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Surface Sediments on the Grand Banks of Newfoundland: a Progress Report*

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To date the texture and mineralogy of 128 surface sediment samples from the Grand Banks southeast of Newfoundland have been studied. The samples are distributed irregularly over an area between 43° and 46°30'N and between 49° and 55°30'W. All the samples were taken at depths of up to 260 metres (142 fathoms), with most being taken in the range 65-95 metres (35-52 fathoms). Large and small-size Van Veen-type grab samplers were used to collect the samples. In the laboratory all the samples were analyzed for particle-size distribution using the standard sieve method and, where necessary, the pipette method. The heavy minerals of most of the samples have been studied and a start has been made on studying the light minerals.

All but 6 of the samples contain 90% or more of sand-size or larger (>.063 mm diameter) material. The other 6 have from 14% to 72% of silt- and clay-size material (<0.063 mm diameter). Samples composed of predominantly (>80%) gravel-size material (>2 mm diameter) occur almost exclusively in the northern and northeastern part of the study area. Separating the gravel area into 2 smaller patches are relatively thin bands of mixed gravel and sand and one sinuous belt of predominantly (>90%) sand-size material. The sand belt appears to occupy a topographic depression averaging nearly 10 metres (5½ fathoms) lower than the flanking, mixed sand and gravel areas. The bulk of the remainder of the study area is covered with predominantly sand-size material with occasional patches of gravel and sand or a sand-silt-clay mixture. A plot of percent sand-size material in each sample against water depth shows there is >90% sand at depths of 60-64 metres (about 34 fathoms) and 115-119 metres (about 64 fathoms).

The transparent heavy-mineral suite in the samples is dominated by garnet (several species), hornblende, pyroxene (several species) and zircon. Of these, garnet is the most generally abundant mineral and masks what appear to be significant variations in the other three. However, after garnet has been eliminated from the data, the others considered on their own, and the resulting data plotted, the area can be divided into 4 definite "provinces" dominated by one or other of the three minerals. The northern portion of the study area is dominated by pyroxene, while a long, relatively thin strip, its seaward edge approximately coincident with the 100-metre contour, is dominated by hornblende. The remainder of the area is zircon-dominated. There is no obvious correlation between these areas as defined by the abundance of various heavy minerals and either bottom topography or sediment texture. However when the percentages of hornblende, pyroxene and zircon in each sample are plotted against water depth, it can be seen that there are distinct concentrations of each mineral at different depths. Hornblende has two

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peaks, 60-64 metres (about 34 fathoms) and 75-79 metres (about 42 fathoms). The pyroxene peak is at 90-94 metres (about 50 fathoms), while the zircon peak is at 65-69 metres (about 37 fathoms). The zircon and deeper hornblende peaks correspond to peaks in the plot of weight percent of heavy minerals in each sample against water depth, while the shallower hornblende peak corresponds to the shallower peak of concentration of sand size material. Other minerals present in amounts less than 10%, are andalusite, apatite, epidote, kyanite, monazite, rutile, sphene, staurolite, tourmaline and zoisite-clinozoisite. The opaque heavy minerals have not yet been studied.

A start has been made on a study of the light minerals using a combination of staining with sodium cobaltinitrite and Eosine "B", after first etching with hydrofluoric acid fumes, as described by HAYES and KLUGMAN (1959). Twenty-three samples have been treated in this way and examined. The results so far indicate that there is a large variation in the amount of plagioclase in the samples (from about 10% to about 60%) but no distribution patterns are yet apparent.

So far, this study has given an approximate indication of the texture of the surface sediments in the Grand Banks area and has shown that the heavy mineral suite is quite complex, probably with more than one source. The geological history of the area is also complex, as there are indications of stillstands of the sea at about 75 metres (41 fathoms) and, possibly, at about 65 metres (35 fathoms). Much more data and samples will become available later on this year when CSS Baffin finishes her season's project of a hydrographic survey of the Grand Banks. This will undoubtedly fill in most or all of the blank areas and so help to get a more complete picture of the surface sediments in the area.

Reference cited

HAYES, J.R., and KLUGMAN, M.A., 1959, Feldspar staining methods: Jour. Sed. Pet., v. 29, p. 227-232.