

# Distribution of Foraminifera in the Sediments of the Grand Banks: A Preliminary Report

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Distribution of Foraminifera in the Sediments of the  
Grand Banks: A Preliminary Report\*\*

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The Grand Banks of Newfoundland support a large and diverse suite of Foraminifera. In order to initiate an investigation on the distribution and ecology of these species, thirty bottom grab samples from the Tail of the Bank were quantitatively studied. Most of these samples were collected during a hydrographic cruise of CSS BAFFIN in 1966; a few were collected in 1964. The stations are generally 50 to 100 m in depth.

Of the 79 species of benthonic Foraminifera identified from these samples, only 12 attain a maximum frequency of 5 per cent or more in any sample. They are indicated by asterisks in the faunal list below.

List of Benthonic Foraminifera

Calcareous species: Angulogerina angulosa (Williamson)\*, A. fluens Todd, Astacolus hyalacrus Loeblich and Tappan, A. occidentalis (Cushman), Asterellina pulchella (Parker), Astrononion gallowayi Loeblich and Tappan, Bolivina pacifica Cushman and McCulloch, B. subaenariensis Cushman, Buccella frigida (Cushman)\*, B. inusitata Andersen, Bulimina exilis Brady, B. marginata d'Orbigny, Caribbeanella sp. cf. C. polystoma Bermudez, Cassidella complanata (Egger), Cibicides lobatulus (Walker and Jacob)\*, C. refulgens Montfort\*, Cornuspira involvens (Reuss), Dentalina baggi Galloway and Wissler, D. ittai Loeblich and Tappan, Elphidium bartletti Cushman\*, E. clavatum Cushman\*, E. orbiculare (Brady), E. subarcticum Cushman\*, Fissurina marginata (Montagu), F. serrata (Schlumberger), F. ventricosa (Wiesner), Glandulina laevigata d'Orbigny, Globobulimina (Desinobulimina) auriculata (Bailey), Globulina glacialis Cushman and Ozawa, Islandiella islandica (Norvang)\*, I. teretis (Tappan)\*, Lagena apiopleura Loeblich and Tappan, L. gracillima (Seguenza), L. laevis (Montagu), L. meridionalis Wiesner, L. mollis Cushman, L. parri Loeblich and Tappan, L. semilineata Wright, L. substriata Williamson, Laryngosigma williamsoni (Terquem), Lenticulina sp., Marginulina subaculeata (Cushman), Melonis zaandamae (van Voorthuysen), Nonionella auricula Heron-Allen and Earland, Nonionella labradorica (Dawson), Oolina caudigera (Wiesner), O. costata (Williamson), O. hexagona (Williamson), O. melo d'Orbigny, O. scalariforme-sulcata (Wiesner), O. striatopunctata (Parker and Jones), Patellina corrugata Williamson, Pateoris hauerinoides (Rhumbler), Pseudopolymorphina novangliae (Cushman), Pyrgo williamsoni (Silvestri), Quinqueloculina agglutinata Cushman, Q. arctica Cushman, Q. seminulum (Linne)\*, Q. stalkerii Loeblich and Tappan, Robertina arctica d'Orbigny, Rosalina sp., Scutularis sp., Spirillina vivipara Ehrenberg, Virgulina loeblichi Feyling-Hanssen\*.

Arenaceous species: Adercotryma glomeratus (Brady), Ammodiscus sp., Cribrostomoides crassimargo (Norman), C. jeffreysi (Williamson), Eggerella advena (Cushman)\*, Hyperammina elongata Brady, Recurvoides turbinatus (Brady), Reophax curtus Cushman, R. scottii Chaster, Saccammina atlantica (Cushman), Spiroplectammina biformis (Parker and Jones), Textularia torquata Parker, Trochammina nana (Brady), T. squamata Jones and Parker.

The total frequency of benthonic foraminiferal tests in the surface sediments of the Tail of the Bank shows a range of variation from less than one to more than 10,000 per gram of dry sediment. The overall pattern of this variation is shown in Figure 1. To make a broad generalization, there is an inverse relation between foraminiferal abundance and the grain-size of the bottom sediment. The lowest figures are for gravelly sand (sand-gravel ratio between 1.00 and 8.99) and the highest figures are for mud (sand-mud ratio 0.32 or less). However, an examination of the details of the foraminiferal distribution pattern suggests very clearly a strong influence of other ecological factors; some anomalous frequencies may perhaps be explained by the nature of local bottom currents which may vary seasonally. The distribution pattern of a particular benthonic species may be quite different from the one that is true for the entire assemblage. For instance, as would be expected, the relative abundance of the well-known sessile species, Cibicides lobatulus (Walker and Jacob) definitely increases with the increase in the grain size of the substrate.

The most abundant and widespread foraminifer on the Tail of the Bank is Islandiella

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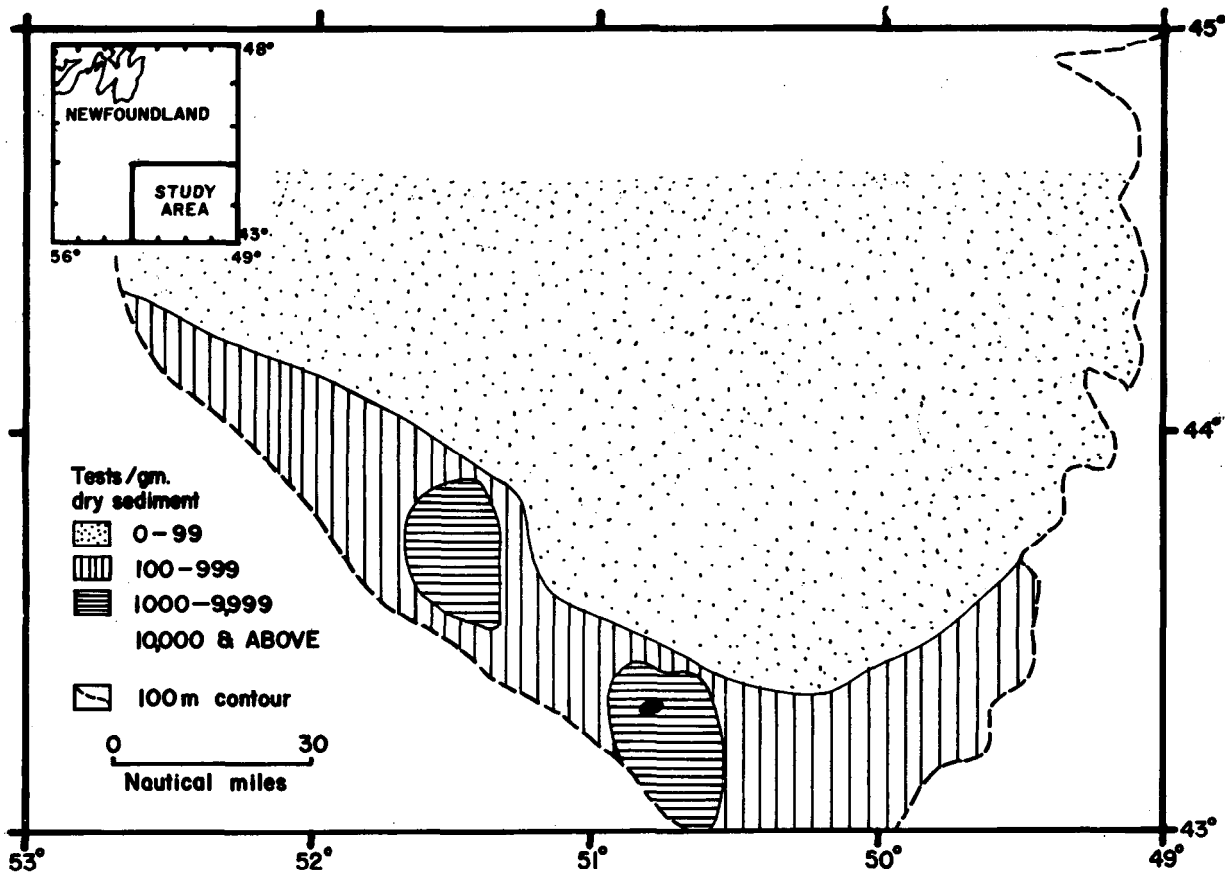


Figure 1. Distribution of benthonic foraminiferal tests on the Tail of the Bank. Insert sketch shows location of study area.

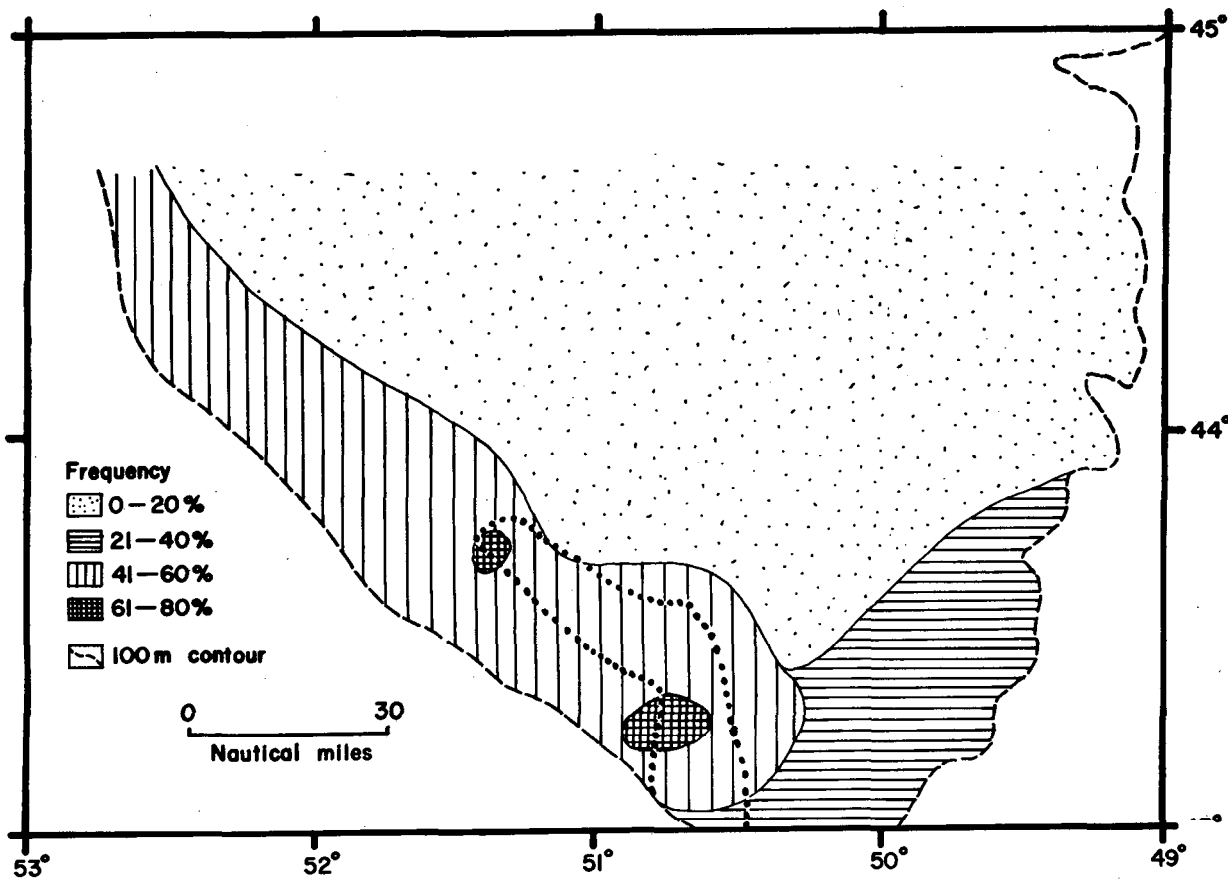


Figure 2. Relative abundance of *Islandiella islandica* (Norvang) on the Tail of the Bank. Area indicated by large dots represents occurrence of *Cribrostomoides crassimargo* (Norman) on the Tail of the Bank.

*islandica* (Nørvang). The frequency of this species, expressed in terms of numbers of individuals per gram of dry sediment, generally increases with a decrease in the grain-size of the substrate, but no apparent relationship exists between this grain-size and the percentage of *I. islandica* in the total benthonic assemblage. Very high percentages are observed at certain stations close to the 100 m contour. The distribution of the percentage frequency of *I. islandica* is illustrated in Figure 2.

The ratio between numbers of calcareous and arenaceous individuals in the benthonic assemblages ranges from about 10 to 1000. This variation, however, seems erratic in terms of either the depth or the substrate.

One particular arenaceous species, *Cribrostomoides crassimargo* (Norman), attains a very large size (up to 2 mm) and has a remarkably localized distribution (Figure 2). It is generally associated with *Reophax curtus* Cushman, *Elphidium bartletti* Cushman, and a large number of ubiquitous species. In spite of the reportedly wide distribution of *C. crassimargo* (Phleger, 1952, p. 85), its affinities are typically Arctic (Loeblich and Tappan, 1953, p. 31; Höglund, 1947, p. 142). The large size and the coarsely arenaceous wall of the Grand Banks specimens also indicate such an affinity. Commenting on the reported occurrence of the species in the Gulf of St. Lawrence (Albatross station D2453), Cushman (1948, p. 27) made a special note of the very low bottom temperature of the region. The possible influence of an extension of the Labrador Current (Bailey et al, 1954, p. 20; Nesis, 1962, p. 220) on the restricted distribution of *C. crassimargo* on the Tail of the Bank is now being investigated by the author.

Six species of planktonic Foraminifera have been identified in the sediments. These are: *Globigerina bulloides* d'Orbigny, *G. dutertrei* d'Orbigny, *G. inflata* d'Orbigny, *G. pachyderma* (Ehrenberg), *G. quinqueloba* Natland, and *Orbulina universa* d'Orbigny. The frequency of this assemblage shows a sharp increase below 140 m, at stations outside the limits of the accompanying distribution maps.

The nature of the sediment samples discussed in this report made it imperative to regard the foraminiferal assemblages as thanatocoenose. In order to understand the distribution and ecology of living populations, the author has, during a recent cruise of the Fisheries Research Board of Canada aboard CGS A. T. CAMERON, collected and stained samples of the top 1-cm layer of the surface sediments. He has also obtained a number of plankton tows and bathythermograph records for all stations. The initial results from these new samples indicate certain interesting ecologic relations.

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