

# Foraminifera of the North Pacific Ocean

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GEOLOGICAL SURVEY PROFESSIONAL PAPER 766





# Foraminifera of the North Pacific Ocean

By PATSY B. SMITH

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*A systematic study of Foraminifera  
from lat 25° to 55° N.*



**UNITED STATES DEPARTMENT OF THE INTERIOR**

**ROGERS C. B. MORTON, *Secretary***

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# FORAMINIFERA OF THE NORTH PACIFIC OCEAN

By PATSY B. SMITH

## ABSTRACT

In 1961, 33 cores were collected by the U.S. Coast and Geodetic Survey ship *Pioneer*. The Foraminifera of these cores, Holocene and older, indicate a wide faunal diversity. Most are arenaceous. In the deep parts of the central North Pacific, faunas are poor, both in number of specimens and species, but in the Aleutian Trench and on the adjacent island shelf, they are rich. A systematic catalog of the 85 species found accompanies the descriptions and information on distribution.

## INTRODUCTION

During 1961, core samples were obtained by the U.S. Coast and Geodetic Survey ship *Pioneer*. Samples were taken between lat 25° and 55° N. and long 160° to 180° W. Water depth ranges from 76 to 7,230 meters (table 1). Samples were taken primarily along two north-south traverses through the mid-Pacific that cross the Aleutian Trench at the north. Distribution of samples is shown in figure 1.

TABLE 1.—*Position, depth, and content of core samples and the abundance of constituents, estimated in percent*  
[C, core-catcher sample; other coarse organic fragments, estimated abundance in percent, given in parentheses]

Core	Location		Ocean depth (m)	Depth in core (cm)	<0.07 mm	Foram-inifera	Diatoms	Radio-laria	Other coarse organic fragments	Coarse residue				
	Lat N.	Long. W.												
P-1-61	57°19'	155°20'	230	0-2	95	<1	<1	---	-----	Fine sand.				
				2-3	95	<1	<1	---	-----	Do.				
				11-12	95	---	---	---	-----	Ash.				
				21-22	96	<1	---	---	-----	Do.				
				31-32	96	---	<1	---	-----	Fine sand, ash.				
				41-42	98	---	<1	<1	-----	Ash.				
				C	98	<1	<1	---	-----	Sand, ash.				
				3-61	54°33'	157°24'	2,090	0-6	90	1	<1	-----	Fine sand.	
				4-61	55°31'	156°16'	245	0-2	80	1	---	-----	Poorly sorted sand.	
								2-14	60	<1	---	-----	Granule to medium sand.	
14-26	50	<1	---					-----	Do.					
26-29	50	3	---					-----	Same and shell, wood.					
29-32	40	3	---					-----	Granule to fine sand, shell.					
41-42	50	2	---					-----	Do.					
51-52	60	1	---					-----	Do.					
61-62	50	1	---					-----	Coarse to fine sand, shell.					
71-72	60	<1	<1					---	-----	Do.				
81-82	50	3	---					-----	Do.					
5-61	55°23'	155°01'	1,980	91-92	60	2	---	-----	Do.					
				101-102	60	2	---	-----	Do.					
				C	50	5	---	-----	Pebbles to fine sand.					
				0-2	98	<1	<1	---	-----	Fine sand.				
				11-12	95	<1	4	---	-----	Do.				
				21-22	95	---	3	<1	Sponge (1) -----	Do.				
				C	95	<1	3	---	do -----	Do.				
				6-61	55°23'	154°27'	819	0-2	75	<1	<1	-----	Sponge (<1) -----	Fine sand, ash.
				53-54	75	3	---	-----	Sponge (2) -----	Ash.				
				7-61	56°25'	155°36'	76	0-1	95	<1	<1	-----	Sponge (<1) -----	Fine sand.
8-61	55°36'	158°23'	150	6-7	25	2	<1	<1	-----	Do.				
				0-1	95	<1	1	---	Sponge (<1) -----	Fine sand.				
				10-11	50	<1	<1	---	Sponge (3) -----	Ash, some fine sand.				
				20-21	60	<1	<1	---	Sponge (1) -----	Do.				
				30-31	60	<1	<1	---	Sponge (3) -----	Do.				
				40-41	50	<1	<1	---	Sponge (1) -----	Do.				
				50-51	50	<1	<1	---	Sponge (<1) -----	Do.				
				60-61	75	<1	<1	---	Sponge (1) -----	Do.				
				70-71	75	<1	<1	---	Sponge (<1) -----	Do.				
				80-81	75	1	<1	---	Sponge (1) -----	Do.				
90-91	25	2	---	-----	Sponge (<1) -----	Ash.								
100-101	25	2	---	-----	do -----	Do.								

See footnotes at end of table.

## FORAMINIFERA OF THE NORTH PACIFIC OCEAN

TABLE 1.—Position, depth, and content of core samples and the abundance of constituents, estimated in percent—Continued

Core	Location		Ocean depth (m)	Depth in core (cm)	<0.07 mm	Foram-inifera	Diatoms	Radio-laria	Other coarse organic fragments	Coarse residue
	Lat N.	Long. W.								
P-9-61	54°55'	157°59'	121	0-1	85	2	---	---	---	Sand, poorly sorted.
				10-11	30	20	<1	---	Sponge (<1)	Do.
				20-21	10	10	---	---	Shell (40)	Do.
				30-31	10	10	---	---	do	Do.
				40-41	10	10	<1	---	do	Do.
				50-51	10	15	<1	---	Shell (35)	Do.
				60-61	10	10	<1	---	Shell (30)	Do.
				70-71	20	10	---	---	Shell (35)	Do.
10-61	54°51'	155°24'	4,170	0-1	95	<1	2	2	---	Ash, fine sand.
				9-13	95	---	2	1	---	Do.
11-61	54°27'	155°23'	5,560	0-1	75	3	15	2	---	Fine sand.
				10-11	90	<1	2	2	---	Do.
				21-22	80	<1	7	8	---	Do.
				31-32	90	<1	2	2	---	Ash, fine sand.
				35-36	95	---	<1	<1	---	Do.
				C	95	---	1	1	---	Do.
12-61	53°16'	161°33'	6,560	0-1	80	5	10	---	---	Fine, sand.
				10-11	90	<1	5	<1	---	Ash.
				20-21	80	<1	15	1	---	Do.
13-61	51°28'	168°38'	7,000	0-1	75	<1	20	2	---	Ash.
				10-11	85	---	5	3	Sponge (2)	Do.
				20-21	80	---	10	3	do	Do.
				30-31	75	---	5	1	Sponge (<1)	Do.
16-61	53°53'	161°40'	2,410	0-1	80	<1	5	1	---	Fine sand.
				10-11	85	---	3	---	Sponge (2)	Do.
				20-21	85	---	3	---	do	Do.
				30-31	85	<1	4	---	Sponge (4)	Do.
				40-41	85	---	4	---	do	Do.
				50-51	85	<1	6	---	do	Do.
				60-61	90	<1	3	---	Sponge (1)	Do.
19-61	52°41'	155°36'	4,430	0-1	80	<1	18	1	---	---
				10-11	70	<1	10	1	Sponge (1)	Ash.
				20-21	70	<1	10	1	do	Do.
				30-31	80	---	8	1	do	Do.
22-61	24°42'	166°24'	4,810	0-1	80	1	<1	---	---	Silt and fine sand.
				10-11	95	---	---	---	Sponge (2)	Do.
				20-21	90	1	---	---	Sponge (1), broken mollusks (1).	Do.
23-61	23°56'	167°21'	4,760	0-1	60	20	---	---	Shells, bryozoans, and so forth.	---
25-61	23°22'	177°54'	5,120	0-1	95	<1	---	<1	---	Very fine sand.
				10-11	99	<1	---	---	---	Fine to medium sand.
				20-21	99	<1	---	---	---	Do.
				30-31	99	<1	---	---	---	Do.
				40-41	99	<1	---	---	---	Do.
				50-51	99	<1	---	---	---	Do.
				60-61	99	<1	---	---	---	Do.
				70-71	99	<1	---	---	---	Do.
				80-81	99	<1	---	---	---	Do.
26-61	25°55'	177°34'	5,210	0-1	99	<1	---	<1	Sponge (<1)	---
27-61	30°06'	177°30'	5,290	0-1	98	<1	<1	1	do	---
29-61	32°22'	177°20'	4,810	0-1	95	<1	<1	4	do	---
32-61	36°50'	177°30'	5,400	0-1	80	<1	2	18	---	---
				10-11	80	---	<1	20	---	---
				20-21	80	---	<1	20	---	---
				30-31	80	<1	<1	20	---	---
				40-41	80	<1	<1	20	---	---
				50-51	80	---	<1	20	---	---
				60-61	80	<1	<1	20	---	---
33-61	39°15'	176°56'	5,230	0-1	80	<1	1	18	---	---
				10-11	90	---	<1	8	Sponge (1)	---
				20-21	90	<1	<1	8	do	---
				30-31	90	---	<1	8	do	---
				40-41	90	---	<1	8	do	---
				50-51	90	---	<1	8	do	---
35-61	41°19'	177°02'	5,530	0-1	95	<1	<1	4	Sponge (<1)	---
38-61	45°50'	176°47'	5,610	0-1	90	<1	4	4	do	---
				10-11	90	<1	<1	1	---	Medium to fine sand.
				20-21	95	---	<1	1	---	Do.
				30-31	95	---	<1	1	---	Do.
				40-41	95	---	<1	1	---	Same, half ash.
				50-51	95	---	<1	1	---	Do.
				60-61	95	---	<1	1	---	Do.
				70-71	95	---	<1	1	---	Do.

See footnotes at end of table.





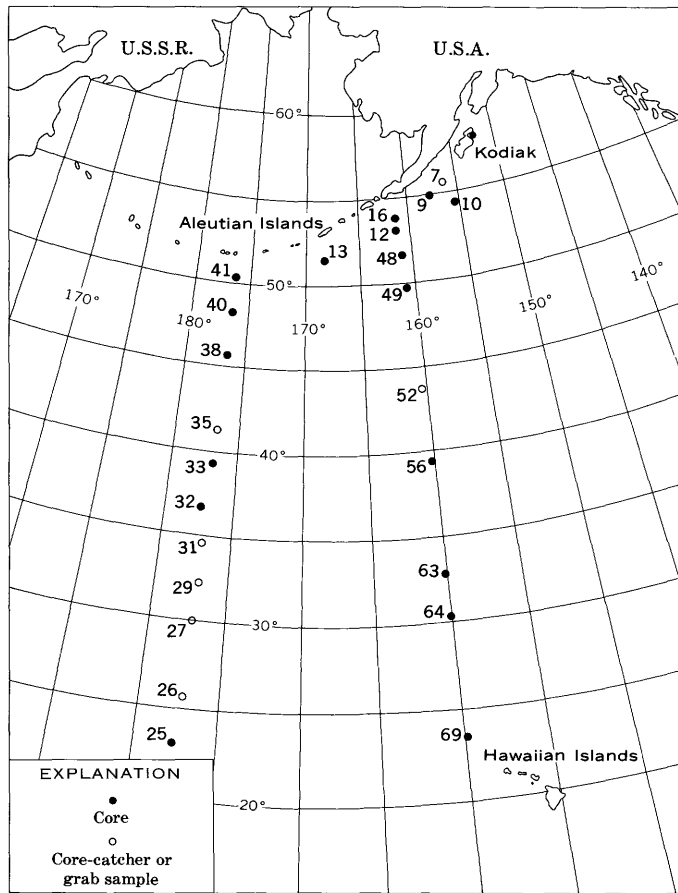


FIGURE 1.—Location of 1961 *Pioneer* stations.

be assembled. Discussion of each species, its morphology, and distribution is included. The species are illustrated on plates 1–4.

#### ACKNOWLEDGMENTS

Credit is here given to Capts. William Dean, Horace Conerly, and Harley Nygren of the National Ocean Survey (formerly Coast and Geodetic Survey) for supervising the coring. George W. Moore of the U.S. Geological Survey logged and sampled the cores and collected the grab samples.

#### PREVIOUS WORK

Published records of bottom sediments and Foraminifera from the Pacific Ocean north of lat 20° N. are sparse. The *Challenger* reports include several samples from this area. The report of the seventh cruise of the *Carnegie* (Revelle, 1944) includes many more samples and also a comprehensive study of sediment type, the distribution of which is shown in figure 2. Figure 3, showing distribution of CaCO<sub>3</sub>, is taken from Lisitzen (1971).

Riedel and Funnell (1965) described several Tertiary cores from the area, and several reports of Tertiary faunas from the North Pacific (Bukry and others, 1971; Krashininnikov, 1971; Olson and Goll, 1970) have been published as results of the deep-sea drilling project of the *Glomar Challenger*.

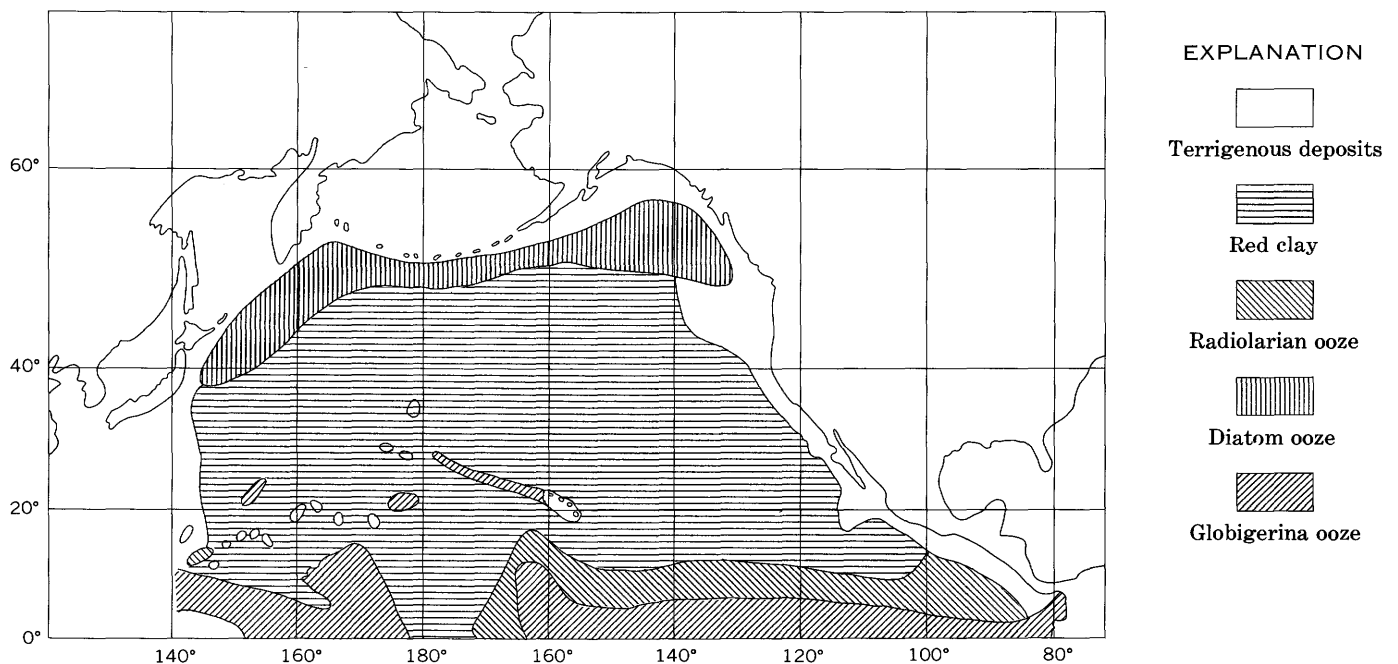


FIGURE 2.—Distribution of marine deposits in the North Pacific Ocean (from Revelle, 1944).

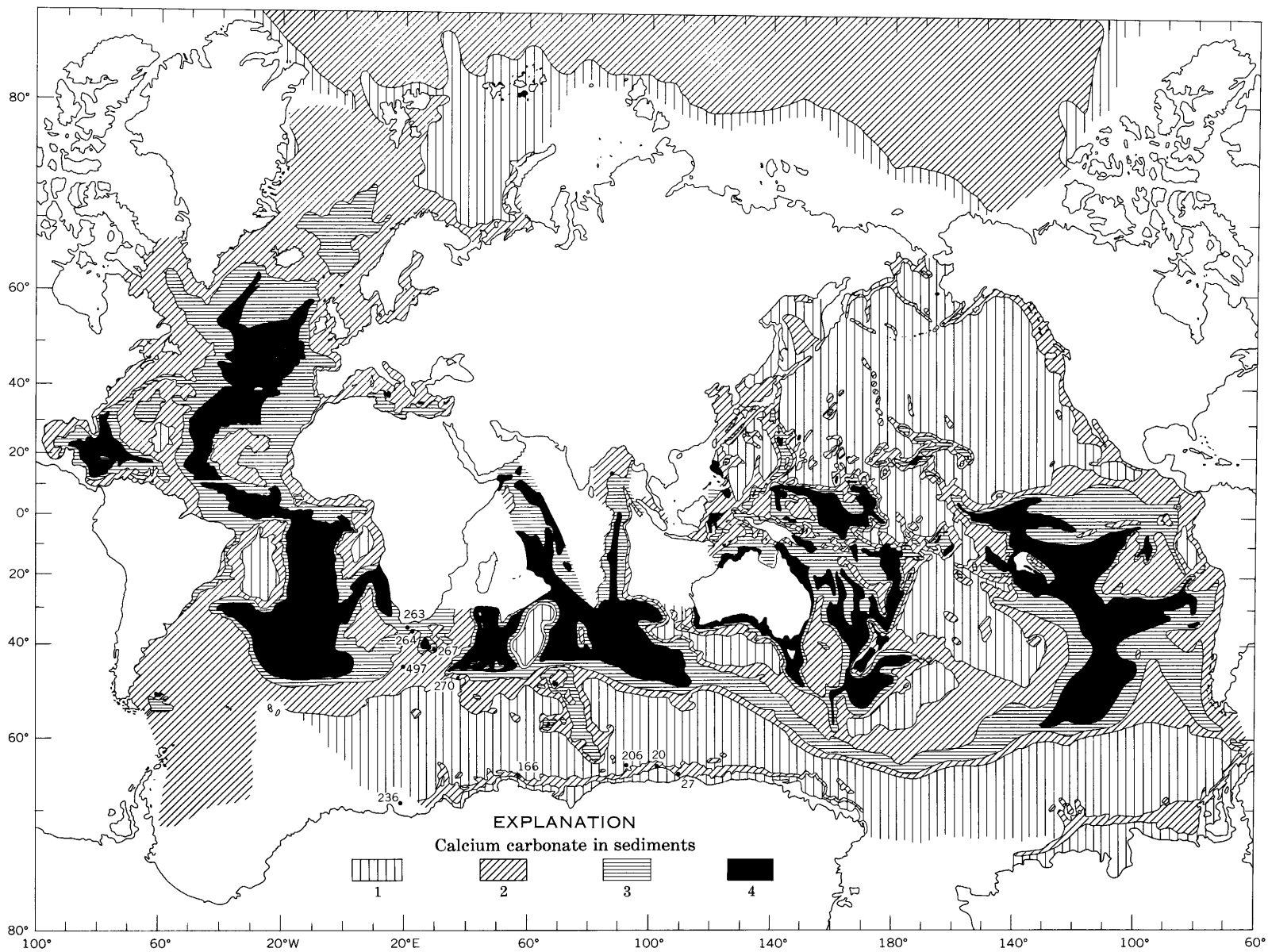


FIGURE 3.—Distribution of calcium carbonate in the ocean deposits (from Lisitzen, 1971). 1, <1 percent; 2, 1-30 percent; 3, 30-70 percent; 4, >70 percent.

















*friabilis* Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 46, pl. 23, figs. 1, 2, 5, 6). Another group is smaller and more finely arenaceous (cf. *H. cylindrica* Parr, 1950, Foraminifera, BANZ Antarctic Research Exped., 1929–1931, Repts., ser. B, v. 5, pt. 6, p. 254, pl. 3, fig. 5). However, where they occur together, it is so difficult to draw a line between the two groups that they are considered together.

*Distribution*.—Lat 32° to 50° N.

Family SACCAMMINIDAE Brady, 1884

Genus PSAMMOSPHAERA Schulze, 1875

*Psammosphaera rustica* Heron-Allen and Earland

*Psammosphaera rustica* Heron-Allen and Earland, 1912, Royal Micros. Soc. London Jour., p. 383, pl. 5, figs. 3, 4; pl. 6, figs. 2–4.

*Distribution*.—Found in only one core sample, P-33–61 (lat 39° N., depth 5,230 m).

Genus SACCAMMINA M. Sars in Carpenter, 1869

*Saccamina sphaerica* M. Sars

*Saccamina sphaerica* M. Sars, 1869, Forhandl. Vidensk.-Selsk. Christiania, Aar 1868, p. 248.

Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 253, pl. 18, figs. 11–15, 17.

Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 39, 40, figs. 33–36.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 36, pl. 18, figs. 11–15, 17.

*Distribution*.—Lat 30° to 52° N. Abundant in the Aleutian Trench.

Genus THURAMMINA Brady, 1879

*Thuramina papillata* Brady

Plate 1, figure 7

*Thuramina papillata* Brady, 1879, Micros. Sci. Quart. Jour., new ser., v. 19, p. 45, pl. 5, figs. 4–8.

Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 321, pl. 36, figs. 7–18.

Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 58, fig. 66.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 74, pl. 36, figs. 7–18.

*Distribution*.—Lat 48° to 52° N. Reported previously from the North Pacific in *Challenger* stations from depths of 3,400 to 4,700 meters.

Family AMMODISCIDAE Reuss, 1862

Genus GLOMOSPIRA Rzehak, 1885

*Glomospira gordialis* (Jones and Parker)

Plate 1, figure 8

*Trochammina squamata* var. *gordialis* Jones and Parker, 1860, Geol. Soc. London Quart. Jour., v. 16, p. 304.

Parker and Jones, 1865, Royal Soc. London Philos. Trans., v. 155, p. 408, pl. 15, fig. 32.

*Ammodiscus gordialis* (Jones and Parker). Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 333, pl. 38, figs. 7–9.

*Gordiammina gordialis* (Jones and Parker). Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 76, 77, figs. 98–100.

*Glomospira gordialis* (Jones and Parker). Cushman, 1918, U.S. Natl. Mus. Bull. 104, pt. 1, p. 99, pl. 36, figs. 7–9.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 78, pl. 38, figs. 7–9.

*Distribution*.—Lat 23° to 53° N. Present, often abundantly, at stations just south of the Aleutian Trench.

Family HORMOSINIDAE Haeckel, 1894

Genus HORMOSINA Brady, 1879

*Hormosina globulifera* Brady

*Hormosina globulifera* Brady, 1879, Micros. Sci. Quart. Jour., new ser., v. 19, p. 60, pl. 4, figs. 4, 5.

Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 326, pl. 39, figs. 1–6.

Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 93–95, figs. 136, 137.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 80, pl. 39, figs. 1–6.

*Distribution*.—Lat 32° to 52° N. Generally present as fragments recognizable by the texture of the wall. Brady described these as fragments of a peculiarly deep-water organism. It was found at 21 *Challenger* stations, only five of which had a depth of less than 1,800 meters.

Genus REOPHAX Montfort, 1808

*Reophax dentalinaformis* Brady

Plate 1, figure 9

*Reophax dentalinaformis* Brady, 1881, Micros. Sci. Quart. Jour., new ser., v. 21, p. 49.

Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 293, pl. 30, figs. 21, 22.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 62, pl. 30, figs. 21, 22.

*Distribution*.—Occurs from lat 39° to 51° N. Brady listed it from 21 stations, only four of which were shallower than 1,800 meters.

*Reophax difflugiformis* Brady

Plate 1, figure 10

*Reophax difflugiformis* Brady, 1879, Micros. Sci. Quart. Jour., new ser., v. 19, p. 51, pl. 4, fig. 3.

Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 289, pl. 30, figs. 1–4.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 62, pl. 30, figs. 1–4.

*Proteonina difflugiformis* (Brady). Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 41, 42, figs. 40, 41.

*Distribution*.—This variable species occurs commonly at nearly all stations, most abundantly in deep water of the Aleutian Trench.

*Reophax distans* Brady

Plate 1, figure 11

*Reophax distans* Brady, 1881, Micros. Sci. Quart. Jour., new ser., v. 21, p. 50.

Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 296, pl. 31, figs. 18-22.

Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 85, 86, fig. 119.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 64, pl. 31, figs. 18-22.

*Distribution.*—Lat 39° to 52° N., rare and fragile. No specimens with more than three chambers found.

***Reophax nodulosus* Brady**

Plate 1, figure 12

*Reophax nodulosa* Brady, 1879, *Micros. Sci. Quart. Jour.*, new ser., v. 19, p. 52, pl. 4, figs. 7, 8.

Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 294, pl. 31, figs. 1-9.

*Reophax nodulosus* Brady. Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 87, 88, fig. 122.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 64, pl. 31, figs. 1-9.

This species is generally large and robust. It shows a great deal of variation in chamber shape, as shown in Brady's (1884) illustrations.

*Distribution.*—Lat 46° to 53° N.

***Reophax pilulifer* Brady**

*Reophax pilulifera* Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 292, pl. 30, figs. 18-20.

*Reoplax pilulifer* Brady. Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 85, figs. 117, 118.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 62, pl. 30, figs. 18-20.

This species is very distinctive and somewhat similar to *Hormosina globulifera* Brady (1884, p. 53), but it has a coarsely arenaceous wall.

*Distribution.*—Found in core sample P-19-61 (lat 53° N., depth 4,430 m).

***Reophax scoriurus* de Montfort**

Plate 1, figure 13

*Reophax scoriurus* de Montfort, 1808, *Conch. Syst.*, v. 1, p. 331, 83d genre.

Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 291, pl. 30, figs. 12, 14-17.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 62, pl. 30, figs. 12, 14-17.

This is one of the few arenaceous species that shows strong variation in wall texture. In the shoreward samples (P-13-61, P-19-61, P-38-61, P-41-61, P-48-61, P-49-61) the wall texture is very coarse; the specimens are large, and the test generally has only three chambers. In the seaward samples (P-32-61, P-33-61, P-63-61, P-69-61), the wall is fine grained, and sponge spicules are often incorporated in the test, which generally has five chambers.

*Distribution.*—Lat 23° to 51° N.

***Reophax scotti* Chaster**

*Reophax scotti* Chaster, 1892, 1st Rept. Southport Soc. Nat. Sci., 1890-91, p. 57, pl. 1, fig. 1.

Höglund, 1947, *Zool. Bidrag Fran Uppsala*, v. 26, p. 94-96, fig. 72.

Cushman and McCulloch, 1939, Allan Hancock Pacific Exped. Repts., v. 6, no. 1, p. 61, 62, pl. 3, fig. 11.

*Distribution.*—A single specimen was found in only one core sample (P-12-61, lat 53° N., depth 6,560 m). The extreme fragility of the test may account for its scarcity in prepared samples.

**Family LITUOLIDAE de Blainville, 1825**

**Genus ADERCOTRYMA Loeblich and Tappan, 1952**

***Adercotryma glomerata* (Brady)**

Plate 1, figure 14

*Lituola glomerata* Brady, 1878, *Ann. Mag. Nat. History*, ser. 5, v. 1, p. 433, pl. 20, figs. 1a-c.

*Adercotryma glomeratum* (Brady). Loeblich and Tappan, 1952, *Washington Acad. Sci. Jour.*, v. 42, no. 5, p. 141, 142, figs. 1-4.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, pl. 70, pl. 34, figs. 15-18.

These specimens are somewhat broader and have more deeply depressed sutures than those figured by Brady and by Loeblich and Tappan.

*Distribution.*—Lat 30° N. to Aleutian Trench. According to Brady (1884, p. 309, 310), this species was found in relatively shallow water in Arctic seas and in deep water (greater than 3,600 m) of tropical and subtropical latitudes.

**Genus CYCLAMMINA Brady, 1879**

***Cyclammina cancellata* Brady**

Plate 1, figure 18

*Cyclammina cancellata* Brady, 1879, *Micros. Sci. Quart. Jour.*, new ser., v. 19, p. 62.

Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 351, pl. 37, figs. 8-16.

Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 110-111, figs. 168-171.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 76, pl. 37, figs. 8-16.

*Distribution.*—Lat 46° to 50° N. Brady listed this species from two samples from the North Pacific, east from Japan, at depths of 3,400 and 5,300 meters.

***Cyclammina trullissata* (Brady)**

Plate 1, figure 15

*Trochammina trullissata* Brady, 1879, *Micros. Sci. Quart. Jour.*, new ser., v. 19, no. 73, p. 56, pl. 5, figs. 10a, b.

Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 342, pl. 40, fig. 13 (not fig. 14, 15).

*Cyclammina bradyi* Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 113, fig. 174.

*Cyclammina trullissata* (Brady). Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 82, pl. 40, fig. 13.

*Distribution.*—Widely distributed (lat 30° to 55° N.), rare.

Genus ALVEOLOPHRAGMIUM Shchedrina, 1936

*Alveolophragmium nitidum* (Göes)

Plate 1, figure 16

- Haplophragmium nitidum* Göes, 1896, Harvard Coll. Mus. Comp. Zoology Bull., v. 29, p. 30, pl. 3, figs. 8, 9.  
*Haplophragmoides nitidum* Göes. Cushman, 1920, U.S. Natl. Mus. Bull. 104, pt. 2, p. 44.  
*Haplophragmoides nitidus* (Göes). Cushman, 1920, U.S. Natl. Mus. Bull. 104, pt. 2, p. 44.  
*Haplophragmoides nitidus* (Göes). Heron-Allen and Earland, 1934, *Discovery* Repts., v. 10, Foraminifera, pt. 3, p. 88, 89, pl. 3, figs. 3–6.

This species is extremely smooth walled, brown in color, completely involute, with 4 or 4½ chambers visible.

*Distribution.*—Most common north of lat 50° N. in the Aleutian Trench area.

*Alveolophragmium* cf. *A. nitidum* (Göes)

Plate 1, figure 17

- Haplophragmoides nitidus* (Göes). Heron-Allen and Earland, 1934, *Discovery* Repts., v. 10, Foraminifera, pt. 3, p. 88, 89, last paragraph.

This form differs from the typical one in having a slightly coarser wall and more inflated chambers. It occurs with the typical form.

*Distribution.*—Most common north of lat 50° N. Extremely abundant in the deep waters of the Aleutian Trench (7,000 m or more).

*Alveolophragmium ringens* (Brady)

- Trochammina ringens* Brady, 1879, *Micros. Sci. Quart. Jour.*, new ser., v. 19, p. 57, pl. 5, fig. 12.  
 Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 343, pl. 40, figs. 17, 18.  
*Haplophragmoides ringens* (Brady). Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 109, fig. 166.  
*Alveolophragmium ringens* (Brady). Parker, 1954, Harvard Coll. Mus. Comp. Zoology Bull., v. 111, no. 10, p. 487, pl. 1, fig. 19.  
 Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 82, pl. 40, figs. 17, 18.

Specimens are identical with those figured by Brady.

*Distribution.*—Widely distributed, but rare. Brady (1884, p. 344) did not record it from any Pacific stations.

*Alveolophragmium scitulum* (Brady)

Plate 1, figure 19

- Haplophragmium scitulum* Brady, 1881, *Micros. Sci. Quart. Jour.*, new ser., v. 21, p. 50.  
 Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 308, p. 34, figs. 11–13.  
*Alveolophragmium scitulum* (Brady). Parker, 1954, Har-

vard Coll. Mus. Comp. Zoology Bull., v. 111, no. 10, p. 487.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 70, pl. 34, figs. 11–13.

*Distribution.*—Present only in the Aleutian Trench area.

*Alveolophragmium subglobosum* (G. O. Sars)

Plate 1, figure 20

- Haplophragmium latidorsatum* (Bornemann). Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 307, pl. 34, figs. 7, 8, 10.  
*Haplophragmoides subglobosum* (G. O. Sars). Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 105, 106, figs. 162–164.  
*Labrospira subglobosa* (G. O. Sars). Höglund, 1947, Zool. Bidrag. Fran Uppsala, v. 26, p. 144, 145, pl. 11, fig. 2, text fig. 126.  
*Alveolophragmium subglobosum* (G. O. Sars). Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 70, pl. 34, figs. 7, 8, 10.

Specimens have less deeply depressed sutures than those of Brady. Coarseness of wall is variable.

*Distribution.*—Widely distributed, from lat 23° to 54° N. Brady (1884, p. 308) found it at nine stations in the North Pacific at depths from 3,600 to 7,300 meters.

*Alveolophragmium weisneri* (Parr)

Plate 2, figure 1

- Trochammina trullissata* Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 342, pl. 40, figs. 14, 15 (not fig. 13).  
*Labrospira weisneri* Parr, 1950, Foraminifera, *BANZ* Antarctic Research Exped., 1929–1931, Repts., ser. B, v. 5, pt. 6, p. 272, pl. 4, figs. 25, 26.  
*Labrospira arctica* Parker, 1952, Harvard Coll. Mus. Comp. Zoology Bull., v. 106, no. 9, p. 399, pl. 2, figs. 7, 12.  
*Alveolophragmium weisneri* (Parr). Parker, 1954, Harvard Coll. Mus. Comp. Zoology Bull., v. 111, no. 10, p. 488, pl. 1, fig. 23.  
 Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 82, pl. 40, figs. 14, 15.

Specimens are identical with those illustrated by Brady.

*Distribution.*—Lat 39° to 52° N., rare.

*Alveolophragmium?* sp.

Plate 2, figure 2

The form is tiny, slightly evolute; sutures are curving, only slightly depressed; periphery is rounded, only slightly lobed; wall is smooth, red-brown, pseudochitinous; aperture is interio-areal.

This is apparently an arenaceous form that has not developed an agglutinating stage (see also *Trochammina* cf. *T. mallovensis*, p. ). It is very rare.

*Distribution.*—Core samples P-48-61 (lat 52° N., depth 4,650 m) and P-49-61 (lat 50° N., depth 5,000 m).

## Genus AMMOBACULITES Cushman, 1910

*Ammobaculites agglutinans* (d'Orbigny)

Plate 2, figure 3

*Spirolina agglutinans* d'Orbigny, 1846, *Foram. Fossiles Wien*, p. 137, pl. 7, figs. 10-12.

*Haplophragmium agglutinans* (d'Orbigny). Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 301, pl. 32, figs. 19-21, 24-26.

*Ammobaculites agglutinans* (d'Orbigny). Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 115, fig. 176.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 66, pl. 32, figs. 19-21, 24-26.

Walls of these specimens are coarser grained than those illustrated by Brady.

*Distribution.*—Lat 23° to 50° N. Brady (1884, p. 301, 775) listed it from deep water in the North Pacific.

*Ammobaculites agglutinans filiformis* Heron-Allen and Earland (smooth form)

Plate 2, figure 4

*Haplophragmium agglutinans* (d'Orbigny). Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 301, pl. 32, fig. 23 (not fig. 22).

*Ammobaculites agglutinans filiformis* Heron-Allen and Earland, 1934, *Discovery Repts.*, v. 10, Foraminifera, pt. 3, p. 92, 93, pl. 3, fig. 12 (not fig. 11).

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 66, pl. 32, fig. 23 (not fig. 22).

This smooth-walled form has low regular chambers, and the wall is brown.

*Distribution.*—Lat 32° to 53° N., most abundant in the Aleutian Trench. Heron-Allen and Earland listed this form from deep water in the Antarctic Ocean.

*Ammobaculites agglutinans filiformis* Heron-Allen and Earland (rough form)

Plate 2, figure 5

*Haplophragmium agglutinans* (d'Orbigny). Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 301, pl. 32, fig. 22 (not fig. 23).

*Ammobaculites agglutinans filiformis* Heron-Allen and Earland, 1934, *Discovery Repts.*, v. 10, Foraminifera, pt. 3, p. 92, 93, pl. 3, fig. 11 (not fig. 12).

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 66, pl. 32, fig. 22 (not fig. 23).

The wall is so coarsely arenaceous that chamber arrangement is difficult to see.

*Distribution.*—Lat 39° to 53° N. This form commonly occurs in the same samples as the smooth-walled form.

*Ammobaculites americanus* Cushman

*Haplophragmium fontinense* Terquem. Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 305, pl. 34, figs. 1-4.

*Ammobaculites americanus* Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 117, 118, figs. 184, 185.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 70, pl. 34, figs. 1-4.

These specimens are similar to those illustrated by Brady and by Cushman but are thicker.

*Distribution.*—Lat 30° to 56° N., most abundant north of lat 50° N.

## Genus AMMOMARGINULINA Weisner, 1931

*Ammomarginulina foliacea* (Brady)

Plate 2, figure 6

*Haplophragmium foliaceum* Brady, 1881, *Micros. Sci. Quart. Jour.*, new ser., v. 21, p. 50.

Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 304, 305, pl. 33, figs. 20-25.

*Ammomarginulina foliacea* (Brady). Cushman, 1933, Cushman Lab. Foram. Research Spec. Pub. 4, pl. 10, fig. 6.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 68, pl. 33, figs. 20-25.

Specimens are identical with Brady's illustrations.

*Distribution.*—Widely distributed (lat 39° to 55° N.) but rare. Brady (1884, p. 305) found only a few specimens in the North Pacific.

## Genus PLACOPSILINA d'Orbigny, 1850

*Placopsilina confusa* Cushman

*Placopsilina confusa* Cushman, 1920, U.S. Natl. Mus. Bull. 104, pt. 2, p. 71, pl. 14, fig. 16.

Heron-Allen and Earland, 1934, *Discovery Repts.*, v. 10, Foraminifera, pt. 3, p. 94, 95.

This tiny form occurs abundantly at several localities. It is commonly attached to diatom frustules. Its small size and distinctive reddish-brown color distinguish it from *P. bradyi* Cushman and McCulloch (1939, p. 112).

*Distribution.*—Lat 44° to 50° N.

## Family TEXTULARIIDAE Ehrenberg, 1838

## Genus SPIROPLECTAMMINA Cushman, 1927

*Spiroplectamina biformis* (Parker and Jones)

Plate 2, figure 7

*Textularia agglutinans* var. *biformis* Parker and Jones, 1865, Royal Soc. London Philos. Trans., v. 155, p. 370, pl. 15, figs. 23, 24.

*Spiroplecta biformis* (Parker and Jones). Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 376, pl. 45, figs. 25-27.

*Spiroplectamina biformis* (Parker and Jones). Cushman, 1927, Cushman Lab. Foram. Research Contr., v. 3, pt. 1, p. 23.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 92, pl. 45, figs. 25-27.

The test is extremely small, fine grained, and brown.

*Distribution.*—Lat 46° to 54° N.

## Genus BIGENERINA d'Orbigny, 1826

*Bigenerina minutissima* Earland

Plate 2, figure 8

*Bigenerina minutissima* Earland, 1933, *Discovery Repts.*, v. 7, Foraminifera, pt. 2, p. 98, pl. 3, figs. 36-38.

Heron-Allen and Earland, 1934, *Discovery Repts.*, v. 10, Foraminifera, pt. 3, p. 117, pl. 4, fig. 48.

*Distribution.*—Lat. 30° to 48° N., rare. Heron-Allen and Earland rarely found the species in deep waters of the Scotia Sea (lat 55° to 60° S.).

Family TROCHAMMINIDAE Schwager, 1877  
Genus TROCHAMMINA Parker and Jones, 1859

*Trochammina grisea* Heron-Allen and Earland

Plate 2, figure 9

*Trochammina grisea* Heron-Allen and Earland, 1934, *Discovery Repts.*, v. 10, Foraminifera, pt. 3, p. 100, 101, pl. 3, figs. 35–37.

*Distribution.*—Rare in several stations north of lat 47° N.

*Trochammina inflata* (Montagu)

Plate 2, figure 10

*Trochammina inflata* (Montagu). Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 338, pl. 41, fig. 4.

Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 121, 122, fig. 188.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 84, pl. 41, fig. 4.

*Distribution.*—Specimens identical with those figured by Brady occur in two core samples, P-38-61 and P-48-61 (lat 46° and 52° N.).

*Trochammina kellestae* Thalmann

Plate 2, figure 12

*Trochammina peruviana* Cushman and Kellett, 1929, U.S. Natl. Mus. Proc., v. 75, art. 25, p. 4, pl. 1, fig. 8.

*Trochammina kellestae* Thalmann, 1932, *Eclogae Geol. Helvetiae*, v. 25, p. 313.

*Distribution.*—A few specimens found at one locality in the Aleutian Trench (core sample P-41-61, lat 50° N., depth 7,230 m).

*Trochammina malovensensis* Heron-Allen and Earland

Plate 2, figure 13

*Trochammina malovensensis* Heron-Allen and Earland, 1932, *Discovery Repts.*, v. 4, Foraminifera, pt. 1, p. 345, pl. 17, figs. 14–19.

?*Haplophragmium turbinatum* var. *helicoideum* Göes, 1896, Harvard Coll. Mus. Comp. Zoology Bull., v. 29, no. 1, p. 30, 31, pl. 3, figs. 10–13.

This species is identical with that in Heron-Allen and Earland's illustrations. The specimen from core sample P-12-61 appears to grade into the pseudochitinous *T. cf. T. malovensensis* (below).

*Distribution.*—Present at two stations in the Aleutian Trench.

*Trochammina cf. T. malovensensis* Heron-Allen and Earland

Plate 2, figure 11

This species appears identical with *T. malovensensis* except in wall character and in its slightly more

irregular shape. The wall is composed of reddish-brown pseudochitin. However, the last few chambers appear finely arenaceous in specimens from core sample P-12-61.

*Distribution.*—Found abundantly in the Aleutian Trench, rarely as far south as lat 33° N.

*Trochammina nana* (Brady)

Plate 2, figure 15

*Haplophragmium nanum* Brady, 1881, *Micros. Sci. Quart. Jour.*, new ser., v. 21, p. 50.

Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 311, pl. 35, figs. 6–8.

Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 123, figs. 190–192.

*Trochammina nana* (Brady). Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 72, pl. 35, figs. 6–8.

This small species is variable in number of chambers. It is characteristically dark reddish-brown.

*Distribution.*—Abundant in core sample P-49-61 (lat 50° N., depth 5,000 m).

*Trochammina nitida* Brady

Plate 2, figure 14

*Trochammina nitida* Brady, 1881, *Micros. Sci. Quart. Jour.*, new ser., v. 21, p. 52.

Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 339, pl. 41, figs. 5, 6.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 84, pl. 41, figs. 5, 6.

*Distribution.*—Lat 24° to 52° N. This little species is widely distributed but rare. All but one of the occurrences described by Brady are shallower than 390 meters.

*Trochammina globigeriniformis* (Parker and Jones)

Plate 3, figure 1

*Lituola nautiloidea globigeriniformis* Parker and Jones, 1865, Royal Soc. London Philos. Trans., v. 155, p. 407, pl. 15, figs. 46, 47.

*Haplophragmium globigeriniforme* (Parker and Jones). Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 312, pl. 35, figs. 10, 11.

*Ammoglobigerina bulloides* Eimer and Fickert, 1899, *Zeitschr. Wiss. Zoologie*, Leipzig, v. 65, pt. 4, p. 107.

*Trochammina globigeriniformis* (Parker and Jones). Cushman, 1910, U.S. Natl. Mus. Bull. 71, pt. 1, p. 124, 125, figs. 193–195.

*Ammoglobigerina globigeriniformis* (Parker and Jones). Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 72, pl. 35, figs. 10, 11.

*Distribution.*—Lat 23° to 54° N. One of the most widely distributed forms. Brady (1884, p. 313) listed it from six stations in the North Pacific, all but one at depths greater than 3,300 meters. Cushman recorded it as one of the most common deep-water species.





Family MILIOLIDAE Ehrenberg, 1839  
Genus QUINQUELOCULINA Cushman, 1917

*Quinqueloculina* sp.

This species is very tiny and compressed; the sutures are only very slightly depressed. Only a single specimen was found.

*Distribution*.—Core sample P-38-61 (lat 46° N., depth 5,610 m).

Genus PYRGO Defrance, 1824

*Pyrgo* sp.

This specimen is possibly referable to *Pyrgo murrhyna* (Schwager) (1866, Novara Exped., 1857-1859, Wien, Geol. Theil, Bd. 2, Abt. 2, p. 203, pl. 4, fig. 15), but the aperture is broken on the single specimen found.

*Distribution*.—Core sample P-16-61 (lat 54° N., depth 2,410 m).

Genus MILIOLINELLA Weisner, 1931

*Miliolinella subrotunda* (Montagu)

Plate 3, figure 8

*Miliolina circularis* (Bornemann). Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 169, pl. 4, fig. 3; pl. 5, figs. 13, 14.

*Miliolinella subrotunda* (Montagu) Weisner, 1931, *Deutsche Sudpolar Exped.*, 1901-1903, v. 20 (Zoology, v. 12), p. 107.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 8, 10, pl. 4, fig. 3; pl. 5, figs. 13, 14.

*Distribution*.—Lat 30° to 53° N. Brady's reports are from shallow water. However, under *Miliolina labiosa* (d'Orbigny) (Brady, 1884, p. 170) he discusses deep-water specimens very similar to *M. subrotunda*, which may be the same species discussed here.

Genus AMMOMASSILINA Cushman, 1933

*Ammomassilina alveolinaformis* (Millett)

*Spiroloculina asperula* Karrer. Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 152, pl. 8, figs. 13, 14.

*Massilina asperula* (Karrer). Cushman, 1921, U.S. Natl. Mus. Bull. 100, v. 4, p. 447, 448.

*Massilina alveolinaformis* Millett. Cushman, 1928, U.S. Natl. Mus. Bull. 104, pt. 6, p. 39.

*Ammomassilina alveolinaformis* (Millett). Cushman, 1933, Cushman Lab. Foram. Research Contr., v. 9, pt. 2, p. 32.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 16, pl. 8, figs. 13, 14.

*Distribution*.—One specimen (corroded) found in core sample P-29-61 (lat 32° N., depth 4,810 m).

Family TURRILINIDAE Cushman, 1927  
Genus BULIMINELLA Cushman, 1911

*Buliminella basicostata* Parr

*Buliminella elegantissima* d'Orbigny var. *seminuda* Terquem. Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 403, pl. 1, figs. 23, 24.

*Buliminella basicostata* Parr, 1950, *Foraminifera, BANZ Antarctic Research Exped.*, 1929-1931, Repts., ser. B, v. 5, pt. 6, p. 336, pl. 12, figs. 11, 12.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 104, pl. 50, figs. 23, 24.

*Distribution*.—Aleutian Terrace.

Family BOLIVINITIDAE Cushman, 1923

Genus BOLIVINA d'Orbigny

*Bolivina robusta* Brady

*Bolivina robusta* Brady, 1881, *Micros. Sci. Quart. Jour.*, new ser., v. 21, p. 57.

Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 421, pl. 53, figs. 7-9.

Cushman, 1911, U.S. Natl. Mus. Bull. 71, pt. 2, p. 36, 37, figs. 59, 60.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 108, pl. 53, figs. 7-9.

*Distribution*.—One specimen (stained) from core sample P-40-61 (lat 50° N., depth 5,500 m). Brady described it from generally less than 1,500 meters.

*Bolivina decussata* Brady

*Bolivina decussata* Brady, 1881, *Micros. Sci. Quart. Jour.*, v. 21, no. 5, p. 58.

Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 406, p. 423, pl. 53, figs. 12, 13.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 110, pl. 53, figs. 12, 13.

*Distribution*.—Aleutian Terrace.

*Bolivina pseudoplicata* Heron-Allen and Earland

*Bolivina plicata* Brady, 1870, *Ann. Mag. Nat. History*, ser. 4, v. 6, p. 302, pl. 12, fig. 7.

*Bolivina plicata* Halkyard, 1889, *Manchester Micros. Soc. Trans. and Ann. Rept.*, v. 6, p. 61, pl. 1, fig. 13.

*Bolivina pseudoplicata* Heron-Allen and Earland, 1930, *Royal Micros. Soc. London*, ser. 3, v. 50, p. 81, pl. 3, figs. 36-49.

*Distribution*.—Lat 55° to 60° N., occurs only on Aleutian Terrace.

Genus BULIMINA d'Orbigny, 1826

*Bulimina aculeata* d'Orbigny

Plate 3, figure 9

*Bulimina aculeata* d'Orbigny, 1826, *Annales des Sci. Naturelles*, v. 7, no. 7, p. 269.

Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 406, pl. 51, figs. 7-9.

Cushman, 1911, U.S. Natl. Mus. Bull. 71, pt. 2, p. 86, 87, fig. 139.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 104, pl. 51, figs. 7-9.

*Distribution*.—Rare in one core sample (P-16-61, lat 54° N., depth 2,410 m).

Genus *GLOBOBULIMINA* Cushman, 1927*Globobulimina auriculata* Bailey

Plate 3, figure 10

*Bulimina auriculata* Bailey, 1851, Smithsonian Inst., Contr. Knowledge, v. 2, p. 12, pl., figs. 25-27.

*Distribution*.—Occurs rarely in core sample P-16-61 (lat 54° N., depth 2,410 m). Two of the three specimens are stained.

*Globobulimina pacifica* Cushman

*Bulimina pyrula* d'Orbigny. Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 339, pl. 50, figs. 7-10.

*Globobulimina pacifica* Cushman, 1927, Cushman Lab. For. am. Research Contr., v. 3, p. 67, pl. 14, fig. 12.

*Globobulimina pacifica* Cushman?. Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 102, pl. 50, figs. 7-10.

*Distribution*.—One stained specimen in core sample P-16-61 (lat 54° N., depth 2,410 m).

## Family UVIGERINIDAE Haeckel, 1894

Genus *UVIGERINA* d'Orbigny, 1826*Uvigerina peregrina* Cushman

Plate 3, figure 11

*Uvigerina pygmaea* d'Orbigny. Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 575, pl. 74, figs. 11, 12.

*Uvigerina peregrina* Cushman, 1923, U.S. Natl. Mus. Bull. 104, pt. 4, p. 166, pl. 42, figs. 7-11.

*Euuvigerina peregrina* (Cushman). Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 154, pl. 74, figs. 11, 12.

*Distribution*.—Several specimens found in core sample P-16-61 (lat 54° N., depth 2,410 m).

*Uvigerina cushmani* Todd

*Uvigerina cushmani* Todd, 1948, in Cushman and McCulloch, 1948, Allan Hancock Pacific Exped. Repts., v. 6, no. 5, p. 257, pl. 33, fig. 1.

*Distribution*.—Aleutian Terrace.

Genus *ANGULOGERINA* Cushman, 1927*Angulogerina fluens* Todd

*Angulogerina angulosa* (Williamson). Cushman, 1948 [not *Uvigerina angulosa* Williamson], Cushman Lab. For. am. Research Spec. Pub. 23, p. 66, pl. 7, fig. 8.

Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 576, pl. 74, figs. 15, 16.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 154, pl. 75, figs. 15, 16.

*Angulogerina fluens* Todd, 1947, in Cushman and Todd, 1947, Cushman Lab. For. am. Research Contr., v. 23, pt. 3, p. 67, pl. 16, figs. 6, 7.

*Distribution*.—Aleutian Terrace.

## Family DISCORBIDAE Ehrenberg, 1838

Genus *EPISTOMINELLA* Husezima and Maruhasi, 1944*Epistominella exigua* (Brady)

Plate 3, figure 12

*Pulvinulina exigua* Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 696, pl. 103, figs. 13, 14.

*Epistominella exigua* (Brady). Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 212, pl. 103, figs. 13, 14.

*Distribution*.—Lat 44° to 55° N. This rare form is generally stained. According to Brady, it is generally found deeper than 1,800 meters.

*Epistominella umbonifera* (Cushman)

Plate 3, figure 13

*Pulvinulina umbonifera* Cushman, 1933, Cushman Lab. For. am. Research Contr., v. 9, pt. 4, p. 90, pl. 9, fig. 9. not *Epistominella? umbonifera* (Cushman). Phleger, Parker, and Pierson, 1953, Repts. Swedish Deep-sea Exped., v. 7, no. 1, p. 43, 44, pl. 9, figs. 33, 34.

*Distribution*.—Core sample P-49-61 (lat 50° N., depth 5,000 m). Two stained specimens, identical with Cushman's figures, occur at this station. Phleger, Parker, and Pierson's specimens have more numerous chambers. Cushman described the form from the South Pacific at a depth of 2,243 meters.

## Family ELPHIDIIDAE Galloway, 1933

Genus *ELPHIDIUM* de Montfort, 1808*Elphidium incertum* (Williamson)

*Polystomella umbilicatula* var. *incerta* Williamson, 1858, Recent British Foraminifera, p. 44, pl. 3, fig. 82a.

*Elphidium incertum* (Williamson). Loeblich and Tappan, 1953, Smithsonian Inst. Misc. Colln., v. 121, no. 7, p. 100-102.

*Distribution*.—This species occurs only in core sample P-16-61 (lat 54° N., depth 2,410 m) north of the Aleutian Trench. It appears identical with Williamson's figures. (See discussion in Loeblich and Tappan, 1953.)

*Elphidium magellanicum* Heron-Allen and Earland

*Elphidium (Polystomella) magellanicum* Heron-Allen and Earland, 1932, *Discovery* Repts., v. 4, p. 440, pl. 16, figs. 26-28.

*Distribution*.—Aleutian Terrace.

Genus *ELPHIDIELLA* Cushman, 1936*Elphidiella groenlandica* (Cushman)

Plate 4, figure 1

*Elphidium groenlandicum* Cushman, 1933, Smithsonian Inst. Misc. Colln., v. 89, no. 9, p. 4, pl. 1, fig. 10.

*Elphidiella groenlandica* (Cushman). Loeblich and Tappan, 1953, Smithsonian Inst. Misc. Colln., v. 121, no. 7, p. 106, 107, pl. 19, figs. 13, 14.

*Distribution*.—This species is abundant in core sample P-16-61 (lat 54° N., depth 2,410 m). Several specimens are stained.

## Family GLOBOROTALIIDAE Cushman, 1927

Genus *GLOBOROTALIA* Cushman, 1927*Globorotalia inflata* (d'Orbigny)

*Globigerina inflata* d'Orbigny, 1839, in Barker-Webb and

Berthelot, Histoire Naturelle des Iles Canaries, v. 2, pt. 2, Foraminifères, p. 134, pl. 2, figs. 7-9.

Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 601, pl. 79, figs. 8-10.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 164, pl. 79, figs. 8-10.

*Globorotalia inflata* (d'Orbigny). Parker, 1962, Micropaleontology, v. 8, no. 2, p. 236, pl. 5, figs. 6-9.

*Distribution*.—One specimen from core sample P-26-61 (lat 26° N., depth 5,210 m).

Family GLOBIGERINIDAE Carpenter, Parker, and Jones, 1862

Genus GLOBIGERINA d'Orbigny, 1826

*Globigerina bulloides* d'Orbigny

*Globigerina bulloides* d'Orbigny, 1826, Annals des Sci. Naturelles, ser. 1, v. 7, no. 1.

Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 593, pl. 77; pl. 79, figs. 3-7.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 164, pl. 77; pl. 79, figs. 3-7.

Parker, 1962, Micropaleontology, v. 8, no. 2, p. 221, pl. 1, figs. 1-8.

*Distribution*.—Lat 23° to 55° N. Rare, often corroded.

Genus CANDEINA d'Orbigny in de La Sagra, 1839

*Candeina nitida* d'Orbigny

*Candeina nitida* d'Orbigny, 1839, in de la Sagra, Histoire physique, politique et naturelle de l'île de Cuba, Foraminifères, p. 108, pl. 2, figs. 27, 28.

Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 622, pl. 82, figs. 13-20.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 170, pl. 82, figs. 13-20.

Parker, 1962, Micropaleontology, v. 8, no. 2, p. 253, pl. 8, figs. 27-30.

*Distribution*.—One specimen found in core sample P-56-61 (lat 39° N., depth 5,400 m).

Family CIBICIDIDAE Cushman, 1927

Genus CIBICIDES de Montfort, 1808

*Cibicides bradyi* (Trauth)

Plate 4, figure 2

*Truncatulina dutemplei* (d'Orbigny). Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 665, pl. 95, fig. 5.

*Truncatulina bradyi* Trauth, 1918, K. Acad. Wiss. Wien, Math.-Naturw. Cl., Denkschr., Wien, v. 95, p. 235.

*Cibicides bradyi* (Trauth). Thalmann, 1942, Am. Midland Naturalist, v. 28, no. 2, p. 464.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 196, pl. 95, fig. 5.

*Distribution*.—Lat 32° to 52° N. Rare but widely distributed. Except for a few specimens in core sample P-19-61 (lat 32° N.), all are stained.

*Cibicides lobatulus* (Walker and Jacob)

*Cibicides lobatulus* (Walker and Jacob). Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 192, pl. 93, figs., 1, 4, 5.

*Distribution*.—Aleutian Terrace.

Family CASSIDULINIDAE d'Orbigny, 1839

Genus CASSIDULINA d'Orbigny, 1826

*Cassidulina subglobosa* Brady

Plate 4, figure 3

*Cassidulina subglobosa* Brady, 1881, Micros. Sci. Quart. Jour., new ser., v. 21, p. 60.

Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 430, pl. 54, fig. 17.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 111, pl. 54, fig. 17.

This rare form is smaller than that described by Brady. The specimens may represent immature forms of Brady's species.

*Distribution*.—Lat 55° N., depth 4,430 meters. One specimen, stained.

*Cassidulina crassa* d'Orbigny

*Cassidulina crassa* d'Orbigny, 1839, Voyage dans l'Amérique Meridionale, v. 5, pt. 5, p. 56, pl. 7, figs. 18-20.

Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 429-430, pl. 54, figs. 4, 5.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 110, pl. 53, figs. 4, 5.

*Distribution*.—Aleutian Terrace.

*Cassidulina teretis* Tappan

*Cassidulina laevigata* d'Orbigny. Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 428, pl. 54, figs. 1-3.

*Cassidulina teretis* Tappan, 1951, Cushman Found. Forum. Research Contr., v. 2, pt. 1, p. 7, pl. 1, figs. 3a-c.

Loeblich and Tappan, 1953, Smithsonian Misc. Colln., v. 121, no. 7, p. 121, pl. 24, figs. 3, 4.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 110, pl. 53, fig. 1.

*Distribution*.—Aleutian Terrace.

*Cassidulina tortuosa* Cushman and Hughes

*Cassidulina tortuosa* Cushman and Hughes, 1925, Cushman Lab. Forum. Research Contr., v. 1, p. 14, pl. 2, fig. 4.

*Distribution*.—Aleutian Terrace.

Genus EHRENBURGINA Reuss, 1850

*Ehrenbergina hystrix* Brady

Plate 4, figure 5

*Ehrenbergina hystrix* Brady, 1881, Micros. Sci. Quart. Jour., new ser., v. 21, p. 60.

Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 434, pl. 55, figs. 8-11.

Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 112, pl. 55, figs. 8-11.

*Distribution*.—One specimen in core sample P-49-61 (lat 50° N., depth 5,000 m). Brady described it as occurring rarely only in the deep water of the South Pacific.

## Family INVOLUTINIDAE Bütschli, 1880

## Genus INVOLUTINA Terquem, 1862

*Involutina tenuis* (Brady)

Plate 4, figure 6

*Ammodiscus tenuis* Brady, 1881, *Micros. Sci. Quart. Jour.*, new ser., v. 21, p. 51.Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 332, pl. 38, figs. 4-6.*Involutina tenuis* (Brady). Barker, 1960, *Soc. Econ. Paleontologists and Mineralogists Spec. Pub.* 9, p. 78, pl. 38, figs. 5, 6.*Distribution*.—Lat 39° to 53° N. The test is thin walled and variable in amount of contortion.

## Family NONIONIDAE Schultze, 1854

## Genus NONION de Montfort, 1808

*Nonion labradoricum* (Dawson)

Plate 4, figure 4

*Nonionina labradorica* Dawson, 1860, *Canadian Naturalist*, v. 5, p. 191, fig. 4.*Nonion labradoricum* (Dawson). Loeblich and Tappan, 1953, *Smithsonian Inst. Misc. Colln.*, v. 121, no. 7, p. 86, 87, pl. 17, figs. 1, 2.*Distribution*.—Only present in core sample P-16-61 (lat 54° N., depth 2,410 m), where all specimens are stained. It is also present in shallower water samples south of the Aleutian Islands.*Nonion scaphum* (Fichtel and Moll)*Nonionina scaphum* (Fichtel and Moll). Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 730, pl. 109, figs. 14, 15.*Nonion scaphum* (Fichtel and Moll). Barker, 1960, *Soc. Econ. Paleontologists and Mineralogists Spec. Pub.* 9, p. 224, pl. 109, figs. 14, 15.*Distribution*.—Aleutian Terrace.

## Genus NONIONELLA Cushman, 1926

*Nonionella turgida* (Williamson)

Plate 4, figure 8

*Rotalina turgida* Williamson, 1858, *Recent British Foraminifera*, p. 50, pl. 4, figs. 95-97.*Nonionina turgida* (Williamson). Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 731, pl. 109, figs. 17-19.*Nonionella turgida* (Williamson). Barker, 1960, *Soc. Econ. Paleontologists and Mineralogists Spec. Pub.* 9, p. 224, pl. 109, figs. 17-19.*Distribution*.—Found only in core sample P-16-61 (lat 54° N., depth 2,410 m). All specimens are stained.*Nonionella bradyi* (Chapman)*Nonion scapha* (Fichtel and Moll). Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 224, pl. 109, fig. 16.*Nonionella bradyi* (Chapman). Barker, 1960, *Soc. Econ. Paleontologists and Mineralogists Spec. Pub.* 9, p. 224, pl. 109, fig. 16.*Distribution*.—Aleutian Terrace.*Nonionella auricula* Heron-Allen and Earland*Nonionella auricula* Heron-Allen and Earland, 1930, *Royal Micros. Soc. London Jour.*, ser. 3, v. 50, p. 192, pl. 5, figs. 68-70.Loeblich and Tappan, 1953, *Smithsonian Misc. Colln.*, v. 121, no. 7, p. 92, 93, pl. 16, figs. 6-10.*Distribution*.—Aleutian Terrace.

## Genus PULLENIA Parker and Jones, in Carpenter, Parker, and Jones, 1862

*Pullenia subcarinata* (d'Orbigny)

Plate 4, figure 9

*Nonionina subcarinata* d'Orbigny, 1839, *Voyage dans l'Amérique Meridionale*, v. 5, pt. 5, *Foraminifères*, p. 28, pl. 5, figs. 23, 24.*Pullenia quinqueloba* Reuss. Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 617, pl. 84, figs. 14, 15.*Pullenia subcarinata* (d'Orbigny). Heron-Allen and Earland, 1932, *Discovery Repts.*, v. 4, *Foraminifera*, pt. 1, p. 403, pl. 13, figs. 14-18.Barker, 1960, *Soc. Econ. Paleontologists and Mineralogists Spec. Pub.* 9, p. 174, pl. 84, figs. 14, 15.*Distribution*.—Lat 37° to 53° N. Widely distributed in deep water, generally represented by only a few specimens, nearly always stained.

## Family ALABAMINIDAE Hofker, 1951

## Genus GYROIDINA d'Orbigny, 1826

*Gyroidina lamarckiana* (d'Orbigny)

Plate 4, figure 7

*Rotalina lamarckiana* d'Orbigny, 1839, in Barker-Webb and Berthelot, *Histoire Naturelle des Îles Canaries*, v. 2, pt. 2, *Foraminifères*, p. 131, pl. 2, figs. 13-15.*Gyroidina lamarckiana* (d'Orbigny). Phleger, Parker, and Pierson, 1953, *Repts. Swedish Deep-sea Exped.*, v. 7, pt. 1, p. 40, pl. 8, figs. 33, 34.*Distribution*.—One stained specimen found in core sample P-49-61 (lat 50° N., depth 5,000 m). Phleger, Parker, and Pierson list this species from six stations in the North Atlantic, all deeper than 4,000 meters.

## Family ANOMALINIDAE Cushman, 1927

## Genus ANOMALINA d'Orbigny, 1826

*Anomalina globulosa* Chapman and Parr

Plate 4, figure 10

*Anomalina grosserugosa* (Gumbel). Brady, 1884, *Challenger Repts.*, Zoology, v. 9, p. 673, pl. 94, figs. 4, 5.*Anomalina globosa* Chapman and Parr, 1937, *Australasian Antarctic Exped.*, 1911-1914, *Sci. Repts.*, Ser. C, v. 1, pt. 2, p. 117, pl. 9, fig. 27.*Anomalina globulosa* Chapman and Parr. Barker, 1960, *Soc. Econ. Paleontologists and Mineralogists Spec. Pub.* 9, p. 194, pl. 94, figs. 4, 5.

A few stained specimens that are apparently referable to this species occur in core sample P-12-61, although the sutures are less distinct and the outline is smooth.

*Distribution*.—Lat 53° N., depth 6,560 meters.

Genus *CIBICIDOIDES* Thalmann, 1939*Cibicoides* cf. *C. mundulus* (Brady, Parker, and Jones)

Plate 4, figure 13

*Truncatulina* sp. Brady, 1884, *Challenger* Repts., Zoology, v. 9, pl. 95, fig. 6.

*Cibicides mundulus* (Brady, Parker, and Jones). Chapman and Parr, 1937, Australasian Antarctic Exped., Sci. Repts., Ser. C, v. 1, pt. 2, p. 120.

*Cibicoides mundulus* (Brady, Parker, and Jones). Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 196, pl. 95, fig. 6.

This form appears identical to that illustrated by Brady, except for its small size. The single specimen found was stained.

*Distribution*.—Lat 50° N., depth 5,000 meters.

Genus *MELONIS* de Montfort, 1808*Melonis* affine (Reuss)

Plate 4, figure 12

*Nonionina affinis* Reuss, 1851, Deutsche Geol. Gesell. Zeitschr., v. 3, p. 72, pl. 5, fig. 32.

*Nonionina umbilacatula* (Montagu). Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 726, pl. 109, figs. 8, 9.

*Nonion affine* (Reuss). Boltovskoy, 1958, Micropaleontology, v. 4, p. 193–200.

*Gavelinonion barleanum* (Williamson). Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 224, pl. 109, figs. 8, 9.

*Distribution*.—One small stained specimen found (core sample P-49-61, lat 50° N., depth 5,000 m).

*Melonis pompilioides* (Fichtel and Moll)

Plate 4, figure 11

*Nautilus pompilioides* Fichtel and Moll, 1798, Testacea Microscopica, p. 31, pl. 2, figs. a-c.

*Nonionina pompilioides* (Fichtel and Moll). Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 727, pl. 109, figs. 10, 11.

*Nonion? pompilioides* (Fichtel and Moll). Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 224, pl. 109, figs. 10, 11.

*Distribution*.—One specimen found in core sample P-29-61 (lat 32° N., depth 4,810 m). It is very small

but is referred to *N. pompilioides* because of its thickness and coarsely perforate wall.

Family *CERATOBULIMINIDAE* Cushman, 1927Genus *HOEGLUNDINA* Brotzen, 1948*Hoeglundina elegans* (d'Orbigny)

*Eotalia elegans* d'Orbigny, 1826, Annals Sci. Naturelles, ser. 1, v. 7, no. 6, p. 272.

*Pulvinulina elegans* (d'Orbigny). Brady, 1884, *Challenger* Repts., Zoology, v. 9, p. 699, pl. 105, figs. 3–6.

*Höglundina elegans* (d'Orbigny). Barker, 1960, Soc. Econ. Paleontologists and Mineralogists Spec. Pub. 9, p. 216, pl. 106, figs. 3–6.

*Distribution*.—Lat 32° to 54° N. All specimens are small and, when not stained, appear corroded.

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## PLATES 1-4

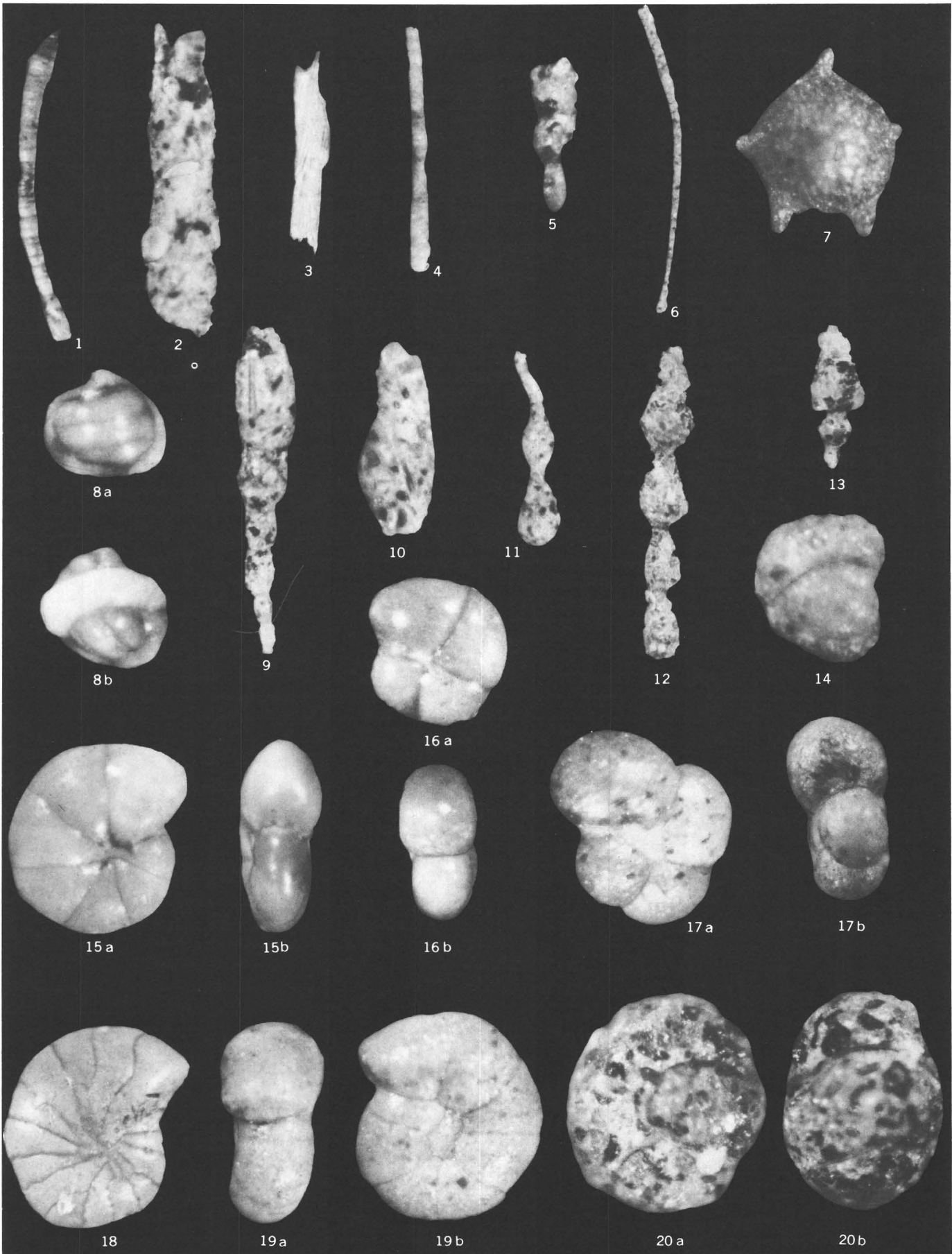
Contact photographs of the plates in this report are available, at cost, from  
U.S. Geological Survey Library, Federal Center, Denver, Colorado 80225.

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## PLATE 1

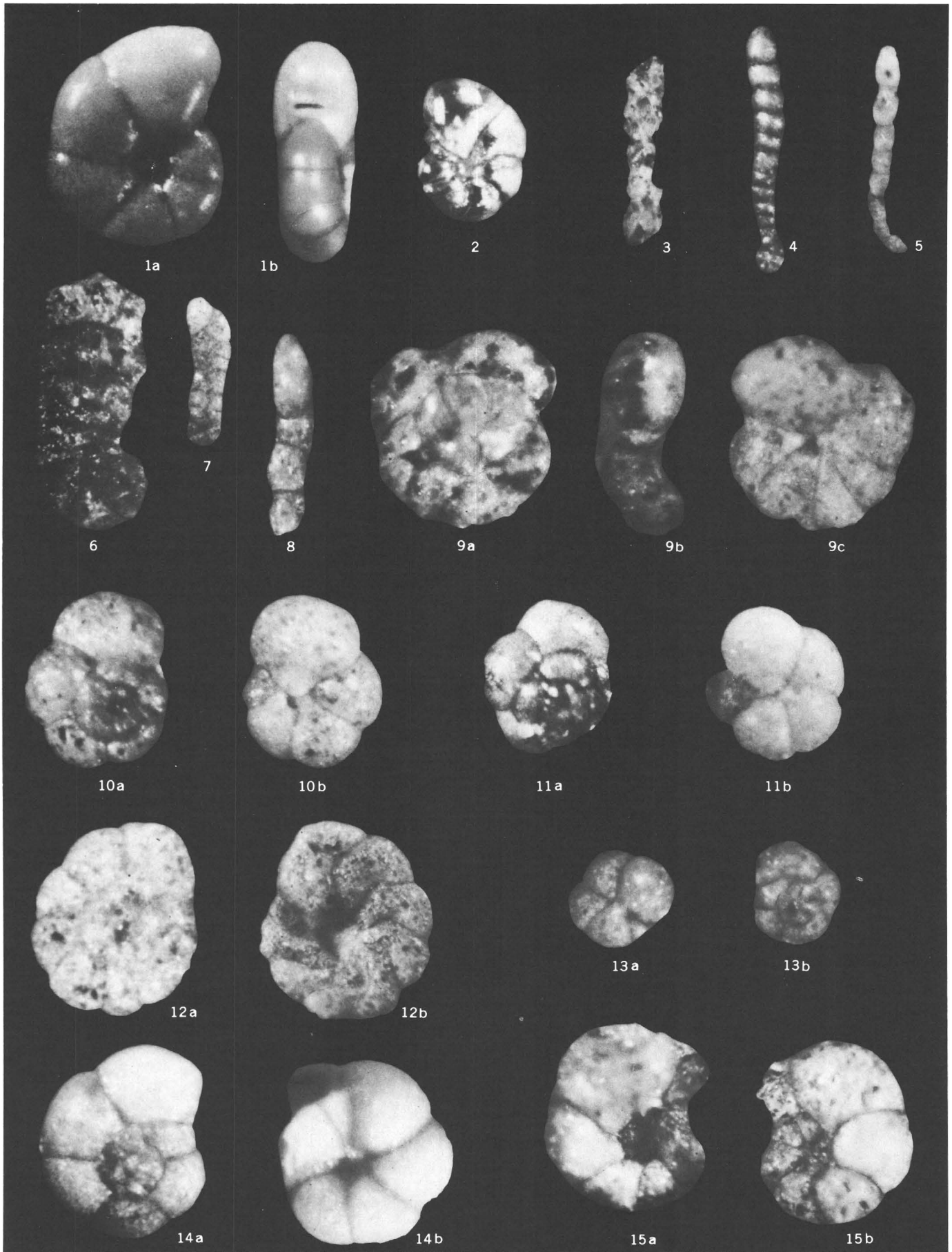
- FIGURE 1. *Nodellum membranaceum* (Brady).  
× 115, sample P-19-61, USNM 175142.
2. *Rhizammina?* sp. (p. 12)  
× 68, sample P-12-61, USNM 175143.
3. *Marsipella cylindrica* Brady (p. 12).  
× 70, sample P-13-61, USNM 175144.
4. *Bathysiphon discreta* (Brady) (p. 12).  
× 73, sample P-19-61, USNM 175145.
5. *Jaculella acuta* Brady (p. 12).  
× 190, sample P-41-61, USNM 175146.
6. *Hyperammina friabilis* Brady (p. 12).  
× 23, sample P-41-61, USNM 175147.
7. *Thurammina papillata* Brady (p. 13).  
× 80, sample P-48-61, USNM 175148.
8. *Glomospira gordialis* (Jones and Parker) (p. 13).  
a, Side view; b, end view; × 43, sample P-40-61, USNM 175149.
9. *Reophax dentalinaformis* Brady (p. 13).  
× 55, sample P-56-61, USNM 175150.
10. *Reophax difflugiformis* Brady (p. 13).  
× 436, sample P-41-61, USNM 175151.
11. *Reophax distans* Brady (p. 13).  
× 62, sample P-33-61, USNM 175152.
12. *Reophax nodulosus* Brady (p. 14).  
× 18, sample P-40-61, USNM 175153.
13. *Reophax scorpiurus* de Montfort (p. 14).  
× 37, sample P-41-61, USNM 175154.
14. *Adercotryma glomeratum* (Brady) (p. 14).  
× 214, sample P-41-61, USNM 175155.
15. *Cyclammina trullissata* (Brady) (p. 14).  
a, Side view; b, apertural view; × 73, sample P-40-61, USNM 175156.
16. *Alveolophragmium nitidum* (Göes) (p. 15).  
a, Side view; b, apertural view; × 200, sample P-19-61, USNM 175157.
17. *Alveolophragmium* cf. *A. nitidum* (Göes) (p. 15).  
a, Side view; b, apertural view; × 185, sample P-41-61, USNM 175158.
18. *Cyclammina cancellata* Brady (p. 14).  
× 19, sample P-40-61, USNM 175159.
19. *Alveolophragmium scitulum* (Brady) (p. 15).  
a, Apertural view; b, side view; × 102, sample P-19-61, USNM 175160.
20. *Alveolophragmium subglobosum* (G. O. Sars) (p. 15).  
a, Side view; b, peripheral view; × 87, sample P-19-61, USNM 175161.



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## PLATE 2

- FIGURE 1. *Alveolophragmium weisneri* (Parr) (p. 15).  
a, Side view; b, apertural view; × 155, sample P-19-61, USNM 175162.
2. *Alveolophragmium?* sp. (p. 15).  
× 195, sample P-49-61, USNM 175163.
3. *Ammobaculites agglutinans* (d'Orbigny) (p. 16).  
× 61, sample P-41-61, USNM 175164.
4. *Ammobaculites agglutinans filiformis* Heron-Allen and Earland (smooth form) (p. 16).  
× 64 sample P-41-61, USNM 175165.
5. *Ammobaculites agglutinans filiformis* Heron-Allen and Earland (rough form) (p. 16).  
× 106, sample P-49-61, USNM 175166.
6. *Ammomarginulina foliacea* (Brady) (p. 16).  
× 137, sample P-38-61, USNM 175167.
7. *Spiroplectammina biformis* (Parker and Jones) (p. 16).  
× 180, sample P-49-61, USNM 175168.
8. *Bigenerina minutissima* Earland (p. 16).  
× 172, sample P-49-61, USNM 175169.
9. *Trochammina grisea* Heron-Allen and Earland (p. 17).  
a, Evolute side view; b, apertural view; c, involute side view; × 154, sample P-19-61, USNM 175170.
10. *Trochammina inflata* (Montagu) (p. 17).  
a, Evolute side view; b, involute side view; × 182, sample P-48-61, USNM 175171.
11. *Trochammina* cf. *T. malovens* Heron-Allen and Earland (p. 17).  
a, Evolute side; b, involute side; × 252, sample P-41-61, USNM 175172.
12. *Trochammina kellestae* Thalmann (p. 17).  
a, Evolute side; b, involute side; × 240, sample P-41-61, USNM 175173.
13. *Trochammina malovens* Heron-Allen and Earland (p. 17).  
a, Involute side; b, evolute side; × 320, sample P-12-61, USNM 175174.
14. *Trochammina nitida* Brady (p. 17).  
a, Evolute side; b, involute side; × 220, sample P-40-61, USNM 175175.
15. *Trochammina nana* (Brady) (p. 17).  
a, Involute side; b, evolute side; × 215, sample P-49-61, USNM 175176.

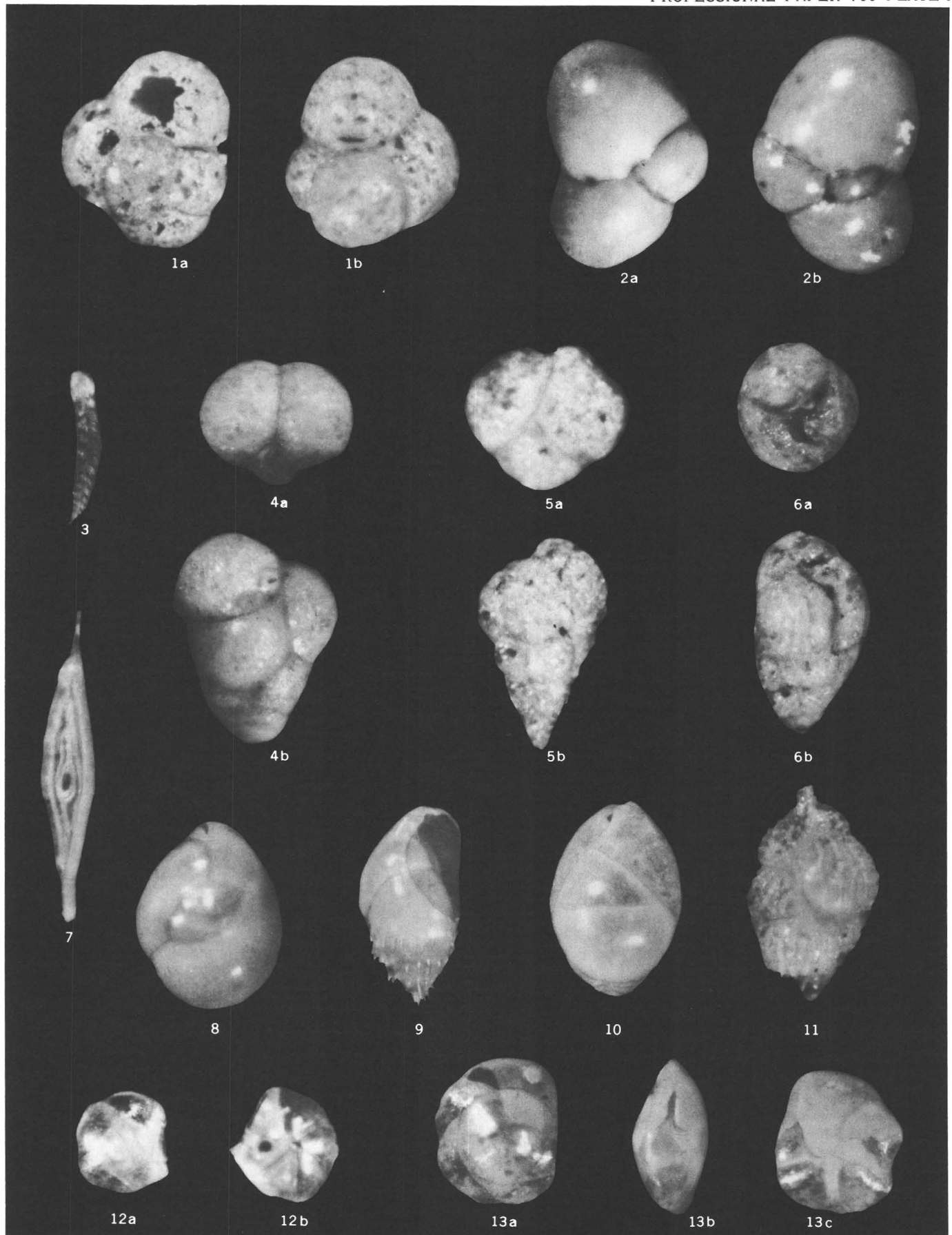


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### PLATE 3

- FIGURE 1. *Trochammina globigeriniformis* (Parker and Jones) (p. 17).  
a, Evolute side; b, involute (apertural) side;  $\times$  174, sample P-41-61, USNM 175177.
2. *Cystammina galeata* (Brady) (p. 18).  
a, b, Side views;  $\times$  83, sample P-19-61, USNM 175178.
3. *Dorothia exilis* Cushman (p. 18).  
 $\times$  190, sample P-49-61, USNM 175179.
4. *Eggerella bradyi* (Cushman) (p. 18).  
a, Apertural view; b, side view;  $\times$  138, sample P-19-61, USNM 175180.
5. *Eggerella scabra* (Williamson) (p. 18).  
a, Apertural view; b, side view;  $\times$  380, sample P-48-61, USNM 175181.
6. *Eggerella propinqua* (Brady).  
a, Apertural view; b, side view;  $\times$  204, sample P-6-61, USNM 175182.
7. *Ophthalmidium pusillum* (Earland) (p. 18).  
 $\times$  113, sample P-32-61, USNM 175183.
8. *Miliolinella subrotunda* (Montagu) (p. 19).  
 $\times$  166, sample P-49-61, USNM 175184.
9. *Bulimina aculeata* d'Orbigny (p. 19).  
 $\times$  56, sample P-16-61, USNM 175185.
10. *Globobulimina* cf. *Bulimina auriculata* Bailey (p. 20).  
 $\times$  47, sample P-16-61, USNM 175186.
11. *Uvigerina peregrina* Cushman (p. 20).  
 $\times$  106, sample P-16-61, USNM 175187.
12. *Epistominella exigua* (Brady) (p. 20).  
a, Evolute side; b, involute side;  $\times$  360, sample P-49-61, USNM 175188.
13. *Epistominella umbonifera* (Cushman) (p. 20).  
a, Evolute side; b, apertural view; c, involute side;  $\times$  97, sample P-49-61, USNM 175189.

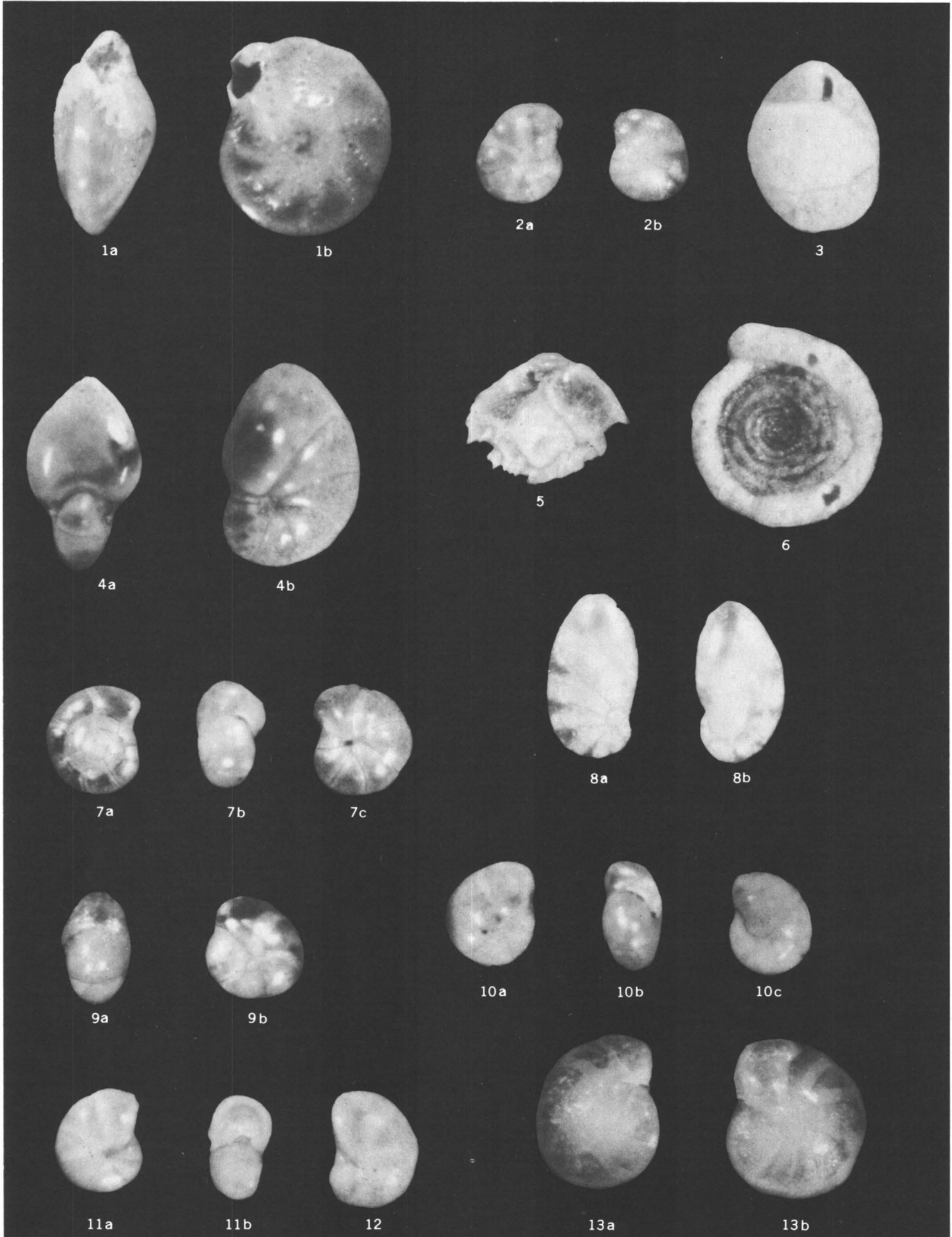




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#### PLATE 4

- FIGURE 1. *Elphidiella groenlandica* (Cushman) (p. 20).  
a, Apertural view; b, side view;  $\times 79$ , sample P-16-61, USNM 175190.
2. *Cibicides bradyi* (Trauth) (p. 21).  
a, Involute side; b, evolute side;  $\times 227$ , sample P-19-61; USNM 175191.
3. *Cassidulina subglobosa* Brady (p. 21).  
 $\times 210$ , sample P-29-61, USNM 175192.
4. *Nonion labradoricum* Dawson (p. 22).  
a, Apertural view; b, side view;  $\times 100$ , sample P-16-61, USNM 175193.
5. *Ehrenbergina hystrix* Brady (p. 21).  
 $\times 78$ , sample P-49-61, USNM 175194.
6. *Involutina tenuis* (Brady) (p. 22).  
 $\times 134$ , sample P-41-61, USNM 175195.
7. *Gyroidina lamareckiana* (d'Orbigny) (p. 22)  
a, Evolute side; b, peripheral (apertural) view; c, involute side;  $\times 122$ ,  
sample P-49-61, USNM 175196.
8. *Nonionella turgida* (Williamson) (p. 22).  
a, Evolute side; b, involute side;  $\times 190$ , sample P-16-61, USNM 175197.
9. *Pullenia subcarinata* (d'Orbigny) (p. 22)  
a, Peripheral view; b, side view;  $\times 142$ , sample P-12-61, USNM 175198.
10. *Anomalina globulosa* Chapman and Parr (p. 22).  
a, Evolute side; b, peripheral view; c, involute side;  $\times 109$ , sample  
P-12-61, USNM 175199.
11. *Melonis pompilioides* (Fichtel and Moll) (p. 23).  
a, Side view; b, peripheral view;  $\times 160$ , sample P-29-61, USNM 179200.
12. *Melonis affine* (Reuss) (p. 23).  
 $\times 200$ , sample P-49-61, USNM 179201.
13. *Cibicidoides* cf. *C. mundulus* (Brady, Parker, and Jones) (p. 23).  
a, Evolute side; b, involute side;  $\times 280$ , sample P-49-61, USNM 179202.



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