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CHARLOTTE HARBOR ESTUARINE STUDIES

Studies on the Geochemistry and Hydrography of the Charlotte Harbor Estuary

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Progress Report

No. I

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I. Hydrography

During August, 1969, a six day hydrographic survey of Charlotte Harbor was conducted in conjunction with geochemical studies. A total of 61 stations were occupied for the collection of temperature, pH, and salinity measurements at 0.5 to 1.0 meter intervals through the water column. All temperature and salinity measurements were made with a Beckman Model RS5-3 induction salinometer with an "in situ" probe. The pH measurements were made immediately on collection using a portable Orion electrometer.

The major features of the thermohaline structure of the Charlotte Harbor area during the period of study can be summarized as follows:

1. The Lemon Bay - Gasparilla Sound - Pine Island Sound water masses receive sufficient exchange with the Gulf of Mexico through numerous breaks in barrier islands to maintain marine salinities ranging from 28.5 - 32.8 ppt (parts per thousand). Water temperatures in these shallow bays ranged from 28.3 - 31.6°C.

2. The outflow of the Peace and Myakka Rivers form a well defined salinity structure in Charlotte Harbor. The river water is transported in a well-defined wedge along the north and west shores and central portion of Charlotte Harbor. At high tide the high salinity bottom water extends up into the Peace River at least to the community of Cleveland.

3. The freshwater outflow followed a well-defined and restricted course through Charlotte Harbor and did not exert a significant influence of the composition of the adjoining bays during the period of study.

II. Geochemical Studies

The initial geochemical studies were directed at the chemical dynamics of phosphorus and boron in the estuarine environment. Phosphorus is of particular interest in Charlotte Harbor because of the relatively high dissolved phosphorus concentrations in the Peace River. Boron is a highly reactive element and is a useful tracer for the study of mineral-water reactions. The results of these preliminary studies on phosphorus and boron can be summarized as follows:

(a) Phosphorus

Eighty-two water and sediment samples were collected and analysed for reactive phosphate. Sediment cores were subdivided into 10 cm sections, which were subsequently squeezed to obtain interstitial water. This pore water was then analysed for salinity, reactive phosphate, calcium and magnesium.

The water samples, which were taken over a wide range of salinities, show a distinct wedge of phosphate rich water (0.2 - 0.6 ppm P) originating from the Myakka ($\sim$0.3 ppm P) and Peace ($\sim$0.6 ppm P) rivers. This wedge of water appears to travel south along the western shore of Charlotte Harbor before turning to flow directly west out Boca Grande Pass. This water mass separates the low phosphate water masses (0.0 - 0.1 ppm P) of Lemon Bay and Pine Island Sound. The Caloosahatchee River has low concentrations of dissolved phosphorus (0.03 - 0.07 ppm P).

The interstitial water data for reactive phosphorus coincide with values observed in the overlying water. Values of reactive phosphorus in the pore waters of the Peace River range from 0.8 to 1.3 ppm P (3 stations). The sediment at the mouth of the Myakka River is 0.2 ppm P, while the Caloosahatchee River sediment exhibits pore water of 0.05 ppm P. There is no apparent correlation between the reactive phosphorus values and the values of calcium and magnesium for these pore waters.

(b) Boron

The objective of this study was to collect water samples of varying salinity over a range from fresh (0.00 o/oo S) to nominal saline sea water (35.00 o/oo S) and analyze these samples for boron content. Upstrom's* modified technique for analysis of boron in sea water was employed.

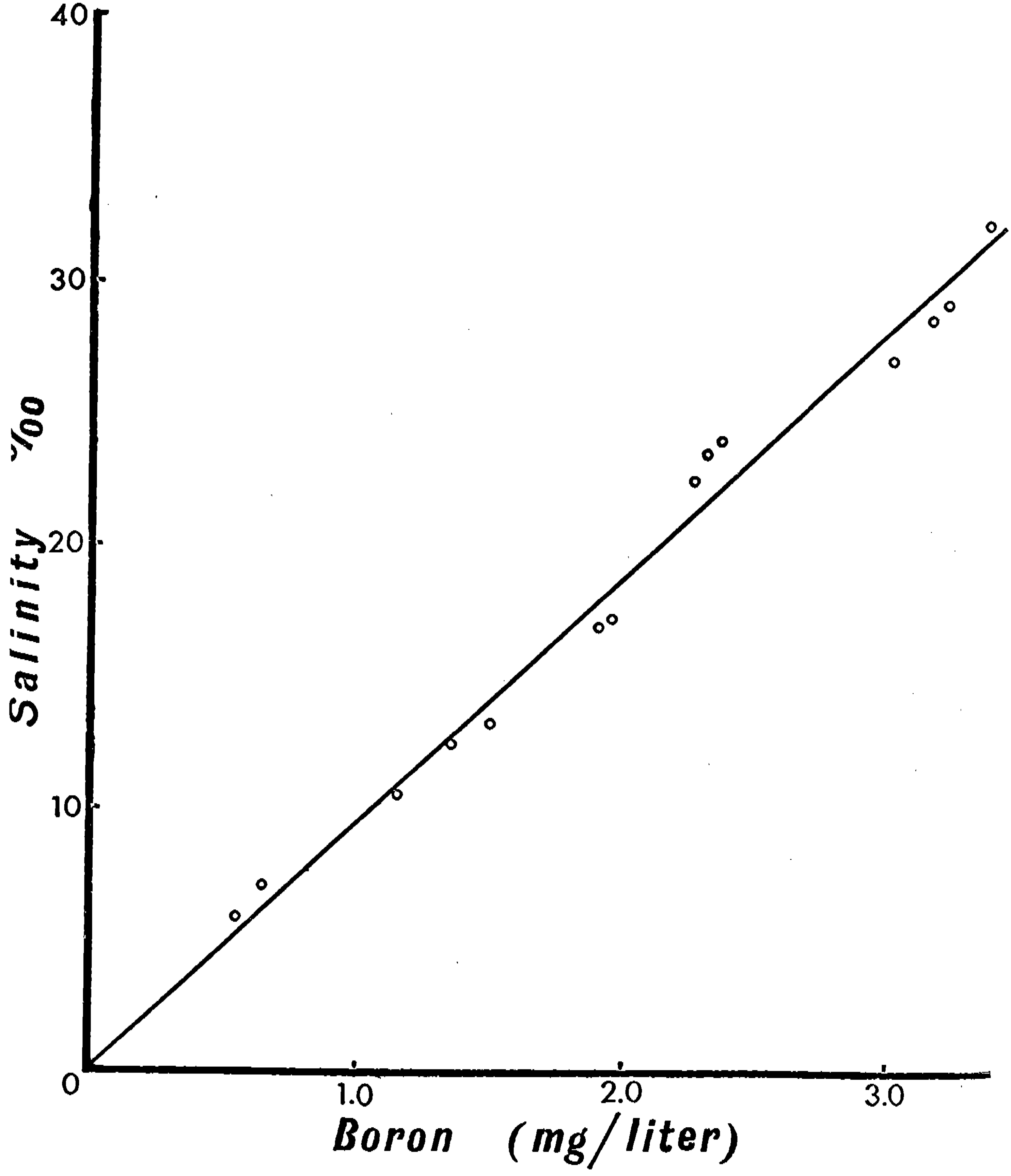
The results from these analyses clearly show a linear relationship between salinity and boron concentration in the estuary system (fig. 1). This implies that boron, a reactive element, is not taken up by the sediment load of the rivers or removed by biological mechanisms to any significant extent. There appears to be no mineral-water reactions between the normally reactive clay fraction of the sediment load and boron. This could be of importance in considering the effects of chemical pollutants; e.g. heavy metals, on the ecological balance of the estuary.

* Uppstrom, Lief. R., Analysis of Boron in Sea Water by a Modified Curcumin Method; Rep on Chem of S.W., Dept. Anal. Chem. Univ. Goteborg, Sweden, no. 4, 1967.

III. Future investigations

These preliminary data indicate numerous interesting problems for continued study. The thermohaline structure of Charlotte Harbor, in particular, the seasonal variations in the dispersion patterns of the freshwater entering the estuary should be investigated in detail.

It is of major importance to determine the residence time and distribution of dissolved phosphorus in Charlotte Harbor to assist in proper land management of the area during urban development. Due to the relatively high phosphorus load in the Harbor the addition of nitrogen from sewage could lead to massive eutrophication of the estuary. Both the phosphorus and nigrogen budgets in Charlotte Harbor should be studied in considerable detail. Nutrient enrichment studies should be conducted to evaluate the possible impact of increased urbanization on the producers in the estuarine food chain. The chemical and biogeochemical studies mentioned above must be conducted as soon as possible so that the results can be applied to the development of a model for the proper use and conservation of the coastal marine resources of this region.



40
30
20
10
0
1.0
2.0
3.0
Salinity ‰
Boron (mg/liter)

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