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Research summary reports for Marine Science Month, July 1992.

October, 1992

Six principle investigators and three assistants participated in Guana's Marine Science Month during July 1992. Preliminary research reports from these participants are presented here. Many of these researchers have not yet completed their data analysis, but most mention what work has yet to be completed and whether any of it will soon be written up for publication.

The program was a success, in that participants got their proposed work accomplished with little difficulty. Guana's facilities were very conducive to marine research, and the sea table (wet lab) was of particular benefit for a variety of projects, from observing the response of fish to tattooing to inducing corals to spawn and collecting their larvae. Nearly everyone was greatly impressed with the natural habitat of Guana's reefs and the island itself. We were able to set up a small laboratory, with microscope, computer, reference books and papers, film developing capability, etc. in one of the staff house rooms, and this was used extensively by all participants. Overall, the program ran quite smoothly, owing in large part to Guana's helpful staff. In particular, I would like to thank Mario, Beverly and Walter, Everton, Darky, Grant, and Lynford for their assistance in organizing, working out logistics, fixing things, or basically just going out of their way to help at any time.

A meeting was held with some of the people working in conservation and education in the BVI. Of particular use were discussions of ways in which scientific programs on Guana and related programs in the BVI could benefit from greater communication and exchange of information, and I sincerely hope that equal efforts to further this goal will be made from both sides.

I hope to run the program again next summer, and most of the participants are eager to return. Although Marine Science Month has much potential for growth with the addition of more diving equipment and use of more than one boat, I plan to limit the number of participants to six at any one time next year. This will keep to a workable size the number of conflicting schedules for people to work around, the amount of time spent filling tanks at all hours of the day and night, and the number of trips the boat will have to make ferrying people around to dive sites.

I would like to incorporate more educational activities in the program. This year, a group of high school students on an ecological tour of the BVI visited Guana for a day. They enjoyed the museum and the hike around the Pyramid, and they were impressed by the quantity and diversity of research conducted on Guana. I'm sure they learned a lot, and they definitely enjoyed the visit. Next year, it would be especially nice to have a group of

interested BVI students come to Guana for a day or to take on a local intern interested in marine science; however, so far it has been difficult to come in contact with potentially interested BVIslanders. Ian Greenspan spent two weeks with us and was, as usual, a great help. Unfortunately, he is not a certified diver and therefore could not participate in many of the activities. I would welcome Ian back for next year since he seems to enjoy the laboratory work, in which he participated quite actively.

Finally and most heartlily, I thank Henry and Gloria Jarecki for supporting this program and many other research and conservation programs on Guana.

Lianna Jarecki

Listed below are my summary reports for a number of projects undertaken last July. These include some ongoing projects such as the coral reef transects and monitoring work begun last year in cooperation with the BVI Conservation and Fisheries Department, and the salt pond monitoring work that I started in 1988.

Coral Reef Monitoring Transects:

Julie Overing from the BVI Conservation and Fisheries Department and I laid four permanent 20 meter long transects on healthy reef around Guana last year. Two are in Muskmelon Bay and two in White Bay. This year, Julie assisted me in locating and re-marking the transects. I then photographed 20 adjacent meter-square plots along each transect. These slides were developed using a home-developing kit while on Guana. I plan to measure dominant species composition and and percent cover in each of these photos and compare them to photos of the exact same sites in coming years. This should provide information about coral growth, species succession, damage from disturbance, etc. over the long term. I am hoping to access a computer that can digitize these images and calculate percent cover, but I haven't found one yet.

Blue-head wrasse:

Blue-head wrasse are small, reef fish that are very common around Guana. A group at Cornell University is doing a genetic study to investigate distribution and dispersal patterns of blue-head wrasse populations around the Caribbean. I collected 20 adults, including all sex types (primary and terminal male, and female), and removed liver, heart, pectoral muscle, gills, and brain from each. These were preserved in 70% ethanol in buffer and delivered to Dr. John Heiser. He and his associates at Cornell plan to isolate mitochondrial DNA from these tissues and compare nucleotide sequences from the highly variable D-loop region. With these data, they should be able to characterize the size, distribution, and relatedness of blue-head wrasse populations around the Caribbean.

I have asked Dr. Heiser to send a letter acknowledging receipt of the specimens and describing his work so that I could include it in this report, but I haven't gotten it yet.

Dr. Liao and the feral sheep:

Dr. Liao has agreed to continue the sheep eradication project while on Guana, provided that he has a gun with which to hunt them. After some discussion, all parties (Beverly and Walter, Mario, Henry, and Gloria) agreed to transfer the gun license from Mario to Dr. Liao. This has to be done in order for Liao to shoot because BVI law requires that any person using a gun not only be licensed but also be the sole user of the gun.

I helped Liao fill out a BVI gun license application and sent it to the BVI Police Department in August. If the gun license has not yet been transferred, it should be looked into a.s.a.p. It would be extremely helpful if someone on Guana would contact the BVI police (Seargent Holder helped Fred get licensed and is familiar with the sheep eradication project on Guana) and make sure that the application process is followed through.

Red-tailed Hawk:

While hiking to the Pinguin Ghut forest plot, Fred and I found a dead Red-tailed Hawk in the woods. This bird may have died from eating poisoned rats as the poison used liberally on Guana is also lethal to birds of prey, which have been observed eating Guana's rats. Christina Leahy is researching the question of how to control rats without poisoning Guana's raptors, but it is imperative that this form of rat poisoning is discontinued on Guana as soon as possible.

Flamingos:

This July, four flamingos were introduced to Guana and twenty to Anegada. One of the Guana birds became ill and, despite much effort to nurse it, it died three days later. An autopsy was performed at the Agricultural Station, and the details are provided in Christina Leahy's report. Since one of the Anegada birds took daily trips to the local hotel on Anegada and seemed to prefer being around people rather than other flamingos, Mario picked up the bird and flew it to Guana, where it could be more closely looked after.

Sponge species distribution and growth rate:

Dr. Vance Vicente, a sponge biologist from the U.S. Fish and Wildlife Service in Puerto Rico, visited Guana for two days during July to help me identify Guana's sponges and to look at the habitat in comparison to that he has seen elsewhere in the Caribbean. He was extremely helpful to my research as he taught me how to recognize most of the common reef sponges in a very short period of time. He also had some useful suggestions regarding interesting ecological research projects targetted at reef sponges that could easily be carried out on Guana. He was quite impressed with Guana's reef and said that it looked healthier (having a greater percentage of live corals and a greater diversity of marine invertebrates) than most areas around Puerto Rico.

With Dr. Vicente's help, I identified, labelled, measured, and photographed fifteen sponges, including twelve different species, near the reef monitoring transects in White Bay and in Muskmelon Bay . These sponges will be relocated, measured, and photographed again next summer. I also plan to mark new sponges so that I have at least ten individuals of each species under study. By recording these data over a number of years, I hope to document growth rates in a variety of common sponges around Guana and to document interactions of these sponges with their environment (e.g. overgrowth of corals, predation by fish or turtles). Presently, I have both encrusting and erect species marked.

I conducted a general observational survey of common sponges on Guana's reefs. A particularly interesting pattern of sponge distribution occurs on a series of patch reefs off of the Bigelow Beach area. These patch reefs are mostly between about 20 and 40 meters in diameter, but I did not have sufficient time to count and measure them accurately. It appeared that some of these patches were dominated by particular sponge species that were not nearly so abundant elsewhere. For example, one patch reef was dominated by very large, old individuals of the genus *Neofibularia*, the fire sponge, which is uncommon elsewhere around Guana. I would like to survey these patches more closely next year. Finding and measuring all the patch reefs in the Bigelow

Beach area will provide interesting habitat information, and documenting composition and abundance of sponge species on these patch reefs may reveal unique patterns in comparison to more continuous reef around Guana.

Salt Ponds:

I continued my ongoing monitoring of Guana's salt pond and other ponds in the area. I was able to collect water and plankton samples from Guana's pond, Flamingo Pond on Anegada, Sprat Point pond on Beef Island, Josiah's Bay Pond on Tortola, and Belmont Pond on Tortola. I documented salinity, nitrate concentration, water coloration, temperature, and zooplankton species present in all of these ponds. Guana's pond, as usual had a great abundance of corixids and copepods, both of which are likely flamingo prey items. Flamingo Pond, on Anegada had a great abundance of brine shrimp in late June but none were collected in late July. However, this may be a reflection of patchy distribution patterns of brine shrimp in Flamingo Pond. I also found an unusual alga growing erect on the bottom of Belmont Pond. I have not previously seen this alga in any of the BVI salt ponds.

Underwater Photography:

I photographed many of Guana's underwater creatures. These photographs were taken both during the day and on our two night dives, which produced some of the more interesting pictures. I hope to continue building a collection of Guana wildlife and natural habitat slide photographs (both on land and underwater) for scientific, educational, and decorative/advertisement purposes. The slides I took during July were developed with developing kits in the laboratory sink. This was a very convenient and less expensive way to do photography on Guana than to get slides developed on Tortola.

The underwater slides were used in a number of slide shows (both in mine and others) wile on Guana, and some were subsequently considered for use in the new Guana Island Club brochure. Additionally these slides can be printed and put in the museum.

Museum:

Two new photographic displays were posted in the museum, one describing the short-eared owl sighted on Guana last year, and another describing the three species of sea turtles (all of which are endangered) that occur around Guana. Nesting records on Guana were included for the turtles.

Many of the insects in the display case were damaged by ants because the Napthalene (moth ball crystals) in the case evaporated. Fortunately, Numi replenished it when she was visiting. Many of the insect specimens need to be replaced, and I have asked Skip to have some of the entemologists visiting during Science Month to replace the specimens if possible.

Lianna Jarecki

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29 Sept 1992

Dear Lianna,

Sorry I didn't get to see you when you passed through New Hampshire, I was away at a conference sucking-up to famous people.

You said you wanted suggestions about ways to make the science month run better. Generally, I thought it went pretty well, and you did an excellent job of running things. I do have a few suggestions, though I realise I may have left them a bit late.

(1) Scheduled use of a vehicle, for half an hour, after breakfast and lunch, and before dinner would help movement of SCUBA tanks from the compressor to the dock, and of samples and equipment to and from the lab.

(2) If there are to be eight people doing field work, then use of several more tanks and a second boat would result in a lot more work getting done. (I realise this may not be realistic.)

(3) More space to store dive gear, and especially to hang wetsuits, would be useful. Again this applies most strongly if there are to eight people working at once.

You said that you wanted a report on the work we did on Guana fairly soon. I have not analysed any of the data I collected on the island yet, because I am frantically trying to finish my thesis so I can defend my Ph. D. in early December. I can write a report now if you'd like, but it would just be a description of methods. After I defend my thesis, I am planning to spend 2-3 weeks analysing my data from Guana, and also some of Peter Sale's (my advisor) data from other parts of the Caribbean, with the aim of us writing a paper about it together. If the report can wait until late December I can include these analyses and say something about what I found. So let me know if the report can wait, or if you need it right away.

I hope this finds you well and happy. I have moved to Vermont to write my thesis and live with Linda (my beloved girlfriend-unit), so come and stay if you're ever near by, and even if you're not, give me a call (802 388-0825).

Take care,

Graham

Graham.

P.S. I have enclosed a copy of an article Peter, Phil and I wrote for the National Geographic Research magazine. I though you might like to see it; it's about reef fish ecology and saving the world.

Dave Gordon

6

GUANA ISLAND MARINE SCIENCE REPORT

Part 1: Influences of local density on the behaviour of coral reef fishes

Objective: The main objective for this study was to test for relationships between local population density and the behaviour of individuals for a coral reef fish. Understanding of relationships between behaviour and density is important to understanding the dynamics of reef fish populations. Preliminary objectives which had to be accomplished in order to achieve the main objective were: (1) identification of a suitable study species, (2) test my ability to individually mark members of the study species without affecting their behaviour (3) describe the social structure and behavioural repertoire of the study species

Choice of study species: A suitable study species needed to be abundant, relatively sedentary, easily observable whilst SCUBA diving, and with a well defined social system. A review of the literature suggested that several benthic gobies and blennies would be good candidates. After preliminary observations of several species while SCUBA diving, the bridled goby (*Coryphopterus glaucofraenum*) was chosen as most suitable for the study. This species lives in sandy/rubble habitat, can be approached by divers, and individuals seem to defend small territories (< 4 m^2 area).

Identifying individual fish: The ability to recognize individual fish was crucial to the project. Subcutaneous injection of tattooing ink has been shown to be an effective method for giving individual marks to small reef fish. By using different coloured inks and injection sites it is possible to give many fish a unique mark. Before marking large numbers of bridled gobies in the field, it was necessary to test that marking the fish this way did not harm them. To test for increased mortality due to marking, 20 bridled gobies were captured and placed in an aquarium filled with running sea water. Ten gobies were marked with dye and 10 were left unmarked. None of the gobies died over the following 19 days, indicating that marking does not cause greatly increased mortality. I therefore proceeded with a more sensitive test for effects of marking fish on their behaviour (described below).

Effects of density on social structure: A 6 * 6 m grid consisting of 36, 1 * 1 m squares was set out over an area of sand and coral rubble, 5 m deep, in White Bay. The grid was constructed of string, tied to metal stakes at the corners of the squares. One hundred and twenty three bridled gobies were resident in the grid area; 48 of them were measured, sexed and given a unique tattoo mark. Over the following two weeks I made a series of observations of the behaviour of the marked gobies. Each of the 48 marked fish was observed for 2, 10 minute periods on SCUBA. At the beginning and end of the 10 min period I estimated the distance from the focal individual to its 4 nearest neighbours. During the 10 min observation period I recorded the movements of the focal on a map of the study grid drawn on a slate. I also noted the frequency and location of feeding (bites at the sediment) and any interactions with other fish. For interactions with other fish I recorded the identity of the other fish (species, size, and I.D. mark if the other fish was a marked goby), and the nature (e.g. chase, bite, courtship) and outcome (e.g. retreat, mating) of the interaction.

Effect of marking on behaviour. I picked 12 unmarked gobies in the study grid and made the same observations on them that I made on the marked gobies. To test the effect of tattoo marking on goby behaviour, I will compare the behaviour (e.g. feeding, home range size, frequency of aggression) of the unmarked gobies the marked gobies using multivariate analysis of variance.

Description of the social system. The social system of bridled gobies was unknown prior to this study. The observations will be used to describe: home range size, the nature of territorial defence, and the nature of dominance relations within the study species. I will also test whether these social interactions change with the size and sex of the goby using canonical correspondence analyses.

Effects of density on behaviour. The density experienced by focal individuals will be measured as the average distance to its nearest neighbours. The influence of density on various aspects of the behaviour of gobies will be tested using multiple regression analyses

Plans for future work and publication: The statistical analyses of the data collected during July 1992 will be done in December 1992. Once analysed these data will provide a description of relationships between population density and individual behaviour in a natural population of reef

fish. During 1993 I hope to expand on this study by better establishing a causal link between density and behaviour. This would be done by altering population density in a controlled field experiment and then testing for effects on goby behaviour. (Manipulation of goby density in the field is feasible and can be done by anaesthetizing and capturing fish, and then relocating them among areas). The combined results of these studies, comprising the description of a pattern in nature and establishment of a cause for that pattern, would be written up for publication in a refereed scientific journal. In the longer term I would like to examine the consequences for survival and growth of behavioural changes caused by population density.

Part 2: Population regulation in coral reef fishes: a long term study

Objective: The main objective of this study was to establish a long-term monitoring study of the dynamics of reef fish populations. This consists of censuses of adult and young-of-the year fishes, as well as characterization of the habitat they occupy. Prior to establishing the study, I also wanted to complete some preliminary studies testing the effectiveness of the monitoring methods

Census methods: Eight sites were selected for censusing; each site was an area roughly 150 m * 150 m in area, at roughly 10 m depth. Sites were spaced roughly equally around the island and chosen to cover a range of habitat types. I censused fish and characterized the reef habitat using 30 m long transects. One permanent transect was established at each site by placing a permanent marker (a ree-bar stake cemented into the substratum) at each end of it. I also set out two temporary transects at each site. Censuses were then done on all 3 transects at each site.

Fish counts: A tape was run along the transect and fish were counted by swimming slowly along the tape, recording the fish observed within a known distance either side of the tape. Young-of-the-year were counted within 0.5 m either side of the tape (within 30 m^2 overall). This transect width was chosen to be compatible with surveys of young-of-the year being done in the Virgin Islands by another researcher (Dr. P. F. Sale). Adult fishes were counted within 0.75 m either side of the tape (45 m^2 overall). This transect width was chosen for adult fishes because a pilot study (comparing counts on transects of four different sizes) showed that 45 m^2 transects gave the most precise counts per unit censusing time. To ensure that counts of fish were repeatable, I recensused the permanent transects 3 times over several days. Fish species counted frequently are listed in Table 1.

Habitat characterization: I characterized the reef habitat along each transect by swimming along the tape and recording the type of substratum or organism under the tape every 0.25 m (giving a total of 120 points). This gives an estimate of the area covered by different habitat categories. The categories used to describe the habitat are listed in Table 1.

Analyses: A two stage procedure known as canonical correspondence analysis will be used to analyse the data. The first stage of the analysis is an ordination of the counts of the fish species. This examines how the counts of each species vary among the transects and identifies groups of species which vary in density in the same way. The second step takes a set of variables to be used as predictors of patterns in fish density (in this case they would be the different sites, and the abundance of the different habitat categories) and identifies which variables, or groups of variables, can be used to predict the patterns in fish density identified by the first stage of the analysis. An example of the type of conclusion that can be drawn from these analyses is that we might find, for example, that all of the planktivorous species are more abundant on the upwind side of the island, or that all butterfly fishes are more common where live coral is abundant.

Plans for publication and future years: I hope to continue the study for several years. The data for one year are of limited value as a study of population dynamics because many reef fishes are long lived. Continuing the censuses for several years will allow examination of how communities respond to environmental change, for example storm events, or changes in fishing pressure. The data would be published at the end of the study, or after long enough time has passed for it to represent a worthwhile description of pattern in community structure (4-5 years).

The counts of young-of-the-year may be analysed jointly with censuses of young-of-the-year done using identical methods at other locations in the Virgin Islands by Dr. Peter Sale. Dr. Sale has been censusing young of the year at two sites around each of 5 islands for two years, and will continue to do so for at least two more years. A joint analysis of these two data sets would allow a more comprehensive analysis of patterns in the replenishment of fish populations.

Table 1. Common fish species censused on the transects (species occurring on at least 25% of the transects) and organisms and substratum categories used to describe the habitat.

Fish species

Damselfishes
- Bicolor damsel
- Yellow tail damsel
- Beaugregory
- Cocoa damsel
- Dusky damsel
- 3-spot damsel
- Longfin damsel
- Blue chromis
- Brown chromis
- Sergeant major

Wrasses
- Bluehead wrasse
- Yellowhead wrasse
- Slippery dick
- Puddingwife
- Blackear wrasse
- Clown wrasse
- Yellowcheek wrasse

Parrotfishes
- Stoplight parrot
- Redband parrot
- striped parrot
- Princess parrot
- Queen parrot
- Rainbow parrot

Surgeonfishes
- Blue tang
- Ocean surgeon
- Doctorfish

Hamlets
- Barred hamlet
- Butter hamlet
- Black hamlet
- Yellow tail hamlet

Groupers
- Red hind
- Rock hind
- Graysby

Basses
- Harlequin bass

Puffers
- Sharpnose puffer

Grunts
- French Grunt

Goatfishes
- Spotted goatfish

Trumpetfishes

Lizardfishes

Habitat category

Sand

Coral pavement

Dead coral

Coral rubble

Algae
- *Dictyota* spp.
- Coralline algae

Sponges
- Encrusting
- Erect

Soft corals
- Branching
- Fans
- Feathers
- Encrusting
- Fire coral

Hard corals
- *Acropora palmata*
- *Acropora cervicornis*
- *Montastrea annularis*
- *Montastrea cavernosa*
- *Porites asteroides*
- *Porites porites*
- *Agaricia agar*
- *Agaricia* spp.
- *Dendrogyra* spp.
- *Siderastrea* spp.
- Brain corals
- *Mycetophelia* spp.
- *Mussa* spp.

Anemones
- colonial
- solitary

Urchins

09 October 1992

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Dear Lianna

Mrs. Patricia M. Bubucis of Sea Research Foundation and I spent from 20 July through 02 August 1992 (including travel days) at Guana Island. Our project involved collecting commensal natantian shrimps from the slimy sea plume (*Pseudopterogorgia americana*), an octocorallian or "soft coral." These shrimps, which ordinarily have carapace lengths of less then 3 mm, may prove to be indicators of the health of a coral reef. We believe that it is important to study them as part of a species diversity assessment on West Indies coral reefs. We have conducted similar studies elsewhere in the West Indies. The data collected at Guana Island are therefore directly comparable and will provide insight on species associations at different locations.

We removed all the shrimps from 57 slimy sea plume at depths ranging from 10 to 70 feet. Samples were collected by placing a numbered plastic bag over a slimy sea plume, cinching the mouth of the bag at the base, and shaking vigorously to dislodge the shrimps. The bag was then tied off with a rubber band and taken aboard the boat. On shore, we poured the contents of the bags through a sieve, picked out the shrimps with forceps, and preserved them in numbered vials. The samples varied greatly in numbers of shrimps and species. Some contained only one or two specimens; others held nearly 200 individuals. As to species, we have so far recorded *Hippolyte nicholsoni*, *Neopontonides* c.f. *beaufortensis*, *Latreutes parvulus*, *Pseudocoutierea antillensis*, and *Periclimenes mclellandi*. Additional specimens of *Neopontonides*. c.f. *beaufortensis* were collected for Dr. Richard W. Heard of the Gulf Coast Research Laboratory (Ocean Springs, Mississippi). I plan to visit Dr. Heard in March 1993 for purposes of reviewing the samples and confirming

the identities of all species recorded. To date, I have examined 376 shrimps and completed the first 17 samples. I expect to finish examination of all the samples by next May. Data will then be entered in a statistics program for analysis. A paper for publication will be produced by the end of next summer.

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Spatial pattern and larval behavior of some reef-building corals at Guana Island

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Introduction and Objectives

Coral reef communities were once thought to be stable environments where large scale disturbances are rare and of little importance. The organization of coral reef communities was therefore assumed to be largely determined by biological processes such as competition and predation (Smith and Tyler 1972, Porter 1974). However, over the last few decades, it is becoming increasingly apparent that biological and physical disturbance play an important role in the structure and organization of coral reef communities (Sale 1977, Connell 1978, Jackson 1991). Disturbances such as Tropical storms and hurricanes (Woodley et al. 1981), extreme low tides (Glynn 1968), and large scale out-breaks of coral eating seastars (e.g. on the Great Barrier Reef of Australia), periodically overturn coral reef communities by causing large scale mortality of dominant reef-building corals.

Corals may adapt to frequent disturbance by constantly recolonizing open space that is made available by storms, predators, and other environmental calamities. In the Caribbean, many species reproduce by means of a planula larvae that is brooded within the parent colony (Szmant 1986). These larvae are typically released at dusk and then drift in the plankton for a short period before returning to the ocean floor where they settle and undergo metamorphosis. Many fundamental aspects of the what occurs during the larval stage are unknown for Caribbean corals. These include the distance coral larvae travel, the types of substrata they prefer to settle on, and potential predators that may feed on coral larvae during the planktonic stage. Some progress has been made by studying coral larvae in the laboratory (e.g. Lewis 1974a, 1974b; Morse et al. 1988, Morse and Morse 1991). However, in order to understand how populations of corals persist in the face of man-made and natural disturbances, coral larvae must be studied in the field.

The objective of this project was to determine some fundamental behaviors of coral larvae in the field and to relate these behaviors to the spatial distribution of coral populations in the field. Specifically, I measured the abundance and spatial pattern of four coral species:

Agaricia agaricites, Agaricia humulis (see van Morsel 1983 for a description of this species), Favia fragum, and Porites asteroides. I also studied larval dispersal in-situ in A. humulis and P. asteroides larvae and determined some preferred surfaces for settlement in P. asteroides larvae. These four species are common on Guana Island in shallow water (< 20 m) and are important species of coral reefs throughout the Caribbean.

Methods

Spatial pattern of adult corals

This work was conducted on the fore-reef slope, approximately 1 km south of White Beach, Guana Island. Two methods were used to measure abundance and spatial pattern of corals. A one meter quadrat constructed of PVC pipe was randomly positioned within a 100 m^2 area and the number of coral colonies within it were counted. This was repeated 27 times and from this data the mean number of colonies and the variance (s^2) were calculated for each species. Another technique was used to estimate the degree of aggregation in each species. In other words, do these species occur in clumps, in a random fashion, or are the over-dispersed (spaced equally apart) on the reef. This technique does not use quadrats but compares the distance between a random point and the nearest coral colony with the distance between pairs of colonies (i.e. a nearest neighbor technique). This measurement of spatial pattern is called T-square sampling and is fully described in Krebs (1984, Ecological Methodology). A total of 40 measurements were taken for each species and Hines index, (H_I) was calculated from these data. This index increases as the degree of aggregation among coral colonies increases.

Larval dispersal and settlement behaviors

Larvae from three species (A. agaricites, A. humulis, and P. asteroides) were obtained by maintaining adult colonies in the running seawater system in small plastic cups and 10 gallon aquaria. All three species released larvae throughout the evening which were transferred to seperate culture containers the following morning. Since these larvae are relatively large (> 1.5 mm) they can easily be observed in the field with the unaided eye. I

observed coral larvae in the field by transporting larvae to the fore-reef slope near White Beach in a 100 ml plastic syringe. An individual larva would then be released approximately 0.5 m from the bottom of the sea floor. This larva would be followed visually at a distance of 1 m. During the observation period, care was taken not to cause turbulence or otherwise disturb the drifting larvae. At the end of the observation the following data were recorded: 1) the fate of the larvae (e.g. whether it had attached to a surface, was still drifting, or had been eaten by a predator), 2) the total swimming time, and 3) the distance traveled from point of release to point of attachment on the reef.

A settlement experiment was also conducted with P. asteroides larvae. The object of this experiment was to determine if P. asteroides larvae preferentially settled and metamorphosed on different substrata. Three substrata were tested: bare coral rubble (no visible epiphytes), coral rubble encrusted with several species of coralline algae, and coral rubble encrusted with the coralline algae Paragoniolithon typica (see Adey and Vassar (1975) for a description). Preference was determined by the following experimental design. A single experimental substratum was placed inside a clear plastic chamber (1.5 l volume) with nitex mesh windows (100 um). Three chambers were attached to a plastic rack (0.60 m x 0.60 m) and the rack was then tied to the reef 0.7 km from White beach. A total of three racks were used and each rack contained all three substrata types. At the beginning of the experiment 10 P. asteroides larvae were injected into each chamber through a small port which was subsequently sealed. A total of 90 larvae were used for this experiment and all larvae were less than 24 hours old at the beginning of the experiment. The experiment was left on the reef for one day and then retrieved. Upon retrieval, each piece of coral rubble was examined with a dissecting microscope and the number of settled and metamorphosed corals were counted. Preference was scored as the number of larvae that settled on the substrata divided by the total number of settled and swimming larvae found within the chamber. This data was analyzed with a one-way analysis of variance (ANOVA).

Results and Discussion

Data on spatial pattern indicated that these four species occur in a clumped fashion on

Table 1 Summary of quadrat and nearest neighbor data for four species of reef corals.

	Species			
Statistic	E. fragum	P. asteroides	A. agaricia	A. humulis
Mean	2.7	4.78	13.70	28.8
Variance (s^2)	14.8	12.3	132.2	627.8
Hines index	1.84	1.77	1.65	1.72

the fore-reef slope (Table 1). In each species the ratio of variance to mean was significantly greater than 1 ($P < 0.001$ in all cases). Similarly, Hines' index also suggested clumped distributions ($H_i > 1.48$ are chacteristic of aggregated distributions). Mean density of corals varied greatly between species. Both Agaricia species occurred at high densities (A. agaricites = 13.7 colonies/m^2, A. humulis= 28.8 colonies/m^2) whereas E. fragum and P. asteroides occurred at much lower densities (2.7 colonies/m^2, and 4.8 colonies/m^2 respectively). Lewis (1970) also found these species to be distributed in a clumped fashion on a fringing reef in Barbados. However, his study reported much higher densities of E. fragum and P. asteroides (30 colonies/m^2, and 14 colonies/m^2 respectively) than those estimated here. It is presently unclear why densities of these two species are lower on Guana Island than Barbados. More extensive sampling of different reef habitats is necessary before any geographic comparisons can be made.

Results from larval dispersal observations may explain the aggregated spatial pattern in field populations of P. asteroides. Of the 29 larvae successfully tracked underwater, 23 attached to the reef bottom within the 10 minute observation period, 3 were drifting near the surface at 10 minutes, and 4 were eaten by damselfish (Stagaster planiformes). Mean swimming time for larvae that attached was approximately 4 minutes (Figure 1), however there was considerable variation in swimming time on different days. This variation was most likely due to genetic differences among individual larvae (e.g. Richmond 1987) and

differences in current speeds among the three days.

Total swimming time was positively related to distance travelled by drifting larvae (Figure 2, $r^2 = 0.56$, $t = 4.41$, $P < 0.001$, $df = 19$). Mean distance travelled by larvae from the point of release to the site of attachment was 0.69 m. Thus, the short planktonic period corresponds to a short dispersal distance in P. asteroides larvae. These results suggest that the majority of these larvae settle within a few meters of the parent colony.

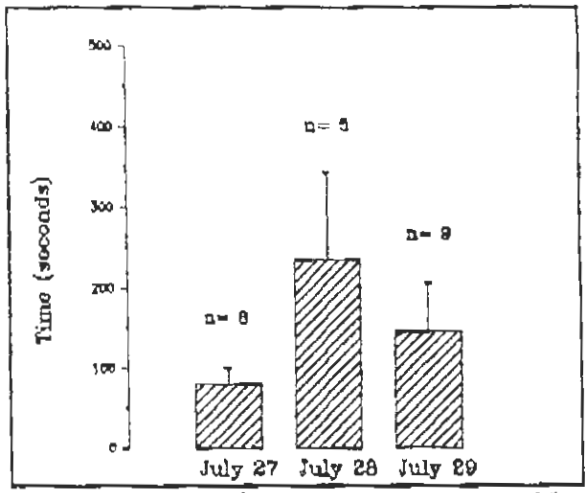

Figure 1 Swimming times for P. asteroides larvae that attached to a surface on three different days. Vertical bars are standard errors.

P. asteroides larvae showed preferential settlement behaviors among the three substrata (Figure 3). More larvae settled on coral rubble with coralline algae (CA and PT in Figure 3) than on bare coral rubble (ANOVA, $P < 0.001$, SNK test, $P < 0.05$). This result is similar to larval settlement behaviors found in other coral species. Several species of Agaricia preferentially settle on coralline algae (Morse et al. 1988, Morse and Morse 1991, Carlon and Olson *in prep*) compared to other natural substrata. These specific settlement behaviors appear to be related to the adult habitat requirements, as Morse et al. (1988) have shown that young corals are non-randomly distributed on coralline algae. Thus it appears that these behaviors can play an important role in the pattern of adult distribution.

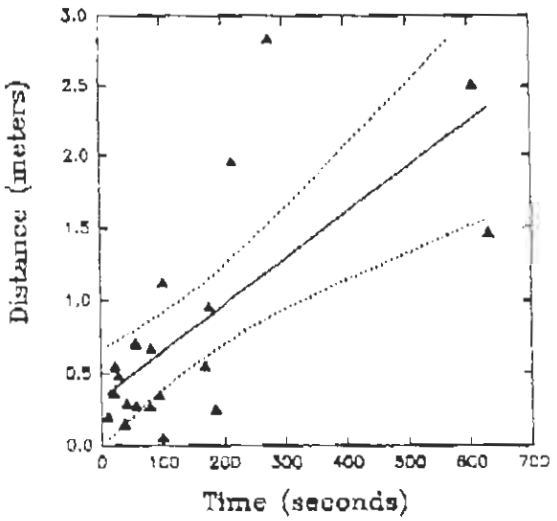

Figure 2 Swimming time vs. distance travelled for P. asteroides larvae. Dotted lines are 95% confidence intervals.

In contrast to P. asteroides, A. humulis larvae drifted for longer periods (Table 2).

Five of the six larvae successfully tracked headed towards the surface and were still drifting
at the end of the observation period. While the number of observations is limited, they are in marked comparison to the swimming times of P. asteroides larvae. If a similar relationship holds between swimming time and distance of dispersal, then A. humulis has the potential to disperse beyond the parental habitat.

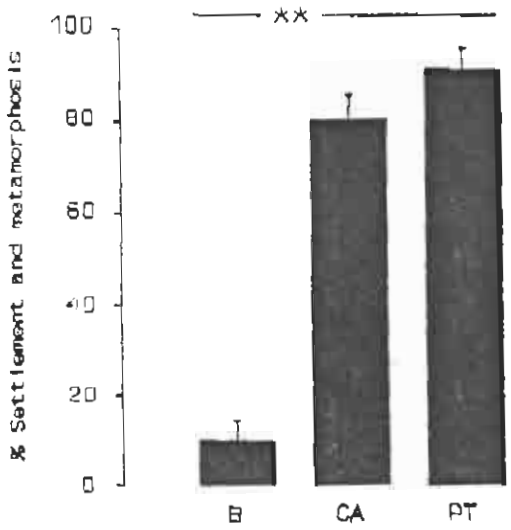

Figure 3 Mean settlement and metamorphosis of P. asteroides larvae on three different substrata: B= bare coral rubble, CA= coralline algae, PT= the coralline alga Paragoniolithon typica. Vertical bars are standard errors.

Conclusions

This study has illustrated that larval behavior varies among ecologically similar coral species. Short scale dispersal in P. asteroides larvae may explain the aggregated distribution of adult populations. In contrast, A. humulis larvae clearly disperse over a much larger scale. These corals also have a highly clumped adult distribution. However, in this species aggreagation is more likely due to preferential settlement behavior by larvae. This behavior would result in aggregated larval settlement in areas with dense cover of coralline algae (Morse et al. 1988). This hypothesis remains to be tested.

Table 2. Swimming time (minutes) and fate of A. agaricia larvae. Fates: D= still drifting, E= eaten by damselfish.

Trial	Swimming time	Fate
1	11.58	D
2	9:05	D
3	0:56	E
4	10:20	D
5	9:45	D
6	9:06	D

Managing coral reefs requires a knowledge of how coral communities maintain

depend on consistent input of colonizing larvae from other reefs, may depend on the life-history and larval behaviors of individual species. In this light, two conclusions can be drawn from this study: 1) Some coral species have limited dispersal (e.g. P. asteroides): the abundance of juvenile corals is therefore predicted to be related to the abundance of adults, and 2) Other coral species (e.g. A. humulis) disperse on a broader scale: the abundance of juvenile corals in these species is therefore predicted to be unrelated to the density of adults.

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Department of Biology

The University of Michigan Ann Arbor, Michigan 48109-1048

Telephone (313)
Fax (313) 747-0884

28 October, 1992

Fred collected these samples.

Lianna Jarecki
10 Timber trail
Rye, New York 10580

Dear Lianna:

This is just a quick note to thank you for the gastropod specimens collected in the Guana Island Wildlife Sanctuary, and to inform you about the uses of these specimens in my research program. Two of the species collected *Plicopurpura patula* and *Thais haemastoma* have geminate or twin species in the eastern Pacific and will be used in my studies of amounts of DNA sequence divergence that have accumulated in these species since the Pliocene emergence of the Central American Isthmus. These studies are useful in calibrating rates of molecular evolution over long term time-scales. Several of the other species will be useful in molecular studies of the relationships among the prosobranch gastropods, and geographic variation within species. These collections represent an important contribution to to my studies and are greatly appreciated.

Sincerely,

Dr. Timothy Collins
Research Investigator

HARBOR BRANCH
OCEANOGRAPHIC INSTITUTION, INC.

5600 OLD DIXIE HIGHWAY
FORT PIERCE, FLORIDA 34946

(407) 465-2400
TELEX 52-2886

August 25, 1992

Lianna Jarecki
Guana Island Wildlife Sanctuary
10 Timber Trail
Rye, N.Y. 10580

Dear Lianna,

Klaus and I thank you Lianna for your support and assistance while at Guana Island last month. On hehalf of Harbor Branch Oceanographic Institution, I also want to thank you, Guana Island Wildlife Sanctuary and the Falconwood Corporation for allowing us to participate in the marine biological studies program at Guana Island. Your enthusiasm and dedication as well as hard work made this program a complete success.

I hope that the Guana Island Wildlife Sanctuary and the Falconwood Corporation will continue with this program in the future. A small permanent laboratory facility would foster a great deal of excellent research.

I will be sending you shortly our preliminary report with a description of sponge fauna of Guana Island. Once the taxonomy is completed, I will then send a final species list.

Thank you again for all of your help and say hello to Beverly and Walter.

Sincerely,

John Reed

John Reed
Senior Research Specialist

10/6/92

Dear Lianna,

What follows is a summary of the activities performed and results obtained (when applicable) from my activities on Guana during the last two weeks of July, 1992.

1) Rare plants - I monitored the success of last year's transplantations of several species of rare plants into native scrub habitat on Guana. The success of each venture varied with the species as follows.

-*Sida eggersii*. Of 79 plants raised from seed and planted in the forest or along trails, 78 still survive and, of these, all but three look to be doing very well. The surviving plants have grown an average of 28cm since October, 1991, though there is significant variation in growth rates depending on site of planting and soil type on which the plants were raised. Those saplings planted along the trail below G House Road have grown significantly faster and generally look to be in better shape than those planted on the eastward-facing hill above North Beach or those along the Iguana Trail. Also, specimens raised in potting soil have grown significantly faster than those raised only in native soil. This, no doubt, stems from the more porous nature of potting soil, allowing plants grown therein to develop a larger root mass and, thereby, increasing their growth rates when planted in native habitat. It still appears likely that specimens grown in potting soil need an inoculation of native soil to provide myccorhizae needed for proper germination and/or development. This remains conjecture, but is based on the observation that seeds placed in potting soil would not germinate.

- *Croton fishlockii*. Of 27 specimens of this rare shrub planted near the trail leading out to Long Point, I could find only 16 specimens remaining this year. This species has two distinct leaf morphologies that seem to develop in response to the amount of water available to the plant. All specimens, when planted, had the mesic leaf morphology; all surviving plants now have the xeric leaf morphology, suggesting that water stress was likely responsible for the loss of the 11 plants. This seems further likely because all specimens of this species were started from cuttings and probably had minimal root development when planted. This was an unavoidable result of the time constraints of last year's project, but could readily be avoided if a concerted effort to propagate the species were ever desired. One last point of interest is that a line of (presumed) surveyor's poles now lies near this population, and if human activity continues in this area, additional specimens may be lost due to trampling.

- *Selenicereus urbanii*. I started two additional populations of this species last year in areas removed from the club. Both are doing well and should establish large populations over the next several years. Specimens taken as cuttings and potted until root growth was initiated had a higher rate of survival than those that were simply cut and scattered, but the additional time and space needed to raise cuttings through that stage may not be worth the increased survivor rate given the large number of cuttings that are potentially available.

- *Sabal causiarum*. Protection from mowing of a small section of the Flat around the lone sabal palm there has allowed for the survival and growth of a large number of seedlings of these rare palms. However, the growth of a large number of saplings of shrubby plants (e.g., *Leucaena*) there at the same time may create problems by crowding out the palm seedlings. It is probably desirable to start a program aimed at cutting back these noxious shrubby plants once each year to give the palms a chance to mature and grow. Once they begin to develop trunks, this program would no longer be necessary. The seedlings that were removed from this spot and retained in the nursery for approximately one year have been planted in various places around the club for horticultural purposes by Lynford. [Lynford has done likewise with seedlings of the rare tree *Guaiacum officinale*.]

- *Mamillaria nivosa*. Many small specimens of this rare cactus were raised by me and kept in the nursery for planting once they had grown to a sufficient size. Apparently all of these specimens were lost because of the careless tossing of pots around on the ground during the frequent occasions when the tables on which the pots were sitting were removed.

2) Forest plots - All living plants within the nine forest plots established last year were measured again this year and identified to species, if possible. Like last year, the sizes of the plants within each plot had a bimodal distribution with a few large plants (trees and large shrubs), several to many very small plants (seedlings), and few or no plants of intermediate size. This is the size distribution to be expected if sheep are effectively removing most or all living plant material before they can reach maturity. The size distributions of plants measured in the plots this year differ in two minor respects from those of last year. First, there is a much larger number of seedlings in almost all the plots from that measured last year. This could result either from a recent flush of germination induced by the heavy rains of May or from the highly reduced number of sheep on the island, or both. Measurements taken over the next few years should allow us to distinguish among these potential causes,

assuming the sheep are in fact removed from the island soon. Second, a few large trees were lost from some of the forest plots. Because there are currently no saplings of intermediate size with which to replace these lost trees, this process will, of course, lead over time to the gradual deforestation of the island if the present bimodal size distribution of the vegetation continues.

3) Liao - I spent a fair amount of time showing Liao several of the taller forest trees on the island, acquanting him with the *Sida* project, and helping him to make a list of target species of native trees to raise for his reforestation project. As well, I left him with notes indicating when the various tree species could be expected to set fruit and told him the supplies he would need for his project.

4) *Cyphoma* experiments - I began a series of preliminary experiments designed to test whether the marine gastropod *Cyphoma gibbosum* has aposematic coloration. This species is a brightly colored orange with black ocelli and has the unusual habit of keeping the mantle extended over the shell during daylight hours. This suggests the species has a noxious taste to at least some reef fishes and that the conspicuous coloration has evolved as a warning device to keep from being bitten by said fish. I wished to test whether fish will in fact avoid biting objects of this color if given a choice among several similarly shaped objects differing only in color. To that end I constructed paraffin models having the shape of *Cyphoma* and painted them variously either uniform orange, green, or purple, or with the natural color pattern of a live *Cyphoma*. I then placed sets of these models, one model of each color pattern per set, on gorgonians in transects in White Bay and Muskmelon Bay and followed their fate for 10 days. Attacks on a model resulted either in large pieces of the model missing or in its complete absence. Unexpectedly, the models attacked most frequently were the orange unicolored models and those painted with the *Cyphoma* color pattern. This suggests that the orange coloration may in fact trigger an increased number of attacks by fish, perhaps because that color is used in intraspecific agonistic interactions by those species. While an increased succeptibility to fish attack could provide a selective regime favoring the evolution of a noxious taste to the mantle of the gastropods (reported in the literature), this observation would not explain the evolution of the orange coloration of the mollusks. A larger experiment is needed to see if these preliminary findings are reproducible and, if so, to expand upon the variables that may modify attack behavior in the fish.

5) Gastropod phylogenetics - While on Guana this July I collected several species of prosobranch and pulmonate gastropods to be used in research on the evolutionary relationships among various subsets of these two large groups. The prosobranch research is being conducted by Dr. Tim Collins of the University of Michigan and his associate Ken Fraser. A letter reporting their ongoing and intended research using these specimens is appended to this report. The pulmonates will be used by myself for an assortment of studies, mostly focusing on the molecular evolution and phylogenetic relationships of a few Caribbean radiations of land snails. My intended studies are: (a) clarification of the relationships among members of the urocoptid genus *Pseudopineria*; (b) investigation of the relationships among different populations of the urocoptid *Macroceramus microdon* complex of the Puerto Rican Bank; (c) resolution of the phylogenetic relationships among the four subfamilies of the neotropical family Bulimulidae; and (d) resolution of the phylogenetic relationships among the Caribbean radiation of the family Camaenidae. These studies will take several years to conduct and will mostly rely on DNA sequence data taken from preserved tissues of animals collected this year in the Virgin Islands and Puerto Rico. The first two studies, however, also include morphological analyses, which I have already begun at the University of Michigan.

Fred

Fred Kraus

A SURVEY OF PORIFERA (SPONGES) FROM GUANA ISLAND FOR BIOMEDICAL RESEARCH

COLLECTIONS IN THE BRITISH VIRGIN ISLANDS, 29 JULY - 4 AUGUST, 1992

By:

John K. Reed

Harbor Branch Oceanographic Institution
Division of Biomedical Marine Research
5600 Old Dixie Highway
Fort Pierce, Florida 34946

September 11, 1992

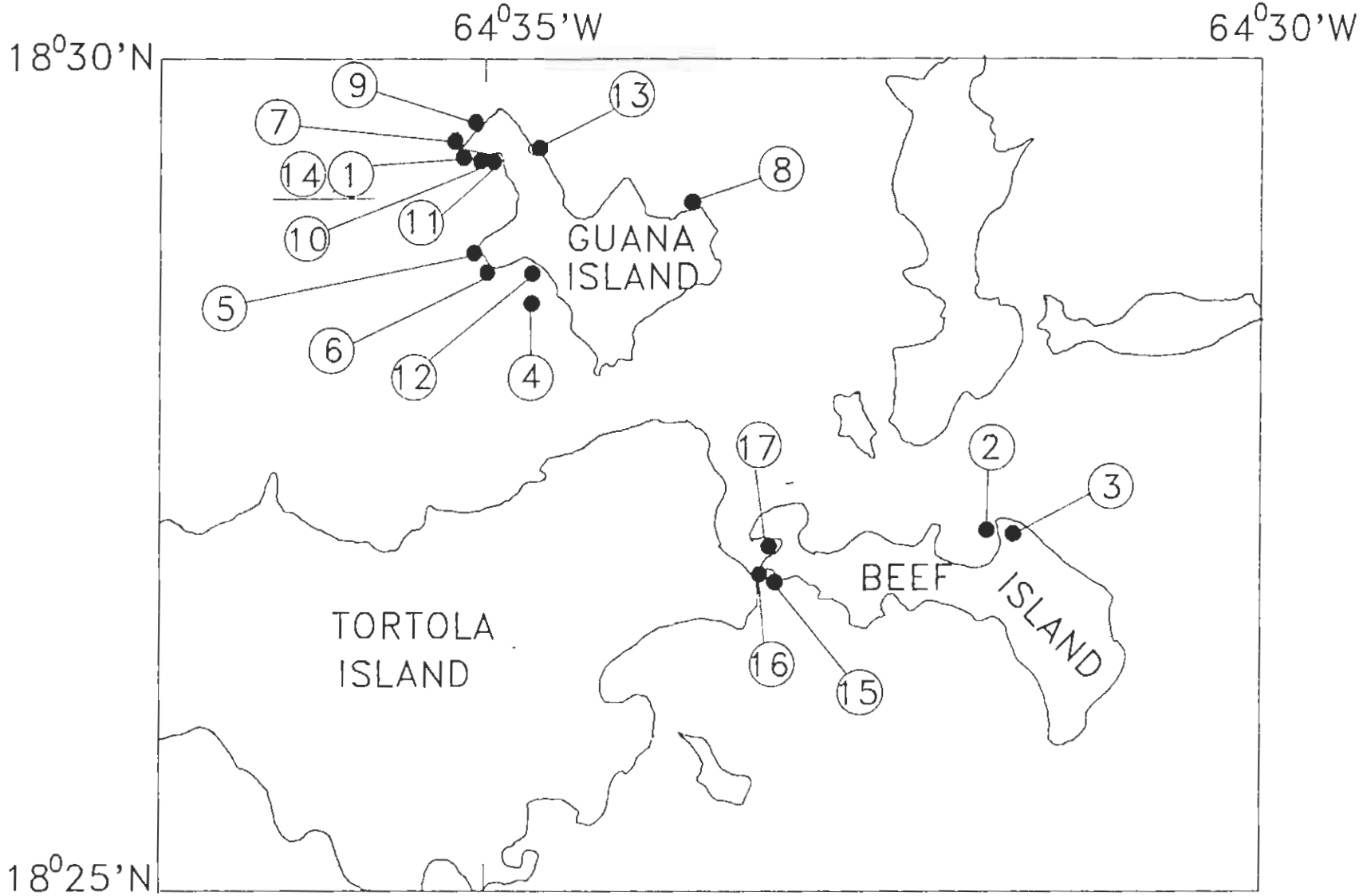

Figure 1. Collection Sites in British Virgin Islands
29 July - 4 August 1992
Harbor Branch Oceanographic Institution

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ACKNOWLEDGMENTS

The Falconwood Corporation and the Guana Island Wildlife Sanctuary are gratefully acknowledged for supporting the summer marine biology program that was first initiated at Guana Island in 1992. This provided visiting scientists with room and board on Guana Island, small boats, scuba facilities, and laboratory space. I also thank Lianna Jarecki for assistance with the field work and for managing and developing the marine biology program at Guana Island. The voluntary assistance of Klaus Borges in the field and the lab is, as always, greatly appreciated. This research was provided and funded by Harbor Branch Oceanographic Institution, Division of Biomedical Marine Research. This is contribution number 146 of Harbor Branch Oceanographic Institution's miscellaneous publications.

SUMMARY

This report summarizes the results of a research expedition conducted by Harbor Branch Oceanographic Institution (HBOI), Division of Biomedical Marine Research (DBMR) at Guana Island, British Virgin Islands from July 29 to August 4, 1992. The marine sponge fauna was surveyed at 17 collection sites which consisted of coral reefs, fore reef slopes, caves, mangroves, and seagrass beds. Each sample was documented with *in situ* and laboratory photographs, taxonomic voucher specimens, and a computer database that included detailed site and sample descriptions. A total of 145 samples were collected, including 118 sponges, 6 cnidarians (hydroids, gorgonians, and zoanthids), 12 ascidians (tunicates), and 9 algae. Frozen samples will be used in DBMR's program to discover biologically active novel compounds that may be applied in the development of drugs to treat human diseases. The research also will provide the Guana Island Wildlife Sanctuary and the Falconwood Corporation with a preliminary survey of the sponge fauna in the vicinity of Guana Island.

SCIENTIFIC PARTICIPANTS

John Reed	Chief Scientist, Dive Officer
Klaus Borges	Research Assistant (volunteer)

OBJECTIVES

1. Observe, photograph, and collect selected benthic marine invertebrates and macroalgae using scuba and snorkel.

2. Collect and screen marine organisms for biological activity against human diseases, including cancer, microbial, and diseases of the immune system.

3. Survey the sponge fauna for studies of taxonomy, systematics, chemotaxonomy, and ecology.

PURPOSE

Harbor Branch Oceanographic Institution (HBOI) is a not-for-profit research institution. Basic research will be conducted by HBOI's Division of Biomedical Marine Research (DBMR) on the taxonomy, systematics, and ecology of the samples collected and observed, as well as on the bioactivity and chemistry of novel compounds isolated from the samples. The results of these studies may be applied in the long term to the development of compounds used to diagnose or treat human diseases, including cancer, microbial, and diseases of the immune system.

The research will provide the Guana Island Wildlife Sanctuary and the Falconwood Corporation with a preliminary survey of the marine sponges from various habitats within the vicinty of Guana Island, British Virgin Islands.

METHODS

1. Collections- Samples of benthic marine invertebrates and macroalgae were collected by snorkeling and scuba diving. Collections were highly selective with minimal impact to the environment or species populations. Only one or a few individuals or colonies of each species was collected at each site with little disturbance to the habitat. Usually only a portion of colonial organisms (e.g., sponges, tunicates, octocorals) were sampled which left the remainder for regrowth. No species protected by the CITES ACT for endangered species were collected.

2. Site and Sample Documentation- During each dive, data were recorded on Nalgene waterproof paper with pencil and included site and sample descriptions and photographic reference numbers for each sample. Collection site descriptions, including latitude, longitude, habitat, depth, temperature, current, and weather conditions; along with sample descriptions, including morphology, color, abundance, and taxonomy for each sample were transcribed in a Nalgene waterproof fieldbook. All data were entered into a Dbase III database and stored on 5 1/2" floppy diskettes.

3. Site Coordinates- Positions of dive sites were estimated in the field using landmarks, and their coordinates were plotted later using the National Ocean Survey chart No. 905 (1973 edition, NOAA).

4. Photography- Samples were photographed *in situ* with a Nikonos V camera, 15-mm lens, Nikonos 103 strobe, and Kodachrome ASA 64 film. Each sample was photographed in the laboratory with a ruler and sample number against a gray background with a 35-mm Olympus OM4T camera, 50-mm macro lens, Sunpack DX8R ring strobe, and Kodachrome ASA 64 film.

5. Taxonomy- Preliminary field identifications reported herein were based on general morphology of the specimens. Microscopic slide mounts of spicules and fibers will be required to verify many of the sponge species which will be submitted as a final species list at a later time.

6. Vouchers- Museum voucher specimens were subsampled from each sample and preserved in 18-oz Whirlpak bags with 10% formalin. Algal samples were fixed and preserved in 5% formalin. For storage, sponge and octocoral samples were transferred to 70% ethanol whereas tunicates and algae remained in 10% and 5% formalin, respectively.

7. Extracts- 5-10 g subsamples were pulverized using a Virtis grinder and 100% ethanol for bioassays in HBOI's laboratories.

8. Labels- Samples, subsamples, and museum vouchers specimens were labeled with a HBOI/DBMR sample number (Date + Dive # + Sample #), using Nalgene paper and water resistant pen or pencil.

9. Storage and Shipping- Samples were stored frozen in a chest freezer on Guana Island. For shipping, samples were packed in two 100-qt Igloo coolers with a layer of Blue Ice packs on top and bottom of each. Samples arrived frozen and were transferred to DBMR's -15°C freezer.

RESULTS

ITINERARY

July 28	Drive from Ft. Pierce to Miami. Fly from Miami to San Juan to Beef Island, British Virgin Islands. Transfer personnel and gear by boat to Guana Island.
July 29-Aug. 4	Scuba and snorkel collections at Guana and Beef Islands.
Aug. 5	Fly from Beef Island to Miami. Drive to Ft. Pierce.

COLLECTIONS

Collections consisted of 8 scuba and 5 snorkel dives. Two HBOI divers made a total of 18 scuba dives to a maximum of 83 feet for a total bottom time of 18 hours. Samples were also collected by wading in a hypersaline lagoon and a supralittoral tidepool. A total of 17 sites were surveyed (Figure 1). Appendix 1 lists each site with latitude, longitude, collection method, maximum depth, and number of samples collected. Appendix 2 summarizes site descriptions, including topography, substrate, visibility, and current.

The various habitats that were sampled included the following: sand and rubble flats at the base of fore reefs (50-80 ft), fore reef slopes (25-70 ft), coral reef flats (10-30 ft), patch reefs (10-20 ft), dead *Acropora* coral spur and groove (3-8 ft), rock pavement with ledges (40-70 ft), rock boulders (15-60 ft), vertical rock walls (0-50 ft), caves (0-12 ft), supratidal rock pool (0-3 ft), hypersaline lagoon (1 ft), *Thalassia* and *Syringodium* grassbeds (1-8 ft), bridge pilings (12 ft), red mangroves (0-2 ft), and sunken boat (0-2 ft).

SAMPLES AND TAXONOMY

A total of 145 samples of benthic macroinvertebrates and macroalgae were collected for biochemical assays and taxonomic analyses. Appendix 3 lists the field identifications of the samples collected at each site, recollection data, and depth in feet. Appendix 4 lists the complete taxonomy based on field identification and is sorted phylogenetically. The collections consisted of 118 Porifera (sponges), 6 Cnidaria (hydroids, gorgonians, and zoanthids), 12

Ascidiacea (tunicates), and 9 algae. Appendix 5 lists the presence or absence for each sample of *in situ* photographs, laboratory photographs, and taxonomic voucher specimens.

The main targets of this survey were sponges which comprised 81% of the total number of samples collected. In general, the dominant, easily recognizable sponges were not collected. However, these were recorded in the field notes and many were documented with *in situ* photographs (Table 1).

SITE DECRIPTIONS

The general location of each site is described below along with notes on topography and habitat. The dominant, common species of sponges, hard corals, and octocorals are also listed. These are by no means complete considering that they were compiled from a single dive for most sites, but they do represent the dominant benthic cover. The site numbers refer to Figure 1 and also correspond to the collection site numbers in Appendix 1.

Site 1- Guana Island, Muskmelon Bay, south side of Long Point within ~100 m of the tip.

0-15 ft: A vertical rock wall with some fissures and crevices occurs from the rocky intertidal zone to a depth of 15 ft. It is fairly barren but has a sparse population of the alga *Caulerpa racemosa*, mats of the colonial anenome *Palythoa caribaeorum*, and various encrusting sponges. The urchin *Echinometra lucunter* has bored into the rock forming shallow grooves, and a small population of the black-spined urchin *Diadema antillarum* is present. Dominant cover of common species consists of hard corals- *Acropora palmata*, *Diploria* sp., *Millepora alcicornis*, and *Montastrea annularis*; and sponges- *Aplysina fistularis*, *Ircinia felix*, *Pseudoceratina crassa*, and several encrusting sponges (e.g., Spirastrellidae).

15-30 ft: A zone of boulders (3-10 ft diameter) occurs within 50 m of shore and has dense populations gorgonians and sponges. Dominant cover consists of octocorals- *Gorgonia ventalina* (3-4 ft colonies), *Plexaura* spp., and *Pseudopterogorgia* spp.; hard corals- *Diploria* sp., *Millepora complanata*, and *Montastrea annularis*; and sponges- *Aplysina cauliformis*, *A. fistularis*, *Callyspongia vaginalis*, *Holopsamma*? sp., *Ircinia* spp., and *Pseudoceratina crassa*.

40-70 ft: A 20-40° fore reef slope extends from ~40 to 70 ft and has a dense cover of hard corals, gorgonians and sponges. Dominant species include hard corals- *Acropora palmata*, *Diploria strigosa*, *Millepora spp.*, *Montastrea cavernosa*, and *Siderastrea* sp.; octocorals- *Pseudopterogorgia* spp. and *Eunicea* spp.; and sponges- *Amphimedon compressa*, *Anthosigmella varians* (3 ft diameter colonies), *Aplysina cauliformis*, *Callyspongia vaginalis*, *Holopsamma*? sp., *Niphates erecta*?, *Pseudoceratina crassa*, *Neofibularia nolitangere*, *Spheciospongia cuspidifera* (=*Xestospongia tierneyi*), and *Verongula rigida*.

70-80 ft: A narrow zone of sand and rubble occurs at the base of the fore reef slope. It has a high diversity of sponges and encrusting ascidians. Common sponges include *Aplysina cauliformis*, *A. fistularis*, *Callyspongia vaginalis*, *Holopsamma*? sp., *Ircinia campana*, *I. stobilina*, *Niphates erecta*?, and *Tethya crypta*?.

Site 2- Beef Island, north shore, east end of Trellis Bay.

Patch reef off rocky point, 1-10 ft: A patch reef with 1-5 ft relief extends from the point to a depth of 10 ft. Dominant species include hard corals- *Acropora palmata*, *Montastrea annularis*, *Dendrogyra cylindricus*, and *Porites porites*; octocorals- *Gorgonia ventalina*, *Plexaura homomalla*, and *Pseudopterogorgia* spp.; and sponges- *Amphimedon compressa*, *Aplysina fistularis*, *Ircinia felix*, *I. strobilina*, *Niphates erecta*?, *Pseudoceratina crassa*, *Sigmadocia*? sp., *Tethya crypta*?, and *Verongula rigida*.

Grassbeds, 1-6 ft: *Syringodium* sp. seagrass is dominant in the center of the bay with 1-2 ft mounds of sand from burrows of *Callianassa*? sp. shrimp.

Table 1. Common sponges observed or collected at Guana and Beef Islands, British Virgin Islands.

SITE	1,14				2		4		5	6		7		8		9	10	11	12	13		15	16	17
SPECIES	0'-15'	15'-30'	50'	75'	3' grass	10' reef	25'-50'	25' flat	30'-70'	25'-60'	10'-25'	60'	10'-20'	40'-70'	10'-20'	0'-30'	6' cave	10'	1'-10'	15'-30'	12' cave	1'-3'	10'-15'	1'-5'
Agelas conifera										x														
Amphimedon compressa			x			x	x			x													x	
Anthosigmella varians			x							x				x		x								
Aplysina cauliformis		x	x	x				x		x													x	
Aplysina fistularis	x	x		x		x	x	x						x									x	
Aplysina fulva							x																	
Aplysina lacunosa							x																	
Calcarea									x							x								
Callyspongia fallax							x																	
Callyspongia vaginalis		x	x	x			x	x		x				x									x	
Chondrilla nucula					x																			x
Cinachyra sp.			x				x		x															
Cribrochalina vasculum														x										
Dysidea sp.														x									x	
Ectyoplasia ferox							x			x													x	
Geodiidae																								x
Holopsamma sp.		x	x	x	x		x																x	
Igernella sp.																							x	
Ircinia campana		x		x			x	x		x				x									x	

Table 1. Common sponges observed or collected at Guana and Beef Islands, British Virgin Islands.

SITE	1,14				2		4		5	6		7		8		9	10	11	12	13		15	16	17
SPECIES	0'-15'	15'-30'	50'	75'	3' grass	10' reef	25'-50'	25' flat	30'-70'	25'-60'	10'-25'	60'	10'-20'	40'-70'	10'-20'	0'-30'	6' cave	10'	1'-10'	15'-30'	12' cave	1'-3'	10'-15'	1'-5'
Ircinia felix	x					x			x					x										
Ircinia strobilina	x	x	x	x		x	x																x	
Monanchora sp.			x																					
Mycale sp.			x							x		x												
Myrmekioderma styx																x								
Neofibularia nolitangere			x						x														x	
Niphates erecta		x	x	x		x	x			x				x									x	
Oceanapia sp.																					x			
Pandaros sp.						x																		
Petrosia sp.									x															
Plakortis sp.									x	x													x	
Polymastia sp.													x											
Pseudaxinella lunaecharta													x											
Pseudoceratina crassa	x	x	x			x	x	x									x							
Ptilocaulis sp.												x	x											
Sigmadocia sp.						x																		
Spheciospongia cuspidifera			x				x																	
Spheciospongia sp.									x															
Spongia sp.					x																	x		x

Table 1. Common sponges observed or collected at Guana and Beef Islands, British Virgin Islands.

SITE	1,14				2		4		5	6		7		8		9	10	11	12	13		15	16	17
SPECIES	0'-15'	15'-30'	50'	75'	3' grass	10' reef	25'-50'	25' flat	30'-70'	25'-60'	10'-25'	60'	10'-20'	40'-70'	10'-20'	0'-30'	6' cave	10'	1'-10'	15'-30'	12' cave	1'-3'	10'-15'	1'-5'
Tedania ignis																								x
Tethya crypta				x		x																		
Ulosa sp.														x										
Verongula rigida	x		x			x	x			x													x	
Xestospongia muta												x		x										
Xestospongia sp.						x						x											x	

Thalassia testudinum is more prevalent along the shore at 1-3 ft, off the southern shore of the point. Common species include: algae- *Penicillus* sp., *Halimeda* sp., *Avrainvillea* sp., and *Dictyota* sp.; echinoderms- *Oreaster* sp., and *Tripneustes* sp.; and sponges- *Holopsamma*? sp., *Chondrilla nucula*, *Spongia* sp., and *Haliclona* sp.

Site 3- Beef Island, hypersaline lagoon, ~100 m east of Trellis Bay. Mats of cyanobacteria (blue-green algae) were collected in the shallow lagoon.

Site 4- Guana Island, ~300 m off Harris Ghut, 90° to beach off Harris Ghut and 360° to Guana Island Hotel (main kitchen building).

25 ft: A reef flat occurs at 25 ft which has dense populations of hard corals including 1-3 ft colonies of *Madracis mirabilis*. Dominant species include hard corals- *Diploria* sp., *Montastrea annularis*, *M. cavernosa*, *Madracis mirabilis*, *Siderastrea siderea*, and *Dendrogyra cylindricus*; octocorals- *Gorgonia ventalina*, *Eunicea* spp., *Pseudoplexaura* spp., *Pseudopterogorgia* spp., and *Plexaura* spp.; and sponges- *Aplysina cauliformis*, *A. fistularis*, *Callyspongia vaginalis*, *Ircinia campana*, and *Pseudoceratina crassa*.

25-50 ft: A 30-40° coral reef slope is present with a dense cover of hard and soft corals. Dominant species include hard corals- *Diploria labyinthiformis* and *Montastrea cavernosa*; octocorals- *Gorgonia ventalina*, *Eunicea* spp., and *Pseudoplexaura* spp.; and sponges- *Amphimedon compressa*, *Aplysina fistularis*, *A. fulva*, *A. lacunosa*, *Callyspongia fallax*, *C. vaginalis*, *Cinachyra* sp., *Ectyoplasia ferox*, *Ircinia campana*, *I. strobilina*, *Niphates erecta*?, *Pseudoceratina crassa*, *Spheciospongia cuspidifera*, and *Verongula rigida*.

50-55 ft: At the base of the fore reef slope a zone of barren silty sand occurs with a sparse cover of the seagrass *Halophila* sp. and *Penicillus* algae. Visibility was poor (3-20 ft) with much suspended sediment in the water.

Site 5- Guana Island, south shore, Iguana Head.

The shoreline is a steep rock cliff which continues underwater as a vertical wall to depths of 15 to 25 ft. A zone of boulders occurs below this and grades into a reef flat plateau at 25-30 ft. The plateau is ~ 50 m wide and drops to a steep fore reef slope (~50-70°) which extends from 30 to 70 ft. A zone of flat sand occurs seaward of this at 70 ft.

30-70 ft: A dense cover of hard corals, gorgonians and sponges occurs on this fore reef slope. Ledges and rock overhangs provide a cave-like habitat for many cryptic species of choristid sponges. At the base of the reef various demosponges occur in the sand/rubble zone.

Site 6- Guana Island, rock point ~100 m southeast of Iguana Head.

Similar in topography to Site 5, a rock cliff extends as a vertical wall underwater to a depth of 15-20 ft. A zone of 5-10 ft boulders forms a reef flat at a depth of 15-25 ft which is ~20-30 m in width. A steep fore reef slope (60-80°) drops from 25 to 60 ft with a sand flat at the base.

25-60 ft: Hard corals, gorgonians and sponges densely populate the reef flat and slope. Dominant sponges on the slope include *Agelas conifera*, *Amphimedon compressa*, *Anthosigmella varians*, *Aplysina cauliformis*, *Callyspongia vaginalis*, *Ectyoplasia ferox*, *Ircinia campana*, *Niphates erecta*?, *Plakortis* sp., and *Verongula rigida*.

Site 7- Guana Island, northwest shore, north side of Long Point, within ~100 m of tip.

Rock cliffs extend into the water as a vertical wall to a depth of 50-60 ft. At the base of the wall is a flat zone of 1-10 ft boulders at a depth of 50-60 ft. Near the tip of Long Point a rock cul-de-sac forms a dead-end cove, ~50 m long and 15-20 ft deep, which has smooth rock walls and a 30-ft long cave at the end in 12 ft of water.

10-20 ft: The upper wall and in the cul-de-sac are fairly barren except for common encrusting species. A bushy black hydroid is common. The sponges *Polymastia* sp., *Pseudaxinella lunaecharta*, and Axinellidae (*Ptilocaulis*? sp.) are present on ledges within the cove.

50-60 ft: This boulder zone is dominated by some hard corals- *Diploria* sp., *Montastrea cavernosa*, and *Siderastrea siderea*; octocorals- *Gorgonia ventalina*, *Pseudopterogorgia* spp., and *Eunicea* spp.; and sponges- Axinellidae (*Ptilocaulis*? sp.) and *Xestospongia muta* which is fairly abundant.

Site 8- Guana Island, north shore, Grand Ghut, within ~100 m of eastern rock point of Grand Ghut.

A rocky intertidal and rock wall extend to a depth of ~20 ft. Boulders are comon in a zone at 20-40 ft. Smooth rock pavement with some ledges and boulders, slopes gently from 30 to 60 ft. A zone of flat sand and rubble extends from the base of the slope at 65-70 ft.

40-60 ft: On the fore reef slope the dominant species include hard corals- *Millepora alcicornis* and *Siderastrea siderea*; octocorals- *Pseudopterogorgia* spp., *Eunicea* spp., and *Pterogorgia* sp.; and sponges- *Anthosigmella varians*, *Aplysina fistularis*, *Callyspongia vaginalis*, *Cribrochalina vasculum*, *Dysidea* sp., *Ircinia campana*, *I. felix*, *Niphates erecta*?, *Ulosa* sp., and *Xestospongia muta*.

60-70 ft: Within the rubble zone, various demosponges, encrusting colonial ascidians and zoanthids are common.

Site 9- Guana Island, northwest shore, ~100 to 300 m northeast of tip of Long Point.

A rocky cliff extends as a vertical wall to a depth of 40-50 ft. A few tide pools occur at 5-10 ft above sea level. Some ledges and caves occur along the wall at depths of 10-40 ft. A flat zone of boulders is present at the base of the wall at 45-60 ft.

Tide pool: Mats of rhodophyta (red algae), filamentous chlorophyta (green algae), and cyanophyta (blue-green algae) occur in this pool which has guano from Boobies nesting above.

1-30 ft: The vertical wall is fairly barren. Dominant species associated with the overhangs and ledges include some ascidians; a fan-shaped hydroid *Solanderia gracilis*; and sponges- *Anthosigmella varians*, *Myrmekioderma styx*?, and Calcarea.

Site 10- Guana Island, Muskmelon Bay, south side of Long Point, ~200-300 m from the tip.

A shallow cave ~30 ft long occurs at a depth of 8 ft at the base of the rock cliffs. Various encrusting demosponges including *Pseudoceratina crassa* occur on the walls of the cave.

Site 11- Guana Island, Muskmelon Bay, ~50 m off the beach at the northwest end of bay.

A patch reef with 1-3 ft of relief occurs at a depth of 10 ft. Common species include hard corals- *Montastrea annularis* and *Millepora alcicornis*; and

octocorals- *Gorgonia ventalina*, *Pseudopterogorgia* spp., *Eunicea* spp., and *Plexaura* spp. A dense bloom of a cyanobacteria (blue-green algae) *Microcoleus lyngbyaceaus* (=*Lyngbya majuscula*) had covered an area of ~ 20 m x 20 m. This reddish-brown, filamentous algae formed long, hair-like skeins nearly 1 ft in length that covered 90-100% of the bottom including living hard corals and gorgonians. The algae thinned in an edge zone that was ~10 m wide and was virtually non-existant beyond that.

Site 12- Guana Island, White Bay, off White Beach, south of beach house.

A series of spur and grooves consisting of dead *Acropora palmata* coral occur at depths of 3-8 ft. These are covered with encrusting fire coral *Millepora alcicornis* and various colonial anenomes (Zoanthidae), including *Zoanthus pulchellus*, *Palythoa grandis*, and *P. caribaeorum*.

Site 13- Guana Island, north shore, a cove approximately half way between North Beach and northwest tip of island.

A rocky shoreline forms a small cove ~50 m wide. Just south of the cove an underwater arch forms an entrance to a cave at a depth of 12 ft. The cave extends as a narrow crevice ~50 ft in length.

8-12 ft: The walls and roof of the arch and cave are covered with a variety of colorful encrusting demosponges. Common species include *Oceanapia* sp., choristids, and Spirastrellidae.

15-30 ft: Seaward of the cove a lush reef flat consists of coral-encrusted boulders and dead *Acropora palmata* spur and groove. Common species include hard corals- *A. palmata*, *Diploria* spp., *Millepora alcicornis*, and *Montastrea annularis*; octocorals- *Gorgonia ventalina*, *Plexaura homomalla*, *Pseudopterogorgia* spp., *Eunicea* spp., and *Plexaura* spp.

Site 14- Same as Site 1.

Site 15- Beef Island, southwest end of island, south of bridge to Tortola Island.

A fringe of red mangroves *Rhizophora mangle* occurs along the edge of the island and extends to a depth of 2 ft. A dense bed of seagrass *Thalassia testudinum* occurs at depths of 1-5 ft between the mangroves and the channel between the islands. Various species of encrusting ascidians are common on the mangrove prop roots.

Site 16- Beef Island, channel and bridge between Beef Island and Tortola Island.

10-15 ft: South of the bridge, swift tidal currents flow through a sand channel with 1-3 ft rock outcrops forming a patch reef habitat. Dense populations of sponges include *Amphimedon compressa*, *Aplysina fistularis*, *A. cauliformis*, *Callyspongia vaginalis*, *Dysidea* sp., *Ectyoplasia ferrox*, *Holopsamma*? sp., *Ircinia* spp., *Niphates erecta*?, *Neofibularia nolitangere*, *Plakortis* sp., and *Verongula rigida*. The bridge pilings are also heavily encrusted with numerous ascidians and sponges including *Igernella* sp.

Site 17- Beef Island, cove at west end of island, north of bridge to Tortola Island.

This mud bottom cove is fringed with red mangroves *Rhizophora mangle*, banks of *Halimeda* spp. green algae at the mouth, and piles of empty conch shells. The mangrove prop roots are heavily encrusted with numerous species of ascidians- Didemnidae, *Clavelina* sp., and *Eudistoma* sp.; and sponges- *Tedania ignis* and Geodiidae.

DISCUSSION

REEF MORPHOLOGY

Of the sites visited, the best developed reefs in terms of coral and sponge diversity and density occur on the southwest side of Guana Island, off Iguana Head and also south of Long Point in Muskmelon Bay. Both of these sites have steep fore reef slopes which abruptly end at a sand flat between 60 and 70 ft.

The reefs within White Bay may be stressed from siltation due to the sandy shoreline, boat traffic and prevailing winds. Visibility was often quite low (5-20 ft) nearshore within the bay and also at the base of the fore reef off Harris Ghut. The spur and groove which had formed from growth of the hard coral *Acropora palmata* is entirely dead except for encrustaions of zoanthid colonial anenomes and fire coral *Millepora* sp.

The reefs off the northwest tip of Guana Island are quite different from the southern reefs. A fairly barren vertical rock wall extends from the coastal cliffs to depths of 40-60 ft. A zone of boulders (3-10 ft diameter) occurs at the base of this wall. The populations of hard corals and octocorals that inhabit the boulder zone and wall are less developed and less dense than those found on the reefs along the south and north sides of the island. Several caves, ledges and supratidal pools also occur along this northwestern shoreline.

SPONGE COMMUNITIES

Eight major sponge communities are apparent from the habitats and sites visited at Guana Island and Beef Island. The sponge communities in the fore reef zone (25-60 ft) and reef flats (15-30 ft) are similar at all sites (Sites 1,4,5,6,8,14). Along rocky shorelines, vertical walls and crevices are inhabited by several species of thin encrusting demosponges (Sites 1,5,6,7,8,9,14). The sand, rubble transition at the base of the deep, fore reef slopes forms a distinct zone at depths of 50-80 ft (Sites 1,5,6,7,8,14). Underwater caves, arches, and ledges also have a distinct sponge community of choristids and encrusting species (Sites 5,7,9,10,13). The sponge community of the patch reef habitats are similar at Sites 2 and 16, as are the mangrove Sites 15 and 17, and the grassbed Sites 2 and 15.

SPONGE DIVERSITY AND DISTRIBUTION

Taxonomic identification of the sponges collected will require microscopic examination of the voucher specimens, especially for the rarer, cryptic or encrusting species. Many of the more common species must also be verified by microscopic examination before the final species list is completed.

The dominant species of sponges inhabiting the reef environments at Guana Island are also commonly found throughout the Caribbean and Bahama Islands. However, the reef and fore reef zone at Guana Island is somewhat depauperate in sponge species compared to the Bahamian reefs. Some common Caribbean and Bahamian sponges that are apparently absent at Guana Island include the following: *Aplysina archeri*, *Callyspongia plicifera*, *Niphates digitalis*, *Verongula gigantea*, *Geodia neptuni*, *Rhaphidophlus juniperinus*, *Iotrochota birotulata*, *Agelas schmidti*, *Agelas dispar*, *Agelas clathrodes*, and *Teichaxinella morchella*.

APPENDIX 1

Collection Site Summary

COLLECTION SITE SUMMARY
BRITISH VIRGIN ISLANDS, GUANA ISLAND, 29 JULY - 4 AUG. 1992
HARBOR BRANCH OCEANOGRAPHIC INSTITUTION
DIVISION OF BIOMEDICAL MARINE RESEARCH

SITE NO.	COLLECTION SITE (DATE + SITE #)	LATITUDE	LONGITUDE	METHOD	DEPTH (Ft)	NUMBER OF SAMPLES (DBMR)
1	29-VII-92-1	18 29.40'N	64 35.05'W	SCUBA	75	10
2	29-VII-92-2	18 27.18'N	64 31.70'W	SNORKEL	10	11
3	29-VII-92-3	18 27.10'N	64 31.60'W	WADE	1	1
4	30-VII-92-1	18 28.40'N	64 34.65'W	SCUBA	55	8
5	30-VII-92-2	18 28.80'N	64 35.00'W	SCUBA	72	14
6	31-VII-92-1	18 28.62'N	64 34.90'W	SCUBA	58	9
7	31-VII-92-2	18 29.42'N	64 35.09'W	SCUBA	60	14
8	1-VIII-92-1	18 29.13'N	64 33.65'W	SCUBA	70	10
9	1-VIII-92-2	18 29.59'N	64 34.97'W	SNORKEL	45	7
10	2-VIII-92-1a	18 29.45'N	64 35.05'W	SNORKEL	6	7
11	2-VIII-92-1b	18 29.38'N	64 34.88'W	SNORKEL	10	1
12	2-VIII-92-2	18 28.70'N	64 34.65'W	SNORKEL	3	1
13	3-VIII-92-1	18 29.45'N	64 34.63'W	SCUBA	12	17
14	3-VIII-92-2	18 29.40'N	64 35.05'W	SCUBA	85	10
15	4-VIII-92-1a	18 26.82'N	64 33.23'W	SNORKEL	3	2
16	4-VIII-92-1b	18 26.90'N	64 33.20'W	SNORKEL	20	4
17	4-VIII-92-1c	18 27.05'N	64 33.06'W	SNORKEL	6	19
*** Total ***						145

APPENDIX 2

Collection Site Descriptions

COLLECTION SITE DESCRIPTIONS
BRITISH VIRGIN ISLANDS, GUANA ISLAND, 29 JULY - 4 AUG. 1992
HARBOR BRANCH OCEANOGRAPHIC INSTITUTION
DIVISION OF BIOMEDICAL MARINE RESEARCH

COLLECTION SITE LOCATION	LATITUDE	LONGITUDE	TOPOGRAPHY SUBSTRATE	METHOD	TEMP. (C)	SALINITY (PPT)	VIS. (FT)	CURRENT (KNOTS)	DEPTH (FEET)	NUMBER OF SAMPLES
** 29-VII-92-1 BRITISH VIRGIN ISLANDS,GUANA ISLAND MUSKMELON BAY,S. SIDE OF LONG POINT	18 29.40'N	64 35.05'W	FORE REEF SLOPE TO 75',BOULDERS @15'-30'ROCK,CORAL REEF,SAND >75'	SCUBA	~28C	~36PPT	50'	0-.1KN	75	10
** 29-VII-92-2 BRITISH VIRGIN ISLANDS,BEEF ISLAND NORTH SHORE,EAST SIDE OF TRELLIS BAY	18 27.18'N	64 31.70'W	FLAT,GRASSBED,PATCH REEF SYRINGODIUM,THALASSIA,CORAL,ROCK,	SNORKEL	~28C	~36PPT	20'	0	10	11
** 29-VII-92-3 BRITISH VIRGIN ISLANDS,BEEF ISLAND EAST OF TRELLIS BAY,HYPERSALINE LAGOON	18 27.10'N	64 31.60'W	HYPERSALINE LAGOON MUD,SAND	WADE	~28C	>50PPT	1'	0	1	1
** 30-VII-92-1 BRITISH VIRGIN ISLANDS,GUANA ISLAND WEST SHORE,WHITE BAY OFF HARRIS GHUT	18 28.40'N	64 34.65'W	FORE REEF SLOPE TO 25'-50',SAND >50' CORAL,ROCK,SAND	SCUBA	~28C	~36PPT	50'-20'	0	55	8
** 30-VII-92-2 BRITISH VIRGIN ISLANDS,GUANA ISLAND WEST SHORE,OFF IGUANA HEAD	18 28.80'N	64 35.00'W	FORE REEF SLOPE 30'-70',BOULDERS 15'-30'CORAL,ROCK,SAND	SCUBA	~28C	~36PPT	50'	0	72	14
** 31-VII-92-1 BRITISH VIRGIN ISLANDS,GUANA ISLAND WEST SHORE,POINT 100M S. OF IGUANA HEAD	18 28.62'N	64 34.90'W	FORE REEF SLOPE 25'-60',BOULDERS 15'-25'CORAL,ROCK,SAND	SCUBA	~28C	~36PPT	50'	0	58	9
** 31-VII-92-2 BRITISH VIRGIN ISLANDS,GUANA ISLAND NW. SHORE,N. SIDE OF LONG POINT	18 29.42'N	64 35.09'W	WALL TO 50',BOULDERS 50'-60',CAVE BOULDERS,ROCK WALL	SCUBA	~28C	~36PPT	50'	0	60	14
** 1-VIII-92-1 BRITISH VIRGIN ISLANDS,GUANA ISLAND NORTH SHORE,BRAND GHUT,N. OF EAST POINT	18 29.13'N	64 33.65'W	SMOOTH PAVEMENT,FEW LEDGES 40'-70' ROCK,SAND	SCUBA	~28C	~36PPT	50'	0	70	10

COLLECTION SITE DESCRIPTIONS
BRITISH VIRGIN ISLANDS, GUANA ISLAND, 29 JULY - 4 AUG. 1992
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DIVISION OF BIOMEDICAL MARINE RESEARCH

COLLECTION SITE LOCATION	LATITUDE	LONGITUDE	TOPOGRAPHY SUBSTRATE	METHOD	TEMP. (C)	SALINITY (PPT)	VIS. (FT)	CURRENT (KNOTS)	DEPTH (FEET)	NUMBER OF SAMPLES
** 1-VIII-92-2 BRITISH VIRGIN ISLANDS,GUANA ISLAND NW. SHORE,N. OF LONG POINT	18 29.59'N	64 34.97'W	WALL TO 40'-50',CAVES ROCK WALL	SCUBA	~28C	~36PPT	45'	0	45	7
** 2-VIII-92-1a BRITISH VIRGIN ISLANDS,GUANA ISLAND MUSKMELON BAY,100M E. OF LONG POINT	18 29.45'N	64 35.05'W	CAVE AT BASE OF CLIFF CAVE WALL	SNORKEL	~28C	~36PPT	40'	0	6	7
** 2-VIII-92-1b BRITISH VIRGIN ISLANDS,GUANA ISLAND MUSKMELON BAY,50M OFF BEACH AT NORTH END	18 29.38'N	64 34.88'W	REEF FLAT CORAL	SNORKEL	~28C	~36PPT	40'	0	10	1
** 2-VIII-92-2 BRITISH VIRGIN ISLANDS,GUANA ISLAND WEST SHORE,WHITE BAY,S. OF BEACH HOUSE	18 28.70'N	64 34.65'W	DEAD ACROPORA SPUR/GROOVE,8' RELIEF DEAD CORAL	SNORKEL	~28C	~36PPT	20'	0	3	1
** 3-VIII-92-1 BRITISH VIRGIN ISLANDS,GUANA ISLAND NORTH SHORE,COVE ~.4NMI N. OF NORTH BEACH	18 29.45'N	64 34.63'W	UNDERWATER ARCH,CAVE,CREVICE ROCK WALL,CEILING	SCUBA	~28C	~36PPT	45'	0	12	17
** 3-VIII-92-2 BRITISH VIRGIN ISLANDS,GUANA ISLAND MUSKMELON BAY,S. SIDE OF LONG POINT(=Site 1)	18 29.40'N	64 35.05'W	FORE REEF SLOPE 30-70' RUBBLE,SAND >70' RUBBLE,SAND,CORAL	SCUBA	~28C	~36PPT	50'	0	65	10
** 4-VIII-92-1a BRITISH VIRGIN ISLANDS,BEEF ISLAND WEST COAST,MANGROVE S. OF BRIDGE	18 26.82'N	64 33.23'W	MANGROVE,THALASSIA GRASSBED MANGROVE ROOTS,THALASSIA	SNORKEL	~28C	~36PPT	40'	0	3	2

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COLLECTION SITE LOCATION	LATITUDE	LONGITUDE	TOPOGRAPHY SUBSTRATE	METHOD	TEMP. (C)	SALINITY (PPT)	VIS. (FT)	CURRENT (KNOTS)	DEPTH (FEET)	NUMBER OF SAMPLES
** 4-VIII-92-1b BRITISH VIRGIN ISLANDS,BEEF ISLAND WEST COAST,CHANNEL AND BRIDGE	18 26.90'N	64 33.20'W	PATCH REEF,BRIDGE PILINGS CORAL,STEEL PILINGS	SNORKEL	~28C	~36PPT	40'	.2KN	20	4
** 4-VIII-92-1c BRITISH VIRGIN ISLANDS,BEEF ISLAND WEST COAST,MANGROVE COVE N. OF BRIDGE	18 27.05'N	64 33.06'W	RED MANGROVES MANGROVE ROOTS,THALASSIA,WOOD HULL	SNORKEL	~28C	~36PPT	20'	0	6	19

APPENDIX 3

Species List

POR= Porifera, CHO= Chordata (Ascidiacea), CYA= Cyanophyta, CHL= Chlorophyta, CNI= Cnidaria, RHO= Rhodophyta

SPECIES LIST OF SAMPLES COLLECTED
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HARBOR BRANCH OCEANOGRAPHIC INSTITUTION
DIVISION OF BIOMEDICAL MARINE RESEARCH

SAMPLE NUMBER (Date +Site # +Species #)	PHYLUM	FIELD IDENTIFICATION	RECOLLECTION NUMBER	COLLECTION METHOD	DEPTH (FEET)
29-VII-92-1-001	POR	DEMOSPONGIAE		SCUBA	75
29-VII-92-1-002	CHO	ASCIDIACEA		SCUBA	75
29-VII-92-1-003	POR	DEMOSPONGIAE		SCUBA	75
29-VII-92-1-004	POR	ANTHOSIGMELLA? VARIANS?		SCUBA	50
29-VII-92-1-005	POR	CALLYSPONGIA? SP.		SCUBA	50
29-VII-92-1-006	POR	MONANCHORA? SP.		SCUBA	50
29-VII-92-1-007	POR	CINACHYRA? SP.		SCUBA	50
29-VII-92-1-008	POR	DEMOSPONGIAE		SCUBA	5
29-VII-92-1-009	POR	HOLOPSAMMA? SP.		SCUBA	20
29-VII-92-1-010	POR	NIPHATES? SP.		SCUBA	75
29-VII-92-2-001	POR	HOLOPSAMMA? SP.		SNORKEL	5
29-VII-92-2-002	POR	DEMOSPONGIAE		SNORKEL	5
29-VII-92-2-003	POR	SIGMADOCIA? SP.		SNORKEL	10
29-VII-92-2-004	POR	AMPHIMEDON COMPRESSA		SNORKEL	10
29-VII-92-2-005	POR	TETHYA? CRYPTA?		SNORKEL	10
29-VII-92-2-006	POR	XESTOSPONGIA? SP.		SNORKEL	10
29-VII-92-2-007	POR	PANDAROS? SP.		SNORKEL	10
29-VII-92-2-008	POR	SPONGIA? SP.		SNORKEL	3
29-VII-92-2-009	POR	CHONDRILLA? SP.		SNORKEL	3
29-VII-92-2-010	POR	CALLYSPONGIA? SP.		SNORKEL	3
29-VII-92-2-011	POR	HALICLONA? SP.		SNORKEL	3
29-VII-92-3-101	CYA	CYANOPHYTA		WADE	1
30-VII-92-1-001	POR	SPHECIOSPONGIA CUSPIDIFERA		SCUBA	50
30-VII-92-1-002	POR	ECTOPLASIA FEROX?		SCUBA	50
30-VII-92-1-003	POR	DEMOSPONGIAE		SCUBA	50
30-VII-92-1-004	POR	CINACHYRA? SP.		SCUBA	50
30-VII-92-1-005	POR	APLYSINA LACUNOSA?		SCUBA	50
30-VII-92-1-006	POR	CALLYSPONGIA FALLAX?		SCUBA	50
30-VII-92-1-007	POR	SPIRASTRELLIDAE?		SCUBA	20
30-VII-92-1-101	CYA	CYANOPHYTA		SCUBA	35
30-VII-92-2-001	POR	DEMOSPONGIAE + ZOANTHIDAE		SCUBA	72
30-VII-92-2-002	POR	CINACHYRA? SP.		SCUBA	70
30-VII-92-2-003	POR	DEMOSPONGIAE + ZOANTHIDAE		SCUBA	70
30-VII-92-2-004	POR	DEMOSPONGIAE		SCUBA	70
30-VII-92-2-005	POR	SPHECIOSPONGIA? SP.		SCUBA	70
30-VII-92-2-006	POR	PLAKORTIS? SP.		SCUBA	70
30-VII-92-2-007	POR	DEMOSPONGIAE		SCUBA	45
30-VII-92-2-008	POR	DEMOSPONGIAE		SCUBA	45
30-VII-92-2-009	POR	PETROSIA? SP.		SCUBA	45
30-VII-92-2-010	POR	IRCINIA SP.		SCUBA	45
30-VII-92-2-011	POR	CHORISTIDA?		SCUBA	45
30-VII-92-2-012	POR	DEMOSPONGIAE		SCUBA	45
30-VII-92-2-013	CHO	APLIDIUM? SP.		SCUBA	15
30-VII-92-2-014	POR	HALICHONDRIDA?		SCUBA	15
31-VII-92-1-001	POR	MYCALE? SP.		SCUBA	55
31-VII-92-1-002	POR	DEMOSPONGIAE		SCUBA	55

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HARBOR BRANCH OCEANOGRAPHIC INSTITUTION
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SAMPLE NUMBER (Date +Site # +Species #)	PHYLUM	FIELD IDENTIFICATION	RECOLLECTION NUMBER	COLLECTION METHOD	DEPTH (FEET)
31-VII-92-1-003	POR	CALCAREA?		SCUBA	55
31-VII-92-1-004	POR	ECTOPLASIA FEROX		SCUBA	40
31-VII-92-1-005	POR	PLAKORTIS? SP.		SCUBA	40
31-VII-92-1-006	POR	DEMOSPONGIAE		SCUBA	40
31-VII-92-1-007	POR	AGELAS SP.		SCUBA	35
31-VII-92-1-008	POR	ECTOPLASIA? SP.		SCUBA	12
31-VII-92-1-101	CHL	ENTEROMORPHA? SP.		SCUBA	3
31-VII-92-2-001	POR	XESTOSPONGIA SP.		SCUBA	60
31-VII-92-2-002	POR	DEMOSPONGIAE		SCUBA	60
31-VII-92-2-003	POR	AXINELLIDAE		SCUBA	60
31-VII-92-2-004	POR	MYCALE SP.		SCUBA	60
31-VII-92-2-005	CHO	ASCIDIACEA		SCUBA	60
31-VII-92-2-006	POR	XESTOSPONGIA MUTA		SCUBA	60
31-VII-92-2-007	CNI	HYDROIDA		SCUBA	30
31-VII-92-2-008	POR	SPIRASTRELLIDAE?		SCUBA	10
31-VII-92-2-009	POR	PSEUDAXINELLA LUNAECHARTA?		SCUBA	8
31-VII-92-2-010	POR	AXINELLIDAE		SCUBA	10
31-VII-92-2-011	POR	CHORISTIDA		SCUBA	10
31-VII-92-2-012	POR	DEMOSPONGIAE		SCUBA	10
31-VII-92-2-013	POR	POLYMASTIA SP.		SCUBA	10
31-VII-92-2-014	POR	CALCAREA		SCUBA	10
1-VIII-92-1-001	POR	DEMOSPONGIAE		SCUBA	63
1-VIII-92-1-002	POR	DEMOSPONGIAE		SCUBA	65
1-VIII-92-1-003	POR	DEMOSPONGIAE		SCUBA	70
1-VIII-92-1-004	POR	DYSIDEA? SP.		SCUBA	70
1-VIII-92-1-005	POR	DEMOSPONGIAE		SCUBA	70
1-VIII-92-1-006	POR	ANTHOSIGMELLA? SP.		SCUBA	70
1-VIII-92-1-007	POR	DEMOSPONGIAE		SCUBA	70
1-VIII-92-1-008	CHO	ASCIDIACEA + PLEXAURIDAE		SCUBA	70
1-VIII-92-1-009	CNI	PARAZOANTHUS? SP. + HYDROIDA		SCUBA	60
1-VIII-92-1-010	POR	ULOSA? SP.		SCUBA	50
1-VIII-92-2-001	CHO	ASCIDIACEA		SNORKEL	10
1-VIII-92-2-002	CNI	SOLANDERIA GRACILIS?		SNORKEL	30
1-VIII-92-2-003	POR	CALCAREA?	Y	SNORKEL	40
1-VIII-92-2-004	POR	MYRMEKIODERMA? STYX?		SNORKEL	15
1-VIII-92-2-101	RHO	RHODOPHYTA?		SNORKEL	5
1-VIII-92-2-102	RHO	RHODOPHYTA		SNORKEL	2
1-VIII-92-2-103	CHL	CHLOROPHYTA		SNORKEL	2
2-VIII-92-1-001	POR	DEMOSPONGIAE		SNORKEL	6
2-VIII-92-1-002	POR	DEMOSPONGIAE		SNORKEL	6
2-VIII-92-1-003	POR	DEMOSPONGIAE	Y	SNORKEL	6
2-VIII-92-1-004	POR	DEMOSPONGIAE		SNORKEL	6
2-VIII-92-1-005	POR	PSEUDOCERATINA CRASSA?		SNORKEL	8
2-VIII-92-1-006	POR	DEMOSPONGIAE		SNORKEL	8
2-VIII-92-1-101	RHO	RHODOPHYTA		SNORKEL	3
2-VIII-92-1-102	CYA	MICROCOLEUS LYNGBYACEUS		SNORKEL	10

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SAMPLE NUMBER (Date +Site # +Species #)	PHYLUM	FIELD IDENTIFICATION	RECOLLECTION NUMBER	COLLECTION METHOD	DEPTH (FEET)
2-VIII-92-2-001	CNI	ZOANTHUS PULCHELLUS?		SNORKEL	3
3-VIII-92-1-001	CHO	ASCIDIACEA		SCUBA	12
3-VIII-92-1-002	POR	CALLYSPONGIA? SP.		SCUBA	12
3-VIII-92-1-003	POR	CHORISTIDA?		SCUBA	12
3-VIII-92-1-004	POR	DEMOSPONGIAE		SCUBA	12
3-VIII-92-1-005	POR	DEMOSPONGIAE		SCUBA	8
3-VIII-92-1-006	POR	DEMOSPONGIAE		SCUBA	12
3-VIII-92-1-007	POR	OCEANAPIA SP.		SCUBA	12
3-VIII-92-1-008	POR	DEMOSPONGIAE		SCUBA	12
3-VIII-92-1-009	POR	DEMOSPONGIAE		SCUBA	12
3-VIII-92-1-010	POR	OCEANAPIA SP.		SCUBA	12
3-VIII-92-1-011	POR	DEMOSPONGIAE		SCUBA	8
3-VIII-92-1-012	POR	DEMOSPONGIAE		SCUBA	8
3-VIII-92-1-013	POR	DEMOSPONGIAE		SCUBA	8
3-VIII-92-1-014	POR	DEMOSPONGIAE		SCUBA	8
3-VIII-92-1-015	POR	DEMOSPONGIAE	Y	SCUBA	12
3-VIII-92-1-016	POR	DEMOSPONGIAE		SCUBA	12
3-VIII-92-1-017	POR	DEMOSPONGIAE		SCUBA	12
3-VIII-92-2-001	POR	DEMOSPONGIAE		SCUBA	83
3-VIII-92-2-002	POR	TETHYA? CRYPTA?		SCUBA	83
3-VIII-92-2-003	CHO	ASCIDIACEA	Y	SCUBA	80
3-VIII-92-2-004	POR	DEMOSPONGIAE		SCUBA	80
3-VIII-92-2-005	POR	DEMOSPONGIAE	Y	SCUBA	80
3-VIII-92-2-006	CNI	GORGONACEA		SCUBA	83
3-VIII-92-2-007	POR	SPHECIOSPONGIA CUSPIDIFERA	Y	SCUBA	55
3-VIII-92-2-008	POR	CLIONA SP.		SCUBA	55
3-VIII-92-2-009	POR	NEOFIBULARIA NOLITANGERI		SCUBA	55
3-VIII-92-2-010	CNI	GORGONACEA		SCUBA	83
4-VIII-92-1-001	CHO	EUDISTOMA TURBINATA?		SNORKEL	2
4-VIII-92-1-002	CHO	ASCIDIACEA		SNORKEL	2
4-VIII-92-1-003	CHO	ASCIDIACEA		SNORKEL	2
4-VIII-92-1-004	CHO	DIDEMNIDAE		SNORKEL	2
4-VIII-92-1-005	CHO	CLAVELINA? SP.		SNORKEL	2
4-VIII-92-1-006	POR	DEMOSPONGIAE		SNORKEL	2
4-VIII-92-1-007	POR	DEMOSPONGIAE		SNORKEL	3
4-VIII-92-1-008	POR	CHONDRILLA NUCULA?		SNORKEL	5
4-VIII-92-1-009	POR	DEMOSPONGIAE		SNORKEL	2
4-VIII-92-1-010	POR	DEMOSPONGIAE		SNORKEL	2
4-VIII-92-1-011	POR	SPONGIA? SP.		SNORKEL	3
4-VIII-92-1-012	POR	DEMOSPONGIAE		SNORKEL	2
4-VIII-92-1-013	POR	DYSIDEA? SP.		SNORKEL	20
4-VIII-92-1-014	POR	DEMOSPONGIAE		SNORKEL	2
4-VIII-92-1-015	POR	IOTROCHOTA? SP.		SNORKEL	15
4-VIII-92-1-016	POR	DEMOSPONGIAE		SNORKEL	2
4-VIII-92-1-017	POR	DEMOSPONGIAE		SNORKEL	2
4-VIII-92-1-019	POR	PLAKORTIS SP.		SNORKEL	15

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SAMPLE NUMBER (Date +Site # +Species #)	PHYLUM	FIELD IDENTIFICATION	RECOLLECTION NUMBER	COLLECTION METHOD	DEPTH (FEET)
4-VIII-92-1-019	POR	SPONGIIDAE?		SNORKEL	2
4-VIII-92-1-020	POR	SPIRASTRELLA COCCINEA?		SNORKEL	1
4-VIII-92-1-021	POR	DEMOSPONGIAE		SNORKEL	1
4-VIII-92-1-022	POR	GEODIIDAE + DEMOSPONGIAE		SNORKEL	2
4-VIII-92-1-023	POR	GEODIIDAE		SNORKEL	2
4-VIII-92-1-024	POR	GEODIIDAE + DEMOSPONGIAE		SNORKEL	3
4-VIII-92-1-101	CYA	CYANOPHYTA?		SNORKEL	1

APPENDIX 4

Taxonomic Distribution

TAXONOMIC DISTRIBUTION
BRITISH VIRGIN ISLANDS, GUANA ISLAND, 29 JULY - 4 AUG. 1992
HARBOR BRANCH OCEANOGRAPHIC INSTITUTION
DIVISION OF BIOMEDICAL MARINE RESEARCH

SAMPLE NUMBER (Date +Site # +Species #)	ORDER FAMILY	GENUS SPECIES	RECOLLECTION NUMBER	DEPTH (FEET)
‡‡ PHYLUM CHL				
‡ CLASS				
1-VIII-92-2-103				2
31-VII-92-1-101	ULVALES ULVACEAE	ENTEROMORPHA? SP.		3
‡‡ PHYLUM CHO				
‡ CLASS ASCIDIACEA				
29-VII-92-1-002				75
31-VII-92-2-005				60
1-VIII-92-2-001				10
3-VIII-92-1-001				12
3-VIII-92-2-003			Y	80
4-VIII-92-1-002				2
4-VIII-92-1-003				2
4-VIII-92-1-004	APLOUSOBRANCHIA DIDEMNIDAE			2
4-VIII-92-1-005	APLOUSOBRANCHIA POLYCITORIDAE	CLAVELINA? SP.		2
4-VIII-92-1-001	APLOUSOBRANCHIA POLYCITORIDAE	EUDISTOMA TURBINATA?		2
30-VII-92-2-013	APLOUSOBRANCHIA POLYCLINIDAE	APLIDIUM? SP.		15
‡ CLASS ASCIDIACEA + ANTHOZOA				
1-VIII-92-1-008	+ GORGONACEA + PLEXAURIDAE			70
‡‡ PHYLUM CNI				
‡ CLASS ANTHOZOA				
3-VIII-92-2-006	GORGONACEA			83
3-VIII-92-2-010	GORGONACEA			83
2-VIII-92-2-001	ZOANTHIDEA ZOANTHIDAE	ZOANTHUS PULCHELLUS?		3
‡ CLASS ANTHOZOA + HYDROZOA				
1-VIII-92-1-009	ZOANTHIDEA + HYDROIDA ZOANTHIDAE +	PARAZOANTHUS? + SP.		60
‡ CLASS HYDROZOA				
31-VII-92-2-007	HYDROIDA			30
1-VIII-92-2-002	HYDROIDA SOLANDERIIDAE	SOLANDERIA GRACILIS?		30

TAXONOMIC DISTRIBUTION
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DIVISION OF BIOMEDICAL MARINE RESEARCH

SAMPLE NUMBER (Date +Site # +Species #)	ORDER FAMILY	GENUS SPECIES	RECOLLECTION NUMBER	DEPTH (FEET)
‡‡ PHYLUM CYA				
‡ CLASS				
29-VII-92-3-101				1
30-VII-92-1-101				35
4-VIII-92-1-101				1
2-VIII-92-1-102	HORMOGONALES OSCILLATORIACEAE	MICROCOLEUS LYNGBYACEUS		10
‡‡ PHYLUM POR				
‡ CLASS CALCAREA				
31-VII-92-2-014				10
‡ CLASS CALCAREA?				
31-VII-92-1-003				55
1-VIII-92-2-003			Y	40
‡ CLASS DEMOSPONGIAE				
29-VII-92-1-001				75
29-VII-92-1-003				75
29-VII-92-1-008				5
29-VII-92-2-002				5
30-VII-92-1-003				50
30-VII-92-2-004				70
30-VII-92-2-007				45
30-VII-92-2-008				45
30-VII-92-2-012				45
31-VII-92-1-002				55
31-VII-92-1-006				40
31-VII-92-2-002				60
31-VII-92-2-012				10
1-VIII-92-1-001				63
1-VIII-92-1-002				65
1-VIII-92-1-003				70
1-VIII-92-1-005				70
1-VIII-92-1-007				70
2-VIII-92-1-001				6
2-VIII-92-1-002				6
2-VIII-92-1-003			Y	6
2-VIII-92-1-004				6
2-VIII-92-1-006				8
3-VIII-92-1-004				12
3-VIII-92-1-005				8
3-VIII-92-1-006				12

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SAMPLE NUMBER (Date +Site # +Species #)	ORDER FAMILY	GENUS SPECIES	RECOLLECTION NUMBER	DEPTH (FEET)
3-VIII-92-1-008				12
3-VIII-92-1-009				12
3-VIII-92-1-011				8
3-VIII-92-1-012				8
3-VIII-92-1-013				8
3-VIII-92-1-014				8
3-VIII-92-1-015			Y	12
3-VIII-92-1-016				12
3-VIII-92-1-017				12
3-VIII-92-2-001				83
3-VIII-92-2-004				80
3-VIII-92-2-005			Y	80
4-VIII-92-1-006				2
4-VIII-92-1-007				3
4-VIII-92-1-009				2
4-VIII-92-1-010				2
4-VIII-92-1-012				2
4-VIII-92-1-014				2
4-VIII-92-1-016				2
4-VIII-92-1-017				2
4-VIII-92-1-021				1
31-VII-92-2-008	SPIRASTRELLIDAE?			10
31-VII-92-1-007	AGELASIDA AGELASIDAE	ABELAS SP.		35
31-VII-92-2-003	AXINELLIDA AXINELLIDAE			60
31-VII-92-2-010	AXINELLIDA AXINELLIDAE			10
31-VII-92-2-009	AXINELLIDA AXINELLIDAE	PSEUDAXINELLA LUNAECHARTA?		8
31-VII-92-1-004	AXINELLIDA RASPAILIIDAE	ECTOPLASIA FEROX		40
30-VII-92-1-002	AXINELLIDA RASPAILIIDAE	ECTOPLASIA FEROX?		50
31-VII-92-1-008	AXINELLIDA RASPAILIIDAE	ECTOPLASIA? SP.		12
1-VIII-92-1-010	AXINELLIDA RASPAILIIDAE	ULOSA? SP.		50
31-VII-92-2-011	CHORISTIDA			10
4-VIII-92-1-023	CHORISTIDA GEODIIDAE			2
30-VII-92-2-011	CHORISTIDA?			45
3-VIII-92-1-003	CHORISTIDA?			12
4-VIII-92-1-015	DENDROCERATIDA DICTYODENDORILLIDAE	IBERNELLA? SP.		15

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SAMPLE NUMBER (Date +Site # +Species #)	ORDER FAMILY	GENUS SPECIES	RECOLLECTION NUMBER	DEPTH (FEET)
1-VIII-92-1-004	DICTYOCERATIDA DYSIDEIDAE	DYSIDEA? SP.		70
4-VIII-92-1-013	DICTYOCERATIDA DYSIDEIDAE	DYSIDEA? SP.		20
29-VII-92-2-008	DICTYOCERATIDA SPONGIIDAE	SPONGIA? SP.		3
4-VIII-92-1-011	DICTYOCERATIDA SPONGIIDAE	SPONGIA? SP.		3
4-VIII-92-1-019	DICTYOCERATIDA SPONGIIDAE?			2
30-VII-92-2-010	DICTYOCERATIDA THORECTIDAE	IRCINIA SP.		45
4-VIII-92-1-008	HADROMERIDA CHONDROSIIDAE	CHONDRILLA NUCULA		5
29-VII-92-2-009	HADROMERIDA CHONDROSIIDAE	CHONDRILLA? SP.		3
3-VIII-92-2-008	HADROMERIDA CLIONIDAE	CLIONA SP.		55
31-VII-92-2-013	HADROMERIDA POLYMASTIIDAE	POLYMASTIA SP.		10
1-VIII-92-1-006	HADROMERIDA SPIRASTRELLIDAE	ANTHOSIGMELLA? SP.		70
29-VII-92-1-004	HADROMERIDA SPIRASTRELLIDAE	ANTHOSIGMELLA? VARIANS?		50
30-VII-92-1-001	HADROMERIDA SPIRASTRELLIDAE	SPHECIOSPONGIA CUSPIDIFERA		50
3-VIII-92-2-007	HADROMERIDA SPIRASTRELLIDAE	SPHECIOSPONGIA CUSPIDIFERA		55
30-VII-92-2-005	HADROMERIDA SPIRASTRELLIDAE	SPHECIOSPONGIA? SP.		70
4-VIII-92-1-020	HADROMERIDA SPIRASTRELLIDAE	SPIRASTRELLA COCCINEA?		1
30-VII-92-1-007	HADROMERIDA SPIRASTRELLIDAE?			
29-VII-92-2-005	HADROMERIDA TETHYIDAE	TETHYA? SP.		10
3-VIII-92-2-002	HADROMERIDA	CRYPIA?		83
1-VIII-92-2-[illegible]	[illegible]RIDA HALICHONDRIIDAE	MYRMEKIODERMA? STYX?		15
-VII-92-2-014	HALICHONDRIDA?			15
30-VII-92-1-006	HAPLOSCLERIDA CALLYSPONGIIDAE	CALLYSPONGIA FALLAX?		50
29-VII-92-1-005	HAPLOSCLERIDA CALLYSPONGIIDAE	CALLYSPONGIA? SP.		50
29-VII-92-2-010	HAPLOSCLERIDA CALLYSPONGIIDAE	CALLYSPONGIA? SP.		3

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SAMPLE NUMBER (Date +Site # +Species #)	ORDER FAMILY	GENUS SPECIES	RECOLLECTION NUMBER	DEPTH (FEET)
3-VIII-92-1-002	HAPLOSCLERIDA CALLYSPONGIIDAE	CALLYSPONGIA? SP.		12
29-VII-92-2-011	HAPLOSCLERIDA HALICLONIDAE	HALICLONA? SP.		3
29-VII-92-2-003	HAPLOSCLERIDA HALICLONIDAE	SIGMADOCIA? SP.		10
29-VII-92-2-004	HAPLOSCLERIDA NIPHATIDAE	AMPHIMEDON COMPRESSA		10
29-VII-92-1-010	HAPLOSCLERIDA NIPHATIDAE	NIPHATES? SP.		75
3-VIII-92-1-007	HAPLOSCLERIDA OCEANAPIIDAE	OCEANAPIA SP.		12
3-VIII-92-1-010	HAPLOSCLERIDA OCEANAPIIDAE	OCEANAPIA SP.		12
30-VII-92-2-009	HAPLOSCLERIDA PETROSIIDAE	PETROSIA? SP.		45
31-VII-92-2-006	HAPLOSCLERIDA PETROSIIDAE	XESTOSPONGIA MUTA		60
29-VII-92-2-006	HAPLOSCLERIDA PETROSIIDAE	XESTOSPONGIA SP.		10
31-VII-92-2-001	HAPLOSCLERIDA PETROSIIDAE	XESTOSPONGIA? SP.		60
4-VIII-92-1-018	HOMOSCLEROPHORIDA PLAKINIDAE	PLAKORTIS SP.		15
30-VII-92-2-006	HOMOSCLEROPHORIDA PLAKINIDAE	PLAKORTIS? SP.		70
31-VII-92-1-005	HOMOSCLEROPHORIDA PLAKINIDAE	PLAKORTIS? SP.		40
3-VIII-92-2-009	POECILOSCLERIDA BIEMNIDAE	NEOFIBULARIA NOLITANGERE		55
29-VII-92-2-007	POECILOSCLERIDA CLATHRIIDAE	PANDAROS? SP.		10
29-VII-92-1-009	POECILOSCLERIDA DESMACIDONIDAE	HOLOPSAMMA SP.		20
29-VII-92-2-001	POECILOSCLERIDA DESMACIDONIDAE	HOLOPSAMMA? SP.		5
29-VII-92-1-006	POECILOSCLERIDA DESMACIDONIDAE	MONANCHORA? SP.		50
31-VII-92-2-004	POECILOSCLERIDA MYCALIDAE	MYCALE SP.		60
31-VII-92-1-001	POECILOSCLERIDA MYCALIDAE	MYCALE? SP.		55
29-VII-92-1-007	SPIROPHORIDA TETILLIDAE	CINACHYRA? SP.		50
30-VII-92-1-004	SPIROPHORIDA TETILLIDAE	CINACHYRA? SP.		50

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SAMPLE NUMBER (Date +Site # +Species #)	ORDER FAMILY	GENUS SPECIES	RECOLLECTION NUMBER	DEPTH (FEET)
30-VII-92-2-002	SPIROPHORIDA TETILLIDAE	CINACHYRA? SP.		70
2-VIII-92-1-005	VERONGIDA APLYSINELLIDAE	PSEUDOCERATINA CRASSA?		8
30-VII-92-1-005	VERONGIDA APLYSINIDAE	APLYSINA LACUNOSA?		50
* CLASS DEMOSPONGIAE + ANTHOZOA				
30-VII-92-2-001	+ ZOANTHIDEA + ZOANTHIDAE			72
30-VII-92-2-003	+ ZOANTHIDEA + ZOANTHIDAE			70
* CLASS DEMOSPONGIAE + DEMOSPONGIAE				
4-VIII-92-1-022	CHORISTIDA + GEODIIDAE +			2
4-VIII-92-1-024	CHORISTIDA + GEODIIDAE +			3
** PHYLUM RHO				
* CLASS				
1-VIII-92-2-101				5
1-VIII-92-2-102				2
2-VIII-92-1-101				3

APPENDIX 5

Photograph and Taxonomic Voucher Checklist

PHOTOGRAPH AND VOUCHER DOCUMENTATION
BRITISH VIRGIN ISLANDS, GUANA ISLAND, 29 JULY - 4 AUG. 1992
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SAMPLE NUMBER (DATE + DIVE + SAMPLE)	IN SITU, DECK 35MM PHOTOGRAPH	DECK POLAROID, IN SITU VIDEO	VOUCHER SPECIMEN
29-VII-92-1-001	Y INSITU,Y	DECK N	LARGE
29-VII-92-1-002	Y INSITU,Y	DECK N	LARGE
29-VII-92-1-003	Y INSITU,Y	DECK N	LARGE
29-VII-92-1-004	Y INSITU,Y	DECK N	LARGE
29-VII-92-1-005	Y INSITU,Y	DECK N	LARGE
29-VII-92-1-006	Y INSITU,Y	DECK N	LARGE
29-VII-92-1-007	Y INSITU,Y	DECK N	LARGE
29-VII-92-1-008	Y INSITU,Y	DECK N	LARGE
29-VII-92-1-009	Y INSITU,Y	DECK N	LARGE
29-VII-92-1-010	Y INSITU,Y	DECK N	LARGE
29-VII-92-2-001	Y INSITU,Y	DECK N	LARGE
29-VII-92-2-002	Y INSITU,Y	DECK N	LARGE
29-VII-92-2-003	Y INSITU,Y	DECK N	LARGE
29-VII-92-2-004	Y INSITU,Y	DECK N	LARGE
29-VII-92-2-005	Y INSITU,Y	DECK N	LARGE
29-VII-92-2-006	Y INSITU,Y	DECK N	LARGE
29-VII-92-2-007	Y INSITU,Y	DECK N	LARGE
29-VII-92-2-008	Y INSITU,Y	DECK N	LARGE
29-VII-92-2-009	Y INSITU,Y	DECK N	LARGE
29-VII-92-2-010	Y INSITU,Y	DECK N	LARGE
29-VII-92-2-011	Y INSITU,Y	DECK N	LARGE
29-VII-92-3-101	N INSITU,Y	DECK N	LARGE
30-VII-92-1-001	Y INSITU,Y	DECK N	LARGE
30-VII-92-1-002	Y INSITU,Y	DECK N	LARGE
30-VII-92-1-003	Y INSITU,Y	DECK N	LARGE
30-VII-92-1-004	Y INSITU,Y	DECK N	LARGE
30-VII-92-1-005	Y INSITU,Y	DECK N	LARGE
30-VII-92-1-006	Y INSITU,Y	DECK N	LARGE
30-VII-92-1-007	Y INSITU,Y	DECK N	LARGE
30-VII-92-1-101	Y INSITU,Y	DECK N	LARGE
30-VII-92-2-001	Y INSITU,Y	DECK N	LARGE
30-VII-92-2-002	Y INSITU,Y	DECK N	LARGE
30-VII-92-2-003	Y INSITU,Y	DECK N	LARGE
30-VII-92-2-004	Y INSITU,Y	DECK N	LARGE
30-VII-92-2-005	Y INSITU,Y	DECK N	LARGE
30-VII-92-2-006	Y INSITU,Y	DECK N	LARGE
30-VII-92-2-007	Y INSITU,Y	DECK N	LARGE
30-VII-92-2-008	Y INSITU,Y	DECK N	LARGE
30-VII-92-2-009	Y INSITU,Y	DECK N	LARGE
30-VII-92-2-010	Y INSITU,Y	DECK N	LARGE
30-VII-92-2-011	Y INSITU,Y	DECK N	LARGE
30-VII-92-2-012	Y INSITU,Y	DECK N	LARGE
30-VII-92-2-013	Y INSITU,Y	DECK N	LARGE
30-VII-92-2-014	Y INSITU,Y	DECK N	LARGE
31-VII-92-1-001	Y INSITU,Y	DECK N	LARGE
31-VII-92-1-002	Y INSITU,Y	DECK N	LARGE

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SAMPLE NUMBER (DATE + DIVE + SAMPLE)	IN SITU, DECK 35MM PHOTOGRAPH	DECK POLAROID, IN SITU VIDEO	VOUCHER SPECIMEN
2-VIII-92-2-001	N INSITU,Y DECK	N	LARGE
3-VIII-92-1-001	Y INSITU,Y DECK	N	LARGE
3-VIII-92-1-002	Y INSITU,Y DECK	N	LARGE
3-VIII-92-1-003	Y INSITU,Y DECK	N	LARGE
3-VIII-92-1-004	Y INSITU,Y DECK	N	LARGE
3-VIII-92-1-005	N INSITU,Y DECK	N	LARGE
3-VIII-92-1-006	Y INSITU,Y DECK	N	LARGE
3-VIII-92-1-007	Y INSITU,Y DECK	N	LARGE
3-VIII-92-1-008	Y INSITU,Y DECK	N	LARGE
3-VIII-92-1-009	Y INSITU,Y DECK	N	LARGE
3-VIII-92-1-010	Y INSITU,Y DECK	N	LARGE
3-VIII-92-1-011	Y INSITU,Y DECK	N	LARGE
3-VIII-92-1-012	Y INSITU,Y DECK	N	LARGE
3-VIII-92-1-013	Y INSITU,Y DECK	N	LARGE
3-VIII-92-1-014	Y INSITU,Y DECK	N	LARGE
3-VIII-92-1-015	Y INSITU,Y DECK	N	LARGE
3-VIII-92-1-016	Y INSITU,Y DECK	N	LARGE
3-VIII-92-1-017	N INSITU,Y DECK	N	LARGE
3-VIII-92-2-001	Y INSITU,Y DECK	N	LARGE
3-VIII-92-2-002	Y INSITU,Y DECK	N	LARGE
3-VIII-92-2-003	Y INSITU,Y DECK	N	LARGE
3-VIII-92-2-004	Y INSITU,Y DECK	N	LARGE
3-VIII-92-2-005	Y INSITU,Y DECK	N	LARGE
3-VIII-92-2-006	Y INSITU,Y DECK	N	LARGE
3-VIII-92-2-007	Y INSITU,Y DECK	N	LARGE
3-VIII-92-2-008	Y INSITU,Y DECK	N	LARGE
3-VIII-92-2-009	Y INSITU,Y DECK	N	LARGE
3-VIII-92-2-010	N INSITU,Y DECK	N	LARGE
4-VIII-92-1-001	Y INSITU,Y DECK	N	LARGE
4-VIII-92-1-002	Y INSITU,Y DECK	N	LARGE
4-VIII-92-1-003	Y INSITU,Y DECK	N	LARGE
4-VIII-92-1-004	Y INSITU,Y DECK	N	LARGE
4-VIII-92-1-005	N INSITU,Y DECK	N	LARGE
4-VIII-92-1-006	Y INSITU,Y DECK	N	LARGE
4-VIII-92-1-007	Y INSITU,Y DECK	N	LARGE
4-VIII-92-1-008	Y INSITU,Y DECK	N	LARGE
4-VIII-92-1-009	N INSITU,Y DECK	N	LARGE
4-VIII-92-1-010	N INSITU,Y DECK	N	LARGE
4-VIII-92-1-011	N INSITU,Y DECK	N	LARGE
4-VIII-92-1-012	Y INSITU,Y DECK	N	LARGE
4-VIII-92-1-013	Y INSITU,Y DECK	N	LARGE
4-VIII-92-1-014	N INSITU,Y DECK	N	LARGE
4-VIII-92-1-015	Y INSITU,Y DECK	N	LARGE
4-VIII-92-1-016	N INSITU,Y DECK	N	LARGE
4-VIII-92-1-017	Y INSITU,Y DECK	N	LARGE
4-VIII-92-1-018	Y INSITU,Y DECK	N	LARGE

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SAMPLE NUMBER (DATE + DIVE + SAMPLE)	IN SITU, DIVE 35MM PHOTOGRAPH	DECK POLAROID, IN SITU VIDEO	VOUCHER SPECIMEN
31-VII-92-1-003	Y INSITU,Y DECK	N	LARGE
31-VII-92-1-004	Y INSITU,Y DECK	N	LARGE
31-VII-92-1-005	Y INSITU,Y DECK	N	LARGE
31-VII-92-1-006	Y INSITU,Y DECK	N	LARGE
31-VII-92-1-007	Y INSITU,Y DECK	N	LARGE
31-VII-92-1-008	Y INSITU,Y DECK	N	LARGE
31-VII-92-1-101	Y INSITU,Y DECK	N	LARGE
31-VII-92-2-001	Y INSITU,Y DECK	N	LARGE
31-VII-92-2-002	Y INSITU,Y DECK	N	LARGE
31-VII-92-2-003	Y INSITU,Y DECK	N	LARGE
31-VII-92-2-004	Y INSITU,Y DECK	N	LARGE
31-VII-92-2-005	Y INSITU,Y DECK	N	LARGE
31-VII-92-2-006	Y INSITU,Y DECK	N	LARGE
31-VII-92-2-007	Y INSITU,Y DECK	N	LARGE
31-VII-92-2-008	Y INSITU,Y DECK	N	LARGE
31-VII-92-2-009	Y INSITU,Y DECK	N	LARGE
31-VII-92-2-010	Y INSITU,Y DECK	N	LARGE
31-VII-92-2-011	Y INSITU,Y DECK	N	LARGE
31-VII-92-2-012	Y INSITU,Y DECK	N	LARGE
31-VII-92-2-013	Y INSITU,Y DECK	N	LARGE
31-VII-92-2-014	Y INSITU,Y DECK	N	LARGE
1-VIII-92-1-001	Y INSITU,Y DECK	N	LARGE
1-VIII-92-1-002	Y INSITU,Y DECK	N	LARGE
1-VIII-92-1-003	Y INSITU,Y DECK	N	LARGE
1-VIII-92-1-004	Y INSITU,Y DECK	N	LARGE
1-VIII-92-1-005	Y INSITU,Y DECK	N	LARGE
1-VIII-92-1-006	Y INSITU,Y DECK	N	LARGE
1-VIII-92-1-007	Y INSITU,Y DECK	N	LARGE
1-VIII-92-1-008	Y INSITU,Y DECK	N	LARGE
1-VIII-92-1-009	Y INSITU,Y DECK	N	LARGE
1-VIII-92-1-010	Y INSITU,Y DECK	N	LARGE
1-VIII-92-2-001	Y INSITU,Y DECK	N	LARGE
1-VIII-92-2-002	Y INSITU,Y DECK	N	LARGE
1-VIII-92-2-003	Y INSITU,Y DECK	N	LARGE
1-VIII-92-2-004	Y INSITU,Y DECK	N	LARGE
1-VIII-92-2-101	Y INSITU,Y DECK	N	LARGE
1-VIII-92-2-102	N INSITU,Y DECK	N	LARGE
1-VIII-92-2-103	N INSITU,Y DECK	N	LARGE
2-VIII-92-1-001	Y INSITU,Y DECK	N	LARGE
2-VIII-92-1-002	Y INSITU,Y DECK	N	LARGE
2-VIII-92-1-003	Y INSITU,Y DECK	N	LARGE
2-VIII-92-1-004	Y INSITU,Y DECK	N	LARGE
2-VIII-92-1-005	Y INSITU,Y DECK	N	LARGE
2-VIII-92-1-006	Y INSITU,Y DECK	N	LARGE
2-VIII-92-1-101	N INSITU,Y DECK	N	LARGE
2-VIII-92-1-102	Y INSITU,Y DECK	N	LARGE

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SAMPLE NUMBER (DATE + DIVE + SAMPLE)	IN SITU, DECK 35MM PHOTOGRAPH	DECK POLAROID, IN SITU VIDEO	VOUCHER SPECIMEN
4-VIII-92-1-019	N INSITU,Y DECK	N	LARGE
4-VIII-92-1-020	Y INSITU,Y DECK	N	LARGE
4-VIII-92-1-021	Y INSITU,Y DECK	N	LARGE
4-VIII-92-1-022	N INSITU,Y DECK	N	LARGE
4-VIII-92-1-023	N INSITU,Y DECK	N	LARGE
4-VIII-92-1-024	N INSITU,Y DECK	N	LARGE
4-VIII-92-1-101	N INSITU,Y DECK	N	LARGE

October 29, 1992

Christina L. Leahy, M.A.L.S.
2049 Main Street
Glastonbury, CT 06073

Preliminary Report
Guana Island Field Notes
July 12-19, 1992

Enclosed are my field notes as dictated from an Olympus microcassette recorder (Pearlcorder S912). Approximately two and one half tapes of field work were collected during my visit to Guana Island July 12 - August 1, 1992. This report includes so far only one full tape worth of notes, collected July 12-19, 1992. The rest of the field notes transcribed from the tapes will follow.

The following data will be gleaned from my field notes and all follow-up work on each project that I am currently involved in will be finalized in a full report as time allows.

First I will present a species account of all birds seen during my three week visit on Guana Island. This will be compared to my bird list taken in October 1991.

Second a detailed report will be written on the Flamingo #4 incidence. Included in this report will be all medical information collected and used in an attempt to cure her illness, contacts used to obtain information concerning her case, measures taken to assist in her recovery process, and post-mortem information. The finalized report will be a collaboration with Dr. Cory Brayton after the pathology (tissue) exam is completed. The tissues have yet to be delivered to C. Brayton, D.V.M. We plan on obtaining any records of all transferred birds from the Bermuda Zoo, and any other pertinent information that the zoo might have on these particular birds - to be kept permanently on Guana Island, with copies retained by C. Brayton, D.V.M. and myself. We see a need to continue to keep detailed records of the flamingos on both Anegada and Guana Island. This action is considered a necessity if we are to maintain a healthy flock, and if we are to learn anything from whatever care is needed for these birds. The information for its research value alone is worth all efforts to maintain.

The natural history of the American kestrel (Falco sparverius) on Guana Island will be . the bulk of my work. This report will include: habitat use - on the flats using maps depicting marked perch sites and an evaluation of the use of particular perch sites, habitat evaluation (tree sps. commonly used for perch/nest site), pellet analysis and comparison to pellets collected in 1985-1986, the possible consequences of the use of the rodenticide Talon-G to the resident kestrels, nest site information, plus any significant behaviors observed.

Reports will be sent to L. Jarecki, H. Jarecki and R. Lazell as each is finalized.

Christina L. Leahy

Guana Island July 1992 Report:

July 12, 1992 10:00 A.M. arrived on Guana Island -
Brown pelican (Pelecanus occidentalis)
Brown booby (Sula leucogaster)
Magnificent frigatebird (Fregata magnificens)
Roseate tern (Sterna dougallii)
Laughing gull (Larus atricilla)

2:45 P.M. at the salt pond:
Black-necked stilts (Himantopus mexicanus) possibly with young - two pairs of adults observed. Black-necked stilts continually vocalizing on shore of salt pond and in air at approach to salt pond. Apparent aggressive displays - flight behavior swooping close to me, vocalizing in flight.
White-cheeked pintail (Anas bahamensis) commonly known as Bahama pintail seen on rock at NE end of pond.
Four Caribbean flamingo (Phoenicopterus ruber ruber) at NE end of pond.
American kestrel (Falco sparverius) - flying around the club, down along the hillside toward the salt pond.

3:00 P.M. Two kestrels up over Harbor House tower.
Three Black-necked stilts continuing aggressive displays. NW shore of salt pond stilts displaying parenting behaviors - i.e. wings held out from body and flapping, standing in one place as if fanning young or eggs, then nestling in the grass as if on a nest. These displays may serve to distract any possible danger (namely myself) away from the nest site or young. The stilts emit continuous vocalizations on the ground and in flight; individuals in flight diving at me as they pass by.
Bahama pintail - more individuals out on the pond (approximately a dozen).
Snowy egret (Egretta thula) - four perched on the NE shore of the salt pond near the flamingos.
Dove sps. (identification unknown) - grassy hillock near the salt pond (N of the beached row boat) where it appears to be hollowed out underneath the grass, there are also what appears to be paths around the hillock and tunnels.

Total field time on July 12, 1992 approximately 2 and 1/2 hours.

July 13, 1992 5:45 A.M. Iguana Trail up the Summit Trail.

6:23 A.M. Along the Summit Trail (prior to the summit) two Bridled quail-dove (Geotrygon mystacea) flushed. Flushed the first individual, which then headed back towards me displaying with wings extended and flapping, possibly mimicking injury - possible nest with eggs/young nearby, behaviors displayed to protect the nest site. Upon investigation and approach to the dove, another dove flushed and proceeded to display similar behaviors as seen by the first bird. Upon approach to the area where the second dove flushed from, two doves flushed - possibly fledglings, smaller than the first two individuals seen. These two birds were not accomplished at flying - therefore it is safe to assume they were probably fledgling age.

July 13, 1992 6:45 A.M. At the summit - many birds (mixed species) up here at this time of day.
Bananaquit (Coereba flaveola) with possible fledglings (pictures taken).
Antillean mango (Anthracothorax dominicus) flew in very close to me, then chased off a Zenaida dove (Zenaida aurita) - aggressive/territorial display by the mango (pictures taken).
Zenaida dove perched on branch where observed kestrel and Gray kingbird (Tyrannus dominicensis) perched on other occasions.
Caribbean elaenia (Elaenia martinica) - picture taken
Pearly-eyed thrasher (Margarops fuscatus) - many present
Antillean crested hummingbird (Orthorhyncus cristatus)
- 100 ASA Fujicolor film -

7:30 A.M. Off the summit - 400 ASA Fujicolor slide film.

8:12 A.M. East side of Guana Island near the area of the Short-eared owl (Asio flammeus) sighting last October 1991.
Red-tailed hawk (Buteo jamaicensis) vocalizing over head, approximate position just below and E of site of Short-eared owl sighting.

8:19 A.M. Attempt play-backs of Short-eared owl at this position. Used playback tapes pieced together by Cornell Ornithological Library of Sounds First group of calls about 1 and 1/2 minutes before talking interrupts vocalizations, then approximately 2-3 minutes of uninterrupted groups of Short-eared owl vocalizations.

I continued N below the summit after wandering around this area in search of any raptor sign, then circled around the summit picking up the Summit Trail just NW of the summit. At this trail juncture observed many butterflies - one fairly large species black and yellow striped, took photo of one species of moth at this spot. Headed down the summit at 9:12 A.M.

9:50 A.M. Back at the club. Only raptor sighting was the Red-tailed hawk on the NE side of the island - a very dark phase, small individual.

11:00 A.M. At the salt pond. Black-necked stilts showing aggressive displays - flying at me. Located one ground nest of small sticks with four eggs - tan with dark/black splotches (pictures taken). Stilts appear to be increasingly more aggressive and aggravated with my closeness to this nest, using displays to attempt to lure me away from the nest site. Due to the reaction of the stilts, one could conclude that these were most likely stilt eggs. Also observed one young (probably) Black-necked stilt that appeared to be following an adult that was vocalizing along the shore N of my position and heading away from me.

2:00 P.M. Dropped off by boat about Harris Ghut Point, scaled rocks to cliff area where crevices and hollowed out rock forms offered possible raptor perch/nest sites. This is the area that R. Lazell and company located pellets back in 1985-1986. All areas investigated showed no signs of raptor use. Located old nest (possibly kestrel) that was first located back in October 1991, that appeared more weathered at this time. Climbed up the hill side until I reached the Harris Ghut Trail, where I turned NW and headed back to the club. End of field time approximately 3:30 P.M.

Total field time for July 13, 1992 approximately 7 hours.

July 14, 1992 10:00 A.M. At the salt pond.
Was quiet at the pond until I came up to the S shore. The stilts then took to the air vocalizing loudly as they flew straight toward me, veering off at the last moment. Four flamingo present, pintails on rocks at the NW side of pond. Four eggs still present on nest. Three adults in air vocalizing, and one adult walking away from me possibly trying to lead me away from the nest site. No sign of chicks.
10:09 A.M. Depart salt pond.

10:20 A.M. Attempt kestrel playbacks just S of plantation. Working way back NW towards the club along the flats. No answer to playbacks, no sign of kestrel. Pictures of kingbirds hunting insects on the flats.

11:12 A.M. Heard young sheep vocalizing from beyond the plantation, followed by adults vocalizing. The sheep appear to be down near the flats but under cover of vegetation. These individuals were later identified by L. Jarecki as the two collared sheep with one possibly two young. Found and collected one partially formed turquoise blue egg under tree on flats - later identified as that of a pearly-eyed thrasher. Another egg shell found and collected near location of first egg, larger than the first egg and pure white.

Scaly-naped pigeon (Columba squamosa)
Common ground dove (Columbina passerina)
Other birds noted today: Brown pelican, Magnificent frigatebird, Gray kingbird, Caribbean flamingo, Black-necked stilts, White-cheeked pintails, Pearly-eyed thrasher.

11:21 A.M. Kestrel up on flats along the salt pond being chased by two kingbirds. Appears to be subadult male, flew out of tree to another perch site tagged #1*. Attempted playbacks from position under perch site #3, with vocal response noted by young adult. The individual appeared to be listening to the playbacks by tilting its head from side to side looking in direction of the playbacks, then the young male left its perch at site #1 and flew straight toward me to perch just above my position at perch site #3. Pictures taken. Young began vocalizing baby feeding calls, then flew back to perch site #1 where he had been listening to playbacks. Continued to vocalize baby feeding calls especially in response to playbacks. Individual bugging in the field, vocalizing baby feeding calls as it perched with prey item, ate the prey then rubbed its beak on the branch. This was followed by more baby feeding calls. Subadult flew back and forth between two perch sites (#1 and #2) as continues to bug in the field. Perched once with no prey item and vocalized with baby feeding calls - very vocal as characteristic of North American individuals. Another individual (appeared to be adult female) flew right to perch site #2 where young was perched and possibly passed off a meal, then took off rather quickly flying off in the same direction E that she had come from (attempted pictures of adult in flight). Adult flew in a circle around me, coming in from behind my position and circling around this position at perch site #3. This sighting confirmed adult/young on Guana Island, the first evidence that kestrels are actively breeding on Guana Island. Young are apparently at fledgling stage where adults occasionally feed the young, but young are actively hunting on their own. Young male remained silent in perch site #2 for approximately 15 minutes after adult visited him.

11:55 A.M. Youngster preening, then left perch to bug, perched at the S side of perch site #1.

July 14, 1992 12:10 P.M. Young male disappeared, did not observe direction that the bird flew off in. Visited perch site #2 in search of white wash and/or pellets, young individual in the field bugging, flew off to perch at site #1. Visited this sight, took pictures, and searched for any raptor evidence. Found white wash present but no pellets. Individual flew back to site #2. Upon looking up after searching site for any pellets, the subadult kestrel was gone. Attempted more playbacks N of site #3, did not see the fledgling until he flew toward me and perched at site #3 just behind and S of my position. Stilts continue to aggressively protect this area. Youngster still bugging moving E of plantation, vocalizing baby feeding calls. May have run into an adult with increased volume (perhaps two voices) and intensity of baby feeding calls noted.

12:25 P.M. Youngster back at site #1. Individual responded to playbacks flying into the tree that I was under, vocalizing baby feeding calls. More pictures taken of young from the back. The fledgling continued baby feeding calls. Back to the club by 12:30 P.M.

2:00 P.M. Salt pond: two egrets - noted yellow legs - need to study pictures more closely to verify species identification. Note snowy egrets have black legs. One Black-necked stilt showing aggressive displays toward an egret that flew in close to the known nest site (pictures taken). Two pintails close to generator house (pictures taken).

2:10 P.M. on flats near salt pond where last saw young adult male kestrel - attempt more playbacks. 2:17 P.M. kestrel vocalizations answering playbacks. Kestrel perched at site #2, probably same individual as seen earlier. Kestrel was then found N side of site #3 after I looked down for pellets under perch site #2. Walked right underneath the kestrel and took many pictures. This individual did not flush, was aware of my presence but seemed not in the least bit bothered - very tractable. Bird took flight, two pictures taken, lost track of individual heading S along the flats. At 2:36 P.M. found another individual kestrel perched in another tree group along the road closest to the salt pond - at this time perch site trees were not marked, but would have been perch site #5, #6 or #11. Individual left perch heading NE. Attempt playbacks 2:42 P.M. No sign of kestrel nor any response to playbacks. Resume playbacks at 2:50 P.M., still no response. End observations at 3:06 P.M.

*Perch sites utilized by the kestrel family on the flats were at a later date tagged with blue sail ribbon with a unique site number written in indelible ink, along with month/year and 'Kestrel Perch Site' written on the ribbon.

Total field time for July 14, 1992 approximately 3 1/2 hours.

Total lab time spent working on setting up transacts along trails on topography map of Guana Island to be used for flagging positions for playbacks, with the assistance of M. Mondo, approximately 3 1/2 hours on July 14, 1992. Determining longitude and latitude settings on the map of Guana. Equipment used: Global Positioning System - "Sony" Pyxis, Model #IPS-360.

July 15, 1992 8:30 A.M. One and 1/2 hours working on transact lines on topo map, setting up a grid overlaying the island. Goal: in each square attempt three playbacks sustaining vocalizations for approximately 1-2 minutes and 5-10 minutes apart. Equipment used to determine bearings: "Tasco" Waterproof 7X50 (366 FT/1000 Yards), Model #322BCW Binoculars.

10:00 A.M. Pictures of a Green-throated carib (Eulampis holosericeus) nest located in tree at parking lot, within rock garden, with the aid of L. Jarecki. There were two small elliptical white eggs in the nest. Female continued to hoover around the nest as I took pictures. The nest was later found destroyed, no young known to hatch from the nest.

10:15 A.M. Iguana trail up to Summit trail. Site of bird kill (pictures taken) on W slope of summit trail. Only feathers remain mostly gray (dove/pigeon sps.), no bones. Indicative of a raptor kill, right on the trail. This kill was not present on this trail two days earlier. Feathers appear plucked similar to accipiter behavior - note that Short-eared owls are described as the accipiters of the owl world. Kestrels are known to prey upon birds also. Collected a few feathers for later identification.

11:00 A.M. Marker number 1 heading 278 W off the top of the pyramid, 354 N northern most point of the north bay coastline. Attempt kestrel playbacks - 3/4 minute of vocalizations, wait 5 minutes than another 3/4 minute loop, wait 5 minutes, followed by another loop and 5 minute wait. Pressed onward at 11:18 A.M.

11:35 A.M. Marker number 2 heading 286 W off the top of the pyramid, 170 S off the part of Sugarloaf summit that could be seen from the rock out-cropping that I walked out onto, just S off the trail. Attempt kestrel playbacks same loop pattern as at marker #1, second loop of playbacks at 11:41 A.M., third loop at 11:47 A.M. with no responses noted. Moved on at 11:53 A.M.

12:15 P.M. At the summit. Marker number 3 at NW side of summit, heading 298 W off the top of the pyramid, and 65 N off the tip of Grand Ghut.

12:25 P.M. Kestrel playbacks started again using same pattern as at marker #1 and #2. 12:31 P.M. second loop of playbacks, no responses noted. Many butterflies at summit species unknown - one all white, one orange and one very dark species. Marker number 4 at the SE side of the summit sighted off two different points than that of marker #3. Kestrel playbacks first loop started at 12:44 P.M. Very little bird activity up here at this time of day - too hot up here. Appear to be more active at the summit in the early morning when it is cooler. The birds were observed feeding on the many berries found here. Second loop at 12:50 P.M. still no response. Third loop 12:56 P.M. no response. Pictures taken from summit - 400 ASA Fujicolor slide film. Depart summit at 1:02 P.M. heading along E side of summit heading toward trail marked by owl sighting of October 1991.

1:36 P.M. Site of owl marker - rewrote sighting information on tag. Kestrel playbacks attempted. Second loop 1:42 P.M. with no response. Depart site at 1:49 P.M.

July 15, 1992 2:06 P.M. Attempted kestrel vocalizations at the 5-way juncture where one trail goes to Grand Ghut, NE end, Palm Point, Palm Ghut, and back along summit. Second loop at 2:13 P.M. No responses noted. Depart intersection at 2:19 P.M. following trail leading to W Summit trail.

2:27 P.M. Kestrel playbacks at the juncture of Palm Ghut and N Summit Trail - can see North beach from this sighting. Unable to get any bearings due to vegetation height, and no open areas or rock outcroppings to climb. Playbacks attempted at sites not capable of obtaining bearings - only two loops were used not three. Second loop of playbacks at 2:32 P.M. Depart area at 2:37 P.M. with no response.

3:20 P.M. At salt pond L. Jarecki discovered in the pond trapped in the vegetation what appears to be a dead pintail chick. The skull was crushed and the whole head was down to bare bones. Maybe an egret kill the way the head was crushed inward indicative of something sharp (a beak) driving into the skull. Body of the dead chick was also preyed upon most likely by crabs. Pictures taken. Another probable pintail young was also located near where the dead chick was found on the flats side of the pond in the grassy vegetation along side the pond (where the pintails were observed only in the evenings feeding). L. Jarecki and I were unable to locate this second chick. She believed that it was still alive at the initial sighting. One egret was standing in the area close to where L. Jarecki believes that she first saw the live chick. I have not observed young pintails since arriving on Guana.

4:26 P.M. Kestrel vocalizing "kikikiki" at same location marker site #2 where I was using playbacks on July 14, 1992. Located an adult female making a low toned call like a tremolo, perched at marker site #2 where subadult male had been yesterday. She was being attacked by a kingbird, the kestrel vocalizing as the kingbird continued to harass her. Attempted to move closer for pictures. She was eating a fresh killed rat (blood noted) and she moved off as I approached closer - took some pictures. Prey gray on dorsal side and white on ventral side, fairly large approximately 200 -300 grams in size, with long naked tail - definitely a rodent. As in raptor fashion she had eaten the head first. She is trying to find a perch site where she can eat her prey undisturbed. First verification of kestrels eating rats on the island - which raises the concern of the type of rat poisoning being used on this island - need to investigate this further.** She finally flew off with her prey up over the salt pond below the club into the vegetation below the first bend of the road. Lost sight of her in vegetation.

5:00 P.M. Perch site #4 marked at edge of dirt road where it leads into vegetative area. Checked salt pond again for pintail chick - no sign of young. Thirteen adult pintails noted. Stilts behaving aggressively, flying at me and vocalizing loudly. Four eggs still present in stilt nest. Pictures taken of an old stilt nest, similar to the nest with eggs present and close to the same location. Checked grassy hillock with L. Jarecki to see if she had ever observed anything of this nature before - she had not, and no ideas were formulated.

6:10 P.M. Last check at the salt pond: two stilt chicks in the pond accompanied by an adult. Two egrets close to white boat on shore of pond, near stilt eggs. Also close to where L. Jarecki had seen the live pintail chick. Thirteen adult pintails on the salt pond.

Total field time for July 15, 1992 approximately 7 hours.

July 16, 1992 6:20 A.M. To the Summit Trail - took one picture of a Smooth-billed ani (Crotophaga ani) right where the Summit Trail starts off of the road to North Beach. Also took a picture of a carib when it perched after chasing a dove.

7:15 A.M. at the summit - one loop of kestrel playbacks at 7:26 A.M., second loop of playbacks at 7:32 A.M., third loop of playbacks at 7:40 A.M. with no responses noted. Bird list includes: bananaquits, frigatebirds, a pair of scaley-naped pigeons, a pair of common ground doves, zenaida dove, kingbird (pictures at 8:11 A.M.). Departed the summit at 8:12 A.M.

8:30 A.M. Kestrel playbacks at approximately 700 ft. elevation on trail towards Monkey Point. Many pearly-eyed thrashers active and vocalizing. Observed two bridled quail-dove at first major intersection off the summit. Second set of playbacks 8:35 A.M. no response noted. Moved on at 8:42 A.M., position heading approximately 220 SW, using hand-held compass.

8:54 A.M. Kestrel playbacks at approximately 500 ft. elevation on trail to Monkey Point, position heading about 180 degrees due S. Second loop of playbacks at 9:00 A.M. It appeared that a couple of bananaquits came close possibly in response to playbacks (pictures taken). Thought I heard some avian baby feeding calls nearby. Upon investigation the baby feeding calls were from two fledged pearly-eyed thrashers (pictures taken). Depart area at 9:10 A.M., trail position heading 230 degrees S. The trail turned about 150 degrees S then easterly about 90 degrees, and a little farther down the trail turned more E as it continued toward Monkey Point. Took pictures of a bananaquit nest, opening the entrance a bit to get more detail in the picture.

9:33 A.M. Attempted more kestrel playbacks. From my position I can see Beef Island airport and Tortola, situated at the crest of the path leading to intersection with trail to Monkey Point and Harris Ghut. Second loop of playbacks at 9:39 A.M., no response. Continue along trail at 9:44 A.M.

10:08 A.M. At the juncture of Monkey Point trail and Harris Ghut Trail. Walked along Harris Ghut Trail, turned back and headed up toward ruins. Flushed a tan sheep with two young, one white and one white with brown spots.

10:26 A.M. Adult male kestrel came up from below me and perched in dead branch along hillside that drops to the water. Appeared to be hunting - continually peering down and all around perch site, tilting head from side to side, area was open with more sparse vegetation. Many pictures taken - individual fanning wing and tail, and holding one leg up. 10:41 A.M. individual dropped down off perch (pictures taken), flew back up to perch on dead branch a bit farther down the slope away from my location on the trail. 10:43 A.M. adult male took to flight and lost sight of over slope. 10:44 A.M. attempt kestrel playbacks, one loop - adult appeared and perched in the branch first observed perched in, vocalizing in answer to playbacks "kikikiki kikikiki." 10:48 A.M. responded to continued playbacks by vocalizing before a loop was done, and looking right in my direction. 10:52 A.M. took to flight, flying over my position, continually vocalizing. Kestrel mobil and still answering playbacks at a greater distance, 10:53 A.M. Continued up the trail to the ruins at 11:00 A.M.

July 16, 1992 11:42 A.M. On flats near dump, hearing young sheep bleating, took pictures of two radio-collared females with one white baby. Baby feeding calls noted 11:50 A.M. Perched at marker site #22 was an adult male and a fledgling male continually vocalizing baby feeding calls. Adult flew down to field bugging in front of perch site while young continued calling. Adult flew back to site #22 but did not attempt to feed young, young still calling. 11:52 A.M. adult flew off towards White beach while youngster remained perched continuing baby feeding calls. 11:55 A.M. youngster flew off vocalizing, in the same direction that the adult had flown off in. Attempted playbacks 11:56 A.M. - heard youngster still calling in the distance. In answer to playbacks youngster flew right at me at 12:04 P.M. perching over my head at marker site #13. A second subadult also came in and perched, answering playbacks with baby feeding calls. Maybe listening to a different dialect here - vocalizations differ slightly from recordings provided by Cornell Ornithological Laboratory (one group of calls is longer with different inflexions heard and tone "kikikikikikikikikikikikikikikikikiki"). Young are perched close by me vocalizing baby feeding calls, and watching me. Walked a short distance away at 12:12 P.M., located near pisonia tree that stands alone near marker site #14, and in response to playbacks the young vocalized baby feeding calls. Also heard baby feeding calls from fledgling kingbirds in pisonia tree. Took picture of a carib that was perched in this same tree. In from field at 12:22 P.M.

3:00 P.M. Salt pond - nineteen pintails, no young observed, two egrets, four black-necked stilts up and flying straight toward me as soon as I got closer to the row boat along the shore of the salt pond. No young stilts seen, four eggs still present on nest.

3:57 P.M. Young male kestrel perched at marker site #2. Two kingbirds flew across from marker site #3 and dove at the kestrel at 3:59 P.M., one individual taking a second dive at the young kestrel. Subadult kestrel appears to be bug hunting from this perch site - looking around on the ground. Took to flight at 4:04 P.M. and lost sight of around the tennis courts. 4:06 P.M. young kestrel flew towards the plantation and I lost sight of as the individual flew into the trees. 4:12 P.M. an adult male kestrel (full adult plumage) flew down into the field from the trees near the tennis courts. Perched in a pisonia, proceeded to preen at marker site #5. 4:25 P.M. individual kestrel flew to closest tree and perched low to the ground, marker site #6. 4:29 P.M. individual preening with legs stretching backwards one after the other, with tail spread. Kestrel than flew to the nearest tree N of its position and perched at marker site #11. 4:40 P.M. kestrel flew off perch and down to the ground capturing a prey item (probably an insect), then it flew N of my position and perched where I lost sight of this individual. 4:55 P.M. no sign of kestrels. Checked all sites that adult kestrel had perched on for pellets - no pellets found. It appears that the kestrels are consistently using the same perch sites on the flats near to the salt pond where good hunting is provided in the high grass vegetation. Therefore the decision to mark perch sites inorder to detect any patterns of use of kestrel perch sites.*

6:30 P.M. Heard baby feeding calls near the tennis courts. Young male perched in the same tree that the adult had been observed in earlier. Took to flight towards marked sites #5 and #6 and flushed another kestrel out from this location, probably a male due to its size. Lost sight of the pair as they flew off. Last check at the salt pond no changes from earlier.

Total field time for July 16, 1992 approximately 8 and 1/2 hours.

July 17, 1992 Spent the morning and early afternoon in Road Town picking up supplies with L. Jarecki. Met shipment of eight Caribbean flamingo arriving on Beef Island from the Bermuda Zoo, on the Jarecki's private jet. Four individuals were flown over to Anegada with Bermuda Zoo personnel, to be introduced to the previously established flock of 17 flamingos. The other four individuals were boated over to Guana Island to join the four original flamingos already introduced on the island. Once on Guana the four individuals were brought over to the salt pond, the wrappings placed around the birds for transport safety, were removed and the birds were walked until they got strength back in their legs to walk unassisted. One female was unable to stand. She would take a few steps and fall, her legs folding underneath her. This female was experiencing an erratic heart beat, as well as an accelerated heart rate. She was extremely weak, and was unable to keep her head up. She also had labored breathing. I continued to walk her for nearly three hours - in that time her heart rate slowed and the heart beat was not as erratic. Every time she went down she was unable to get back up by herself. She needed much assistance. It was obvious to me that we had an emergency situation as far as the bird's health was concerned, and I was hoping that when the Bermuda Zoo team of supposed experts would arrive, that they would have been prepared for emergency treatment of their animals. When the two arrived I found this not to be the case. Instead it was quoted by Mr. James Conners that he was not a biologist /scientist or in academia, and they (the Bermuda Zoo I presume) had introduced wild stock into their flamingo zoo stock so that they did not want to "interfere" with these particular birds - as if transporting these individuals by plane/boat was not interfering in any manner. So this evening we did nothing in the way of treating this bird as decided by J. Conners. It was obvious that she would not be capable of joining the flock since she could not stand or walk on her own. The Zoo people made the decision to leave her down in the beach house on a cement floor for the night where she probably did not get up at all during the night, then went off to their dinner. It is uncertain whether or not the flamingo ate anything offered to her that evening (dog meal crushed and soaked in water). She had been drinking some water during this period, both fresh and some from the salt pond. At 9:00 P.M. and 10:00 P.M. check the flamingo was still down. The Bermuda Zoo staff said that by the 10:00 P.M. check she had eaten a little bit of dog food. I was not convinced of this belief.

6:30 P.M. Kestrel - one maybe two - vocalizing loudly up around the staff housing. Due to the town trip and the unforeseen emergency care of the downed flamingo, no field time was achieved for kestrel work on this day.

July 18, 1992 7:00 A.M. Check on flamingo to find her still down; she was incapable of staying on her feet after being helped up. Bermuda staff left with some helpful (?) suggestions. M. Mondo and I went over to Road Town on a quest to get emergency medical supplies (i.e. for tube feeding) for the ailing flamingo - which proved to be a story all in itself. Necessary medical supplies down here were greatly lacking.

July 18, 1992 8:00 A.M. Everton constructed a sling from M. Mondo's instruction, to place the flamingo in so that she could be off the ground with her legs stretched underneath her. The sling was placed under the palm trees near the salt pond so that she could visually see the flock on the pond. Flamingo #4 was placed in the sling around 11:00 A.M. and she appeared much more alert at seeing the other flamingos. She was offered a chick poultice meal soaked in water that she started to chow down immediately, and she was also offered salt pond water with plankton filtered from the bottom by L. Jarecki. She had been submerging her head in fresh water as if searching for food - so we provided her with food from the salt pond that the other flamingo were feeding on. She proceeded to eat most of the live critters from the salt pond water. This was offered fresh to her 2 times per day. She remained weak in her legs and unable to stand by herself. We proceeded as such for this day, with frequent checks. In the mean time I began making calls to veterinarians state side for medical assistance via the telephone.

12:13 P.M. Juvenile kestrel at perch site #2. No apparent response to playbacks at 12:15 P.M. Individual preening, stretching both wings outwards and fanning tail. 12:26 P.M. individual flew down in front of my position, caught a bug, looked in my direction then flew back to perch site #3, proceeded to eat the bug then promptly flew off NE of my position at 12:27 P.M. 12:28 P.M. individual bugging in the open field by the salt pond closer to the hillside. 12:30 P.M. kestrel still hunting in the back fields near the crossroads and the storage area toward the hillside, chased by a kingbird. 12:31 P.M. kestrel perched in new perch site marker #8, took off S toward beach house again chased by a kingbird, lost track of. Latest check on Flamingo #4 she appeared as well as she could be, alert and comfortable in the sling.

3:00 P.M. Set two have-a-heart traps just over the first summit heading out to Long Point. One trap is large enough to trap rats, the other is smaller in size hoping to catch lizards. Used cheese as bait, traps set off from trail. 3:15 P.M. back to the club from Long Point. 3:30 P.M. check on flaming #4 all seems well, no changes.

3:40 P.M. Adult male perched at new site perch marked site #9, near sites marked #5, #6, and #7. The adult left the perch at 3:42 P.M. bugging, perched again in a tree adjacent to site #9, marked as site #10. Flew down to ground bugging, then back to perch. Left perch at 3:45 P.M. chased by pearly-eyed thrasher. Perched again near road that follows the salt pond. Kestrel perched at roadside near green wooden structure, flew off up towards the club across the salt pond chased by a kingbird that kept diving at the kestrel (pictures). The kestrel then flew up toward the staff housing and dove down into vegetation what looked like right in front of the houses. Lost sight of the individual and it did not appear to come back up. Kestrel used perch site sequence #9, #10 and #8. Kestrel perch sites #9, #10, and #11 marked located in the field across the road that follows the salt pond, surrounding marker sites #5, #6, and #7.

One long fairly large white partial eggshell found and collected under Tamarin tree along the road that follows along the salt pond. Scaley-naped pigeons appear to hang out in the thick upper story vegetation of this tree.

Kestrel field work the last two days was hard to accomplish, due to intensive care of Flamingo #4.

July 18, 1992 4:15 P.M. Along the road that runs the length of the field closest to White Beach, near the East end of the field is a Pisonia tree that stands alone. As was noted on a previous day, a kingbird family was perched at the top of the tree. Pictures of the fledglings being fed by the parents - young vocalizing baby feeding calls. Also a Green-throated carib that was sighted on previous occasions was perched in the lower branches of the tree.

At the E end of the field where young adult male kestrel and adult male kestrel were sighted previously at perch site #13, baby feeding calls heard and found young adult male perched and vocalizing at the same site. The fledgling took to flight and perched at a different site where it continued baby feeding calls. Observed an adult male on the ground struggling with a fairly large prey item - appeared to be a lizard (sps. unknown). The adult kestrel was having trouble taking flight with this prey item. The adult managed to get off the ground with the prey, flying toward the W end of the field. The youngster remained perched and ceased vocalizing. The adult male flew in less than ten feet from my location, retrieved another lizard from the ground, flew to perch and proceeded to devour the prey item. Subadult remained perched at the same site and resumed baby feeding calls. Also heard kestrel baby feeding calls close by the first fledglings location, but cannot detect this individual. Caught a brief glimpse of a kestrel (not 100% sure of this observation) flying W above tree line along White Beach. Adult male perched at perch site #13, subadult perched in tree within same tree group marked perch site #13. The kestrels appear to be utilizing the same perch sites. At 4:27 P.M. the adult kestrel was observed in the field bugging, appeared unsuccessful, flew to briefly perch in a tree near to the tree that the youngster was perched in, then flew to perch next to the young. Youngster responded with baby feeding calls, than became quiet. Youngster preening, vocalized briefly, then took to flight into surrounding vegetation, destiny unknown. Adult remained perched at 4:29 P.M. At 4:30 P.M. the adult took to flight circling around perch site #13 flying into vegetation over the plantation area, then lost sight of this individual. Baby feeding calls right above my position approximately 4:35 P.M., as investigating tree site #13 that these kestrels seem to be continually using. Baby feeding calls at 4:43 P.M., fledgling preening. At 4:50 P.M. the fledgling took flight from its perch to the ground, landing underneath a red-barked tree at the opening where the road leads into the plantation area. This individual walked further into the understory and dashed back and forth a few times as if in chase of some prey item (approximate time = 2 minutes). The kestrel walked out from under the vegetation and perched nearby. The youngster then took to flight heading straight towards me, banked around and over the trees bordering the plantation where I lost sight of this bird at 4:53 P.M. Upon investigating the area where the kestrel went into the understory vegetation I found rather large holes (possibilities include fire ants, tarantula, crabs). Heard baby feeding calls again, and observed youngster flying back in to perch at site #13 (an obviously popular perch site). The fledgling's left eye was observed to be partially closed (possible injury), not seen at previous sightings. Then the bird opened the eye at 4:57 P.M. Baby feeding calls vocalized again. Abandoned kestrel field work to check on Flamingo #4 at 5:00 P.M. The fledgling's left eye closed again at departure time - possibly resting with eye closed.

July 18, 1992 6:00 P.M. Took Flamingo #4 (nicknamed Lulu Belle) out of her sling for a stroll. She is much more alert and feisty, actually fighting with me as I handled her, appears to want to walk. She struggles to stay up using her wings and her head/neck to keep from falling over. She is still unstable on both legs, the left leg is weaker than her right leg, favoring this leg as if its tied up - stiffness of the thigh muscles. I pinched the left thigh muscle and she picked up the leg as if experiencing some pain or discomfort. Flamingo #4 placed back into her sling. Watched her for some time and then departed. When I arrived back to check on the flamingo I found her almost out of her sling. This made me realize the danger of the sling to the flamingo and that time was running against us in her treatment and recovery. Note to check on her more frequently. Placed her back into the sling about 6:30 P.M. Rode out to the plantation area with Wally near the dump site and heard kestrel baby feeding calls. Sighted youngster perched high on a dead branch over looking the dump site. Another smaller kestrel vocalizing baby feeding calls flew in to perch on a different branch of the same tree that the first kestrel was perched in. An adult male kestrel than flew overhead near the perched young as they both vocalized baby feeding calls. Then the adult kestrel flew over the plantation with the youngster that was perched first flying closely behind, the fledgling vocalizing as it flew. The youngster than perched in a tree at the N end treeline of the plantation (Sugarloaf Summit rising behind the vegetation) vocalizing baby feeding calls.

Set up hourly checks on Flamingo #4 to cover the whole night. At 8:00 P.M., 9:00 P.M. and 10:00 P.M. checks she appeared quiet and comfortable. At 11:00 P.M. check she was sleeping with her head tucked in under her wing - did not disturb her at this time. L. Jarecki and I had the 12:00 A.M., 1:00 A.M. and 2:00 A.M. check this evening. At the 2:00 A.M. check I was on my own and it rained heavily for about 15 minutes. Flamingo #4 got soaked through and it was fairly cool at this time of the morning. My concern for the bird was that she would get too wet and would not be able to keep warm. I stayed with her for awhile, then decided that she would be all right until morning and departed.

July 19, 1992 9:00 - 9:30 A.M. check on Flamingo #4 - she appeared very alert and more aggressive, and appeared to have more stamina. Provided her fresh water and collected fresh pond water with plankton. Will move her around later on in the morning.

Wally sighted kestrels up near the salt pond field early around 6:00 A.M. While tending for the flamingo an adult male kestrel flew off its perch on an unmarked tree near a marked tree and flew to another marked tree #7. The individual then flew N down the road toward a youngster perched at the popular site #2. The adult fed the fledgling an unidentified insect. Kestrel baby feeding calls were heard at a distance and the adult flew off across the field toward the vocalizations, in the direction of the plantation. This youngster remained perched with no vocalizations.

During our afternoon walk, the flamingo appeared more agitated and finally struck out at me with great force and hit my right eye - luckily I had my sun glasses on that deflected the blow a bit. There was a definite scratch to the sclera and there was a good deal of pain. The vision in my right eye was quite blurry at first. Treated with antibiotic eye drops.

July 19, 1992 6:00 P.M. check on the flamingo found her condition unchanged, though still feisty. Disappointed with her this afternoon, upon taking her for a walk - she could only take a few steps before she fell. Her condition was worse than yesterday, for she relied heavily upon my support to walk. She made very little effort to get back up after falling. She was still eating heartily - offered fresh pond water with plankton, and flamingo fare meal brought over from the Bermuda Zoo (the feed picked up upon return flight of zoo keepers to Bermuda). No kestrels spotted at pond end of flats at this hour. Four stilt eggs still present on the nest - stilts actively aggressive in displays.

8:00 - 8:30 P.M. check on Flamingo #4 found her moving about alot at my approach and her sling needed some adjustments. Still concerned about her remaining in the sling at night - changed to every 2 hour watches. My 2:00 A.M. flamingo check was taken by M. Mondo due to eye injury discomfort. Flamingo #4 got through this night, her condition unchanged.