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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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PRELIMINARY OBSERVATIONS ON THE HOLOCENE DEPOSITIONAL HISTORY OF NIXON'S BLUE HOLE, GREAT INAGUA, BAHAMAS

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ABSTRACT

Nixon's Blue Hole lies near the south shore of Great Inagua on the southern flank of a northeast trending, lithified dune ridge. Steep, rubble-covered slopes surround the blue hole and rise approximately 20 feet on the north side. Water level lies at or near sea level. At time of collection (1/9/86) salinity was 10.8 ppt.

An 82 cm core was collected from Holocene sediments and selected 2 cm intervals were processed and counted for ostracodes. *Cyprideis americana* and *Perissocytheridea bicelliforma* are most abundant, the former predominating in the upper 22 cm and the latter throughout the rest of the core. *Hemicyprideis setipunctata* is more common in the upper half of the core, attaining a maximum abundance of 20%, and is rare to absent in the lower half. The abundance of *P. bicelliforma* and the frequent occurrence of the pitted variant of *C. americana* suggests brackish conditions throughout the core.

Salinity controlled magnesium content in *C. americana* indicates salinities less than 10 ppt. to slightly over 20 ppt. during the deposition of the core. Salinity below 30 cm core depth, for the most part, was higher than above, resembling Holocene salinity trends observed on San Salvador Island, Bahamas.

INTRODUCTION

During the past few years consistent salinity trends have been interpreted through Holocene saline lake deposits of San Salvador Island, Bahamas (Sanger and Teeter, 1982; Luginbill, 1983; Crotty and Teeter, 1984; Teeter and others, this volume). The purpose of the present study is to test the possibility that a similar salinity fluctuation has occurred during the Holocene on Great Inagua.

Nixon's Blue Hole, named in honor of Jimmy Nixon, Park Ranger for the Bahamas National Trust and guide for the CCFL research group in January, 1986, is located near the south coast of Great Inagua approximately 100 m north of the coast road at 20°57'15"N latitude, 73°26'28" W longitude (Fig. 1). The blue hole is roughly circular in outline, approximately 30 m in diameter and lies on the southern flank of a northeast-trending, lithified dune ridge. It is sur-

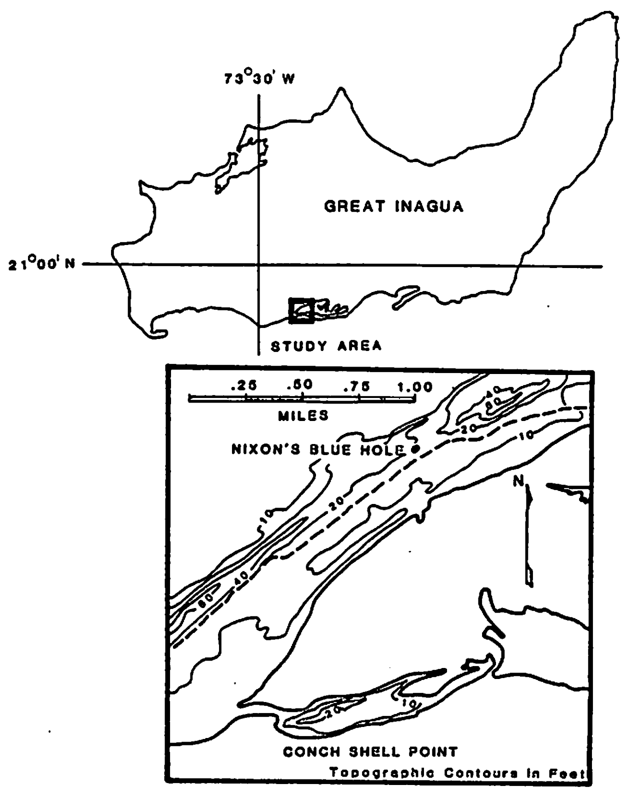

Fig. 1. Location map of Nixon's Blue Hole.

rounded by relatively steep-sided slopes which rise approximately 20 feet on the north side. The north slope is rubble-covered, and large, shallowly submerged slump blocks form a narrow discontinuous ledge around the blue hole. Water depth in the center is unknown but the bottom could not be seen in spite of the water's clarity, and depth is therefore judged to be appreciable. At the time of coring the titrated salinity was 10.8 ppt. The blue hole lies at or near sea level and no tidal fluctuation was observed.

Probing revealed a thin (less than 30 cm) cover of unconsolidated sediment resting on and around most of the submerged slump blocks except in a small area on the north side. Here, in an apparent pocket between slumped blocks and the wall of the blue hole, in excess of 2.6 m of unconsolidated sediment has accumulated. Using a 2.3 m core tube, a core measuring 0.82 m long was recovered. Compaction and possibly some loss during extraction resulted in the shortened core.

LITHOLOGY

The cored carbonate sediments are sandy textured and are predominantly gray in color. Much of the sand appears to have come from the older, adjacent dune. The only macroscopic, obviously indigenous material is the small gastropod *Zebina browniana* (Smooth Risso) which is locally abundant in the core.

OSTRACODE MICROFAUNA

Sixteen 2 cm intervals were selected throughout the 82 cm long core, and approximately 1 gm of sediment from each was processed using standard micropaleontological techniques. A minimum of 300 ostracodes (adult through A-2 instars, right valves, and complete carapaces) was counted for each interval. The results are plotted in Figure 2.

Cyprideis americana dominates through the upper 20 cm closely followed in abundance by *Perissocytheridea bicelliforma*. Below 20 cm the abundances are reversed. *Hemicyprideis setipunctata* ranks third in abundance and is most frequent in the upper half of the core. These three species are primarily controlled by salinity. For a

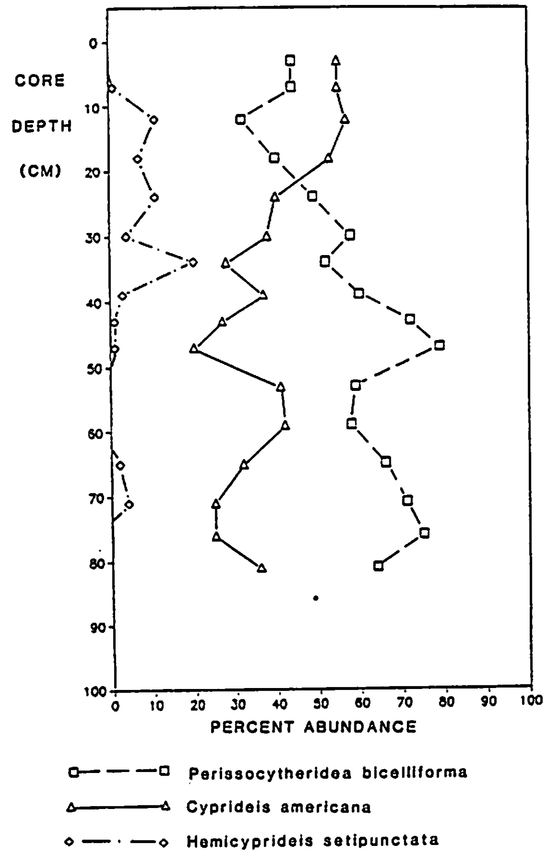

Fig. 2. Ostracode distribution within core from Nixon's Blue Hole.

Teeter and others (this volume).

The presence of *P. bicelliforma* suggests brackish salinities. *C. americana* exhibits a broad salinity tolerance ranging from brackish to hypersaline and thus may not have coexisted with *P. bicelliforma*. However, the pitted variant of *C. americana* occurs frequently throughout the core. This variant apparently exists at the low end of the species' salinity spectrum (Crotty and Teeter, 1984) any may in fact live at salinities lower than 10 ppt. Thus both species probably indicate prevailingly brackish salinities. *H. setipunctata* can also exist at such salinity.

Preliminary research by the senior author has revealed an inverse relationship between magnesium content of the shell of *C. americana* and salinity in living adult specimens (Teeter and others, this volume). For each of the 16 intervals of this core, five adult right valves of *C. americana* were selected and prepared for electron microprobing. Each sectioned ostracode valve was probed medially for magnesium in three locations. The average magnesium content and standard deviation for each interval is plotted in Figure 3.

The most obvious feature of the magnesium distribution in *C. americana* throughout the core is that the averages (0.56 to 0.85 weight percent MgO) exhibit restricted range. These averages correspond to salinities of less than 10 ppt. to slightly over 20 ppt., confirming the interpretation based on the ostracode assemblages. Closer inspection reveals that the intervals from 30 cm to the top of the core all have average magnesium contents equal to or greater than 0.74 weight percent MgO (corresponding to a salinity of approximately 5.0 ppt.). Why freshwater ostracodes are absent at such low salinities is unknown. Of the intervals below 30 cm all but two have magnesium contents less than 0.74 weight percent MgO. Thus the lower part of the core generally experienced slightly higher average salinities than the upper 30 cm. This pattern is similar to, but less pronounced than, those observed on San Salvador. The likely reason for the reduced salinity range and thus the subtle increase below 30 cm is the moderating effect of fresh water seepage from the adjacent dune into the conduit system bringing salt water to the blue hole.

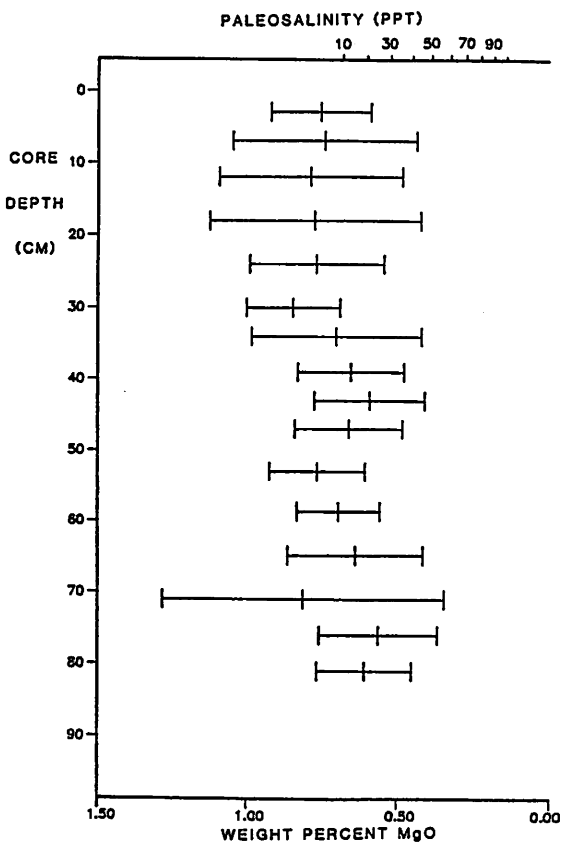

Fig. 3. Distribution of weight percent MgO (and correlative paleosalinity) in *Cyprideis americana* within core from Nixon's Blue Hole.

CONCLUSIONS

Holocene ostracode assemblages from Nixon's Blue Hole suggest brackish conditions throughout the history of the core. Salinity controlled magnesium abundance indicates less saline conditions from 30 cm to the top of the core, and for the most part, slightly more saline conditions in the lower part of the core. This salinity distribution is similar to that observed on San Salvador, thus suggesting a regional control such as climate fluctuation.

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