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Sedimentological Survey of Baffin Bay*

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The purpose of this survey is to study the acoustic, petrographic, mineralogical, and biological characteristics of the sediments of Baffin Bay and their dependence on marine processes in an Arctic environment. Two graduate students at Rensselaer Polytechnic Institute, John J. Blee, and Seymour R. Baker, in conjunction with the U. S. Naval Oceanographic Office carried out a bottom sampling survey of Baffin Bay during the late summer of 1967.

Four weeks were spent at sea during August and September of 1967 aboard the U. S. C. G. C. Southwind (a "Wind" class icebreaker) equipped with Loran "A" navigation system and radar. Since most of the sampling locations were within the range of radar, it was the primary navigation system in use. Due to the inoperativeness of the PGR system on board, the ship's fathometer was used to keep a continuous record of the depth of the ocean bottom. The positions of the stations were plotted on special charts prepared by the U. S. Naval Oceanographic Office. In addition to the continuous topographic traverses, 51 bottom sampling stations were taken; the stations were gridded so as to lend maximum sampling control. A total of 47 cores, taken with a 10 foot "modified Ewing" corer equipped with 2-1/2 in. ID polycarbonate plastic liners, and a total of 43 grab samples, taken with an "orange peel" type sampler, were collected during the survey. Seven additional cores, taken with a Kullenberg corer equipped with 1-1/2 in. ID polycarbonate plastic liners, were collected and immediately checked for Eh and pH at 6 in. intervals and "squeezed" of interstitial water at 10 in. intervals using a sediment squeezer provided by Hudson Laboratories, Dobbs Ferry, New York. The "modified Ewing" cores were kept constantly wrapped in wet towels and covered with plastic wrap and plastic tape in order to prevent any water loss by diffusion. The sample stations are shown in Fig. 1.

On the voyage back to the United States the cores were run through a portable sound-velocimeter, which checked the speed of sound through the cores. The cores were then shipped, at all times being handled and stored in the vertical position, or as nearly vertical as possible, to Rensselaer Polytechnic Institute where they are presently being analyzed.

The analyses include: 1) Grain Size; 2) Sedimentary structures by x-ray; 3) Petrographic study of the sand and gravel fractions; 4) X-ray analysis of the clays; 5) Carbonate content; 6) Geochemistry of the interstitial water (Cl, Ca, Mg, Na, K, Li, Rb, Sr); 7) Microfauna; 8) Mass physical properties, and 9) Sediment density determinations by gamma-ray scatter scanner. All of the analyses are being made at Rensselaer Polytechnic Institute, except the density determinations by gamma-ray scatter which will be made at the Hudson Laboratories of Columbia University.

Marlowe (1968) has recently completed a reconnaissance study of the sediments over the entire Baffin Bay area, and others have studied selected areas in the bay (Marlowe, 1966; Grant, 1965; Kranck, 1966; Barrett and Manchester, 1967; Pelletier, 1966a, 1966b; Perry, 1961; Trask, 1932, and Vibe, 1939). The present study is a supplement to previous studies by providing a grid pattern of cores across the entire bay. Moreover, this comprehensive project will go beyond the descriptive phases of identifying the many variables of the sediments in the bay; the main purpose is to determine the interrelationship between these variables and the depositional processes.

Twenty-eight unopened cores from Baffin Bay have been analyzed with x-rays. The radiographs obtained from these analyses indicate that Baffin Bay is a highly complex sedimentary basin in terms of sediment distribution and deposition.

Core material is found to be essentially homogeneous throughout the core length in only five of the twenty-eight cores studied. As a rule the sediment is stratified; in eight cores the sediment consists of very fine laminations which average 5 mm or less in thickness. In fifteen cores the thickness of the interbeds ranged from 5 to 75 cm. In six cores, recovered from water depths of 821 to 2383 metres, cross-bedding occurs in beds ranging in thickness from 2 to 15 cm with the cross-beds having foreset dips of 5 to 30 degrees. The cross-beds are found at depths within these cores at 82 to 148 cm below the water-sediment interface.

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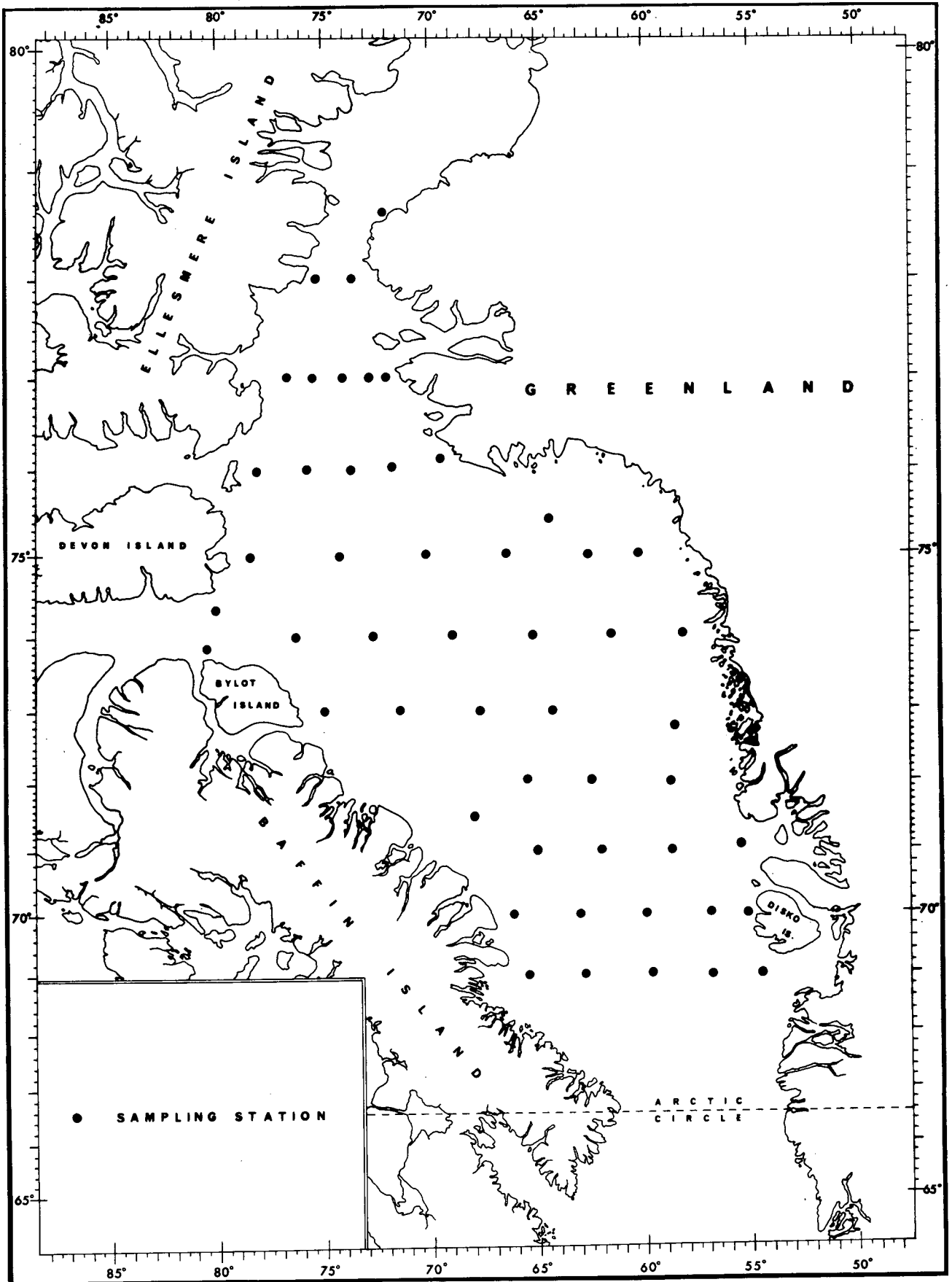


Figure. 1 Sampling stations in Baffin Bay, Blee, Baker & Friedman. (Sedimentological study of Baffin Bay).

Individual cores exhibit various degrees of pebble concentration. The size of the pebbles varies with the largest so far found in our x-rays having a maximum diameter of 7 cm. Pebbles are found in discrete beds or are scattered throughout the core. Three cores are practically devoid of pebbles.

Our preliminary observations indicate that two important agents of sediment transport and deposition in Baffin Bay include bottom currents and ice-rafting. From the radiograph data, one can see that the location of these agents has shifted and their intensity has changed with time over most of the Baffin Bay area.

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