FORAMINIFERA FROM THE RAISED BEACH DEPOSITS ON THE EAST COAST OF LÜTZOW-HOLM BAY, ANTARCTICA

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Abstract: Sediment samples collected from raised beach deposits (1.5–11.5 m a.s.l.) of East Ongul Island in Lützow-Holm Bay, Langhovde and Skarvsnes on the Sôya Coast, Antarctica, are analyzed for foraminiferal assemblages. Twenty-eight species belonging to 24 genera are identified, of which 19 species named here are newly recorded.

The assemblage characterized by the predominance of *Globocassidulina biora* (CRESPIN) and *Cassidulinoides porrectus* (HERON-ALLEN and EARLAND) suggests that the sediments of raised beaches have been originally deposited at depths shallower than 30–50 m.

1. Introduction

It is known that Pleistocene marine sediments are distributed on the raised beaches of Lützow-Holm Bay (MEGURO *et al.*, 1964; FUJIWARA, 1973; MORIWAKI, 1974, 1976; OMOTO, 1977). But the reports of foraminifera from the raised beach deposits of Antarctica are very meager; there are only two reports, one from the Vestfold Hills area on Princess Elizabeth Land (CRESPIN, 1960) and another from East Ongul Island in Lützow-Holm Bay (MEGURO *et al.*, 1964).

One of the problems concerning the raised beaches is depth at which the sediments were originally deposited. In contrast to the opinion that these sediments are of coastal origin from topographical points of view, they are considered to have been deposited on the sea floor at a depth of about 100 m from paleontological evidence, particularly of foraminiferal assemblages analyses (CRESPIN, 1960; MEGURO *et al.*, 1964; UCHIO, 1966).

Twenty sediment samples collected by Mr. H. HAYASHI of Geographical Institute, Shimane University, from several localities in East Ongul Island, Langhovde and Skarvsnes were entrusted to the author for a foraminiferal analysis, in order to decipher the paleodepth (Fig. 1 and Table 1). Among them, 12 samples yielded foraminifera, which include 28 species belonging to 24 genera (Table 2). This assemblage has some similarities to that reported by MEGURO *et al.* (1964). It is probable, however, that the raised beach deposits are of shallower origin than previously estimated.

The purpose of this study is to analyze the foraminiferal assemblage, and to comment on paleodepths based on the latest knowledge of modern distribution of Antarctic foraminifera.

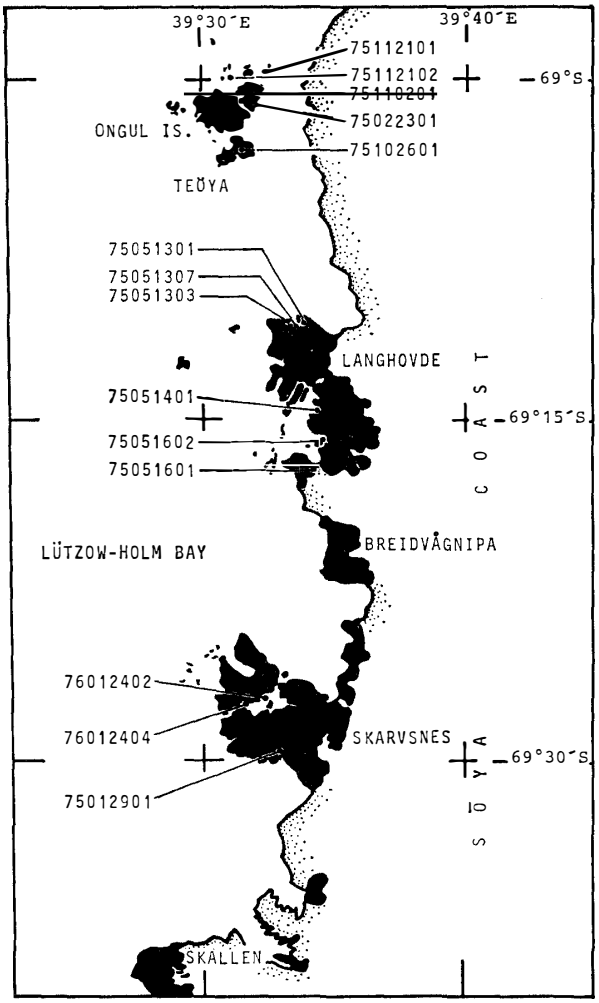

Fig. 1. Sampling localities on the eastern coast of Lützow-Holm Bay.

2. Methods

Because of the small sample size, the analyzed amount of sediments ranges from 10 to 90 g in dry weight. All samples were processed by the naphtha method (KATO and TAI, 1979) to disintegrate slightly consolidated sediments. After this method has been applied, the sediments were washed through a 200-mesh sieve (74 microns in opening) and were dried.

All foraminiferal tests were picked up directly from the dried sample. However, the samples amounting to 60 g and over were treated first with carbon tetrachloride, in which the foraminifera were floated off from the fraction. Then the specimens from each sample were identified and counted as shown in Table 2.

3. Results

The specific composition of foraminifera from the raised beach deposits at 12 localities is similar in general, but shows differences in abundance. Sample 75051307

Table 1. Samples from the raised beach deposits of the Lützow-Holm Bay.

Sample Nos.	Locality	Latitude	Longitude	Elevation (a.s.l.)	Remarks
75012901	East of Mt. Suribati, Skarvsnes	69°29.2′S	39°38.4′E	11.5 m	Sand, containing serpuloid tubes
76012402	Osen, Skarvsnes	69 27.3	39 36.3	9.3	Sand, containing molluscan shell fragments
76012404	Osen, Skarvsnes	69 14.6	39 43.0	1.5	Sand, containing molluscan shell fragments
75051301	Ko-minato Inlet, Langhovde	69 10.9	39 40.5	4.7	Coarse-grained sand
75051303	Ko-minato Inlet, Langhovde	69 10.7	39 39.4	6–7	Sand, containing molluscan shell fragments
75051307	Ko-minato Inlet, Langhovde	69 10.8	39 40.9	5–6	Sand, containing pebbles and molluscan shell fragments
75051401	Hamna Glacier, Langhovde	69 14.6	39 43.0	1.5	Coarse-grained sand
75051601	Hamna Glacier, Langhovde	69 17.1	39 42.4	2	Coarse-grained sand, containing molluscan shell fragments
75051602	South of Simo-kama, Langhovde	69 15.9	39 43.4	2–3	Coarse-grained sand, containing molluscan shell fragments
75022301	Kai-no-hama Beach, East Ongul Island	69 0.9	39 34.6	7–8	Coarse-grained sand, containing pebbles
75102601	Teöya	69 3.1	39 34.4	11.5	Sand, containing molluscan shell fragments
75110201	Kitami Beach, East Ongul Island	69 0.7	39 34.5	9	Coarse-grained sand, containing molluscan shell fragments
75112101	West of Iwa-zima Island	68 59.7	39 37.3	–31.7	Fine-grained sand, containing serpuloid tubes and echinoid spines
75112102	West of Nesöya	69 00	39 33.1	–98	Silty sand, containing sponge spicules

Table 2. Occurrence of foraminifera from the raised beach deposits.

Studied area	Skarvsnes			Langhovde						Ongul Island				
Sample number	75012901	76012402	76012404	75051301	75051303	75051307	75051401	75051601	75051602	75022301	75102601	75110201	75112101*	75112102*
Amount of sediment (g)	17	80	60	70	25	90	68	60	90	90	70	80	10	30
Elevation (m a.s.l.)	11.5	9.3	1.5	4.7	6-7	5-6	1.5	2	2-3	7-8	11.5	9	−31.7	−98
Textulariina														
Pelosphaera cornuta														13
Saccammina sphaerica														4
Glomospira sp.														5
Reophax nodulosus														4
Reophax distans gracilis														1
Reophax scorpiurus														23
Cribrostomoides jeffreysii	1												53	42
Textularia wiesneri													1	
Trochammina globulosa														10
Trochammina antarctica													52	45
Trochammina sp.													1	
Rotaliammina sp.	1						2						2	
Miliolina														
Cyclogyra involvens	12												1	3
Quinqueloculina seminula	17											8	3	
Pyrgo elongata	33												4	
Sigmoilina umbonata		1										3		
Triloculina rotunda												2		
Triloculina tricarinata	40													
Miliolinella oblonga													8	4
Miliolinella sp.													2	
Scutuloris serra	6													
Nummoloculina irregularis												1		
Lagenina														
Lagena heronalleni	8													
Lagena subarcticosta	1											1		
Lenticulina sp.													1	
Fissurina crebra													1	
Fissurina subcircularis	3													
Fissurina sp.														1
Spirillinina														
Spirillina sp.	1													
Patellina corrugata	12													
Rotaliina														
Brizalina pacifica	3												4	
Trifarina angulosa												1	39	41

Epistominella exigua													2		
Rosalina globularis	61	13											45		
Heronallenina sp.													1		
Elphidium incertum												13			
Cibicides lobatulus	10	3										12			
Cibicides refulgens	16	2	1	1			2					4	56	60	
Cassidulinoides porrectus	190								30	3	293		200	212	
Cassidulinoides parvus	7												120	20	
Globocassidulina biora	210	280	7	7	7	1	20	2	5		208		180	218	
Ehrenbergina glabra	20										67		25	25	
Hastilina sp.	1														
Astrononion antarcticus	8												7		
Nonionella bradii													4		
Pullenia subcarinata	1														
Globigerina pachyderma													25		
Globigerina sp.													30		
Total number	662	299	2	8	7	1	2	22	2	35	3	613	867	731	

* Indicating the bottom surface sediments from the Lützow-Holm Bay.

from Langhovde yields only one individual of *Globocassidulina biora*, but many taxa are found in samples 75012901 and 76012402 from Skarvsnes and in sample 75110201 from East Ongul Island, which yield 299 to 662 individuals of foraminifera. All sediment samples yielding foraminifera are coarse- or medium-grained sand, containing shell fragments of such mollusca as *Laternula elliptica* (KING and BRODERIP).

The assemblage is characterized by the following points: very abundant or common occurrences of hyaline and porcellaneous foraminifera such as Cassidulinidae (*e.g., Globocassidulina biora, Cassidulinoides porrectus, Ehrenbergina glabra*), *Cibicides refulgens, Rosalina globularis*, and Miliolidae (*e.g., Pyrgo elongata, Triloculina tricarinata*); absence or very rare occurrences of arenaceous and planktonic species (Table 2). However, such porcellaneous and hyaline forms as *Cyclogyra involvens, Pyrgo elongata, Triloculina tricarinata, Patellina corrugata*, and *Rosalina globularis* occurred only in the Skarvsnes area. On the other hand, *Elphidium incertum, Cassidulinoides porrectus*, and *Ehrenbergina glabra* tend to occur much in the Ongul Island area. It is noted that *G. biora* is very abundant in two samples (75012901 and 75110201) amounting to about 32% and 34% respectively. Overall, the assemblage from Skarvsnes and Ongul Island is well diversified as mentioned above, whereas that of Langhovde consists of only three species with less abundance. This result may be due to the state of inadequate preservation of the samples.

The following species were discriminated in the assemblage studied here: *Ehrenbergina glabra, Cassidulinoides porrectus, Astrononion antarcticus, Patellina corrugata, Cibicides refulgens, Pyrgo elongata, Cribrostomoides jeffreysii, Cyclogyra involvens, Quinqueloculina seminula, Scutuloris serra, Sigmoilina umbonata, Triloculina rotunda, T. tricarinata, Nummoloculina irregularis, Lagena heronalleni, L. subarcticosta, Fissurina subcircularis, Brizalina pacifica, Trifarina angulosa, Rosalina globularis, Elphidium incertum, Cibicides lobatulus, Cassidulinoides parvus, Globocassidulina biora*, and *Pullenia*

subcarinata. The first six of those species have already been reported by MEGURO *et al.* (1964), from some Quaternary marine sediments.

4. Discussion

In recent years, the depth distribution of foraminifera has been investigated in the seas of Antarctica. In the Ross Sea, KENNETT (1968) recognized the depth of CCD (Carbonate Compensation Depth) at depths of 500–550 m, on the basis of evidence that calcareous foraminifera are mostly restricted to depths shallower than 550 m. Similarly the differentiation of calcareous from arenaceous faunas has been also recognized, as the effect of the CCD by FILLON (1974, 1975) and ANDERSON (1975), in the Ross Sea and the Weddell Sea, respectively. On the other hand, depth zonation of foraminifera in the seas of Antarctica is considered to be very difficult to recognize because of bathymetric irregularity (OSTERMAN and KELLOGG, 1979). MILAM and ANDERSON (1981) stressed that foraminiferal distribution depends on a variety of parameters such as water depth, water mass properties and substrata conditions.

In estimating paleodepths, therefore, they should be inferred from the properties of Antarctic water mass and substrata. In this respect, MEGURO *et al.* (1964) noted the depth distribution of cassidulinid and uvigerinid species in the region of the South Argentine shelf, and remarked that these species are very abundant or very common at depths of 75–108 m. As stated above, however, it is difficult to apply these depth ranges to the inference of paleodepths in the Antarctic regions, because the foraminiferal Argentine Province (Malvine Subprovince) belongs to the temperate water fauna influenced by the Brazil warm water current (BOLTOVSKOY *et al.*, 1980; GIUSSANI and WATANABE, 1981).

The foraminiferal assemblage from the raised beach deposits is composed mainly of calcareous and porcellaneous forms. In Lützow-Holm Bay, KATO and TAI (1979) analyzed the bottom sediments obtained from depths of 8–644 m. According to them, abundant occurrences of such calcareous forms as *Cassidulinoides* spp., *Globocassidulina subglobosa, Ehrenbergina* cf. *glabra, E.* cf. *pacifica*, and *Rosalina* cf. *globularis* are recorded at a depth of 17 m in association with such arenaceous forms as *Trochammina conica* (EARLAND), *T. pacifica* CUSHMAN, *Textularia* cf. *torquata* PARKER, and *Haplophragmoides bradyi* (ROBERTSON). In the present study, a mixed assemblage of calcareous and arenaceous foraminifera was also recognized in the bottom sediments at depths of 31.7 m (No. 75112101) and 98 m (No. 75112102). As shown in Table 2, particularly, Sample 75112101 consists largely of *Cassidulinoides porrectus, Globocassidulina biora, Cassidulinoides parvus* in association with *Cribrostomoides jeffreysii, Trochammina antarctica, Rosalina globularis* and *Trifarina angulosa*. Moreover, planktonic species such as *Globigerina pachyderma* is frequently found in this sample. The assemblage of raised beach deposits is conspicuously different from the assemblage just mentioned above, in the very rare occurrences of arenaceous forms and *Trifarina angulosa*, and absence of globigerinid planktonic species.

On the George V-Adelie Continental Shelf and Slope, Antarctica, MILAM and ANDERSON (1981) stated that calcareous faunas are mainly associated with a sandy substratum which resulted from intense bottom currents, and that arenaceous faunas

are associated with organic-rich mud. FINGER and LIPPS (1981) investigated foraminiferal biocoenoses around Deception Island in the South Shetland Islands, and further reported on the microfauna characterized by the following species: *Globocassidulina crassa* plexus (including *G. crassa, G. crassa porrecta, G. subglobosa, G. subglobosa producta, G. biora*, and *G. crassa rossensis*), *Cribrostomoides jeffreysii, Rotaliammina ochracea, Trochammina malovensis*, and *Rosalina globularis*, in coarse-grained sedimentary facies (including depths less than 50 m).

From the foregoing information, the foraminiferal assemblages from raised beach deposits seem to have lived at shallower depths than about 100 m as previously considered. The coarse-grained sandy facies of these deposits may provide unsuitable habitats for arenaceous foraminifera in Antarctica, and in turn be suitable for calcareous and porcellaneous foraminifera as observed by MILAM and ANDERSON (1981). In addition, the highest surface of the raised beach is recognized at the level of 33–35 m a.s.l. on Ongulkalven (island) (OMOTO, 1977). From the foregoing remarks, it is possible that the raised beach deposits have accumulated at depths less than the range of 30–50 m. The biocoenoses of *Globocassidulina crassa* plexus, *Cibicides lobatulus, Rosalina globularis* and other species reported by FINGER and LIPPS (1981) seem to support this inference.

5. Faunal Reference List

The following is an alphabetical list of the identified species, in which the original references are given. Asterisks indicate species from raised beach deposits. All types are catalogued and deposited in the Department of Earth Sciences, Faculty of Education, Shimane University.

**Astrononion antarcticus* PARR, 1959, B.A.N.Z. Antarct. Res. Exped., 1929–1931, Rep., Ser. B (Zool. Bot.), Vol. 5, pt. 6, p. 371, pl. 15, Figs. 13, 14a, b.

**Brizalina pacifica* (CUSHMAN and MCCULLOCH) = *Bolivina acerosa* CUSHMAN var. *pacifica* CUSHMAN and MCCULLOCH, 1942, Allan Hancock Pacific Exped., Vol. 6, No. 4, p. 185, pl. 21, Figs. 2, 3.

**Cassidulinoides parvus* (EARLAND) = *Ehrenbergina parva* EARLAND, 1934, Foraminifera, pt. III, Discovery Rep., Vol. 10, p. 139, pl. 6, Figs. 28–32.

**Cassidulinoides porrectus* (HERON-ALLEN and EARLAND) = *Cassidulina crassa* var. *porrecta* HERON-ALLEN and EARLAND, 1932, Foraminifera, pt. I, Discovery Rep., Vol. 4, p. 358, pl. 9, Figs. 34–37.

**Cibicides lobatulus* (WALKER and JACOB) = *Nautilus lobatulus* WALKER and JACOB, 1798, in Kanmacher, Adam's Essays on the Microscope. London, Dillon and Keating, 2nd ed., p. 542, pl. 14, Fig. 36.

**Cibicides refulgens* DE MONTFORT, 1808, Conchyl. Systém. Classific. Méthod. Coquilles. Paris, F. Schoell, Vol. 1, p. 123; p. 122, text-fig.

**Cribrostomoides jeffreysii* (WILLIAMSON) = *Nonionina jeffreysii* WILLIAMSON, 1858, Ray Soc., London, p. 34, pl. 3, Figs. 72, 73.

**Cyclogyra involvens* (REUSS) = *Operculina involvens* REUSS, 1850, Denkschr. Akad. Wiss., Math.-Naturwiss. Kl., Vol. 1, p. 370, pl. 46, Figs. 20a, b.

**Ehrenbergina glabra* HERON-ALLEN and EARLAND = *Ehrenbergina hystrix* var. *glabra*

HERON-ALLEN and EARLAND, 1922, Protozoa, pt. II, Foraminifera, Br. Antarct. ("Terra Nova") Exped., 1910, Nat. Hist. Rep., Zool., Vol. 6, No. 2, p. 140, pl. 5, Figs. 1–6.

**Elphidium incertum* (WILLIAMSON) = *Polystomella umbilicatula* var. *incerta* WILLIAMSON, 1858, Ray Soc. Publs., 20, p. 44, pl. 3, Fig. 82a.

Epistominella exigua (BRADY) = *Pulvinulina exigua* BRADY, 1884, Rep. Voy. Challenger, Zool., Vol. 9, p. 696, pl. 103, Figs. 13, 14.

Fissurina crebra (MATTHES) = *Lagena crebra* MATTHES, 1939, Palaeontographica, Vol. 90, pt. A, p. 72, pl. 5, Figs. 66–70.

**Fissurina subcircularis* (PARR) = *Parafissurina subcircularis* PARR, 1950, B.A.N.Z. Antarct. Res. Exped. 1929–1931, Rep., Ser. B (Zool. Bot.), Vol. 5, pt. 6, p. 318, pl. 10, Figs. 10a, b.

Globigerina pachyderma (EHRENBERG) = *Aristerospira pachyderma* EHRENBERG, 1861, K. Preuss. Akad. Wiss. Berlin, Monatsber., p. 276, 277, 303.

**Globocassidulina biora* (CRESPIN) = *Cassidulina biora* CRESPIN, 1960, Sci. Rep. Tohoku Univ., Ser. 2, Spec. Vol., No. 4, p. 28, 29, pl. 3, Figs. 1–10.

**Lagena heronalleni* EARLAND, 1934, Foraminifera, pt. III, Discovery Rep., Vol. 10, p. 152, pl. 6, Figs. 55–57.

**Lagena subarcticosta* PARR, 1950, B.A.N.Z. Antarct. Res. Exped. 1929–1931, Rep., Ser. B (Zool. Bot.), Vol. 5, pt. 6, p. 302, pl. 8, Fig. 3.

Miliolinella oblonga (MONTAGU) = *Vermiculum oblongum* MONTAGU, 1803, Test. Brit., p. 522, pl. 14, Fig. 9.

Nonionella bradii (CHAPMAN) = *Nonionella scapha* (FICHTEL and MOLL) var. *bradii* CHAPMAN, 1916, Br. Antarct. Exped. 1907–1909, Rep. Sci. Invest., Geol., Vol. 2, pt. 3, p. 71, pl. 5, Fig. 42.

**Nummoloculina irregularis* (D'ORBIGNY) = *Biloculina irregularis* D'ORBIGNY, 1839, Voy. Am. Mérid., Foraminifères. Paris, Pitois-Levrault et c^{e}, Vol. 5, pt. 5, p. 67, pl. 8, Figs. 20, 21.

**Patellina corrugata* WILLIAMSON, 1958, Ray Soc., Publs. 20, p. 46, 47, pl. 3, Figs. 86–89.

Pelosphaera cornuta HERON-ALLEN and EARLAND, 1932, R. Micr. Soc. London, J., Vol. 52, p. 255, pl. 2, Figs. 12–15.

**Pullenia subcarinata* (D'ORBIGNY) = *Nonionina subcarinata* D'ORBIGNY 1839, Voy. Am. Mérid., Foraminifères, Paris, Pitois-Levrault et c^{e}, Vol. 5, pt. 5, p. 28, pl. 5, Figs. 23, 24.

**Pyrgo elongata* (D'ORBIGNY) = *Biloculina elongata* D'ORBIGNY, 1826, Ann. Sci. Nat., Sér. 1, Vol. 7, p. 298.

**Quinqueloculina seminula* (LINNÉ) = *Serpula seminula* LINNÉ, 1758, Systema naturae per regna tria naturae, secundum classes, oridines, genera, species, cum characteribus, differentiis, synonymis, locis. Holmiae, Suecia, L. Salvii, 10th ed., Vol. 1, p. 786.

Reophax distans gracilis EARLAND = *Reophax distans* BRADY var. *gracilis* EARLAND, 1933, Foraminifera, pt. II, Discovery Rep., Vol. 7, p. 76, pl. 2, Fig. 21.

Reophax nodulosus BRADY, 1879, Q. J. Microsc. Sci. New Ser., Vol. 19, p. 52, pl. 4, Figs. 7, 8.

Reophax scorpiurus DE MONTFORT, 1808, Conchyl. Systém. Classific. Méthod. Coquilles. Paris, F. Schoell, Vol. 1, p. 123, text-fig.

**Rosalina globularis* D'ORBIGNY, 1826, Ann. Mag. Nat. Hist., Ser. 1, Vol. 7, p. 271, pl. 13, Figs. 1–4.

Saccammina sphaerica BRADY, 1971, Ann. Mag. Nat. Hist., Ser. 4, Vol. 7, p. 183, pl. 12.

**Scutuloris serra* (CRESPIN)=*Quinqueloculina serra* CRESPIN, 1960, Sci. Rep. Tohoku Univ., Ser. 2, Spec. Vol., No. 4, p. 22, pl. 2, Figs. 1–3.

**Sigmoilina umbonata* HERON-ALLEN and EARLAND, 1922, Protozoa, pt. II, Foraminifera, Br. Antarct. ("Terra Nova") Exped., 1910, Nat. Hist. Rep., Zool. Vol. 6, No. 2, p. 71, pl. 1, Figs. 7, 8.

**Textularia wiesneri* EARLAND, 1933, Foraminifera, pt. II, Discovery Rep., Vol. 7, p. 95, pl. 3, Figs. 18–20.

**Trifarina angulosa* (WILLIAMSON)=*Uvigerina angulosa* WILLIAMSON, 1858, Ray Soc., London, p. 67, pl. 5, Fig. 140.

**Triloculina rotunda* D'ORBIGNY, 1826, Ann. Sci. Nat., Ser. 1, Vol. 7, p. 299, pl. 4, Figs. 38a, b.

**Triloculina tricarinata* D'ORBIGNY, 1826, Ann. Sci. Nat., Ser. 1, Vol. 7, p. 299, No. 7.

Trochammina antarctica PARR, 1950, B.A.N.Z. Antarct. Res. Exped. 1929–1931, Rep., Ser. B (Zool. Bot.), Vol. 5, pt. 6, p. 280, pl. 5, Figs. 2–4.

Trochammina globulosa CUSHMAN, 1920, U.S. Nat. Mus., Bull., 104, pt. 2, p. 77, pl. 16, Figs. 3, 4.

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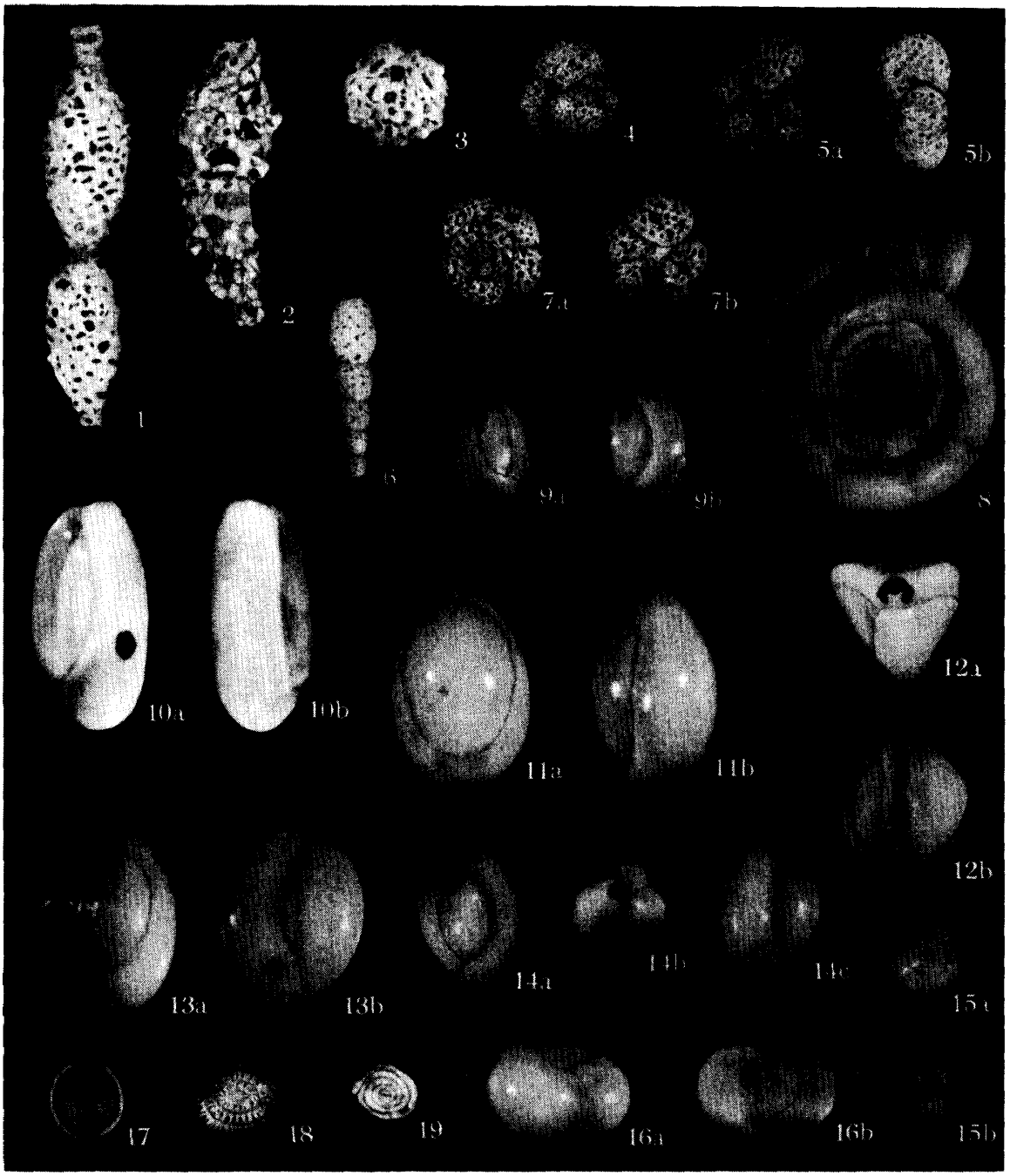
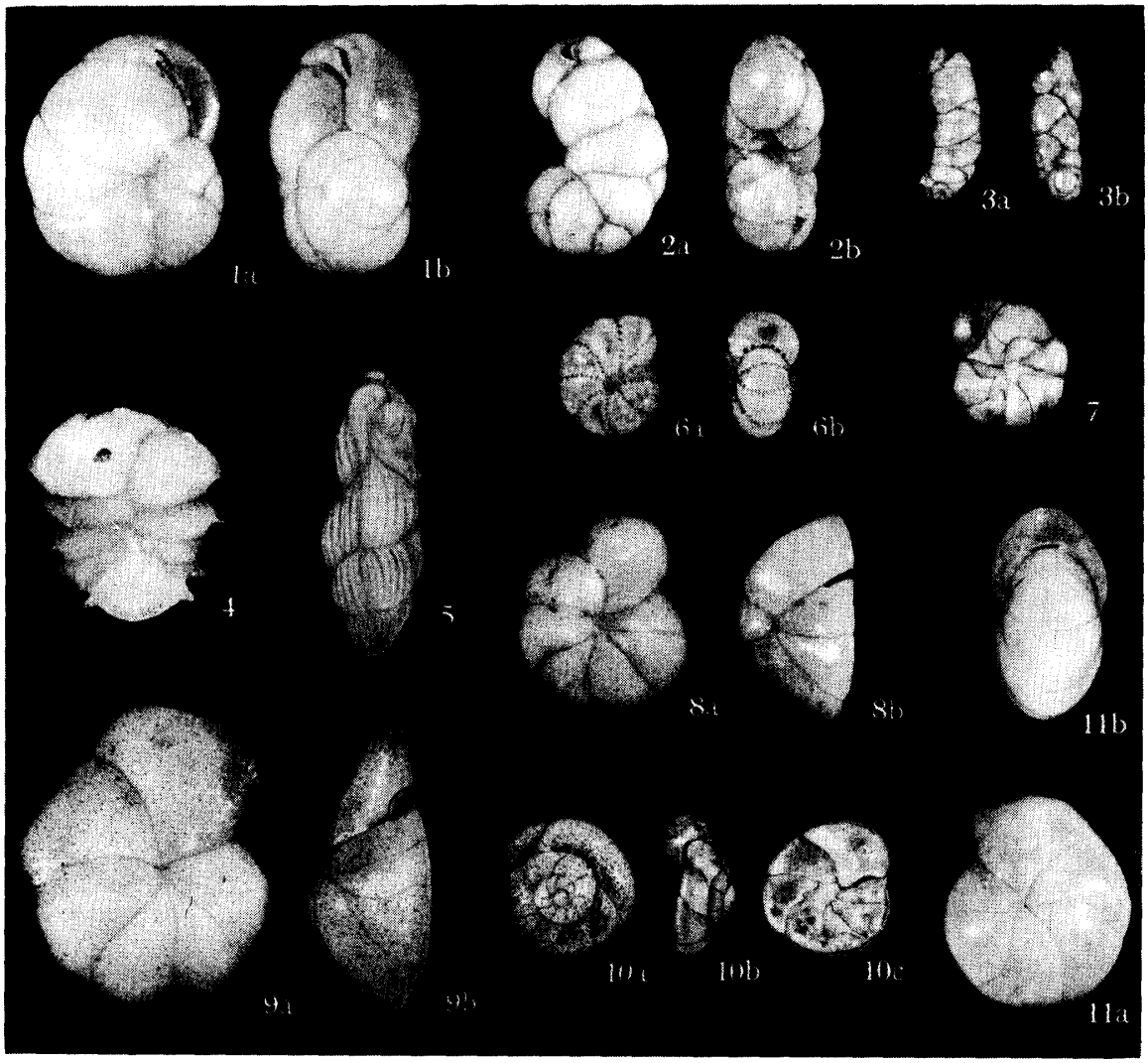


Fig. 1. *Reophax distans gracilis* EARLAND. Cat. no. 82030 from sample 75112101, ×27.
Fig. 2. *Reophax scorpiurus* DE MONTFORT. Cat. no. 82032 from sample 75112101, ×34.
Fig. 3. *Saccammina sphaerica* BRADY. Cat. no. 82029 from sample 75112101, ×34.
Fig. 4. *Trochammina globulosa* CUSHMAN. Cat. no. 82035 from sample 75112101, ×34.
Figs. 5a, b. *Cribrostomoides jeffreysii* (WILLIAMSON). Cat. no. 82002 from sample 75112101, ×34.
Fig. 6. *Reophax nodulosus* BRADY. Cat. no. 82031 from sample 75112101, ×34.
Figs. 7a, b. *Trochammina antarctica* PARR. Cat. no. 82034 from sample 75112101, ×34.
Fig. 8. *Cyclogyra involvens* (REUSS). Cat. no. 82003 from sample 75012901, ×34.
Figs. 9a, b. *Scutuloris serra* (CRESPIN). Cat. no. 82005 from sample 75012901, ×34.
Figs. 10a, b. *Miliolinella oblonga* (MONTAGU). Cat. no. 82036 from sample 75112101, ×34.
Figs. 11a, b. *Pyrgo elongata* (D'ORBIGNY). Cat. no. 82006 from sample 75012901, ×34.
Figs. 12a, b. *Triloculina tricarinata* D'ORBIGNY. Cat. no. 82009 from sample 75012901, ×34.
Figs. 13a, b. *Quinqueloculina seminula* (LINNÉ). Cat. no. 82004 from sample 75112101, ×34.
Figs. 14a, b, c. *Triloculina rotunda* D'ORBIGNY. Cat. no. 82008 from sample 75110201, ×34.
Figs. 15a, b. *Sigmoilina umbonata* HERON-ALLEN and EARLAND. Cat. no. 82007 from sample 75110201, ×34.
Figs. 16a, b. *Nummoloculina irregularis* (D'ORBIGNY). Cat. no. 82010 from sample 75110201, ×34.
Fig. 17. *Fissurina subcircularis* (PARR). Cat. no. 82013 from sample 75012901, ×34.
Fig. 18. *Patellina corrugata* WILLIAMSON. Cat. no. 82018 from sample 75012901, ×34.
Fig. 19. *Spirillina* sp. Cat. no. 82017 from sample 75012901, ×34.

Plate 2



Figs. 1a, b. *Globocassidulina biora* (CRESPIN). Cat. no. 82024 from sample 76012402, ×34.
Figs. 2a, b. *Cassidulinoides porrectus* (HERON-ALLEN and EARLAND). Cat. no. 82022 from sample 75110201, ×34.
Figs. 3a, b. *Cassidulinoides parvus* (EARLAND). Cat. no. 82023 from sample 75110201, ×34.
Fig. 4. *Ehrenbergina glabra* HERON-ALLEN and EARLAND. Cat. no. 82025 from sample 75112101, ×34.
Fig. 5. *Trifarina angulosa* (WILLIAMSON). Cat. no. 82015 from sample 75112101, ×34.
Figs. 6a, b. *Elphidium incertum* (WILLIAMSON). Cat. no. 82019 from sample 75110201, ×34.
Fig. 7. *Astrononion antarcticus* PARR. Cat. no. 82026 from sample 75012901, ×34.
Figs. 8a, b. *Cibicides refulgens* DE MONTFORT. Cat. no. 82021 from sample 75110201, ×34.
Figs. 9a, b. *Cibicides lobatulus* (WALKER and JACOB). Cat. no. 82020 from sample 75110201, ×27.
Figs. 10a, b, c. *Rosalina globularis* D'ORBIGNY. Cat. no. 82016 from sample 75012901, ×34.
Figs. 11a, b. *Pullenia subcarinata* (D'ORBIGNY). Cat. no. 82027 from sample 75012901, ×34.