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Bottom Sediments and Foraminifera from Labrador

BLUE DOLPHIN - 1951 and 1952

by

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Table of Contents

Abstract

Bottom samples from coastal waters of Labrador have been studied to determine grain size distribution and foraminiferal content.

The sediments vary from gravel to silty clay. Several anomalous conditions occur in which the sediment types are not those normally expected in similar topographic and geographic positions elsewhere. These conditions are probably due to imperfectly understood current patterns.

Of about 60 species for Foraminifera identified from the samples, less than a half dozen are abundant in any area. Only a few species are restricted to a given locality, and these are so uncommon that they may not have shown up in the other areas because of inadequate sampling. Neither depth nor bottom type seem to exert a decisive control over the distribution of species. No explanation can be offered at present for the absence of Foraminifera in the samples from several localities along the Labrador coast.

Introduction

In the course of the 1951 and 1952 BLUE DOLPHIN Labrador expeditions, a total of 48 bottom sediment samples were collected. Butcher (1952) discussed the 16 samples collected in 1951. All of the 1951 samples and a few of the 1952 were collected by a small snapper, most 1952 samples came from the anchor flukes, seven were from Phleger cores and one came from a beam trawl.

Mechanical analysis and examination for Foraminifera have been carried out on the remaining 32 samples. These samples are from scattered localities along the Labrador coast between Hawke Bay and Hebron Fjord (Fig. 1). The location, mechanical analysis and foraminiferal data from Butcher (1952) have been included to make the discussion of the sediments and Foraminifera as comprehensive as possible.

The wide and irregular scattering of the samples, together with an insufficient knowledge of the hydrography of the areas sampled, makes it inadvisable to attempt a detailed study of the ecology of the Foraminifera in these samples at present. Therefore, this report is confined principally to a discussion of the bottom sediments and to the general distribution of the Foraminifera.

Thanks are due to Dr. W. S. Butcher for the help he gave at the start of the study, particularly in regard to the identification of the Foraminifera; to Mr. D. C. Nutt, master of the

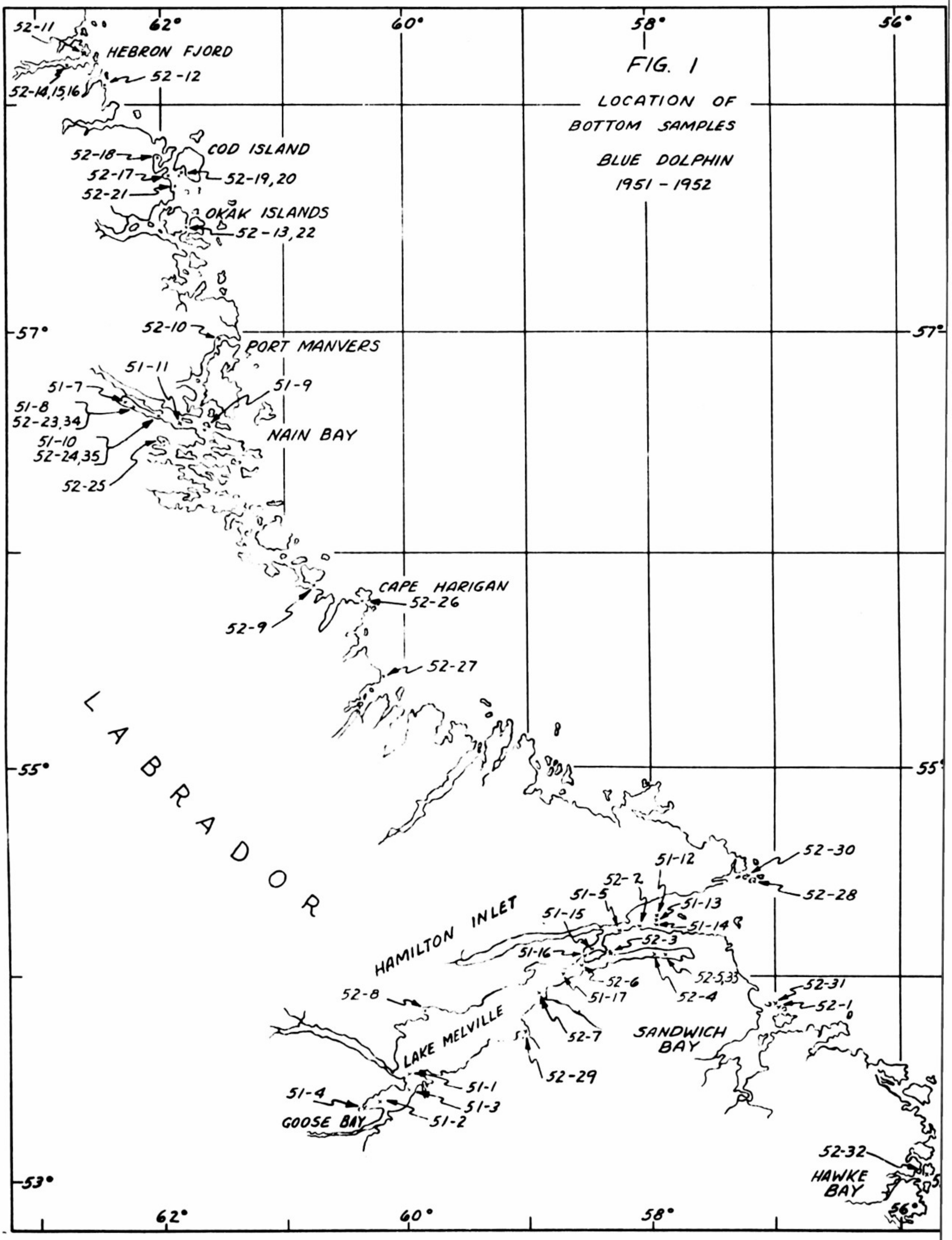
FIG. 1
LOCATION OF
BOTTOM SAMPLES
BLUE DOLPHIN
1951 - 1952
62°
60°
58°
56°
57°
55°
53°
HEBRON FJORD
52-11
52-12
52-14,15,16
COD ISLAND
52-18
52-17
52-19,20
52-21
OKAK ISLANDS
52-13,22
52-10
PORT MANVERS
51-11
51-7
51-9
51-8
52-23,34
NAIN BAY
51-10
52-24,35
52-25
CAPE HARIGAN
52-26
52-9
52-27
LABRADOR
52-30
52-28
51-12
52-2
51-5
51-13
51-14
51-15
HAMILTON INLET
52-3
51-16
52-5,33
52-6
51-17
52-4
52-31
52-1
52-8
LAKE MELVILLE
52-7
SANDWICH
BAY
52-29
51-1
51-4
51-3
GOOSE BAY
51-2
52-32
HAWKE
BAY

BLUE DOLPHIN, for the samples and for additional information concerning their locations; and to Dr. R. H. Backus for information he has made available.

Bottom Sediments

The bottom sediments show the normal relationship to topographic position in general (i.e., coarser sediments on the highs and finer sediments in the basins), but a few anomalies are apparent at various places along the Labrador coast. Unknown currents probably cause most of these anomalies.

Statistical data derived from the mechanical analyses of the bottom sediments are arranged according to locality in Appendix I. The samples collected in 1951 are prefixed by 51-, those collected in 1952 by 52-. Depth in meters, median diameter in millimeters (Md), phi median diameter (Md_ϕ), phi standard deviation or sorting (σ_ϕ), phi skewness (S_ϕ), phi kurtosis (K_ϕ) and general sediment type are recorded with the sample number (for a detailed discussion of these parameters see Inman, 1951). Whenever our method of analysis failed to provide sufficient data to extend the cumulative frequency curve of the sediment to either the 16 or 84 percentile, only the median is given. No mechanical analysis was made of samples 51-13, containing only invertebrate remains, or of 51-16, comprising only a pebble and a shell fragment. Geographical location of the sampling positions and type of sampler is given in Appendix I.

The most southerly sample (52-32) was taken from a small cove in the Hawke Bay area. The depth was 13 meters. The analysis of sample 52-32, which shows it to be a sandy, clayey silt, indicates that strong currents are not likely to be encountered here.

The samples from the Sandwich Bay area were taken from shallow water in relatively exposed positions along the coast where fairly strong currents and wave action may be expected. The sandy, moderately well-sorted sediments (σ_ϕ: 1.09 and 1.50) which were obtained support this view.

Sand predominates in the samples from outer Hamilton Inlet with the exception of sample 51-14, a clayey, sandy silt, which was collected from a depth of 86 meters, almost twice as deep as any of the other samples. Sorting is fair to poor (σ_ϕ: 1.03 to 2.99) and skewness moderate (S_ϕ: 0.16 to 0.29) except at Indian Harbor (52-28), nearest the open sea. There sorting is good (σ_ϕ: 0.76) and skewness is low (S_ϕ: -0.05).

In the vicinity of The Narrows and Henrietta Island, which separates the outer part of Hamilton Inlet from Lake Melville, the water is shallow and tidal currents are strong. The sediments are coarse and poorly sorted. An apparent anomaly is noted just southwest of Henrietta Island (52-6) where gravel and shells occur at a depth of 283 meters, probably the deepest point in Hamilton Inlet. Inasmuch as the water shoals rapidly toward The Narrows from this position, it is possible that strong currents sweep over the sill here, creating turbulence sufficient to keep the bottom clear of the finer sediment.

Bottom sampling within Lake Melville has been conducted principally at anchorages around the edges of the lake and consequently sedimentary data from the middle of the lake are lacking. The sediments from the anchorages are generally fine and poorly sorted.

Sandy gravel is found in the passage between Goose Bay and Lake Melville through which a large part of the runoff from the Ungava Peninsula ultimately flows. This channel is relatively shallow and currents, particularly active in late spring, might be expected to winnow the fine sediment from the channel bed. Butcher (1952) noted an apparently anomalous condition in Goose Bay in regard to samples 51-2 and 51-4. The silty sand of 51-4, from 13 meters, was skewed toward the finer grade sizes (S_ϕ: 0.49), while the clayey silt of 51-2, from 51 meters, shows almost no skewness (S_ϕ: 0.07). Water circulating in a predominantly clockwise direction in Goose Bay possibly carries sediment from the Hamilton River around the margin of the bay, depositing some of it near the entrance to Terrington Basin, the locality of 51-4. The deeper part of the bay, from which 51-2 was collected, would be largely by-passed by the main body of sediment from the river. As a result, 51-4 could receive not only enough coarse sediment to be classed as a sand, but also enough silt to skew the frequency curve of the sediment toward the finer sizes, while 51-2 would receive only finer sediments which had remained suspended longer in the more slowly circulating water at the center of the bay.

The Backway is a relatively narrow, deep inlet extending about 25 miles eastward from Lake Melville at Henrietta Island. Strong currents are not to be expected because no large streams enter The Backway. The fine, relatively poorly-sorted (σ_ϕ: 2.01 to 2.20) sediments collected here (52-4, 5 and 33) bear this out. Samples 52-5 and 52-33, taken from the top and bottom, respectively, of a single core 6-1/2 inches long, are practically identical (Appendix II).

Three samples (52-9, 26 and 27) from the BLUE DOLPHIN's anchor flukes were recovered in the Cape Harrigan area between Hamilton Inlet and Nain Bay. All the positions are adjacent to the open sea and the sediments have median diameters within the sand sizes. Phi sorting is fair to poor (σ_ϕ: 1.80 to 3.27).

All samples within Nain Bay itself are silt. The sample with the coarsest median diameter came from the deepest part of the bay, nearest the sea. This reversal of the usual order could very likely be explained if one had a more complete knowledge of the current structure at the outer end of the bay. In 1952 cores were obtained from approximately the same positions as 51-8 and 51-10 (samples 52-23 and 34, and 52-24 and 35, respectively). These cores were about 9 inches long. The top samples were essentially the same as the bottom samples in each of the cores and the analyses correspond closely with those of the 1951 surface samples from the same locations.

Sample 52-25 was collected from a small, nearly landlocked embayment off Anaktalik Bay just south of Nain Bay. Little circulation is likely here and the sediment is a silty clay, the finest of the 1951 and 1952 BLUE DOLPHIN bottom samples.

A gravelly sand bottom is found near Port Manvers, north of Nain Bay (52-10). The location is several miles from the ocean and is protected from wave action by a narrow inlet. The coarse sediment indicates that considerable water moves between Webb Bay, 12 miles farther inland, and the sea through Port Manvers Run.

A few samples were collected near the Okak Islands and Cod Island. The sediments are mostly sand; sorting is fair to poor (σ_ϕ: 1.76 to 2.89). Except for samples 52-13, 52-22 and 52-18, the positions are well exposed to the ocean. Samples 52-13 and 52-22 are sand although they were collected in the narrow inlet between the Okak Islands. Clayey silt is found in Kai-Kai Inlet (52-18), the most protected of the positions in this area.

Five samples were collected in the vicinity of Hebron Fjord. Three of these samples are from the South Anchorage, one-third of the way to the head of the fjord. The deepest sample (52-14, from 27.5 meters) is a silty sand, while the shallower samples (52-15 and 16, both from 18 meters) are sandy and gravelly silts. Sorting is very poor in these samples (σ_ϕ: 3.27 to 4.59). The sediment from a depth of 13 meters at Hebron, at the seaward end of the fjord, is a silty sand and sorting is fair (σ_ϕ: 1.19). Ferdinand Inlet, an exposed bay a few miles south of Hebron Fjord, has a gravelly sand bottom (52-12). Sorting could not be determined in the analysis of this sample.

Foraminifera

The Foraminifera counted from each sample are listed in Appendix III. Butcher (1952) points out that it would be more significant to express the Foraminifera as number per unit area, but since the area sampled is not known it has been necessary to report them as number per gram of sediment. If the occurrence of a species in a sample is less than 0.1 per gram, its presence is indicated by a "P". The species have been identified principally from Cushman (1944 and 1948), Parker (1948 and 1952), Phleger (1951) and Phleger and Parker (1952).

Species: The species of Foraminifera from the BLUE DOLPHIN samples are listed below by genera in alphabetical order. The general area and range of depth in which each species was found is given. The number of Foraminifera per gram of sediment is usually small and notation is made of abundance unusual to the region. Inner Hamilton Inlet includes Goose Bay and Terrington Basin; middle Hamilton Inlet includes Lake Melville, The Backway and The Narrows; and outer Hamilton Inlet is the area seaward from The Narrows.

Ammobaculites cf. *foliaceous* (H. B. Brady). Middle Hamilton Inlet; 24 meters.

Ammodiscus cf. *catinus* Höglund. Middle Hamilton Inlet; 18 meters.

cf. *Amphicoryne falx* (Jones and Parker). Middle Hamilton Inlet; 22 meters.

Angulogerina angulosa (Williamson). Middle and outer Hamilton Inlet; 46 and 54 meters.

Astrononion stellatum Cushman and Edwards. Middle and outer Hamilton Inlet; 18 to 54 meters.

Bigenerina arctica (H. B. Brady). Nain Bay and Hebron Fjord; 18 and 22 meters.

Bolivina pseudopunctata Höglund. Port Manvers; 20 meters.

Bulimina marginata d'Orbigny. Nain Bay; 116 meters.

Cassidulina algida Cushman. Middle Hamilton Inlet; 18 meters.

Cassidulina islandica Nørvang var. *minuta* Nørvang. Outer and middle Hamilton Inlet, Cape Harrigan, Nain Bay, Port Manvers and Hebron Fjord; 11 to 116 meters.

Cassidulina laevigata d'Orbigny. Middle Hamilton Inlet; 18 meters.

Cassidulina norcrossi Cushman. Outer and middle Hamilton Inlet; 20 to 283 meters.

Cibicides cf. *concentricus* (Cushman). Middle Hamilton Inlet; 283 meters.

Cibicides lobatulus (Walker and Jacob). Outer and middle Hamilton Inlet (abundant in the vicinity of The Narrows) and Port Manvers; 18 to 283 meters. An attached form.

Cibicides pseudoungeriana (Cushman). Port Manvers; 20 meters.

Cibicides sp. Cape Harrigan; 11 meters.

Cribroelphidium bartletti (Cushman). Outer Hamilton Inlet, Nain Bay, Port Manvers and Hebron Fjord; 18 to 283 meters.

Discorbis columbiensis Cushman. Port Manvers and Hebron Fjord; 18 and 20 meters.

Discorbis sps. Middle Hamilton Inlet, Nain Bay and Hebron Fjord; 18 to 283 meters.

Eggerella advena (Cushman). Sandwich Bay (abundant), outer and middle Hamilton Inlet, Cape Harrigan (abundant), Nain Bay, Okak Islands, Cod Island (abundant) and Hebron Fjord (abundant); 5.5 to 133 meters.

Elphidiella arctica (Parker and Jones). Outer Hamilton Inlet; 46 meters.

Elphidium cf. articulatum d'Orbigny. Port Manvers; 20 meters.

Elphidium incertum (Williamson). Outer and middle Hamilton Inlet, Cape Harrigan, Nain Bay and Port Manvers; 11 to 54 meters.

Elphidium incertum (Williamson) var. clavatum Cushman. Outer and middle Hamilton Inlet, Nain Bay and Port Manvers; 18 to 283 meters.

Elphidium subarcticum Cushman. Sandwich Bay, outer and middle Hamilton Inlet, Cape Harrigan (common), Nain Bay, Port Manvers and Hebron Fjord; 5.5 to 283 meters.

Entosolenia lineata (Williamson). Middle Hamilton Inlet; 18 meters.

Eponides frigidus (Cushman). Sandwich Bay, outer and middle Hamilton Inlet, Cape Harrigan (common), Nain Bay, Port Manvers and Hebron Fjord; 11 to 283 meters.

Eponides wrightii (H. B. Brady). Middle Hamilton Inlet; 283 meters.

Globigerina inflata d'Orbigny. Nain Bay; 47.5 meters.

Globulina glacialis Cushman and Ozawa. Outer and middle Hamilton Inlet; 46 and 54 meters.

cf. Gyroidina sp. Hebron Fjord; 18 meters.

<u>Haplophragmoides</u> <u>glomeratum</u> (H. B. Brady). Outer Hamilton Inlet and Okak Islands; 5.5 and 86 meters.

<u>Haplophragmoides</u> sp. Middle Hamilton Inlet; 283 meters.

<u>Labrospira</u> <u>crassimargo</u> (Norman). Outer Hamilton Inlet, Nain Bay and Okak Islands; 5.5 to 86 meters.

<u>Labrospira</u> <u>jeffreysii</u> (Williamson). Outer Hamilton Inlet, Nain Bay and Hebron Fjord; 18 to 116 meters.

<u>Labrospira</u> sps. Middle Hamilton Inlet and Nain Bay; 82 and 164.5 meters.

<u>Lagena</u> sps. May include some <u>Entosolenia</u> sps. Outer and middle Hamilton Inlet, Cape Harrigan and Nain Bay; 46 116 meters.

<u>Miliammina</u> <u>groenlandica</u> Cushman. Nain Bay; 62 and 116 meters.

<u>Nonion</u> cf. <u>barleeanum</u> (Williamson). Outer and middle Hamilton Inlet and Nain Bay; 18 to 283 meters.

<u>Nonion</u> <u>labradoricum</u> (Dawson). Outer and middle Hamilton Inlet, Nain Bay, Port Manvers and Hebron Fjord; 18 to 86 meters.

<u>Nonion</u> <u>orbiculare</u> (H. B. Brady). Middle Hamilton Inlet; 283 meters.

<u>Nonionella</u> <u>atlantica</u> Cushman. Outer and middle Hamilton Inlet and Nain Bay; 20 to 57 meters.

<u>Patellina</u> <u>corrugata</u> Williamson. Middle Hamilton Inlet; 18 meters.

<u>Proteonina</u> <u>atlantica</u> Cushman. Outer and inner Hamilton Inlet; 46 to 86 meters.

cf. <u>Psammosphaera</u> <u>fusca</u> F. E. Schulze. Port Manvers; 20 meters.

<u>Pseudopolymorphina</u> <u>curta</u> Cushman and Ozawa. Middle Hamilton Inlet; 18 meters.

<u>Pulleniatina</u> <u>obliquiloculata</u> (Parker and Jones). Nain Bay; 11 meters.

<u>Pyrulina</u> <u>cylindroides</u> (Roemer). Nain Bay, 57 meters.

<u>Reophax</u> <u>arctica</u> H. B. Brady. Sandwich Bay and Ferdinand Inlet; 5.5 and 18 meters.

Reophax curtus Cushman. Outer Hamilton Inlet and Nain Bay; 46 to 116 meters.

Reophax sps. Middle Hamilton Inlet and Nain Bay; 62 and 91 meters.

cf. Sphaeroidina sp. Port Manvers; 20 meters.

Spiroplectammina biformis (Parker and Jones). Sandwich Bay, middle Hamilton Inlet and Nain Bay; 5.5 to 164.5 meters.

Spiroplectammina typica Lacroix. Middle Hamilton Inlet; 22 meters.

Textularia tenuissima Earland. Middle Hamilton Inlet and Nain Bay; 11 to 283 meters.

Textularia torquata Phleger and Parker. Nain Bay and Hebron Fjord; 18 to 62 meters.

Trochammina inflata (Montagu). Middle Hamilton Inlet; 22 meters.

Trochammina macrescens H. B. Brady. Middle Hamilton Inlet and Nain Bay; 62 and 91 meters.

Trochammina quadriloba Höglund. Nain Bay and Hebron Fjord; 18 to 116 meters.

Trochammina rotaliformis Wright. Okak Islands; 5.5 meters.

Trochammina squamata Parker and Jones. Nain Bay and Port Manvers; 20 to 82 meters.

Virgulina sp. Middle Hamilton Inlet; 54 meters.

Distribution of species: Several species are apparently restricted to single localities along the Labrador coast but most of these species are infrequent even in their restricted areas. None are abundant. Butcher (1952) listed species which appeared to be restricted either to Hamilton Inlet or to Nain Bay. Several of these were found in other areas when the 1952 samples were studied. They include Cibicides lobatulus (Walker and Jacob), Elphidium incertum (Williamson), Nonion labradoricum (Dawson), Textularia tenuissima Earland and Trochammina quadriloba Höglund. It is possible that many of these less common forms will be found at other localities in the region when more samples have been collected.

Eggerella advena Cushman is by far the most common species present in the samples and is found in the greatest number of locations. It appears to be absent only from the Hawke Bay (where no Foraminifera were found) and Goose Bay areas . *Elphidium subarcticum* Cushman and *Eponides frigidus* (Cushman) are correspondingly ubiquitous in their distribution, although they are found in lesser numbers than *Eggerella advena*. One other species with a relatively wide distribution is *Nonion labradoricum* (Dawson). It has been identified in samples from Hamilton Inlet exclusive of Goose Bay, in Nain Bay, at Port Manvers and in Hebron Fjord. This form is not common in any of the samples and, with more intensive sampling, may eventually be found in other areas. *Cibicides lobatulus* (Walker and Jacob) has a more limited distribution though it sometimes occurs in relatively high concentrations. It is found only in outer Hamilton Inlet, Lake Melville and at Port Manvers (rare).

No definite relationship has been observed between depth of water and species distribution. In general, there seems to be no correlation between bottom type and the distribution of the benthonic forms although it is noted that *Cibicides lobatulus*, an attached form, is found almost exclusively in areas of gravel or gravelly sand. Probably the few individuals found in finer sediments (51-1 and 17) are dead tests carried in from other areas, because there would be no solid attachment for living individuals in such an environment. *Reophax arctica* H. B. Brady, an arenaceous form, is found only off Sandwich Bay (52-31) and in Ferdinand Inlet (52-12). The bottom at both locations is sandy but both locations are also open to the ocean. It is hard to determine whether bottom type, hydrographic conditions, or other factors such as food and light exert the controlling influence in the distribution of this species.

No Foraminifera were found at Eagle Cove in Hawke Bay (52-32); at Ice Tickle in outer Hamilton Inlet (52-30); at Mulligan Bay in Lake Melville (52-8); in Goose Bay at 51-3 and 51-4; at Hopedale Harbor (52-27); at Windy Tickle, Cape Harrigan (52-26); at Kai-Kai Inlet and Sutherland Inlet, Cod Island (52-18, 19 and 20); or at Hebron (52-11). The water in the vicinity of these samples, except at Goose Bay, is not likely to be too fresh for all Foraminifera, nor does the bottom water appear to be stagnant except possibly at Eagle Cove and Kai-Kai Inlet. The sediment types range from clayey silt to gravel. Future study and additional sampling may eventually provide the explanation for the lack of Foraminifera in the samples from these areas.

Planktonic Foraminifera have been found only in two samples, both from the Nain area (51-7 and 52-25). *Pulleniatina obliquiloculata* (Parker and Jones) was found at the head of Nain Bay, and *Globigerina inflata* d'Orbigny was found in the small embayment at the north side of Anaktalik Bay. Both are infrequent.

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Appendix I

LOCATION OF SAMPLES

Sample No.	Depth (m)	Sampler	Latitude (N)	Longitude (W)
51-1	84	snapper	53-30.8	59-59.6
51-2	51	"	53-22.7	60-13.7
51-3	11	"	53-26.4	59-58.5
51-4	13	"	53-21.1	60-21.5
51-5	20	"	54-12.8	58-14.5
51-7	11	"	Head of	Nain Bay
51-8	57	"	56-36.4	62-06.7
51-9	116	"	56-33.8	61-38.3
51-10	77	"	56-36.0	61-57.2
51-11	62	"	56-35.2	61-49.9
51-12	46	"	54-17.6	57-57.6
51-13	46	"	54-16.0	57-56.9
51-14	86	"	54-14.7	57-56.2
51-15	54	"	54-07.5	58-28.5
51-16	35	"	54-05.0	58-34.0
51-17	91	"	54-00.0	58-43.0
52-1	11	anchor	53-50.8	56-59.2
52-2	15	"	54-13.7	58-07.2
52-3	18	"	54-56.1	58-19.7
52-4	22	"	54-06.2	57-59.0
52-5	164.5	corer	54-05.2	57-54.1
52-6	283	"	54-02.2	58-34.1
52-7	24	anchor	53-54.8	58-55-4
52-8	24	"	53-49.4	59-52.4
52-9	11	"	55-51.5	60-45.0
52-10	20	"	56-57.7	61-31.6
52-11	13	"	58-12.6	62-37.4
52-12	18	snapper	58-04.8	62-24.6
52-13	5.5	trawl	57-29.5	61-48.3
52-14	27.5	snapper	58-07.6	62-49.1
52-15	18	"	58-07.3	62-49.7
52-16	18	"	58-07.6	62-49.7
52-17	29	anchor	57-44.6	62-00.5
52-18	159	snapper	57-51.0	62-07.0
52-19	22	"	57-45.6	61-50.5
52-20	24	"	57-45.2	61-51.7
52-21	20	"	57-40.8	61-56.6
52-22	133	anchor	57-29.5	61-48.3
52-23	62	corer	56-36.4	62-06.6
52-24	82	"	56-36.0	61-57.1
52-25	47.5	snapper	56-31.1	62-00.1
52-26	13	anchor	55-47.3	60-20.9
52-27	11	"	55-25.6	60-12.4
52-28	11	"	54-27.4	57-12.6

Appendix I (cont'd.)

Sample No.	Depth (m)	Sampler	Latitude (N)	Longitude (W)
52-29	22	anchor	53-43.4	59-01.2
52-30	9	"	54-28.4	57-15.1
52-31	5.5	"	53-51.7	56-59.3
52-32	13	"	53-01.4	55-48.7
52-33	164.5	corer	54-05.2	57-54.1
52-34	62	"	56-36.4	62-06.6
52-35	82	"	56-36.0	61-57.1

Appendix II. Statistical Characteristics of Bottom Sediments, Labrador 1951-52

Area	Sample No.	Depth (m)	Md (mm)	Mdϕ	$\sigma\phi$	Sϕ	Kϕ	Type
Hawke Bay	52-32	13	0.023	5.42	1.90	0.32	0.74	sandy, clayey silt
Sandwich Bay	52-1	11	0.083	3.60	1.50	-0.22	--	silty sand
	52-31	5.5	0.063	3.98	1.09	0.16	2.16	silty sand
Outer Hamilton Inlet	52-28	11	0.094	3.42	0.76	-0.05	0.97	silty sand
	52-30	9	0.073	3.78	2.08	0.29	1.23	clayey, silty sand
	51-12	46	0.157	2.67	--	--	--	silty, gravelly sand
	51-13	46	--	--	--	--	--	invertebrate remains
	51-14	86	0.029	5.10	2.99	0.16	0.40	clayey, sandy silt
	52-2	15	0.115	3.11	1.03	0.16	2.77	silty sand
	51-5	20	1.470	-0.59	--	--	--	silty, sandy gravel
Lake Melville	51-15	54	0.285	1.81	3.49	0.89	--	silty, gravelly sand
	51-16	35	--	--	--	--	--	pebble and shell
	52-6	283	0.852	0.23	--	--	--	clayey, silty, sandy gravel
	52-5	164.5	0.015	6.03	2.20	0.34	--	clayey silt
	52-33	164.5	0.015	6.10	2.13	0.31	--	clayey silt

Appendix II (cont'd.)

Area	Sample No.	Depth (m)	Md (mm)	Mdϕ	$\sigma\phi$	Sϕ	Kϕ	Type
	52-4	22	0.024	5.40	2.01	0.63	1.08	sandy, clayey silt
	52-3	18	0.201	2.32	2.30	0.83	--	gravelly silty sand
Lake	51-17	91	0.009	6.69	2.70	0.15	0.21	clayey silt
Melville	52-7	24	0.039	4.70	4.84	0.07	--	clayey, silty sand
(cont'd.)	52-29	22	0.004	7.84	2.44	0.22	--	clayey silt
	52-8	24	0.087	3.53	0.76	0.33	3.33	silty sand
	51-1	84	0.005	7.65	2.48	-0.28	--	clayey silt
	51-3	11	1.000	0.00	--	--	--	sandy gravel
Goose	51-2	51	0.009	7.80	1.94	0.07	0.67	clayey silt
Bay	51-4	13	0.092	3.45	1.31	0.49	1.46	silty sand
	52-27	11	0.102	3.30	1.96	-0.24	--	gravelly, silty sand
Cape	52-26	13	0.096	3.38	1.80	0.12	1.92	silty sand
Harrigan	52-9	11	0.344	1.54	3.27	0.33	0.70	gravelly, silty sand
Nain	52-24	82	0.011	6.47	1.78	0.24	--	clayey silt
Bay	52-35	82	0.009	6.78	1.81	0.12	0.68	clayey silt

Appendix II (cont'd.)

Area	Sample No.	Depth (m)	Md (mm)	Mdϕ	σ_ϕ	Sϕ	Kϕ	Type
Nain Bay (cont'd.)	51-9	116	0.052	4.45	2.12	0.62	0.89	clayey, sandy silt
	51-11	62	0.019	5.73	2.10	0.32	0.79	clayey silt
	52-25	47.5	0.004	8.03	2.53	0.14	--	silty clay
	52-23	62	0.013	6.32	1.90	0.21	--	clayey silt
	52-34	62	0.011	6.48	1.74	0.20	0.64	clayey silt
	51-10	77	0.009	6.77	2.31	0.20	--	clayey silt
	51-8	57	0.010	6.78	2.58	0.36	0.60	clayey silt
	51-7	11	0.049	4.35	1.88	0.39	1.11	sandy silt
Port Manvers	52-10	20	0.483	1.05	--	--	--	gravelly sand
Okak Islands and Cod Island	52-13	5.5	0.099	3.33	2.13	0.22	1.61	silty sand
	52-22	133	0.081	3.62	1.76	0.15	1.66	silty sand
	52-21	20	0.071	3.82	1.32	-0.18	1.79	silty sand
	52-17	29	1.240	3.01	--	--	--	gravelly, silty sand
	52-19	22	>4	<-2	--	--	--	gravel
	52-20	24	0.110	3.18	2.23	0.03	--	clayey, gravelly, sandy silt
	52-18	159	0.007	7.24	2.89	0.19	--	clayey silt

Appendix II (cont'd.)

Area	Sample No.	Depth (m)	Md (mm)	Mdϕ	$\sigma\phi$	Sϕ	Kϕ	Type
Ferdinand Inlet	52-12	18	0.335	1.58	--	--	--	gravelly sand
	52-11	13	0.105	3.26	1.19	0.36	1.52	silty sand
Hebron	52-14	27.5	0.203	2.30	3.27	0.31	0.67	silty sand
Fjord	52-15	18	0.051	4.29	4.59	0.24	--	clayey, gravelly, sandy silt
	52-16	18	0.047	4.41	3.39	-0.36	--	clayey, gravelly, sandy silt

LOCALITY	HAWKE BAY	SANDWICH BAY		OUTER HAMILTON INLET							LAKE MELVILLE AREA						
SAMPLE	52-32	52-1	52-31	52-28	52-30	51-12	51-13	51-14	52-2	51-5	51-15	51-16	52-6	52-5	52-33	52-4	52-3
DEPTH IN METERS	13	11	5.5	11	9	46	46	96	15	20	54	35	283	164.5	164.5	22	18
TOTAL PLANKTONIC POP.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
GLOBIGERINA INFLATA																	
PULLENIATINA OBLIQUILOCULATA																	
TOTAL BENTHONIC POP.	0	10	97	6	0	8	34	1	2	1	32	1	38	8	10	1	58
AMMOBACULITES CF. FOLIACEOUS																	
AMMODISCUS CF. CATINUS																	P
CF. AMPHICORYNE FALX																	
ANGULOGERINA ANGULOSA						.2					.1						
ASTRONONION STELLATUM						.2					.2						2
BIGENERINA ARCTICA																	
BOLIVINA PSEUDOPUNCTATA																	
BULIMINA MARGINATA																	
CASSIDULINA ALGIDA																	4
C. ISLANDICA VAR. MINUTA						.1					.1						
C. LAEVIGATA																	6
C. NORCROSSI						1				.2	3		9				
CIBICIDES CF. CONCENTRICUS													1				
C. LOBATULUS						.8	33			.3	20		8				12
C. PSEUDOUNGERIANA																	
C. SP.																	
CRIBROELPHIDIUM BARTLETTI						.1											
DISCORBIS COLUMBIENSIS																	
D. SPS.													1				2
EGGERELLA ADVENA		7	76	6		2		.7	2	P	.2						
ELPHIDIELLA ARTICA						.2	1										
ELPHIDIUM CF. ARTICULATUM																	
E. INCERTUM						.6					.5	1					
E. INCERTUM VAR. CLAVATUM						.2				.3	2		5				7
E. SUBARCTICUM		2	7			1				.3	2		1				8
E. SPS.																	1
ENTOSOLENIA LINEATA																	1
EPONIDES FRIGIDUS		1				.3				.1	2		2				5
E. WRIGHTII													1				
E. SPS.																	1
GLOBULINA GLACIALIS						.1					.2						
CF. GYROIDINA SP.																	
HAPLOPHRAGMOIDES GLOMERATUM								.1									
H. SP.													6				
LABROSPIRA CRASSIMARGO						P		.2									
L. JEFFREYSII						P											
L. SPS.															1		
LAGENA SPS.						.1					1						
MILIAMMINA GROENLANDICA																	
NONION CF. BARLEEANUM						.7					.5		1				1
N. LABRADORICUM						.3		.1		P	.6						4
N. ORBICULARE													1				
N. SPS.													1				
NONIONELLA ATLANTICA										P	.1						
PATELLINA CORRUGATA																	2
PROTEONINA ATLANTICA						1		.1									
CF. PSAMMOSPHAERA FUSCA																	
PSEUDOPOLYMORPHINA CURTA																	1
PYRULINA CYLINDROIDES																	
REOPHAX ARCTICA			7														
R. CURTUS						P											
R. SPS.																	
CF. SPHAEROIDINA SP.																	
SPIROPLECTAMMINA BIFORMIS			7												1		
S. TYPICA																.6	
TEXTULARIA TENUISSIMA													1	8	8		
T. TORQUATA																	
TROCHAMMINA INFLATA																.6	
T. MACRESCENS																	
T. QUADRILOBA																	
T. ROTALIFORMIS																	
T. SQUAMATA																	
T. SPS.																	
VIRGULINA SP.											.1						

LOCALITY	LAKE MELVILLE AREA					GOOSE BAY AREA			CAPE HARRIGAN AREA			NAIN BAY					
SAMPLE	51-17	52-7	52-29	52-8	51-1	51-3	51-2	51-4	52-27	52-26	52-9	52-24	52-35	51-9	51-11	52-25	52-23
DEPTH IN METERS	91	24	22	24	84	11	15	13	11	13	11	82	82	116	62	47.5	62
TOTAL PLANKTONIC POP.	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	.1	0
GLOBIGERINA INFLATA																.1	
PULLENIATINA OBLIQUILOCULATA																	
TOTAL BENTHONIC POP.	2	2	.4	0	1	0	.1	0	0	0	88	6	3	6	2	4	8
AMMOBACULITES CF. FOLIACEOUS		1															
AMMODISCUS CF. CATINUS																	
CF. AMPHICORYNE FALX			.1														
ANGULOGERINA ANGULOSA																	
ASTRONONION STELLATUM																	
BIGENERINA ARCTICA												1					
BOLIVINA PSEUDOPUNCTATA																	
BULIMINA MARGINATA														P			
CASSIDULINA ALGIDA																	
C. ISLANDICA VAR. MINUTA											7			P		.1	
C. LAEVIGATA																	
C. NORCROSSI	1																
CIBICIDES CF. CONCENTRICUS																	
C. LOBATULUS	.2				.1												
C. PSEUDOUNGERIANA																	
C. SP.											4						
CRIBROELPHIDIUM BARTLETTI														.2			
DISCORBIS COLUMBIENSIS																	
D. SPS.																	.9
EGGERELLA ADVENA											44	2	2	4	1	.9	4
ELPHIDIELLA ARTICA																	
ELPHIDIUM CF. ARTICULATUM																	
E. INCERTUM											7					1.3	
E. INCERTUM VAR. CLAVATUM														4			
E. SUBARCTICUM	.2				.1						11			2		.7	
E. SPS.			.1													.1	
ENTOSOLENIA LINEATA																	
EPONIDES FRIGIDUS		.6									11			.3			
E. WRIGHTII																	
E. SPS.																	
GLOBULINA GLACIALIS																	
CF. GYROIDINA SP.																	
HAPLOPHRAGMOIDES GLOMERATUM																	
H. SP.																	
LABROSPIRA CRASSIMARGO															.1	.8	
L. JEFFREYSII														.3			.9
L. SPS.													.2				
LAGENA SPS.	.1										4			P			
MILIAMMINA GROENLANDICA														P	.1		
NONION CF. BARLEEANUM					.1												
N. LABRADORICUM																.4	
N. ORBICULARE																	
N. SPS.																	
NONIONELLA ATLANTICA																	
PATELLINA CORRUGATA																	
PROTEONINA ATLANTICA							.1										
CF. PSAMMOSPHAERA FUSCA																	
PSEUDOPOLYMORPHINA CURTA																	
PYRULINA CYLINDROIDES																	
REOPHAX ARCTICA																	
R. CURTUS														.1	.3		
R. SPS.	.2																9
CF. SPHAEROIDINA SP.																	
SPIROPLECTAMMINA BIFORMIS			.2		.8										.1		
S. TYPICA																	
TEXTULARIA TENUISSIMA																	
T. TORQUATA																.1	
TROCHAMMINA INFLATA																	
T. MACRESCENS	.1														.1		
T. QUADRILOBA														.1			
T. ROTALIFORMIS																	
T. SQUAMATA												3					.9
T. SPS.													.4				.9
VIRGULINA SP.																	

LOCALITY	NAIN BAY				PORT MANVERS	OKAK ISLANDS		COD ISLAND AREA					FERDINAND INLET	HEBRON FJORD			
SAMPLE	52-34	51-10	51-8	51-7	52-10	52-13	52-22	52-21	52-17	52-19	52-20	52-18	52-12	52-11	52-14	52-15	52-16
DEPTH IN METERS	62	77	57	11	20	5.5	133	20	29	22	24	159	18	13	27.5	18	18
TOTAL PLANKTONIC POP.	0	0	0	.1	0	0	0	0	0	0	0	0	0	0	0	0	0
GLOBIGERINA INFLATA																	
PULLENIATINA OBLIQUILOCULATA				.1													
TOTAL BENTHONIC POP.	8	1	2	1	33	20	8	13	16	0	0	0	6	0	19	40	28
AMMOBACULITES CF. FOLIACEOUS																	
AMMODISCUS CF. CATINUS																	
CF. AMPHICORYNE FALX																	
ANGULOGERINA ANGULOSA																	
ASTRONONION STELLATUM																	
BIGENERINA ARCTICA																3	3
BOLIVINA PSEUDOPUNCTATA					.8												
BULIMINA MARGINATA																	
CASSIDULINA ALGIDA																	
C. ISLANDICA VAR. MINUTA					3											6	
C. LAEVIGATA																	
C. NORCROSSI																	
CIBICIDES CF. CONCENTRICUS																	
C. LOBATULUS					.8												
C. PSEUDOUNGERIANA					2												
C. SP.																	
CRIBROELPHIDIUM BARTLETTI					.8											2	
DISCORBIS COLUMBIENSIS					.8											2	
D. SPS.															2		
EGGERELLA ADVENA	6	9	1	1	.8	5	8	13	16						8	11	21
ELPHIDIELLA ARTICA																	
ELPHIDIUM CF. ARTICULATUM					.8												
E. INCERTUM					2												
E. INCERTUM VAR. CLAVATUM					4												
E. SUBARCTICUM			.3		5											3	
E. SPS.					2												
ENTOSOLENIA LINEATA																	
EPONIDES FRIGIDUS			.1		5										2	2	
E. WRIGHTII																	
E. SPS.																	
GLOBULINA GLACIALIS																	
CF. GYROIDINA SP.																1	
HAPLOPHRAGMOIDES GLOMERATUM						5											
H. SP.																	
LABROSPIRA CRASSIMARGO		.1				5											
L. JEFFREYSII		.1	.1														1
L. SPS.																	
LAGENA SPS.	7																
MILIAMMINA GROENLANDICA																	
NONION CF. BARLEEANUM			.2														
N. LABRADORICUM					.8										2	3	
N. ORBICULARE																	
N. SPS.					.8											1	
NONIONELLA ATLANTICA			.1														
PATELLINA CORRUGATA																	
PROTEONINA ATLANTICA																	
CF. PSAMMOSPHAERA FUSCA					.8												
PSEUDOPOLYMORPHINA CURTA																	
PYRULINA CYLINDROIDES			.1														
REOPHAX ARCTICA													6				
R. CURTUS																	
R. SPS.																	
CF. SPHAEROIDINA SP.					.8												
SPIROPLECTAMMINA BIFORMIS	.7	.1															
S. TYPICA																	
TEXTULARIA TENUISSIMA		.1		.1													
T. TORQUATA	.7															2	3
TROCHAMMINA INFLATA																	
T. MACRESCENS																	
T. QUADRILOBA																2	
T. ROTALIFORMIS						5											
T. SQUAMATA					2												
T. SPS.															5		
VIRGULINA SP.																	

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