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Cover photo: *Diploria strigosa*, the common brain coral, preserved in growth position at the Cockburn Town fossil coral reef site (Sangamon age) on San Salvador Island. Photo by Al Curran.

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SPECULATIONS ON PREHISTORIC COASTAL TOPOGRAPHY OF THE BAHAMAS

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ABSTRACT

Sea level rise and associated coastal progradation and retrogradation have altered the shoreline of the Bahamas Archipelago since the Wisconsinan glaciation. Between these alternations, the low energy bay and tidal creek shorelines were used by the prehistoric inhabitants of the Bahamas for their settlements. The settlements were usually built on unlithified Holocene dune ridges. This use took place between A.D. 900 to 1500. The locations of prehistoric settlements on San Salvador and Rum Cay may be useful as an aid in determining the prehistoric coastal topography of these islands.

INTRODUCTION

The Bahamas archipelago, like the Greater Antilles, lies within the northern hemisphere's tradewinds, which produce a northeasterly breeze. The tradewinds are associated with a northward longshore current, which results from the 0.9 knot current of the Old Bahama Channel as it works its way through the archipelago. Together, the current and wind deposit the white/pink coral sands to form the beaches of these islands.

Although the tradewinds are fairly constant, there are seasonal variations. In the winter months, cold weather fronts are brought across the archipelago from the North American continent by northwesterly winds. This activity counters the normal longshore current, and now wave and surf action attack the white/pink coral sands from a different direction. In the summer months, the rainy weather is brought up from the Caribbean region by southeasterly winds, creating high rolling waves and strong winds that reshape the beaches.

The ultimate effect of the wind and current is related to the axis of the landforms in the archipelago. Those islands which lie along a N/S or NW/SE axis (such as Cat, San Salvador, and Long Islands) present a leeward side from the prevailing winds. The leeward side of the island will often have coral sand beaches in association with low energy bays, tidal flats, and tidal creeks. The windward side will have coral sand beaches, if there is a fringing reef to absorb the high energy of the ocean or a tidal creek. Those islands which lie along an E/W axis (such as Great Inagua, New Providence, and Rum Cay) offer no true leeward side from the prevailing winds. Therefore, a fringing reef or tidal creek would be needed if sandy beaches are to be built and maintained (Index Map 1).

After the coral sand beaches have taken on their initial form, they are then exposed to the geological processes of progradation and retrogradation (Fig. 1). These processes, a direct result of the wind and current, will then alter the topographic form of the beaches.

In addition, there has been a rise in the mean sea level since the Wisconsinan glaciation. This rise in mean sea level has covered and destroyed the coral sand beaches, eventually altering the coastal topography. The average rise of sea level for the past 2,000 years has been estimated to be about 15 cm per century (Kraft, 1985).

Therefore, it can be stated that the coastal topography of the archipelago is constantly undergoing change. The amount of change that has taken place within the islands, through time, can best be realized by the location of the prehistoric Indian settlements.

SETTLEMENTS

Indian settlements were reported by Christopher Columbus during his initial voyage to the New World in October, 1492. It was shortly thereafter that the prehistoric inhabitants were forced to leave their settlements (Granberry, 1980). This produced

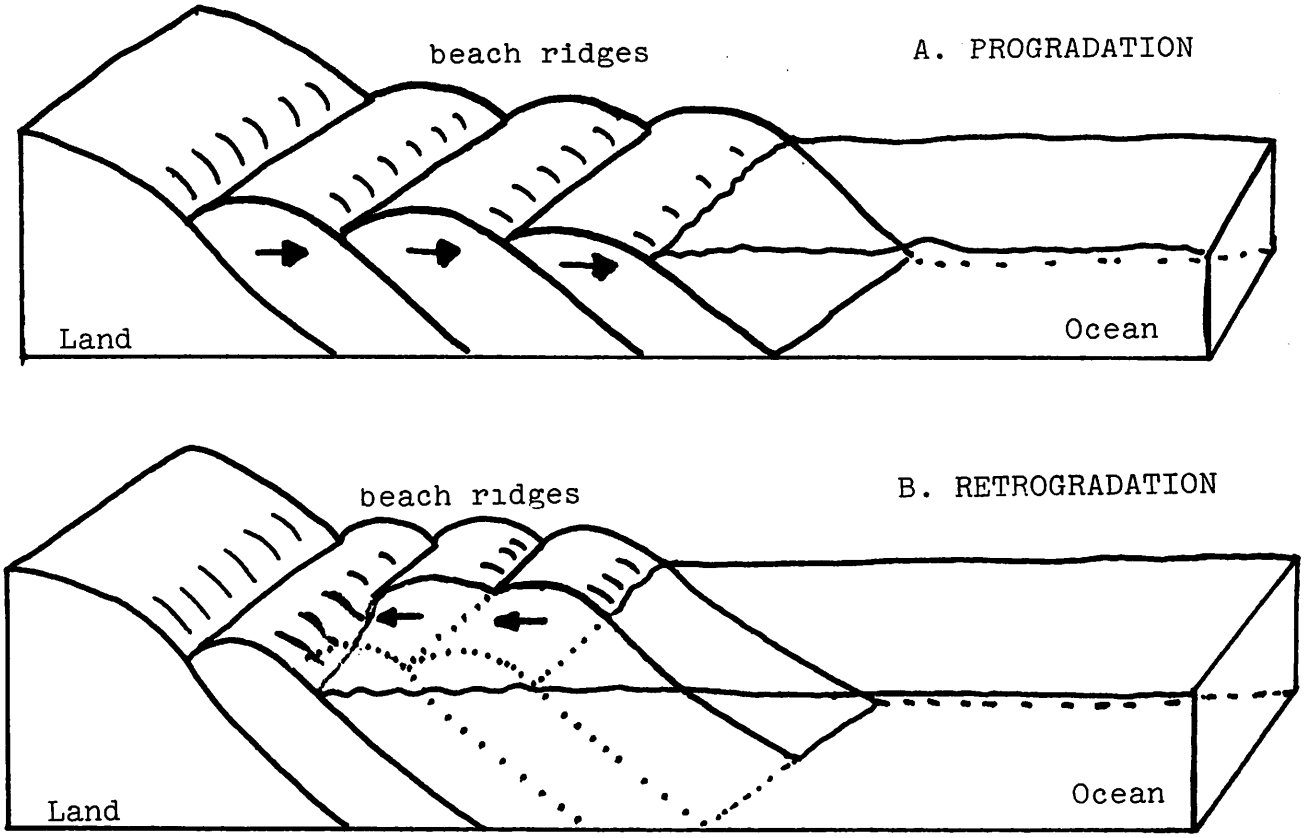

Fig. 1. Beach progradation (A) and retrogradation (B) as adapted from A.N. Strahler (1971).

an end to settlement development, and the beginning of coastal processes which would alter the remains of these settlements.

It appears that these prehistoric inhabitants, being seafarers and horticulturalists, entered the Bahamas archipelago by way of the Greater Antilles around A.D. 900 (Winter and others 1985). The settlements were established near the beaches and were related to the depth and condition of the soil, and to the closeness of natural freshwater wells or freshwater lenses below the surface. The location of settlements allowed for the nearby beaching of canoes and the collecting of a diversity of food resources, both fish and shellfish.

There appear to have been two types of settlements: along the tidal creeks, and along the coast. The settlements along the tidal creeks were built on unlithified coral sand along the creek margin, whereas, the coastal settlements were built on or behind the first unlithified dune ridge above the high tide level. Prehistoric settlements built on dune ridges are found about 3 meters above sea level. A key to understanding the location of these prehistoric settlements may be the homebuilding behavior of the present inhabitants of the archipelago. When building a home near the coast, the inhabitants build on or behind the first dune ridge, between 50 and 100 meters inland from the high tide line. These two factors, distance from the ocean and dune height, tend to reduce the effects of salt spray and flooding.

If this previous information has merit, it may then be possible to reconstruct the prehistoric coastal topography based upon known archaeological sites. Fortunately, slash and burn (swidden) agriculture is now practiced by the local inhabitants. By this clearing of vegetation, many inland archaeological sites have been located, but others probably still exist under the dense coppice-scrub vegetation. Because of beach progradation, some of these former coastal sites are now found further inland. On the other hand, there are archaeological sites which are being lost because of coastal erosion.

TOPOGRAPHIC RECONSTRUCTION

Of the four prehistoric Indian sites discovered by the author on San Salvador

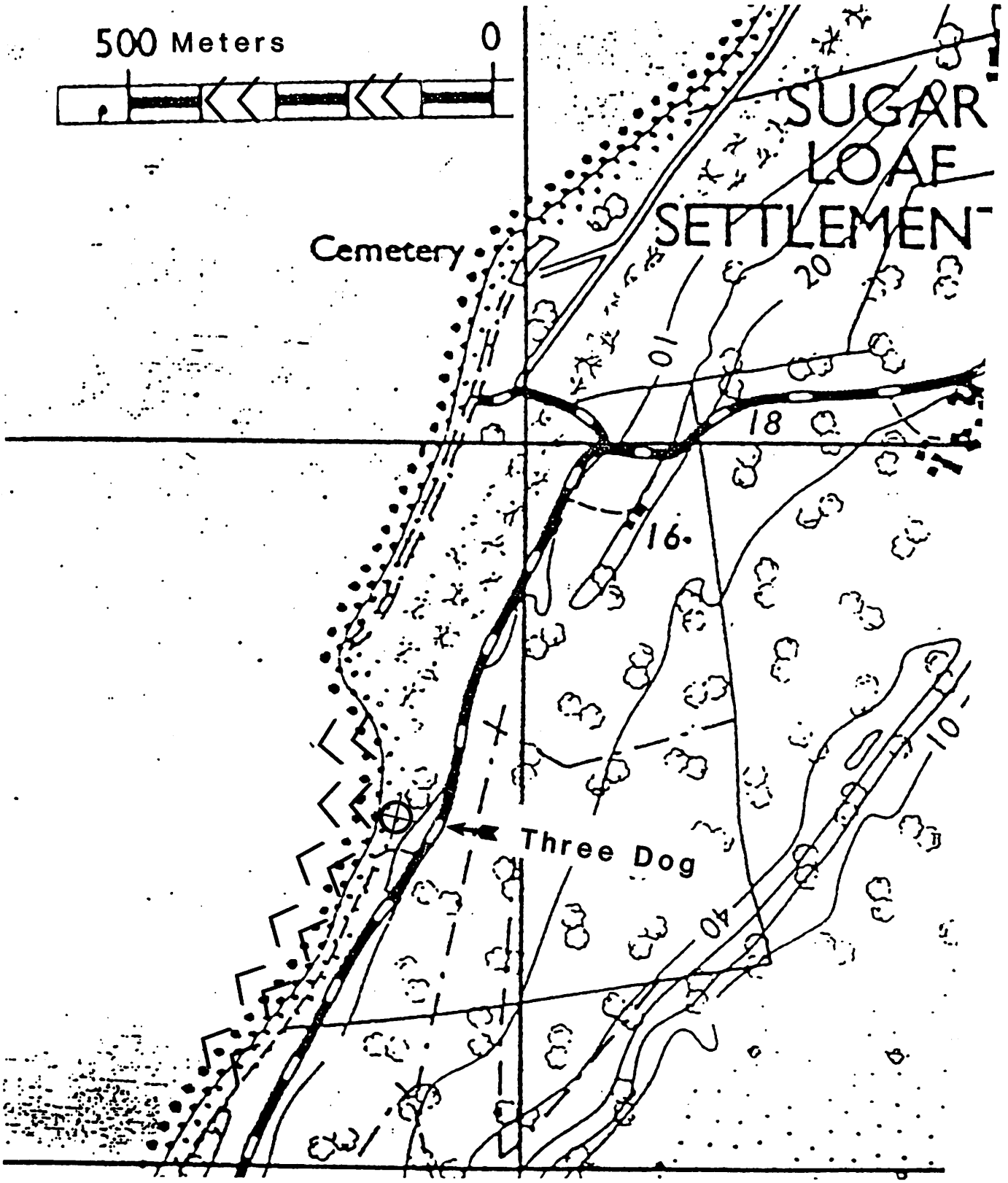

Fig. 2. Location and topographic conditions of the Three Dog Site, San Salvador. Prehistoric coastal topography would have the beach area further seaward.

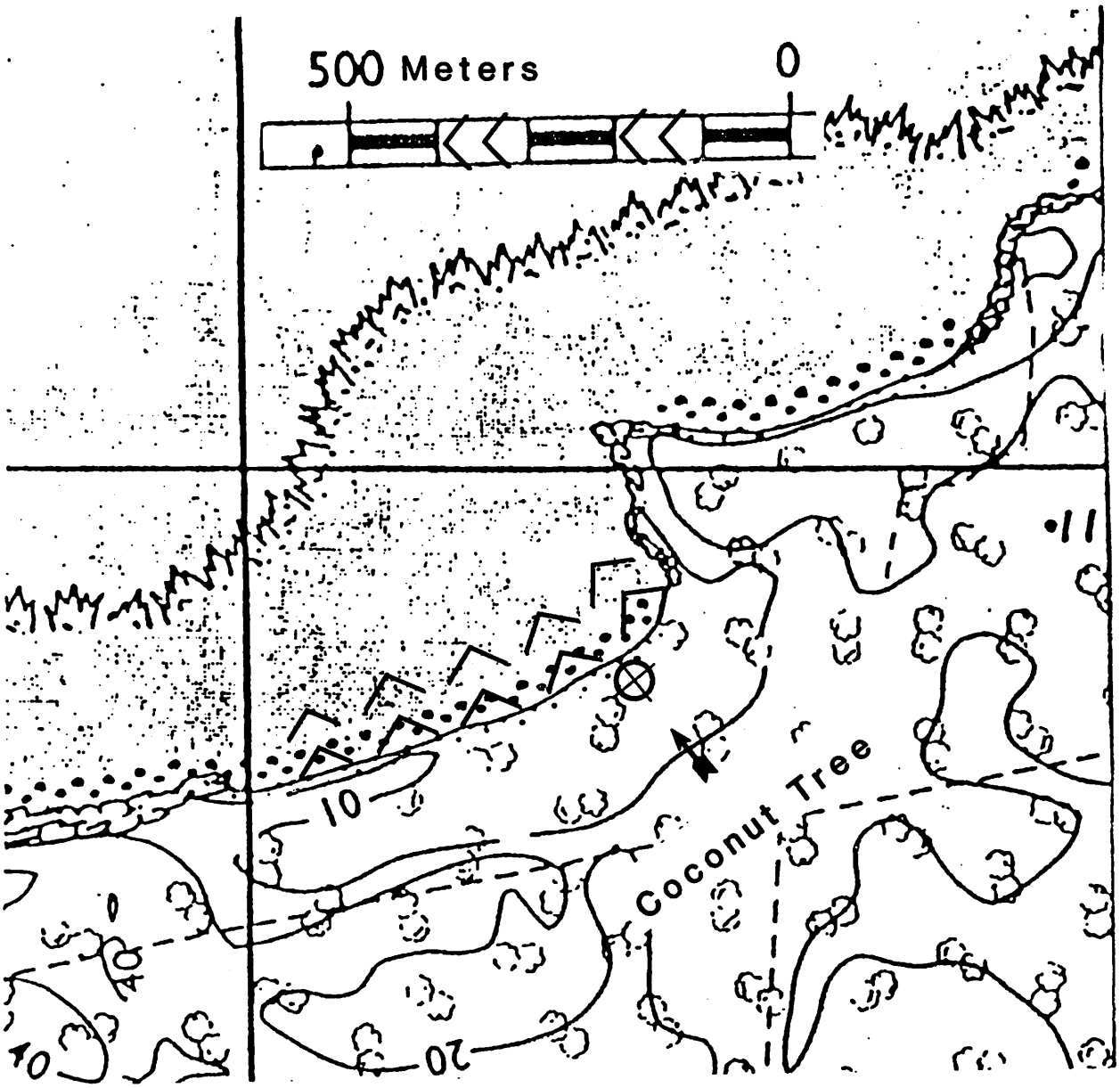

Fig. 3. Location and topographic conditions of the Coconut Tree Site, Rum Cay. Prehistoric coastal topography would have the beach area further seaward.

and Rum Cay, two (Three Dog site and Coconut Tree site) are being eroded; two (Davis site and Storrs Lake site) are in areas of coastal deposition.

The Three Dog site is on the leeward shore of San Salvador, southwest of the modern settlement of Sugar Loaf. A nearby road, built on a lithified dune, appears to be the inland boundary of the site. On the eroding ocean side, the site can be seen in cross-section as a darkened organic layer between two layers of white/yellow unlithified coral sand. Assuming that the building patterns of the present inhabitants (mentioned earlier) is relevant for purposes of reconstructing prehistory, then an ancient shoreline, 50 to 100 meters seaward seems reasonable. It can also be assumed, from existing sea-level curves, that mean tide line was 50 cm below the present. Figure 2 illustrates the present topography and reconstructed shoreline for the prehistoric occupation period.

The Coconut Tree site is on the north shore of Rum Cay, to the east of Hartford Cave and west of Port Boyd. The site is undergoing erosion and can be seen in cross-section as a darkened organic layer between

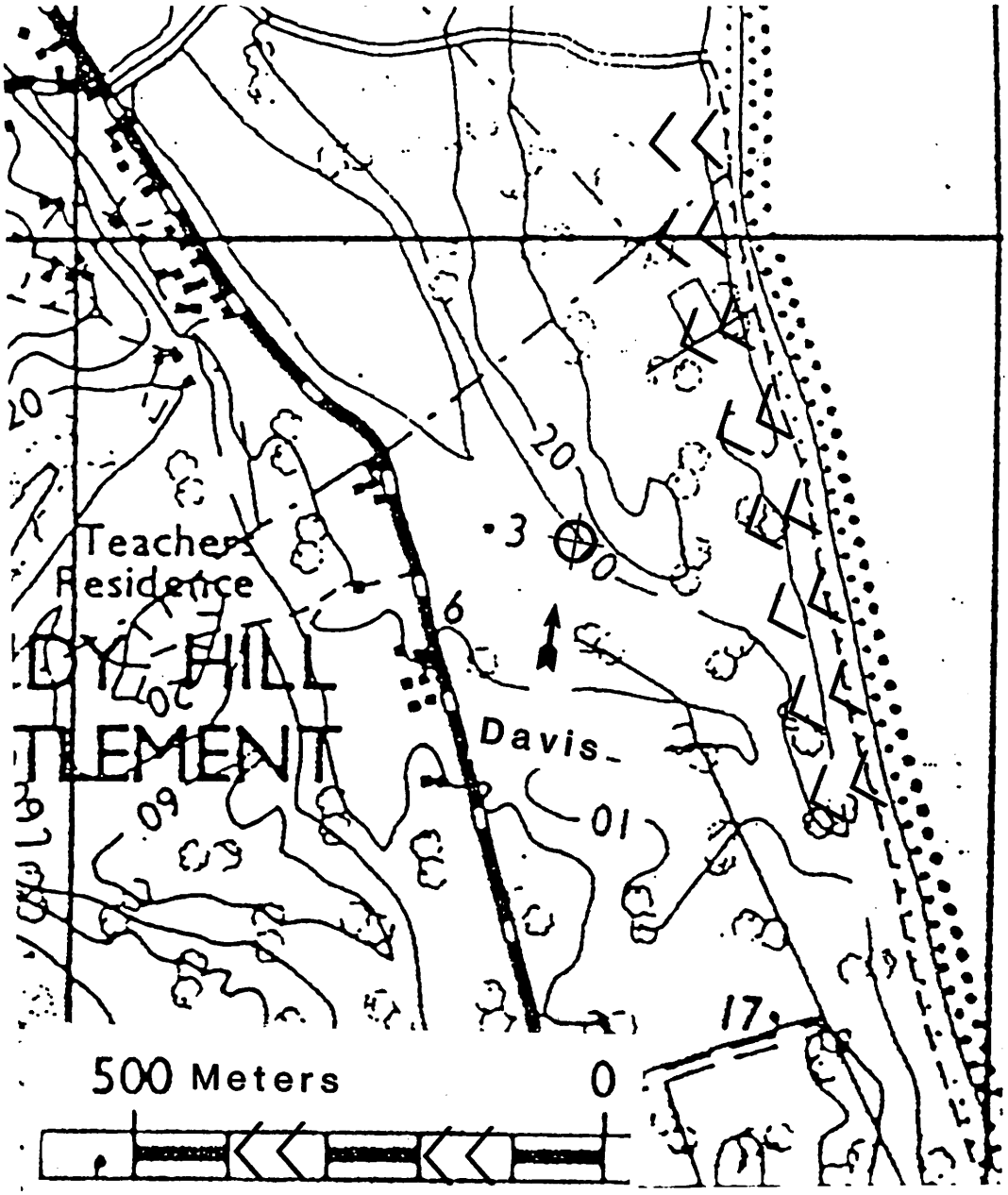

Fig. 4. Location and topographic conditions of the Davis Site, San Salvador. Prehistoric coastal topography would have the beach area further inland.

two layers of white/yellow unlithified coral sand. The prehistoric shoreline shown in Figure 3 is based on the same assumptions used for the Three Dog site shoreline location.

The Davis site is located on the windward side of San Salvador, southeast of the Brandy Hill settlement. The site is on the inland slope of a dune ridge, and there is a prograding beach to the east. There are surface freshwater occurrences to the south of the site. Figure 4 shows the assumed position of the prehistoric shoreline 50 to 100 meters from the crest of the dune near the site.

The Storrs Lake site is located on the windward side of San Salvador, east of the Polly Hill settlement. The site is located on the inland slope of a dune ridge near the northeast corner of Storrs Lake, which appears to be an old tidal creek. To the west of the site is a surface saltwater conduit that feeds into the present lake, while to the east is a prograding beach. A portion of the site is submerged during the rainy season. This seasonal submergence may be the result of both the rise in sea level and closing of the tidal creek. Therefore, if 50 to 100 meters were added from the top of the dune ridge and sea level dropped 50 cm, the site would become dry year-round and the coastline would be closer (Fig. 5).

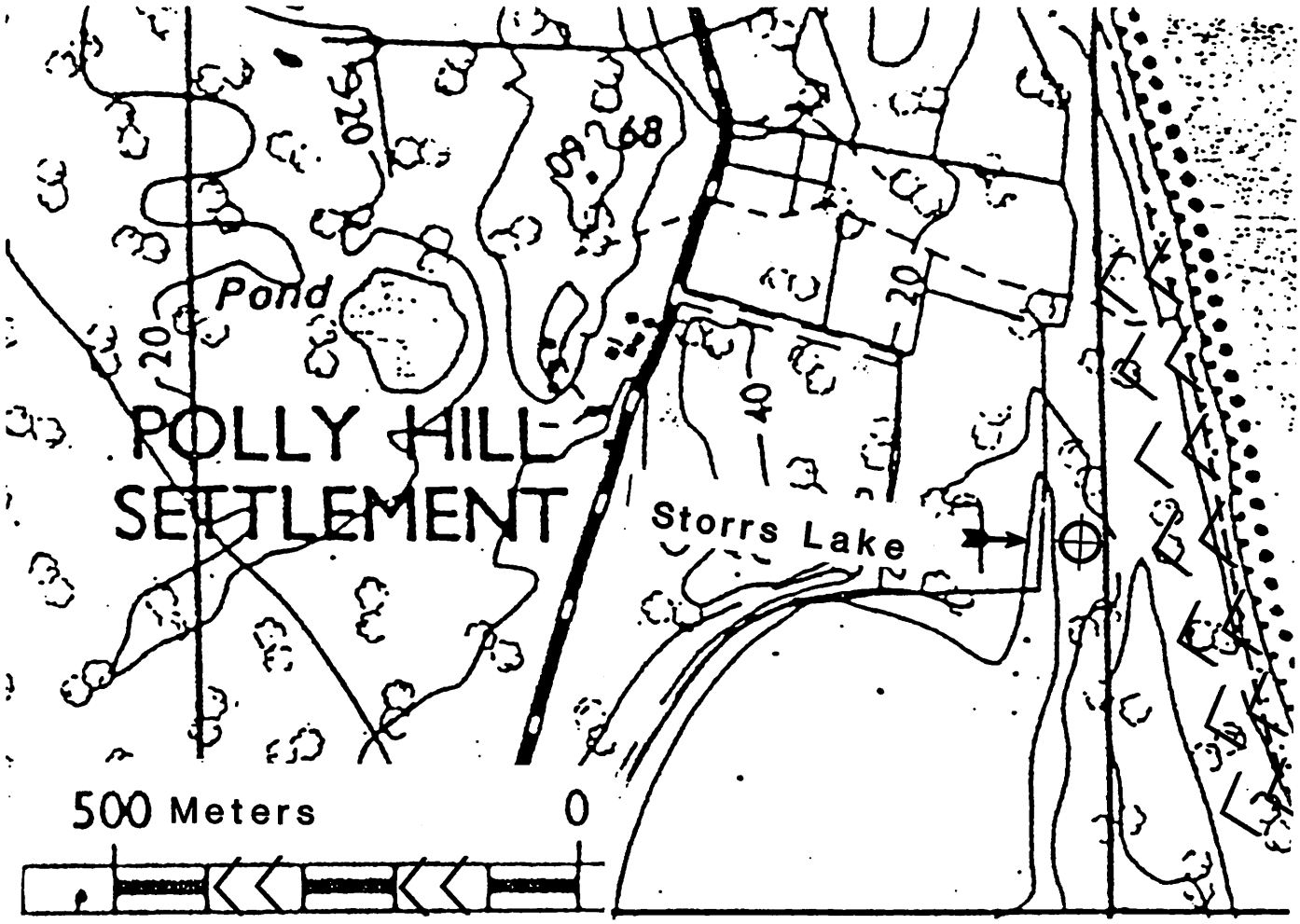

Fig. 5. Location and topographic conditions of the Storrs Lake Site, San Salvador. Prehistoric coastal topography would have the beach area further inland.

DATING TOPOGRAPHIC RECONSTRUCTION

The use of radiocarbon dates can provide a time frame as to when the prehistoric shorelines may have existed. The Delta site is located across from the mouth of Pigeon Creek on the southeast corner of San Salvador. The site is situated upon an unlithified sand deposit and is south of a brackish water pond (Fig. 6). The site appears to be disturbed as there is a scatter of artifacts brought to the surface by the white land crab. A test pit, 1 meter by 1 meter was dug into the site and a cultural layer was found between 22 to 28 cm. The cultural level appears to have been disturbed, as 11 conch shells (*Strombus gigas*) and ceramic sherds were found scattered within the level. Three of the conch shells had been culturally modified and they were sent for radiocarbon-14 analysis. The following dates were obtained from Beta Analytic: 630 +/-50 BP (Beta-15863), 560 +/-80 BP (Beta15864), 1,060 +/-50 BP (Beta-15865). Two of the dates, Beta 15863 and 15864, fit within one sigma of one another and can be considered as one date averaging 595 +/-65 BP. The other date could indicate a previous occupation or the variations which occur with the dating of shells. A core sample was removed from the brackish water pond to the north. The core measured 82 cm in length and contained a continuous layer of peat from a depth of 44 cm to 78 cm. The bottom 20 cm of the peat sample was sent for radiocarbon-14 analysis to Beta Analytic. A date of 950 +/-70 BP (Beta-16995) was reported for the sample. It would

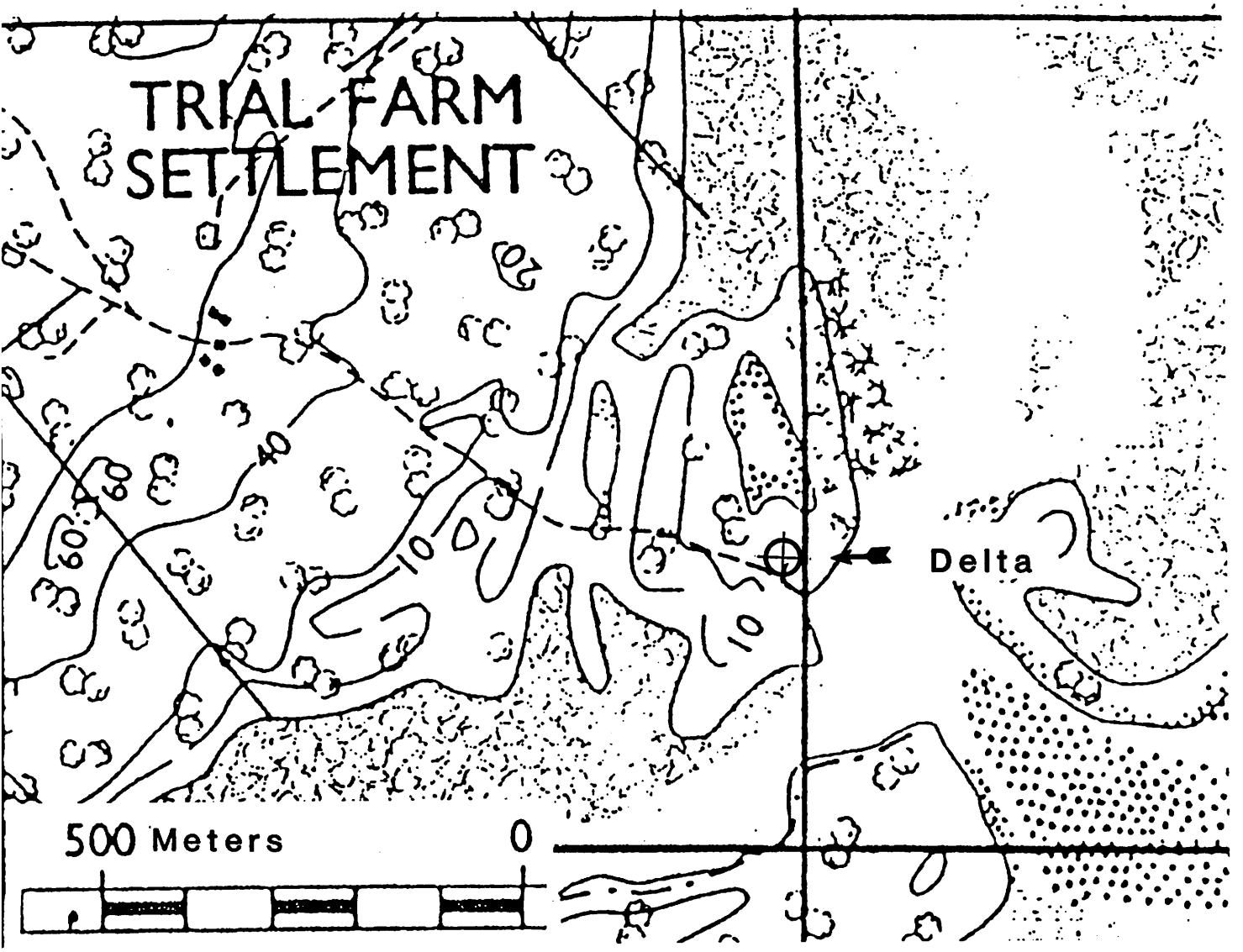

Fig. 6. Location and topographic conditions of the Delta Site, San Salvador.

then appear that the pond was connected to the present tidal creek in the past, perhaps as a cove. Eventually mangrove trees took root and soil was trapped so as to seal off the cove. However, the tidal channel remained open until sometime after the Delta site was first occupied. However, more radiocarbon dates and core samples will be needed to give a complete picture of shoreline configuration during the period of prehistoric occupation.

The Melville site is situated on the south coast of Rum Cay, west of Port Nelson. A comparison of the modern beach position with photos of 20 years ago show that this beach area is currently undergoing retrogradation. The site is 65 meters behind the first dune ridge with an elevation of 10 feet above present sea level. Besides the surface scatter of fragmented shells and ceramics, a darkened organic area was observed, and a 1 meter by 1 meter test pit was then dug. At a depth of 10 to 18 cm, the pit revealed a hearth area with large amounts of burnt animal bones and charcoal. The charcoal was submitted to Beta Analytic for radiocarbon-14 analysis, and a date of 1,030 +/-100 BP (Beta-11282) was determined. Six months later, a new pit was dug next to the previous pit to obtain additional charcoal. These samples (Beta-12132) revealed a radiocarbon date of 940 +/-50 BP. These dates are within one standard deviation of each other and can be considered as one

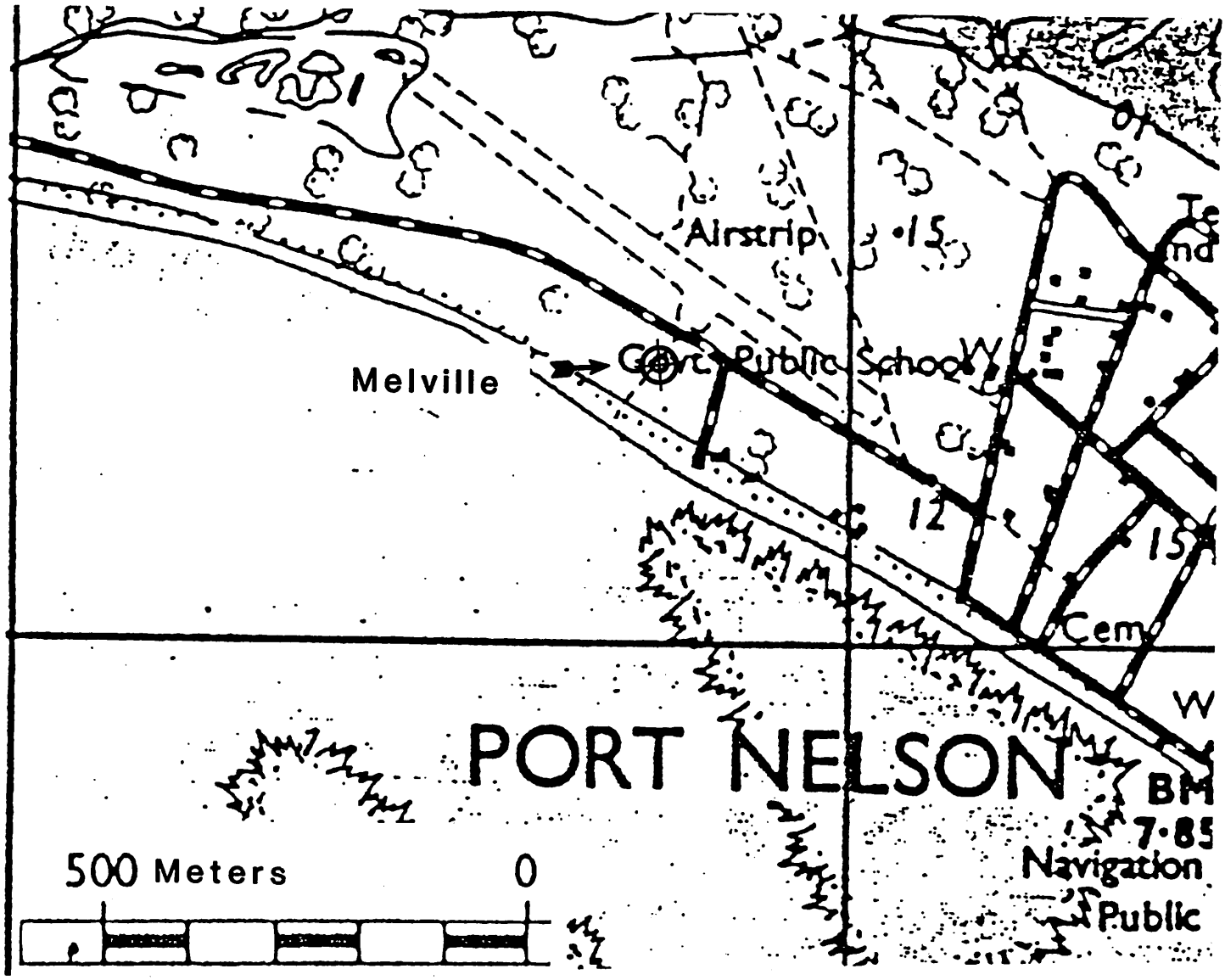

Fig. 7. Location and topographic conditions of the Melville Site, Rum Cay.

date averaging 985 +/- BP. This site is considered to be a model from which to extrapolate ancient shoreline positions relative to prehistoric settlement patterns (Fig. 7). Because of its potential importance, this site should receive more thorough study.

CONCLUSIONS

Since the last prehistoric inhabitants occupied the Bahamas, about 500 years ago, the islands have been battered by hurricanes and lesser storms. Coastal change has also been enhanced by the rise in mean sea level. These natural processes will continue to alter the coastal topography of the archipelago.

From observations at the sites discussed in this report and other sites in the Bahamas, it seems reasonable to hypothesize that prehistoric settlements were located on the lee side of coastal foredunes or along tidal creeks in proximity to open water. For foredune sites it is assumed, based on present occupancy patterns on unlithified dunes, that distance from the settlement to the shoreline was between 50 to 100 meters. By assuming, further, that mean sea level has risen on an average of 15 cm per century, it is then possible to extrapolate a shoreline position relative to prehistoric dune habitations. Therefore, by knowing the present conditions of the archipelago, it may be possible to reconstruct the past and

perhaps predict the future coastal changes in the archipelago.

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REFERENCES CITED

Granberry, J., 1980, Spanish slave trade in the Bahamas, 1509-1530: Journal of the Bahamas Historical Society, v. 2, no. 1, p. 15-17.

Kraft, J.C., 1985, Marine environments: paleogeographic reconstruction in the littoral region, in Stein, J.K., and Farrand, W.R., eds., Archaeological Sediments in Context: Center for the Study of Early Man, University of Maine: Orono, p. 111-125.

Strahler, A.N., 1971, The Earth Sciences: New York, Harper and Row, p.

Winter, J., Granberry, J., and Leibold, A., 1985, Archaeological investigations within the Bahamas Archipelago, in Allaire, L., ed., Proceedings of the 10th International Congress for the Study of Pre-Columbian Cultures of the Lesser Antilles: Centre de Recherches Caraibes, Montreal, p. 83-92.