

# FORAMINIFERA FROM THE EASTERN PART OF LÜTZOW-HOLM BAY, ANTARCTICA

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**Abstract:** In this article, the authors deal with the foraminiferal fauna obtained from the bottom surface samples at 15 stations and those from the cores at 4 stations in the eastern part of Lützow-Holm Bay, Antarctica, during the 15th Japanese Antarctic Research Expedition, 1973–1975. The sediment samples were taken at depths ranging from 8 to 644 m. The distribution of the fauna and its characteristics are discussed oceanologically and biostratigraphically.

## 1. Introduction

The studies on the distribution and the ecology of the recent foraminifera in the surrounding seas of Antarctica had been carried out by many authors such as HERON-ALLEN and EARLAND (1922), UCHIO (1960), BANDY and ECHOLS (1964) and KENNETT (1968).

Recently, the present authors had the opportunity to examine the foraminiferal assemblages in the marine sediments collected by Mr. Kiichi MORIWAKI of the National Institute of Polar Research, Japan, during the 15th Japanese Antarctic Research Expedition, 1973–1975, from the eastern part of Lützow-Holm Bay. This work was carried out as a part of the project under the National Institute of Polar Research, Japan–Hiroshima University Cooperative Science Program, entitled “Study of the submarine topography, geology and marine sediments in Lützow-Holm Bay, Antarctica”. The submarine topography of the same region was already reported by MORIWAKI (1975).

## 2. Locations and Samples

The locations of these samples are shown in Figs. 1 and 2, and listed in Table 1. The water depth is based on a chart by MORIWAKI (1975). The samples of the marine sediments were accompanied by data on location and water depth but not by oceanographic data such as bottom temperature and salinity. Sampling of the bottom sediments was attempted at 19 stations with a short gravity corer, and 4 core samples of mud were obtained. The authors regarded the samples from 15 stations, where

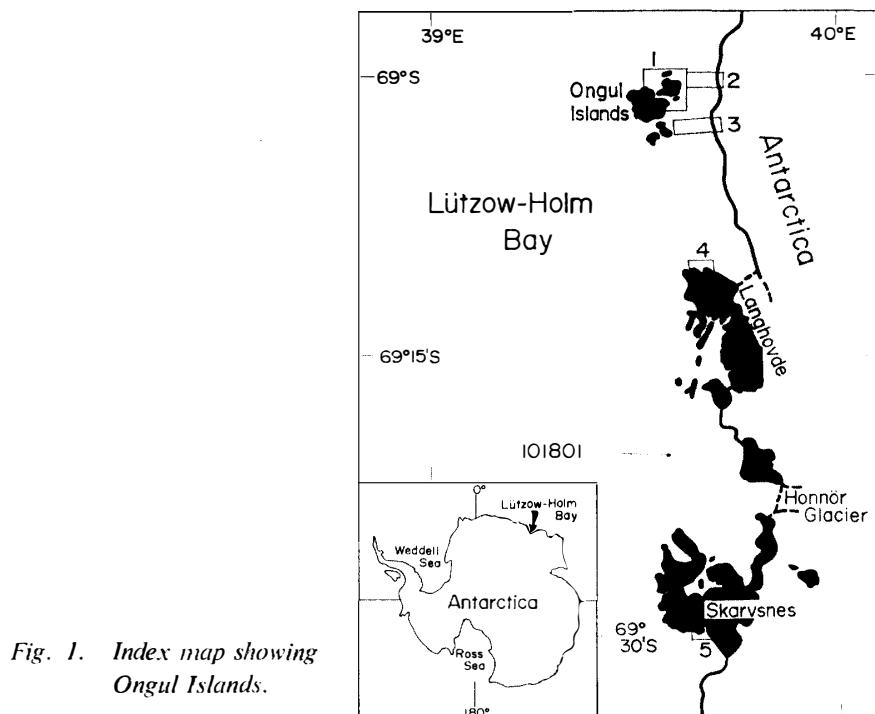


Fig. 1. Index map showing Ongul Islands.

Table 1. Samples in the eastern part of Lützow-Holm Bay.

Station number	Locality	Depth (m)	Remarks
40401	Nishi-no-ura Cove	33	Small amount of mud
81301	Nishi-no-ura Cove	50	Very small amount of mud
81303	West of East Ongul Island	32	Very small amount of mud and sand
81401	West of East Ongul Island	81	Very small amount of mud and sand
81402	East of Hiyoko Island	62	Very small amount of mud and sand
82201	North of Naka-no-seto	24	Very small amount of sand
82202	North of Naka-no-seto	66	Very small amount of mud
82401	North-east of Hiyoko Island	91	Small amount of mud and sand
82601	West of Nesöya	87	Small amount of mud
82602	East of Ondori Island	112	Small amount of mud
82603	North-east of Ondori Island	163	Small amount of mud
82701	North of West Ongul Island	8	Very small amount of sand
82801	North of West Ongul Island	17	Very small amount of sand
82802	South of Ondori Island	67	20 cm core of mud
100601	Kominato Inlet, Langhovde	58	50 cm core of mud
101601	Southern inlet of Mt. Suribati	14	Small amount of mud
101801	Off Honnör Glacier	641	40 cm core of mud
110501	Ongul Channel	644	80 cm core of mud
110704	Ongul Channel	373	Small amount of mud

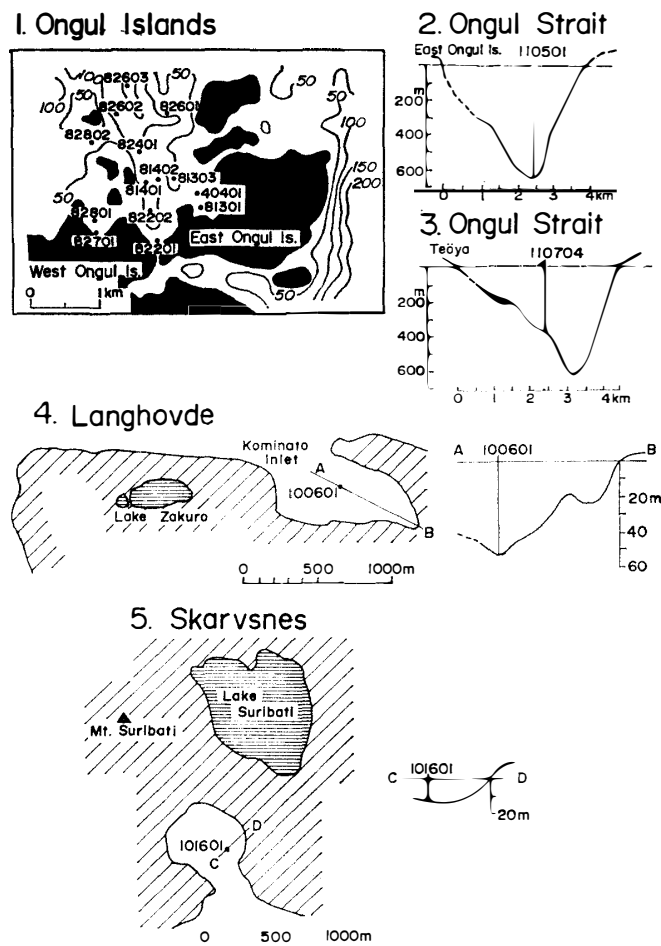


Fig. 2. Locations of stations where sediment samples analyzed were collected.

only a small amount of sediments were collected, as the samples from the sea floor surface.

For the foraminiferal study about 10 g of sediments were taken from the bottom surface samples. In the case of the core samples 1 cm thick portions of the core sediments were picked out at 10 cm intervals for Stations 100601 and 110501. The cores of Stations 82802 and 101801 were sampled at two horizons, top and bottom of the cores.

5 g of dry samples of the sediments, except 2.5 g for Station 82401, were processed by the naphtha method as follows:

1. Put the samples into evaporating dishes, and dry them in an oven.
2. After about 12 hours, weigh the samples (5 or 2.5 g).
3. Pour naphtha into the dish and let the sediment fragments repose for about 30 minutes.

4. After taking off excessive naphtha, pour boiling water into the dish and then heat it for about 30 minutes.

5. Wash the material using a sieve of 63 microns mesh.

After the samples had been treated with the process mentioned above, all the foraminiferal tests from each sample were identified and the foraminiferal population was determined.

### 3. Foraminiferal Assemblages

The samples examined are from the bottom surface at 15 stations (depth 8–373m) and from 18 horizons of the cores at 4 stations (depth 58–644 m). Of these samples, three bottom samples and one horizon yielded no foraminifera unfortunately.

The specific names and individual numbers of the foraminifera are shown in Tables 2 and 3, respectively.

#### 3.1. Foraminifera from the bottom surface samples

The foraminiferal assemblages consist of 51 species and indetermined species belonging to 30 genera (Table 2). The percentage of the arenaceous forms derived from Table 2 is shown in Fig. 3.

From Table 2 and Fig. 3, it is noticed that the arenaceous forms at most stations are dominant in the number of individuals, although the number of species is rather small in comparison with the calcareous forms.

From the specific composition, two characteristic assemblages, Types A and B, are discriminated (Fig. 4). Type A is represented by the fauna at Stations 82201 and 82701, which is characterized by the dominance of *Trochammina conica*. This type is distributed from the littoral zone to the depths shallower than 30 m. Type B is

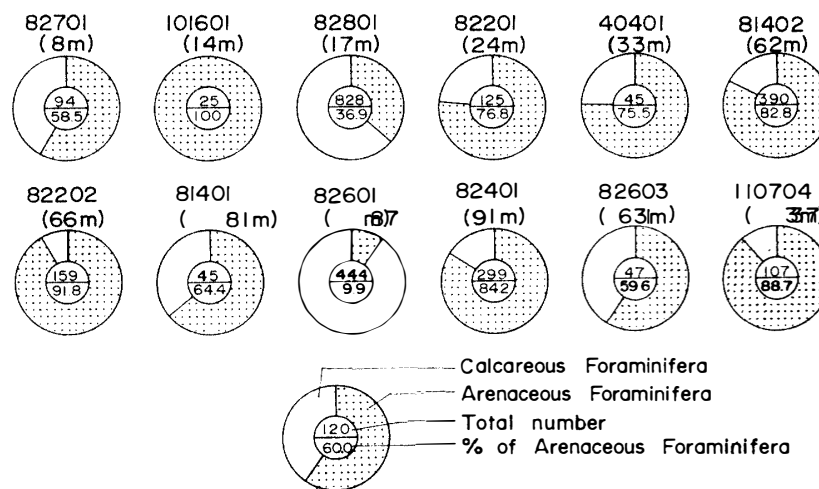
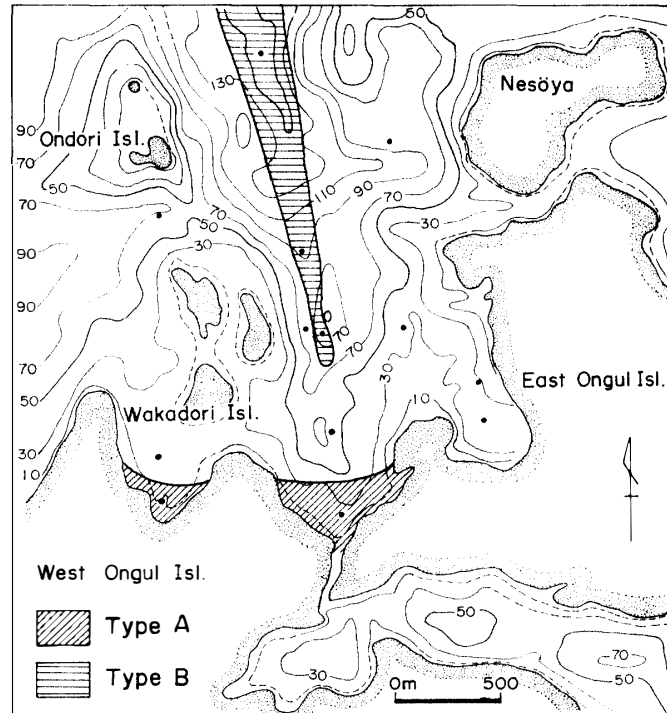


Fig. 3. Faunal composition in the bottom surface sample.

Table 2. Foraminifera from the bottom surface samples.

Station number	40401	81401	81402	82201	82202	82401	82601	82603	82701	82801	101601	110704
Depth (m)	33	81	62	24	66	91	87	163	8	17	14	373
Mud ratio (%)	34	46	74	14	54	42	82	82	20	52	36	96
<i>Rhabdammina</i> sp.			1			3						
<i>Hyperammina</i> sp. A												4
<i>H.</i> sp. B						2						
<i>Ammodiscus</i> cf. <i>gullumarensis</i> HÖGLUND		1	8	6		6	4			8		1
<i>Reophax guttifer</i> BRADY			2	1		5						8
<i>R. scorpiurus</i> MONTFORT			2		2	3						
<i>R.</i> sp.			1									3
<i>Haplophragmoides bradyi</i> (ROBERTSON)			35	11	7	23	4	1	9	10	2	9
<i>Textularia earlandi</i> PARKER			1			1						1
<i>T.</i> cf. <i>torquata</i> PARKER		9	49	2	29	62		5		11		9
<i>Trochammina conica</i> (EARLAND)	19	8	74	63	68	64		10	36	220	20	17
<i>T. globulosa</i> (CUSHMAN)			13			1						2
<i>T. pacifica</i> CUSHMAN	18	11	121	12	31	47		10	10	54	3	6
<i>T.</i> sp. A			1			3						2
<i>T.</i> sp. B												13
<i>Eggerella bradyi</i> (CUSHMAN)						4		1		3		10
<i>E.</i> cf. <i>bradyi</i> (CUSHMAN)				1	5	14						10
<i>E.</i> sp.			15		4	14	36	1				
<i>Quinqueloculina elongata</i> NATLAND					1						7	1
<i>Q. seminulum</i> (LINNÉ)		2	5	10	4	7		3	1			6
<i>Q. vulgaris</i> D'ORBIGNY			2	1				1				5
<i>Triloculina</i> sp.					1		4				3	
<i>Dentalina ittai</i> LOEBLICH & TAPPAN							8					
<i>Lagena distoma</i> PARKER & JONES						1						
<i>Marginulina</i> cf. <i>glabra</i> D'ORBIGNY							4				5	
<i>Fissurina semimarginata</i> (REUSS)											4	
<i>Islandiella</i> sp.									1		38	
<i>Cassidulinoides</i> sp. A			6						6	182		
<i>C.</i> sp. B				1		1			4	16		
<i>Trifarina angulosa</i> (WILLIAMSON)						3	8					8
<i>Epistominella exigua</i> (BRADY)							128					28
<i>E.</i> cf. <i>exigua</i> (BRADY)							20					
<i>Rosalina</i> cf. <i>globularis</i> D'ORBIGNY			1			2						
<i>R.</i> sp.	12	13	51	15	7	25	31	15	12	61		
<i>Patellina corrugata</i> WILLIAMSON						1						8
<i>Elphidium</i> cf. <i>incertum</i> (WILLIAMSON)							7					8
<i>E.</i> cf. <i>subarcticum</i> CUSHMAN							17					5
<i>Cibicides refulgens</i> (MONTFORT)						4						
<i>C.</i> sp.											11	
<i>Fursenkoina</i> cf. <i>complanata</i> (EGGER)							5					
<i>F.</i> cf. <i>fusiiformis</i> (WILLIAMSON)									6			
<i>Cassidulina subglobosa</i> BRADY			1	2		3			9			32
<i>Ehrenbergina</i> cf. <i>glabra</i> HERON-ALLEN & EARLAND												38
<i>E.</i> cf. <i>pacifica</i> CUSHMAN										29		
<i>Florilus labradoricum</i> (DAWSON)							129					8
<i>F.</i> sp.						2						4
<i>Astrononion</i> cf. <i>stellatum</i> CUSHMAN & EDWARD			1				3					7
<i>Nonionella</i> sp.												9
<i>Nonionellina</i> sp.							6				11	
<i>Globigerina pachyderma</i> (EHRENBERG)							5					
<i>G.</i> sp.		1					25					
Total population in 5g of sediment	49	45	390	125	159	598	444	47	94	828	25	107
% of arenaceous foraminifera	75.5	64.4	82.8	76.8	91.8	84.2	95.9	59.6	58.5	36.9	100	88.7
% of planktonic foraminifera	—	2.2	—	—	—	—	6.8	—	—	—	—	—



*Type A:* Assemblage characterized by dominance of *Trochammina conica* (EARLAND).

*Type B:* Assemblage characterized by dominance of *T. conica* (EARLAND), *T. pacifica* CUSHIMAN, *Textularia cf. torquata* PARKER, *Haplophragmoides bradyi* (ROBERTSON) and *Rosalina sp.*

Fig. 4. Characteristic assemblages around Ongul Islands.

represented by the fauna at Stations 81402, 82401 and 82603. This type is characterized by the dominance of *Trochammina conica*, *T. pacifica*, *Textularia cf. torquata*, *Haplophragmoides bradyi* and *Rosalina sp.* and occupies the sea floor deeper than 50 m.

As shown in Fig. 4, the distribution pattern of Type A occupies two bay-like innermost parts along the northern side of West Ongul Island, whereas Type B is distributed along the channel between Nesöya and Ondori Islands in the NNW-SSE direction. Each faunal distribution seems to be controlled by some ecologic and submarine geologic factors peculiar to the Antarctic.

Among other stations, the fauna at Station 82601 (depth 87 m) near Nesöya Island differs from both A and B types in completely lacking the species belonging to the genera *Trochammina* and *Textularia* and, on the contrary, in bearing abundant calcareous forms such as *Epistominella exigua*, *Rosalina sp.*, *Florilus labradoricum*, etc. On the other hand, the fauna at Station 82801 (depth 17 m), which is situated on the col between West Ongul and Wakadori Islands, has a resemblance to both

Table 3. Foraminifera from the core samples.

Station number	82802		100601				101801		110501									
	0-1 cm	19-20 cm	0-1 cm	20-21 cm	30-31 cm	40-41 cm	0-1 cm	39-40 cm	0-1 cm	10-11 cm	20-21 cm	30-31 cm	40-41 cm	50-51 cm	60-61 cm	70-71 cm	79-80 cm	
Depth (m)	67		58				641		644									
Mud ratio (%)	32	32	34	16	24	34	98	98	96	98	98	96	98	92	98	98	98	
<i>Rhabdammina</i> sp.							1											
<i>Ammodiscus</i> cf. <i>gullumarensis</i> HÖGLUND		2					1											
<i>Reophax guttifer</i> BRADY							1											
<i>Haplophragmoides bradyi</i> (ROBERTSON)	1	2				1	4											
<i>Textularia earlandi</i> PARKER							1											
<i>T.</i> cf. <i>torquata</i> PARKER	2	18					6											
<i>Trochammina conica</i> (EARLAND)	6	13	17	40	17	11	14						1					
<i>T.</i> <i>globulosa</i> (CUSHMAN)	4																	
<i>T.</i> <i>pacifica</i> CUSHMAN		2	20	3			14		8	6		1						
<i>T.</i> sp. B							2		9			1						
<i>Eggerella bradyi</i> (CUSHMAN)							10					2						
<i>E.</i> cf. <i>bradyi</i>		5					2		7	1		2		1	1			
<i>E.</i> sp.		1					1											
<i>Quinqueloculina elongata</i> NATLAND								13			5	11	7	22	4	5	12	19
<i>Q.</i> <i>seminulum</i> (LINNÉ)	2	1					3		20	31	31	17	24	25	24	23	10	
<i>Q.</i> <i>vulgaris</i> D'ORBIGNY							1	1	7	2	5	10	4	5	8	12	9	
<i>Triloculina</i> sp.									2									
<i>Fissurina semimarginata</i> (REUSS)				1														
<i>Cassidulinoides</i> sp. A		25	7	23	10	14												
<i>C.</i> sp. B			1	2														
<i>Trifarina angulosa</i> (WILLIAMSON)						1												
<i>Epistominella</i> cf. <i>exigua</i> (BRADY)					1													
<i>Rosalina</i> sp.		5	6		8	14	2											
<i>Elphidium</i> cf. <i>incertum</i> (WILLIAMSON)				1														
<i>Cibicides</i> cf. <i>grossepunctatus</i> EARLAND				1														
<i>Fursenkoina</i> cf. <i>complanata</i> (EGGER)							2											
<i>F.</i> cf. <i>fusiformis</i> (WILLIAMSON)							2											
<i>Cassidulina subglobosa</i> BRADY				9	15	10												
<i>Florilus labradoricum</i> (DAWSON)							1											
<i>F.</i> sp.					1	3												
<i>Astrononion</i> cf. <i>stellatum</i> CUSHMAN & EDWARD					1		1											
<i>Nonionella</i> sp.				2	1	2		1										
<i>Nonionellina</i> sp.					1	2												
Total population in 5 g of sediment	15	74	51	83	55	63	63	15	51	47	47	38	52	36	38	47	38	
% of arenaceous foraminifera	86.6	58.1	72.5	51.8	30.9	19.0	88.8	6.6	47.0	14.9	—	10.5	3.8	5.6	2.6	—	—	

A and B types in the arenaceous forms. However, this fauna also differs from the two types in having abundant calcareous forms such as *Islandiella* sp., *Cassidulinoides* sp., *Epistominella exigua*, *Rosalina* sp., *Cibicides* sp., *Cassidulina subglobosa*, *Ehrenbergina* cf. *glabra*, *E.* cf. *pacifica*, *Nonionella* sp., etc.

### 3.2. Foraminifera from the core samples

The foraminiferal fauna obtained from the cores consists of 33 species and indetermined species belonging to 22 genera as shown in Table 3. The percentage distributions of the arenaceous and calcareous forms in each core are shown in Fig. 5.

At a glance over Table 3 and Fig. 5, some conspicuous facts are noticed in the specific composition and individual numbers. It is noteworthy that the percentage of the arenaceous forms is highest at the top horizon of each core, and gradually decreases downward.

In the case of Station 110501, the foraminifera consists mainly of 3 species belonging to the genus *Quinqueloculina*. Arenaceous forms are very poor, but their percentage slightly increases from lower stratigraphic horizon to upper one.

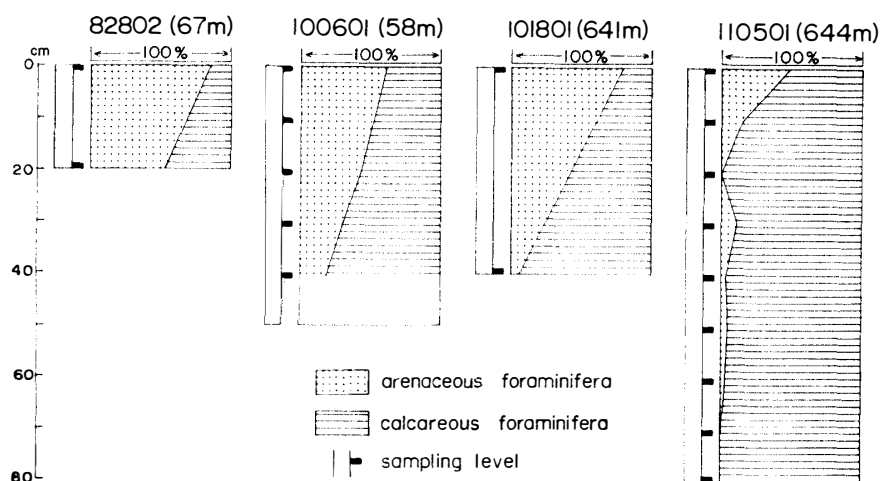


Fig. 5. Faunal composition in the core samples.

## 4. Remarks on the Distribution of the Lützow-Holm Bay Foraminifera in the Other Regions

UCHIO (1960) recorded 189 species of the recent benthonic foraminifera collected from 11 stations (depth 350–2480 m) in Lützow-Holm Bay, Antarctica, by the survey ship *SÔYA* during the 2nd Japanese Antarctic Research Expedition, 1957–1958. Of these species, the following 16 species are found among the species studied here.

*Reophax guttifer* BRADY

*R. scorpiurus* MONTFORT



*Haplophragmoides bradyi* (ROBERTSON)

*Textularia earlandi* PARKER

*Eggerella bradyi* (CUSHMAN)

*Quinqueloculina seminulum* (LINNÉ)

*Q. vulgaris* D'ORBIGNY

*Dentalina ittai* LOEBLICH and TAPPAN

*Lagena distoma* PARKER and JONES

*Marginulina* cf. *glabra* D'ORBIGNY

*Fissurina semimarginata* (REUSS)

*Trifarina angulosa* (WILLIAMSON)

*Epistominella exigua* (BRADY)

*Cibicides refulgens* (MONTFORT)

*Fursenkoina* cf. *complanata* (EGGER)

*Ehrenbergina* cf. *pacifica* CUSHMAN

BANDY and ECHOLS (1964) proposed four bathyal foraminiferal zones in the Antarctic, based on the upper depth limits of their selected 19 index species. Of these species, the following 3 index species are in common with those identified here.

*Haplophragmoides bradyi* (ROBERTSON)

*Eggerella bradyi* (CUSHMAN)

*Epistominella exigua* (BRADY)

Subsequently, KENNETT (1968) recorded the foraminifera of the Ross Sea, especially describing their ecology and distribution in detail. Of these foraminifera, the following species also occur in the present material.

*Textularia earlandi* PARKER

*Trochammina conica* EARLAND

*Eggerella* cf. *bradyi* (CUSHMAN)

*Lagena distoma* PARKER and JONES

*Fissurina semimarginata* (REUSS)

*Epistominella exigua* (BRADY)

*Rosalina* cf. *globularis* D'ORBIGNY

*Cibicides grossepunctatus* EARLAND

*C. refulgens* MONTFORT

*Globigerina pachyderma* (EHRENBERG)

## 5. Conclusion

Since the foraminiferal assemblages mentioned above are the so-called thanato-coenose and not biocoenose, it is difficult to discuss a direct relationship between them and any ecologic factors. The authors were able, however, to reveal a part of the total foraminiferal composition (living and dead tests) in the sediments on the shallow continental shelves under conditions peculiar to Antarctica.

The foraminiferal assemblages obtained from 12 bottom samples and 17 core samples, which were taken at depths ranging from 8 m to 644 m in the eastern part of Lützow-Holm Bay, Antarctica, are recorded and a stratigraphic frequency-distribution derived from the core data is indicated in the present paper.

The foraminiferal fauna of the bottom samples consists of 51 species and indetermined species belonging to 30 genera (Table 2). The fauna of the core samples consists of 33 species and indetermined species belonging to 22 genera (Table 3).

On the basis of the foraminiferal composition from each station and each horizon of cores, the distribution pattern characteristic to some species, and a biostratigraphic consideration, the authors may be able to make some concluding remarks as follows:

1) The foraminiferal composition of the bottom samples is characterized by the large number of arenaceous forms amounting to more than 70% of the total population, notwithstanding the small number of species.

2) In the surrounding seas of Ongul Islands, two characteristic assemblages are recognized. Type A is characterized by the dominant occurrence of *Trochammina conica* occupying two bay-like innermost parts along the northern side of West Ongul Island. Type B is characterized by the dominance of *T. conica*, *T. pacifica*, *Textularia* cf. *torquata* and *Rosalina* sp. This type is distributed along the channel between Nesöya and Ondori Island.

3) As to the core samples, from the stratigraphic point of view, the highest percentage of arenaceous forms is found at the top horizon of each core, and the percentage gradually decreases downward with increase of the calcareous forms.

4) The foraminiferal fauna is considerably different between Stations 110501 and 101801 in composition. The former station is characterized by the dominance of the genus *Quinqueloculina*, and the latter by the dominance of the arenaceous forms as shown in Table 3.

By comparing stratigraphic changes in the percentages of arenaceous and calcareous forms in Fig. 5, it is found that the arenaceous percentage in the uppermost horizon of Station 110501 is nearly equal to that at about 20 cm below the top of Station 101801. If these similar ratios can be correlated, it may suggest that a top part of the bottom sediments at Station 110501 was already eroded out about 20 cm in thickness so that an ancient sediment is exposed now.

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