory space and supplies for collection curating and an endless amount of logistic support.

1. INTRODUCTION

The emphasis of Subtask 1.2 was to produce a scientific collection of the common marine macrofauna and macroflora within the Virgins Islands National Park to enhance the holdings within the Virgin Islands National Park Marine Specimens Collection. Previous collections by various investigators have yielded an incomplete and fragmented collection. A major portion of this investigation was an evaluation of existing specimens and a brief assessment of collection condition.

Two approaches were taken for collection of specimens. First, a general collection of all common specimens was accomplished simultaneous to the field investigation for Subtask 1.1. Information on all specimens was recorded during collection and transcribed to note cards which accompany the collection. Secondly, a quantitative method was investigated within Areas of Particular Concern. A long-term monitoring phototransect method was combined with simultaneous collection of specimens.

Specimens collected during this investigation have been given NPS labels with accession and catalog numbers, preliminary identification and corresponding cards with locality information and collection notes. An extreme effort was made to prepare and preserve specimens for adequate reference and review.

A discussion on present collection conditions is presented. Collections previously completed within the area are reviewed. Recommendations are presented for future collections and adequate curation.

2. METHODS AND MATERIALS

Phototransects and simultaneous collection of marine invertebrates, algae, plants, and fish were accomplished to provide information on long-term monitoring and enhance the Virgin Islands National Park Service Marine Specimens Collection. The collecting of common marine organisms was accomplished within the park waters. The methods used for phototransects and simultaneous collection is presented in the following section. Specific methods for collection and preservation of marine specimens are presented in Section 2.2. Color photographs of many specimens were taken to aid in identification.

2.1 Phototransect Methods and Materials

Phototransects were accomplished in Areas of Particular Concern. At least two phototransects were accomplished within each area. One or more transects were established in each of the upper and lower fore reef zones. Each transect was located in representative areas of hard substrate zones. The phototransects were 20 meters in length unless physical restrictions of the area required the establishment of two 10 meter transects. The ends of each transect were permanently marked with a one meter length of steel reinforcing rod. For ease of relocation, each transect was mapped and large outstanding features described.

For each transect, a line marked every meter with a knot and surveyor tape was stretched between the two steel rods. The line was placed as close as possible to the substrate. Photographs were then taken every meter along the transect line with approximately 30% overlap. This yielded a continuous record approximately one meter wide along the transect line. A small slate was placed at the beginning and end of each transect with the following information: 1.) transect location; 2.) direction of phototransect; 3.) quadrat number; 4.) depth; and 5.) film speed.

Several workers have used a large rigid frame attached to the camera to ensure correct distance and defined unit area. During this investigation, a modification of the method derived by Boulon (1980) was used. A piece of surveyor tape was tied to the transect line on the half meter and was used as the point of reference for each photograph. A weight on a two meter line was suspended from the camera. When the weight and the point of reference met in the center point of the camera framer with the weight contacting the

substrate, the photograph was taken. This ensured correct distance and location. This technique proved efficient and simple. Surge in shallow water causes a major problem in maintaining position.

The camera used was a Nikonos IV-A with 28mm lens and a Nikonos SB-101 strobe. Kodachrome 64 film was used for sharp detail and good color definition to improve species recognition and percent live coverage definition. Initially, test shots of a typical reef area circumscribed within a marked square meter quadrat were accomplished using this camera system. The test shots demonstrated that best definition with least distortion was obtained by photographing at a distance of two meters from the substrate. The strobe was set on automatic for color enhancement and fill. With the long axis of the framer lined with the transect line, the resultant photograph covered a square meter area with approximately a 30% overlap of the adjacent meters. The metered line was used for reference in the photographs and dimensions used for measurements.

Upper fore reef with dense Acropora palmata stands in shallow water are extremely difficult to photograph. A modification of the above method was required. Within these areas, the transect line was placed along a stand of Acropora palmata in a channel. The photographs were taken horizontally by stretching the reference line out from the transect line. A large square meter framer attached to the framer would be extremely beneficial within this type of habitat to insure position.

Simultaneous to the photographic work, a collection of representative organisms was accomplished. Within 0.5 meter of each side of the transect line, the common benthic organisms were counted and of all organisms observed were recorded. These data are supplemental to the data recorded on the phototransects of colonial organisms.

Areas of Particular Concern were selected as location for phototransects. Fish and Hawksnest Bays were selected due to the present and potential sedimentation from development. Hawksnest Bay is located on the northwestern shore of St. John, while Fish Bay is located on the southwestern shore. Their location is presented in Figure 1.

2.2 Collection Methods and Materials

The methods for collecting, narcotization, fixing and preserving are presented in detail as an aid for the preparation of reference and

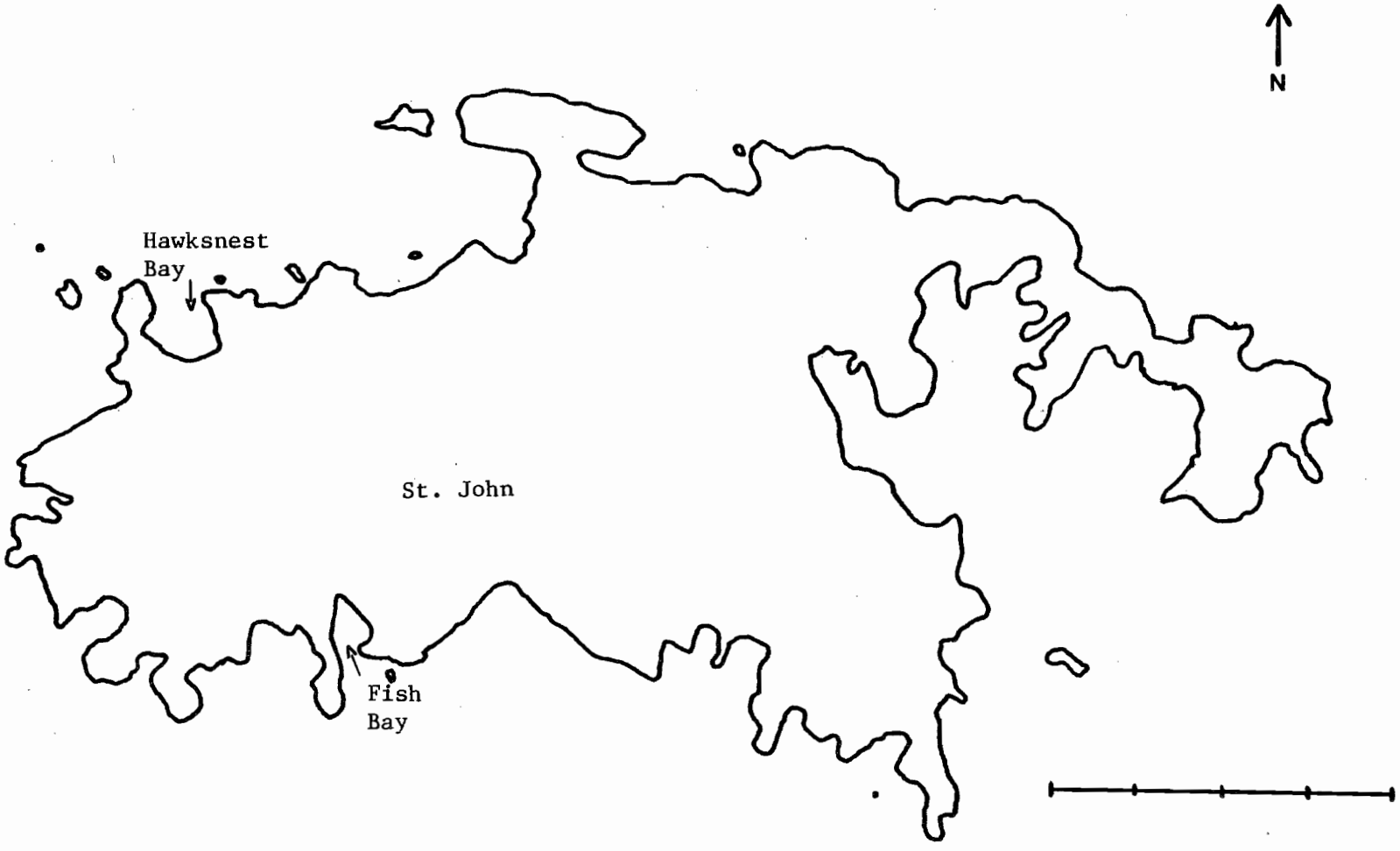

Figure 1. Location of Hawksnest and Fish Bay - St. John.

representative collections of marine flora and fauna.

Generally, most specimens for the collection were acquired by snorkeling or SCUBA. Most specimens were collected and handled with gloves to avoid being stung. Delicate specimens were placed in labelled plastic bags whereas larger specimens such as sponges, gorgonians, hard corals, shelled molluscs, seastars, sea cucumbers, and fish were held in mesh bags. Included with the specimen at the time of collection are the field notes which include the date, location, depth, type of substrate, associations with other species, and any other physical parameters (i.e. water temperature, current velocity, etc.) which might affect the specimen's zonation or ecological distribution.

Some animals need to be narcotized so that body parts needed for identification are observable. In such instances, a few crystals of either L-ascorbic or citric acid (Sigma Chemical Co.) were added to help maintain the specimen's coloration throughout the fixing and preserving processes. Animals which possess calcium carbonate structures must always be fixed in buffered formalin (pH: 6.8-7.2) in order to retard disintergration of those structures. Preliminary identification of specimens were completed with the use of available keys and relevant publications. Publications and keys used in Subtask 1.2 are presented in References.

Once a collection has been accessioned and cataloged, it must be properly maintained. The collection should be checked every 2-3 months in order to fill the jars with alcohol, check on condition of specimens, check for disintergrating labels and update label information.

2.2.1 Sponges

Collecting: Animals were deattached at base with dive knife or putty knife.
Fixing: Specimens were fixed with 70% Ethyl Alcohol (ETOH) and 5% glycerol for one week.
Preservation: The sponges were either dried or preserved in 70% ETOH and 5% glycerol.

2.2.2 Delicate Hydroids

Collecting: Hydroids were collected by insertion of dive knife into substrate beneath the animal and lifting. They were commonly found on such substrates as sponges, buoys, fish traps, or fish trap lines.

Narcotization: Animals were relaxed with a solution of 8% $MgCl_2.5H_2O$ (Sigma Chemical Co.).
Fixing: Specimens were fixed in 8% Formalin.
Preservation: Animals were washed in freshwater for two days and then placed in 70% ETOH and 5% glycerol.

2.2.3 Hydrocorals
Collecting: Branching types were removed near the base with butt of dive knife. Encrusting types were removed with aid of dive knife and hammer or collected with a piece of substrate.
Fixing: Specimens were air dried for one week or more then bleached (Clorox diluted to 25%) for at least 3 weeks. (Note: Too high a concentration will destroy the calcium carbonate structure.)
Preservation: Specimens were washed thoroughly with freshwater and allowed to dry.

2.2.4 Scyphozoans (Jellyfish)
Collecting: The medusa was carefully maneuvered into a plastic bag. The bag was filled with water to prevent damage to the specimen.
Narcotization: Specimen was relaxed with 8% $MgCl_2.5H_2O$ solution for one hour.
Fixing: Specimens were fixed with 8% Formalin for one week.
Preservation: Animal was washed in freshwater for two days then placed in 70% ETOH and 5% glycerol.

2.2.5 Gorgonians and Antipatharians
Collecting: Animals were removed at the attachment point to substrate with the aid of dive knife and hammer.
Fixing: Specimens were fixed in 8-10% Formalin for one week or more.
Preservation: Specimens were washed in freshwater for four days and allowed to dry or placed in 70% ETOH and 5% glycerol.

2.2.6 Anemones
Collecting: When possible, the anemone's gastrovascular cavity was flushed continually for one hour with a 10% solution of $MgCl_2.5H_2O$. This induced relaxation of the basal attachment muscles. The anemone was then removed

with a putty knife or dive knife. The preferred method is collecting the specimen with the attached substrate.

Narcotization: Specimens were relaxed with the addition of a few drops of 8% $MgCl_2.5H_2O$ solution, crystals of urethane or menthol (Sigma Chemical Co.), and slow heating.

Fixing: After the specimen became unresponsive to physical stimuli, a small volume of 8% Formalin was added. If no response was detected, the rest of the Formalin was added and animal was held in this solution for one week.

Preservation: Anemone was washed in freshwater for three days and preserved in 70% ETOH and 5% glycerol.

2.2.7 Zoanthids, Corallimorpharians, and Cerianthids

Collecting: Zoanthus spp. and Palythoa spp. were administered a 10% $MgCl_2.5H_2O$ solution for one hour, then 12% Formalin was administered via syringe until specimens did not respond to pressure. The specimens were then removed by lifting and peeling from the substrate. Ricordea sp. and other delicate zoanthids and corallimorpharians would always be removed with attached substrate for the tissue is easily torn. If this method is not possible, the same method for anemone removal was used. Burrowing species were removed by utilizing the same techniques for delicate hydroid removal.

Narcotization: Animals were relaxed with slow heat and crystals of menthol, MS-222 (Ethyl m-Aminobenzoate; Tricaine methane sulfonate) (Sigma Chemical Co.), and drops from an 8% $MgCl_2.5H_2O$ solution.

Fixing: When relaxed, specimens were fixed in 8% Formalin for one week.

Preservation: Specimens were washed for three days in freshwater and placed in 70% ETOH and 5% glycerol.

2.2.8 Scleractinians (True Corals)

Collecting: Due to coral morphology, several techniques were necessary for the removal of good specimens. Most were removed with a dive knife and/or hammer.

Fixing and preserving techniques were the same used for Hydrocorals.

2.2.9 Gastropods

Collecting: Normally, specimens were removed from substrate by hand.

Fixing: Each specimen was placed in seperate labelled jars with freshwater

to allow disintegration of tissue. Numerous changes of freshwater were necessary. Care was taken to retain operculum.
Preservation: Specimens were allowed to dry and placed in box with operculum.

2.2.10 Nudibranchs and Sea Hares
Collecting: Animals easily removed from substrate by hand.
Narcotization: Slow heat with drops of an 8% $MgCl_2.5H_2O$ solution or urethane, menthol, or MS-222 crystals relaxed the animals.
Fixing: Specimens were fixed in 8% buffered Formalin for ten days.
Preservation: Specimens were washed in freshwater for two days then placed in 70% ETOH and 5% glycerol.

2.2.11 Limpets and Polyplacophorans (Chitons)
Collecting: Due to extreme muscular attachment to the substrate, specimens were removed by insertion of putty knife between their foot and substrate and lifting.
Narcotization, Fixing, and Preservation techniques were the same as in 2.2.10.

2.2.12 Bivalves
Collecting: Since most bivalves were cemented or adhered to substrate via byssal threads, a dive knife was used to pry them free.
Narcotization: The addition of drops of 100% Clove oil (Sigma Chemical Co.) and an 8% $MgCl_2.5H_2O$ solution in conjunction with slow heat completely relaxed the animals.
Fixing: Bivalves were fixed in 8% buffered Formalin for one week or more or allowed to disintegrate in freshwater and then dried.
Preservation: Specimens were washed for four days in freshwater and placed in 70% ETOH and 5% glycerol.

2.2.13 Cephalopods
Collecting: Squid were collected easiest at night from a boat or dock. A strong light was directed through the water. When the squid approached, it was retrieved with a cast or dip net. Collecting octopods required the prodding of the octopus out of its hole and into a mesh bag.
Narcotization: Slow heat, MS-222 crystals and a 2% Curare solution (Sigma

Chemical Co.) relaxed the specimens.
Fixing: Specimens were fixed in 10% buffered Formalin.
Preservation: Specimens were washed in freshwater for five days and placed in 70% ETOH and 5% glycerol.

2.2.14 Platyhelminthids, Annelids, and Sipunculids
Collecting: Free living worms were maneuvered into a plastic bag. Worms housed in soft tubes were removed by carefully deattaching the tube from the substrate. Worms in calcium carbonate tubes were removed with their substrate.
Narcotization: The specimens were ususally relaxed with slow heat and also with the addition of urethane crystals and an 8% $MgCl_2.5H_2O$ solution.
Fixing: A few drops of 8% Formalin were added, if the worms did not contract, then the remaining Formalin was added.
Preservation: The animals were washed for two days in freshwater and then placed in 70% ETOH and 5% glycerol.

2.2.15 Crustacea (shrimps, lobsters, and brachyuran crabs)
Collecting: Shrimp and other small crustaceans were maneuvered into plastic bags. Collecting of floating or attached algae and washing into small mesh screening would also produce numerous specimens. Lobsters were either snared (tail or antenna) or caught by hand. Brachyuran crabs were usually caught by hand. Arthropods were normally handled by the specimen's carapace since handling extremities usually resulted in their loss.
Narcotization: Relaxation was always complete and accomplished by slow heat, drops of clove oil, crystals of MS-222, and drops of a 2% Curare solution. If relaxation is not taken to completion, the fixing process will make the specimen unnecessarily brittle.
Preservation: Specimen was washed in freshwater for seven days or longer and then placed in 70% ETOH and 5% glycerol.

2.2.16 Starfish, Brittle stars, and Basket stars
Collecting: All were collected by hand. In most instances, basket stars had to be cut from the surrounding gorgonian. Brittle stars were always handled by oral disc to avoid loss of limb.
Narcotization: Animals were relaxed with slow heat, menthol and urethane

crystals, and drops of a 2% Curare solution. In general, echinoderms took four to eight hours for complete relaxation.
Fixing: Specimens were fixed in 8-10% Formalin for one week.
Preservation: Specimens were washed in freshwater for five days and placed in 70% ETOH and 5% glycerol.

2.2.17 Echinoids (Urchins)
Collecting: Most urchins were found either boring into rocks, between coral heads, under rocks, or sometimes in grass beds and underneath the sand substrate. Most were collected by hand. Sharp spined urchins were guided into a mesh bag with dive knife.
Narcotization: Slow heat and menthol crystals relaxed the animals.
Fixing: Specimens were fixed in 8-10% Formalin for one week.
Preservation: Specimens were washed in freshwater for six days and either dried or held in 70% ETOH and 5% glycerol.

2.2.18 Holothurians (Sea cucumbers)
Collecting: Animals were collected by hand.
Narcotization: Slow heat, menthol crytals, and drops of a 2% Curare solution
Fixing: Specimens were fixed in 10% Formalin for one week. Large specimens were cut on the ventral surface to expose viscera to fixative.
Preservation: Specimens were washed in freshwater for four days and then placed in 70% ETOH and 5% glycerol.

2.2.19 Crinoids
Collecting: Most crinoids are found with their oral disc attachment site underneath coral heads or ledges with only their tentacles in view. They were collected by carefully removing the oral disc of the specimen from the substrate. If substrate could not be removed, a flattened rod was inserted under the oral disc and lifted thus removing the animal.
Narcotization, Fixing, and Preservation techniques were the same as 2.2.16.

2.2.20 Fish
Collecting: Small fish were collected with a hand net or by subjecting them to a Quinaldine solution (5% Quinaldine and 95% Ethyl alcohol v/v) (Eastman Kodak Co.) which was administered to individuals via a squirt bottle. This

solution was only effective in areas of little or no surge. Larger fish were caught in native style fish traps.

Fixing: Fish were fixed in 10% Formalin for one week. The abdomen was slit on the right side of the body cavity to insure fixation of viscera.

Preservation: Specimens were washed in freshwater for four days and placed in 70% ETOH and 5% glycerol.

2.2.21 Algae and Sea grasses

Collecting: Algae and sea grasses were collected by hand or by aid of a putty knife.

Fixing: Specimens were fixed in 2-3% Formalin for one week.

Preservation: Specimens were washed in freshwater for two days and either place in 70% ETOH and 5% glycerol or pressed and dried. Specimens to be dried were spread out on herbarium paper so that a large percentage of the filaments were discernable and not layered. Specimens were then pressed.

3. RESULTS

Phototransects were completed in Hawksnest and Fish Bays (Fig. 2 & 3). Two 10 meter phototransects were completed on the eastern patch of upper fore reef and one 20 meter phototransect on the middle patch of upper fore reef in Hawksnest Bay. One 20 meter phototransect was completed on the shallow bay patch reef within Hawksnest Bay. The data collected simultaneously on macroinvertebrates for the two 20 meter transects are found in Tables 1 and 2. The population density of invertebrate species along the phototransect line was recorded by number/m^2.

Two 10 meter phototransects were completed within the sediment-impacted portion of western upper fore reef within Fish Bay. One 20 meter phototransect was completed in the lower fore reef zone. Macroinvertebrate data collected along the transects are located in Tables 3 and 4.

All phototransect film (slides) have been labelled and submitted to the Virgin Islands National Park for adequate storage. Supporting information on location of transects and numbering system for slides was submitted with the film.

The list of specimens collected during the project are listed in Table 5. Specimens are listed phylogenetically with corresponding catalog numbers. Conditions listed for each specimen in Table 5 yield information on whether the specimen was preserved wet or dry and whether the species is presently represented within the park service collection or deaccessioned or unaccounted for.

Cards were completed on each specimen which contain field note information on collection location, relative abundance, associated species and any other pertinent data. The card files will be submitted to the Virgin Islands National Park Service during accession.

A complete inventory of marine specimens within the existing park service collection was accomplished. Conditions of specimens were listed and notes were recorded on missing labels, additional labels and numbers, misidentifications, specimens unaccounted for, deaccessioned specimens, unaccessioned specimens and preservation status (wet or dry). A complete list of specimens previously and presently held within the Virgin Islands National Park Service Marine Specimens Collection was prepared and distributed to divisions within the park. The list is phylogenetically arranged and contains catalog numbers and conditions. This list is not

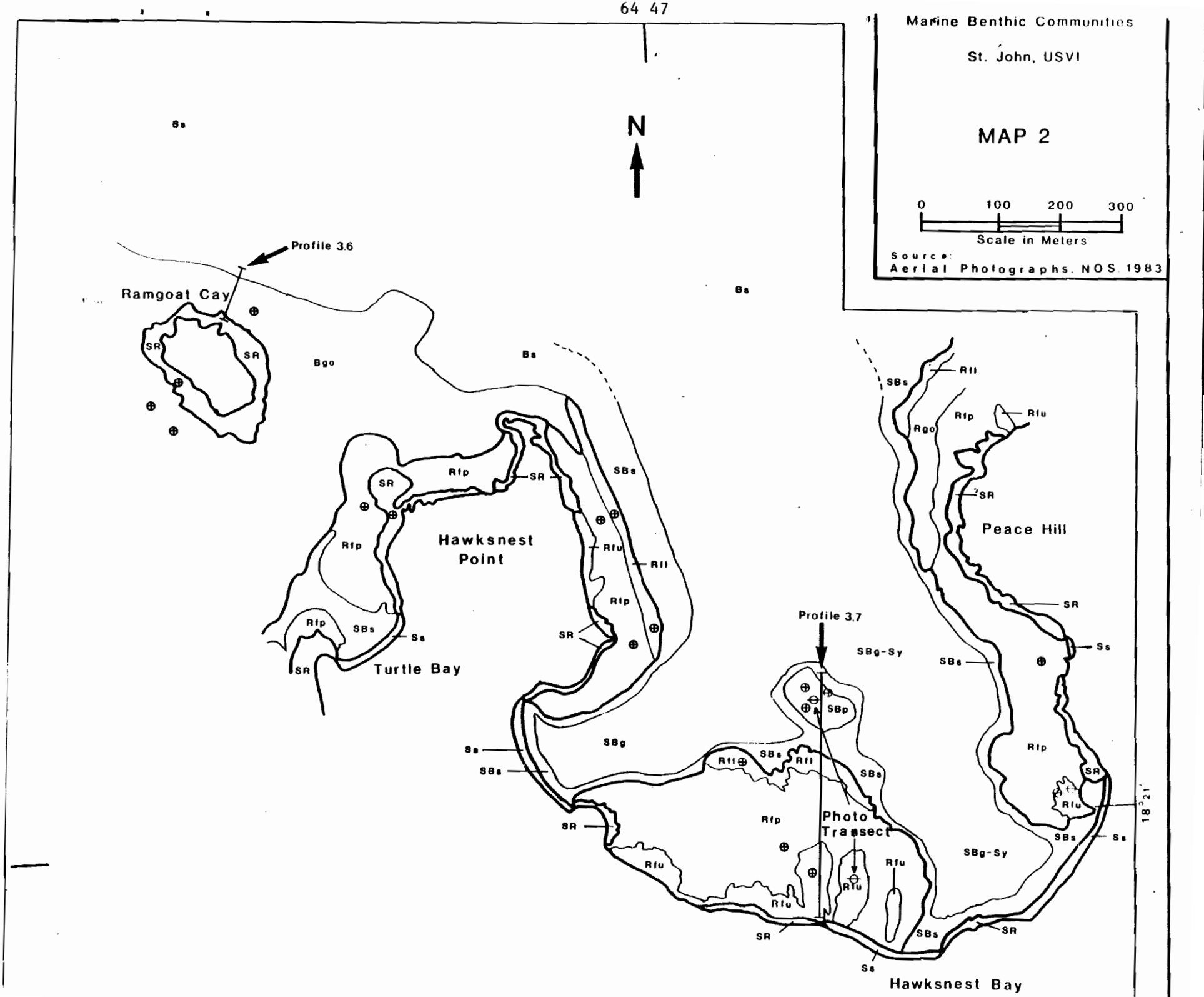

Figure 2. Location of Phototransects in Hawksnest Bay

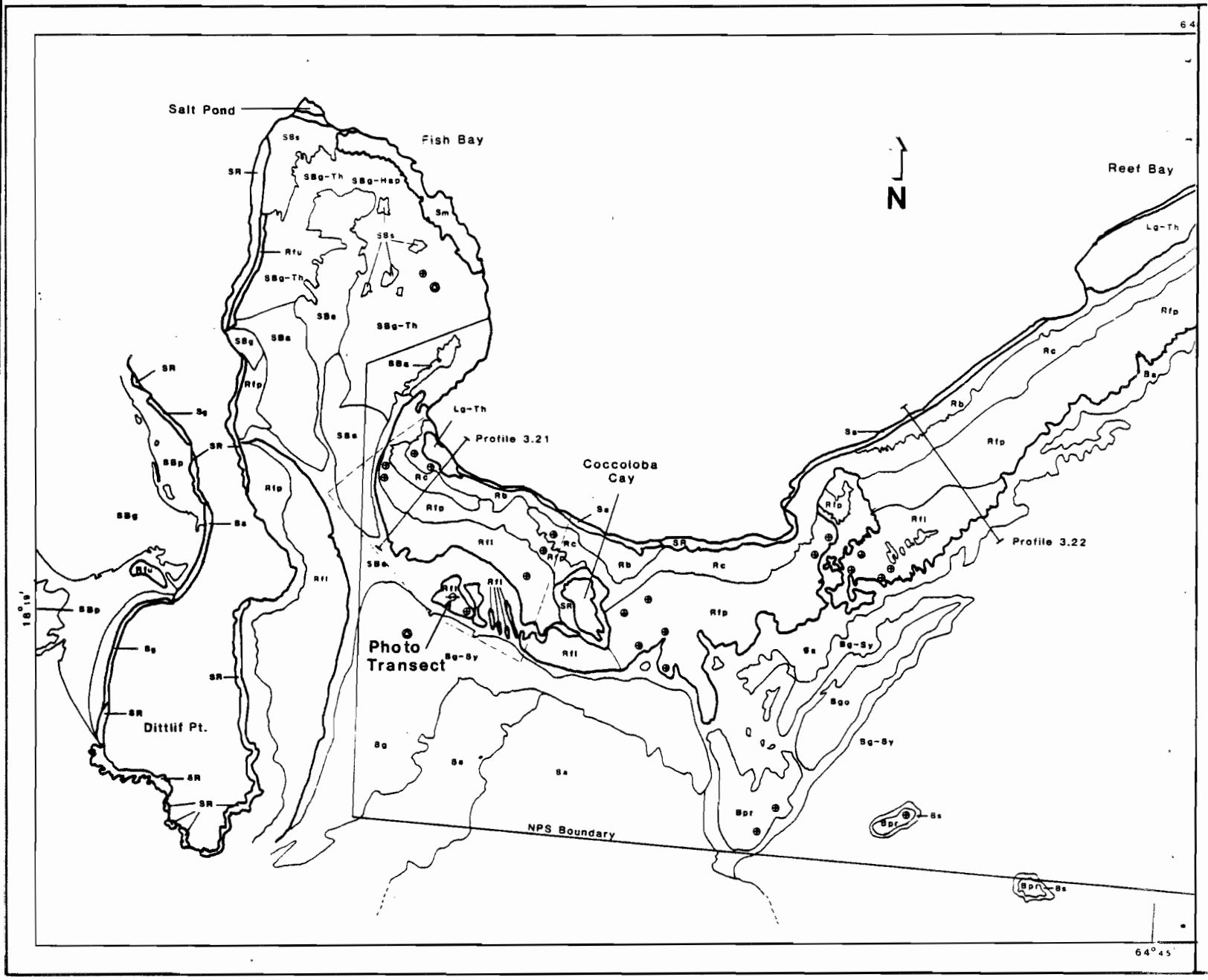

Figure 3. Location of Phototransects in Fish Bay

included in the present report, however, information was used to target species for collection and to obtain information for Table 5.

The collection completed during this project focused on specimens of common species which are not within the existing collection. Many groups were adequately collected by previous investigators. Specifically, the attempt was to enhance the holdings of hydrozoans, anthozoans, annelids, natantians, reptantians and ascidians.

Additionally, a list of fishes surveyed within the Virgin Islands National Park during 1983-1984 is presented in Table 6.

TABLE 1 Density of invertebrate organisms along the twenty meter phototransect on the upper fore reef (middle patch) in Hawknest Bay (0.5 meter on either side of the transect line)

NAME	DENSITY (number/m^2)
Sponges	0.05
Bartholomea annulata	0.1
Phymanthus crucifer	0.15
Lebrunia danae	0.05
Ricordea florida	0.7
Palythoa caribbea	0.5 colonies
Gorgonia spp.	0.3
Eunicea spp.	0.1
Astraea tecta	4.0
Cittarium pica	0.1
Leucozonia nassa	0.2
Lima scabra	0.3
Cassis tuberosa	0.05
Calliostoma javanicum	0.1
Arca imbricata	0.05
Tridachia crispata	0.3
Octopus briareus	0.05
Diodora spp.	5.0
Sabellastarte magnifica	0.25
Sabella melanostigma	0.2
Spirobranchus giganteus	0.05
Eupolymnia nebulosa	0.5
Microphrys bicornutus	0.2
Mithrax sculptus	1.0
Periclimenes pedersoni	2.0
Calcinus spp.	5.0
Ophiocoma spp.	2.0
Ophioderma spp.	1.5
Diadema antillarum	0.2
Echinometra lucunter	3.5
E. viridis	0.5
Eucidaris tribuloides	0.15
Pyura spp.	0.1

TABLE 2 Density of invertebrate organisms along the twenty meter phototransect on the patch reef in Hawknest Bay (0.5 meter on either side of the transect line)

NAME	DENSITY (number/m^2)
Sponges	1.0
Bartholomea annulata	0.8
Lebrunia danae	0.1
Phymanthus crucifer	0.05
Ricordea florida	2.0
Rhodactis sanctithomae	1.0
Palythoa caribbea	0.5 colonies
P. grandis	0.5
Zoanthus sociatus	0.05 colonies
Gorgonia spp.	0.7
Eunicea spp.	0.1
Pseudopterogorgia spp.	0.1
Spondylus americanus	0.05
Astraea tecta	0.05
Cittarium pica	0.05
Tellina spp.	0.1
Astraea phoebia	0.9
Murex pomum	0.05
Tridachia crispata	0.15
Diodora spp.	1.0
Sabellastarte magnifica	0.5
Sabella melanostigma	0.4
Spirobranchus giganteus	1.0
Eupolymnia nebulosa	0.5
Mithrax sculptus	0.05
Periclimenes pedersoni	3.0
Alpheus spp.	0.5
Thor amboinensis	0.1
Stenorhynchus seticornis	0.8
Ophiocoma spp.	0.8
Ophioderma spp.	1.0
Echinometra lucunter	6.0
E. viridis	2.0
Eucidaris tribuloides	0.2
Pyura spp.	1.5
Ascidia sydneiensis	0.1

TABLE 3 Density of invertebrate organisms along the two ten meter phototransects on the upper fore reef in Fish Bay (0.5 meter on either side of the transect line)

Transect 1 - northernmost ten meter transect
Transect 2 - southernmost ten meter transect

NAME	DENSITY (number/m^2)	
	Transect 1	Transect 2
Sponges	0.2	0.3
Bartholomea annulata	0.2	0.6
Lebrunia coralligens		0.8
L. danae	0.1	
Phymanthus crucifer	0.1	0.1
Paradiscosoma neglecta	0.2	0.3
Rhodactis sanctithomae	4.7	0.2
Ricordea florida	7.3	5.0
Palythoa caribbea	0.1 colonies	5.3 colonies
P. grandis	0.8	
Cittarium pica	0.4	0.6
Cyphoma gibbosum	0.1	
Astraea tecta	0.6	0.5
Leucozonia nassa	0.2	
Tridachia crispata	0.2	0.1
Sabellastarte magnifica	0.6	
Sabella melanostigma	0.8	0.2
Spirobranchus giganteus	0.1	0.5
Eupolymnia nebulosa	0.5	0.3
Panulirus argus juvenile	0.1	
Paguristes cadenati		0.3
Stenorhynchus seticornis		0.1
Ophiocoma spp.	2.4	0.4
Ophioderma spp.	3.1	0.6
Echinometra lucunter	0.3	2.0
E. viridis	0.1	0.3
Eucidaris tribuloides	0.5	0.1
Lytechinus variegatus	0.2	0.2
Diadema antillarum juvenile		0.1
Pyura spp.	0.2	0.3
Distaplia stylifera		0.2
Ascidia nigra		0.1
A. sydneiensis	0.1	0.1

TABLE 4 Density of invertebrate organisms along the twenty meter phototransect on the lower fore reef in Fish Bay (0.5 meter on either side of the transect line)

NAME	DENSITY (number/m^2)
Sponges	2.25
Bartholomea annulata	0.6
Heteractis lucida	0.1
Lebrunia danae	0.35
Phymanthus crucifer	0.2
Condylactis gigantea	0.05
Paradiscosoma neglecta	0.35
Rhodactis sanctithomae	0.45
Palythoa caribbea	1.9 colonies
Cittarium pica	0.05
Astraea tecta	0.15
Spondylus americanus	0.05
Strombus pugilus	0.05
Lima scabra	0.1
Tridachia crispata	0.1
Sabellastarte magnifica	0.4
Sabella melanostigma	0.45
Spirobranchus giganteus	0.4
Eupolymnia nebulosa	0.05
Paguristes cadenati	0.4
Calcinus spp.	1.15
Stenorhynchus seticornis	0.05
Stenopus hispidus	0.05
Alpheus spp.	0.1
Periclimenes pedersoni	0.5
Microphrys bicornutus	0.5
Ophiocoma spp.	0.3
Ophioderma spp.	0.4
Echinometra lucunter	0.2
Lytechinus variegatus	0.05
Pyura spp.	0.45
Distaplia stylifera	0.2
Ascidia nigra	0.05
A. sydneiensis	0.05

TABLE 5

List of specimens collected for accession to Virgin Islands National Park Service Marine Specimens Collection during Subtask 1.2

CONDITION:
W = wet preserved specimen
D = dry preserved specimen
I = presently in VI National Park Service collection
O = previously in VI National Park Service collection; lost or deaccessioned

CAT. NO.	FAMILY	SCIENTIFIC NAME	CONDITION
PHYLUM: PORIFERA			
CLASS: DEMOSPONGIAE			
2476	Spongiidae	Ircinia strobilina (Lamarck)	D,I
2479		Ircinia sp.	D
2477		Verongia lacunosa (Lamarck)	D
2474	Mycalidae	Mycale sp.	W
2459		Ulosa hispida Hechtel	D
2478	Haliclonidae	Dasychalina cyathina de Laubenfels	D,I
2470		Haliclona sp.	W
2460	Adociidae	Agelus sp.	D
2481		Agelus sp.	D
2482		Agelus sp.	D
2483		Agelus sp.	D
2475	Desmacidonidae	Iotrochota sp.	D
2462		Xestospongia muta (Schmidt)	D
2464	Callyspongidae	Callyspongia sp.	D
2467	Tedaniidae	Tedania sp.	D
2468		Tedania sp.	D
2480	Raspailiidae	Hemectyon ferox Duchassaing & Michelotti	D
2472	(?)	UNIDENTIFIED	D
2484	(?)	UNIDENTIFIED	D
PHYLUM: CNIDARIAN			
CLASS: HYDROZOA			
2332	Sertulariidae	Thyroscyphus ramosus Allman	W
2274	Plumariidae	Gynangium longicauda Nutting	W
2331		G. longicauda Nutting	W
2273		Plumaria habereri Stechow	W
2118	Aglaopheniidae	Aglaophenia allmani Stechow	W
2119		A. allmani Stechow	W
2463	Milleporidae	Millepora alcicornis Linnaeus	D,I
2465		M. complanata Lamarck	D,I
2466		M. squarrosa Lamarck	D,I
2289	Stylasteridae	Stylaster roseus (Pallas)	D,I
2315		S. roseus (Pallas)	D,I

CLASS: SCYPHOZOA

2163	Cassiopeidae	Cassiopea xamachana Bigelow	W
2162		C. xamachana Bigelow	W

CLASS: ANTHOZOA

2443	Briareidae	Briareum asbetinum (Pallas)	W,I
2445	Anthothelidae	Erythopodium polyanthes Duch. & Michelotti	W
2450	Plexauridae	Eunicea calyculata Ellis & Solander	W
2453		E. palmeri Bayer	W
2451		E. succinea (Pallas)	W
2447		Muricea muricata (Pallas)	W
2457		Plexaura flexuosa Lamouroux	W,I
2452		P. homomalla (Esper)	W,I
2448		Plexaurella nutans Duch. & Michelotti	W
2455		P. pumila Verrill	W
2449		Pseudoplexaura wagennaari Lamouroux	W
2275	Gorgoniidae	Gorgonia mariae Bayer	W
2446		G. mariae Bayer	W
2444		G. ventalina Linnaeus	W,I
2458		Pseudopterogorgia acerosa (Pallas)	W
2454		P. americana (Gmelin)	W,I
2456		P. bipinnata (Verrill)	W
2206	Aliciidae	Lebrunia coralligens (Wilson)	W
2198		L. coralligens (Wilson)	W
2135		L. danae (Duchassaing & Michelotti)	W
2130		L. danae (Duchassaing & Michelotti)	W
2216		L. danae (Duchassaing & Michelotti)	W
2179	Actiniidae	Anthopleura krebsi (Duch. & Michelotti)	W
2159		Bartholomea annulata (Lesueur)	W,O
2437		B. annulata (Lesueur)	W,O
2195		Bundosoma granulifera (Lesueur)	W,I
2156		Condylactis gigantea (Weinland)	W,I
2101		C. gigantea (Weinland)	W,I
2341		C. gigantea (Weinland)	W,I
2309		Phyllactis flosculifera Lesueur	W
2197	Stoichactiidae	Stoichactus helianthus (Ellis)	W,I
2434		S. helianthus (Ellis)	W,I
2102	Phymanthidae	Phymanthus crucifer (Lesueur)	W
2123		P. crucifer (Lesueur)	W
2157		P. crucifer (Lesueur)	W
2169	Hormathidae	Calliactis tricolor (Lesueur)	W,I
2131		C. tricolor (Lesueur)	W
2214		C. tricolor (Lesueur)	W
2199	Aiptasiidae	Aiptasia tagetes Duch. & Michelotti	W
2356		A. tagetes Duchassaing & Michelotti	W
2103		Heteractis lucida Duch. & Michelotti	W
2202		H. lucida Duchassaing & Michelotti	W
2217		H. lucida Duchassaing & Michelotti	W
2312	Arachnanthidae	Arachnantus nocturnus Hartog	W
2178	Actinodiscidae	Paradiscosoma neglecta (Duch. & Mich.)	W,I
2310		P. neglecta (Duchassaing & Michelotti)	W,I

2121		Rhodactis sanctithomae (Duch. & Mich.)	W
2113		R. sanctithomae (Duch. & Michelotti)	W
2165		R. sanctithomae (Duch. & Michelotti)	W
2224		R. sanctithomae (Duch. & Michelotti)	W
2126	Corallimorphidae	Ricordia floridea (Duch. & Michelotti)	W
2137		R. floridea (Duchassaing & Michelotti)	W
2360		R. floridea (Duchassaing & Michelotti)	W
2313	Zoanthidea	Isaurus tuberculatus (=duchassaingi) Gray	W
2128		Palythoa caribbea Duch. & Michelotti	W,I
2122		P. grandis Verrill	W
2104		P. grandis Verrill	W
2314		P. grandis Verrill	W
2177		Parazoanthus swifti (Duch. & Mich.)	W
2158		P. swifti (Duchassaing & Michelotti)	W
2150		Zoanthus sociatus Ellis	W
2111	Zoanthidae	Z. sociatus Ellis	W
2221		Z. sociatus Ellis	W
2306	Pocilloporidae	Madracis decactis (Lyman)	D,I
2282		M. mirabilis (Duchassaing & Michelotti)	D,I
2299	Acroporidae	Acropora cervicornis (Lamarck)	D,I
2469		A. palmata (Lamarck)	D,I
2298		A. prolifera(Lamarck)	D,I
2297		A. prolifera (Lamarck)	D,I
2317		A. prolifera (Lamarck)	D,I
2286	Agariciidae	Agaricia agaricites (linnaeus)	D,I
2301		A. agaricites humilis Verrill	D
2284		A. lamarcki Milne Edwards & Haime	D
2487		A. sp. (fragilis?)	D
2288		Leptoseris (=Helioseris) cucullata (Ellis & Solander)	D
2302		L. cucullata (Ellis & Solander)	D
2316	Siderastreidae	Siderastrea radians (Ellis & Solander)	D,I
2304		S. siderea (Ellis & Solander)	D,I
2303	Poritidae	Porites astreoides Lesueur	D,I
2486		P. divaricata Lesueur	D,I
2300		P. porites (Pallas)	D,I
2307		P. porites (Pallas)	D,I
2321	Faviidae	Cladocora arbuscula (Lesueur)	D,I
2322		C. arbuscula (Lesueur)	D,I
2279		Colpophyllia natans (Muller)	D,I
2295		Diploria clivosa (Ellis & Solander)	D,I
2281		D. labyrinthiformis (Linnaeus)	D,I
2282		D. labyrinthiformis (Linnaeus)	D,I
2471		D. strigosa (Dana)	D,I
2325		Favia fragum (Esper)	D,I
2279		Manicina areolata (Linnaeus)	D,I
2290		M. areolata (Linnaeus)	D,I
2294		M. areolata (Linnaeus)	D,I
2296		Montastrea annularis (Ellis & Solander)	D,I
2473		M. annularis (Ellis & Solander)	D,I
2305		M. cavernosa (Linnaeus)	D,I
2485		Solenastrea bournoni Edwards & Haime	D
2277	Rhizangiidae	Astrangia solitaria (Lesueur)	D,I
2280	Oculinidae	Oculina diffusa Lamarck	D,I

2320	Meandrinidae	Dendrogyra cylindrus Ehrenberg	D,I
2461		D. cylindrus Ehrenberg	D,I
2319		Dichocoenia stellaris Edwards & Haime	D
2318		D. stokesi Edwards & Haime	D,I
2278		Meandrina meandrites (Linnaeus)	D,I
2293		M. meandrites forma brasiliensis (Edwards & Haime)	D,I
2292	Mussidae	Isophyllastrea rigida (Dana)	D,I
2491		Isophyllia sinuosa (Ellis & Solander)	D,I
2324		Mussa angulosa (Pallas)	D,I
2492		Mycetophyllia aliciae Wells	D
2493		M. ferox Wells	D
2494		M. lamarckiana Milne Edwards & Haime	D,I
2287		Scolymia cubensis (Edwards & Haime)	D
2323		S. lacera (Pallas)	D
2276	Caryophyllidae	Eusmilia fastigiata (Pallas)	D,I
2283	Dendrophyllidae	Tubastraea aurea (Quoy & Gaimard)	D
2488	Anthipatharidae	Antipathes atlantica Grey	W
2489		Antipathes sp.	W
2490		Stichopathes lutkeni Brook	W

PHYLUM: MOLLUSCA
CLASS: GASTROPODA

2439	Acmaeidae	Acmaea antillarum (Sowerby)	W,I
2384	Trochidae	Calliostoma javanicum (Lamarck)	D
2372		Cittarium pica Linnaeus	D,I
2406		C. pica Linnaeus	D,I
2396		Tegula fasciata Born	D,I
2410	Turbinidae	Astraea caelata Gmelin	D
2400		A. phoebia Roding	D
2409		A. tecta Solander	D
2383		A. tuber (Linnaeus)	D,I
2403	Cerithiidae	Cerithium algicola C.B. Adams	D,I
2402		C. eburneum Bruguiere	D
2388	Naticidae	Natica canrena (Linnaeus)	D,I
2387	Cypraeidae	Cypraea zebra Linnaeus	D,I
2180	Ovulidae	Cyphoma gibbosum (Linnaeus)	W,I
2373		C. gibbosum (Linnaeus)	D,I
2385	Cassididae	Cassis tuberosa (Linnaeus)	D,I
2370		Phlaium cicatricosum	D,I
2411	Xenophoridae	Xenophora trochiformis (Born)	D,I
2379	Strombidae	Strombus costatus Gmelin	D,I
2188		S. gigas Linnaeus	W/D,I
2377		S. gigas Linnaeus	D,I
2378		S. pugilis Linnaeus	D,I
2413		S. raninus Gmelin	D,I
2381	Cymatiidae	Charonia variegata Lamarck	D,I
2386		Cymatium femorale (Linnaeus)	D,I
2343	Tonnidae	Tonna maculosa Dillwyn	D,I
2412	Magilidae	Coralliophila abbreviata Lamarck	D,I

2422	Muricidae	Murex brevifrons Lamarck	D,I
2425		M. pomum Gmelin	D,I
2423		Purpura patula Linnaeus	D
2376	Thaididae	Drupa nodulosa (C.B. Adams)	D
2405		Thais deltoidea (Lamarck)	D,I
2397	Columbellidae	Columbella mercatoria Linnaeus	D,I
2401	Fasciolariidae	Leucozonia nassa (Gmelin)	D,I
2404		L. nassa (Gmelin)	D,I
2407	Olividae	Oliva sayana citrina John	D
2424	Xancidae	Vasum muricatum Born	D
2408	Bullidae	Bulla occidentalis A. Adams	D
2205	Doridiidae	Felimare bayeri Marcus	W
2181		F. bayeri Marcus	W
2110	Elysiidae	Tridachia crispata Moerch	W
2117		T. crispata Moerch	W
2145		T. crispata Moerch	W
2148		T. crispata Moerch	W
2105	Lanellariidae	Coriocella sp.	W
2350	Ischnichitonidae	Chaetopleura apiculata (Say)	W
2440	Chitonidae	Acanthopleura granulata Gmelin	W
2334		Chiton squamosus Linnaeus	W
2441		C. squamosus Linnaeus	W

CLASS: BIVALVIA

2366	Arcidae	Anadara notabilis (Roding)	W,I
2173		Arca imbricata Bruquiere	W,I
2421	Glycymeridae	Glycymeris undata (Linnaeus)	D,I
2154	Mytilidae	Brachidontes citrinus (Roding)	W,I
2229		Lithophaga nigra Orbigny	W
2418	Isognomonidae	Isognomon alatus Gmelin	D,I
2419		I. radiatus Anton	D,I
2359	Pteriidae	Pinctada radiata (Leach)	W,I
2115		Pteria colymbus (Roeding)	W,I
2166		P. colymbus (Roeding)	W,I
2147	Pinnidae	Pinna carnea Gmelin	W,I
2394	Pectinidae	Clamys imbricata Gmelin	D,I
2420		Pecten raveneli Dall	D
2164	Limidae	Lima scabra (Born)	W,I
2175		L. scabra (Born)	W,I
2120		L. scabra tenera Sowerby	W,I
2176		L. scabra tenera Sowerby	W,I
2146	Spondylidae	Spondylus americanus Hermann	W,I
2218		S. americanus Hermann	W/D,I
2369		S. americanus Hermann	D,I
2172	Ostreidae	Lopha frons (Linnaeus)	W
2382	Lucinidae	Codakia orbicularis (Linnaeus)	D,I
2170	Chamidae	Chama macerophylla Gmelin	W,I
2171		C. macerophylla Gmelin	W,I
2374	Cardiidae	Dinocardium robustum vanhyningi Clench & Smith	D
2392		Laevicardium laevigatum Linnaeus	D,I
2417		L. laevigatum Linnaeus	D,I
2415		Papyridea soleniformis Bruguiere	D

2416		Trachycardium magnum Linnaeus	D
2389		T. muricatum (Linnaeus)	D
2380	Veneridae	Transennella conradina Dall	D
2414	Tellinidae	Acropagia fausta Pulteney	D,I
2391		Macoma constricta (Bruquiere)	D
2393		Tellina listeri Roding	D
2371		T. radiata Linnaeus	D,I
2368		Tellina sp.	D
2174	Hiatellidae	Hiatella arctica (Linnaeus)	W
CLASS: CEPHALOPODA			
2168	Octopodidae	Octopus joubini Roboson	W
PHYLUM: PLATYHELMINTHES			
2345	Planoceridae	Gnesioceros sp.	W
PHYLUM: ANNELIDA			
CLASS: POLYCHAETA			
2208	Amphinomidae	Eurythoe complanta (Pallas)	W
2152		E. complanta (Pallas)	W
2207		Hermodice carunculata (Pallas)	W,I
2435	Polynoidea	Hermenia verrucolosa Grube	W
2342	Eunicidae	Eunice denticulata Webster	W
2220	Terebellidae	Eupolymnia nebulosa (Montagu)	W
2308		E. nebulosa (Montagu)	W
2223	Sabellidae	Sabella melanostigma Schmarda	W,I
2124		S. melanostigma Schmarda	W,I
2194		Sabellastarte magnifica (Shaw)	W,I
2215		S. magnifica (Shaw)	W,I
2151	Serpulidae	Spirobranchus giganteus (Pallas)	W
PHYLUM: SIPUNCULIDA			
CLASS:			
2345	(?)	UNIDENTIFIED	W
PHYLUM: ARTHROPODA		SUBPHYLUM: CRUSTACEA	
CLASS: CIRRIPEDIA			
2153	Lepadidae	Lepas ansifera Linnaeus	W
2442	Balanidae	Balanus amphitrite	W

CLASS: MALACOSTRACA

2203	Gonodactylidae	Gonodactylus oerstedii (Hansen)	W,I
2114	Penaeidae	Trachypenopsis mobilispinis (Rathbun)	W
2427	Palaemonidae	Palaemonetes intermedius Holthuis	W
2428		Periclimenaeus schmitti Holthuis	W
2430		P. schmitti Holthuis	W
2109		Periclimenes pedersoni Chace	W
2140		P. pedersoni Chace	W
2222		P. pedersoni Chace	W
2139		P. yucatanicus (Ives)	W
2436	Alpheidae	Alpheus armatus Rathbun	W,I
2189		A. armillatus Milne Edwards	W,I
2357		A. armillatus Milne Edwards	W,I
2431		A. bahamensis Rankin	W
2426		A. normanni Kingsley	W
2429	Hippolytidae	Hippolyte coerulescens (Fabricius)	W
2190		Lysmata wurdemanni (Gibbes)	W
2138		Thor amboinensis (DeMan)	W
2136	Stenopodidae	Stenopus hispidus (Olivier)	W,I
2141		S. hispidus (Olivier)	W,I
2129		S. hispidus (Olivier)	W,I
2149	Palinuridae	Panulirus argus (Latreille)	W,O
2183		P. argus (Latreille)	W,O
2200		P. argus (Latreille)	W,O
2127		P. guttatus (Latreille)	W,O
2108	Scyllaridae	Scyllarides aequinoctialis (Lund)	W
2133	Porcellanidea	Porcellana sayana (Leach)	W,O
2362	Coenobitidae	Coenobita clypeatus (Herbst)	W
2201	Paguridae	Clibanarius vittatus (Bosc)	W
2132		Dardanus fucosus (Biffar & Provenzano)	W
2185		Paguristes cadenati Forest	W
2196		P. grayi Benedict	W
2161	Diogeniidae	Petrochirus diogenes (Linnaeus)	W,I
2167		P. diogenes (Linnaeus)	W,I
2358	Hippidae	Hippa cubensis (Saussure)	W,I
2209	Majidae	Macrocoeloma trispinosum (Latreille)	W
2210		Microphrys bicornutus (Latreille)	W
2228		M. bicornutus (Latreille)	W
2192		Mithrax commensalis Manning	W
2227		M. commensalis Manning	W
2187		M. hispidus (Herbst)	W
2349		M. ruber (Stimpson)	W
2160		M. sculptus (Lamarck)	W,I
2155		M. spinosissmus (Lamarck)	W,I
2186		M. spinosissmus (Lamarck)	W,I
2433		M. spinosissmus (Lamarck)	W,I
2106		Stenorhynchus seticornis (Herbst)	W,I
2204		S. seticornis (Herbst)	W,I
2333	Portunidae	Portunus sayi (Gibbes)	W
2335		P. sayi (Gibbes)	W
2211	Xanthidae	Paraliomera longimana(Milne Edwards)	W
2346	Grapsidae	Grapsus grapsus (Linnaeus)	W,I
2438		G. grapsus (Linnaeus)	W,I

2212		Pachygrapsus transversus (Gibbes)	W
2226		Percnon gibbesi (Milne Edwards)	W,I
2375	Gecarcinidae	Cardisoma guanhumi Latreille	W
2361		Gecarcinus lateralis (Freminville)	W
2390	Calappidae	Calappa flammea (Herbst)	D
2336	Ligididae	Ligia exotica Roux	W

PHYLUM: ECHINODERMATA

CLASS: STELLEROIDEA

2399	Astropectinidae	Astropecten duplicatus Gray	W
2328	Oreasteridae	Oreaster reticulatus (Linnaeus)	D,I
2329		O. reticulatus (Linnaeus)	D,I
2184	Ophidiasteridae	Ophidiaster guildingii Gray	W,I
2125	Gorgoncephalidae	Astrophyton muricatum (Lamarck)	W,I
2116		A. muricatum (Lamarck)	W,I
2353	Amphiuridae	Amphipholis squamata (Delle Chiaje)	W
2352	Ophiotrichidae	Ophiothrix angulata var megalaspis H.L. Clark	W
2351		O. suensonii Lutken	W
2191	Ophiocomidae	Ophiocoma echinata (Lamarck)	W
2355		O. echinata (Lamarck)	W
2354		O. wendti(=riisei) Muller & Troschel	W
2213	Ophidermatidae	Ophioderma appressum (Say)	W,I
2365		O. brevispinum (Say)	W
2364		O. cinereum Muller & Troschel	W,I

CLASS: ECHINOIDEA

2219	Cidaroidae	Eucidaris tribuloides (Lamarck)	W,I
2231		E. tribuloides (Lamarck)	W,I
2193	Echinida	Lytechinus variegatus (Leske)	W,I
2326		Tripneustes esculentus (Leske)	D,I
2330		T. esculentus (Leske)	W,I
2225	Echinometridae	Echinometra lucunter (Linnaeus)	W,I
2230		E. viridis Agassiz	W,I
2367	Clypeastridae	Clypeaster rosaceus (Linnaeus)	D,I
2395	Mellitidae	Leodia sexiesperforata (Leske)	D,I
2327	Spatangidae	Meoma ventricosa Lamarck	D,I
2398		M. ventricosa Lamarck	D,I

CLASS: HOLOTHURIDEA

2347	Holothuriidae	Actinopyga agassizi Selenka	W
2348		A. agassizi Selenka	W
2495	(?)	UNIDENTIFIED	W

CLASS: CRINOIDEA

2182	Comasteridae	Nemaster rubiginosa (Pourtales)	W

2363		N. rubiginosa (Pourtales)	W

PHYLUM: CHORDATA

2134	Polycitoridae	Distaplia stylifera (Van Name)	W
2253	Ascidiidae	Ascidia nigra (Savigny)	W
2112	Pyuridae	Pyura momus forma pallida Heller	W

DIVISION: CHLOROPHYTA
CLASS: ULOTRIDALES

2263	Ulvaceae	Ulva lactuca Linnaeus	W

CLASS: SIPHONOCLADIALES

2269	Dasycladaceae	Acetabularia crenulata Lamouroux	W
2247	Valoniaceae	Anadyomene stellata (Wulfen) C.Agardh	W
2240		A. stellata (Wulfen) C.Agardh	W
2107		Valonia ventricosa Agardh	W
2142		V. ventricosa Agardh	W

CLASS: SIPHONALES

2246	Caulerpaceace	Caulerpa cupressoides (West) C.Agardh	W
2242		C. cupressoides v. tuneri Webar-van Bosse	W
2271		C. microphysa (Webar-van Bosse) Feldmann	W
2255		C. prolifera (Forsskal) Lamouroux	W
2144		C. racemosa (Forsskal)	W
2239		C. racemosa v. uvifera (Turner)	W
2254		C. racemosa v. macrophysa (Kutzing) Taylor	W
2241		C. sertulariodes f. farlowii (W.-v. Bosse)	W
2248		C. sertulariodes f. farlowii (W.-v. Bosse)	W
2244		C. sertulariodes f. brevipes (J. Agardh)	W
2258	Codiaceae	Halimeda goreaui Colinvaux & Graham	W
2233		H. monile (Ellis & Solander) Lamouroux	W
2256		H. opuntia (Linnaeus) Lamouroux	W
2259		H. opuntia (Linnaeus) Lamouroux	W
2339		Penicillus capitatus Lamarck	W
2234		Udotea cyathiformis Decaisne	W
2249		U. cyathiformis Decaisne	W
2340		U. flabellum (Ellis & Solander)	W

DIVISION: PHAEOPHYTA
CLASS: DICTYOTALES

2261	Dictyotaceae	Dictyota bartayresii Lamouroux	W
2243		D. cervicornis Kutzing	W

2270		D. ciliolata v. bermudensis Lamouroux	W
2237		D. dichotoma (Hudson) Lamouroux	W
2262		D. divaricata Lamouroux	W
2235		D. jamaicensis (Taylor)	W
2236		Lobophora variegata (Lamouroux) Womersley	W
2232		Padina sanctae-crucis Borgesen	W
2245		Stypopodium zonale (Lamouroux)	W
	CLASS: FUCALES		
2264	Sargassaceae	Sargassum polyceratium Montagne	W
2266		S. polyceratium Montagne	W
2143		Turbinaria turbinata (Linnaeus)	W
2265		T. turbinata (Linnaeus)	W
	DIVISION: RHODOPHYTA		
	CLASS: NEMALIONALES		
2257	Helmintho-cladiaceae	Liagora sp	W
2260	Chaetangiaceae	Galaxaura obtusa (Ellis & Solander)	W
2272		G. obtusa (Ellis & Solander)	W
	CLASS: CRYPTONEMIALES		
2250	Melobesiceae	Neogoniolithon strictum Foslie	W
2238	Corallinaceae	Corallina cubensis (Montagne) Kutzing	W
2100		Jania adherens Lamouroux	W
	CLASS: BANGIALES		
2252	Gracilariaceae	Gracilaria cylindrica Borgesen	W
	CLASS: CERAMIALES		
2267	Rhodomelaceae	Acanthophora spicifera (Vahl) Borgesen	W
2268		Laurencia papillosa (Forsskal) Greville	W
2251		UNIDENTIFIED	W
	DIVISION: TRACHEOPHYTA		
	CLASS: ANGIOSPERMAE		
2344	Cymodoceae	Halodule wrightii (Ascherson)	W
2338		Syringodium filiforme Kuetzing	W
2337	Hydrocharitaceae	Thalassia testudinum Koeing	W

TABLE 6 Fishes sampled around St. John during 1983-1984.

Conditions:
P - presently in NPS collection; recollected/observed during this project
A - presently in NPS collection but not accessioned; recollected/observed during this project
U - previously in NPS collection but unaccounted for; recollected/observed during this project
N - not previously in the NPS collection
O - observed but not collected during this project

FAMILY	SCIENTIFIC NAME	CONDITIONS
Orectolobidae	Ginglymostoma cirratum (Bonnaterre)	N,O
Carcharhinidae	Carcharhinus limbatus (Valenciennes)	N,O
	Rhizoprionodon sp.	N
Dasyatididae	Dasyatis americana Hildebrand & Schroeder	N,O
Myliobatidae	Aetobatus narinari (Euphrasen)	P,O
Elopidae	Megalops atlantica Cuvier & Valenciennes	P
Albulidae	Albula vulpes (Linnaeus)	P
Muraenidae	Echidna catenata (Bloch)	P
	Enchelycore carychroa	N
	E. nigricans (Bonnaterre)	P
	Gymnothorax funebris Ranzani	N
	G. moringa (Cuvier)	P
	Muraena miliaris (flavopicta)	N
Congridae	Heteroconger (=Nystactichthys) halis (Bohlke)	P
Clupeidae	Harengula clupeola Valenciennes	P
	H. humeralis Cuvier	N
	Jenkinsia lamprotaenia (Gosse)	P
Engraulidae	Anchoa lyolepis (Evermann & Marsh)	N
Syndontidae	Synodus intermedius (Agassiz)	P
Gobiesocidae	Arcos macrophthalmus (Gunther)	P
	Gobiesox punctulatus (Poey)	P
Belonidae	Platybelone argalus (LeSueur)	A
	Strongylura spp.	N,O
	Tylosaurus crocodilus (Peron & LeSueur)	N
Atherinidae	Atherinomorus stipes (Muller & Troschel)	P
Holocentridae	Holocentrus ascenscionis (Osbeck)	P
	H. rufus (Walbaum)	P
	Myripristis jacobus Cuvier	P
	Neoniphon (=Holocentrus) marianus (Cuvier & Valenciennes)	P
	Plectrypops retrospinis (Guichenot)	P
	Sargocentron (=Adioryx) coruscus (Poey)	P
Aulostomidae	Aulostomus maculatus Valenciennes	A
Syngnathidae	Micrognathus crinitus (Jenyns)	N
Apogonidae	Apogon binotatus (Poey)	N
	A. lachneri Bohlke	N
	A. maculatus (Poey)	P
	A. quadrisquamatus Longley	N
	A. townsendi (Breder)	P

	Astrapogon stellatus (Cope)	P
	Phaeoptyx conklini (Silvester)	P
	P. pigmentaria (Poey)	N
Centropomidae	Centropomus sp.	N
Serranidae	Alphestes afer (Bloch)	P
	Cephalopholis cruentatus (Lacepede)	P
	C. fulva (Linnaeus)	P
	Epinephelus adscensionis (Osbeck)	P
	E. guttatus (Linnaeus)	P
	E. itajara (Lichtenstein)	N,O
	E. striatus (Bloch)	P
	Hypoplectrus aberrans Poey	N
	H. chlorurus (Valenciennes)	P
	H. nigricans (Poey)	P
	H. puella (Cuvier)	P
	H. unicolor (Walbaum)	P
	Mycteroperca interstitialis (Poey)	P
	M. rubra (Bloch)	P
	M. tigris (Valenciennes)	N
	M. venenosa (Linneaus)	P
	Paranthias furcifer (Cuvier & Valenciennes)	P,O
	Serranus baldwini (Evermann & Marsh)	P
	S. tabacarius (Cuvier)	P
	S. tigrinus (Bloch)	P
	S. tortugarum Longley	N
Grammistidae	Rypticus bistrispinus (Mitchill)	N
	R. saponaceus (Bloch & Schneider)	P
Grammidae	Gramma loreto Poey	P
Emmelichthyidae	Inermia vittata Poey	N
Priacanthidae	Priacanthus arenatus (Cuvier & Valenciennes)	P,O
	P. cruentatus (Lacepede)	
Branchiostegidae	Malacanthus plumieri (Bloch)	N
Echeneidae	Echeneis naucrates Linnaeus	P
	E. neucratoides Zuieuw	P
Carangidae	Alectis ciliatus (Bloch)	P
	Carangoides bartholomaei (Cuvier & Valenciennes)	P
	C. crysos (Mitchill)	P
	C. ruber (Bloch)	N
	Caranx latus Agassiz	P
	Elagatis bipinnulatus (Quoy & Gaimard)	O
	Selar crumenophthalmus (Bloch)	P
	Selene vomer (Linnaeus)	A
	Seriola dumerili (Risso)	P,O
	Trachinotus falcatus (Linnaeus)	N
	T. goodei Jordan & Evermann	P
Lutjanidae	Lutjanus analis (Cuvier)	N
	L. apodus (Walbaum)	A
	L. griseus (Linnaeus)	P
	L. jocu (Bloch & Schneider)	A
	L. mahogani (Cuvier)	P
	L. synagris (Linnaeus)	P
	Ocyurus chrysurus (Bloch)	P
Gerreidae	Eucinostomus sp.	P

	Gerres cinereus (Walbaum)	P
Pomadasyidae	Anisotremus surinamensis (Bloch)	P,O
	A. virginicus (Linnaeus)	P,O
	Haemulon aurolineatum Cuvier	P
	H. carbonarium Poey	A
	H. chrysargyreum Gunther	P,O
	H. flavolineatum (Desmarest)	P
	H. macrostomum Gunther	O
	H. plumieri (Lacepede)	P
	H. sciurus (Shaw)	P
Sparidae	Archosargus rhomboidalis (Linnaeus)	A
	Calamus calamus (Valenciennes)	P
	C. penna (Valenciennes)	P
	C. pennatula Guichenot	N
Sciaenidae	Equetus lanceolatus (Linnaeus)	P
	E. punctatus (Bloch & Schneider)	P
	Odontoscion dentex (Cuvier)	P
	Pareques (=Equetus) acuminatus (Bloch & Schneider)	P
Mullidae	Mulloidichthys martinicus (Cuvier)	P
	Pseudopeneus maculatus (Bloch)	P
Pempheridae	Pempheris schomburgki Muller & Troschel	P,O
Kyphosidae	Kyphosus sectatrix (Linnaeus)	P,O
Ephippidae	Chaetodipterus faber (Broussonet)	O
Chaetodontidae	Chaetodon capistratus (Linnaeus)	P
	C. sedentarius Poey	P
	C. striatus Linnaeus	P
Pomacanthidae	Holacanthus ciliaris (Linnaeus)	P
	H. tricolor (Bloch)	P
	Pomacanthus arcuatus (Linnaeus)	P
	P. paru (Bloch)	P
Pomacentridae	Abudefduf saxatilis (Linnaeus)	P
	A. taurus Muller & Troschel	P,O
	Chromis cyaneus (Poey)	P
	C. multilineatus (Guichenot)	P
	Microspathodon chrysurus (Cuvier)	P
	Stegastes diencaeus	N
	S. dorsopunicans (Poey)	P
	S. leucostictus (Muller & Troschel)	P
	S. partitus (Poey)	P
	S. planifrons (Cuvier)	A
	S. variabilis (Castelnau)	U
Cirrhitidae	Amblycirrhitus pinos (Mowbray)	P
Labridae	Bodianus rufus (Linnaeus)	P
	Clepticus parrai (Bloch & Schneider)	P,O
	Doratonotus megalepis Gunther	A
	Halichoeres bivittatus (Bloch)	P
	H. garnoti (Valenciennes)	P
	H. maculipinna (Muller & Troschel)	P
	H. poeyi (Steindachner)	N
	H. radiatus (Linnaeus)	P
	Lachnolaimus maximus (Walbaum)	P
	Thalassoma bifasciatum (Bloch)	P
	Xyrichtys (=Hemipteronotus) sp.	P

Scaridae	Scarus inserti (=croicensis) Bloch	P,O
	S. guacamaia Cuvier	O
	S. taeniopteris Desmarest	P
	S. vetula Bloch & Schneider	P
	Sparisoma aurofrenatum (Valenciennes)	A
	S. chrysopterum (Bloch & Schneider)	P
	S. radians (Valenciennes)	P
	S. rubripinne (Cuvier & Valenciennes)	P
	S. viride (Bonneterre)	P
Mugilidae	Mugil curema Valenciennes	P
Sphyraenidae	Sphyraena barracuda (Walbaum)	P,O
Opistognathidae	Opistognathus aurifrons (Jordan & Thompson)	U
	O. maxillosus Poey	P
Clinidae	Acanthemblemaria spinosa Metzelaar	N
	Emblemaria pandionis Evermann & Marsh	P
	Emblemariopsis bahamensis Stephens	N
	Labrisomus bucciferus (Poey)	P
	L. gobio (Valenciennes)	P
	L. guppyi (Norman)	P
	L. haitiensis Beebe & Tee-Van	P
	L. nuchipinnus (Quoy & Gaimard)	P
	Malacoctenus boehlkei Springer	P
	M. gilli (Steindachner)	P
	M. macropus (Poey)	P
	M. triangulatus Springer	P
	Paraclinus nigripinnis (Steindachner)	P
	Starksia nanodes Bohlke & Springer	N
	S. ocellata (Steindachner)	N
Tripterygiidae	Enneanectes altivelis Rosenblatt	N
	E. jordani (Evermann & Marsh)	N
Blennidae	Entomacrodus nigricans Gill	P
	Ophioblennius atlanticus (Valenciennes)	P
	Parablennius marmoreus (Poey)	N
Callionymidae	Callionymus bairdi Jordan	N
	C. pauciradiatus Gill	N
Gobiidae	Barbulifer ceuthoecus (Jordan & Evermann)	N
	Bathygobius soporator (Valenciennes)	P
	Coryphopterus eidolon Bohlke & Robins	N
	C. glaucofraenum Gill	N
	C. lipernes Bohlke & Robins	N
	C. personatus (Jordan & Thompson)	N
	Eleotris pisonis (Gmelin)	N
	Gnatholepis thompsoni Jordan	P
	Gobiosoma evelynae Bohlke & Robins	N
	G. horsti Metzelaar	N
	G. multifasciatum Steindachner	N
	G. saucrum	N
	Ioglossus helenae Randall	N
	Lythrypnus elasson Bohlke & Robins	N
	L. nesiotes Bohlke & Robins	N
	Quisquilius hipoliti (Metzelaar)	N
Acanthuridae	Acanthurus bahaianus Castelnau	P
	A. chirurgus (Bloch)	P
	A. coeruleus Bloch & Schneider	P

Scombridae	Euthynnus alletteratus (Rafinesque)	P
	Scomberomorus regalis (Bloch)	P
	Thunnus atlanticus (Lesson)	N
Scorpaenidae	Scorpaena grandicornis Cuvier	A
	S. inermis Cuvier	N
	S. plumieri Bloch	P
Bothidae	Bothus lunatus (Linnaeus)	N
Balistidae	Balistes vetula Linnaeus	P
	Cantherhines pullus (Ranzani)	P
Monacanthidae	Monacanthus ciliatus (Mitchill)	P
	M. tuckteri Bean	P
Ostraciidae	Acanthostracion polygonius Poey	P
	A. quadricornis (Linnaeus)	P
	Lactophrys polygonia (Poey)	P
	L. triqueter (Linnaeus)	P
Tetraodontidae	Canthigaster rostrata (Bloch)	P
	Sphoeroides splengleri	P
	S. testudineus (Linnaeus)	N
Diodontidae	Chilomycterus antennatus (Cuvier)	P
	Diodon holocanthus Linnaeus	P
	D. hystrix Linnaeus	A

4. DISCUSSION

Several investigators have completed collections within the Virgin Islands area. The most notable was the 'Scientific Survey of Porto Rico and the Virgin Islands' (1930 -1939) which was conducted by the New York Academy of Sciences. These investigations were comprehensive collections which were conducted as initial surveys for the region although some groups were not investigated.

John Randall and associates from the University of Miami conducted the original collection for the Virgin Islands National Park. Their collections provided the greatest number of specimens for the Virgin Islands National Park Service Marine Specimens Collection. During this period of intensive investigation (1958 - 1961), many groups of organisms were adequately collected including octocorals, scleractinians, molluscs, echinoderms and fishes. G. L. Warmke assisted with the mollusc collection.

Additional collections were completed by J. W. Wells (Scleractinians) and E. H. Woodlock (Molluscs). F. St. Clair provided an extensive mollusc collection of specimens collected with G. L. Warmke throughout the Caribbean. This later collection has not been accessioned.

Other collections contain specimens from this area of the Caribbean. The College of the Virgin Islands has a modest collection of algae, invertebrates and fishes. Nancy Ogden has a comprehensive collection of algae at the West Indies Laboratory. The University of Puerto Rico has an extensive collection of invertebrates and fishes. The list of investigators who have collected and/or received specimens from the area is extensive and mentioned in numerous publications. Significant contributions are listed in References.

The 'Studies on the Fauna of Curacao' are another collection of surveys on the marine fauna which was conducted in the southeastern Caribbean. These surveys are recent and provide keys and descriptions to additional groups of marine organisms.

Review of the present collection demonstrates an extreme need for more adequate curation and museum space. The collection is scattered throughout many buildings and storage sheds at the Virgin Islands National Park Service Visitor Center in Cruz Bay, St. John and the Virgin Islands Ecological Research Station in Lameshur Bay, St. John. None of the holding areas have adequate controlled environments and several dry specimens have deteriorated.

Several specimens have been lost due to preservative evaporation. Inadequate labelling technique and curation have yielded a confused state. The new Science Center on Lind Point, St. John will hopefully be completed by the end of 1984 and will hold the entire collection. The review and resulting specimen list with collection information will hopefully assist in future assessment and curation of the collection.

The collection prepared during this investigation has focused on only common species. Future collections should focus on specific taxonomic groups to provide comprehensive information on species which exist within the park. Adequate collection and preservation is essential if the specimens are to be useful collection specimens.

Collecting should never be overzealous but comprehensive collecting is frequently necessary for adequate investigation and reference. Occasionally, specimens should be collected for proper identification to insure reliability of field identification.

During the present investigation, several general observations on common species were recorded.

-Holothurian density appeared lower than in previously surveyed areas. A potential cause may be the disease affecting Diadema antillarum.

-Stoichactus helianthus inhabits intertidal subzones (0-4 m) with strong wave action.

-Bartholomea annulata is probably the most abundant anemone associated with lower fore reef areas followed by Condylactis gigantea, Lebrunia danae and Heteractis lucida.

-Phymanthus crucifer is the most abundant anemone on reef pavement and on upper fore reef zones.

-Bundosoma granulifera is the most abundant anemone found on fragmented pavement with many holes and crevices.

-Mangrove inlets and roots provide a habitat for large populations of shrimp, brachyuran crabs and anemones belonging to the genus Aiptasia. A diverse assemblage of juvenile fishes inhabits these areas.

-Crinoids are found exclusively on deep reefs (>16 m) or highly diverse reefs and are usually associated with Montastrea annularis.

-Gorgonian density and diversity was higher on points of bays and on reef pavement subjected to a constant, strong current.

-Acropora palmata was the major constituent of undamaged upper fore reef

areas.

-Montastrea annularis was the most abundant coral in lower fore reef areas but is replaced in dominance by Agaricia spp. below 20 m in depth.

-Montastrea cavernosa, Colpophyllia spp., Porites spp., and Diploria spp. are other significant contributors in lower fore reef formations.

-Halimeda incrassata and Penicillus capitatus were the most abundant algae found in seagrass bed communities.

-Millepora spp., Palythoa caribbea and Zoanthus spp. were major constituents of upper fore reef, reef crest and back reef areas.

-Pinna carnea appeared most abundant in seagrass beds but were occasionally observed in the sand zone of the lower fore reef.

-Lima scabra and Lima scabra tenera were most often attached by byssal threads inside the crevices of Montastrea annularis colonies.

-The highest density of Chama macerophylla was observed on fish trap lines outside protected bays.

-Spirobranchus giganteus appears to prefer settlement on colonies of Montastrea annularis.

-Gonodactylus oerstedii was the most abundant stomatopod found in reef communities.

-Cleaning shrimp such as Periclimenes pedersoni and P. yucatanicus and the snapping shrimp, Alpheus armatus are most commonly associated with the anemone Bartholomea annulata but may also be found with Condylactis gigantea.

4.1 Recommendations

The following recommendations are provided for development of future investigations and resource management.

1) Comprehensive and systematic collections of the following groups are recommended for the Virgin Islands National Park Service Marine Specimens Collection: algae, poriferans (sponges), delicate hydroids, zoanthids, ctenophores, scyphozoans, platyhelminths, nemerteans, chaetognathids, pogonophorids, phoronids, bryozoans, brachiopods, sipunculids, echiuroids, polychaetes, crustaceans, holothurians, crinoids, and hemichordates. These collections should be accomplished to provide a complete inventory for each group within the biosphere reserve. Species lists from other Caribbean inventories should be reviewed to assess completeness of inventories.

2) Collections and inventories following the methods used during the investigation, or equivalent, should be completed in all Areas of Particular Concern and control areas. Surveys should be completed annually within these areas. Surveys are warranted within areas of potential impact.

3) Effort should be made to utilize visiting educational groups in the establishment and continuation of long-term monitoring. This is a mutually beneficial situation and would insure future monitoring in the absence of adequate funding.

4) A serious attempt should be made to establish adequate curation for the Virgin Islands National Park Service Collection. It is suggested that National Park Service curators from Harpers Ferry, West Virginia be assigned to the Virgin Islands National Park for 2 - 4 weeks to renovate the collection and establish adequate curation procedures. Monthly curation is needed.

5) Specimens in formalin or a mixture should be washed and placed in correct preservative.

6) Most specimens need to be relabelled, especially those with two or more labels, with correct information and preservative type.

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