CERAMIC CULTURE SITE LOCATION PARAMETERS FOR THE VIRGIN ISLANDS

By

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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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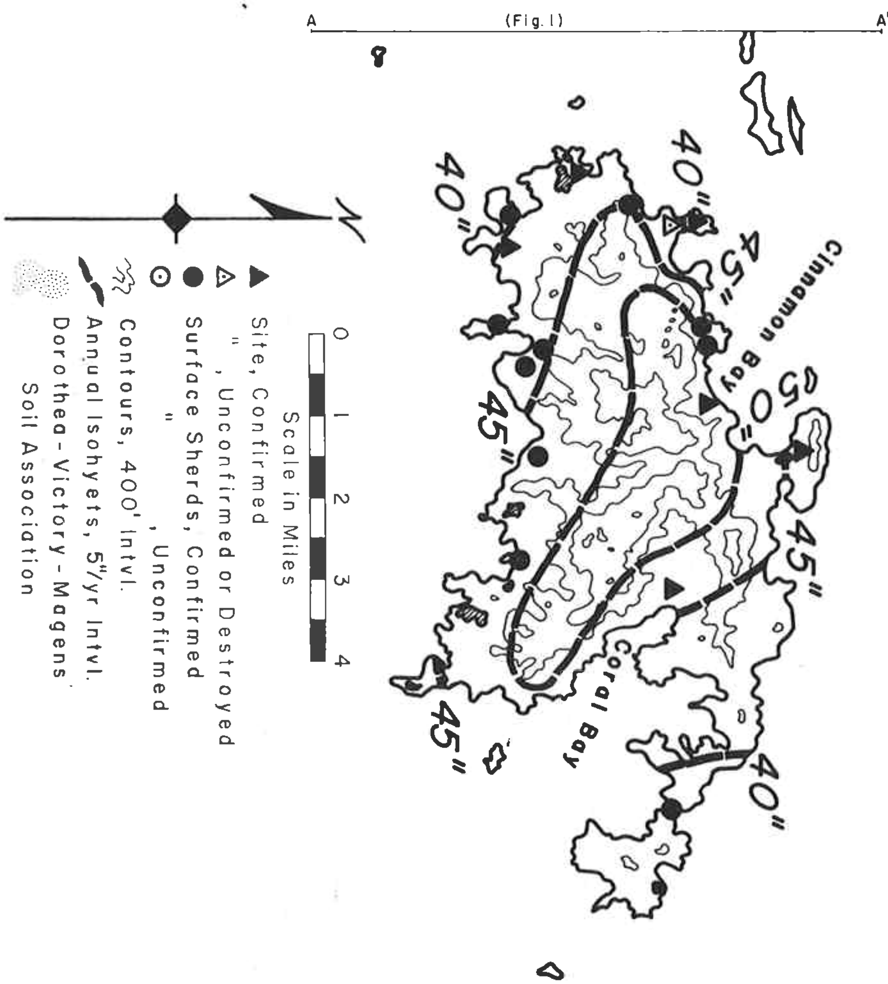

FIGURE 1.
CERAMIC SITE DISTRIBUTION, ST. JOHN. Archaeological data from Sleight 1962, Figueredo and Bradstreet 1973. Rainfall data from Bowden et al. 1970.

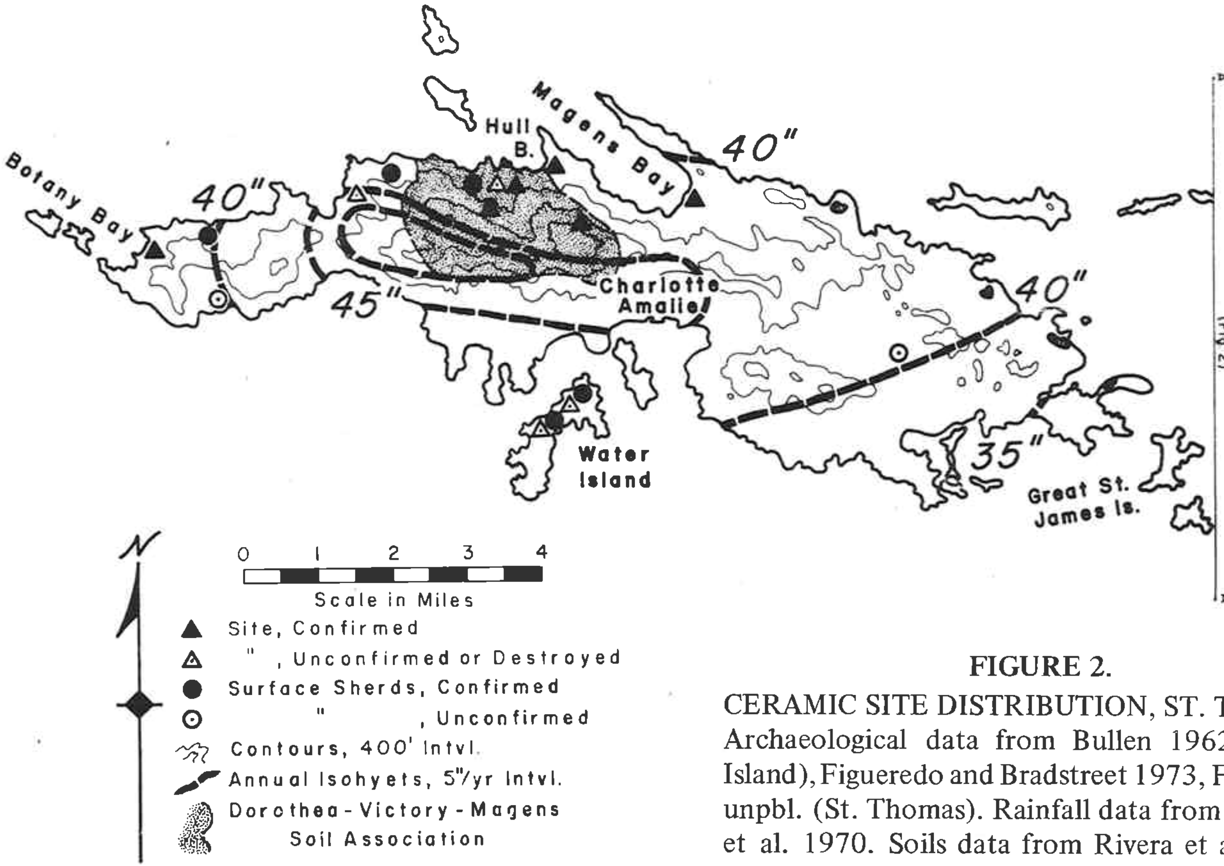

FIGURE 2.

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.