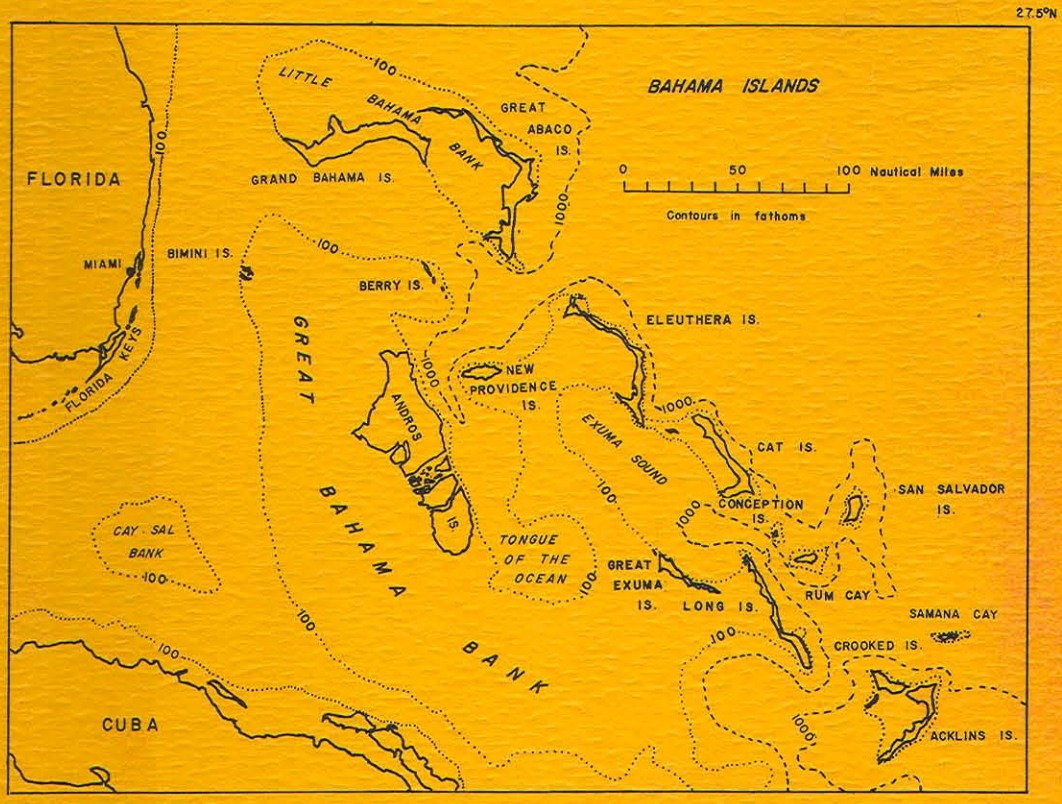
PROCEEDINGS OF THE FIRST SYMPOSIUM ON THE GEOLOGY OF THE BAHAMAS

MARCH 23--25, 1982



College Center of the Finger Lakes
Bahamas Field Station
San Salvador, Bahamas

THE DISTRIBUTION OF LIVING AND FOSSIL FORAMINIFERA AND THEIR USE IN THE INTERPRETATION OF THE POST PLEISTOCENE OF LITTLE LAKE, SAN SALVADOR ISLAND, BAHAMAS

Patricia A. Bowman
James W. Teeter
Department of Geology
University of Akron
Akron, OH 44325

Little Lake has been isolated from the ocean by surrounding limestone bedrock since the Pleistocene. The surface of the bedrock flooring the lake consists of several shallow basins more or less separated by low ridges. The saline lake waters, which lie at sea level, have apparently been introduced by percolation through the porous Pleistocene bedrock. Because of its protected nature the lake has preserved a relatively complete sedimentary sequence from the time of its first flooding, by rising sea level, to the present.

Sediment surface samples, consisting of a constant volume of the uppermost centimeter of sediment, were collected and preserved in formalin for later determination of living foraminifera. Piston cores were taken through the unconsolidated sediments to Pleistocene bedrock. Sampling localities (Fig. 1) used in this study include all except those with the suffix "-81".

Foraminifera in Sediment Surface Samples

Of the 18 species found in the sediment surface samples of Little Lake, Quinqueloculina bosciana and Q. costata dominate, constituting an average of 79% of all species present.

Q. costata exhibits pronounced variation. We concur with the suggestion of Bock (1971) that there is morphological overlap between Q. subpoeyana, Q. tenagos, Q. laevigata and Q. poeyana

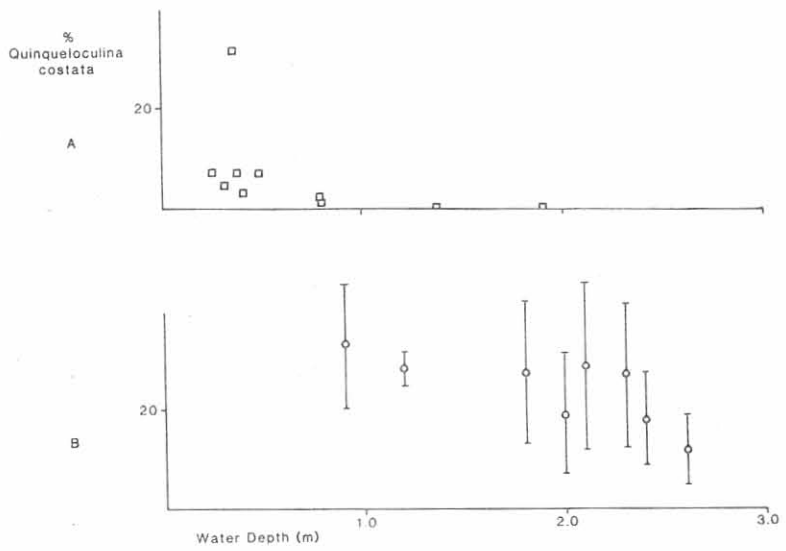


Figure 2. Percent abundance of Q. costata vs. depth.
A: Little Lake, San Salvador Island.
B: Buttonwood Sound, Florida Bay (Data from Lynts, 1971). Bars each represent one standard deviation.

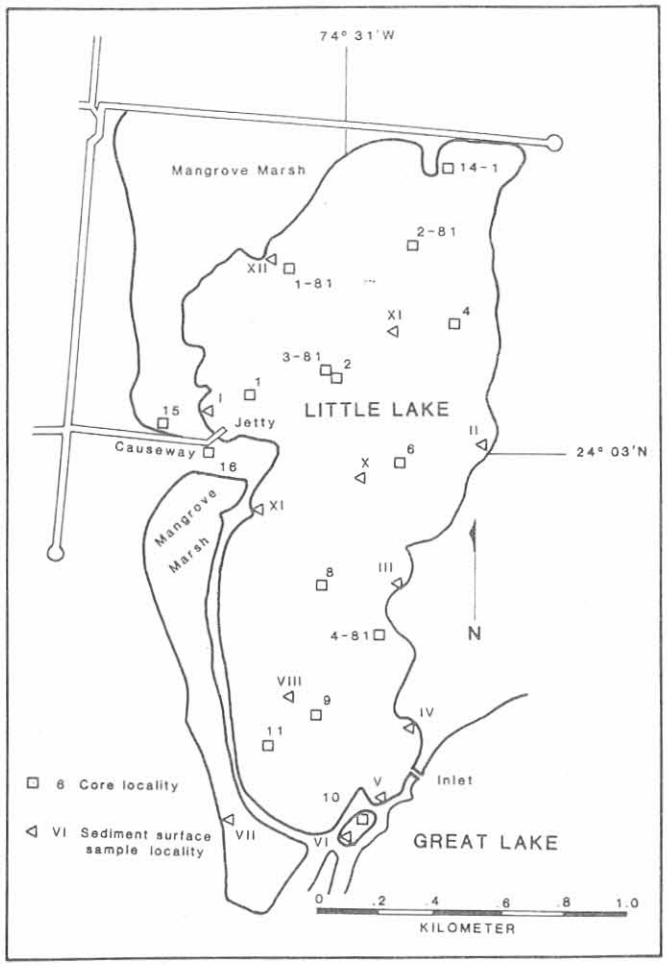


Figure 1. Core and sediment surface localities, Little Lake, San Salvador Island.

and we include these species with Q. costata.

Nearly all samples reveal an inverse abundance relationship between the two dominant species. The literature offers no ecological explanation of this relationship.

In Little Lake, the abundance of Q. costata is inversely related to depth (Fig. 2). Examination of depth distributions of conspecific taxa in Lynts (1971) reveals a similar trend in Buttonwood Sound, Florida Bay. Although this distribution may be affected by such depth-related variables as hydrostatic pressure, salinity, temperature, or wave agitation the foregoing seem unlikely in Little Lake and we strongly favour light penetration. In the somewhat turbid waters of Little Lake, light penetration decreases rapidly with depth. The presumed relationship between light penetration and Q. costata is unknown but possibilities include plant substrate and food preferences, and sybiotic algae. The inverse abundance relationsip between Q. costata and Q. bosciana may reflect a greater ability of the former species to thrive in shallow, well-lit waters.

Post Pleistocene Foraminifera

As in the sediment surface samples, Q. bosciana and Q. costata dominate, constituting 85-90% of the total population, and exhibit an inverse abundance relationship in all cores. Core 9 (Fig. 3) demonstrates the typical distribution of these two species. Alternating dominances permit subdivision of the post Pleistocene into three zones - a lower Q. bosciana zone, Q. costata zone and an upper Q. bosciana zone.

The lower Q. bosciana zone suggests more turbid water

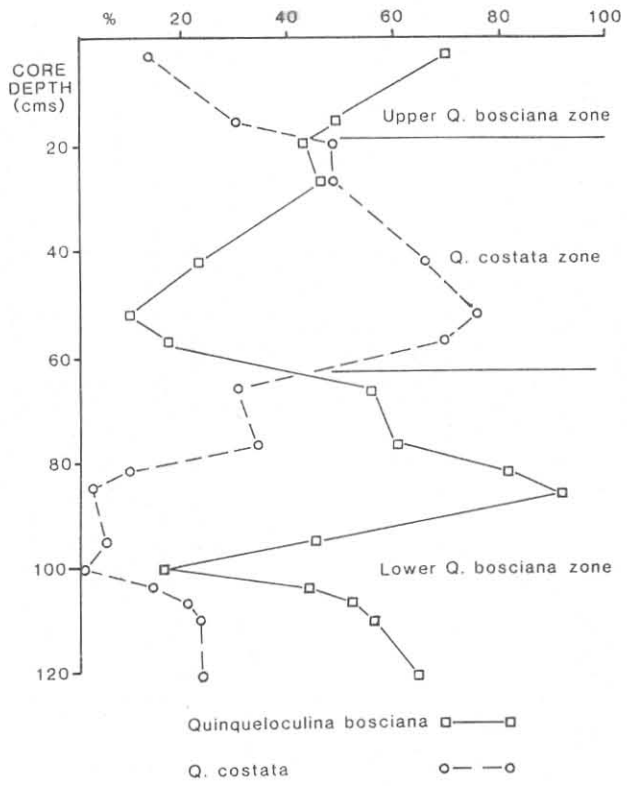


Figure 3. Percent abundance distribution of Q. bosciana and Q. costata, core 9, Little Lake, San Salvador Island.

conditions, possibly the result of wave agitation of sediments during the earliest, very shallow submersion of the lake's bedrock basins by rising sea level. The Q. costata zone reflects improved water clarity favouring its dominant species. This improvement is possibly the result of deepening lake water during sea level rise and decreased rainfall producing reduced erosion and sediment influx. The upper Q. bosciana zone suggests a return to more turbid water conditions. This may be in response to the advent of slash and burn agriculture and resultant increased rates of erosion and sediment influx.

References Cited

Bock, W. D. 1971. A handbook of the benthonic foraminifera of Florida Bay and adjacent waters. in Jones, J. I. and Bock, W. D. (eds.) A Symposium of Recent South Florida Foraminifera. Miami Geological Society, Memoir 1, p. 1-72.

Lynts, G. W. 1971. Distribution and model studies on foraminifera living in Buttonwood Sound, Florida Bay. in Jones, J. I. and Bock, W. D. (eds.) A Symposium of Recent South Florida Foraminifera. Miami Geological Society, Memoir 1, p. 73-115.