From Lazell

cc to DGL (but not RWJ)

The Conservation Agency

Exploration, Education, and Research

President
James D. Lazell, Ph.D.
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6 Swinburne Street
Conanicut Island
R.I. 02835 U.S.A.

29 January 1988

Dr. Henry Jarecki
Mocatta Corporation
Four World Trade Center
New York, NY 10048

Dear Henry:

Here is the works and progress report on our 1987 season on Guana. All seems to be proceeding well scientifically and I do not recommend any major changes.

CONTENTS

THE BOOK

Michael Gibbons and I spent 19-20 December working on Island: An Introduction to Population Biology and Theoretical Ecology. We agreed to co-author it, with Michael as second author. In addition to editing he has corrected a lot of math (none with conclusion-altering effects) and added considerable data. He will put in a section on the subfossil bone faunule and how changes over geological time can be evaluated. He will also add a fascinating bit on the protozoa which inhabit tiny, ephemeral water bodies in leave axils and the like.

Gibbons had made an appointment with Harvard University Press and will consider others.

There are massive amounts of data to be worked up on particular species since my first species accounts of 1982. I will have to do this, and will if and when a publisher is willing to come up with a substantial advance: no more Yale deals!

GUANA GUIDE, SECOND EDITION

I believe we should do a far more detailed and well-illustrated Guide in the near future. We have discussed a full-color cover, printed front and back. Outside front would be a flamingo shot taken sometime after November 1987, so as to get plumage color after a full year on Guana (not the pale hues the birds had on arrival). Outside back cover should have two shots of gaudy reef fish, including the stoplight parrotfish central to Karen Koltes's research at Guana.

Inside front cover will have addresses, etc., as in the first edition, but will have space for a colorful butterfly or moth. Inside back cover could have two shots of native flowers (for example), or more birds or fishes.

At present I have yet to see a single color photo I consider fully worthy for our purpose. All the flamingo shots are too palid, no photos of Guana fishes seem to exist, and no one has come up with a colorful butterfly or moth photo. Didi has some lovely flower shots; she said she would send a bunch to me back in September, but never got around to it.

I plan an expanded text including excerpts from the reports of various other scientists on their specialties and about ten black-and-white illustrations - including a much better map. I have in hand a delightful historical account by Erma J. (Jonnie) Fisk and Beth Bigelow. It will have to be edited and reorganized, but that is not difficult.

I append Hederman Brothers detail of the cost of producing such a Guide: six color separations and ten black-and-whites would cost $4,769 for 3,000 copies. I will check with Mrs. Fisk's own Arey's Pond Press, which specializes in natural history books, and see if we can get a better price. I think it is all quite reasonable, though.

HEDERMAN BROTHERS

July 6, 1987

Dr. James D. Lazell
Box 32
Road Town Tortola
Guana Island
British Virgin Islands

Dear Dr. Lazell:

We were delighted to learn that you were so pleased with our printing of "A Guana Guide", that you are considering a "bigger and better" version.

As you know, your order last Christmas was for 700 copies of a 16-page self-cover booklet, printed in black ink only.

From the various methods of obtaining a larger and more attractive booklet that you suggested, a rough estimate will be from $4000 to $5000. The exact amount will depend on the number of color photographs, the type of cover, as well as the total number of copies printed.

If we set the type similiar to that before, making a total of 32 pages, using black ink only on the inside, and printing one color photograph on the front cover and two on the back cover, the following prices will be applicable (including everything except the color separations, tax and freight):

1,000 -- $3,060.00
2,000 -- $3,500.00
3,000 -- $3,939.00

To the above prices, add $125 for each color separation (photograph), and $8 for each black-and-white photograph.

You indicated that you were considering printing additional color photographs on the inside front and/or inside back cover -- or possibly the center-page spread of the booklet. Either of these would add about $400, and I think the money would be better spent on the center-spread.

The reason for the extra charge on the cover is the additional cost of the cover paper. The cover should be coated on both sides to show your color photographs to their best advantage. Thus, the "Coated Two Side" cover is about $400 more than the "Coated One Side". If you add color on any of the inside pages, $400 will cover the additional plates and presswork. Either way, be sure to add $125 for each color photograph and $8 for each black-and-white halftone.

There are several ways we could economize, and save a hundred dollars or so, if it becomes necessary. For instance, we could go to a lighter weight and less expensive cover material. We are enclosing a sample of the paper we suggest. Let us hear from you as your plans progress.

Yours very truly,

HEDERMAN BROTHERS

Kirk G. Taylor

KGT:llm

FLAMINGOS

"Flamingos are, at the least, remarkable, at best sublimely beautiful, and at all times strange, rather remote beings inhabiting a world only they can inhabit with enjoyment . . . . Yet they always manage to be clean and beautiful . . . in appalling heat and glare, in surroundings fatal to any ordinary animal and inimical to even the most determined and well-equipped human investigator . . . . Suddenly they appear . . ., delight us for awhile, and then are gone again."

Leslie Brown, 1959.
The Mystery of the Flamingos

My research into flamingo literature has served to increase the levels of discrepancy between various things we have been told about the birds, but is generally encouraging.

In Rooth's monograph (conclusions and summary attached), no density estimates are provided. From his maps I calculate the total area of salt ponds available on Bonaire at 583 hectares. Rooth's actual flamingo counts vary from 440 to 4,130: from less than one bird per hectare to about seven per hectare. The Guana salt pond is about three hectares when full. Making the unwarranted assumption that food supply on Guana is the same as on Bonaire, Guana could support about 21 flamingos maximally, or drop as low as two. I believe at least two pinioned birds should be in the Guana flock, so that even if the others leave we will

have flamingos. These would serve as live decoys to attract flamingos back again when food supply improves.

Alexander Sprunt, pp. 65-74 in Kear and Duplaix-Hall (cited below) provides a poorly researched account of Carribean flamingos but admits that Galapagos populations breed at as few as five pairs. I have been told they sometimes breed there as single pairs.

J.A. Griswold, pp. 193-195 in the same book, records breeding in a captive flock. A single pair built a nest but laid no eggs. Three pairs nested and laid eggs, but hatched no chicks. Seven pairs nested, laid six eggs, and reared two chicks successfully. I do not doubt that nesting might be attempted, at least, on Guana with a flock of 15 - 20 birds. Of course, the pond might not support them: prediction from Bonaire data indicates it would not on a long term basis. Thus I suggest a slow build up and the constant presence of a couple of pinioned birds.

Griswold records longevity of 44 years. I recommend bringing a dozen birds from Bermuda in 1988. Two pinioned birds would come to Guana, two pinioned to Necker, and eight unpinioned would be released on Anegada. I append a copy of my most recent letter to Richard Branson, to which I have not received a reply.

Perhaps you could contact him and see if he is still interested. Richard Winchell, Bermuda, remains enthusiastic and believes he will have a dozen birds in 1988.

REFERENCE

Kear, J., and N. Duplaix-Hall, eds. 1975. Flamingos. The Wildfowl Trust: 246 pp. (T. & A.D. Poyser Ltd., 281 High St., Berkhamsted, Hertfordshire, England.)

Published with financial aid from the
Government of the Netherlands Antilles

THE FLAMINGOS ON BONAIRE
(NETHERLANDS ANTILLES)

HABITAT, DIET AND REPRODUCTION OF *PHOENICOPTERUS RUBER RUBER*

BY

JAN BOOTH

With 48 text illustrations and 20 plates

UITGAVEN „NATUURWETENSCHAPPELIJKE STUDIEKRING VOOR SURINAME EN DE NEDERLANDSE ANTILLEN", UTRECHT

No. 41, December 1965

X. CONCLUSIONS

From our field observations on Bonaire, and from the literature, it appears that flamingos are capricious birds.

The breeding grounds, breeding periods and frequencies can all be very variable. The breeding grounds are not particularly restricted to muddy building material, although this is probably preferred. The breeding periods are, outside the tropics, more restricted than in them and on Bonaire only the months September and October showed no breeding activity. The breeding frequency is not very high and in various places there are indications that years with poor results are compensated for by years with good breeding successes.

On Bonaire there is no predation of the eggs, young or adult birds.

Flamingos can reach a high age, whereby even though breeding is with « wing success, the population can still remain stable. This is possible, however, only when man does not interfere and the birds and their habitat are left in peace.

The habitat selection does not appear to be directly influenced by the food supplies. Large numbers of birds and/or lengthly breeding activities on Bonaire can decimate the food supply, with as a result the dispersal of the flamingos over the island and a more or less *en masse* departure. It is important in this connection that the flamingos on this island are practically monophagous and that *Ephydra* larvae and chrysalids form the most important item of diet.

Their preference in habitat selection for extreme physical and/or chemical circumstances enables them to occur in such large numbers. The biocoenosis is here poor in species but rich in individuals but these supplies of food are not inexhaustible and this is probably the origin of the roaming behaviour seen in the flamingo. This changing of feeding grounds allows the temporarily deserted areas to recuperate their food supplies.

Influences due to mankind may be extremely destructive and it is therefore necessary that a strict protection of the birds, breeding grounds and feeding areas should exist.

The great reduction found by ALLEN (1956) for the last decades, is not continuing on Bonaire. ALLEN (p. 73) mentions for Bonaire in 1952, 1953 1954 and 1955, 2,000, 4,150, 3,000 and 2,400 breeding birds respectively. From June 1959 to August 1960 about 2,500 pairs bred and 1,800 young were reared on Bonaire. In addition hundreds of adult birds, which were non-breeding, and several hundreds of subadults, were also seen. There are no indications in the literature that flamingos breed more than once

per year and we can therefore say that this 2,500 pairs represent a population of about 5,000 breeding birds. In comparison to ALLEN's figures we may have to speak in fact of an increase.

Taking into consideration the number of birds which did not breed, the subadults and juveniles, we can estimate the total Bonaire population of flamingos at several (5—10) thousand.

There is no question of a decline in the flamingo population on Bonaire in this case.

XI. SUMMARY

The problem leading to this investigation was that of establishing if the West Indian flamingo on Bonaire (Neth. Antilles) was on the decline and, if this was the case, what the possible causes of this could be. To this end a study was made on the island from August 1959 to August 1960 of the environment, food, reproduction and the numbers of birds.

In the description of the habitat in Chapter IV much attention has been given to the water management of the salinas, since these form the biotope of the flamingos. It appeared that even in extensive droughts the salinas retain a certain waterlevel. This is caused by the entry of seawater, the salinas being somewhat below the average sea-level. The rate of entry is determined particularly by the seasonal fluctuation in the sea-level, and the water-level in the salinas follows this more or less parallel; the Cl-content shows an opposite fluctuation.

The extreme physico-chemical circumstances in the salinas ensure the occurrence of a biocoenosis, with few species, but the number of individuals of these species may be very great. This is probably one of the reasons why the flamingos show a preference for these areas.

In Chapter V food-searching and the food itself was considered both qualitatively and quantitatively. Seven clearly different methods were described, and imitation of these indicated the type of food searched for under the given circumstances. From this it appeared that the food was chiefly the larvae and chrysalids of *Ephydra gracilis*. Less frequently were *Artemia salina* and the molluscs *Batillaria minima* and *Cerithidea costata* taken as food. Under certain circumstances the eating of organic ooze was noted. Exceptionally attempts were seen at eating the fishes *Cyprinodon dearborni* and *Mollienesia sphenops*.

The examination of stomach contents confirmed that on Bonaire the staple diet was formed by the larvae and chrysalids of *Ephydra gracilis*.

A quantitative approach was given to the effect that the flamingos have on the food supply, whereby the number of *Ephydra* chrysalids acted as a standard. If 1/4 to 1/3 of the *Ephydra* chrysalids are consumed per 24 hours (theoretically, since larvae are also taken), the number of chrysalids remains more or less constant. With an increasing predation percentage, exploitation occurs and the number of *Ephydra* chrysalids decreases. The flamingos then switch to other food and/or leave, so that the *Ephydra* population is then able to recuperate.

In Chapter VI the reproductive behaviour was described. Both males and females show the same behaviour during pair-formation. During paired foraging is copulation most frequent. The partners build the nest together.

The height of this depends on the amount of building material in the immediate neighbourhood of the future nest. The time given to the building is very variable, sometimes old nests are used and these are simply repaired a little.

Brooding lasts about 30 days. In the Pekelmeer continuous brooding took place due to the overlapping of various groups from December 1959 to August 1960. Partly in connection with this long period, during which both large and small young were present in and around the colony, the occurrence of crèches was examined critically. On Bonaire it appeared that none of the typical functions of the crèche were to be found. The young were, as far as could be established, fed by their own parents. The feeding frequency decreases during the growth of the young, but the duration increases. Young of 4 months age were sometimes fed now and then.

Various sub-adult plumages could be distinguished after the juvenile plumage, with gradual transitions between them. There was evidence that it is several years before the birds have a fully coloured adult plumage.

In Chapter VII the numbers and movements were considered. In addition to emigration and immigration to and from the South American continent, food migration was also undertaken to Venezuela.

During the study period a minimum of 440 and a maximum of 4,130 flamingos were present on Bonaire.

In Chapter VIII the reproduction and mortality were considered. In something more than one year nearly 2,500 pairs bred and reared more than 1,800 fledglings, i.e. 73%. The breeding success in small and large colonies showed no striking differences. There is no predation on Bonaire of the eggs, pullets, juveniles or adult flamingos. The mortality of eggs and young is on the average 25–30%: 20–25% for the eggs and 5% for the young. Since mortality figures for other stages and life-classes in the West Indian flamingo are absent, it has been shown, using data from other areas, that the population probably remains constant in size if successful breeding occurs 3 times in 6 to 7 years.

It is a fact that, although there have been years when little or no breeding took place, the present South Caribbean flamingo population, with its breeding ground on Bonaire, shows no signs of a decline. It is possible that there has been a slight increase during the last 5 to 10 years.

It is very necessary for the conservation of the flamingos on Bonaire, however, that both the breeding and the feeding grounds be protected and given the status of a reservation.

September 29, 1987

Mr. Richard Branson
80 Oxford Gardens
London W11
England, U.K.

Dear Mr. Branson:

We were able to spend 21 July on Necker with excellent success in terms of natural history. I am now able to more tightly frame proposals for what could and should be done. I hope we can arrange about one week of field work on the island, preferably next summer during July. There are two separate major projects.

1. Flamingos: I enclose an article I wrote which alludes to the problems of transport. It cost Guana eleven thousand dollars to bring down the first batch last year. Richard Winchell in Bermuda believes he may be able to send a dozen next year. We must put most of these on Anegada for both biological and political reasons. Anegada was the original breeding ground and is the only island with large enough salt ponds to insure sufficient space and nourishment to sustain breeding effort. We got the entire flamingo project approved by both Bermuda and the BVI because we agreed to restock Anegada. We have to do it.

I am impressed by your salt pond. I believe it will support flamingos, but very few because of its size. I believe you should start with two and build up. (We could find no evidence that your pond supports mosquitoes.)

My proposal for the birds of next year is put two on Necker, two on Guana and all the rest on Anegada. What I would hope is that you and Henry Jarecki would work out the financial details (maybe you can get a Lear jet much more cheaply?), make a suitable contribution to this Agency, and we will carry on from there.

2. Biological Survey: As I outlined last year, I would like to set up pit traps and/or drift fences to capture small animals like lizards, and do mark-recapture population censuses. Our entomologist would also set up several sorts of traps: ultraviolet light, malaise, and pit traps.

Thanks to Shaun, we got a fine speciman of the snake - definitely the widespread and common Liophis portoricensis anegadae, not a boa. We also found apparently breeding yellow warblers which belong to a form found only in Puerto Rico and the Virgin Islands. We have not found them elsewhere in the BVI. They are beautiful, bright yellow and orange birds. We found a big population of Cerion tree snails which belong to known, but as yet unnamed species which may also occur on Anegada. Or, the Anegada one may be different. Only mine specimens had ever been previously collected, none alive. It will require genetic comparisons of live animals to determine relationships.

The big turnip-tailed gecko, found nowhere else in the Virgins or entire Greater Antilles except Necker, is egregiously abundant. It provides an opportunity to produce a paper on population density, biomass, and food relations which would be most amazing. I have been all over the world and never seen so many big geckos (including the Lesser Antilles where your species occurs but is relatively scarce).

I believe we can guarantee production of several nifty scientific papers as a result of spending a week on Necker. I envision a group of eight or ten people.

We need all expenses covered: room, board, transport to and from Guana (if done in July). We need one airfare for an entomologist, round trip New York-BVI: about $450.00. Our overhead costs (due to bookkeeping/accounting) have gone up to $125/day: $875.00.

Probably dates like 20-27 July would be best for us. Hope all this meets with your approval.

Best,

James D. Lazell, Ph.D.

JDL/js

OTHER ORNITHOLOGY

Robert Chipley has not sent in a report for 1987. I know he hoped to have enough radio-tracking and mark-recapture data to write a paper on the bridled quail doves this year. He got a lot of nesting data in 1987. When last I heard (November) Chip was off to Cuba to attempt a comparative study of the Key West quail dove - another rare species which, virtually extinct in the Florida Keys, survives in lowland Cuba.

Liao still wants to spend a year on Guana. I still believe it would yield excellent results for both ornithology and herpetology (we need lizard series during most months of the year except January and July). Liao's problem is getting out of China. His son who is at the University of Houston has applied for U.S. citizenship. I believe that will make things very difficult for Liao. I keep in touch with him by phone(86-20-420-404 from U.S.), and plan to visit him in May.

HERPETOLOGY

We continued our intensive population plot sampling for lizards and continued working the two pit trap grids. Our results indicate anole lizard populations are way up, presumably as a result of wetter weather and more insect food. We got lizards marked in other years. A sphaerodactyl gecko first marked as an adult male four years ago is a remarkable age record for an animal just over an inch long.

Anole egg-laying was up. We got about 30 eggs, of which more than 20 hatched. These mother-offspring sets provide the heritability data we need to assess trends in lizard variation. It takes a very long time to build up these data.

The Iguana pinguis transplant from Anegada seems successful. I first saw baby iguanas in July. By October they were reported all over the place in large numbers. It will be very interesting to capture and mark individuals next July and thus begin to get growth rate data and evidence of movements. We have growth data for the captive individual, of course. Numi Spitzer Goodyear, U.R.I., will be working on the Anegada population for BVI National Parks Trust all of June, 1988. I hope she will come to Guana for a few days in July just to provide a quick comparison.

Paula reported one tortoise found dead of unknown cause. She said she would mail the bones and shell, but I have not received them yet. The other five tortoises are frequently seen and appear in excellent health. They mate frequently, but no

little tortoises have yet been seen. I do not understand what the problem is and expect reports of baby tortoises any time.

The worst news on the herpetological front is from the MacLeans. Since Bill wrote in August (copy follows), he has been diagnosed as having cancer and is undergoing intensive therapy. Apparently it had far metastatised. Margaret Collins said she would keep track of developments, but I have not heard from her since November.

For July, 1988, Greg Mayer and I plan to continue our mark-recapture program. I have proposed to Richard Branson (in Flamingo section, above) a week's work on Necker Island reptiles too.

UNIVERSITY of the VIRGIN ISLANDS

6 August 87

Dr. James D. Lazell, Jr
The Conservation Agency
6 Swinburne St
Jamestown, RI 02835

Dear Skip:

Many thanks for again including Ellen and I in the Guana Island project; in my new job, my time on Guana and a few days at a conference are all my annual opportunity to be involved in science, so I value this time even more than before.

I have found Lantao Island in an atlas and in a yachting magazine; it is the home of Cheoy Lee, the largest yacht builder in the orient. I will write to find out what kind of facilities and services are available as this may be our base there. Our new accelerated plans call for arrival in 1990—the only contingencies we anticipate which could delay this plan are difficulty in selling our house and me being offered the presidency of UVI, both of which seem remote.

The Explorers Club definitely interests me and I would appreciate being nominated. Let me know if you need anything from me to proceed.

We had a good visit with Vitor, who was in heaven at 12 Misgunst. He collected many little moths which he thought quite wonderful and we found him good company.

I have discussed the Guana Island opportunity with Charles Shabica, my friend who could lead the salt-pond study; he is interested and will probably write up a proposal. Chas would be a great addition in all departments, from scholarly productivity to sociability.

Thanks again for having us.

Bill

William P. MacLean

TEL: (809) 776-9200 CHARLOTTE AMALIE ST. THOMAS - U.S. VIRGIN ISLANDS 00802 TELEX 3470102 UVI

ICHTHYOLOGY

Report from Dr. Karen Koltes follows. It is missing any proposal for next year, so I checked with her: an omission of oversight. She definitely wants to continue her study and actually collect individuals for gonad examination to firm up the evidence for her theory.

Dr. Nicholas Clarke reports (via' phone) that marine sanctuary status for White and Muskmelon Bays is proceeding smoothly. A little gentle prodding at high government levels will probably speed things along.

Dr. Arini Waworoentoe, Universitas Sam Ratulangi, Manado, Sulawesi, would like to participate in our marine program with a student or two. Finances will be a problem because of great travel costs. I will be in Manado in March and April and will work on the details then. If a reasonable financial proposal can be worked out, this might provide a dramatic and impressive boost to our international program. We should consider the possibility of bringing in Philippine ichthyologists, too.

Finances are a problem for the marine biology program in general. Costs of equipment and supplies are orders of magnitude greater than for terrestrial biology. I was totally unprepared for the 1987 costs - and misinformed in the planning stages. I thcught our regular slush fund could accommodate the costs, but it failed by a factor three. Costs of tanks, air, and transport

for the tanks and divers was over $2,000. We did no marine photography, and we should have.

I believe a marine program greatly enhances the overall study, and we should continue and expand it. Securing marine sanctuary status will be a great benefit because it will decrease the number of boats and stop anchor dropping. Our research has been necessary for moving us toward sanctuary status. I think that if we preserve we will get sanctuary status this year.

SMITHSONIAN INSTITUTION
WASHINGTON, D. C. 20560

9 December, 1987

Dear Skip,

John and I are off to Belize on Monday and I'm trying to tie up all the loose ends that have accumulated over the past several months, one of which is this final report. I don't know why it's taken so bloody long for me to get it to you, but here it is with apologies. I'm still working on it as a publication and hope to whip it into shape while sitting on my half acre pile of sand.

In addition to my parrotfish report, I've enclosed a list of the new species records from my snorkeling and scuba dives around White and Muskmelon Bays. I included the fish I saw at "Grand Central" and the cave dive under the Muskmelon Bay list. I've listed them all the way the Stokes' did so that they can be added to their original species count. If time were more forgiving, I'd even arrange them sytematically. As it is, you are getting them chronologically!!

I'm sending everything to your parents' home under the assumption you'll be there over the holidays <u>and</u> that you want to see this report within your lifetime!

All the best to you and keep me posted about next year.

Happy holidays!

Karen

Spawning behavior of the stoplight parrotfish, *Sparisoma viride* at Guana Island, B.V.I.

Final Report to the Conservation Agency

Karen H. Koltes, Ph.D.

December, 1987

The stoplight parrotfish, *Sparisoma viride* is a large reef herbivore and an important member of the coral reef fish community. *S. viride* is sexually dimorphic in color and a protogynous hermaphrodite. All individuals are born female ("initial-phase") and males are derived from females, undergoing sex reversal at about 200 mm. Males with fully developed color are known as "terminal-phase" males. Individuals in the process of reversing sex are termed "transitional". Sexual function precedes development of terminal-phase coloration: transitionals possess fully formed testes with viable sperm. Transitonals have very large gonads relative to body size suggesting an enormous reproductive potential and a unique role in the mating system.

Previous studies on the life history of *S. viride* conducted at Grand Turk, Turks and Caicos Islands, B.W.I. (Koltes, in review) indicated that stoplight parrotfish spawn in high energy zones, typically off headlands, and/or areas experiencing strong currents. Large schools of reproductively active individuals (gonads ripe or ripening) were found in shallow water along the barrier reef and especially off the ends of the island. However, no spawning was observed at Grand Turk and few data exist elsewhere on the spawning behavior of this species. Early studies suggested that *S. viride* terminal-phase males temporarily dominated a harem of females with whom they spawned, but the species was otherwise non-territorial. Twenty-one pair-spawnings between territorial terminal-phase males and females were observed in a more recent study in Panama, but no details of the spawning behavior were reported. Only one anecdotal account of group spawning, common in other sparisomatines, exists for the stoplight parrotfish.

A study of the reproductive behavior of the stoplight parrotfish was conducted at Guana Island during July, 1987. The purpose of the study was to determine aspects of their breeding biology, particularly which members of the population breed, the behavioral ecology of the breeding individuals and the location of the spawning grounds.

Twenty-five scuba dives constituting approximately 18 hours of underwater observation were made during this study. Several areas around the island were surveyed to locate spawning grounds. Since the work at Grand Turk had indicated that stoplight parrotfish spawn in high energy zones, the survey effort was concentrated off the Guana Island headlands. White Bay was

surveyed from Monkey Point to the 'Guana Head' and Muskmelon Bay from the 'Guana Head' to Long Point. Surveys of several patch reefs in White Bay and Muskmelon Bay also were conducted.

At least one major spawning ground was located off Long Point. Spawning was also observed at the 'Guana' Head, but there was much less activity there than at Long Point. Spawning occurred between terminal-phase males which actively defended territories and females which moved through their territories. Territories were mapped and the behavior monitored for fifteen males.

Territories averaged about 65 m^2 and were located at a depth of 17 to 25 m. Territories were contiguous and were located over rocky areas which were sparsely covered with gorgonians (soft corals). Visibility was poor (often less than 5 m) and currents varied from weak to very strong, depending primarily on the tidal stage and to a lesser extent on wind.

Territory holders actively defended their territory against other terminal-phase males who entered their territory. Because visibility was poor, it was not possible to determine if the intruders were adjacent territory holders or bachelor males attempting to gain a territory. Almost all territory holders were observed making extended forays into adjacent territories, suggesting that at least some of the intruders came from surrounding territories. Additionally, some initial-phase fish (which can be either female or males in their early stages of sex reversal) were chased from the territory. Although the sex could not be verified, it appeard that these initial-phase fish were transitionals.

Groups of from one to several initial-phase fish moved slowly through the area. Females usually took refuge in patches of gorgonians and their presence was often noted by the change in the male's behavior before they were actually seen by the observer. Females would 'solicit' by hanging at a 45° angle in the gorgonians while males would court by circling rapidly several meters above the female. Successful courtship resulted in the female slowly rising to meet the male. They would swim in parallel and perform a brief "waggle swim", followed by a rapid spawning rush. Gametes were released at the apex of the spawning rush. Both would then quickly return to the substrate.

Previous studies demonstrated that breeding occurs year-round and the present study indicated that they spawn throughout the day. There was some indication that spawning activity increases during periods of maximum tidal currents.

In addition to current exposure, the location of territories off headlands may provide optimum conditions for spawning in terms of high productivity, well-oxygenated water and turbulence which would keep the negatively buoyant eggs in suspension as well as promoting dispersal of gametes. It also may provide orientation cues by which individuals may be able to locate the spawning ground. Results from this study also indicated that the location of territories vertically may be related to the abundance of gorgonians at this depth since females move from patch to patch and spawning occurs above gorgonians. These aspects of territory "quality" need further investigation.

Results from this study and those at Grand Turk indicate a complex social organization in the stoplight parrotfish. Studies at Grand Turk seemed to indicate that stoplight parrotfish may be haremic, at least in shallow reef areas, while those from Guana Island appear to indicate a lek-type mating system. More than one type of mating system may exist in this species as in other scarids and the particular type of mating system may vary from one region to another. Terminal-phase males appear to compete for access to females either by controlling a group of females (haremic mating system) or holding a territory (lek-type). Despite their high reproductive potential, transitional males do not appear to play a significant role in reproduction, although their mating strategy needs further investigation.

White Bay

3-spot goatfish
barred cardinalfish
honeycomb cowfish
French angelfish
masked goby
black margate
yellowhead jawfish
blue runner
crevalle jack
blue chromis
yellowtail hamlet
Caribbean stingray
flamefish
schoolmaster
purple mouth moray

Muskmelon Bay

frillfrin goby
spotted moray
painted wrasse
queen triggerfish
orange filefish
spadefish
roundspot porgy
whitespotted filefish
fairy basslet
mutton snapper
little tunny
horse-eye trevally
creole wrasse
chain moray
reef scorpionfish
jewfish
lane snapper
cardinal soldierfish
dusky cardinalfish
glassy sweeper
margate
midnight parrotfish
creole fish
blackfin snapper
red-spotted hawkfish
dog snapper
spotted snake eel
reef croaker
clown wrasse
dwarf herring
viper moray
spotted eagle ray
cobia
Gobiosoma mullifasciatum

ENTOMOLOGY

Dr. Scott Miller's report follows. He plans to return in 1988 and continue the project despite the great distance from Hawaii and the fact that he is supposed to concentrate now on the Pacific. Dr. Vitor Becker is back in Brazil and cannot return to Guana this year. Miller will find another entomologist.

Dr. Ed Ross got lots of new material of embiids on Guana and on extended travels to Puerto Rico, Dominican Republic, and Jamaica. He has a major paper in the works in which Guana will figure importantly. His work on Guana is done.

Dr. Margaret Collins is finishing her book on North American termites and has not made a separate report on the Guana termites this year. She got excellent results with her excluding barrier experiments and plans to return in 1988.

BISHOP MUSEUM
1525 BERNICE STREET • P.O. BOX 19000A • HONOLULU, HAWAI'I • 96817 0916 • (808) 847-3511

5 November 1987

Dr. James Lazell
The Conservation Agency
6 Swinburne Street
Conanicut Island, RI 02835

Dear Skip:

Here is my report for the 1987 Guana Island field season. This report covers the "general entomology" activities of Vitor Becker and I. Margaret Collins continued her investigations of termite faunistics, biology, and behaviour; she will be submitting a separate report to you. Ed Ross was following up my earlier discoveries of Embioptera (web spinners) on Guana, I assume he will submit a separate report as well.

This season was, as usual, very successful in terms of general collecting, and the moths which we concentrated on. We collected something on the order of 5000-6000 specimens, which are being split between the Smithsonian Institution and Bishop Museum collections (and, in the moths, Becker's collection in Brazil). Each year we continue to be amazed at the number species that were not seen in previous years, as well as species from previous years which are not seen again. Population flucuations from year to year must be great!

A highlight of the trip was the opportunity to run blacklight traps two nights in the moist forest on the top of Tortola. This continues to produce valuable comparative material from a very poorly sampled locality. Becker went on to collect on St. Thomas and Puerto Rico, adding further comparative material.

Some 3000 specimens of Lepidoptera (butterflies and moths, almost all moths) were collected, representing more than 300 species! The most interesting finds among these included one specimen of Heliodinidae (a family of tiny moths) which might represent a species described by Fabricius in the late 1700s, from St. Thomas, but never collected again. The systematic placement of this species has been problematic due to the poor condition of the original specimen. In our four seasons of collecting, only one species of the large moth family Notodontidae has been collected. This species, which we first recorded this season, turns out to be a new species of Nystalea, related to nyseus (we collected one specimen on Guana, one on Tortola, and Becker collected another two on Puerto Rico).

We continue to distribute specimens to appropriate specialists, through our various networks. This network is now broadening with inclusion of the Bishop Museum collaborator network. But, for the reasons I've detailed in previous letters, results continue to accumulate slowly. We are eagerly awaiting the publication of a series of papers by Michael Ivie and his collaborators, which include extensive data from Guana Island beetles (including a color plate of a new species from Guana Island).

For next season, we should continue the same program. Margaret Collins should continue her termite work, and two other entomologists (it takes two to effectively utilize the traps, etc.) can profitably continue "general survey" work. It is also important to start sampling insects at seasons other than July. November ought to be a good time. Next year we should try to schedule trips, especially for termites and moths, at other times as well. I will be happy to coordinate the entomology program for another season, although I cannot yet guarantee (due to responsibilities here) that I will be able to go myself. I will try to go, but if I cannot go to Guana myself, I will be able to send a substitute.

Thank you again for the opportunity for us to participate in this project.

Best Regards,

Scott

Scott E. Miller
Chair, Dept. of Entomology, and
Acting Assistant Director for
Research and Scholarly Studies

CC: Dr. M. Collins
Dr. V. Becker
Dr. H. Jarecki
Paula Selby

PS: I am happy to say that the following manuscript, based largely on material collected on these trips, will soon be submitted for publication:

Epstein, M.E. and S.E. Miller. Systematics of the West Indian moth genus Heuretes (Lepidoptera: Limacodidae). J. Res. Lepid.

BISHOP MUSEUM
1525 BERNICE STREET • P.O. BOX 19000-A • HONOLULU, HAWAI'I • 96817-0916 • (808) 847-3511

August 5, 1987

Dr. Michael Ivie
Department of Entomology
419A Leon Johnson Hall
Montana State University
Bozeman, Montana 59717

Dear Mike:

I have just returned from another field season at Guana Island. All the Coleoptera were kept in alcohol and are being sent to you under separate cover. Four bottles are involved: one each of adults from Guana, Tortola, and Necker Islands; and one large Scarab larva from Guana. While the larva will probably not be very useful, but must represent a new island record.

This (1987) material has not been accessioned yet by USNM or Bishop Museum, but should be split evenly between the two. When you return the material to USNM and Bishop Museum, please keep the following in mind:

1. Because of the USNM's strong West Indian collection and the history of the Guana Island project, holotypes and uniques should go to USNM.

2. For Neotropical material, Bishop Museum is more interested in maximum representation of species than long series of fewer species. Thus, we would appreciate substitution of different species from previous years (e.g. 1984, 1985, 1986) for duplicate 1987 specimens.

I hope this material is useful for your studies. In order to get it to you without delay, I am sending it unmounted. To facilitate mounting I am sending data labels and pins (500 USNM, 500 Bishop Museum).

Please remember to include an acknowledgement such as the following in papers utilizing this material: Collections from Guana Island were sponsored by the Conservation Agency, through a grant from the Mocatta Metals Corporation.

I hope your fieldwork in Cuba went well.

Best Regards,

Scott E. Miller
Chairman
Dept. of Entomology

cc: Gary Hevel, USNM
Warren Steiner, USNM
Al Samuelson, Bishop Museum
James Lazell, TCA

BOTANY

I here include George Proctor's list of plants prior to our July, 1987, field session. That added another couple of dozen species, including a rare Mammilaria cactus from Monkey Point.

We should begin transplanting some of our native rarities up to the building area, and label them. These include the mallow tree Sida eggersii, the stopper tree Eugenia underwoodii, both Coccothrinax and Sabal palms, both species of Peperomia, and the Mammilaria cactus.

I have not heard further from Proctor since July, but at that time he planned to submit his enlarged flora for publication and to return in July, 1988, to help the zoologists with plant identification (especially in the lizard plots). He should also supervise the transplant operations.

CHECKLIST OF GUANA ISLAND VASCULAR PLANTS

George R. Proctor

The following list is based on specimens collected (and observations made) during four visits to Guana Island: July 22-24 and November 17-22, 1986; April 21-25 and June 2-6, 1987. A total of 336 numbered collections were gathered. The attached map indicates the localities investigated. It is possible that areas not yet examined may yield a few more species, but the present list probably includes at least 90% of the natural flora. A few of the more conspicuous cultivated plants are also listed, but the horticultural catalog is quite incomplete. Most of the records are based on numbered specimens (these numbers cited in the list), but sight records have also been included in a few cases. The first (and only complete) set of specimens is retained in the herbarium of the Dept. of Natural Resources, San Juan, Puerto Rico; the second set will be deposited in the U.S. National Herbarium, Smithsonian Institution, Washington, D.C. Third and fourth (partial) sets will be sent to the Institute of Jamaica, Kingston, and to the New York Botanical Garden.

Rare indigenous species, or those seen at only one or two localities, are indicated by citation of these localities. Statistical findings and comments are given at the end of the list.

Acknowledgements

With great appreciation I thank Dr. Henry Jarecki, Dr. James Lazell, and the Conservation Agency, for inviting me to carry out this very interesting study; and Paula Selby and her excellent staff for making my visits to Guana Island both greatly enjoyable and successful.

PTERIDOPHYTA

POLYPODIACEAE - Nephrolepis multiflora 42015
Pteris vittata 42634

MONOCOTS

BROMELIACEAE - Aechmea lingulata (sight, cult. only)
Tillandsia fasciculata 42652 Summit area, Sugar Loaf Hill
T. utriculata 42602

Guana Island - 2 -

COMMELINACEAE - Callisia repens 42533
C. sp. indet. (cult. & escaping) 43417
Commelina elegans 42552
Rhoeo spathacea (sight, cult. only)
Tradescantia pallida (cult., becoming naturalized) 43422

CYPERACEAE - Cyperus capillaris (nanus) 42566
C. filiformis ? 42513
C. planifolius 42565, 43439
C. rotundus 42629
C. swartzii 42020, 42567
C. unifolius 43700 Near landing jetty
Fimbristylis cymosa ssp. spathacea 42519

GRAMINEAE - Andropogon (or Bothriochloa) pertusus 42544
Anthephora hermaphrodita 42548
Brachiaria adspera 42549, 43477
B. fasciculata 42543
Bouteloua americana 42508
Cenchrus echinatus 43410
C. incertus 43409
Chloris inflata 42547
Cynodon dactylon 43451
Dactyloctenium aegyptium 42518
Digitaria horizontalis 42507
D. insularis 43404
Eleusine indica 42559
Eragrostis ciliaris 42536
Oplismenus hirtellus ssp. setarius 42661 Sugar Loaf Hill
Panicum maximum
Pappophorum pappiferum 42600 S. end, Muskmelon Bay Beach
Paspalum caespitosum 42545
P. laxum 43432; 43452 ?
P. pleostachyum 42599 S. end, Muskmelon Bay Beach
P. vaginatum 43412
Spartina patens 43431
Sporobolus virginicus 43696
Tragus berteronianus 42595

HYDROCHARITACEAE - Thalassia testudinum (sight)
LILIACEAE (Agavoideae) - Agave missionum 43413, 43699
A. sp. indet. (sight, cult. only)
A. sp. indet. (sight, cult. only)
Sansevieria trifasciata (sight, cult & escaping)
(Amaryllidoideae) - Hymenocallis expansa (sight, cult.)
Zephyranthes candida (sight)
(Lilioideae) - Aloe vera (sight, cult.)
ORCHIDACEAE - Epidendrum bifidum 42571
E. ciliare (sight; cult., also indigenous)
Oncidium prionochilum 43678
PALMAE - Coccothrinax barbadensis 41996
Cocos nucifera (sight)
Sabal causiarum 42022 Slopes SW. of North Beach
ZANNICHELLIACEAE - Syringodium filiforme (sight)

DICOTS

ACANTHACEAE - Asystasia gangetica 43402
Blechum brownei 43480
Oplonia microphylla 42014, 43703 Common in Grand Ghut
Ruellia tuberosa 43430
AIZOACEAE - Mollugo nudicaulis 42517
Sesuvium portulacastrum 43437
Trianthema portulacastrum 42526
AMARANTHACEAE - Achyranthes aspera (A. indica) 42645
Alternanthera crucis 42598 S. end, Muskmelon Bay Beach
A. pungens 42558
Amaranthus crassipes 43479
A. viridis 43478
Celosia nitida 43414
Iresine angustifolia 42617, 43407
ANNONACEAE - Annona glabra 43682
A. muricata 43683
A. squamosa 43407

APOCYNACEAE - Nerium oleander (sight, cult.)
Plumeria alba 42563
P. rubra (sight, cult.)
Prestonia agglutinata 42586
Rauvolfia viridis 42003
Urechites lutea 42593

ASCLEPIADACEAE - Asclepias curassavica 42525
Cryptostegia grandiflora (sight; cult. & naturalized)

BIGNONIACEAE - Crescentia cujete 42522
Macfadyena unguis-cati 42001, 43470
Tabebuia heterophylla 42581
Tecoma stans (sight; cult. & naturalized)

BORAGINACEAE - Argusia gnaphalodes 43400 North Beach
Bourreria succulenta var. succulenta 42024
Cordia collococca 43449
C. laevigata ? 43712 Grand Ghut
C. rickseckeri 42601
Heliotropium angiospermum 42632
H. curassavicum 42631

BURSERACEAE - Bursera simaruba 42006

CACTACEAE - Hylocereus trigonus 43462
Melocactus intortus 43456
Opuntia dillenii (sight)
O. repens 43418
O. rubescens (sight, cult.)
Pilosocereus royenii 42592
Selenicereus sp. indet. 43420 (Probably introduced)

CAPPARACEAE - Capparis baducca 43464
C. cynophallophora 43408
C. flexuosa 42619
C. indica 43463, 43677
Cleome viscosa 42550
Morisonia americana 42572

CARICACEAE - Carica papaya (sight, cult.)

CASUARINACEAE - Casuarina equisetifolia (sight, planted)

CELASTRACEAE - Crossopetalum rhacoma 42606
Elaeodendron xylocarpum 42564
Maytenus laevigata 42005, 42664, 43465, 43704
Schaefferia frutescens 42568, 43395, 43442

CLUSIACEAE - Clusia rosea (sight) Summit of Sugar Loaf Hill

COMBRETACEAE - Conocarpus erectus (sight)
Laguncularia racemosa 42630

COMPOSITAE - Bidens alba var. radiata 43713
B. cynapiifolia 42541
Conyza canadensis 42642
Emilia forbergii 43460
Eupatorium corymbosum 43399
E. sinuatum 42574, 42591 Ridge E. of Muskmelon Bay; also northernmost hill.
Pluchea symphytifolia 43453
Tridax procumbens 42542
Vernonia cinerea 43425

CONVOLVULACEAE - Convolvulus nodiflorus 42621
Cuscuta americana 42021
Ipomoea pes-caprae ssp. brasiliensis
I. steudelii 42604 Hillside NE. of Guana Island Club
I. triloba 43484
I. violacea 42608
Jacquemontia havanensis 42607
J. pentantha 42651
J. solanifolia 42537
Merremia quinquefolia 42633
Stictocardia tiliifolia 43448

CRASSULACEAE - Kalanchoë tubiflora (naturalized) 43423

CRUCIFERAE - Cakile lanceolata 42650

CUCURBITACEAE - Cayaponia racemosa 43424
Momordica charantia 43489

ERYTHROXYLACEAE - Erythroxylum rotundifolium 43472

EUPHORBIACEAE - Acalypha chamaedrifolia 42556
Adelia ricinella 42658, 43389, 43390
Argythamnia candicans 42510
A. fasciculata 43711 Grand Ghut

EUPHORBIACEAE (continued)

Chamaesyce hirta 42539
C. hypericifolia 42506
C. hyssopifolia 43461
C. mesembrianthemifolia 42612
C. ophthalmica 42505
C. prostrata 42557
Croton astroites 42535
C. betulinus 42540
C. lobatus 43436
C. rigidus 42521
Dalechampia scandens 43485
Euphorbia lactea (sight, cult.)
E. neriifolia (cult.) 43419
E. petiolaris 43398
E. tirucalli (cult.) 42588
Gymnanthes lucida 42594
Hippomane mancinella 43438 Bigelow Beach; N. end, North Beach
Phyllanthus amarus 43429
Poinsettia heterophylla 42555
Savia sessiliflora 43466, 43710
Securinega acidoton 43440
Tragia volubilis

FLACOURTIACEAE - Samyda dodecandra 42000, 43679

GOODENIACEAE - Scaevola plumieri 42610 North Beach

LABIATAE - Leonotis nepetifolia 43434
Plectranthus amboinicus (naturalized) 43427
Salvia serotina 42512

LAURACEAE - Ocotea (Nectandra) coriacea 43684 Base of hill SE. of White Bay

LEGUMINOSAE (Caesalpinioideae) - Bauhinia variegata (sight, seminaturalized)
Caesalpinia bonduc 43447 White Bay
C. pulcherrima (sight, naturalized)
Cassia bicapsularis ? 42654
C. glandulosa var. swartzii 42551
C. occidentalis 43692
Parkinsonia aculeata (sight, planted)
Tamarindus indica (planted) 42516

Guana Island - 7 -

LEGUMINOSAE (Faboideae) - Abrus precatorius 43446
Alysicarpus vaginalis 42635
Canavalia rosea 42616
Centrosema virginianum 43393
Crotalaria incana 43405
C. lotifolia 43394
Desmodium incanum 42589
D. procumbens 42590
Erythrina variegata var. orientalis (sight, planted)
Galactia dubia 42573, 43406
G. eggersii 42529
G. striata 42538
Gliricidia sepium (planted) 42644
Indigofera suffruticosa 42649
Pictetia aculeata 42013, 43474
Piscidia carthagenensis 43392
Rhynchosia minima 42647
R. reticulata 42011
Sabinea florida 43685, 43705 Base of hill SE. of
Stylosanthes hamata 42646 \ White Bay; Grand Ghut

LEGUMINOSAE (Mimosoideae) - Acacia macracantha 42641
A. muricata 42653, 43469 NW. ridge, Sugar Loaf Hill
A. westiana 42656
Calliandra portoricensis 43689 Base of hill SE.
Desmanthus depressus 42640 \ of White Bay
D. virgatus 42648
Leucaena leucocephala 43457
Pithecellobium unguis-cati 42585
Samanea (Pithecellobium) saman (planted) 43691

LORANTHACEAE - Dendropemon caribaeus 42012, 42562

LYTHRACEAE - Ginoria rohrii 43473 Palm Ghut

MALPIGHIACEAE - Bunchosia glandulosa 42023, 42562
Heteropteris purpurea 43397, 43467
Stigmaphyllon periplocifolium 42588

MALVACEAE - Bastardia viscosa 43426
Hibiscus sinensis cultivars (sight, cult.)
Malvastrum corchorifolium 42627
M. coromandelianum 42579
Sida ciliaris 42554
S. eggersii 43706 Grand Ghut; rarest tree in Virgin Is.
S. javensis ssp. expilosa 42620
S. pyramidata 42570
S. urens ? (sight)
MORACEAE - Artocarpus altilis (sight, cult.)
Ficus citrifolia 42613, 43707
MYOPORACEAE - Bontia daphnoides 42027 North Beach
MYRTACEAE - Eugenia axillaris 42524
E. biflora 42004, 42019, 43686
E. cordata 42527, 42561
E. ligustrina 42657, 43702
E. monticola 42018
E. procera 42662, 43687
E. underwoodii 43701 Grand Ghut; first record for Virgin Is.
Myrcianthes fragrans 42016 W. side of saddle just S. of Sugar Loaf Hill; tallest tree on Guana Is.
NYCTAGINACEAE - Bougainvillea spectabilis (sight; planted & naturalized)
Guapira fragrans 42007, 43445, 43468
Boerhavia diffusa 43459
B. erecta 43458
Pisonia subcordata 43411, 43490
OLACACEAE - Schoepfia schreberi 42528, 43680
OLEACEAE - Forestiera eggersiana 42530, 42531, 43435
PAPAVERACEAE - Argemone mexicana 43403
PASSIFLORACEAE - Passiflora foetida 43454
P. suberosa 42509, 42514
PHYTOLACCACEAE - Petiveria alliacea 43450
Rivina humilis 42663
Trichostigma octandrum 43688 Base of hill SE. of White Bay
PIPERACEAE - Peperomia humilis 42010, 42659 NW. ridge, Sugar Loaf Hill
P. magnoliifolia 42660 Near summit, Sugar Loaf Hill

PLUMBAGINACEAE - Plumbago scandens 43444 Ravine behind Bigelow Beach

POLYGONACEAE - Antigonon leptopus (naturalized) 43421

Coccoloba uvifera 43396

PORTULACACEAE - Portulaca oleracea (sight)

PUNICACEAE - Punica granatum (sight; cult.)

RHAMNACEAE - Colubrina arborescens 42624

C. elliptica 42578

Gouania lupuloides 42584

Krugiodendron ferreum 42587

Reynosia guama 43709 Grand Ghut

RUBIACEAE - Chiococca alba ? 43708 Grand Ghut; corolla uniformly 4-lobed, in typical C. alba usually 5-lobed.

Erithalis fruticosa 43475

Exostema caribaeum 41999

Guettarda parviflora 43401, 43698

Psychotria microdon 42002

Randia aculeata 43391

Rondeletia pilosa 42017, 42603

Scolosanthus versicolor 42560, 43697 Hillside NE. of Guana Island Club; Palm Ghut

Spermacoce assurgens 42511, 42636

RUTACEAE - Amyris elemifera 42009, 42532

Citrus aurantifolia (naturalized) 43690

SAPINDACEAE - Cardiospermum microcarpum 42520

Melicoccus bijugatus (planted) 43695

Serjania polyphylla 42622

SAPOTACEAE - Bumelia krugii 42597 Summit area of northernmost hill

B. obovata 43433 Just W. of North Beach

SCROPHULARIACEAE - Bacopa monnieri 42634 NW. end of lagoon

Capraria biflora 42625

SOLANACEAE - Cestrum laurifolium ? 42655

Physalis angulata 43486, 43487

Solanum americanum 43455

S. persicifolium 42008, 42515

S. polygamum 41997, 42533, 43443

S. torvum 43681

STERCULIACEAE - Ayenia insulicola 43428, 43471
Helicteres jamaicensis 42569
Melochia nodiflora 43476
M. tomentosa 42626
Waltheria indica 42577
SURIANACEAE - Suriana maritima 42611
THEOPHRASTACEAE - Jacquinia arborea 42596, 42609
J. berterii 41998, 42026
TILIACEAE - Corchorus aestuans 43482
C. hirsutus 42648
C. siliquosus 43483
ULMACEAE - Trema micranthum 43488 S. end of plain E. of White Bay
URTICACEAE - Pilea microphylla (sight; garden weed, rare)
P. tenerrima 42615 N. end of North Beach
VERBENACEAE - Citharexylum fruticosum 42582
Clerodendrum aculeatum 42623
Lantana involucrata 42605
L. urticifolia 42583
Lippia nodiflora 42639
Priva lappulacea 42628
Stachytarpheta jamaicensis 43481
VITACEAE - Cissus sicyoides 42614, 43694
C. trifoliata 43693
ZYGOPHYLLACEAE - Guaiacum officinale (sight; planted ?)
Kallstroemia maxima 43416

TOTAL: 308 species. Of these, 45 have definitely been introduced, many as ornamentals; some of these are becoming naturalized. This leaves 263 species tentatively to be considered indigenous, though many weedy plants in this category probably were not present prior to human occupation. Of the total 308 species, 65 can be considered trees, 64 as shrubs, and 47 as vines, while the remaining 132 are herbaceous plants of various growth forms.

The most interesting botanical locality on the island is the ravine known as Grand Ghut. Here occurs Sida eggersii, believed to be extinct on Tortola and Culebra, and to be represented by possibly a single surviving tree on Jost Van Dyke. Also present is Eugenia underwoodii, known previously from the type specimen collected in Yauco, Puerto Rico, and a few other doubtful Puerto Rican records.

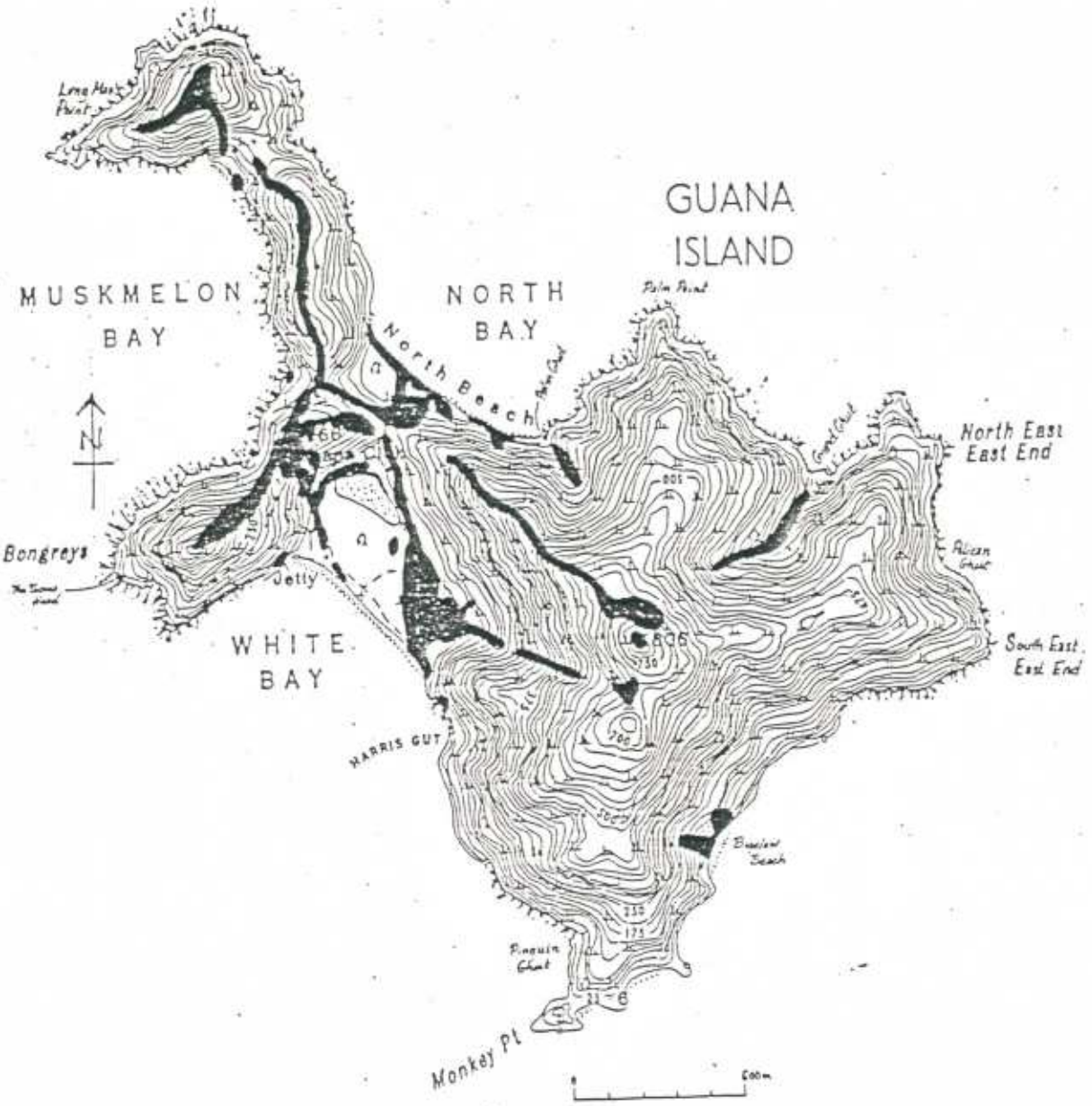

Fig. 1. Map of Guana Island, B.V.I., showing areas botanically investigated by George R. Proctor from July 1986 to June 1987. A total of 308 species of vascular plants was collected or observed in these localities (shaded black).

ARCHEOLOGY AND PALEONTOLOGY

No report from Michael Gibbons, who promised one first in Mississippi in November, then Florida in December, and finally in January in Hawaii. I will ask him to send it to you directly, but I am not happy about that as I like to know what is happening myself.

Elizabeth (Holly) Righter's letters are included. She wants to work on Guana but is accustomed to grants which include salary. I explained we cannot provide that. She thought she might be able to return when we talked in July, but I have heard nothing since the letter which follows. I hope she can return because I think there is exciting stuff to dig up. I especially hope for large animal bones: iguana, tortoise, monk seal (Gibbons has one phalange of the latter).

In any case, Holly will coordinate her activities with Michael. I told her the BVI government topo maps were all that is available and gave her a copy.

GOVERNMENT OF
THE VIRGIN ISLANDS OF THE UNITED STATES
OFFICE OF THE GOVERNOR

VIRGIN ISLANDS PLANNING OFFICE
DIVISION FOR ARCHAEOLOGY &
HISTORIC PRESERVATION
P.O. Box 2606
Charlotte Amalie, St. Thomas, V.I. 00801

PLANNING

PRESERVATION

July 31, 1987

Dr. James D. Lazell
President
The Conservation Agency
6 Swinburne Street
Conanicut Island, R.I. 02836

Dear Skip:

Thank you for your nice note and my refund check! It was wonderful to be included in the Guana Island studies and I certainly enjoyed my stay on the island. It was so nice to meet you and the other researchers. I, also, hope to be seeing you and the others next year, as I believe that the archaeological data that can be obtained from the prehistoric site could be very usefully integrated with studies that are being conducted by the natural scientists on the island. I have sent a copy of a short, informal paper on the natural resource potential of archaeological sites to Michael. If you would like a copy I could send one to you also. In fact, if you would like articles on some of the topics we discussed at Guana; i.e. early prehistoric sites in Haiti, or tectonic movements and their effects on coastal archaeological sites in the Caribbean, I would be happy to send them to you.

I am in the process of preparing a short report of the archaeological reconnaissance which we conducted on Guana. I plan to send this to Michael with a copy to you. In the meantime, I would be very grateful if you could supply me with a map of the "flat area", on which I could plot our test pits and findings. Would you also have an extra copy of the topo map produced by the B.V.I. government, or could you give me the address of the agency from which one could be ordered?

Thank you again for your hospitality, and for including me in the Guana Island research program. Your ability to coordinate the many projects and to bring such interesting people together resulted in a unique and rewarding experience for all. I hope that we continue to work together, and that I will hear from you again soon.

Best wishes,

GOVERNMENT OF
THE VIRGIN ISLANDS OF THE UNITED STATES
OFFICE OF THE GOVERNOR

VIRGIN ISLANDS PLANNING OFFICE
DIVISION FOR ARCHAEOLOGY &
HISTORIC PRESERVATION
P.O. Box 2606
Charlotte Amalie, St. Thomas, V.I. 00801

PLANNING

PRESERVATION

August 12, 1987

Dr. Michael Gibbons
Primatology
University of Massachusetts
Boston, Massachusetts

Dear Michael:

I have just returned from a visit to Tortola, where I obtained the bone specimens which were recovered during the systematic archaeological sampling survey which took place during Easter of 1985 at the Belmont Grove site, Tortola, British Virgin Islands. The archaeological materials are in the care of the Virgin Islands Historical Society by whom the survey was sponsored. Ms. Carol Arneborg and Mr. David Hughes kindly assisted me in sorting out the bones and entrusting them to my care. There are not many, and I think that only a few species are represented.

We really appreciate your offer to have the bones analysed by experts at the University of Massachusetts. I have also enclosed a list of the materials enclosed. The Society is hoping to exhibit the Belmont Grove materials at the upcoming meeting of the Caribbean Conservation Association which will take place between September 9 and September 14, 1987. They would be very pleased to have the bones back in time for the exhibit, but if this is not possible, there is no problem. The bones can be returned to me since I will be going to the meeting, where I plan to photograph the exhibit for a formal report of the archaeological survey, which I am in the process of writing.

Both Carol and David expressed an interest in the archaeological investigations at Guana Island. It would be very nice to do more work there, and I wanted to make sure that both you and Skip understood that I would be pleased to undertake future small-scale excavation/research projects at the prehistoric site under the same arrangements as this summer, i.e. in exchange for expenses. The only additional expense would be some field equipment. I will present what I feel are feasible objectives and projects in my report to you.

Thank you again for your help with the bone specimens from Belmont Grove. The Zufriedenheit materials will take a little more time to sort out. I am looking forward to learning the results

of the analyses for both Guana Island and Belmont Grove.

I hope everything is going well. My report will be along soon.

Sincerely,

Elizabeth Righter

cc: Dr. James (Skip) Lazell

Belmont Grove
Tortola, BVI
August 10, 1987

Bone Specimens Recovered from Systematic Archaeological Sampling, Easter 1985.

Materials Sent to the University of Massachusetts, Boston, for Analysis courtesy of Dr. Michael Gibbons.

Telephone Box #1-	one fish bone.
D2-Level 1-	two fish bones
I2-Level 1-	one vertebra
I1-Level 1-	two fish bones.
I3-Level 2-	fourteen bone fragments including two vertebrae.
I3-Level 1-	two vertebrae
I2-Level 2-	two vertebrae
J2-	one bone
J3-Level 1-	eight vertebrae.
J3-Level 1-	twenty-three misc bones.

E. Righter

THE 1988 SEASON

I hope to get to Guana on or about 28 June with a field assistant, as usual. I plan to stay a few days into August to close everything down, as usual. Investigators for whom we pay airfare are the same as last year. Airfares are from the NE U.S: Washington, New York, Boston - or Puerto Rico.

1. Lazell (35 days)
2. Lazell's Assistant (35 days)
3. Miller (20 days)
4. Second Entomologist (20 days)
5. Mayer (30 days)
6. Chipley (30 days)
7. Proctor (20 days)

In addition, seven other investigators either paid their own airfares, or in the cases of the MacLeans and Holly Righter (from USVI), got their costs out of the slush fund. These averaged about 18 days on Guana totalling 126 person days. We should have about the same in 1988.

Then there were 16 field assistants averaging 23 days each, so 368 more person days. I reckon the total to be 190 plus 126 plus 368, or 684 person days total. If eight or ten of us spent a week on Necker this year, that would reduce the total to 628 or 614 person days on Guana. That total does not yet include the Jareckis, but there are 900 possible person days in a month.

We need to increase the slush fund from one to three thousand dollars to accomodate our marine program. This is the only financially major change since last year.

Several more papers are in press, so there should be new publications for the project by June.

All the Best,

James D. Lazell, Ph.D.

JDL:tmk