JOURNAL OF THE VIRGIN ISLANDS ARCHÆOLOGICAL SOCIETY

NUMBER 2
1975

THE VIRGIN ISLANDS ARCHAEOLOGICAL SOCIETY

founded and incorporated, January 1974, at St. Thomas, U.S. Virgin Islands as a non-profit, scientific organization.

The object for which this corporate society is formed is to bring together those persons having a serious interest in archaeology, history and related studies; to explore, excavate (under the aegis and direction of the Territorial Archaeologist of the government of the U.S. Virgin Islands), chart and study the cultures of primitive peoples who once inhabited our Islands; to publish the Society's findings; to communicate with other archaeological and historical societies and disseminate knowledge acquired through such activities.

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Manuscripts, (drawings, charts, maps, photographs) submitted to the Society's Journal shall be in the English language, typewritten and doubled spaced; and shall become the property of the Society unless return is requested and accompanied by a self-addressed, stamped envelope. All correspondence deemed suitable for publication should be sent via air, certified mail: Kenneth C. Dick, Editor, High Road, Star Route, Vessup Bay Estates, St. Thomas, U.S. Virgin Islands, 00801. The Society cannot guarantee publication of unsolicited articles and reserves the right to reject and/or edit all articles, in the best interests of the Society.

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SOCIETY MEETING DATES: the 3rd Thursday of each month, 8 p.m. at the Society's headquarters, Havensight Road, St. Thomas.

VIRGIN ISLANDS ARCHAEOLOGICAL SOCIETY

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1975

Journal

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IN MEMORIAM

Archaeology has suffered a sad loss in the passing of Mr. Otto Feger, who died in New York at the age of 57 on March 11, 1975.

Just a few weeks prior to his demise, ill health had forced him to resign as Administrator for the Society's proposed dig at Dorothea, St. Thomas

Apart from his field experience in Israel, Greece, and Italy, and his work with us at Hull Bay, Otto Feger was kind and considerate, a willing worker, a man of deep understanding. His friends will grieve with his wife, Helen, to whom he had been happily married for more than 25 years.

This issue of our Journal is dedicated to the memory of Otto Feger.

EDITOR'S NOTE

After the publication of Volume 1, this JOURNAL will be numbered sequentially in Arabic numerals. Thus, this is Number 2 and Number 3 will follow. Authors are advised that they are to adhere to the stylistic guidelines of AMERICAN ANTIQUITY in writing their articles, but that all affiliations and credentials will be listed in the BIOGRAPHICAL NOTES at the end of each issue.

NOTES

BIOGRAPHICAL NOTES

Theodore E. Bradstreet was born in Augusta, Maine. He holds a Master's degree in quaternary geology from the University of Maine and another in anthropology from the State University of New York. A Fellow of the Society, he is to undertake salvage archaeology along the new Alaska Pipeline this summer, under contract with the University of Alaska.

Dr. Aimery P. Caron is Assistant to the President of the College of the Virgin Islands and Associate Professor of Chemistry at that institution. Born in Paris, France, he completed his graduate studies at the University of Southern California, and has been an avid student of West Indian prehistory for many years.

Dr. Isaac Dookhan, Historian-in-Residence of the College of the Virgin Islands, was born in Guyana and educated in the University of the West Indies. The author of many erudite treatises, he has recently published the latest comprehensive history of the U.S. Virgin Islands.

Alfredo E. Figueredo was born in Las Tunas, Cuba, and was educated in New York City, earning a B.A. in anthropology from Queens College of the City University of New York. He was the first Territorial Archaeologist of the U. S. Virgin Islands until January 1975. He had also served previously as Curator of the Virgin Islands Museum and as an instructor at Russell Sage College. Presently, he is Chairman of the Society's Executive Council, and the Archaeologist of the Federal Virgin Islands State Review Board for National Historic Preservation.

Frederik C. Gjessing was born in St. Louis, Missouri. From the age of 3 and until 19 years old, he lived in Denmark, where he was a student at the Royal Academy of the Arts, attending Cornell University on his return to the United States. He served in the U.S. Navy as a First Lieutenant in the capacity of a photographic interpreter. Presently, he is Historical Architect of the National Park Service (U.S. Department of the Interior), stationed in St. Thomas.

Jeffrey M. Gross was born in New York. He is a junior at Yale University, and has done archaeological work in the U.S. Southwest, England, and Wales, as well as in the Virgin Islands. He currently resides in St. Thomas on a leave of absence to study the local preceramic cultures.

Bruce E. Tilden was born in San Gabriel, California. He graduated *cum laude* from the College of the Virgin Islands with a B.A. in Social Sciences, and has participated in archaeological work from the Dominican Republic to Saba. He is presently an Assistant Archaeologist in the Office of the Territorial Archaeologist, U.S. Virgin Islands, and Chairman of the Society's Ethics Committee.

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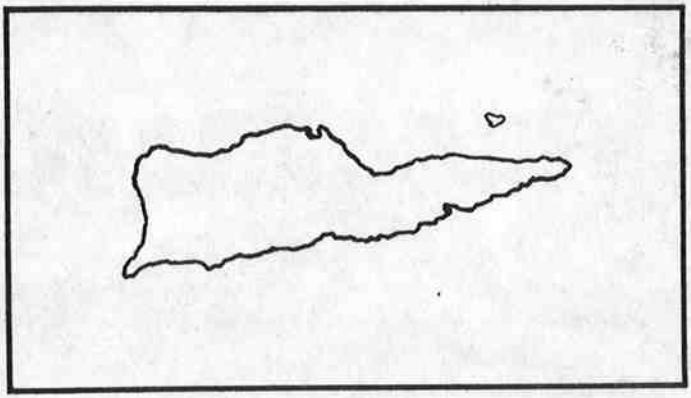
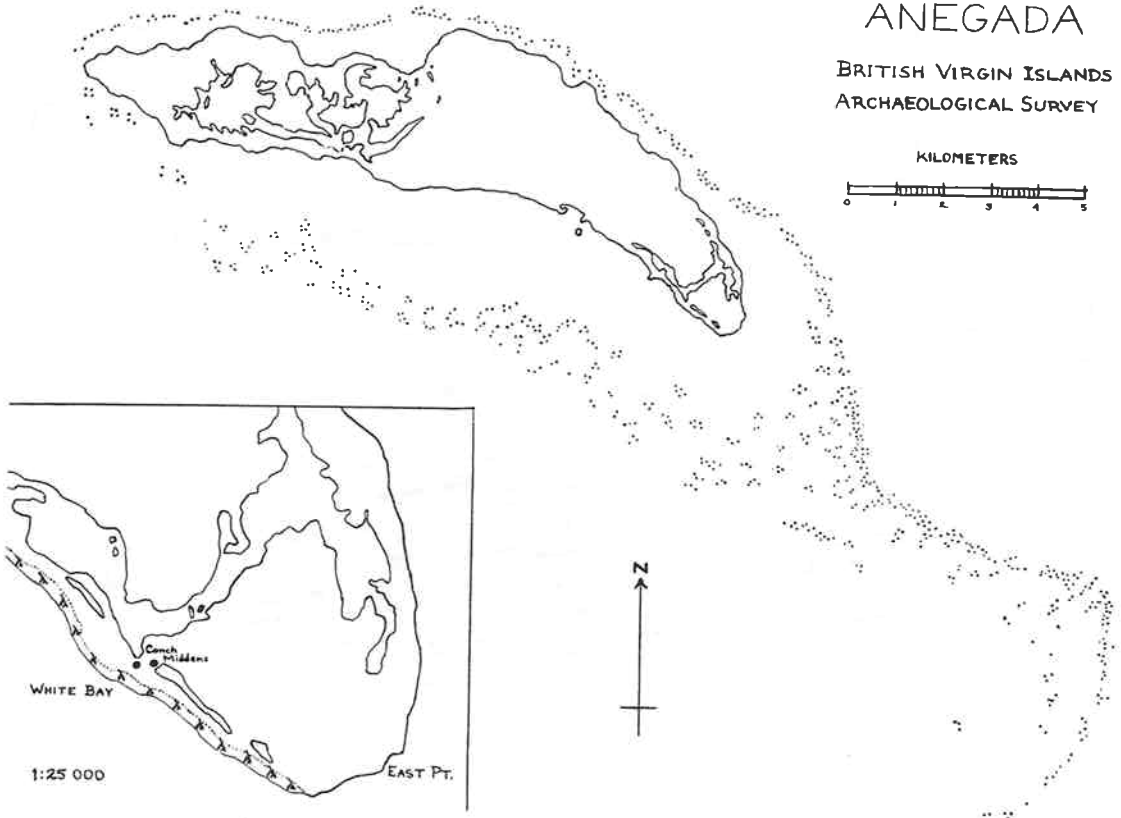


THE INDIAN NAMES OF ST. CROIX

Aboriginal place names are almost unknown for the Virgin Islands, the result perhaps of relatively late settlement, when slaving raids from Puerto Rico had in all probability effectively exterminated the native population. As late as 1587 one Indian village is reported from St. Croix, yet we do not know if any were still left there when the first Dutch settlers arrived sometime before 1625. If any remained, its inhabitants were killed off or assimilated very early, since aborigines are not reported on the island in the XVII Century. The first Danes on St. Thomas, for instance, found only four Indians to convert and enslave in 1671.

Peter Martyr observed that the land which Columbus named Santa Cruz in 1493 was called *Ay Ay* by its inhabitants. Samuel E. Morison and other historians believe this to be St. Croix, though the matter is by no means settled. The name has been variously spelled as *Ayay, Aye Aye,* and *Agay,* the last form being preferred by McGuire's *Geographical Dictionary,* an official guide to the spelling of local place-names. The meaning is obscure.

Half a century after Peter Martyr, when it is assumed that the name 'Santa Cruz' already definitely applied to St. Croix, we read in Oviedo's *History* that it was called *Cibuqueira* by its native inhabitants. The name appears three times, once with the *c* changed to an *l (Libuqueira)* presumably through a copyist's error. If Arawakan, the first element in the name is probably akin to *ciba,* 'stone' the middle element to the suffix *-que,* 'land', with the distant possibility that the last element is related to *eyeri,* 'men', and the infixed position of *-que* is thereby resolved: *Cibuque,* 'stony land', *Cibuqueira,* 'men of the stony land'. If Cariban, it may comprise two elements, *cibu* and *queira* (as in *Caracueira,* modern Guadeloupe), probably with a similar meaning to our hypothetical *Cibuque.*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THE ARCHAEOLOGY OF ANEGADA ISLAND

By Jeffrey M. Gross

Introduction:

In August 1974 a field party of the British Virgin Islands Archaeological Survey (Museum of the American Indian, Heye Foundation), consisting of Survey Director Alfredo E. Figueredo and the author, conducted a three day general reconnaissance of the island of Anegada. The following is a report of this expedition's findings and a review of previous archaeological work; a brief discussion of geography, geology, and the environmental setting has been included as added background to the archaeology of this unfamiliar region.

The Island:

Anegada (latitude 18°47'N, longitude 64°20'W) is the northeasternmost of the Virgin Islands; its closest neighbor is Virgin Gorda, some 22 km. to the south; north, the Atlantic Ocean, and east, more than 150 km., lie the Lesser Antilles.

Approximately 33 square km. in area, Anegada is a rough crescent 12 km. southeast to northwest, 3½ km. north to south at its widest point. Geologically, the island has been discribed as a recently emergent (*i.e.* late Cenozoic, probably Pleistocene) barrier reef platform and reef front on the northeastern edge of the Virgin Bank (Howard 1970). Bedrock is exclusively limestone, in contrast to the predominantly igneous and metamorphic formations that compose the other Virgin Islands. The island is surrounded by reefs, ranging from a fringing reef on the north shore to a more extensive reef platform on the south shore dominated by relatively small patch reefs; a projection of the fringing reef extends southeast for a distance of some 16 km. along the edge of the Virgin Bank (*Ibid.*: 1).

Anegada attains a maximum elevation of approximately 7.5 m. above sea level along the northeast coast; elsewhere the average elevation does not exceed 4.5 m. The limestone bedrock is exposed over a large part of the island, soils tending to be thin and patchy (though adequately suited to the provision crops, such as sorghum and sweet potato, grown by the modern inhabitants). Average annual rainfall has been estimated at 30 inches, or 76 cm. (Bowden, *et al.* 1970: 15); there are no known permanent streams, although large pools of standing water have been observed after heavy rains. Sinkholes or natural wells are abundant however, providing fresh or only slightly brackish water. The western portion of Anegada is occupied by extensive salt or brackish water ponds, as is to a lesser extent the eastern end of the island.

Outside of the Settlement area, which is severely overgrazed, vegetative cover consists mainly of open scrub and thorn forest. The original vegetation must have been considerably more developed, especially prior to clearing of land for cultivation and pasture, and charcoaling operations. There is also a fairly extensive area of mangrove swamp along the sheltered southeast coast. In general, much of the island's flora is of widespread West Indian species, though necessarilly limited to those capable of growing on limestone, in the presence of varying amounts of salt spray, and on a small, hot, dry and windblown land mass (D'Arcy 1971: 3). Anegada is remarkable for having one endemic genus and five endemic species of flora (quite a large number for such a small West Indian island) and some twenty nonendemic species not reported from the other Virgins (*Ibid.*: 3-4).

Archaeological Investigations:

Botanist Robert H. Schomburgk makes mention of Indian relics in what is the earliest general account of the natural history of Anegada. His interesting remarks on the subject are quoted in full below:

> Pere Labat, the only early writer who speaks of the lesser West India islands, observes, that the aborigines used it [*i.e.* Anegada] as an occasional rendezvous, where they procured great quantities of conchs (*Strombus gigas*); and large piles of these shells are still to be seen at the east end of the island, but nowhere else; which seems to prove decidedly that it was not permanently occupied, but merely resorted to from time to time. These conchs are still found in great numbers in the shallow waters at the east end, chiefly in the months of May and November; and the dry shells piled up have all a hole in the lower end of the spire, for which the most probable reason is, that the animal is thus most easily extracted. It appears surprising that so much care should have been taken to pile them up, and it has been surmised, in consequence, that these heaps were burialplaces; but several have been taken down, and burnt for lime (the quality of which is excellent), without any trace having been found of human bones or other extraneous substance. And it is more probable that they were merely piled up to be out of the way, the current not being strong enough to carry them off had they been thrown into the sea; where, had they remained, they would have embarrassed the fishing for the living animal. [1832: 153]

The "hole in the lower end of the spire," which Schomburgk notes as characteristic of these conch shells from Anegada (see plate), has been taken (in the West Indies at least) to represent a distinctively aboriginal technique for extracting the animal from its shell. Theodoor de Booy, for instance, concluded that "if the aperture is a small round one..., it is certain that the conch was opened and used by an Indian." (1915: 80). Such a practice, indeed, differs substantially from that of modern West Indian conch fishermen, and there is still some question as to how such small perforations served to allow an Indian to extract the conch. Perhaps observing this distinction, or even through an oral tradition from the time of the first European settlers, the modern natives of Anegada preserve a knowledge of the aboriginal origin of those shell heaps at the east end of their island, and are careful to distinguish them from ones left by "our own generation" (which latter are to be seen on shore or in the shallows just south of the Settlement, or as scattered collections of conch along the southeast coast).

Schomburgk also records that in the hardened ground by one of the sinkholes on the north shore of Anegada he was shown "the marks of feet..., which, from their form and the outward turn of the toes, are considered to be those of Indians." His account continues: "Mr. John Vanterpool, who has passed the the great climacteric, recollects having seen them on his first visit to the island, when the oldest inhabitants remembered them from their infancy; and there is therefore little doubt that they have been left by the aborigines...." (*Op.cit.*: 160). In the course of this most recent expedition no attempt was made to locate these "marks," but one elderly native did report having seen them, and basically confirmed Schomburgk's description.

Herbert Krieger, then Curator of Ethnology at the U.S. National Museum, Smithsonian Institution, went to Anegada in 1937, to investigate the report of a

single large aboriginal shell mound, and to obtain Indian relics for comparison with Smithsonian collections from elsewhere in the West Indies (Krieger 1938: 95). He does not seem to have read Schomburgk's account. Krieger spent several days on the island, photographing and measuring the mound–which he reported to be "a very large one built up almost entirely of conch shells, *Strombus gigas.*" (*Ibid.*: 98) -- and conducted a brief survey of the island for other aboriginal sites, randomly surface sampling pottery, shell, and polished stone (*Ibid.*). Krieger's collection from Anegada, still in the Smithsonian Institution, is scheduled to be examined in the near future by Alfredo E. Figueredo.

No reported archaeological research was conducted on Anegada following Krieger's prior to the arrival of the British Virgin Islands Archaeological Survey team. The aim of this team's brief reconnaissance was chiefly to locate and examine the previously reported aboriginal site or sites, and assess problems involved in extending the full activities of the Survey to Anegada. Two of the above-discussed shell heaps were found at the east end of the island (see Map), and a third reported in the vicinity of these two by a native guide. Due to limitations in time and resources no systematic attempt was made to locate or study other aboriginal sites, beyond reconnoiterring as much of the island as was accessible by car or on foot.

Of the two shell heaps examined, the first proved to be a very large bare heap of whitened conch, just on the western shore of a salt pond; it covered an area of approximately 200 square meters, varying from 2 to 3 meters in height. Judging from his report and an accompanying photograph, this was the mound investigated by Krieger; though somewhat obscured by brush at the margins,it rises very conspicuously above the flat surrounding terrain. The second shell heap was lower, perhaps no more than 1 to 1½ meters in height, and though a scattering of old conch appeared on the surface this mound was largely covered by sandy soil and sparse vegetation. Shallow test pitting here revealed a mixed midden deposit, consisting principally of *Strombus gigas*, but with substantial admixture of *Codakia orbicularis*. Considering the proximity of both these sites to a mangrove swamp (see Map) the absence of oyster (*Crassostrea rhizophora*) is conspicuous.

No pottery, nor any aboriginal remains other than heaped shell, were present on the surface of either mound or in the surrounding area. Several sherds were recovered from the test excavation however; of these, none were especially diagnostic, although two rim sherds as well as the general thickness, crudeness, and poor paste quality of most of the pottery bear some comparison with pottery of the Elenoid Series, as defined from sites in Puerto Rico and the Virgin Islands. Two conch shells from the subsurface midden deposit (both withan "aboriginal perforation") were taken as radiocarbon samples; these produced a date of A.D. 1245±80 (I-8216). This may be compared to radiocarbon dates of A.D. 1310±120 and A.D. 1220±110 (RL-409 and RL-411 respectively) from the site at Hull Bay, St. Thomas, which has produced pottery of the Elenoid Series (Ensomhed Style).

Though suggestive, the partial archaeological evidence recovered from Anegada to date can hardly serve as a basis for the most preliminary conclusions. This most recent archaeological expedition enables us now to frame the scope of previous investigations, providing a starting point for future research. It is to be hoped that a fuller reconnaissance may be undertaken soon by the British Virgin Islands Archaeological Survey, followed by controlled excavations; at such a point we can begin to clarify the scientific issues now at hand, and gain a more

accurate understanding of Anegada's archaeology and its relationships with the rest of the Virgin Islands.

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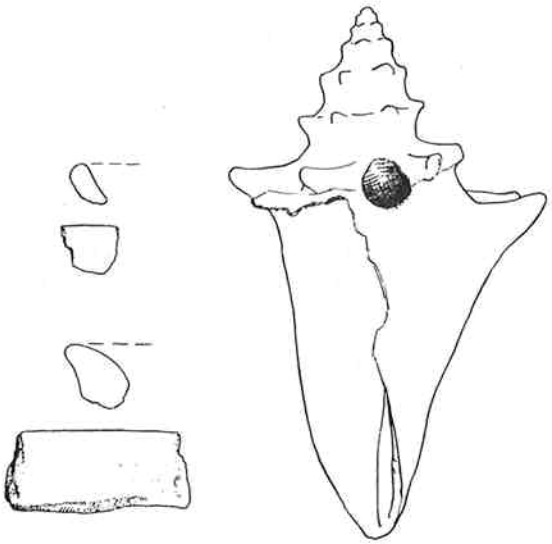

CERAMIC CULTURE SITE LOCATION PARAMETERS FOR THE VIRGIN ISLANDS

By

Theodore E. Bradstreet

Since at least the time of Fewkes (1914), there has been concern over the influence of the insular environment on culture in the Caribbean. Rouse (1956) approached this through a settlement pattern study limited by the available data largely, if not entirely, to the large islands, Cuba, Hispaniola, and Puerto Rico. Since the small islands differ both in resources and site distribution from the large, Rouse's (1956) study is only applicable in a broad way to the area to be considered here.

Sleight (1962, 1965) and to some extent Bullen (1962), wrestled with the problem as it applied specifically to the island of St. John. Sleight (1962, 1965) pointed out that site distribution on St. John strongly favored the north and west shores, and a recent survey (Figueredo and Bradstreet 1973) shows this also to be true of St. Thomas (see Figures 1 and 2). Sleight attempted to explain this distribution by examining all the major environmental factors--physiography, meteorology, oceanography, geology, and soils--and suggesting ways in which each could have operated to produce the observed pattern. However, he depended heavily on the traditional version of local meteorology, a version not supported by actual observations (Bowden *et al.* 1970). Further, he lacked detailed soil data, which has since become available (Rivera *et al.* 1970), and for these reasons I felt that a re-examination of the problem using the recently available meteorological and soils data, together with archaeological data from St. Thomas as well as St. John, would prove useful in understanding adaptation to the small islands and might shed light on their history as well.

My consideration was limited to ceramic sites on the islands of St. Thomas and St. John. Aceramic sites are so few that a search for their common locational parameters is not feasible, and inclusion with ceramic sites is not justified since ecological factors important to the inhabitants of each can be expected to differ. These sites, then, pertain to periods II, III and IV and to the Tropical Forest Indian and perhaps the Circum-Caribbean cultural levels of the scheme used by Rouse (1956) in his discussion of settlement patterns. (No ceremonial structures are known as yet, but an "elbow-stone" is known from Botany Bay, St. Thomas). My conclusions therefore apply best to islands similar in size and physiography to St. Thomas and St. John (for example Tortola), and to periods II, III, and perhaps IV.

My approach to the analysis was the reverse of Sleight's (1962, 1965), in that I first examined the sites for common environmental factors, rather than initially examining the environmental factors for possible effects on sites in general. I expected that this approach would prove more efficient in yielding an explanatory model, and I feel it has.

The first factor to become apparent is that nearly all sites and all but one surface find were on or very near substantial areas of Jaucas Series Soil. This has a double set of implications. First, since Jaucas soil is beach sand (Rivera *et al.* 1970) it implies that the environment of its deposition is one of moderate energy. This means that a bayhead in which Jaucas soil occurs is protected from wind and surf and is favorable in terms of navigability and ease of landing, being neither deep, rough, and therefore rocky, nor shallow, calm, and therefore muddy or

swampy.

Second, Jaucas soil apparently accounts for the majority of the arble land on St. Thomas and much of that on St. John. The chief disadvantage of Jaucas soil for horticulture is its extremely poor water-holding capacity (Rivera *et al.*1970) due to its being sand. The fact that it is sand has three distinct advantages for primitive horticulture, however. The most obvious is the ease of digging and clearing it. Less obvious is the fact that the high permeability allows rainwater to rapidly remove salt from it. Least obvious is the fact that it is internally drained; water running down the valley behind it runs *through* it, rather than *over* it. It therefore functions as a filter, trapping much of the organic detritus washed off the landscape behind the beach. This makes it relatively rich in organic nutrients and suitable for such drought-resistant crops as manioc (Purseglove 1968). Jaucas soil may well represent the preferred soil for most pre-Columbian horticulture on the islands in question, as all the other soils available are generally clayey (Rivera *et al.* 1970)

The association with Jaucas soils shows, then, that the majority of the prehistoric inhabitants of St. Thomas and St. John preferred habitation sites at the heads of fairly well-protected bays where land suited to horticulture, particularly the raising of manioc, was available. This should surprise no one. What is surprising is that locations on the south and east shores, where these conditions are also met, show no or limited evidence of occupation. On St. Thomas this might be attributed to destruction during development for the tourist trade, heaviest on the south and east, but St. John is relatively undeveloped and the pattern is repeated there.

Sleight (1962, 1965) has attempted to explain this site distribution in terms of two things, protection of habitation sites from storm destruction, and higher horticulture. The first of these is a weak argument. In the case of hurricanes, the major violent storm type in the area, wind direction is a function of the position of the storm center ("eye") relative to the observer, and can (and often does), swing thru 180^{O} in the course of a storm. Aside from storm wind and resultant surf, heavy rains can cause, and I understand have caused, flooding and major slumping in most of the valleys of the north side. Actually, there seems to be no reason to consider the north side more safe from storm damage.

The second argument is contradicted by actual observation (see Figures 1 - and 2 for rain fall data from Bowden *et al.* 1970). This was a surprise to me, as cursory examination of vegetation and soils on St. Thomas seems to *support* the idea. It is possible that the more verdant vegetation on the north side and west end are merely the result of less constant clearing. On the south side, permanent streams have returned to runs in areas allowed to grow up, so infrequent clearing could even account for the presence of streams. The soil development does not support this simple argument, however. There are two major soil associations on St. Thomas (Rivera *et al.* 1970), Cramer-Isaac and Dorothea-Victory-Magens (see Figure 1). Their development can be safely assumed to date to well before European contact. (Only Cramer-Isaac is present on St. John). They differ only in depth and form of weathering (Rivera *et al.* 1970), being developed on the same slopes and on the same bedrock (Donnelly 1966). The key here seems to be soil moisture. The deeper weathering of the Dorothea-Victory-Magens association, and its somewhat less oxidized form appear to be the result of greater available moisture. However, as can be seen from Figures 1 and 2, precipitation does not explain the difference. There are other factors influencing soil moisture, however,

one of the most important being evaporation. Evaporation, in turn, brings us to wind, not storm wind, but "prevailing wind".

A check of a year's worth of U.S. Weather Bureau North American Surface Charts makes clear that the average wind direction is a little south of east, and observation of wind-sculptured vegetation on Great St. James Island at the windward tip of St. Thomas makes clear that these winds are both constantly blowing and drying. The soil association requiring more moisture for its formation is developed in the lee of these winds, as are the archeological sites in question. This leads to an hypothesis to explain the distribution of ceramic sites on St. Thomas and St. John.

We have already seen that soil suitable for simple agriculture is a major factor in site location. Bowden *et al.* (1970) points out that soil moisture is crucial to agriculture in the islands. Highly permeable soils such as the Jaucas Series are especially sensitive to evaporation. I therefore hypothesize that ceramic sites are limited to the north and west shores of St. Thomas and St. John due to soil moisture being kept critically low on the south and east by the constant drying action of the prevailing winds. This is similar to the hypothesis advanced by Sleight (1962, 1965) and Bullen (1962), except that they attributed the dryness to low precipitation rather than to high evaporation.

This model points up the marginal suitability of these islands for agriculture in general; they are on the razor's edge, with little arable land, and that very sensitive to low precipitation and high evaporation (i.e., drought prone). This leads to hypotheses to explain two problems in the pre-history of the islands.

First is the anomalous position of the Coral Bay site. Bullen (1962) felt that it was earlier than most of the sites on the lee sides of the islands (based on ceramics), and that, at any rate, it was abandoned long before they were, perhaps as the result of drought. It is not associated with Jaucas soil, but lies on the floor of the largest drainage basin on St. John. This basin is floored with San Anton soil, a good moisture holder (Rivera *et al.* 1970), and has gentler slopes and higher rainfall than average (see Figure 1), These factors would tend to counterbalance the high evaporation rates of the windward side and would probably have allowed the practice of swidden agriculture initially, but, as more land was cleared and kept cleared, reduction in natural vegetational cover would swing the balance back towards dryness. I therefore hypothesize that the Coral Bay site was abandoned as a result not of a single drought, but of recurring and increasingly severe drought brought on by increasing clearing of land for agriculture. This may have constituted a positive feedback loop, with more land being cleared after each drought in an effort to increase yield, and this in turn ensuring a still worse drought to follow.

Both in location and archaeology, the Coral Bay site is similar to the Indian Creek site on Antigua (Rouse, *in press.).* According to Rouse *(in press.),* shellfish remains are considerably less important in the earliest levels of the midden at Indian Creek than at earlier (aceramic) or later sites and later levels of the same site (Rouse, *pers. comm.*). This information is not provided for Coral Bay by either Bullen (1962) or Sleight (1962), but, if the situation is similar, it leads to an hypothesis about shifts in the subsistence pattern at the period II/period III boundry which applied to the smaller Caribbean islands in general. If we hypothesize the period II people to have been Tropical Forest Indians *sensu stricto* (i.e., not yet island adapted, e.g., the Yanomamo; Chagnon 1968) having a primary subsistence base of perhaps plantain horticulture backed up by root crops and fishing, then the shift at the end of period II can be seen as an adaptive

one. That shift would consist of the elevation of the marine resources to primary importance by broadening marine exploitation to include more shellfish and increasing overall intensity. Horticulture would be altered by loss or abandonment of all but the most drought-resistant crops (such as manioc, in particular). This results in a good adaptive fit to the small-island environment, but is not very efficient for the large islands with their much higher ratio of arable land to coastline.

This model is supported further by Rainey (1940), who grouped the Saladoid sites of all the Antilles into a "Crab culture" (including Coral Bay), as opposed to, and earlier than, a "Shell culture" (including such later sites as Magens Bay), based on the observed difference in relative importance of molluscan remains in the respective middens. It is also supported by Rouse's *(in press)* observation that the earliest sites in the Antilles are "inland", while the later sites are "along beaches". Perhaps more importantly, these sources support extension of the model beyond the Virgin Islands to the Antilles in general.

This leads into the second and perennial problem in Virgin Islands prehistory, the fact that the islands were reportedly uninhabited at contact (Fewkes 1914). If we accept the scheme proposed by Rouse (1956), then period III was characterized by the transition from Tropical Forest Indian *(sensu lato)* to Circum-Caribbean cultural level. This involved de-emphasizing the marine component of the subsistence base, increasing the dependance on horticulture, and the introduction of maize. This can be seen as an adaptive shift toward the large islands and away from the smaller ones. The two "high" sites on the north side of St. Thomas ("anomalous" in their locations) are consistant with this pattern. They are apparently relatively late (based on ceramics, A. E. Figueredo, *pers. comm.)* located on Dorothea Series soil (a good moisture-holder) and lie approximately on an annual and monthly isohyet (that is, they receive almost exactly equal rainfall not only annually, but monthly). That "late" sites should be tied closely to rainfall and soil moisture conditions implies a shift away from a "drought horticulture" toward a more moisture-sensitive, and probably more diverse, group of crops. I therefore hypothesize that, since these small islands were marginal for any agriculture, as it grew in importance and moisture demands, they dwindled in importance, until in late period III or early IV they were no longer considered suitable for permanent habitation and were relegated to special purpose-use (fishing stations, ceremonial locations, *etc.).*

Examination of these problems in the light of environmental data has thus yielded a hypothetical sequence of subsistence development. This sequence begins with broad-spectrum tropical forest horticulture, probably plantain-centered but supplemented by drought-resistance rootcrops and by fishing. This stage corresponds with Rouse's (1956) period II and is followed in period III by a shift to dependance on a broadened maritime base including increased shellfish exploitation, now supplemented by manioc-centered, drought-resistance root-crop horticulture. This level is best adapted to the smaller islands but is in turn followed in period IV by a shift back to horticulture as primary, this time in a moisture-demanding form (including maize), which makes the small islands inhospitable while allowing more efficient exploitation of the large islands.

I must emphasize the hypothetical nature of this sequence. However, I maintain that this hypothetical model is valid in that it accounts for all the available data and, moreover, is testable by direct archaeological means. It should prove useful in archaeological investigation not just of the Virgin Islands, but of all the smaller Caribbean islands as well.

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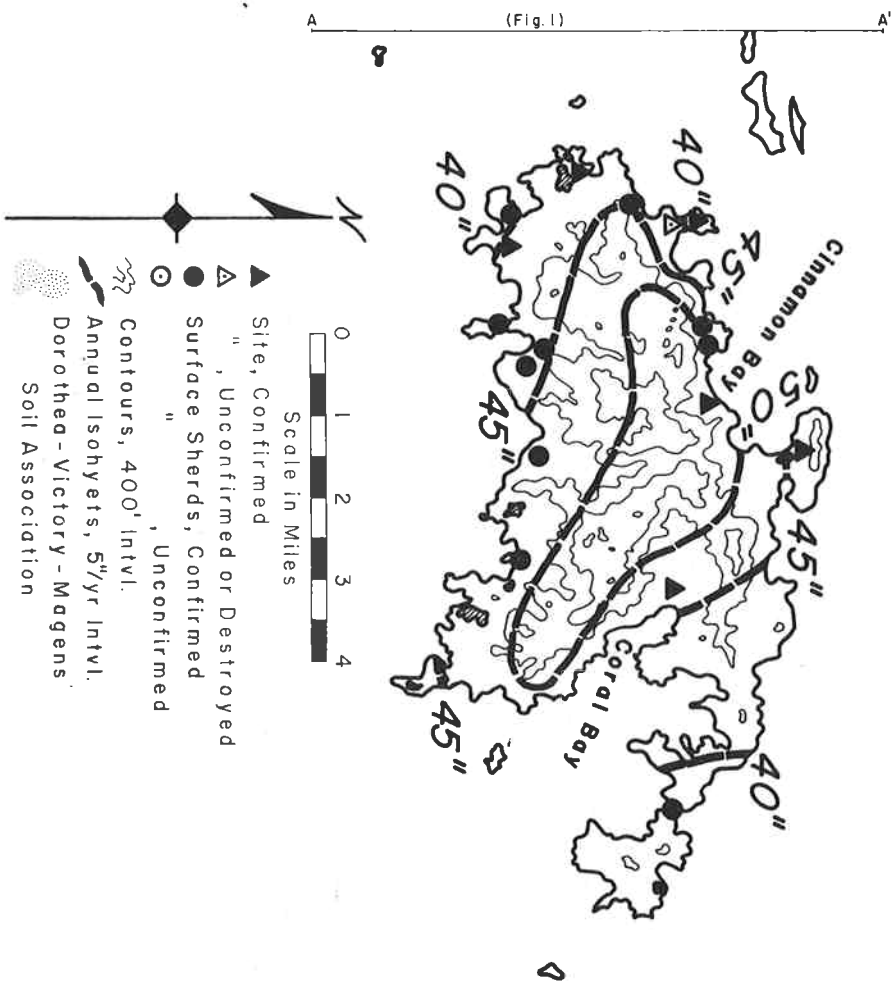

FIGURE 1.

CERAMIC SITE DISTRIBUTION, ST. JOHN. Archaeological data from Sleight 1962, Figueredo and Bradstreet 1973. Rainfall data from Bowden et al. 1970.

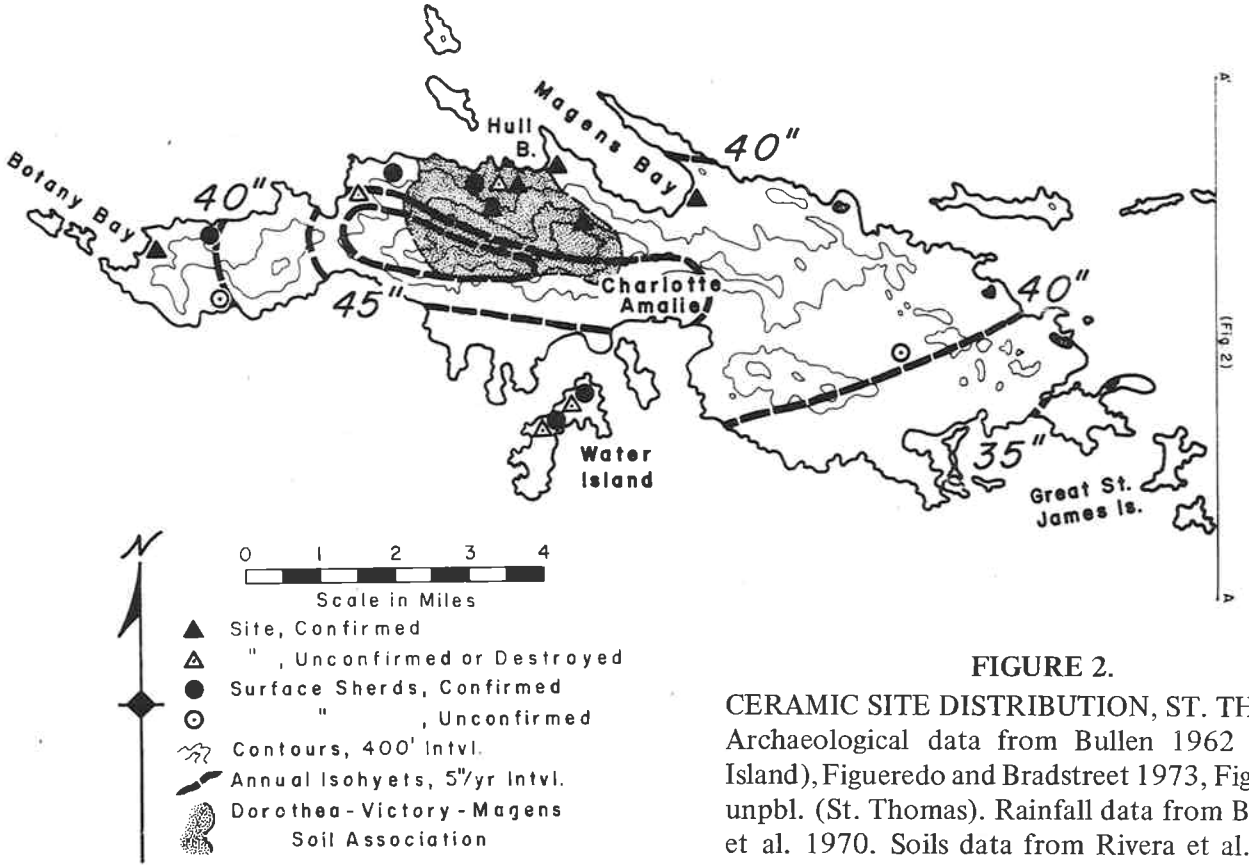

FIGURE 2.

CERAMIC SITE DISTRIBUTION, ST. THOMAS
Archaeological data from Bullen 1962 (Water Island), Figueredo and Bradstreet 1973, Figuerado unpbl. (St. Thomas). Rainfall data from Bowden et al. 1970. Soils data from Rivera et al. 1970.

EXCAVATIONS AT THE ARBORETUM SITE

By Bruce E. Tilden

During the summer of 1972, the Arboretum site (so named because of its location within the former Magens Bay arboretum) was discovered by Alfredo E. Figueredo while conducting excavations there for the Department of Conservation and Cultural Affairs.

The Arboretum site is one of four preceramic sites all within walking distance of each other and located within the Magens Bay site cluster. Of these sites, three (Zufriedenheit, Herleins Kob, and Arboretum) are marked by surface midden deposits composed of shell (*Chione cancellata*, arks, whelks), and fine-grained basalt flakes. All are located in soil resembling Jaucas sand which is riddled with land crab holes.

The Arboretum site composes approximately one acre of surface situated on the southeastern perimeter of the former arboretum within the Magens Bay Authority property. The site is bounded on the north and east by a flat area overgrown with grass and low bush. To the south a barbed wire fence marks the southern limits of the site and the Magens Bay Authority property. To the west the site's borders are halfway into the former arboretum.

In the summer of 1972, two 1.5x1.5m test pits were aligned 9m apart along a southwest-northeast axis and excavated. The organic assemblage was comprised of *Chione cancellata* shells mixed with a few arks, whelks, land snails and fish bones. The artifactual assemblage was composed of both used and unused fine-grained basalt flakes, basalt cores, several oval hammerstones (see plate 1 A& E), shell picks (see plate 1 D), and an oval shell inlay approximating 2 cm in length with beveled edges (see plate 1 B).

The Arboretum site based on the artifactual assemblage was assesed to be preceramic dating to the first millenium B.C.

In the summer of 1974, the author conducted excavations at the Arboretum site for the Department of Conservation and Cultural Affairs with volunteers from the Federally sponsored Youth Conservation Corps summer program. Three 1.5x1.5m test pits were aligned along a southwest-northeast axis adjacent to the southwestern test pit excavated during 1972 where the central portion of the midden was found. Artificial 10cm levels were employed in the excavations due to the lack of any apparent natural strata. All materials excavated were sifted through 1/8" mesh screen. All three pits were excavated to a depth of at least 100cm where the uniform gray Juacas-like sand ended and a hard yellowish white sand predominates.

As was expected both organic and artifactual assemblages collected in 1974 were similar to those collected in 1972; however, with the addition of organic and artifactual materials collected in 1974 the overall sample for the Arboretum site was significantly enlarged. As in 1972 the 1974 organic assemblage was dominated by *Chione cancellata* shells, a few arks, whelks, land snails and fish bones. The artifactual assemblage was composed of used and unused fine-grained basalt flakes, large and small fine-grained basalt cores, several hammer stones, shell picks, a possible very worn shell scoop and two very thin shell beads fashioned from mother-of-pearl and not exceeding 1cm in diameter (see plate 1 C).

In order to obtain absolute dates fro the Arboretum site two radiocarbon samples were submitted to Lamont-Doherty Geological Observatory which em-

ploys the CO_2 gas proportional counting system. The radiocarbon samples were composed of *Chione cancellata* fragments collected from pit 10. Radiocarbon sample L-1380A was procured from level E (35-45cm) and L-1380B from level J (85-95cm). The final results indicate the following dates: 50A.D ±70 (L-1380A) and 460 B.C.±60 (L-1380B). When modified to allow for secular fluctions in atmospheric 14C and other contingencies, these samples yield the following dates: 550 B.C. (L-1380A) and 1050 B.C. (L-1380B) (Gary S. Vescelius: personal communication).

The final results for L-1380A and L-1380B indicate that habitation of the Arboretum site by preceramic peoples occured during the first millennium B.C. as had been predicted earlier (Figueredo 1974a). From the material evidence available it appears that the preceramic inhabitants of the Arboretum site were fishermen and gatherers. Due to the small quantity of organic remains (shell and fish bone) and a rather unsophisticated lithic industry (when compared to earlier and other contemporary perceramic peoples of the region), two explanations are possible: 1) Because the Arboretum site lacks such traits as the manufacture of ground stone tools and stone beads which are common at the earlier preceramic Krum Bay culture it is possible to infer that the lack of such traits exhibits a lithic and possible cultural degeneration with the progression of time. 2) Because deposition of organic and artifactual remains at the Arboretum site has been estimated at 1mm per year as compared to 5mm per year at the Krum Bay site cluster and later ceramic sites in the Virgin Islands (Gary S. Vescelius: personal communication), it is reasonable to infer that the Arboretum site was one of specialized (seasonal?) occupation.

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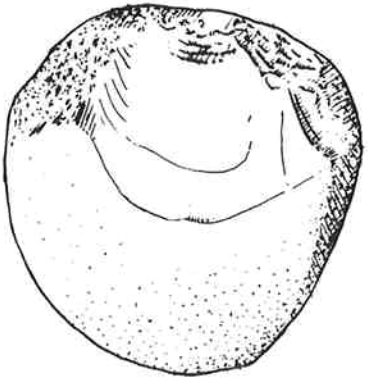

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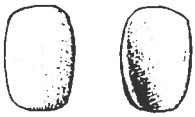

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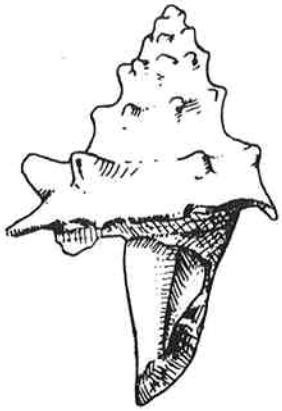

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E

PLATE ONE

THE VIEQUES ARCHAEOLOGICAL PROJECT

By Alfredo E. Figueredo

Vieques, with approximately 161 square kilometers of surface area, is the second largest of the Virgin Islands, surpassed only by St. Croix with its approximately 223 square kilometers. Its present government is that of a Municipality within the Commonwealth of Puerto Rico (a Free State associated to the Union), with large areas under Federal United States jurisdictions, primarily those of the Department of the Navy and the General Services Administration. Firing ranges and other military uses preclude access to over half the island except under special circumstances.

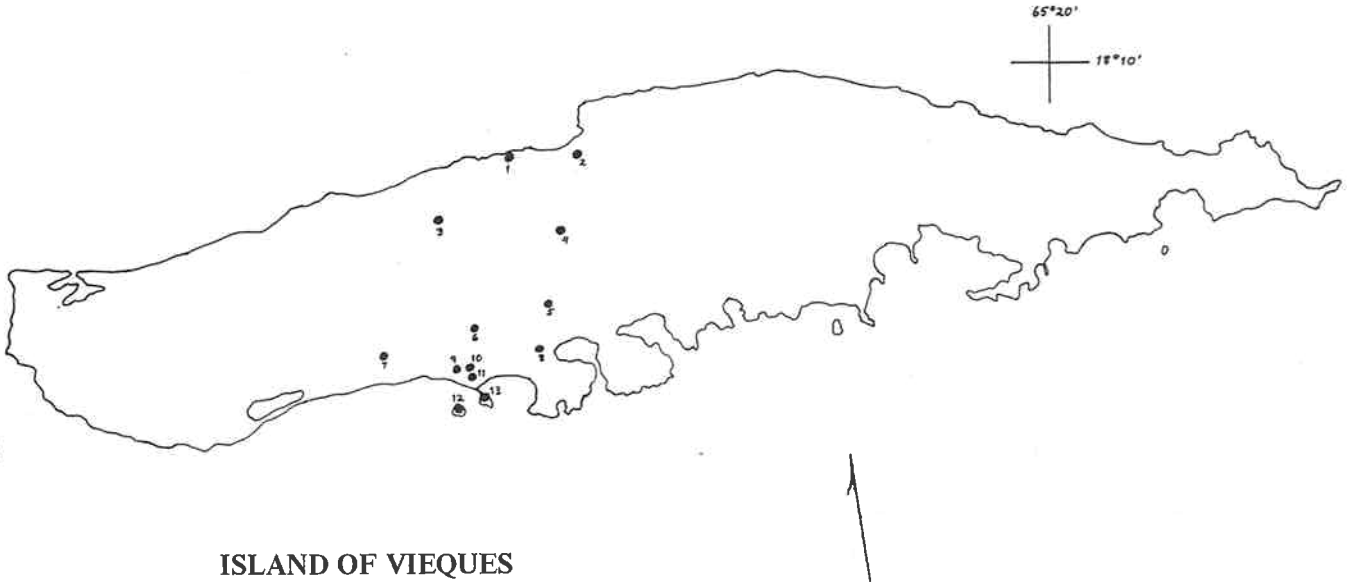
Warlike Indians inhabited the island during Contact times until they were exterminated in 1514 (Rouse 1952: 555). They called their homeland *Bieque*, whence the modern name. European attempts at settlement were thwarted by the Spaniards of Puerto Rico, who themselves only occupied the island effectively during the first half of the XIX Century, building an impressive fortress above the new seat of government, a town named after the reigning monarch, Isabel II. Under its own governor at first, it was annexed to Puerto Rico in 1854.

For the hundred years that ended in 1941, sugar cane culture was the dominant economic activity, and Vieques knew periods of great prosperity, during which railroads and harbors, now abandoned, were built. Production in the large sugar factories is said to have reached 20,000 tons annually (Anonymous 1971), which, at today's prices, would bring $8,000,000.00 (about $1,000.00 *per capita* based on the present population of 8,000). Had the centrals remained open, Vieques would be in another sugar boom! The fields, however, lie waste or as pasture for cattle of poor quality. A savannah landscape, with *Acacia* stands, predominates.

Monte Pirata, named after the famous sea-robber Cofresi, is the highest point with but 299 meters' elevation, the island relief being mostly gentle hills and dissected plateaux and plains. Whereas the northern coast affords few anchorages, the southern coast possesses several good harbors for small and medium-sized vessels, being very indented with prominent peninsulas and bottleneck bays. The rainfall has been estimated at 47 inches annually (Anonymous 1971), but it varies from place to place, the western and northwestern areas appearing better watered. There are numerous perennial brooks and brackish tidal ponds.

Saved for scattered allusions (cf. Loven 1935: 278), Vieques was unknown to archaeology until Irving Rouse conducted excavations there in 1938. Since then, Diana Lopez has investigated a larger number of sites (Davila 1975). Charles Tricoli and Pablo A. Delerme, amateur archaeologists, have conducted limited excavations, while Bertha Coles, an interested local resident, has collected materials from site surfaces. Irresponsible looters and uneducated builders have destroyed many times the area excavated by these serious students. Some sites exhibit the appearance of a fresh battlefield full of artillery craters. There is no effective control on these immoral activities.

After looters and bulldozers, the other major danger to Vieques archaeology is haphazard research. With the exception of Rouse's (1952), there is no published account of archaeological field work in Vieques. Because of this, every interested student is forced to undertake his own basic excavations, since he is likely to be either in ignorance of previous field work or unable to use it. This proliferation of useless or redundant excavations, ever repeating the first steps



ISLAND OF VIEQUES
Major Archaeological Sites

1. Juan Carlos
2. Saleme
3. Martineau
4. Los Chivos
5. La Perie
6. La Mina
7. Zorce
8. Cano Hondo
9. Esperanza 1
10. Esperanza 2
11. Esperanza 3
12. Cayo de Afuera
13. Cayo de Tierra

of research, and going no further, is most censurable.

The Vieques Archaeological Project was first conceived as an attempt to round-out information provided by Rouse on the aceramic sites of Vieques' southern coast (cf. Figueredo 1974b). For this purpose the author contacted Ricardo E. Alegria, Puerto Rico's foremost and most respected anthropologist, who had the kindness to arrange a small grant matched between two local societies. Once the grant had been awarded by the Puerto Rican Society of Natural History and the Guaynia Archaeological and Historical Society of Ponce, Edward L. Towle of Island Resources Foundation generously matched it a third time with funds that Paul M. Caron, of Paris, France, had provided the Foundation for scientific work in Vieques. Thus armed financially, the Project could expand into a more ambitious research plan.

It was proposed primarily to fullfil the first objective explained to Alegria, then with his leave use the extra funds to acquire a chronological framework for the prehistory of Vieques by means of radiocarbon dates. For that purpose, suitable samples were to be obtained from one each of the following sites: aceramic, early ceramic, and late ceramic.

A preliminary reconnaissance of the island was effected 22-25 November, 1974, by Jeffrey M. Gross, Katheryne B. Kay, Bruce E. Tilden, and the author. All the necessary sites having been located in the field, Jeffrey M. Gross and the author returned to Vieques accompanied by William Willard, who had the kindness to fly us there and back in his private plane 25-31 March, 1975; this was particularly helpful, as scheduled flights between St. Thomas and Vieques were no longer available. In Vieques itself, we were generously assisted by Joseph Campbell, Pablo A. Delerme, and Deborah Young during the excavations of late March. Angel Colon of Fomento Industrial and the Mayor of Vieques, Luis A. Castano, were very cooperative in obtaining the necessary permissions for excavation, as was Bertha Coles.

Rouse (1952: 556) had located 3 small aceramic sites forming an apparent site cluster such as those of the St. Thomian Archaic (Figueredo 1974a: 9) The site at Cano Hondo (Puerto Mosquito), excavated by Rouse in 1938, was selected for our purposes. We camped at Puerto Mosquito for 5 days, laying out a grid covering the central portion of the site and surface-sampling using plane coordinates. A trench one meter wide was aligned north to south, two units 1.0 by 1.5 with an intervening balk 1.0 by 0.25 m being excavated down to bedrock, which was found at a maximum depth of 35 cm. Thre superposed strata were found in both units. Soil samples were taken from the balk.

Three hammerstones were found on the site surface; the upper half of a ground stone celt, a conch-lip hammer, and several conch-tip 'picks' were found in Stratum I; one hammer-edge grinder, an edge grinder, some flakes and several conch-tip 'picks' were found in Stratum II, and no definite artifact was found in Stratum III. Midden shell was submitted for radiocarbon-dating from strata II and III, using *Murex brevifrons* and *Cittarium pica* respectively. In order to date an artifact and settle the question of whether three Coroso-type sites were aboriginal or not, the conch-lip hammer *(Strombus costatus)* was submitted from Stratum I.

The dates were as follows:

Stratum I	UGa-995	3010±70 B.P.
Stratum II	UGa-997	2705±70 B.P.
Stratum III	UGa-996	2855±65 B.P.

Gary S. Vescelius was kind enough to assess these dates on the basis of their

reported isotopic fractionation and the secular fluctuations of ^{14}C, approximating thereby the true calendric dates. According to this assessment, strata II and III should refer to 1580 and 1600 B.C. respectively. Stratum I yielded the oldest date, but this may be explained in terms of an old conch shell having been used as a tool at a later time; the true age of desposition may be estimated at 1560 B.C.

It will be seen, then, that our assumption, based upon preliminary data, that Cano Hondo belong to the Virgin Islands Archaic has been borne out by our excavations. A celt akin to those from Grambokola was found in Stratum I, and edge grinders such as occur at the Krum Bay sites were found in Stratum II. The radio carbon dates for Krum Bay establish the probable occupation there to between 1700 and 1450 B.C. (Gary S. Vescelius: personal communication), dates contemporary with the occupation at Cano Hondo of perhaps 1600 to 1550 B.C.

Pablo A. Delerme and others had informed us that Diana Lopez excavated at the early ceramic site of Zorce yet took no radiocarbon samples. Since we had no access to information regarding her work at any rate, we decided to excavate at this rather large site. A test pit 1.0 by 0.6 m was plotted next to a huaquero-hole, which we taylored and used to control stratigraphy. The soil was extremely hard-packed clay, though we dug down to 60 cm through 5 strata. Charcoal was found at Stratum IVB in what we thought may have been sufficient quantity, yet it proved to be extremely light in weight (the substance is not yet identified), and yielded a very poor date:

Stratum IVB UGa-994 2055±1525 B.C.

Taking into account the mass spectrometry analysis and other factors, Gary S. Vescelius (personal communication) believes the true calendric date to be 325 A.D. This is roughly the date we would expect from the middle-Cuevas pottery associated with the sample. The error factor, though, is relatively large.

The westernmost midden at the large Esperanza site (Rouse 1952: 558) was selected for dating the late ceramic period, since our surface sampling revealed relatively late and complex Chicoid pottery there. Two small test pits, 0.75 by 0.5 m, were excavated into the single stratum to a maximum depth of 30 cm A sample of *Lucina pectinata* yielded the following result:

Stratum I I-8476 405±80 B.P.

The true calendric date may be somewhere between 1200 and 1300 A.D.

The net result of the Vieques Archaeological Project was to demonstrate that the Virgin Islands Archaic was represented in that Island. Over a dozen aboriginal sites were relocated in the field and some were surface-sampled. First-hand information on the geography of Vieques was obtained, and the articles on specific topics that will follow this one will lay the foundations for further scientific archaeology in that second largest of the Virgin Islands.

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