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PLIOCENE BENTHIC FORAMINIFERA FROM THE ONTONG-JAVA PLATEAU (WESTERN EQUATORIAL PACIFIC OCEAN): FAUNAL RESPONSE TO CHANGING PALEOENVIRONMENT

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ABSTRACT

The relative abundance of benthic foraminifera in Deep Sea Drilling Project Hole 586A (2,207 m) on the Ontong-Java Plateau in the western equatorial Pacific Ocean has been analyzed. The investigated sequence represents the time interval between 1.9 and 5.0 Ma.

The relative abundance patterns for various species, composition of faunal assemblages and their variation through time, as well as sedimentological data has been used to develop a model for the paleoceanographic and paleoenvironmental evolution of the Ontong-Java Plateau area. Correspondence analysis shows that there are three significantly different assemblages present. Alternation in dominance between the three assemblages can be linked to major changes in the paleoenvironment.

The benthic foraminiferal fauna contains 262 taxa assigned to 83 genera, of which 179 taxa have been illustrated and discussed in the taxonomic section. One genus, *Siphoeggerella,* is new.

INTRODUCTION

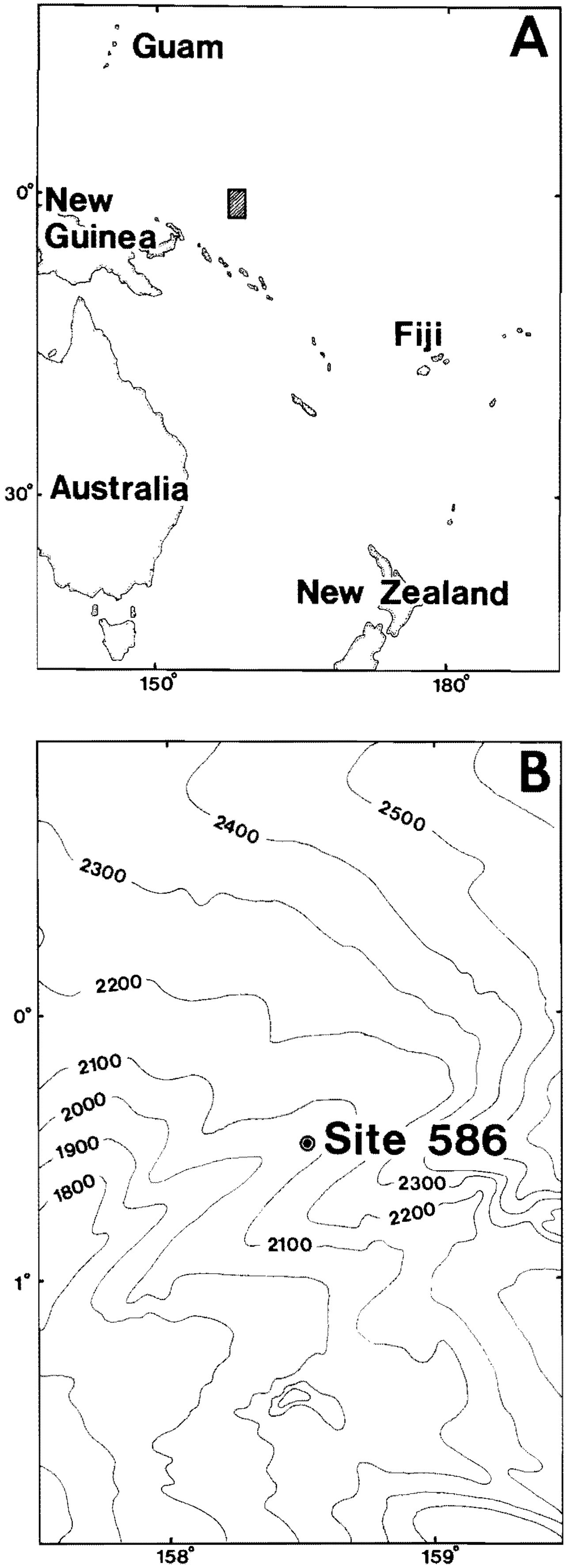
Studies of benthic foraminifera have contributed significantly to paleoclimatic and paleoceanographic reconstructions (Streeter, 1973; Schnitker, 1974, 1979; Lohmann, 1978; Sen Gupta and others, 1982; Hodell and others, 1983; Hermelin, 1986). Although benthic foraminifera are rare (compared to planktonic shells) in most deep-sea samples, they are generally the only bottom living organisms found in significant numbers in deep-sea cores. The relative abundances of benthic foraminifera are often correlated to the substrate and to properties such as temperature, salinity, oxygen, nutrients, carbonate saturation, but are relatively independent of the regional water depth (Said, 1953; Blanc-Vernet, 1958; Uchio, 1960; Lutze, 1962; Phleger and Bradshaw, 1966; Murray, 1969; Greiner, 1974). Benthic foraminifera are, therefore, particularly useful in reconstructions of conditions and changes of the deep water circulation.

The species composition of benthic foraminiferal faunas is often found to be specific for principal water masses (Atlantic Ocean: Streeter, 1973; Schnitker, 1974, 1980; Lohmann, 1978; Culver and Buzas, 1981, 1982; Weston, 1982; Weston and Murray, 1984; Norwegian-Greenland Sea: Belanger and Streeter, 1980; Sejrup and others, 1981; Mackensen and others, 1985; Indian Ocean: Corliss, 1979; and Pacific Ocean: Smith, 1964; Ingle and others, 1980; Burke, 1981; Resig, 1981). Comparisons of the results of these and other studies are often hampered because (1) deep-sea benthic foraminiferal faunas are diverse, (2) many species occur in low abundancies, and (3) taxonomic confusion is severe.

The primary objective of this study is to use the benthic foraminiferal assemblages for analysis of the paleoceanographic changes that occurred on the Ontong-Java Plateau during Pliocene times. A secondary objective is to record and illustrate, with scanning electron photomicrography, the Pliocene benthic foraminifera of this area.

THE ONTONG-JAVA PLATEAU AREA

The Ontong-Java Plateau is located in the western equatorial Pacific Ocean, east of New Guinea (Fig. 1A). It is a shallow platform, about 1,600 km long and 800 km wide, trending northwest-southeast. Seismic refraction has delineated an oceanic crustal thickness of continental magnitude, 35–42 km (Furumato and oth-



ers, 1976). Seismic reflection profiling shows that the sedimentary sequence is about 1.5 km thick, forming a more or less flat surface about 1,800 m below sea level (Furumato and others, 1976). Previous drilling reveals that the oldest sediments are of Aptian age (Scientific Party Leg 7, 1971; Scientific Party Leg 30, 1975). Resig and others (1976) showed that the Ontong-Java Plateau has existed as a topographic high at least since late Eocene times.

The subsurface water masses in the Ontong-Java Plateau area are as follows (modified after Wyrtki, 1962; Ried, 1965) (Fig. 2).

(1) The flat, elevated surface of the Ontong-Java Plateau lies within the PIW (Pacific Intermediate Water) which ranges from 1,200 to 2,400 m depth. The oxygen content is low (2.76–3.94 ml/L), the temperature ranges from 1.9 to 3.9°C and the salinity from 34.58 to 34.65‰.
(2) The upper slope of the plateau, between 2,500 and 3,000 m depth is intersected by PDW (Pacific Deep Water) with a salinity maximum of 34.74‰. The temperature ranges from 1.4 to 1.9°C and the oxygen from 4.0 to 4.4 ml/L.
(3) The lower part of the slope and the abyssal plain is bathed by PBW (Pacific Bottom Water) which is found below 3,000 m depth and is characterized by low potential temperatures (1.5–1.75°C). The salinity is less than 34.70‰ and the oxygen ranges from 3.4 to 4.6 ml/L.

The Ontong-Java Plateau is located well above the present CCD (Calcite Compensation Depth) and the present carbonate lysocline is calculated to intersect the lower part of the plateau at 3,400 to 3,600 m (Berger and others, 1977, 1982). The foraminiferal lysocline lies approximately at 3,000 m, which approximates the upper boundary for the PBW (Parker and Berger, 1971).

PREVIOUS WORK

Western Equatorial Pacific

Prior to the DSDP, our knowledge of deep-sea benthic foraminifera in the world ocean was primarily

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Figure 1. A. Map of the equatorial and southern part of the western Pacific Ocean showing location of Ontong-Java Plateau (shaded rectangle). B. Enlargement of the shaded rectangle showing the location of Site 586 on the northeastern upper slope of the Ontong-Java Plateau. Bathymetric contours (in meters) from Kroenke (1972) are based on an assumed sound-velocity of 1,500 m/s^{-1} and are not corrected for changes in the velocity.

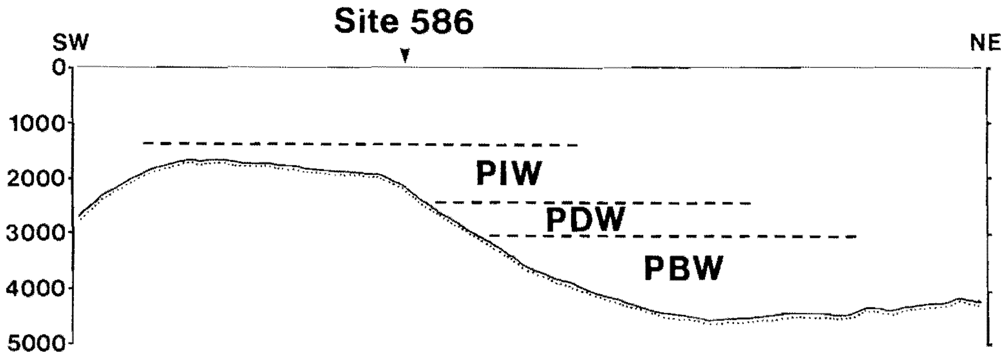

FIGURE 2. Schematic southwest/northeast transect over the Ontong-Java Plateau showing the general stratification of the subsurface water masses in the area. PIW = Pacific Intermediate Water. PDW = Pacific Deep Water. PBW = Pacific Bottom Water.

limited to Holocene and Pleistocene assemblages because of lack of older core material. Cushman contributed to our knowledge of the Holocene deep-water benthic foraminiferal fauna of the Pacific Ocean by his series of monographs of the foraminifera of the North Pacific Ocean (Cushman, 1910, 1911, 1913, 1914, 1915, 1917a), by a monograph of the foraminifera off the Philippine Islands (Cushman, 1921), and by his descriptions of the foraminifera of the *Albatross* Expedition, 1899–1900 (Cushman, 1932a, 1933a, 1942). Cushman and his co-authors also published numerous papers concerning Holocene as well as older fossil assemblages (the latter found in outcrops) from the Pacific region.

Several DSDP sites have been drilled in the Pacific Ocean but there are only a few articles dealing with Neogene benthic deep-sea foraminifera from the central or western part of the Pacific (Central North Pacific: Douglas, 1973; Sea of Japan: Ingle, 1975; Northwestern Pacific: Butt, 1980; North Philippine Sea: Echols, 1980; Japan Trench: Keller, 1980; Thompson, 1980; Central Equatorial Pacific Boersma, 1986; Kurihara and Kennett, 1986).

ONTONG-JAVA PLATEAU

The Recent benthic foraminiferal fauna of the Ontong-Java Plateau area has been studied by Culp (1977) and Burke (1981) who found that the distribution of benthic foraminifera is influenced by the topography of the area, the deep water masses, the lysocline, terrigenous input from the Solomon Islands (to the southeast of New Guinea), and the upwelling of deep water.

The top of the plateau is characterized by a high relative abundance of *Siphouvigerina interrupta* (=*Uvigerina auberiana,* this paper). This species is also present on the upper part of the slope, but in lower relative frequencies. It is absent on the lower part of the slope and on the abyssal plain. The species *Astrononion stelligerum* (=*A. novozealandicum,* this paper), *Cibicides pseudoungerianus,* and *Hoeglundina elegans* show similar distribution patterns. Other species common on the top of the plateau are *Oridorsalis umbonatus* and *Pullenia bulloides.* These two species also occur on the slope and on the abyssal plain.

The slope is characterized by a high abundance of *Pullenia bulloides.* Species more or less restricted to the slope are *Favocassidulina favus* and *Cassidulina subglobosa* (=*Globocassidulina subglobosa,* this paper). *Epistominella exigua, Pullenia bulloides, Melonis affinis,* and *Melonis pompilioides* are present on the slope as well as on the abyssal plain.

The abyssal plain is strongly dominated by *Nuttallides umbonifera* (=*Epistominella umbonifera,* by others) and *Epistominella exigua.* Additional species are *Planulina wuellerstorfi* (=*Cibicidoides wuellerstorfi,* this paper), *Melonis affinis, Melonis pompilioides, Oridorsalis umbonatus,* and *Pullenia bulloides.*

The Miocene benthic foraminifera of the Ontong-Java Plateau have been studied at DSDP Site 289 (Woodruff, 1979; Woodruff and Douglas, 1981). They compared the faunal changes in the benthic foraminiferal assemblages with fluctuations in the stable isotope record. According to their study the greatest faunal change is linked to an oxygen isotopic event which occurred during planktonic foraminiferal Zones N9 to N11 (15–13 Ma), followed by a short period of stability and a second period of faunal change in the latest Miocene (Zones N16 and N17; 10–5 Ma). This faunal change in the latest Miocene produced a benthic foraminiferal assemblage that, in terms of species composition and relative abundance, is similar to the Holocene "top of plateau" assemblage described by Culp (1977) and Burke (1981).

MATERIAL AND METHODS

Material

Site 586 is located on the northeastern upper slope of the Ontong-Java Plateau (00°29.84′S and 158°28.89′E) at 2,207 m water depth (Fig. 1B). Site 586 is located within 2 km of DSDP Site 289 (Andrews and others, 1975) and has been described by Moberley and others (1986).

Because the Hydraulic Piston Corer (HPC) and the Extended Core Barrel (XCB) were used, the sedimentary sequences obtained were relatively continuous and virtually undisturbed. Hole 586A showed an excellent recovery (98.5%) from the top of the cored sequence (approximately the Pliocene/Pleistocene boundary) down through the latest Miocene. For this study, cores 1 through 11 were sampled at approximately 1 m intervals (101 samples) throughout most of the Pliocene, corresponding to an average sample resolution of approximately 0.03 Ma.

Methods

Approximately 3 cc of wet sample was first dried for about 5 hours at 80°C. The samples were then disintegrated in 3% Calgon solution and washed through a 63 micrometer sieve. The <63 and >63 micrometer fractions were then dried separately.

Coarse fraction percentages (for each sample) were determined by sieving through a series of sieves (500, 250, 125, and 63 micrometer). The derived sediment coarse fraction percentages are shown in Figure 3 (63–125, 125–250, 250–500, and >500 micrometers), and the cumulative percentages in Figure 4. The dry weight of the samples ranged from 0.7 gram to 3.4 gram with an average weight of 1.8 gram (Table 1).

Benthic foraminifera were picked from the >125 micrometer fraction; the number of specimens per sample ranged from 33 to 352 (Table 1) with an average of 192 specimens per sample.

The number of specimens of each benthic species were recorded as the percentage of the total benthic foraminiferal assemblage in each sample; these data are presented in Appendix 1.

Correspondence Analysis

Correspondence analysis was performed in order to establish an understanding of the inter-species relationships and the sample/species interrelationship. This multivariate statistical method can be regarded as a variety of principal component analysis in which the properties of both *R*-mode and *Q*-mode techniques are combined. By a special method of scaling, a simultaneous representation of samples and variables on the same factorial axes can be obtained (David and others, 1974; Teil, 1975). The possibility of interpreting the sample points and the variable points in the same plane has obvious advantages and provides the following information: (1) nearby variable points will show the correlation between variables, (2) clusters of sample points will be interpreted as the result of the same process, or belonging to a specific group, (3) a cluster of sample points will be characterized by the variable points close to that cluster.

In this study the program *CORRES* (originally written by J. E. Klovan and revised for processing on a micro-computer by B. Granlund, University of Stockholm) was used. Although 272 taxa were initially recognized, only 28 were considered at the first stage. These 28 species were the most common (each comprising >2% of the fauna in at least five samples) in the 101 samples. At a later stage, only the seven taxa that have specific bathymetric, bottom substrate, and/or watermass preferences were considered. The final results of the two analyses were essentially the same. By eliminating the species that had no strongly documented correlation to the bottom water properties, the noise in the analysis was considerably reduced and the factor assemblages retained the same composition.

Bathymetric Zonation

Several different systems for bathymetric zonation can be found in the literature. This may cause confusion because the abyssal zone is considered by some authors to begin at 1,850 m (e.g., Bandy, 1953), whereas others consider depths below 4,000 m as belonging to the abyssal zone (e.g., Ingle and others, 1980). In this study all references are recalculated to conform with the following bathymetric zonation (Fig. 5), neritic zone (0–150 m), upper bathyal zone (150–500 m), upper middle bathyal zone (500–1,500 m), lower middle bathyal zone (1,500–2,000 m), lower bathyal zone (2,000–4,000 m), and abyssal zone (below 4,000 m).

AGE MODEL FOR DSDP HOLE 586A

Five planktonic foraminiferal and five calcareous nannofossil biostratigraphic datum levels were determined (Table 2) in order to establish an age model for the Pliocene interval of Hole 586A.

Planktonic Foraminifera

Planktonic foraminifera are abundant in the sediments recovered from Hole 586A. They were studied

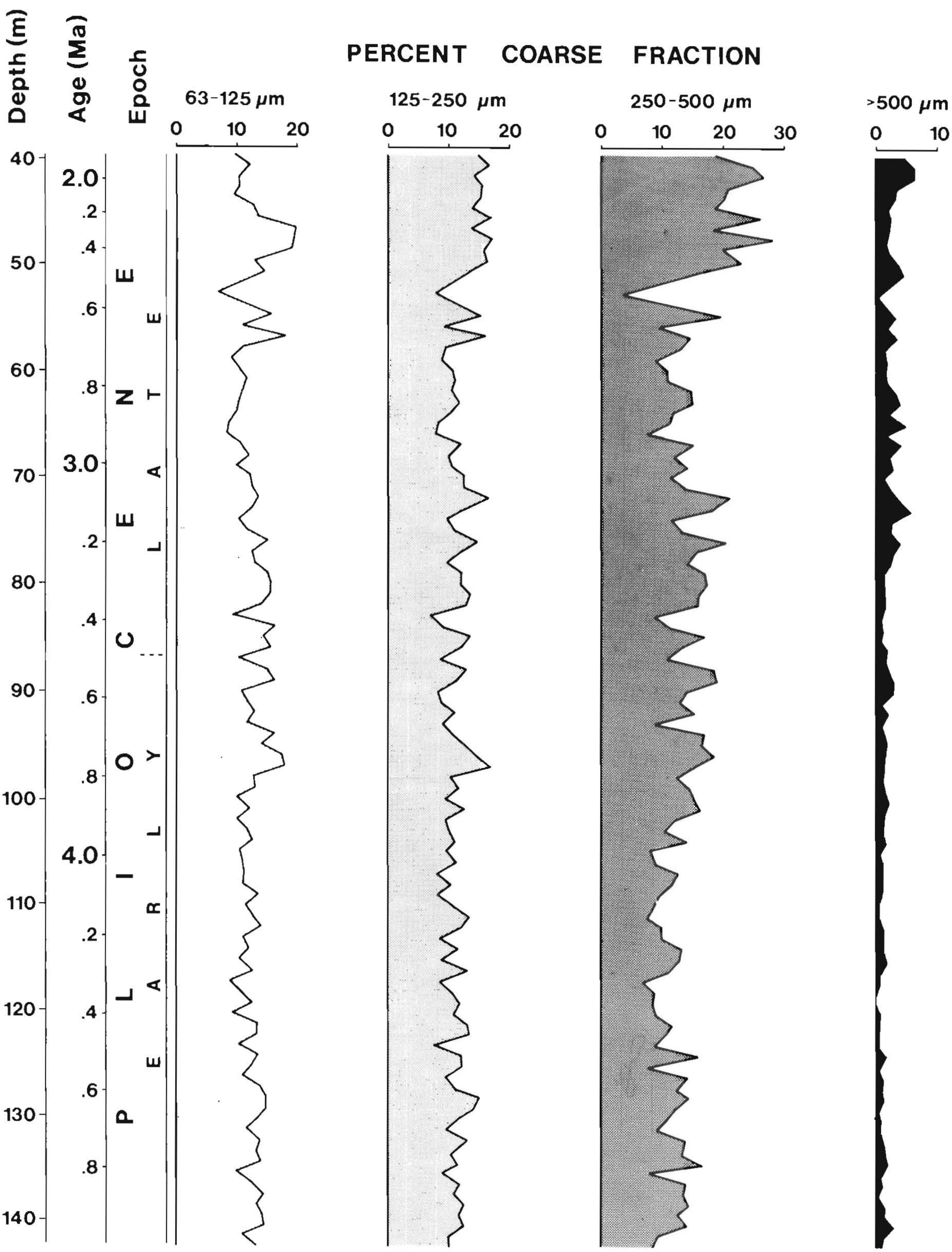

FIGURE 3. Plots of sediment coarse fraction percentages in Hole 586A. The ages are derived from Figure 6.

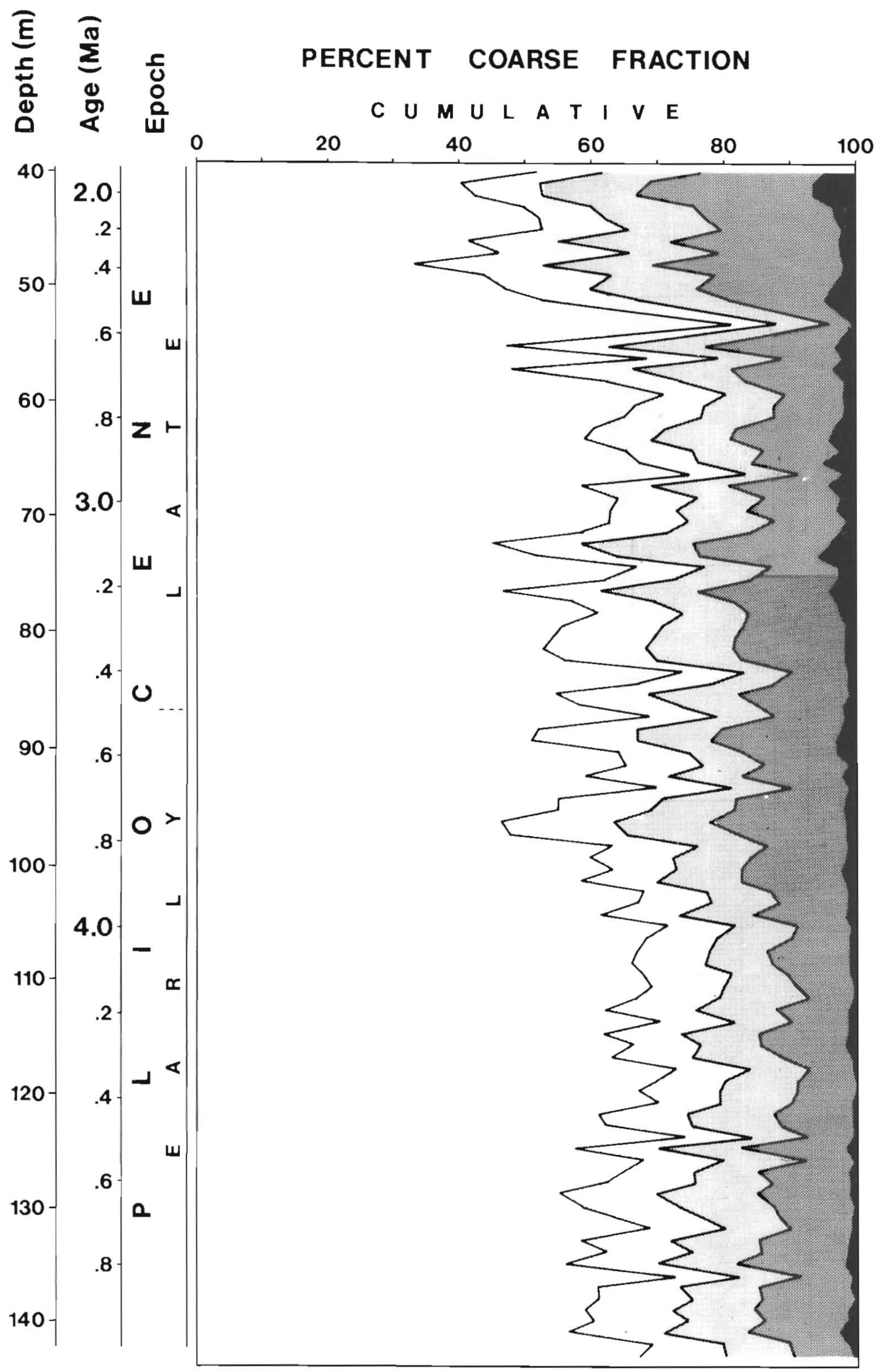

FIGURE 4. Plot of cumulative sediment coarse fraction percentages in Hole 586A. The unshaded part represents the <63 micron size fraction and the shading corresponds to that in Figure 3. The ages are derived from Figure 6.

TABLE 1. Total weight, number of specimens examined in the >125 micron fraction, and the calculated number of specimens per gram dry sediment.

Core	Section	Interval (cm)	Depth (m)	Weight (gram)	Number of specimens	
					Total	Per gram
1	1	1–2	39.31	2.6046	147	56.4
		100–101	40.30	0.9061	177	193.3
	2	50–51	41.30	1.0776	202	187.4
		149–150	42.29	0.7127	129	181.0
	3	100–101	43.30	1.1775	178	151.2
	4	50–51	44.30	1.1154	122	109.4
		149–150	45.29	1.3782	153	111.0
	5	100–101	46.30	0.9506	187	196.7
	6	50–51	47.30	0.7392	182	246.2
		149–150	48.29	0.9209	341	370.3
2	1	50–51	49.40	1.8363	118	64.2
	2	0–1	50.40	1.7184	33	19.2
	3	50–51	52.40	1.8394	116	63.1
		100–101	54.40	1.3482	139	103.1
	5	50–51	55.40	1.6568	222	134.0
	6	0–1	56.40	1.8912	167	88.3
		100–101	57.40	2.0860	154	73.8
3	1	0–1	58.50	1.9198	139	72.4
		100–101	59.50	1.8535	163	87.9
	2	50–51	60.50	2.1091	310	147.0
	3	1–2	61.51	1.5096	160	106.0
		100–101	62.50	1.6894	196	116.0
	4	50–51	36.50	1.9337	134	69.3
	5	0–1	64.50	2.0173	128	63.4
		100–101	65.50	1.4829	146	98.4
	6	50–51	66.50	1.4865	166	111.7
	7	0–1	67.50	1.9251	227	117.9
4	1	50–51	68.60	3.4206	241	70.4
	2	0–1	69.60	1.6744	218	130.2
		100–101	70.60	1.9042	289	151.8
	3	50–51	71.60	1.2808	106	82.8
	4	0–1	72.60	1.6517	199	120.5
		100–101	73.60	2.0716	351	169.4
	5	50–51	74.60	1.8699	210	112.3
	6	0–1	75.60	1.2798	212	165.8
		100–101	76.60	1.3530	145	107.2
5	1	0–1	77.70	1.2770	159	124.5
		100–101	78.70	1.2862	166	129.1
	2	50–51	79.70	1.4538	200	137.5
	3	1–2	80.71	1.2556	94	74.9
		100–101	81.71	1.7587	125	71.1
	4	50–51	82.70	1.1614	129	111.1
	5	0–1	83.70	1.7944	168	93.6
		100–101	84.70	1.9496	116	59.5
	6	50–51	85.70	1.4696	129	87.8
	7	0–1	86.70	1.6797	247	147.1
6	1	50–51	87.80	1.9912	188	94.4
	2	0–1	88.80	1.9543	210	107.4
		100–101	89.80	1.6787	149	88.7
	3	50–51	90.80	2.4559	317	129.1
	4	0–1	91.80	2.0738	222	107.0
		100–101	92.80	1.3270	193	145.4
	5	50–51	93.80	1.6128	217	134.5
	6	0–1	94.80	1.3900	203	146.0
		100–101	95.80	1.6985	178	104.8
7	1	0–1	96.90	1.8656	197	105.6
		100–101	97.90	1.4749	196	132.9
	2	50–51	98.90	1.7814	172	96.5
	3	0–1	99.90	1.7125	282	164.7
		100–101	100.90	2.0111	227	112.9
	4	50–51	101.90	2.1594	288	133.4
	5	0–1	102.90	1.5362	161	104.8
		100–101	103.90	1.8854	227	120.4
	6	50–51	104.90	1.8161	198	109.0
	7	0–1	105.90	2.2767	275	120.8
8	1	50–51	107.00	2.0033	132	65.9
	2	0–1	108.00	1.8667	240	128.6
		100–101	109.00	1.6623	95	57.1
	3	50–51	110.00	1.7403	218	125.3
	4	0–1	111.00	1.4885	168	112.9
		100–101	112.00	1.5553	167	107.4
	5	50–51	113.00	1.7315	196	113.2
	6	0–1	114.00	1.9587	173	88.3
		100–101	115.00	2.0157	280	138.9
9	1	0–1	116.10	1.6521	155	93.8
		100–101	117.10	1.8690	295	157.8
	2	50–51	118.10	2.2437	131	58.4
	3	0–1	119.10	2.0842	117	56.1
		100–101	120.10	1.4979	237	158.2
	4	50–51	121.10	1.1745	143	121.7
	5	0–1	122.10	1.8094	74	40.9
		100–101	123.10	1.4940	118	79.0
	6	50–51	124.10	1.0971	92	83.9
	7	0–1	125.20	2.0494	181	88.3
10	1	50–51	126.20	1.5840	131	82.7
	2	0–1	127.20	1.0335	76	73.5
		100–101	128.20	1.2707	62	48.8
	3	50–51	129.20	1.0794	58	53.7
	4	0–1	130.20	2.0439	60	29.3
		100–101	131.20	1.4083	39	27.7
	5	50–51	132.20	1.8183	95	52.2
	6	0–1	133.20	1.9476	134	68.8
		100–101	134.20	2.0330	82	40.3
11	1	0–1	135.30	1.8902	100	52.9
		100–101	136.30	1.8841	76	40.3
	2	50–51	137.30	2.2143	98	44.2
	3	0–1	138.30	2.3439	115	49.1
		100–101	139.30	1.6430	73	44.4
	4	50–51	140.30	2.3735	133	56.0
	5	0–1	141.30	2.6462	208	78.6
		100–101	142.30	1.7707	75	42.3

in the >63 micrometer fraction and the material shows evidence of mechanical erosion by having a high percentage (>50%) of fragmented tests. The LAD (Last Appearance Datum) for *Globoquadrina altispira* occurs in Section 586A-3-5 and represents an age of 2.9 Ma (Berggren and others, 1985). The characteristic species *Globigerinoides fistulosus* appears for the first time in Section 586A-3-6. This species is usually considered to have a FAD (First Appearance Datum) that coincides with the LAD of *G. altispira,* but there are reports showing that the range of *G. altispira* overlaps with that of *G. fistulosus* (Keigwin, 1982; Hermelin, 1986, 1987). The FAD of *Globorotalia tosaensis* was found in Section 586A-4-3 and is dated at 3.1 Ma (Berggren and others, 1985). The change from sinistral to dextral coiling in *Pulleniatina primalis* is sharp and occurs in the lower part of Section 586A-6-6. This

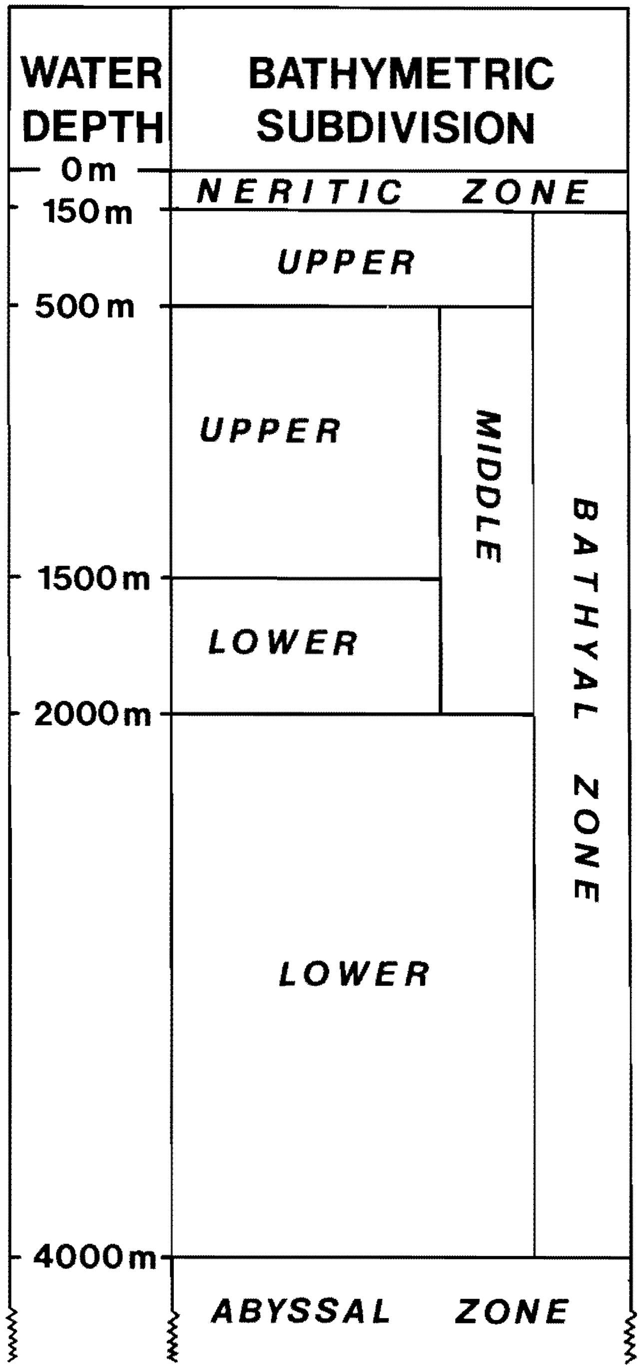

FIGURE 5. General bathymetric zonation used in this paper. All text references to depth limits and preferred habitats for different species have been recalculated to conform with this zonation.

event is dated at 3.8 Ma (Berggren and others, 1985). The LAD of *Pulleniatina spectabilis,* which is restricted to the Indian and Pacific oceans, occurs in the lower part of Section 586A-7-5 and is dated at 3.9 Ma (Berggren and others, 1985).

NANNOFOSSILS

Sample 586A-1-1, 74–76 cm, is above the LAD of *Discoaster brouweri,* which is dated at 1.89 Ma (Backman and Shackleton, 1983), whereas sample 586A-1-3, 74–76 cm is below the beginning of the acme-interval of *Discoaster triradiatus,* which is dated at 2.07 Ma (Backman and Pestiaux, 1986). The LAD of *Discoaster pentaradiatus* occurs between Sections 586A-1-6 and 586A-2-1 and is dated between 2.35 and 2.40 Ma (Backman and Shackleton, 1983). *Reticulofenestra pseudoumbilica* occurs for the last time in Section 586A-6-1. This event is dated at 3.56 Ma (Backman and Shackleton, 1983). The species *Ceratolithus rugosus* evolved from *Ceratolithus acutus* and the datum level placed at the frequency crossover of these two taxa appears in Section 586A-10-3 and is dated at 4.57 Ma (Backman and Shackleton, 1983).

SEDIMENTATION RATES

The sedimentation rate curve outlined by the Shipboard Scientists Leg 89, Site 586 (see Moberly and others, 1986, p. 228, Fig. 10) has an offset of 5.1 m compared to the biostratigraphic events (see Moberly and others, 1986, p. 225, Fig. 8). The reason for this discrepancy is probably ". . . that prime data for Hole 586 and 586A collected aboard ship may reflect the originally established water depths and sub-bottom depths and may be in error by 5.1 m in the sub-bottom depths" (Moberly and others, 1986, p. 216). To make a correction for this, 5.1 m was subtracted from each original sample depth. Thus, the top of core 1 is regarded to represent a depth of 39.3 m below the seafloor rather than the originally assumed 44.4 m. By using the planktonic foraminiferal and nannofossil datums presented above, a sedimentation rate model can be established for Hole 586A (Fig. 6). The sedimentation rate is extrapolated below 130 m and seems to be constant up to about 49 m, where a drastic decrease occurs. The sedimentation rate is approximately 3.75 cm/kyr below this change at 49 m and approximately 1.60 cm/kyr above the change.

SIZE FRACTION ANALYSIS

The sediments are composed mostly of nannofossils with foraminifera as a minor component and are classified as foraminifer-bearing nannofossil oozes. The coarse-fraction component (>63 micrometers) is composed of planktonic foraminifera, whereas the fine fraction principally is composed of nannofossils and juvenile foraminifera. Figures 3 and 4 demonstrate that both the fine and the coarse fractions are relatively

TABLE 2. Planktonic foraminiferal and nannofossil events used to develop an age/depth model for Hole 586A. Information from Berggren and others (1986) was used for the foraminiferal ages. Backman and Shackleton's (1983) and Backman and Pestiaux's (1986) data were used for nannofossil ages.

Age	Event	Species	Depth in hole 586A
1.89	LAD	*Discoaster brouweri*	below 40.05 m
2.07	Acme	*Discoaster triradiatus*	above 43.05 m
2.35–2.40	LAD	*Discoaster pentaradiatus*	54.40 m
2.90	LAD	*Globoquadrina altispira*	64.50–65.50 m
2.90	FAD	*Globigerinoides fistulosus*	66.50–67.50 m
3.10	FAD	*Globorotalia tosaensis*	74.60 m
3.56	LAD	*Reticulofenestra pseudoumbilica*	87.80 m
3.80	S→D	*Pulleniatina primalis*	95.80–96.90 m
3.90	LAD	*Pulleniatina spectabilis*	102.90–103.90 m
4.60	Trans.	*Ceratolithus acutus/C. rugosus*	129.10–130.20 m

FAD = First Appearance Datum.
LAD = Last Appearance Datum.
Acme = first occurence of Acme-zone.
S→D = shift in coiling direction from sinistral to dextral.
Trans. = transition from species A to species B.

constant throughout the sequence studied. The <63 micrometer fraction fluctuates around 60% whereas the percentages for each of the 63–125, 125–250, and the 250–500 micrometer fractions vary between 10 and 15%. There is a slight increase in the >63 micrometer fraction at about 100 m (3.8 Ma) to approximately 50%. The upper part of the sequence, above 100 m, is more variable than the lower part. This becomes especially obvious in the 250–500 micrometer fraction where the relative percentage suddenly drops to about 5% at 52.4 m (2.6 Ma), and increases to 20–25% in the uppermost 12 meters of the sequence.

Fluctuations in coarse fraction properties can be interpreted as the result of one or more of the following conditions: (1) fluctuations in the size-selective dissolution of biogenic carbonate, (2) fluctuations in the rate of production and accumulation of nannofossils relative to those of foraminifera, (3) fluctuations in the amount of winnowing of fine grained biogenic components.

Dissolution would tend to break down the foraminiferal test into smaller particles which would result in a decrease in coarse-fraction and an increase in fine-fraction. However, since Site 586 (2,207 m) is well above the depth of the present carbonate lysocline of 3,400 to 3,600 m (Berger and others, 1982). The influence of dissolution has probably been small on the fluctuation of the coarse fraction.

Depocenters of material that has been winnowed from other places would exhibit a coarse-fraction diluted by the fine-fraction. Likewise, areas of high primary production result in a larger flux of phytoplankton (nannofossils and diatoms) than zooplankton (planktonic foraminifera and radiolarians) (Gardner and others, 1986). Site 586 is presently located near the Equatorial Divergence, an area which might well have produced sediment with higher percentages of finer material relative to an area of low productivity.

Variations in winnowing effects may also yield changes in the coarse-fraction content. In spite of the fact that the biostratigraphy suggests that the sequence studied is complete, minor erosional events may have occurred at Site 586 as suggested by Gardner and others (1986).

THE PLIOCENE BENTHIC FORAMINIFERAL FAUNA

ABUNDANCE

The number of benthic foraminifera per gram sediment is presented in Figure 7. This number varies around 50 (±20) in the lower part of the investigated sequence. Above the 122 m level (~4.4 Ma) the number of specimens increases to about 100 (±40). Pronounced fluctuations begin at about 51 m (~2.4 Ma), with a low of 19 and a high of 370 specimens per gram of sediment.

DIVERSITY

The benthic foraminiferal fauna is highly diverse, generally between 35 and 60 taxa per sample are recognized when 150 or more specimens were counted (see Fig. 8A). There is a strong correlation between the number of specimens examined and the number of taxa recognized. If species that are represented by single occurrences are excluded, the diversity decreases to between 15 and 30 taxa when 150 or more specimens were counted (see Fig. 8B).

The diversity through time is shown in Figure 7. The diversity is around 30 for the lower part of the sequence

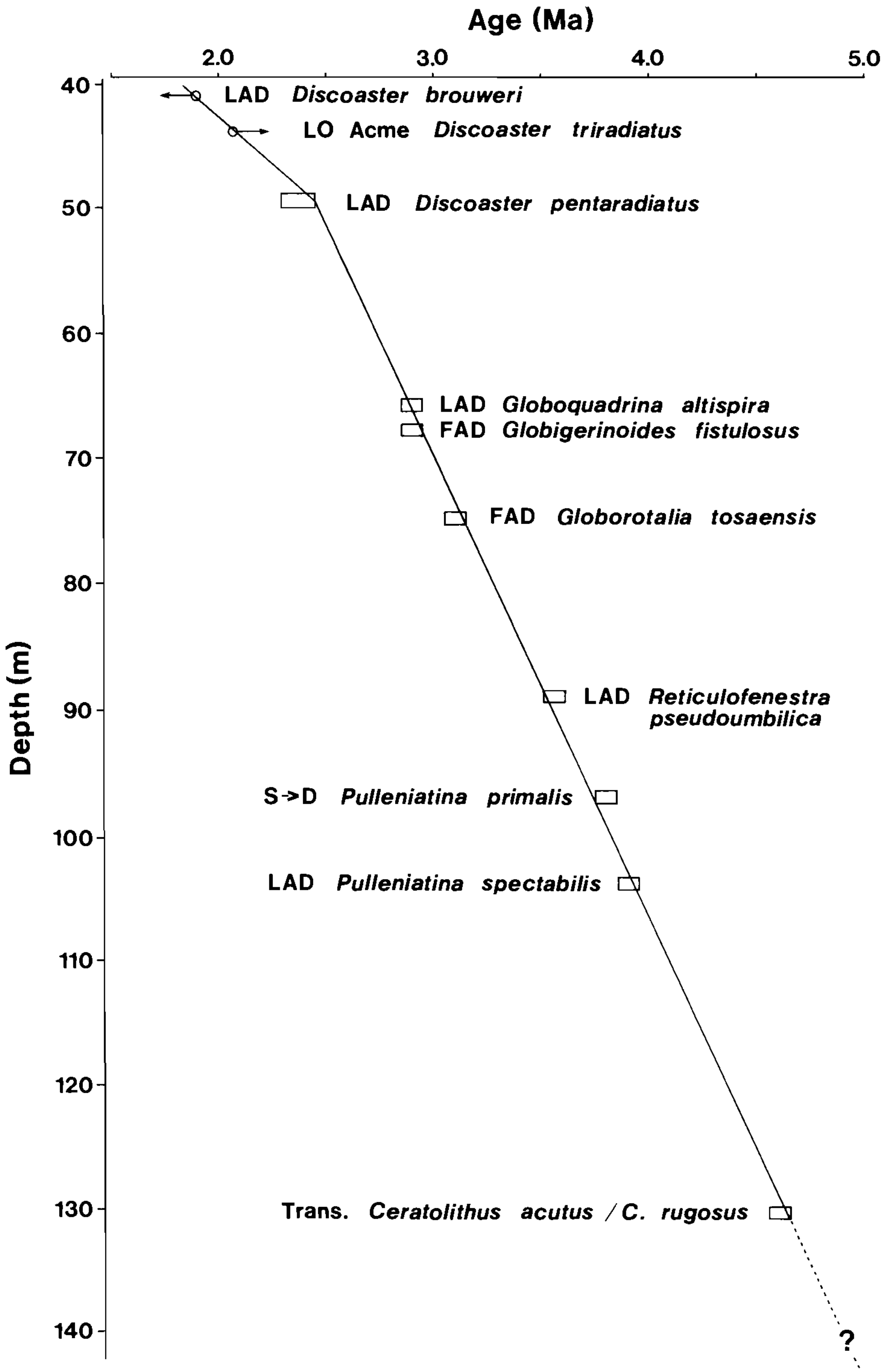

FIGURE 6. Age/depth relationships of planktonic foraminiferal and nannofossil datums in Hole 586A. For abbreviations see Table 2.

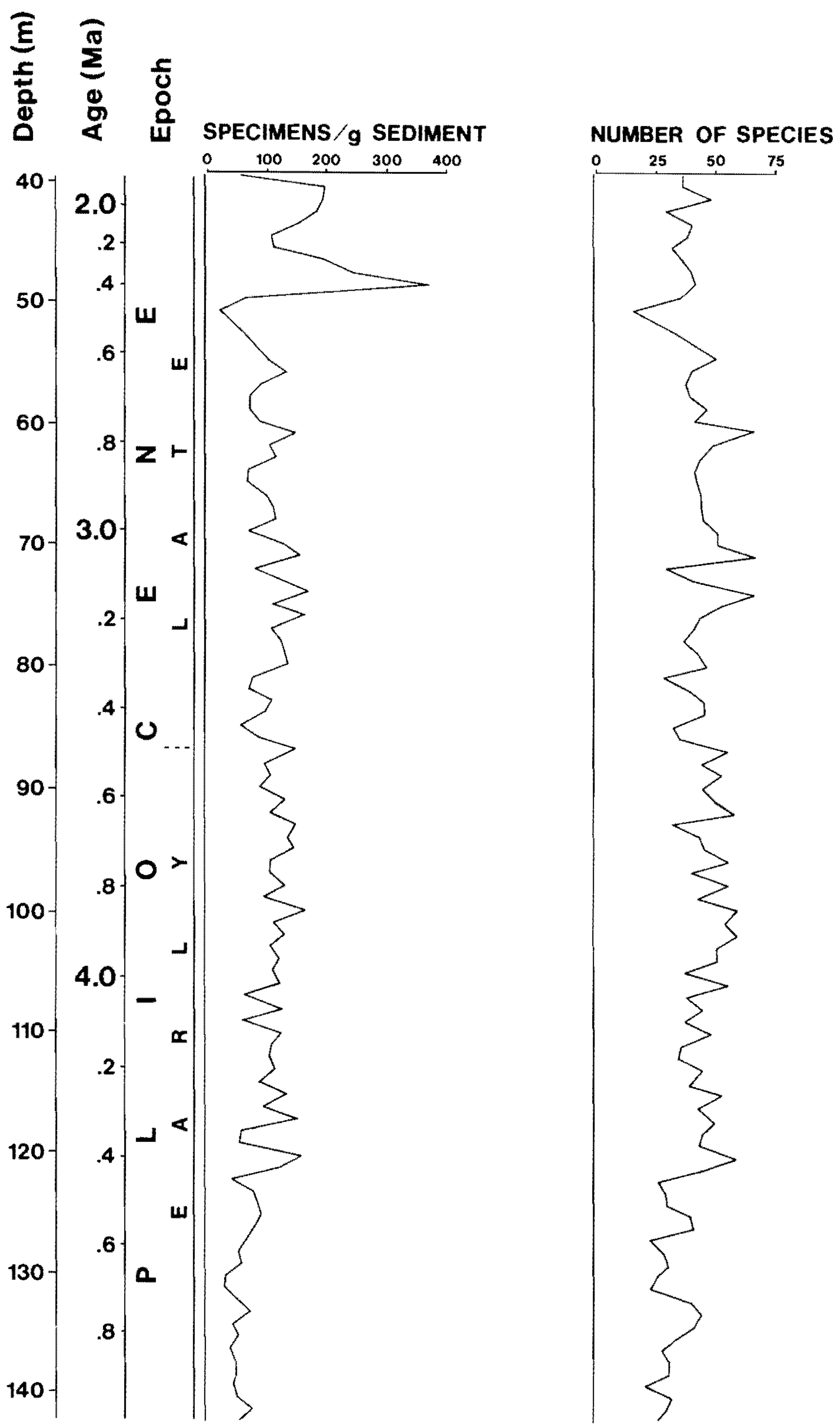

FIGURE 7. Calculated total number of benthic foraminifers per total gram dry sediment and the diversity (number of species) plotted versus depth and time in Hole 586A.

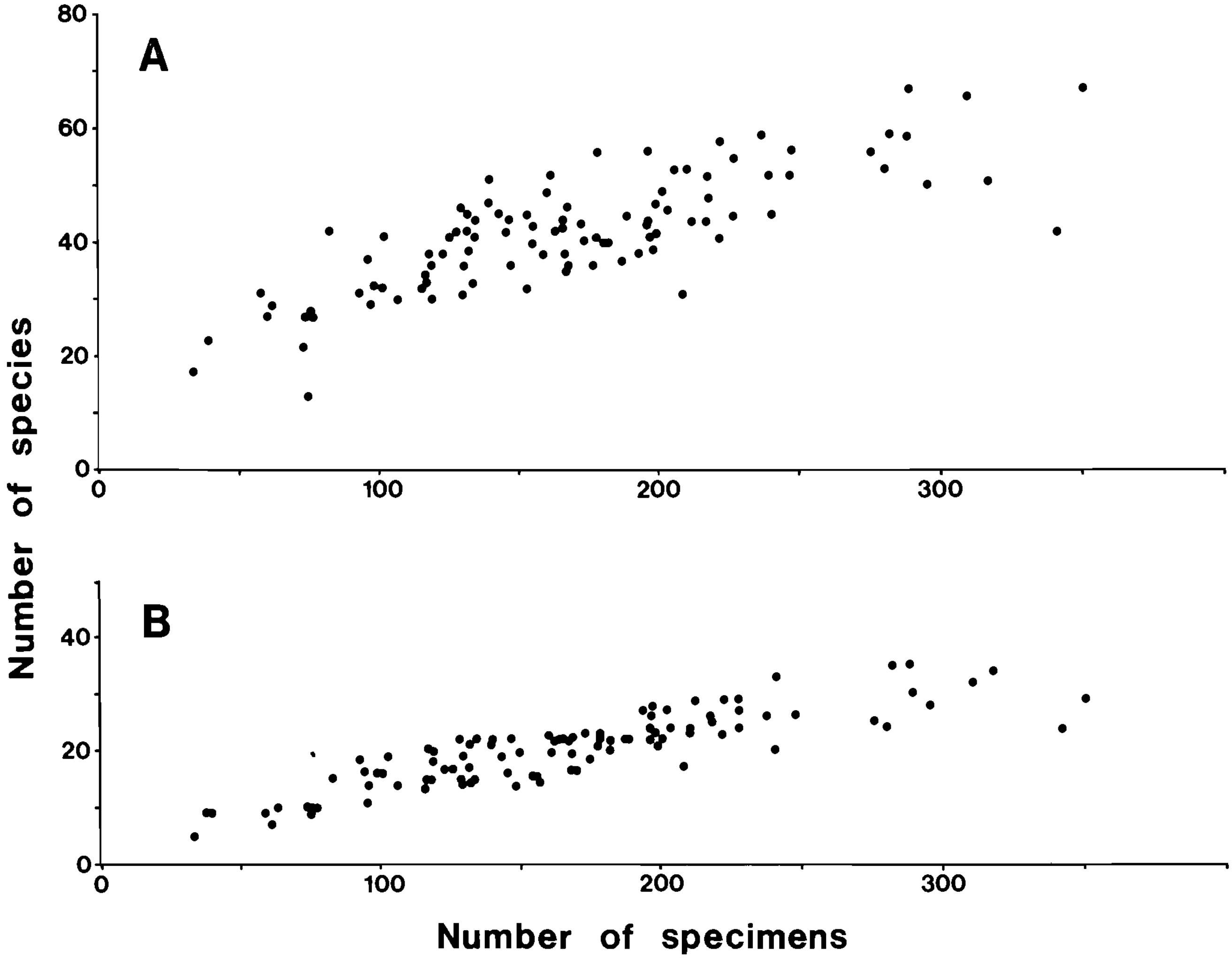

FIGURE 8. Scatter diagram of the number of species versus the number of specimens for all samples. A. All species. B. Species that are represented by two or more specimens.

and increases to 40–45 at about 120 m and do not show any significant change above this level. The increase of both the total number of specimens and diversity at about 120 m (4.3–4.4 Ma) indicates a major change in the benthic environment at Site 586.

COMPOSITION

Several species and species groups are common throughout the studied interval. These include *Globocassidulina subglobosa, Melonis* spp., *Nuttallides umbonifera, Oridorsalis umbonatus, Pullenia* spp., and *Uvigerina auberiana* (Figs. 9, 10). Several species are represented by single specimens and several genera exhibit great taxonomic diversity (e.g., *Fissurina*).

Agglutinated taxa are rare, generally constituting less than 5% of the fauna. The most common agglutinated species is *Eggerella bradyi.*

The most common species throughout the sequence is *Uvigerina auberiana* with a relative abundance ranging between 2.6% and 45.2%, averaging around 25% (Fig. 10). Short-term decreases in relative abundance occur around 130 m and between 55 and 49 m, the latter coinciding with a peak in *Uvigerina peregrina* (Fig. 10). *Uvigerina peregrina* is a species which otherwise is fairly uncommon, with relative abundances of 5% or less in the upper part of the sequence and being absent below 120 m. *Nuttallides umbonifera,* with a maximum abundance of 29% is a common species in the interval 111–134 m. Above 111 m and below 134 m the relative abundance for this species averages between 2 and 3%; above 51 m it is mostly absent.

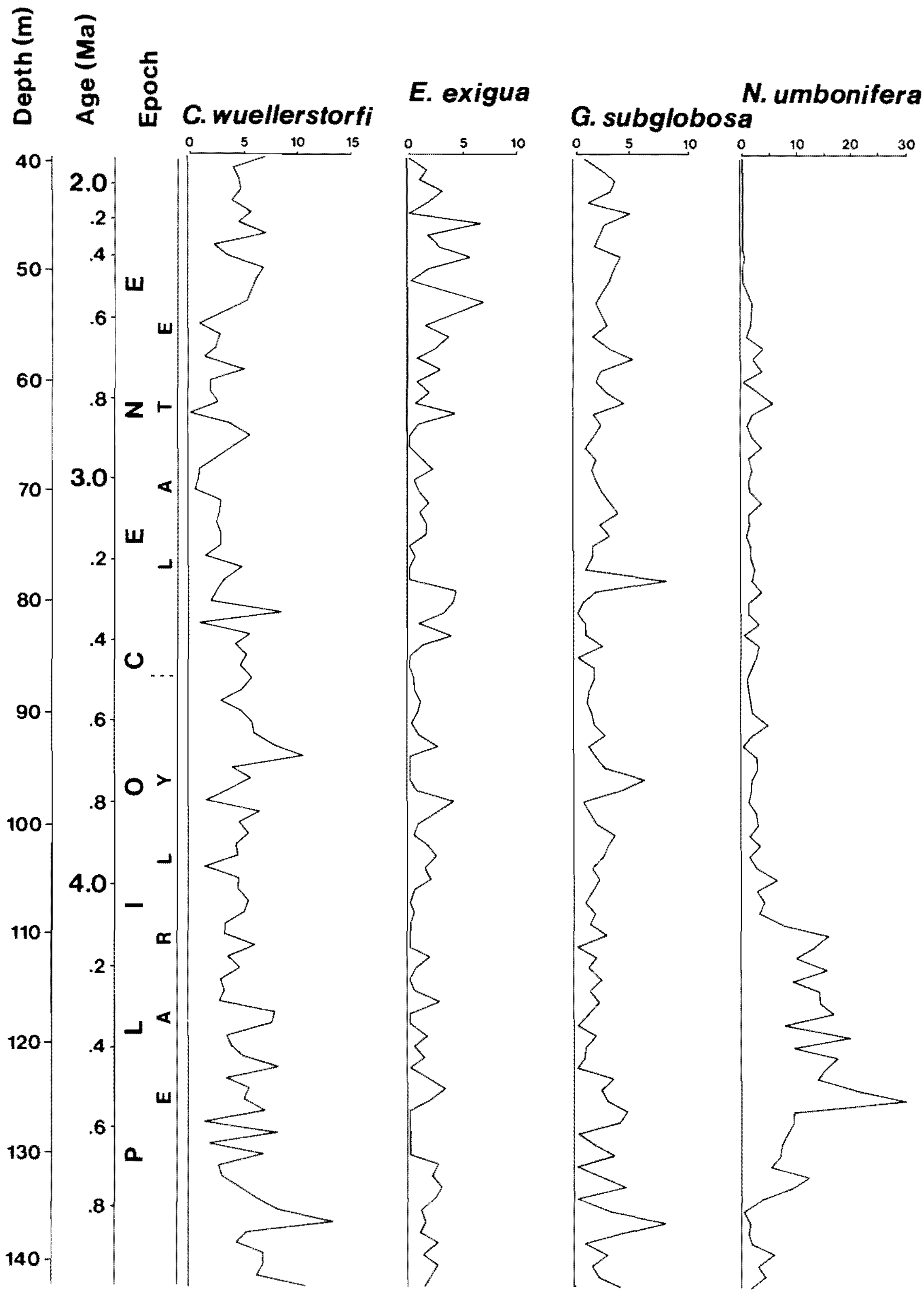

FIGURE 9. Relative abundance curves for *Cibicidoides wuellerstorfi*, *Epistominella exigua*, *Globocassidulina subglobosa*, and *Nuttallides umbonifera*. Note the different percentage scale for *Nuttallides umbonifera*. The ages are derived from Figure 6.

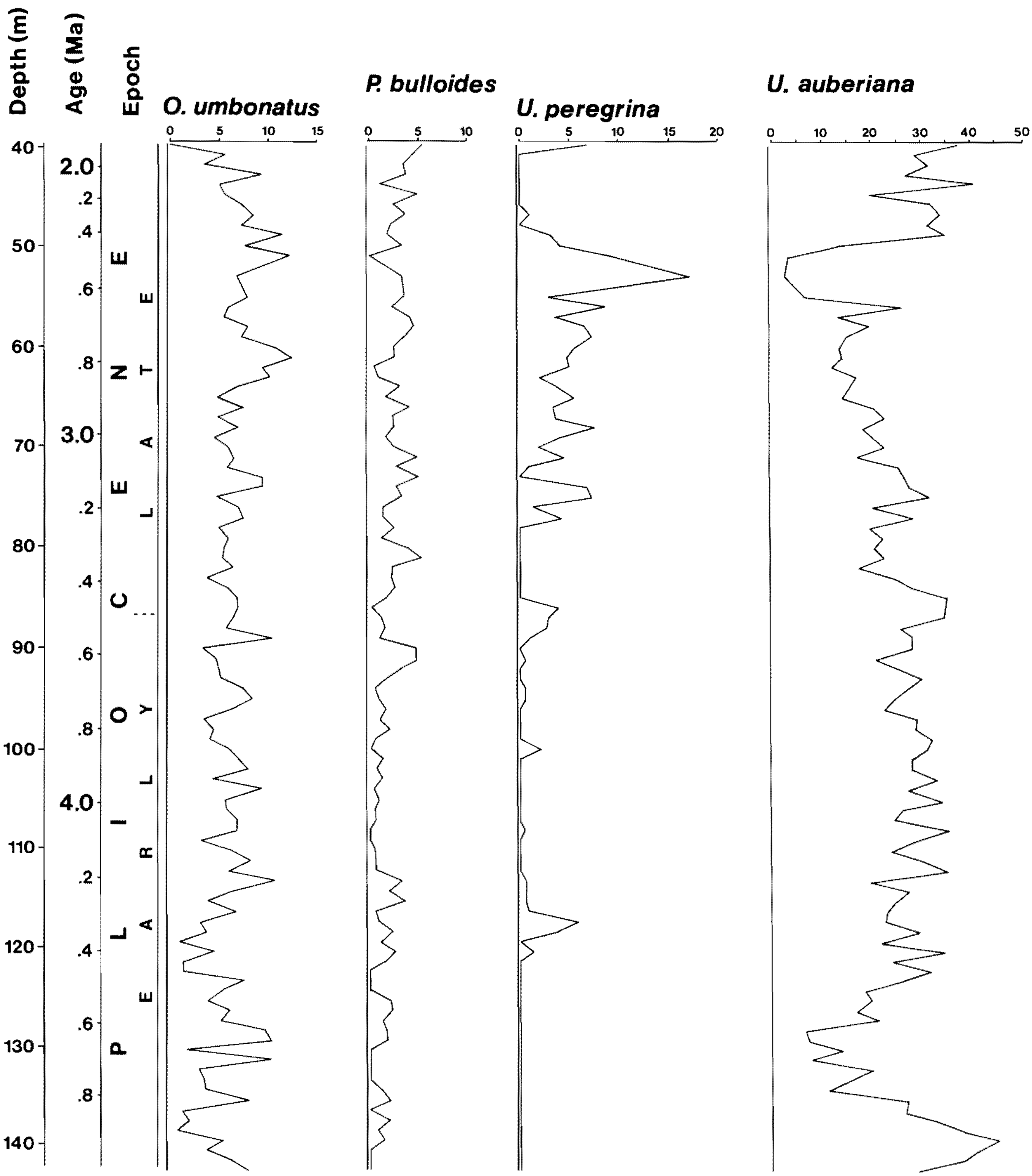

FIGURE 10. Relative abundance curves for *Oridorsalis umbonatus, Pullenia bulloides, Uvigerina peregrina,* and *Uvigerina auberiana.* Note the different percentage scale for *Uvigerina auberiana.* The ages are derived from Figure 6.

RESULTS OF THE CORRESPONDENCE ANALYSIS

The "Most Common Species" Analysis

The correspondence analysis of the 28 most common species (Table 3) show that the first two factors account for almost 31% of the total variance (within these 28 species) (Table 4). Plots of the 28 species along the first two factors show that there are two species that stand out, *Nuttallides umbonifera* and *Uvigerina peregrina* (Fig. 11). The other species cluster in the middle, except for *Fissurina* sp. 26 which is found between the main cluster and *U. peregrina* (Fig. 11).

The "Water Mass Dependent Species" Analysis

Using only those species that are presumed to be water mass dependent gives a result showing essentially the same pattern as the "most common species" analysis. The water mass dependent species included are *Cibicidoides wuellerstorfi, Epistominella exigua, Globocassidulina subglobosa, Nuttallides umbonifera, Oridorsalis umbonatus, Pullenia bulloides,* and *Uvigerina peregrina.* Their relative abundances are presented in Figures 9 and 10. Recent studies show that some species (e.g., *U. peregrina*) are infaunal and hence are probably less directly influenced by the overlying water mass. Other species (e.g., *C. wuellerstorfi*) are epifaunal and are probably more influenced by the properties of the water mass (Corliss, 1985; Lutze and Thiel, 1987; Berger and Wefer, 1988). Further investigations on the microhabitat of benthic foraminifera are needed to clarify the vertical microdistribution of different species as well as their relationship to the overlying water mass. This was outside the scope of the present study and the species included in this analysis were those generally regarded as water mass dependent.

In the correspondence analysis of the "water mass dependent species," the first two factors account for about 65% of the total variation (Table 5). The higher order factors account for 11% or less of the total variation and do not show any meaningful trends. Plots of the seven species along the first two factors show a clear separation into three "groups" (Fig. 12). Two of the groups contain single species, *Nuttallides umbonifera* in the upper left part of the plot, and *Uvigerina peregrina* in the upper right part of the plot. The third group (Assemblage A) contains *Cibicidoides wuellerstorfi, Epistominella exigua, Globocassidulina subglobosa, Oridorsalis umbonatus,* and *Pullenia bulloides.*

TABLE 3. List of the 28 benthic foraminiferal species used in the correspondence analysis. These species are included in the "most common species" analysis.

Anomalinoides globulosus
Astrononion novozealandicum
Bulimina truncana
Cibicides mundulus
Cibicidoides bradyi
Cibicidoides wuellerstorfi
Eggerella bradyi
Epistominella exigua
Fissurina sp. 26
Globocassidulina subglobosa
Gyroidina neosoldanii
Gyroidinoides altiformis
Laticarinina halophora
Melonis barleeanum
Melonis pompilioides
Nuttallides umbonifera
Oridorsalis umbonatus
Pullenia bulloides
Pullenia quinqueloba
Pullenia sp. 1
Pullenia sp. 3
Pyrgo murrhina
Pyrgo sp. 1
Sigmoilina edwardsi
Siphonodosaria abyssorum
Sphaeroidina bulloides
Uvigerina auberiana
Uvigerina peregrina

These species are grouped together in a dense cluster in the lower middle part of the plot.

The factor loadings of the 101 sample levels along the first two factors show to what degree the three "groups" influence each sample (Table 6). The correspondence analysis reveals that the samples show a clear trend through time (Fig. 13). Below 110 m there is an alternation between a *Nuttallides umbonifera*-dominated fauna and Assemblage A, whereas the fauna above is dominated by Assemblage A or by an alternation between a *Uvigerina peregrina*-dominated fauna and Assemblage A. The trend through time found in the samples is also shown in Figure 14 where the information from the correspondence analysis is inserted on a time/sample depth axis.

BENTHIC FORAMINIFERA AS WATER MASS INDICATORS

World Ocean

Generally, the species *Nuttallides umbonifera* has been associated with low temperature water masses and is most common on the sea floor between the lysocline and the CCD. Its upper depth limit varies in different oceans depending on the vertical water mass structure (Streeter, 1973). Thus, a *Nuttallides umbon-*

TABLE 4. Factor loadings of the first five factors with the percentage of the total variance explained for the 28 species included in the correspondence analysis. These 28 species are included in the "most common species" analysis.

	Variable projections				
	1	2	3	4	5
Variance explained	18.28	12.46	8.08	7.69	5.46
Cumulative percentage	18.28	30.74	38.82	46.51	51.97
Species					
Anomalinoides globulosus	0.079	−0.244	0.127	0.114	0.075
Astrononion novozealandicum	0.203	0.077	0.329	−0.329	0.050
Bulimina truncana	0.074	−0.113	0.406	−0.069	0.765
Cibicides mundulus	−0.304	−0.038	0.338	0.278	−0.145
Cibicidoides bradyi	0.138	0.249	0.343	1.048	0.181
Cibicidoides wuellerstorfi	−0.068	−0.100	−0.161	0.202	0.028
Eggerella bradyi	0.008	0.028	0.158	−0.015	−0.190
Epistominella exigua	0.267	0.039	−0.213	−0.419	−0.116
Fissurina sp. 26	0.628	0.528	0.000	0.326	0.392
Globocassidulina subglobosa	0.072	−0.025	0.073	0.237	−0.241
Gyroidina neosoldanii	−0.352	0.112	0.012	−0.017	0.403
Gyroidinoides altiformis	−0.093	−0.060	−0.004	0.192	0.001
Laticarinina halophora	0.031	0.100	0.291	0.405	−0.119
Melonis barleeanum	0.108	0.142	0.319	−0.245	−0.214
Melonis pompilioides	0.262	0.040	−0.126	−0.110	−0.363
Nuttallides umbonifera	−1.011	0.629	−0.160	−0.087	0.048
Oridorsalis umbonatus	0.172	0.087	0.128	0.020	−0.007
Pullenia bulloides	0.332	0.029	−0.038	−0.109	0.153
Pullenia quinqueloba	−0.046	0.066	0.070	−0.242	0.253
Pullenia sp. 1	0.048	0.002	0.005	−0.039	−0.046
Pullenia sp. 3	−0.224	0.001	0.086	−0.128	0.135
Pyrgo murrhina	0.268	0.254	−0.339	−00031	0.329
Pyrgo sp. 1	0.247	−0.334	0.016	−0.134	0.430
Sigmoilina edwardsi	0.039	−0.046	−0.004	−0.041	−0.123
Siphonodosaria abyssorum	0.058	−0.043	0.015	−0.429	0.400
Sphaeroidina bulloides	−0.304	0.058	0.238	−0.028	−0.210
Uvigerina auberiana	−0.040	−0.243	−0.171	0.001	−0.003
Uvigerina peregrina	1.185	1.085	−0.527	0.151	0.028

ifera assemblage is generally associated with the bottom water mass of the oceans, usually AABW (Antarctic Bottom Water). During Neogene times, *Nuttallides umbonifera* reaches high percentages in Atlantic and Pacific sites deeper than 3,000 m, but occurs in low numbers, if at all, at shallower depths (Woodruff, 1979; Tjalsma, 1983). The species that co-occur with *Nuttallides umbonifera* vary in the different oceans (Table 7).

The variations in the faunal assemblages of deep and intermediate water masses of the oceans are greater than those found in bottom water masses. However, different water masses can be characterized and discriminated by the benthic foraminiferal faunas. The deep water masses of the different oceans overlying the bottom water mass usually contain a faunal assemblage dominated by *Epistominella exigua* (Table 7). The presence of an *Epistominella exigua*-dominated as-

TABLE 5. Factor loadings of the first five factors with the percentage of the total variance explained for the seven species included in the "water mass dependent species" correspondence analysis.

	Variable projections				
	1	2	3	4	5
Variance explained	42.45	22.77	11.59	8.98	7.61
Cumulative percentage	42.45	65.22	76.81	85.79	93.40
Species					
Cibicidoides wuellerstorfi	−0.006	−0.270	−0.310	0.310	−0.094
Epistominella exigua	0.241	−0.303	0.809	0.446	−0.038
Globocassidulina subglobosa	0.134	−0.300	−0.278	−0.212	0.124
Nuttallides umbonifera	−0.924	0.322	0.051	−0.012	0.048
Oridorsalis umbonatus	0.188	−0.116	0.107	−0.260	−0.184
Pullenia bulloides	0.390	−0.123	0.073	−0.056	0.633
Uvigerina peregrina	0.961	1.091	−0.106	0.134	−0.056

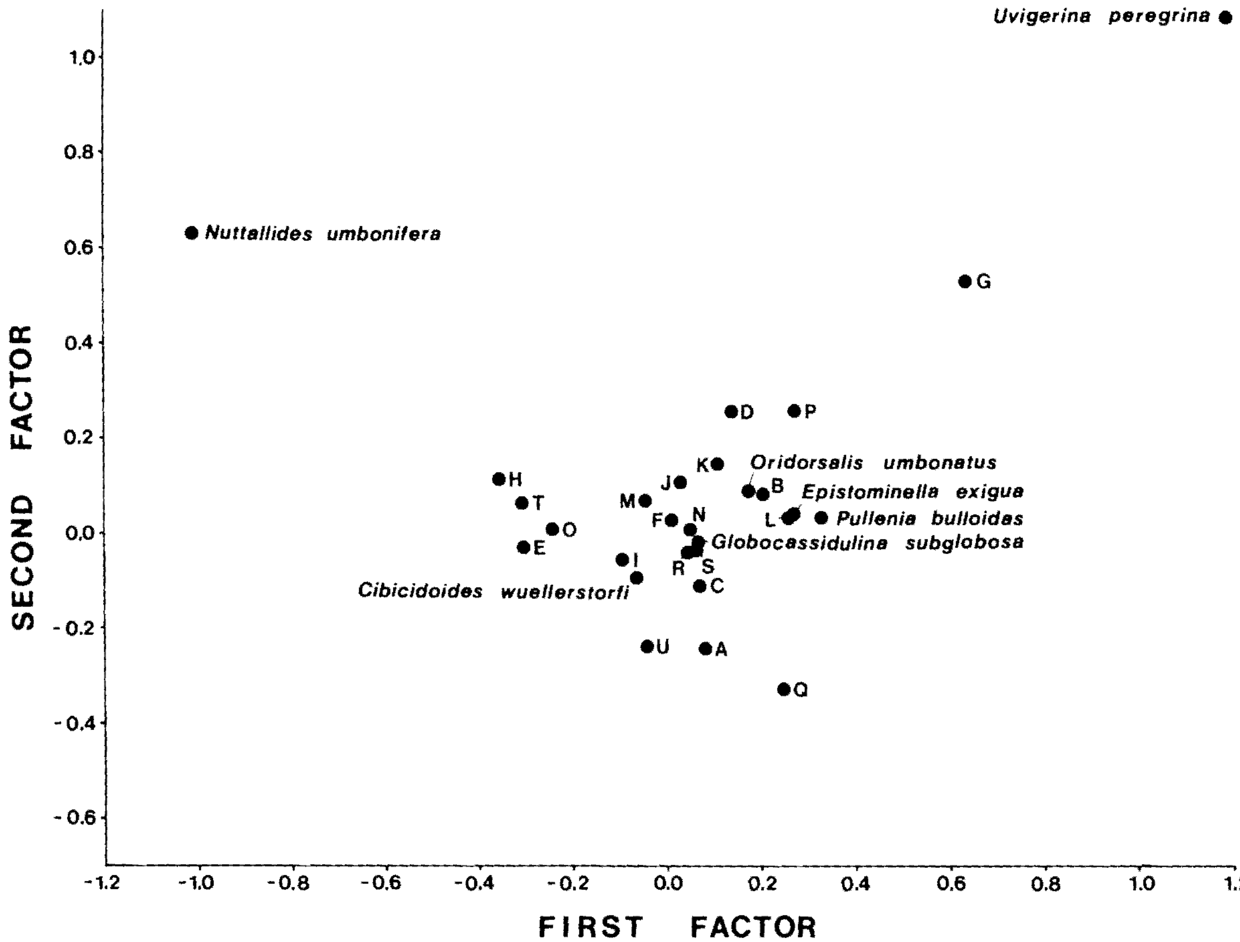

FIGURE 11. Plot of the first two factors showing the distribution of the 28 most common species used in the "most common species" analysis. The benthic foraminiferal species are abbreviated as follows: A = *Anomalinoides globulosus*; B = *Astrononion novozealandicum*; C = *Bulimina truncana*; D = *Cibicidoides bradyi*; E = *Cibicides mundulus*; F = *Eggerella bradyi*; G = *Fissurina* sp. 26; H = *Gyroidina neosoldanii*; I = *Gyroidinoides altiformis*; J = *Laticarinina halophora*; K = *Melonis barleeanum*; L = *Melonis pompilioides*; M = *Pullenia quinqueloba*; N = *Pullenia* sp. 1; O = *Pullenia* sp. 3; P = *Pyrgo murrhina*; Q = *Pyrgo* sp. 1; R = *Sigmoilina edwardsi*; S = *Siphonodosaria abyssorum*; T = *Sphaeroidina bulloides*; U = *Uvigerina auberiana*.

semblage may discriminate a warmer (1.5–2.0°C) and more saline deep water mass, often found immediately above the bottom water mass.

At intermediate depths (above 3,000 m), along the lower part of the continental slope and the mid-Atlantic Ridge, the Atlantic Ocean is dominated by a fauna that shows a small but significant correlation with oxygen content. An increase in abundance of primarily *Uvigerina* spp., but also of *Globocassidulina subglobosa, Hoeglundina elegans,* and *Ehrenbergina* spp. is associated with lowered oxygen content (Lohmann, 1978). The intermediate water mass of the Pacific Ocean shows a similar faunal pattern, although its structure is somewhat different with a thick oxygen minimum zone ranging from the shelf down to around 1,500 to 1,800 m in the tropics and mid-latitudes of the eastern Pacific Ocean. In the southern hemisphere Antarctic Intermediate Water (AAIW) creates a shallow and a deep oxygen minimum layer (Ingle and others, 1980) which can be traced into the western equatorial Pacific Ocean where the deep oxygen minimum layer has its lower depth limit at about 2,400 m (Culp, 1977; Burke, 1981). Higher abundance of *Uvigerina peregrina* is often inferred to be associated with glacial periods (Schnitker, 1974; Corliss, 1982) and/or increased organic carbon content in the sediments (Douglas, 1981; Miller and Lohmann, 1982). The response of uvigerinids and associated species found in the intermediate waters suggests that the presence of a *Uvigerina peregrina*-dominated assemblage is associated with water masses of lowered oxygen content and with organic rich sediments (Lohmann, 1978; Streeter and Shackleton, 1979;

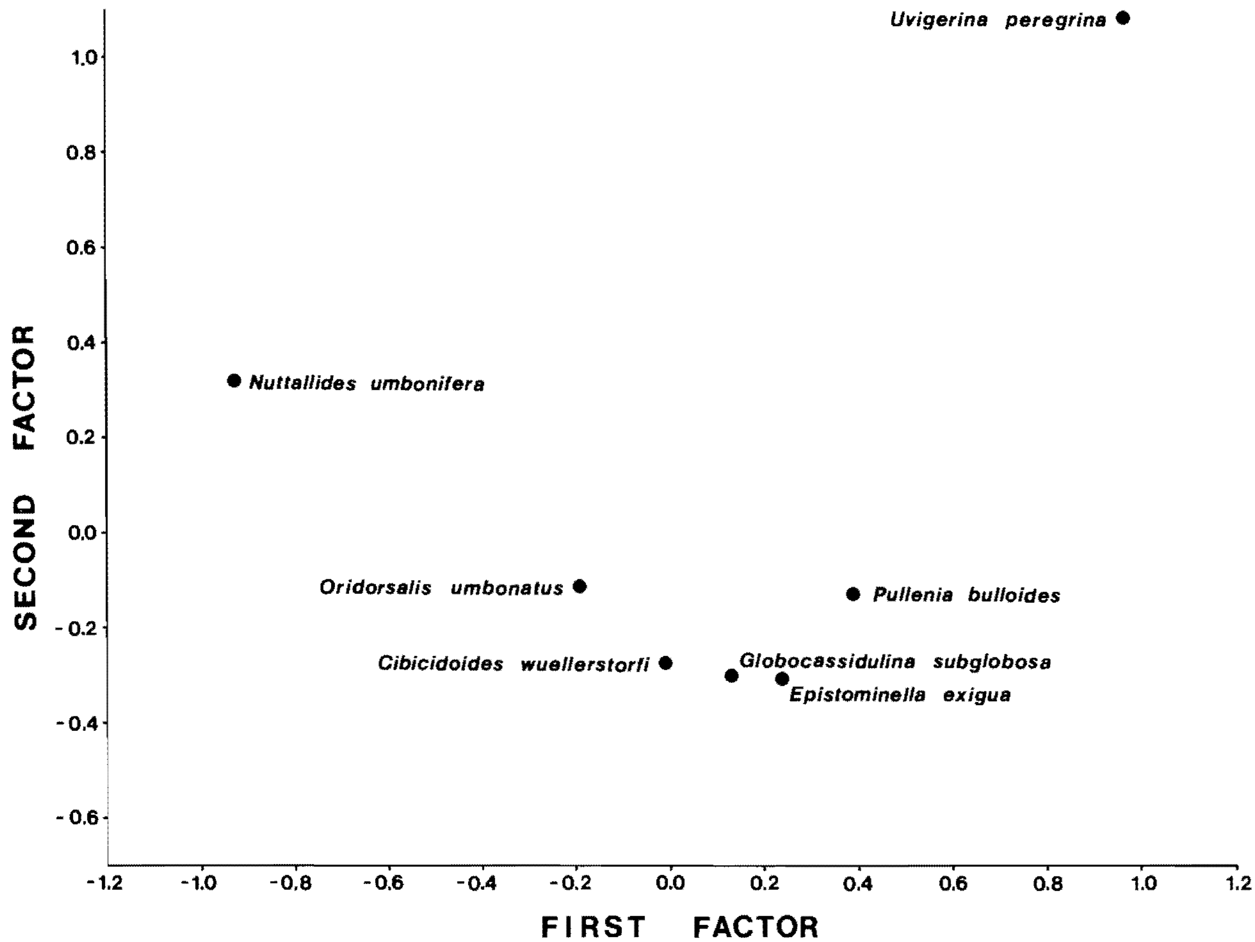

FIGURE 12. Plot of the first two factors showing the distribution of the seven species used in the "water mass dependent species" analysis.

Schnitker, 1979; Douglas, 1981; Miller and Lohmann, 1982).

ONTONG-JAVA PLATEAU AREA

A *Nuttallides umbonifera* assemblage dominates the modern sea-floor below the lysocline (about 3,500 m) in the Ontong-Java Plateau area (Culp, 1977; Burke, 1981) (Table 8). The species *Epistominella exigua* is an important subsidiary species in this assemblage.

The interval between the top of the PDW (about 2,500 m) and the lysocline is characterized by high relative abundance of *Epistominella exigua, Globocassidulina subglobosa,* and *Pullenia bulloides* (Table 8).

The deep oxygen minimum layer within the PIW of the western Pacific Ocean, which intersects the top of the plateau, occurs from 1,500 to 2,400 m and is characterized by a faunal assemblage dominated by *Uvigerina auberiana* (Culp, 1977; Burke, 1981). Subsidiary species in this shallow portion are *Astrononion novozealandicum, Cibicidoides pseudoungerianus, Oridorsalis umbonatus,* and *Pullenia bulloides* (Table 8).

DISCUSSION

THE BENTHIC FORAMINIFERAL ASSEMBLAGES AND THEIR ASSOCIATION WITH WATER MASSES

Based on the information of environmental preferences of various species in the modern ocean, the following associations with subsurface water masses are assumed for the three different assemblages:

(1) The *Nuttallides umbonifera*-dominated assemblage appears to reflect the presence of a well-oxygenated water mass, undersaturated with respect to calcite, and with a low potential temperature.
(2) Assemblage A (*Cibicidoides wuellerstorfi, Epistominella exigua, Globocassidulina subglobosa, Oridorsalis umbonatus,* and *Pullenia bulloides*) is similar to the present fauna on the Ontong-

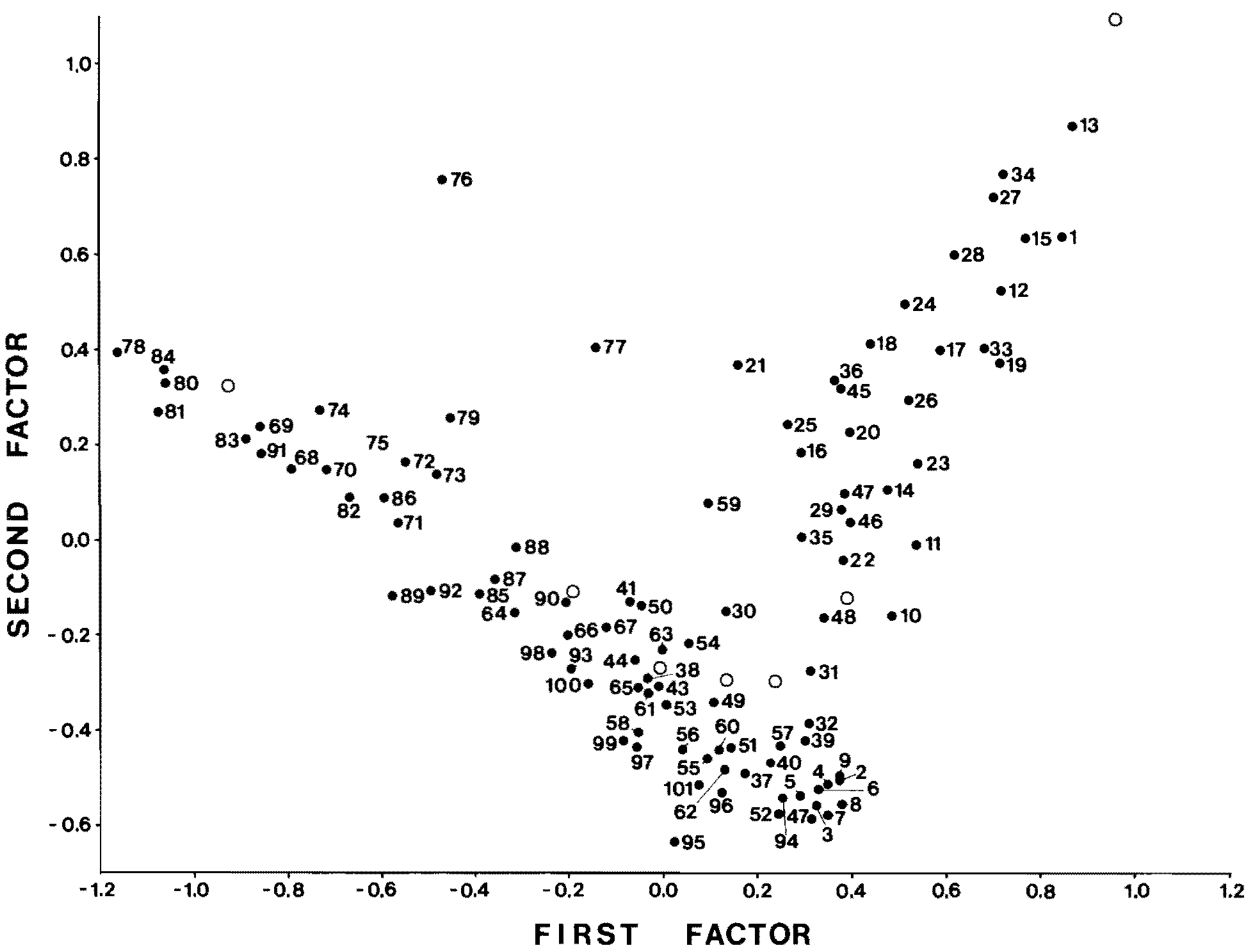

FIGURE 13. Plot of the first two factors showing the distribution of samples. Numbers refer to stations as coded in Table 6. Open circles represent the species plotted in Figure 12.

Java Plateau which is associated with the deep oxygen minimum layer of the PIW. This assemblage is assumed, therefore, to reflect reduced oxygen content associated with episodes of upwelling.

(3) The *Uvigerina peregrina*-dominated assemblage is considered to reflect episodes of further depletion in oxygen content due to intensified upwelling or to changes in the thermohaline circulation.

CHANGES IN THE FAUNAL COMPOSITION: RESPONSES TO PALEOCLIMATIC AND PALEOCEANOGRAPHIC CHANGES

A benthic foraminiferal fauna similar in its species composition and proportions to the modern fauna described by Culp (1977) and Burke (1981) became established on the Ontong-Java Plateau by latest Miocene time (Woodruff and Douglas, 1981). Prior to this time, during the early and middle Late Miocene (10.5–6.5 Ma), the sedimentation rate at Site 586 was typical of carbonate platforms outside areas of high productivity (Gardner and others, 1986).

Between 6.2 and 4.9 Ma a general increase in the $\delta^{18}O$ values occurs which is interpreted to represent a major expansion of the Antarctic ice-cap (Shackleton and Kennett, 1975; Kennett, 1986; Elmstrom and Kennett, 1986). This would cause an intensified oceanic circulation (Savin and others, 1985) that effects the character of the surface as well as the intermediate and bottom water masses. During this period, inferred to be a period of glacial expansion, the bottom water probably became colder. A similar increase in $\delta^{18}O$ values during the Pleistocene is calculated to have lowered the bottom water temperature 2–3°C on average (Chappell and Shackleton, 1986; Labeyrie and others, 1987). Since O_2 is more soluble in colder waters, the incorporation of polar surface waters into bottom water

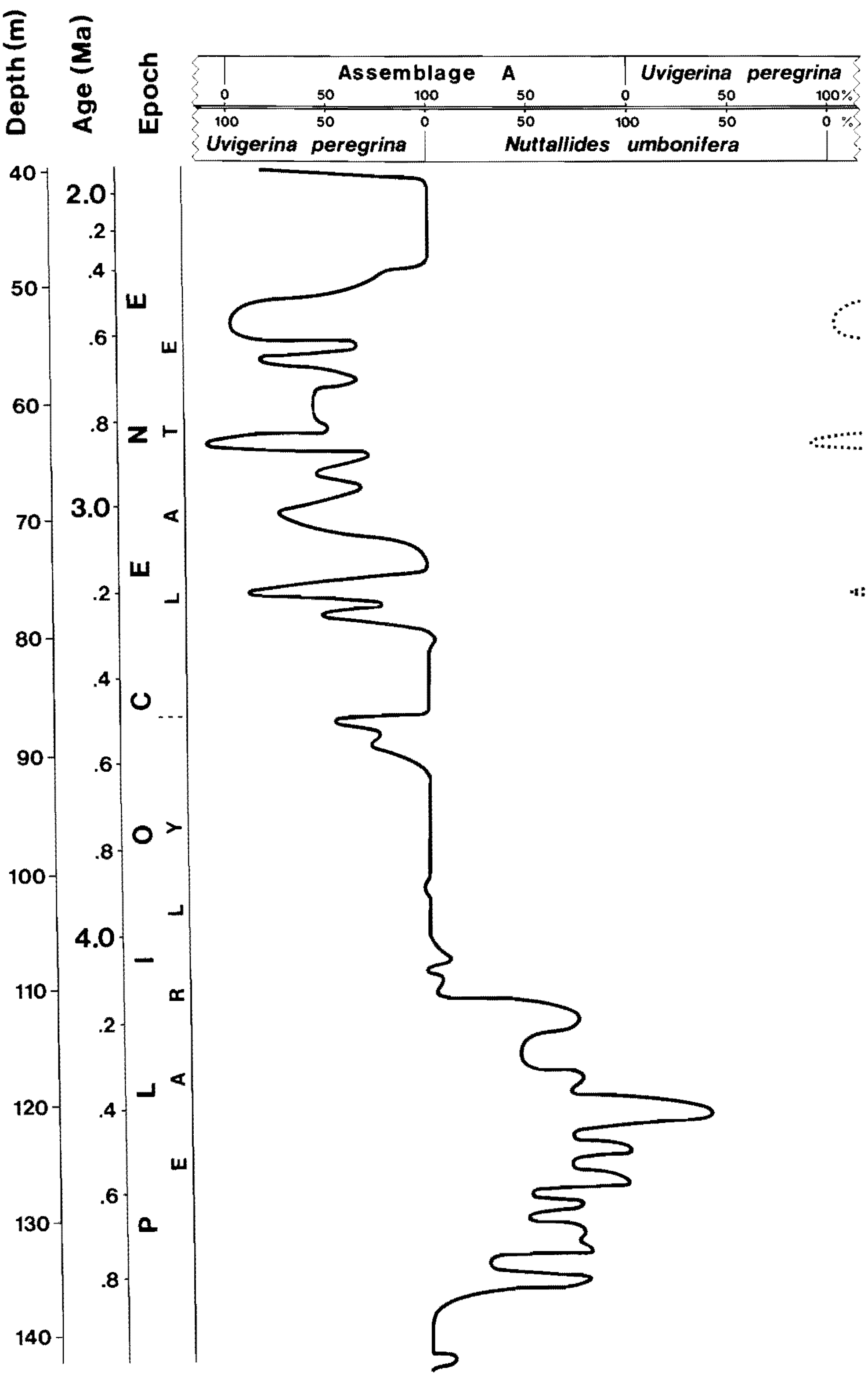

FIGURE 14. Plot of the trend in the benthic foraminiferal assemblages through time. Correspondence analysis of the "water mass dependent species" shows that the relative contribution of the three assemblages varies through time. The horizontal axis represents the relative contribution (in percent) of the three assemblages. At each time-slice the fauna consists of various percentages of two of the three assemblages. The solid curve represents the faunal trend (percent of the various assemblages). The dotted line is a replica of the extreme left part of the solid curve.

during glacials would produce higher dissolved oxygen values for these waters.

The appearance of the *Nuttallides umbonifera*-dominated assemblage at about 4.8 Ma on the Ontong-Java Plateau, as well as at other sites in the Pacific Ocean (Woodruff, 1985), can be explained in several different ways. (1) It could be due to greater production and thickening of the PBW layer. Higher dissolved oxygen values for the bottom water reduce the oxygen minimum zone and allow the cold-water species *Nuttallides umbonifera* to migrate upslope to depths around 2,200 m (the water depth of Site 586). In order to cover this depth the PBW has to expand about 800 m upslope. An upslope migration of *Nuttallides umbonifera* during the Late Miocene is noted in other parts of the Pacific Ocean (Woodruff, 1985) and in the Atlantic Ocean (F. Woodruff, pers. comm., 1988). (2) An undifferentiated bottom/deep water mass could favor a shallower presence of *Nuttallides umbonifera.* (3) A third explanation would be dissolution. This seems less likely as miliolids and other dissolution-prone species do not show any significant change in their relative abundance patterns during this time. (4) Another less likely explanation is a transitory shift in environmental preference of *Nuttalides umbonifera.*

At about 4.1 Ma the *Nuttallides umbonifera*-dominated assemblage is replaced by Assemblage A. This predates slightly an increase in the >63 micrometer fraction (Fig. 5). The appearance of Assemblage A corresponds to a period of maximum sedimentation rates in other areas (the Colombia Basin, Scientific Party Leg 68, 1982; the Walvis Ridge area, Moore and others, 1983) and to a period of maximum carbonate mass accumulation rates for the Pacific Ocean (Davies and Worsley, 1981). The increase in the >63 micrometer fraction observed at Site 586 at about 4.0 Ma can have two explanations: (1) intensified winnowing where currents, not strong enough to remove an entire biostratigraphic zone, eroded and transported some but not all of the fine fraction; (2) better preservation (less fragmentation) of larger planktonic foraminifera. Both these explanations would explain an increase in the >63 micrometer fraction without a significant change in sedimentation rate. Visual inspection of the samples does not support the preservation explanation.

Assemblage A characterized the benthic foraminiferal fauna during the middle Pliocene, between approximately 4.1 and 3.3 Ma. Its composition is similar to the modern fauna on the Ontong-Java Plateau, and may therefore be associated with weak upwelling. Elmstrom and Kennett (1986) noted (1) a distinct increase in $\delta^{18}O$ of the planktonic foraminifera, (2) a decrease in the gradients of $\delta^{13}C$ and $\delta^{18}O$ between surface and intermediate water, and (3) a mixing of warm and cold water planktonic foraminiferal species during this period of time. This is normally an indication of seasonal upwelling (Thiede, 1983). These data and the presence of the benthic foraminiferal Assemblage A suggest that Site 586 was bathed by PIW during the middle part of the Pliocene.

At approximately 3.3–3.2 Ma, a faunal shift occurs from Assemblage A to a *Uvigerina peregrina*-dominated assemblage. This coincides with a decrease in the benthic $\delta^{18}O$ recorded in the Pacific Ocean (Shackleton and Opdyke, 1977; Keigwin, 1979; Prell, 1984; Elmstrom and Kennett, 1986), the South Atlantic (Weissert and others, 1984), the North Atlantic (Shackleton and Cita, 1979), and the Mediterranean (Keigwin and Thunell, 1980). This shift is interpreted as a cooling of the bottom water mass (Prell, 1984, 1985). The planktonic foraminiferal record shows only a minor excursion in the $\delta^{18}O$ at this time (Prell, 1985) which suggests that a short event of ice growth may have occurred (Prell, 1984, 1985; Shackleton and others, 1984) rather than the initiation of large-scale glaciation in the northern hemisphere. Further, the 3.2 Ma isotopic event may be related more to bottom water production in the Antarctic region, as suggested by Backman (1979), than to glaciation in the northern hemisphere.

The presence of *Uvigerina peregrina*-dominated assemblages is normally linked to oxygen-poor water masses and organic-rich sediments (Lohmann, 1978; Streeter and Shackleton, 1979; Schnitker, 1980; Douglas, 1981). The organic carbon values at Site 586 increase from less than 0.01% to an average of about 0.35% at about 3.3 Ma (Scientific Parties Legs 89 and 90, 1986). Although the organic carbon content is relatively low, the increase at about 3.3 Ma is significant and may be an indication of increased upwelling which would favor the occurrence of an uvigerinid assemblage. Further to the south, in the Lord Howe Rise region, a m· jor change in the benthic foraminiferal fauna occurs at about 3.2 Ma together with an increase in the abundance of uvigerinids (Boersma, 1986). The time interval where the *Uvigerina peregrina*-dominated assemblage of Site 586 is present (3.3–2.4 Ma) is characterized by rapid fluctuations between this assemblage and Assemblage A, although the former is predominant. This coincides with an increase in the amount and variability of the coarse fraction, which may be explained by intensified winnowing at Site 586 during the late Pliocene as suggested by Gardner and others (1986).

TABLE 6. Factor loadings of the first five factors with the percentage of the total variance explained for 101 analyzed samples from DSDP Hole 586A.

		Sample projections				
		1	2	3	4	5
Variance explained		42.45	22.77	11.59	8.98	7.61
Cumulative percentage		42.45	65.22	76.81	85.79	93.40
Depth in core (m)	Code (in Fig. 13)					
39.31	1	0.853	0.631	−0.494	0.548	0.575
40.30	2	0.374	−0.509	0.086	−0.045	0.419
41.30	3	0.327	−0.562	−0.216	−0.001	0.440
42.29	4	0.353	−0.515	0.225	−0.079	0.110
43.30	5	0.288	−0.538	0.139	0.114	−0.190
44.30	6	0.329	−0.532	−0.378	−0.203	0.457
45.29	7	0.350	−0.579	0.640	0.315	−0.007
46.30	8	0.380	−0.357	−0.060	0.026	0.045
47.30	9	0.373	−0.499	0.462	−0.112	−0.007
48.29	10	0.487	−0.162	0.412	0.011	−0.176
49.40	11	0.543	−0.010	−0.144	0.081	0.037
50.40	12	0.727	0.520	−0.293	−0.092	−0.441
52.40	13	0.874	0.864	0.236	0.453	−0.057
54.40	14	0.475	0.098	0.174	−0.334	0.213
55.40	15	0.776	0.627	0.248	0.264	−0.046
56.40	16	0.295	0.179	0.158	−0.003	0.314
57.40	17	0.594	0.394	−0.106	−0.281	0.270
58.50	18	0.446	0.403	0.074	0.163	0.060
59.50	19	0.725	0.364	0.032	−0.329	−0.140
60.50	20	0.402	0.222	0.162	−0.274	−0.099
61.51	21	0.162	0.367	−0.093	−0.263	−0.173
62.50	22	0.385	−0.044	0.715	−0.195	−0.281
63.50	23	0.540	0.158	−0.110	−0.087	0.087
64.50	24	0.518	0.490	−0.367	0.159	−0.089
65.50	25	0.267	0.240	−0.088	−0.116	0.175
66.50	26	0.523	0.289	0.020	−0.003	0.117
67.50	27	0.711	0.717	0.218	0.001	0.004
68.60	28	0.624	0.595	−0.040	−0.199	0.057
69.60	29	0.380	0.058	0.151	−0.385	0.157
70.60	30	0.136	−0.151	0.121	−0.165	0.387
71.60	31	0.316	−0.283	−0.090	−0.251	0.228
72.60	32	0.308	−0.384	0.225	−0.340	0.302
73.60	33	0.688	0.398	−0.011	−0.134	−0.040
74.60	34	0.730	0.761	−0.215	0.022	0.170
75.60	35	0.296	0.005	0.092	−0.400	−0.127
76.60	36	0.377	0.330	−0.196	−0.038	−0.221
77.70	37	0.173	−0.495	−0.453	−0.467	0.329
78.70	38	−0.049	−0.295	0.591	0.124	−0.079
79.70	39	0.306	−0.421	0.741	0.157	0.346
80.71	40	0.229	−0.471	0.152	0.427	0.294
81.71	41	−0.070	−0.130	0.308	−0.409	0.155
82.70	42	0.314	−0.586	0.418	0.542	0.051
83.70	43	−0.012	−0.309	−0.006	−0.088	0.099
84.70	44	−0.056	−0.254	−0.140	−0.078	−0.155
85.70	45	0.388	0.310	−0.293	−0.043	−0.405
86.70	46	0.399	0.037	−0.266	0.048	−0.217
87.80	47	0.388	0.095	−0.183	0.049	−0.130
88.80	48	0.246	−0.167	0.155	−0.342	−0.357
89.80	49	0.108	−0.346	−0.098	0.081	0.580
90.80	50	−0.045	−0.140	−0.162	0.020	0.402
91.80	51	0.146	−0.442	−0.197	0.036	0.219
92.80	52	0.246	−0.580	0.016	0.445	−0.164
93.80	53	0.010	−0.347	−0.464	0.181	−0.343
94.80	54	0.047	−0.218	−0.170	−0.340	−0.212
95.80	55	0.096	−0.463	−0.448	−0.256	0.055
96.90	56	0.045	−0.446	−0.341	−0.158	0.062
97.90	57	0.250	−0.435	0.918	0.267	0.078
98.90	58	−0.050	−0.406	0.031	0.406	−0.217
99.90	59	0.101	0.073	−0.164	0.011	−0.335
100.90	60	0.119	−0.444	−0.273	−0.185	−0.117
101.90	61	−0.030	−0.323	0.064	−0.141	−0.220

TABLE 6. Continued.

		Sample projections				
		1	2	3	4	5
Variance explained		42.45	22.77	11.59	8.98	7.61
Cumulative percentage		42.45	65.22	76.81	85.79	93.40
Depth in core (m)	Code (in Fig. 13)					
102.90	62	0.131	−0.484	0.139	0.189	−0.047
103.90	63	−0.002	−0.233	0.329	−0.457	−0.377
104.90	64	−0.316	−0.153	0.113	0.055	−0.076
105.90	65	−0.051	−0.319	−0.167	−0.097	−0.231
107.00	66	−0.203	−0.202	−0.188	−0.092	−0.250
108.00	67	−0.122	−0.190	−0.181	−0.086	−0.357
109.00	68	−0.792	0.145	−0.143	−0.046	−0.121
110.00	69	−0.858	0.233	−0.033	−0.219	−0.010
111.00	70	−0.714	0.147	−0.034	−0.073	−0.176
112.00	71	−0.566	0.030	0.161	−0.031	−0.087
113.00	72	−0.552	0.159	0.083	−0.193	0.048
114.00	73	−0.482	0.136	−0.052	−0.251	0.064
115.00	74	−0.736	0.269	0.052	−0.063	0.349
116.10	75	−0.643	0.202	0.276	−0.034	−0.040
117.10	76	−0.465	0.655	−0.219	0.231	−0.011
118.10	77	−0.139	0.401	−0.265	0.278	0.036
119.10	78	−1.165	0.391	0.134	0.137	0.190
120.10	79	−0.453	0.254	−0.011	−0.016	0.169
121.10	80	−1.058	0.323	0.077	0.206	0.174
122.10	81	−1.073	0.265	−0.242	0.339	−0.056
123.10	82	−0.669	0.093	0.110	−0.148	−0.108
124.10	83	−0.890	0.208	0.202	0.116	−0.044
125.20	84	−1.064	0.353	0.093	0.020	0.193
126.20	85	−0.390	−0.115	−0.271	−0.095	0.109
127.20	86	−0.596	0.084	−0.063	−0.398	0.142
128.20	87	−0.357	−0.087	−0.127	−0.030	−0.189
129.20	88	−0.308	−0.018	0.096	−0.507	−0.089
130.20	89	−0.574	−0.121	−0.497	0.195	−0.052
131.20	90	−0.203	−0.134	0.477	−0.157	−0.441
132.20	91	−0.855	0.177	0.180	0.091	−0.018
133.20	92	−0.494	−0.108	0.095	0.121	−0.042
134.20	93	−0.193	−0.272	0.156	0.464	−0.109
135.30	94	0.253	−0.545	−0.254	0.020	−0.129
136.30	95	0.026	−0.640	−0.745	0.445	−0.089
137.30	96	0.126	−0.533	−0.366	0.142	0.281
138.30	97	−0.056	−0.441	0.252	0.743	0.038
139.30	98	−0.235	−0.239	−0.120	0.106	−0.043
140.30	99	−0.080	−0.425	−0.031	0.454	−0.308
141.30	100	−0.161	−0.306	−0.011	0.150	−0.314
142.30	101	0.083	−0.521	−0.360	0.159	−0.355

The reoccurrence of faunal Assemblage A as the dominant element at about 2.4 Ma coincides with (1) a major increase in the coarse size fraction, (2) a decrease in sedimentation rate from 3.75 cm/kyr to 1.60 cm/kyr, (3) a doubling of the number of specimens per gram sediment, and (4) an increase in $\delta^{18}O$ values in both planktonic and benthic foraminifera in the world ocean (Shackleton and Opdyke, 1977; Shackleton and others, 1984; Prell, 1985). This change in the isotopic record is known to be related to increased continental ice volumes in the northern hemisphere.

CONCLUSIONS

1. *Uvigerina auberiana* is the most common species throughout the studied sequence.

2. *Nuttallides umbonifera* shows high relative abundance between 4.8 and 4.1 Ma, whereas *Uvigerina peregrina* exhibits scattered occurrences and low relative abundance up to 3.3 Ma where an increase in the relative abundance takes place and persists up to 2.4 Ma.

3. Correspondence analysis performed on seven species generally considered to be dependent upon the composition of the overlying water mass show that there has been a fluctuation in dominance between a *Nuttallides umbonifera*-dominated and a *Uvigerina peregrina*-dominated fauna and a faunal assemblage including *Cibicidoides wuellerstorfi, Epistominella exigua, Globocassidulina subglobosa, Oridorsalis umbonatus,* and *Pullenia bulloides* (Assemblage A).

4. The *Nuttallides umbonifera*-dominated fauna is

TABLE 7. Benthic foraminifera reported to be associated with different subsurface water masses in different oceans. Species names in bold represent dominant species. (Modified after Douglas and Woodruff, 1981.)

Indian Ocean	Atlantic Ocean	Pacific Ocean
Corliss, 1979	Streeter, 1973 Schnitker, 1974 Lohmann, 1980 Streeter and Shackleton, 1979	Culp, 1977 Walch, 1978 Burke, 1981
Intermediate water mass		
	IW	PIW
	Uvigerina ***Hoeglundina elegans*** *Ehrenbergina*	***Uvigerina*** *Hoeglundina elegans* *Gyroidina* *Ehrenbergina*
Deep water mass		
IBW	NADW	PDW
>2,500 m	>500–2,000 m	>2,500 m
Epistominella exigua *Uvigerina*	***Epistominella exigua*** *Cibicidoides wuellerstorfi* *Cibicidoides kullenbergi* *Globocassidulina subglobosa*	***Epistominella exigua*** ***Pullenia*** ***Melonis*** *Favocassidulina* *Nuttallides umbonifera*
Bottom water mass		
AABW	AABW	PBW
>3,000–4,000 m	>4,000 m	>3,500 m
Nuttallides umbonifera *Cibicidoides wuellerstorfi* *Globocassidulina subglobosa* *Oridorsalis umbonatus*	***Nuttallides umbonifera*** *Oridorsalis umbonatus*	***Nuttallides umbonifera*** ***Epistominella exigua*** *Pullenia bulloides* *Cibicidoides wuellerstorfi*

believed to be associated with the bottom water mass of this area (PBW). On the basis of the correspondence analysis the PBW bathed Site 586 between 4.8 and 4.1 Ma.

5. The *Uvigerina peregrina*-dominated fauna is considered to reflect episodes of more extensive oxygen depletion (compared to modern conditions) and/or increased organic carbon in the sediment. The results indicate that such conditions occurred during the interval 3.3–2.4 Ma.

6. Assemblage A is in many respects similar to the modern fauna of the Ontong-Java Plateau and therefore regarded as reflecting PIW. The benthic foraminiferal data suggest that PIW bathed Site 586 prior to 4.8 Ma and in the intervals 4.1–3.3 Ma and 2.4–2.0 Ma.

7. Changes in the dominating faunal assemblage and thus in the dominating water mass type are found to be approximately coeval with levels of known paleoclimatic changes.

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TABLE 8. Benthic foraminifera associated with different subsurface water masses in the Ontong-Java Plateau area (compiled and modified after faunal data from Culp (1977) and Burke (1981)).

Water mass	Dominant species	Additional species
PIW (1,500–2,500 m)	*Uvigerina peregrina*	*Astrononion novozealandicum* *Cibicidoides pseudoungarianus* *Oridorsalis umbonatus* *Pullenia bulloides*
PDW (2,500–3,500 m)	*Pullenia bulloides*	*Epistominella exigua* *Globocassidulina subglobosa* *Oridorsalis umbonatus*
PBW (below 3,500 m)	*Nuttallides umbonifera*	*Epistominella exigua* *Pullenia bulloides* *Cibicidoides wuellerstorfi*

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TAXONOMIC NOTES ON SELECTED SPECIES

The foraminiferal suprageneric classification used in this study conforms chiefly to that of Loeblich and Tappan (1964). Genera included herein and not found in the Treatise (Loeblich and Tappan, 1964) are: *Abditodentrix* (Patterson, 1985), *Francesita* (Loeblich and Tappan, 1963), *Globofissurella* (Patterson, 1986), *Rutherfordoides* (McCulloch, 1981), and *Siphoeggerella* new genus.

The synonymies include references to original descriptions, name changes, and significant discussions. The synonyms are followed by a short description of the species, remarks on its taxonomic position, and information about its ecological preferences (e.g., depth, salinity, substrate) if available. Finally, the species distribution in Hole 586A is presented, as well as its recorded stratigraphic (Holocene through Miocene) and geographic distribution. Stratigraphic and geographic distributional data were gathered from several sources and are not claimed to be complete.

Most of the species included in this section are illustrated by scanning electron micrographs and are presented in 17 plates arranged taxonomically as in the text. In addition, 26 unidentified and possibly new species of the genus *Fissurina* are illustrated by line drawings in Figures 15 and 16.

The relative percentages for the 262 species are presented in Appendix 1.

Order FORAMINIFERIDA Eichwald, 1830
Suborder TEXTULARIINA Delage and Hérouard, 1896
Superfamily LITUOLACEA de Blainville, 1825
Family LOFTUSIIDAE Brady, 1884
Subfamily CYCLAMMININAE Marie, 1941
Genus **CYCLAMMINA** Brady, 1879

Cyclammina cancellata Brady
Pl. 1, Fig. 1

Cyclammina cancellata BRADY, 1879, p. 62.—BRADY, 1884, p. 351–353, pl. 37, figs. 8–16.—CUSHMAN, 1921, p. 84–85, pl. 16, figs. 1a–b.—BARKER, 1960, p. 76, pl. 37, figs. 8–16.—AKERS and DORMAN, 1964, p. 32, pl. 1, fig. 1.—PFLUM and FRERICHS, 1976, pl. 1, fig. 1.—INGLE and others, 1980, p. 132, pl. 2, fig. 1.—THOMPSON, 1980, pl. 8, fig. 15.—COLE, 1981, p. 32, pl. 5, fig. 2.—KOHL, 1985, p. 28, pl. 1, figs. 4a–c.

Description. Test free, large, planispiral, biconvex, involute, periphery rounded, subcircular in side view. Chambers slightly inflated, nine to 13 in the last whorl, gradually increasing in size. Sutures radial, slightly depressed. Wall finely agglutinated. Aperture multiple, consisting of an interiomarginal slit and a series of rounded pores scattered over the apertural face.

Ecology. Cyclammina cancellata is found at middle and lower bathyal depth off Newfoundland (Cole, 1981). In the Gulf of Mexico, the upper depth limit for this species is close to the upper boundary of the upper middle bathyal zone (Pflum and Frerichs, 1976). Pflum and Frerichs (1976) recorded a size increase towards deeper water.

Distribution in 586A. Cyclammina cancellata is a very rare species and occurs in only one sample (79.70 m).

Recorded Distribution. Cyclammina cancellata was described from the Holocene of the Atlantic and Pacific. Holocene: Atlantic (Brady, 1884), Gulf of Mexico (Pflum and Frerichs, 1976), Mediterranean (Brady, 1884), Pacific (Brady, 1884; Cushman, 1921; Ingle and others, 1980). Pleistocene: Gulf of Mexico (Akers and Dorman, 1966). Pliocene: Mexico (Kohl, 1985), Pacific (Thompson, 1980). Miocene: Pacific (Thompson, 1980).

Family TEXTULARIIDAE Ehrenberg, 1838
Subfamily SPIROPLECTAMMININAE Cushman, 1927a
Genus **VULVULINA** d'Orbigny, 1826

Vulvulina spinosa Cushman

Vulvulina spinosa CUSHMAN, 1927e, p. 111, pl. 23, fig. 1.—DOUGLAS, 1973, pl. 2, figs. 1–4.—MCDOUGALL, 1985, p. 399, pl. 1, fig. 2.

Description. Test free, large, compressed, rhomboid in cross-section, biserial in early portion, later uniserial, periphery acute. Chambers distinct, broad and low, curved downward with a projecting spine at the outer margin. Sutures depressed. Wall agglutinated, relatively smooth, especially in the early portion. Aperture terminal, an elongate slit in the plane of compression.

Remarks. Vulvulina miocenica Cushman (1932b) differs from *Vulvulina spinosa* in having raised rather than depressed sutures in the biserial portion of the test. *Vulvulina jarvisi* Cushman (1932b), in turn, differs from *V. spinosa* in its lack of spines and in that the biserial portion of the test is flat sided rather than biconvex as in *V. spinosa.*

Distribution in 586A. Only one broken specimen of *Vulvulina spinosa* was found at 81.70 m.

Recorded Distribution. Vulvulina spinosa was described from the upper Eocene of Mexico. Pliocene: Pacific (McDougall, 1985). Miocene: Atlantic (Boersma, 1984a), Pacific (Douglas, 1973; Resig, 1976; McDougall, 1985; Thompson, 1985), Guam (Todd, 1966).

Subfamily TEXTULARIINAE Ehrenberg, 1838
Genus **TEXTULARIA** Defrance, in Blainville, 1824

Textularia lythostrota (Schwager)
Pl. 1, Figs. 2, 5

Plecanium lythostrotum SCHWAGER, 1866, p. 194, pl. 4, figs. 4a–c.
Textularia milletti CUSHMAN, 1911, p. 13, text-figs. 18–19.
Textularia lythostrota (Schwager).—LALICKER and MCCULLOCH, 1940, p. 131, pl. 15, figs. 16a–c.—LEROY, 1964, p. 17–18, pl. 16, fig. 16.—BOERSMA, 1984b, p. 663, pl. 1, fig. 4.—KOHL, 1985, p. 30, pl. 2, figs. 2a–c.—BOERSMA, 1986, p. 990, pl. 3, figs. 8–9.—KURIHARA and KENNETT, 1986, pl. 1, figs. 1–2.

Description. Test free, compressed, biserial, somewhat longer than broad, subrectangular in cross-section, periphery subacute. Chambers low and broad, upper margin of each chamber thickened so that the surface consists of raised ridges alternating with depressions. Sutures obscure, straight. Wall coarsely agglutinated, with a rough surface. Aperture a low, narrow opening in an indentation at the inner margin of the ultimate chamber.

Remarks. Textularia lythostrota appears to be conspecific with *Textularia bermudezi* Cushman and Todd (1945), described from the Miocene of Jamaica. It is also closely related to, and may be conspecific with, *Textularia leuzingeri* Cushman and Renz (1941), described from the Miocene of Venezuela, and *Textularia seligi* Stuckey (1946), described from the Oligocene of Texas, even though the pinched periphery of those species in most cases is not present. I have in this study lumped all these intergrading forms under the older taxon, *T. lythostrota.*

Distribution in 586A. Textularia lythostrota exhibits scattered occurrences below 88.80 m.

Recorded Distribution. Textularia lythostrota was described from the Pliocene of Kar Nikobar, off Sumatra. Holocene: Pacific (Cushman, 1911; Lalicker and McCulloch, 1940). Pleistocene: Atlantic (Boersma, 1984b), Pacific (Kurihara and Kennett, 1986). Pliocene: Atlantic (Boersma, 1984b), Pacific (Boersma, 1986; Kurihara and Kennett, 1986), Sumatra (Schwager, 1866), Mexico (Kohl, 1985). Miocene: Pacific (Boersma, 1986; Kurihara and Kennett, 1986), Okinawa (LeRoy, 1964).

Textularia secasensis Lalicker and McCulloch
Pl. 1, Figs. 3, 6

Textularia secasensis LALICKER and MCCULLOCH, 1940, p. 141, pl. 16, figs. 24a–c.—SMITH, 1964, p. 28, pl. 1, figs. 5a–b.
Textularia candeiana (d'Orbigny).—SCHNITKER, 1971, p. 212, pl. 1, figs. 10a–b (not *Textularia candeiana* d'Orbigny, 1839a).

Description. Test free, subtriangular in front view, ovate in top view, peripheral margin subacute. Chambers numerous, much broader than high, inflated evenly. Sutures distinct, depressed, almost oblique to the mid-line. Wall coarsely agglutinated. Aperture a broad, low opening at the base of the inner margin of the ultimate chamber, in a shallow indentation.

Remarks. Textularia secasensis differs from *Textularia candeiana* d'Orbigny (1839a), described from the Holocene of the Caribbean, in being distinctively ovate in cross-section. A closer investigation of earlier studies would probably reveal that several of the specimens assigned to *T. candeiana* are ovate in cross-section and should therefore be referred to *T. secasensis* instead.

Ecology. Textularia secasensis is very common in the neritic zone off the coasts of Central America (Lalicker and McCulloch, 1940; Smith, 1964), California, western Mexico, and the Galapagos Islands (Lalicker and McCulloch, 1940).

Distribution in 586A. Textularia secasensis is a rare species and has only scattered occurrences below 88.80 m.

Recorded Distribution. Textularia secasensis was described from the Holocene off the west coast of Mexico. Holocene: Pacific (Lalicker and McCulloch, 1940; Smith, 1964).

Subfamily PSEUDOBOLIVINAE Wiesner, 1931
Genus **SIPHOTEXTULARIA** Finlay, 1939a

Siphotextularia catenata (Cushman)

Textularia catenata CUSHMAN, 1911, p. 23, figs. 39–40.—CUSH-

MAN, 1921, p. 112, pl. 23, fig. 5.—CUSHMAN, 1922a, p. 12, pl. 6, fig. 3.

Siphotextularia catenata (Cushman).—CORLISS, 1979, p. 5, pl. 1, figs. 1–2.—BOERSMA, 1984b, pl. 1, fig. 5.—MURRAY, 1984, pl. 3, figs. 8–9.

Siphotextularia rolshauseni PHLEGER and PARKER, 1951, p. 4, pl. 1, figs. 23–24a–b.—PHLEGER and others, 1953, p. 26, pl. 5, fig. 7.—SCHNITKER, 1971, p. 210, p. 1, figs. 15a–b.—COLE, 1981, p. 36, pl. 5, fig. 7.—HERMELIN and SCOTT, 1985, p. 217, pl. 1, figs. 6a–7b.—KURIHARA and KENNETT 1986, pl. 1, fig. 3.

Description. Test free, elongate, biserial, rounded in end view, lobate periphery. Chambers globular, increasing in size rapidly. Sutures depressed. Wall coarsely agglutinated, finely perforate. Aperture subterminal, rounded, on a distinct neck, in the lower face of the ultimate chamber.

Remarks. Phleger and Parker (1951) described *Siphotextularia rolshauseni* from the Gulf of Mexico. This species differs from Cushman's holotype of *Textularia catenata* only in the size; the latter is significantly larger. I agree with Corliss (1979) that a difference in size is not a valid specific taxonomic character. Therefore, *S. rolshauseni* should be regarded as a junior synonym of *S. catenata.*

It should be noted that several authors use the name *S. catenata* for specimens that do not agree with the original description. The type description stated that the aperture in the last-formed chamber is subterminal and rounded.

Ecology. Pflum and Frerichs (1976) found that *S. rolshauseni* (=*S. catenata*) had its upper depth limits in the lower middle bathyal zone and ranged into abyssal water depths in the Gulf of Mexico. In the Indian Ocean Corliss (1979) reported this species from the lower bathyal zone.

Distribution in 586A. Siphotextularia catenata occurs in low relative frequencies throughout the sequence.

Recorded Distribution. Siphotextularia catenata was described from Holocene sediments from the western North Pacific. Holocene: Atlantic (Phleger and others, 1953; Schnitker, 1971; Cole, 1981; Hermelin and Scott, 1985), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Cushman, 1911, 1921; Burke, 1981), Indian Ocean (Corliss, 1979). Pleistocene: Atlantic (Blanc-Vernet, 1983; Murray, 1984), Gulf of Mexico (Phleger and Parker, 1951; Akers and Dorman, 1964), Pacific (McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984b; Murray, 1984), Pacific (Thomas, 1985; Kurihara and Kennett, 1986). Miocene: Atlantic (Murray, 1984), Pacific (Thomas, 1985; Kurihara and Kennett, 1986).

Siphotextularia curta (Cushman)
Pl. 1, Fig. 4

Textularia flintii Cushman var. *curta* CUSHMAN, 1922a, p. 14, pl. 2, figs. 2–3.

Siphotextularia curta (Cushman).—PHLEGER and others, 1953, p. 26, pl. 5, figs. 5–6.—PARKER, 1954, p. 491, pl. 2, fig. 15.—SCHNITKER, 1971, p. 210, pl. 1, figs. 14a–b.—KOHL, 1985, p. 31, pl. 3, figs. 1a–c.

Siphotextularia flintii (Cushman) var. *pacifica* LEROY, 1964, p. 18, pl. 2, figs. 3–4.

Description. Test free, biserial, slightly longer than broad, periphery broadly rounded. Chambers increasing fairly rapidly in size as added, last chambers strongly inflated and globular. Sutures strongly depressed. Wall agglutinated, smooth, finely perforate. Aperture an elongate slit in the lower face of the ultimate chamber, bordered by a rim.

Remarks. Siphotextularia curta differs from *S. catenata* in its much smoother test, more globular chambers and elongate aperture perpendicular to the compression of the test.

Ecology. In the Gulf of Mexico *Siphotextularia curta* is characteristic for the lower bathyal and abyssal zones (Pflum and Frerichs, 1976).

Distribution in 586A. Siphotextularia curta occurs as a single specimen at 48.29 m.

Recorded Distribution. Siphotextularia curta was described from the Holocene of the Caribbean. Holocene: Atlantic (Cushman, 1922a; Phleger and others, 1953; Schnitker, 1971), Caribbean (Cushman, 1922a), Gulf of Mexico (Parker, 1954; Pflum and Frerichs, 1976). Pleistocene: Atlantic (Phleger and others, 1953). Pliocene: Atlantic (Hermelin, 1986), Mexico (Kohl, 1985), Okinawa (LeRoy, 1964). Miocene: Okinawa (LeRoy, 1964).

Siphotextularia sp. 1
Pl. 1, Figs. 7, 10

Description. Test free, elongate, twisted, biserial, rounded in end view, lobate periphery. Chambers globular. Sutures depressed. Wall finely agglutinated, finely perforate. Aperture subterminal, rounded, on a short neck.

Remarks. Siphotextularia sp. 1 differs from *S. catenata* in its more elongate and strongly twisted test, and finely agglutinated wall.

Distribution in 586A. Siphotextularia sp. 1 occurs as a single specimen at 59.50 m.

Family TROCHAMMINIDAE Schwager, 1877
Subfamily TROCHAMMININAE Schwager, 1877
Genus **CYSTAMMINA** Neumayr, 1889

? **Cystammina** sp. 1
Pl. 1, Figs. 8, 11

Description. Test free, trochoid, slightly compressed. Chambers few, the last three chambers almost entirely conceal the earlier ones. Sutures distinct, depressed. Wall very finely agglutinated, smooth, finely perforated. Aperture rounded, in the junction of the three visible chambers.

Remarks. This species has in most respects the characters of the genus *Cystammina* except for the aperture which is rounded instead of being a slit in the face of the ultimate chamber.

Distribution in 586A. This species is very rare and occurs as only a few specimens.

Family ATAXOPHRAGMIIDAE Schwager, 1877
Subfamily GLOBOTEXTULARIINAE Cushman, 1927a
Genus **EGGERELLA** Cushman, 1933d

Eggerella bradyi (Cushman)
Pl. 2, Figs. 1–2

Verneuilina pygmaea (Egger).—BRADY, 1884, p. 385–386, pl. 47, figs. 4–7 (not *Bulimina pygmaea* Egger, 1857).
Verneuilina bradyi CUSHMAN, 1911, p. 54–55, text-figs. 87a–b.—CUSHMAN, 1921, p. 141, pl. 27, fig. 4.
Verneuilina bradyi nitens WIESNER, 1931, p. 99, pl. 13, figs. 154a–b.
Eggerella bradyi var. *nitens* (Wiesner).—CUSHMAN, 1937a, p. 53, pl. 5, fig. 20.
Eggerella bradyi (Cushman).—CUSHMAN, 1937b, p. 52, pl. 5, fig. 19.—PHLEGER and PARKER, 1951, p. 6, pl. 3, figs. 1–2.—PHLEGER and others, 1953, p. 27, pl. 5, figs. 8–9.—BARKER, 1960, p. 96, pl. 47, figs. 4–7.—LEROY, 1964, p. 18, pl. 1, figs. 13–14.—BOLTOVSKOY, 1978a, pl. 3, fig. 33.—CORLISS, 1979, p. 5, pl. 1, figs. 3–4.—KELLER, 1980, pl. 1, fig. 8.—BURKE, 1981, pl. 1, fig. 6.—BOERSMA, 1984a, pl. 8, fig. 1.—MURRAY, 1984, pl. 1, figs. 20–21.—KOHL, 1985, p. 32, pl. 3, fig. 3.—MEAD, 1985, p. 225–226, pl. 1, figs. 1a–b.—THOMAS, 1985, p. 676, pl. 1, fig. 4.—BOERSMA, 1986, pl. 10, figs. 1–2.
Eggerella nitens (Wiesner).—ECHOLS, 1971, p. 163.
Eggerella bradyi bradyi (Cushman).—HERB, 1971, p. 296, pl. 12, fig. 1.

Description. Test free, conical, early stages trochospiral, later stages triserial, chambers increasing rapidly in size as added. Wall smooth, finely agglutinated, finely perforate. Sutures distinct and depressed. Aperture a thin slit at the base of the junction between the ultimate chamber and the penultimate and antepenultimate chambers.

Remarks. The agglutinated test of *Eggerella bradyi* is composed of calcareous particles cemented together, which gives the surface a smooth and polished finish.

Eggerella bradyi exhibits great variation, from conical forms [i.e., *E. bradyi nitens* (Wiesner)] where the size of the chambers increases rapidly, to more cylindrical forms [i.e., *E. bradyi bradyi* (Cushman)]. Since these two forms seem to intergrade they are counted as one species in this study. Specimens referred to in the literature as *E. propinqua* (Brady) may also be included in the concept of *E. bradyi.* In this study only specimens with a triserial chamber-arrangement throughout are retained in *E. bradyi.* Specimens with a short biserial stage are referred to as *E. bradyi* trans. *Karreriella bradyi* (see discussion under that group).

Ecology. Eggerella bradyi is a cosmopolitan species and is mostly found in waters of bathyal and abyssal depths of the world's oceans (Ingle and Keller, 1980). Pflum and Frerichs (1976) recorded an increase in size with increasing depth in the Gulf of Mexico. In the upper bathyal zone the maximum length was about 300 micrometers which increased to about 1 mm in the middle and lower bathyal and abyssal zones. Mead (1985) found this species in increasing relative abundance (up to 10%) with increasing water depths in the lower middle and lower bathyal zones. Corliss (1979) found it in the lower bathyal zone in the Indian Ocean.

Distribution in 586A. Eggerella bradyi is a common species that occurs at most levels. The relative abundance varies from 0.0 to 4.8%.

Recorded Distribution. Eggerella bradyi was described from the Holocene of the Pacific. Holocene: Atlantic (Brady, 1884; Cushman, 1922a; Phleger and others, 1953; Boltovskoy, 1978b; Murray, 1984; Hermelin and Scott, 1985; Mead, 1985), Gulf of Mexico (Phleger and Parker, 1951; Pflum and Frerichs, 1976), Mediterranean (Todd, 1965), Pacific (Brady, 1884; Cushman, 1911; Cushman, 1921; Ingle and others, 1980; Burke, 1981), Indian Ocean (Boltovskoy, 1978a; Corliss, 1979), Antarctic Ocean (Brady, 1884; Parr, 1950; Hornibrook, 1961; Bandy and Echols, 1964; Echols, 1971; Herb, 1971; Fillon, 1972). Pleistocene: Atlantic (Phleger and others, 1953; Blanc-Vernet, 1983), Pacific (Resig, 1976; Keller, 1980; Thompson, 1980; McDougall, 1985; Thomas, 1985). Pliocene: Atlantic (Boersma, 1984a, b; Murray, 1984; Hermelin, 1986), Mexico (Kohl, 1985), Pacific (Cushman, 1911; Keller, 1980; Thompson, 1980; McDougall, 1985; Thomas, 1985; Boersma, 1986), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Indian Ocean Boltovskoy, 1978a). Miocene: Atlantic (Boersma, 1984a, b; Murray, 1984), Mediterranean (Colom, 1946), Pacific (Resig, 1976; Keller, 1980; Woodruff and

Douglas, 1981; McDougall, 1985; Thomas, 1985; Boersma, 1986), Guam (Todd, 1966), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a).

Eggerella bradyi (Cushman) trans.
Karreriella bradyi (Cushman)

Remarks. Some authors have raised the question of whether or not *Eggerella bradyi* (Cushman) and *Karreriella bradyi* (Cushman) should synonymized (Phleger and others, 1953; Mead, 1985). There is a strong similarity between the two species and in my material there are several specimens that in their early stages are developed as typical *E. bradyi* while they in their later stages develop characteristics typical of *K. bradyi.*

Most authors have placed these "intermediate" forms in either *E. bradyi* or *K. bradyi* (e.g., Boersma, 1984b, *Eggerella bradyi,* pl. 1, fig. 7; Keller, 1980, *Karreriella bradyi,* pl. 2, fig. 9). In this study they were separated, when possible, from the typical representatives of the two species, and placed in the *E. bradyi* trans. *K. bradyi*-group.

Bandy and Echols (1964) and Boltovskoy (1978b) suggested that *E. bradyi* and *K. bradyi* are different growth stages, or dimorphic forms, of the same species.

Distribution in 586A. The *Eggerella bradyi* trans. *Karreriella bradyi* group exhibits scattered occurrences in the sequence.

Genus **KARRERIELLA** Cushman, 1933a

Karreriella bradyi (Cushman)

Gaudryina pupoides d'Orbigny.—BRADY, 1884, p. 378, pl. 46, figs. 1–4 (not *Gaudryina pupoides* d'Orbigny, 1840).
Gaudryina bradyi CUSHMAN, 1911, p. 67, text-figs. 107a–c.—CUSHMAN, 1921, p. 149, pl. 29, fig. 3.—CUSHMAN, 1932a, p. 13–14, pl. 3, figs. 8–9.
Karreriella bradyi (Cushman).—CUSHMAN, 1937b, p. 135, pl. 16, figs. 6–11.—CUSHMAN and TODD, 1945, p. 8, pl. 1, fig. 20.—BERMÚDEZ, 1949, p. 89, pl. 5, fig. 11–16.—BARKER, 1960, p. 94, pl. 46, figs. 1–4.—MURRAY, 1971, p. 47, pl. 16, figs. 1–4.—BOLTOVSKOY, 1978a, pl. 4, figs. 28–29.—CORLISS, 1979, p. 5, pl. 1, figs. 5–6.—COLE, 1981, p. 44, pl. 6, fig. 5.—HERMELIN and SCOTT, 1985, p. 212, pl. 1, fig. 8.—KOHL, 1985, p. 32, pl. 3, figs. 4–5.—MCDOUGALL, 1985, p. 394, pl. 1, fig. 4.—BOERSMA, 1986, pl. 10, fig. 5.
Alvarezina bradyi (Cushman).—AKERS and DORMAN, 1964, p. 20–21, pl. 1, fig. 22.
Karreriella aff. *bradyi* (Cushman).—BUTT, 1980, pl. 7, fig. 26.
Kareriella bradyi (Cushman) [sic].—KELLER, 1980 (part), pl. 1, fig. 10 (not 9).

Description. Test free, early portion trochospiral, later stages biserial, eventually somewhat twisted, elongate, rounded in cross-section. Wall finely agglutinated, smooth, finely perforate. Sutures indistinct in early portion, distinct and depressed in the biserial portion. Aperture an elongate opening at terminal face of ultimate chamber, parallel to suture, with a raised lip.

Remarks. Parr (1950) and Phleger and others (1953) discussed the possibility that *Eggerella bradyi* (Cushman) was a juvenile stage of this species. Phleger and others (1953) also noted that the two species had the same bathymetric range. Pflum and Frerichs (1976) also discussed the possibility of an intergradational series between *K. bradyi* and *E. bradyi* and found that the two species had their upper depth limits in the upper bathyal zone and ranged throughout all the deeper water zones. For further discussion of the relationship between *K. bradyi* and *E. bradyi* see the discussion under the genus *Eggerella.*

Ecology. Karreriella bradyi has a distribution similar to that of *Eggerella bradyi* with its upper depth limit in the lowermost neritic zone and occurrences throughout the bathyal and abyssal zones (Atlantic: Brady, 1884; Gulf of Mexico: Pflum and Frerichs, 1976; Pacific: Brady, 1884).

Distribution in 586A. Karreriella bradyi is a rare species that exhibits scattered occurrences below 57.40 m.

Recorded Distribution. Karreriella bradyi was described from the Holocene of the Atlantic and the Pacific. Holocene: Atlantic (Brady, 1884; Cushman, 1937b; Murray, 1971; Cole, 1981; Hermelin and Scott, 1985), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Brady, 1884; Cushman, 1921, 1932a, 1937b; Douglas, 1973; Ingle and others, 1980; Burke, 1981), Indian Ocean (Boltovskoy, 1978a; Corliss, 1979), Antarctic Ocean (Parr, 1950). Pleistocene: Atlantic (Murray, 1984), Gulf of Mexico (Akers and Dorman, 1964), Pacific (Douglas, 1973; Keller, 1980). Pliocene: Atlantic (Blanc-Vernet, 1983; Murray, 1984), Mexico (Kohl, 1985), Spain (Cushman, 1937b), Pacific (Douglas, 1973; Butt, 1980; Keller, 1980; Thomas, 1985; Boersma, 1986), New Guinea (Cushman, 1937b), Indian Ocean (Boltovskoy, 1978a). Miocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984a; Murray, 1984; Hermelin, 1986), Caribbean (Cushman and Todd, 1945), Egypt (Cushman, 1937b), Pacific (Cushman, 1937b; Resig, 1976; Butt, 1980; Keller, 1980; Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985), Guam, (Todd, 1966), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a).

Genus **SIPHOEGGERELLA** new genus

Type species. S. siphonella (Reuss).

Description. Test trochospiral with three chambers to whorl in adult, basal part rounded. Wall agglutinated. Aperture round, in terminal face of ultimate chamber, on a short distinct neck.

Remarks. This genus resembles *Eggerella* in many of its features except for the apertural characteristics.

Siphoeggerella siphonella (Reuss)
Pl. 1, Figs. 9, 12

Gaudryina siphonella REUSS, 1851a, p. 78.

Description. Test free, conical, early stages trochospiral, later stages triserial, chambers increasing rapidly in size as added. Wall smooth, finely agglutinated, finely perforate. Sutures distinct and depressed. Aperture rounded, on a distinct neck, in the lower face of the ultimate chamber, close to the junction between the ultimate chamber and the penultimate and antepenultimate chambers.

Remarks. Siphoeggerella siphonella is very close to *E. bradyi* except for the aperture which is small, rounded and situated on a short neck.

Distribution in 586A. Siphoeggerella siphonella is a rare species with few occurrences.

Recorded Distribution. Siphoeggerella siphonella was described from the Miocene of Germany. Miocene: Germany (Reuss, 1851a).

Subfamily VERNEUILININAE Cushman, 1927a
Genus **VERNEUILINA** d'Orbigny, 1839a

Verneuilina sp. 1
Pl. 2, Fig. 3

Description. Test free, short, triangular with flattened sides, subacute angles, slightly longer than broad, rapidly increasing in width. Chambers rapidly increasing in size as added, the last three rounded. Sutures flush with surface in the early portion, depressed between the last formed chambers. Wall agglutinated. Aperture a rounded opening at the base of the ultimate chamber, at the junction between the penultimate and antepenultimate chambers.

Remarks. Verneuilina sp. 1 resembles *Verneuilina monmouthensis* Olsson (1960) although the apertural characteristics differ.

Distribution in 586A. Verneuilina sp. 1 occurs as one single specimen at 133.20 m.

Subfamily VALVULININAE Berthelin, 1880
Genus **MARTINOTTIELLA** Cushman, 1933d

Martinottiella communis (d'Orbigny)
Pl. 2, Figs. 5–6

Clavulina communis D'ORBIGNY, 1826, p. 268, mod. no. 4.—D'ORBIGNY, 1846, p. 196, pl. 12, figs. 1–2.—BRADY, 1884 (part), p. 394, pl. 48, figs. 3–4, 6–8 (not 1–2, 5, 9–13).—CUSHMAN, 1911, p. 72, text-figs. 115–117.—CUSHMAN, 1921, p. 154, pl. 31, fig. 1.—CUSHMAN, 1932a, p. 16, pl. 4, figs. 3a–b.
Verneuilina communis (d'Orbigny).—JONES and PARKER, 1860, p. 303.
Martinottiella communis (d'Orbigny).—CUSHMAN, 1933a, p. 37, pl. 4, figs. 6–8.—CUSHMAN, 1933d, p. 122, pl. 12, fig. 11.—ASANO, 1950, p. 3, figs. 16–17.—BARKER, 1960, p. 98, l. 48, figs. 3–4, 6–8.—INGLE and others, 1980, p. 140, pl. 4, fig. 14–15.—KELLER, 1980, pl. 1, fig. 12.—THOMPSON, 1980, pl. 8, fig. 9.—COLE, 1981, p. 45–46, pl. 17, fig. 24.—KOHL, 1985, p. 33, pl. 4, fig. 2.—BOERSMA, 1986, pl. 3, fig. 5.
Listerella communis (d'Orbigny).—CUSHMAN, 1937b, p. 148, pl. 17, figs. 4–9.
Schenckiella communis (d'Orbigny).—THALMANN, 1942, p. 463.—LEROY, 1964, p. 19, pl. 1, fig. 17.
Martinottiella occidentalis (Cushman).—LEROY and LEVINSON, 1974, p. 6, pl. 1, fig. 18 (not *Clavulina occidentalis* Cushman, 1922a).
Martinotiella communis (d'Orbigny) [sic].—BOERSMA, 1984b, pl. 1, figs. 2–3.

Description. Test free, elongate, early portion trochospiral, later triserial, quickly reduced to uniserial, chambers indistinct in early portion, more distinct in the uniserial portion. Sutures slightly depressed in later stages. Wall finely agglutinated, smooth, finely perforate. Aperture rounded or slightly elliptical, on a short neck at the center of the ultimate chamber.

Ecology. In the western Pacific *Martinottiella communis* is reported from the upper bathyal, shallow oxygen-minimum zone (Ingle and Keller, 1980).

Distribution in 586A. Martinottiella communis is a rare species with scattered occurrences.

Recorded Distribution. The type locality for *Martinottiella communis* was not designated. Holocene: Atlantic (Brady, 1884; Cole, 1981), Gulf of Mexico (Pflum and Frerichs, 1976), Caribbean (Brady, 1884), Pacific (Brady, 1884; Cushman, 1911, 1921, 1932a; Matoba, 1976; Ingle and others, 1980), Antarctic Ocean (Brady, 1884). Pleistocene: Atlantic (Blanc-Vernet, 1983), Gulf of Mexico (LeRoy and Levinson, 1974), Pacific (Keller, 1980; Thompson, 1980). Pliocene: Atlantic (Boersma, 1984b), Europe (Cushman, 1937b), Mexico (Kohl, 1985), Pacific (Keller, 1980; Thompson, 1980; McDougall, 1985; Thomas, 1985; Boersma, 1986), Okinawa (LeRoy, 1964). Miocene: Atlantic (Boersma, 1984b), Mediterranean (Colom, 1946), Europe (Cushman, 1937b), Pacific (Keller, 1980; Thompson, 1980; McDougall, 1985; Thomas, 1985; Boersma, 1986), Okinawa (LeRoy, 1964).

Martinottiella petrosa (Cushman and Bermúdez)
Pl. 2, Fig. 7

Listerella petrosa CUSHMAN and BERMÚDEZ, 1937, p. 5–6, pl. 1, figs. 24–26.—CUSHMAN, 1937a, p. 139, pl. 16, figs. 26–28.

Martinottiella petrosa (Cushman and Bermúdez).—DOUGLAS, 1973, pl. 3, fig. 1.
Schenckiella petrosa (Cushman and Bermúdez).—MCDOUGALL, 1985, p. 398.
Martinottiella variabilis (Schwager).—BOERSMA, 1986, pl. 3, figs. 6–7 (not *Clavulina variabilis* Schwager, 1866).

Description. Test free, elongate, triserial in early stages, later uniserial. Chambers in the uniserial part of equal size. Sutures indistinct, slightly depressed. Wall coarsely agglutinated. Aperture terminal, rounded.

Distribution in 586A. Martinottiella petrosa is a rare species with few occurrences.

Recorded Distribution. Martinottiella petrosa was described from the Eocene of Cuba. Pliocene: Pacific (Boersma, 1986). Miocene: Pacific (Douglas, 1973; Resig, 1976; Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985; Boersma, 1986).

Suborder MILIOLINA Delage and Hérouard, 1896
Superfamily MILIOLACEA Ehrenberg, 1839
Family NUBECULARIIDAE Jones, 1875
Subfamily SPIROLOCULININAE Wiesner, 1920
Genus **SPIROLOCULINA** d'Orbigny, 1826

Spiroloculina sp. 1
Pl. 2, Fig. 8

Description. Test free, planispiral, slightly twisted, periphery rounded, fusiform in side view. Chambers tubular, broad, alternating in a single slightly twisted plane. Wall calcareous, smooth. Sutures distinct, depressed. Aperture terminal, slightly produced, with a short simple tooth at the inner margin.

Distribution in 586A. Spiroloculina sp. 1 is a rare species with few occurrences.

Subfamily OPHTHALMIDIINAE Wiesner, 1920
Genus **OPHTHALMIDIUM** Kübler and Zwingli, 1870

Ophthalmidium pusillum (Earland)
Pl. 2, Fig. 10

Spiroloculina tenuis (Cžjžek).—BRADY, 1884 (part), p. 152–153, pl. 10, figs. 9–10 (not 7–8, 11) (not *Quinqueloculina tenuis* Cžjžek, 1848).
Spiroloculina tenuissima Reuss.—CUSHMAN, 1917a, p. 32–33.—CUSHMAN, 1921, p. 400, pl. 84, fig. 2 (not *Spiroloculina tenuissima* Reuss, 1867).
Spiroloculina pusilla EARLAND, 1934, p. 47, pl. 1, figs. 3–4.
Spiroloculina sp. PHLEGER and others, 1953, p. 28, pl. 5, figs. 15–16.
Spirophthalmidium pusillum (Earland).—BARKER, 1960, p. 20, pl. 10, figs. 9–10.
Ophthalmidium pusillum (Earland). LOEBLICH and TAPPAN, 1964, p. C448.—CORLISS, 1979, p. 5–6, pl. 1, figs. 7–8.—COLE, 1981, p. 48, pl. 9, fig. 1.—RESIG, 1981, pl. 5. fig. 5.—HERMELIN and SCOTT, 1985, p. 214, pl. 1, fig. 10.—KURIHARA and KENNETT, 1986, pl. 1, fig. 9.

Description. Test free, planispiral, all chambers visible, flat, periphery rounded, fusiform in side view, widest at middle of test. Chambers few, tubular, alternating in a single plane. Wall porcellaneous, thin, smooth. Sutures distinct. Aperture terminal, round, at end of last chamber which produces a neck.

Distribution in 586A. Ophthalmidium pusillum is a rare species with scattered occurrences.

Recorded Distribution. Ophthalmidium pusillum was described from the Holocene of the Antarctic Ocean. Holocene: Atlantic (Brady, 1884; Phleger and others, 1953; Cole, 1981; Hermelin and Scott, 1985), Pacific (Brady, 1884; Cushman, 1917a, 1921; Resig, 1981), Indian Ocean (Corliss, 1979), Antarctic Ocean (Earland, 1934). Pleistocene: Atlantic (Murray, 1984), Pacific (Resig, 1976; Thomas, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Murray, 1984; Hermelin, 1986), Pacific (Thomas, 1985; Kurihara and Kennett, 1986). Miocene: Atlantic (Murray, 1984), Pacific (Thomas, 1985).

Family MILIOLIDAE Ehrenberg, 1839
Subfamily QUINQUELOCULININAE Cushman, 1917a
Genus **QUINQUELOCULINA** d'Orbigny, 1826

Quinqueloculina lamarckiana d'Orbigny
Pl. 2, Figs. 4, 9

Quinqueloculina lamarckiana D'ORBIGNY, 1839a, p. 189, pl. 11, figs. 14–15.—CUSHMAN, 1921, p. 418–420, pl. 87, figs. 2–3.—CUSHMAN, 1932a, p. 24–25, pl. 6, figs. 2a–c.—BARKER, 1960, p. 10, pl. 5, figs. 7a–c, 12a–c.—SCHNITKER, 1971, p. 208, pl. 2, figs. 1a–b.
Quinqueloculina cuvieriana D'ORBIGNY, 1839a, p. 190, pl. 11, figs. 19–20.
Quinqueloculina auberiana D'ORBIGNY, 1839a, p. 193, pl. 12, figs. 1–3.
Miliolina cuvieriana (d'Orbigny).—BRADY, 1884, p. 162, pl. 5, figs. 12a–c.

Description. Test free, fusiform, nearly as long as wide, chambers prominently triangular in cross-section, peripheral angles subacute. Sutures distinct, slightly depressed. Wall calcareous, porcellaneous, smooth, polished. Aperture elliptical, with a long narrow tooth, on a short contracted neck.

Remarks. D'Orbigny (1839a) described three almost identical quinqueloculine species from the Caribbean: *Quinqueloculina lamarckiana, Q. cuvieriana,* and *Q. auberiana.* I follow Cushman who placed *Q. auberiana* and *Q. cuvieriana* in synonymy of *Q. lamarckiana* (Cushman, 1922b).

Distribution in 586A. Quinqueloculina lamarckiana is a rare species although it appears in most samples between 70 and 100 m.

Recorded Distribution. Quinqueloculina lamarckiana was described from the Holocene off the islands of Cuba and Jamaica. Holocene: Atlantic (Brady, 1884; Schnitker, 1971), Caribbean (d'Orbigny, 1839a), Pacific (Cushman, 1921, 1932a; Todd, 1966). Pleistocene: Pacific (McDougall, 1985). Pliocene: Pacific (McDougall, 1985; Thomas, 1985). Miocene: Pacific (McDougall, 1985; Thomas, 1985), Guam (Todd, 1966).

Quinqueloculina venusta Karrer
Pl. 2, Figs. 11, 14

Quinqueloculina venusta KARRER, 1868, p. 147, pl. 2, fig. 6.—CUSHMAN, 1917a, p. 45–46, pl. 11, figs. 1a–c.—CUSHMAN, 1921, p. 420–421, pl. 91, figs. 2a–c.—PHLEGER and others, 1953, p. 27, pl. 5, figs. 11–12.—BOLTOVSKOY, 1978a, pl. 6, figs. 32–33.—CORLISS, 1979, p. 6, pl. 1, figs. 9–11.—KURIHARA and KENNETT, 1986, pl. 1, figs. 14–15.

Miliolina venusta (Karrer).—BRADY, 1884 (part), p. 162, pl. 5, figs. 5a–c (not 7a–c).

Quinqueloculina venusta Karrer ?.—BARKER, 1960, p. 10, pl. 5, figs. 5a–c.

Triloculina sp. A BURKE, 1981, pl. 1, figs. 7, 10–11.

Description. Test free, fusiform, one and one-half as long as wide, prominently triangular in cross-section, peripheral angles bluntly angular. Sutures distinct, slightly depressed. Wall calcareous, porcellaneous, smooth. Aperture circular with a thickened lip and a short tooth, on a short contracted neck.

Ecology. Corliss (1979) found *Quinqueloculina venusta* in the lower bathyal zone of the Indian Ocean, whereas Burke (1981) reported it (as *Triloculina* sp. A) from abyssal depths at the Ontong-Java Plateau.

Distribution in 586A. Quinqueloculina venusta is a rare species with scattered occurrences.

Recorded Distribution. Quinqueloculina venusta was described from the Miocene of Romania. Holocene: Atlantic (Brady, 1884; Phleger and others, 1953; Hermelin and Scott, 1985), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Cushman, 1917a; Parr, 1950; Burke, 1981), Indian Ocean (Corliss, 1979). Pleistocene: Atlantic (Phleger and others, 1953; Blanc-Vernet, 1983), Pacific (Douglas, 1973; McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Blanc-Vernet, 1983), Pacific (Douglas, 1973; McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986), Indian Ocean (Boltovskoy, 1978a). Miocene: Romania (Karrer, 1868), Pacific (Douglas, 1973; McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986), Indian Ocean (Boltovskoy, 1978a).

Genus **PYRGO** Defrance, in Blainville, 1824

Pyrgo murrhina (Schwager)
Pl. 2, Figs. 12, 15–16

Biloculina murrhina SCHWAGER, 1866, p. 203, pl. 4, figs. 15a–c.—CUSHMAN, 1917a, p. 75, pl. 28, figs. 3a–b, pl. 29, figs. 1a–c.

Biloculina depressa d'Orbigny.—BRADY, 1884, p. 145–146, pl. 2, figs. 15a–b.

Biloculina depressa d'Orbigny var. *murrhyna* Schwager.—BRADY, 1884, p. 146, pl. 2, figs. 10–11.

Biloculina bradyi FORNASINI, 1886, p. 261 (after Brady, 1884, pl. 2, figs. 15a–b).

Pyrgo murrhina (Schwager).—CUSHMAN, 1929a, p. 71, pl. 19, figs. 6a–b (after Brady, 1884, pl. 2, figs. 15a–b).—CUSHMAN, 1932a, p. 64–65, pl. 15, figs. 1–3.—PHLEGER and PARKER, 1951, p. 7, pl. 3, fig. 11.—PHLEGER and others, 1953, p. 28–29, pl. 5, figs. 22–24.—AKERS and DORMAN, 1964, p. 49, pl. 3, figs. 14–15.—LEROY, 1964, p. 21, pl. 12, figs. 32–33.—BOCK, 1971, p. 24, pl. 8, fig. 14.—LEROY and LEVINSON, 1974, p. 6, pl. 2, fig. 5.—BOLTOVSKOY, 1978a, pl. 6, fig. 26.—CORLISS, 1979, p. 6, pl. 1, figs. 15–18.—BOERSMA, 1984a, pl. 5, fig. 2, pl. 7, fig. 2.—MURRAY, 1984, pl. 3, fig. 4.—KOHL, 1985, p. 35, pl. 5, fig. 1.—THOMAS, 1985, pl. 1, fig. 10.—KURIHARA and KENNETT, 1986, pl. 1, fig. 13.—MORKHOVEN and others, 1986, p. 50–52, pl. 15, figs. 1–2.

Pyrgo murrhyna (Schwager).—BARKER, 1960, p. 4, pl. 2, figs. 10–11, 15.—BURKE, 1981, pl. 1, fig. 9.—COLE, 1981, p. 52–53, pl. 8, fig. 9.—RESIG, 1981, pl. 5, fig. 9.

Description. Test free, inflated, subcircular in side view, subovate in cross-section with margin extended and carinate. Test biloculine, chambers inflated. Wall calcareous, porcellaneous, smooth, ornamented with a broad keel that extends completely about the periphery, but possessing a small sinus at posterior end, sometimes with two projecting points, penultimate chamber may have a weak carina parallel to the keel. Aperture terminal, on a prominent tubular neck, round to ovate, with bifid tooth.

Remarks. The sinus at the posterior end as well as the projecting points may be missing in some specimens as pointed out by Phleger and others (1953).

Ecology. Pyrgo murrhina is found in the lower middle bathyal zone of the eastern North Pacific (Bandy and Arnal, 1957).

Distribution in 586A. Pyrgo murrhina is a common species with relative abundance of 0.0 to 6.2%.

Recorded Distribution. Pyrgo murrhina was described from the Pliocene of Kar Nikobar, off Sumatra. It has a known stratigraphic range from middle Miocene through Pleistocene (Morkhoven and others, 1986). Holocene: Atlantic (Brady, 1884; Cushman, 1929a; Phleger and others, 1953; Cole, 1981; Boersma, 1984b; Hermelin and Scott, 1985; Mead, 1985), Gulf of Mexico (Phleger and Parker, 1951; Bock, 1971), Pacific (Brady, 1884; Cushman, 1917a, 1921, 1932;

Bandy and Arnal, 1957; Ingle and others, 1980; Burke, 1981; Resig, 1981), Indian Ocean (Boltovskoy, 1978a; Corliss, 1979). Pleistocene: Atlantic (Murray, 1984; Phleger and others, 1953), Gulf of Mexico (Akers and Dorman, 1964; LeRoy and Levinson, 1974), Pacific (Douglas, 1973; Resig, 1976; McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Murray, 1984; Hermelin, 1986), Mexico (Kohl, 1985), Pacific (Douglas, 1973; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Okinawa (LeRoy, 1964), Sumatra (Schwager, 1866), Indian Ocean (Boltovskoy, 1978a). Miocene: Atlantic (Murray, 1984), Pacific (Douglas, 1973; Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985; Boersma, 1984a, 1986; Kurihara and Kennett, 1986), Guam (Todd, 1966), Indian Ocean (Boltovskoy, 1978a).

Pyrgo cf. **P. murrhina** (Schwager)
Pl. 2, Fig. 16

Description. Test free, inflated, subcircular in side view, subovate in cross-section with margin extended and carinate. Test biloculine, inflated, diameter of penultimate chamber about a third of that of the ultimate chamber. Wall calcareous, porcellaneous, smooth, ornamented with a very broad keel that extends completely about the periphery. Aperture terminal, on a short tubular neck, round to ovate, with bifid tooth.

Remarks. This form might belong to *P. murrhina* even though the increase in size between the penultimate and ultimate chambers usually is much smaller in *P. murrhina.*

Distribution in 586A. Pyrgo cf. *P. murrhina* has the same distribution as *P. murrhina* although in lower relative frequencies.

Pyrgo serrata (Bailey)

Biloculina serrata BAILEY, 1861, p. 350, pl. 8, fig. E.—CUSHMAN, 1917a, p. 75–76, pl. 29, figs. 2a–c.—CUSHMAN, 1921, p. 471, pl. 95, figs. 3a–b.

Biloculina depressa d'Orbigny var. *serrata* BRADY, 1884, p. 146, pl. 3, figs. 3a–c.

Pyrgo serrata (Bailey).—BARKER, 1960, p. 6, pl. 3, figs. 3a–c.—SCHNITKER, 1971, p. 208, pl. 3, figs. 4a–b.—BOLTOVSKOY, 1978a, pl. 6, fig. 31.

Pyrgo serrata (d'Orbigny).—BOERSMA, 1986, pl. 14, figs. 1–2.

Description. Test free, inflated, almost circular in side view, subovate in cross-section. Test biloculine. Wall calcareous, porcellaneous, smooth, ornamented with a broad keel which is deeply serrate, serrations less deep toward the apertural end. Aperture terminal, rounded, on a short neck.

Ecology. In the Gulf of Mexico *Pyrgo serrata* is found in the upper middle bathyal zone (Pflum and Frerichs, 1976).

Distribution in 586A. Pyrgo serrata occurs in low frequencies in Hole 586A.

Recorded distribution. Pyrgo serrata was described from the Holocene of the western Atlantic. Holocene: Atlantic (Brady, 1884; Schnitker, 1971), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Brady, 1884; Cushman, 1917a, 1921; Ingle and others, 1980; Burke, 1981). Pleistocene: Pacific (McDougall, 1985). Pliocene: Pacific (Boersma, 1986), Java (Saint-Marc and Suminta, 1979). Miocene: Pacific (McDougall, 1985; Boersma, 1986), Java (Saint-Marc and Suminta, 1979), Indian Ocean (Boltovskoy, 1978a).

Pyrgo sp. 1
Pl. 3, Figs. 1–2

Description. Test free, small, elongate, circular in cross-section, margin extended and rounded, with small sinus at the posterior end. Suture depressed. Wall calcareous, porcellaneous, smooth, ornamented with two projecting points at each side of the sinus at the posterior end. Aperture terminal, round, on a prominent tubular neck, with a bifid tooth.

Remarks. Pyrgo sp. 1 resembles *P. murrhina* in many ways, but is smaller and has a more elongate test. *Pyrgo* sp. 1 may represent a juvenile stage of *P. murrhina.*

Distribution in 586A. Pyrgo sp. 1 is a relatively common species with relative abundances up to 2.7%.

Pyrgo sp. 2
Pl. 3, Fig. 3

Description. Test free, rounded in side view and in cross-section, with a keel. Wall calcareous, porcellaneous, ornamented with very fine longitudinal striae. Aperture terminal rounded, on a short neck, with a bifid tooth.

Remarks. Pyrgo sp. 2 is close to *Pyrgo comata* (Brady), but has a carinate periphery instead of a rounded periphery.

Distribution in 586A. Pyrgo sp. 2 is represented by one specimen at 99.90 m.

Genus **SIGMOILINA** Schlumberger, 1887

Sigmoilina edwardsi (Schlumberger)
Pl. 3, Figs. 4–5, 9

Planispirina edwardsi SCHLUMBERGER, 1887, p. 113, pl. 7, figs. 15–18, text-fig. 8.

Sigmoilina edwardsi (Schlumberger).—HERON-ALLEN and EARLAND, 1915, p. 584, pl. 45, figs. 19–21.—CUSHMAN, 1932a,

p. 45–46, pl. 11, figs. 9a–c.—RESIG, 1981, pl. 5, fig. 10.—KURIHARA and KENNETT, 1986, pl. 1, figs. 16–17.

Description. Test free, slightly longer than broad, somewhat sigmoid in cross-section, periphery subacute. Sutures indistinct, flush with the surface. Wall calcareous, smooth, polished. Aperture rounded, with a small tooth.

Remarks. Sigmoilina edwardsi seems to be a fragile species and often shows signs of erosion and fragmentation.

Ecology. In the *Albatross* material from the Pacific *Sigmoilina edwardsi* was found only in the lower middle and lower bathyal zones (Cushman, 1932a).

Distribution in 586A. Sigmoilina edwardsi is a common species occurring throughout the sequence with relative abundances of 0.0 to 4.6%.

Recorded Distribution. Sigmoilina edwardsi was described from the Holocene at 4,000 to 5,000 m off the Canary Islands, eastern Atlantic Ocean. Holocene: Atlantic (Schlumberger, 1887), Pacific (Cushman, 1932a; Resig, 1981). Pleistocene: Pacific (Resig, 1976; Kurihara and Kennett, 1986). Pliocene: Pacific (Kurihara and Kennett, 1986). Miocene: Pacific (Woodruff and Douglas, 1981; Kurihara and Kennett, 1986).

Genus **SIGMOILOPSIS** Finlay, 1947

Sigmoilopsis schlumbergeri (Silvestri)

Spiroloculina celata Costa.—BRADY, 1877, p. 534 (not *Spiroloculina celata* Costa, 1855).

Planispirina celata (Costa).—BRADY, 1884, p. 197–198, pl. 8, figs. 1–4 (not *Spiroloculina celata* Costa, 1855).

Sigmoilina celata (Costa).—CUSHMAN, 1917a, p. 61, pl. 24, fig. 1 (not *Spiroloculina celata* Costa, 1855).

Sigmoilina schlumbergeri SILVESTRI, 1904a, p. 267, 269, pl. 7, figs. 12–14, p. 481–482, text-figs. 6–7.—CUSHMAN and TODD, 1945, p. 11, pl. 2, fig. 3.—PHLEGER and others, 1953, p. 28, pl. 5, fig. 17.—BOCK, 1971, p. 25, pl. 9, figs. 1–2.—BOLTOVSKOY, 1978a, pl. 7, figs. 5–6.—BOERSMA, 1984b, pl. 1, fig. 8.

Sigmoilopsis schlumbergeri (Silvestri).—FINLAY, 1947, p. 270.—BARKER, 1960, p. 16, pl. 8, figs. 1–4.—BOCK, 1971, p. 25, pl. 9, figs. 1–2.—COLE, 1981, p. 55, pl. 10, fig. 1.—BOERSMA, 1984a, pl. 8, fig. 2.—HERMELIN and SCOTT, 1985, p. 217, p. 2, fig. 6.—KOHL, 1985, p. 36, pl. 5, fig. 6.—BOERSMA, 1986, pl. 14, figs. 1–2.—KURIHARA and KENNETT, 1986, pl. 1, figs. 11–12.—MORKHOVEN and others, 1986, p. 57–59, pl. 18, figs. 1a–e.

Description. Test free, elongate, ovate in side view, subtriangular in cross-section. Chambers indistinct, inflated, slightly more than 180° apart, forming a sigmoidal curve when seen in cross-section. Sutures indistinct. Wall finely agglutinated. Aperture terminal, rounded, on a short neck, with a bifid tooth, and a lip.

Ecology. Phleger (1951) and Pflum and Frerichs (1976) found that *Sigmoilopsis schlumbergeri* ranges from the upper neritic zone down to the upper middle bathyal zone in the Gulf of Mexico, although it occurs in greatest abundances in the upper part of the upper middle bathyal zone (Phleger, 1951).

Distribution in 586A. Sigmoilopsis schlumbergeri is a rare species with scattered occurrences.

Recorded Distribution. Sigmoilopsis schlumbergeri was described from Holocene sediment at 600–1,200 m in the Gulf of Gascony, France. The species has a known stratigraphic range from the lower middle Miocene through Quaternary (Morkhoven, 1981). Holocene: Atlantic (Brady, 1884; Cushman, 1917a; Phleger and others, 1953; Cole, 1981; Hermelin and Scott, 1985), Gulf of Mexico (Phleger, 1951; Bock, 1971; Pflum and Frerichs, 1976), Pacific (Brady, 1884; Cushman, 1921; Burke, 1981), Indian Ocean (Brady, 1884), Antarctic Ocean (Brady, 1884). Pleistocene: Atlantic (Phleger and others, 1953; Blanc-Vernet, 1983; Boersma, 1984b; Murray, 1984), Gulf of Mexico (Akers and Dorman, 1964), Pacific (Kurihara and Kennett, 1986). Pliocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984a, b; Murray, 1984; Hermelin, 1986), Jamaica (Cushman and Todd, 1945), Mexico (Kohl, 1985), Pacific (Boersma, 1986; Kurihara and Kennett, 1986), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a). Miocene: Atlantic (Boersma, 1984b; Murray, 1984), Jamaica (Cushman and Todd, 1945), Pacific (Boersma, 1986; Kurihara and Kennett, 1986), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964).

Genus **TRILOCULINA** d'Orbigny, 1826

Triloculina tricarinata d'Orbigny
Pl. 3, Figs. 6–7

Triloculina tricarinata D'ORBIGNY, 1826, p. 299, no. 7, mod. no. 94.—CUSHMAN, 1917a, p. 66, pl. 25, figs. 1–2.—CUSHMAN, 1932a, p. 59–60, pl. 13, figs. 3a–b.—PHLEGER and others, 1953, p. 28, pl. 5, fig. 21.—CUSHMAN and others, 1954, p. 340, pl. 85, figs. 15–16.—BARKER, 1960, p. 6, pl. 3, figs. 17a–b.—AKERS and DORMAN, 1964, p. 57, pl. 3, fig. 21.—FEYLING-HANSSEN, 1964, p. 258, pl. 6, figs. 7–8.—LEROY, 1964, p. 20, pl. 3, figs. 32–33.—BOCK, 1971, p. 28, pl. 12, figs. 1–2.—SCHNITKER, 1971, p. 212, pl. 3, fig. 10.—COLE, 1981, p. 55, pl. 10, fig. 2.—HERMELIN and SCOTT, 1985, p. 218, pl. 2, fig. 7.

Miliolina tricarinata BRADY, 1884, p. 165, pl. 3, figs. 17a–b.

Triloculina tricarinata d'Orbigny var. *convexa* CUSHMAN, 1921, p. 456, fig. 37.

Description. Test free, slightly longer than broad, strongly triangular in apertural view, three chambers visible, sides straight or slightly concave. Sutures distinct, slightly depressed. Wall calcareous, opaque, smooth. Aperture rounded, with a small bifid tooth.

Distribution in 586A. Triloculina tricarinata is a rare species with a few occurrences below 62 m.

Recorded Distribution. Triloculina tricarinata was described from the Holocene of the Red Sea. Age not determined: Australia (Brady, 1884; Barker, 1960). Holocene: Atlantic (Phleger and others, 1953; Schnitker, 1971; Hermelin and Scott, 1985), Norway (Feyling-Hanssen, 1964), Gulf of Mexico (Bock, 1971; Pflum and Frerichs, 1976), Red Sea (d'Orbigny, 1826), Pacific (Cushman, 1917a, 1921, 1932a; Cushman and others, 1954; Smith, 1964; Todd, 1966; Burke, 1981), Indian Ocean (Todd, 1950). Pleistocene: Gulf of Mexico (Akers and Dorman, 1964), Pacific (Kurihara and Kennett, 1986). Pliocene: Pacific (Kurihara and Kennett, 1986), Okinawa (LeRoy, 1964). Miocene: Okinawa (LeRoy, 1964).

Triloculina trigonula (Lamarck)
Pl. 3, Fig. 8

Miliolites trigonula LAMARCK, 1804, p. 351, no. 3.
Triloculina trigonula (Lamarck).—D'ORBIGNY, 1826, p. 299, pl. 16, figs. 5–9, mod. no. 93.—CUSHMAN, 1917a, p. 65, pl. 25, figs. 3a–b.—CUSHMAN, 1932a, p. 56–57, pl. 13, figs. 1a–b.—CUSHMAN and others, 1954, p. 340, pl. 85, fig. 18.—BARKER, 1960, p. 6, pl. 3, figs. 15–16.—AKERS and DORMAN, 1964, p. 57, pl. 3, figs. 19–20.—LEROY, 1964, p. 20–21, pl. 16, figs. 30–31.—BOCK, 1971, p. 28–29, pl. 12, figs. 3–4.—SCHNITKER, 1971, p. 212, pl. 3, figs. 11a–b.
Miliolina trigonula (Lamarck).—WILLIAMSON, 1858, p. 83, pl. 7, figs. 180–182.—BRADY, 1884 (part), p. 164, pl. 3, figs. 15–16 (not 14).

Description. Test free, slightly longer than broad, periphery broadly convex, triangular in apertural view, three chambers visible, sides convex, angles rounded. Sutures distinct, slightly depressed. Wall calcareous, smooth. Aperture rounded, with a bifid tooth.

Ecology. Triloculina trigonula is found in the lower bathyal zone in the eastern Pacific Ocean (Ingle and others, 1980), whereas in the Florida Keys (Bock, 1971) and the Gulf of California (Bandy, 1961) it is present in the neritic zone.

Distribution in 586A. Triloculina trigonula is a very rare species.

Recorded Distribution. Triloculina trigonula was described from the Eocene of France. Holocene: Atlantic (Williamson, 1858; Brady, 1884; Schnitker, 1971; Hermelin and Scott, 1985), Gulf of Mexico (Bock, 1971; Pflum and Frerichs, 1976), Pacific (Cushman, 1917a, 1921, 1932a; Parr, 1950; Cushman and others, 1954; Todd, 1966; Ingle and others, 1980), Gulf of California (Bandy, 1961), Indian Ocean (Parr, 1950). Pleistocene: Gulf of Mexico (Akers and Dorman, 1964), Pacific (Thomas, 1985). Pliocene: Okinawa (LeRoy, 1964). Miocene: Pacific (Thomas, 1985).

Triloculina sp. 1
Pl. 3, Figs. 10–11

Description. Test free, elongate, about three times as long as wide, rounded triangular in cross-section, three chambers visible. Sutures distinct, almost flush with the surface. Wall calcareous, porcellaneous, smooth. Aperture round, with a narrow tooth.

Distribution in 586A. Triloculina sp. 1 is a rare species with scattered occurrences.

Suborder ROTALIINA Delage and Hérouard, 1896
Superfamily NODOSARIACEA Ehrenberg, 1838
Family NODOSARIIDAE Ehrenberg, 1838
Subfamily NODOSARIINAE Ehrenberg, 1838
Genus **CHRYSALOGONIUM** Schubert, 1907

Chrysalogonium lanceolum Cushman and Jarvis
Pl. 3, Figs. 12–13

Chrysalogonium lanceolum CUSHMAN and JARVIS, 1934, p. 75, pl. 10, fig. 16.

Description. Test free, very elongate, gradually tapering, widest close to the apertural end, slender, often slightly arcuate. Chambers numerous, gradually increasing in length as added. Sutures distinct, slightly depressed. Wall calcareous, smooth. Aperture terminal, cone-shaped, appears at first to be radiate but in between the ridges is a series of rounded or slightly elongate pores.

Distribution in 586A. Chrysalogonium lanceolum is a rare species with scattered occurrences.

Recorded Distribution. Chrysalogonium lanceolum was described from the lower Miocene of Trinidad. Pliocene: Pacific (Douglas, 1973; McDougall, 1985). Miocene: Pacific (Douglas, 1973; McDougall, 1985), Trinidad (Cushman and Jarvis, 1934).

Chrysalogonium longicostatum Cushman and Jarvis
Pl. 3, Figs. 14–15

Chrysalogonium longicostatum CUSHMAN and JARVIS, 1934, p. 74, pl. 10, figs. 12a–b.

Description. Test free, elongate. Chambers distinct, sutures slightly depressed. Wall calcareous, ornamented with longitudinal costae continuing over nearly the entire test, the striation is slightly twisted. Aperture consisting of a definite sieve plate composed of concentric rings of rounded or slightly polygonal openings.

Remarks. Chrysalogonium longicostatum differs from *C. tenuicostatum* in having fewer and more raised costae.

Distribution in 586A. Chrysalogonium longicostatum is a very rare species with scattered occurrences.

Recorded Distribution. Chrysalogonium longicostatum was described from the lower Miocene of Trinidad. Miocene: Pacific (Douglas, 1973; McDougall, 1985), Trinidad (Cushman and Jarvis, 1934).

Chrysalogonium tenuicostatum Cushman and Bermúdez
Pl. 3, Figs. 16–18

Chrysalogonium tenuicostatum CUSHMAN and BERMÚDEZ, 1936, p. 27–28, pl. 5, figs. 3–5.
Chrysalogonium equisetiformis (Schwager).—BOERSMA, 1986, pl. 9, figs. 1–3 (not *Nodosaria equisetiformis* Schwager, 1866).

Description. Test free, elongate, very slightly tapering, straight. Chambers increasing gradually in length as added, sides slightly convex. Sutures limbate, slightly depressed. Wall calcareous, ornamented with numerous fine longitudinal costae, slightly spiral. Aperture terminal, a very fine circular sieve plate with many openings.

Remarks. Macrospheric as well as microspheric forms are present in this material. The proloculus of the macrospheric forms is often as wide as the later chambers whereas the microspheric forms have a very small proloculus and the width of the chambers gradually increases towards the aperture. *C. tenuicostatum* somewhat resembles *C. longicostatum* but is more finely costate and has much coarser apertural openings.

Distribution in 586A. Chrysalogonium tenuicostatum is the most common member of this genus and appears at most levels in relatively low frequencies.

Recorded Distribution. Chrysalogonium tenuicostatum was described from the Eocene of Cuba. Pliocene: Pacific (Thomas, 1985; Boersma, 1986). Miocene: Pacific (Douglas, 1973; McDougall, 1985; Thomas, 1985; Boersma, 1986).

Genus **DENTALINA** Risso, 1826

Dentalina communis d'Orbigny
Pl. 4, Figs. 1–2

Nodosaria (Dentalina) communis D'ORBIGNY, 1826, p. 254, no. 35.
Dentalina communis d'Orbigny.—D'ORBIGNY, 1840, p. 13, pl. 1, fig. 4.—BARKER, 1960, p. 130, pl. 62, figs. 21–22.—AKERS and DORMAN, 1964, p. 32, pl. 6, fig. 12.—LEROY, 1964, p. 23, pl. 15, fig. 28.—TODD, 1966, p. 26, pl. 12, fig. 1.—BOCK, 1971, p. 38–39, pl. 14, figs. 16–17.—SCHNITKER, 1971, p. 196, pl. 3, figs. 20a–b.—BOLTOVSKOY, 1978a, pl. 3, fig. 23.—KOHL, 1985, p. 39, pl. 7, figs. 3–5.
Nodosaria (D.) communis d'Orbigny.—BRADY, 1884 (part), p. 504–505, pl. 62, figs. 21–22 (not 19–20).
Nodosaria communis d'Orbigny.—CUSHMAN, 1913, p. 54, pl. 28, figs. 1–2.—CUSHMAN, 1921, p. 192–193, pl. 34, fig. 7.—CUSHMAN, 1923, p. 75, pl. 12, figs. 3–4, 15–17.

Description. Test free, elongate, uniserial, slightly curved, circular in cross-section. Chambers increasing gradually in size, early chambers subglobular, later chambers inflated. Sutures oblique, slightly depressed in later portion of test. Wall calcareous, hyaline, smooth, finely perforate, often ornamented with an initial spine. Aperture terminal, radiate.

Distribution in 586A. Dentalina communis is a very rare species with scattered occurrences.

Recorded Distribution. Dentalina communis was described from the Holocene of the Adriatic Sea. Holocene: Atlantic (Brady, 1884; Schnitker, 1971; Cole, 1981; Hermelin and Scott, 1985), Gulf of Mexico (Bock, 1971; Pflum and Frerichs, 1976), Mediterranean (d'Orbigny, 1826), Pacific (Brady, 1884; Cushman, 1921; Ingle and others, 1980; Burke, 1981), Indian Ocean (Boltovskoy, 1978a). Pleistocene: Gulf of Mexico (Akers and Dorman, 1964), Pacific (Thomas, 1985). Pliocene: Mexico (Kohl, 1985), Pacific (Thomas, 1985), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a). Miocene: Pacific (Thomas, 1985), Guam (Todd, 1966), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a).

Dentalina cf. **D. communis**
Pl. 4, Fig. 3

Description. Test free, elongate, uniserial, slightly curved, compressed laterally. Chambers almost equal in size throughout. Sutures oblique, mostly flush with surface. Wall calcareous, hyaline, smooth, finely perforate, often ornamented with an initial spine. Aperture terminal, radiate.

Remarks. Differs from *D. communis* in its less curved and laterally more compressed test.

Distribution in 586A. Dentalina cf. *D. communis* is a very rare species.

Dentalina intorta (Dervieux)
Pl. 4, Fig. 4

Nodosaria intorta DERVIEUX, 1894, p. 610, pl. 5, figs. 32–34.
Dentalina intorta (Dervieux).—BARKER, 1960, p. 132, pl. 62, figs. 27–31.—BOLTOVSKOY, 1978a, pl. 3, fig. 25.

Description. Test free, elongate, uniserial, with one side more or less straight and the other curved, widest at the middle, tapering towards the initial as well as the apertural end, last chamber making up nearly half of test. Sutures distinct, flush with surface. Wall calcareous, hyaline, smooth. Aperture terminal, radiate.

Distribution in 586A. Dentalina intorta is a very rare species.

Recorded Distribution. Dentalina intorta was described from the Tertiary of Italy. Holocene: Gulf of Mexico (Pflum and Frerichs, 1976). Pleistocene: Pacific (McDougall, 1985; Thomas, 1985). Pliocene: Atlantic (Blanc-Vernet, 1983), Pacific (Thomas, 1985). Miocene: Pacific (McDougall, 1985; Thomas, 1985), Indian Ocean (Boltovskoy, 1978a).

Genus **LAGENA** Walker and Jacob, 1798

Lagena advena Cushman
Pl. 4, Fig. 5

Lagena striata (d'Orbigny).—BRADY, 1884 (part), p. 460, pl. 57, fig. 30 (not 22, 24, 28–29) (not *Oolina striata* d'Orbigny, 1839b).
Lagena striata (d'Orbigny) var. *haidingeri* Cžjžek.—CUSHMAN, 1913, p. 19–20, pl. 7, figs. 6a–b (not *Oolina haidingeri* Cžjžek, 1848).
Lagena advena CUSHMAN, 1923, p. 6, pl. 1, fig. 4.—BARKER, 1960 (part), p. 118, pl. 57, fig. 30 (not 29).—LEROY, 1964, p. 26, pl. 1, fig. 1.—BOLTOVSKOY and DE KAHN, 1982, p. 433, pl. 8, figs. 17–19.

Description. Test free, unilocular, rounded with subconical neck. Wall calcareous, hyaline, body ornamented with numerous fine costae, running from the basal end to the neck, basal part also ornamented with irregularly arranged short spines, apertural neck ornamented with several broad costae. Aperture terminal, on a conical neck.

Distribution in 586A. Lagena advena is a very rare species with only three occurrences.

Recorded Distribution. Lagena advena was described from the Holocene of the Caribbean Sea. Holocene: Atlantic (Brady, 1884), Caribbean (Cushman, 1923), Pacific (Cushman, 1913, 1921). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982). Miocene: Atlantic (Boltovskoy and de Kahn, 1982), Okinawa (LeRoy, 1964).

Lagena alticostata Cushman
Pl. 4, Fig. 6

Lagena sulcata (Walker and Jacob) var. *alticostata* CUSHMAN, 1913, p. 23, pl. 9, figs. 5a–b.—BOLTOVSKOY and DE KAHN, 1982, p. 440, pl. 11, figs. 10–11.

Description. Test free, unilocular, subglobular. Wall calcareous, hyaline, finely perforate, ornamented with a few prominent primary costae running from the base of the test to the aperture, between these are finer secondary costae, running only to the base of the neck. Aperture terminal, rounded, on a neck.

Distribution in 586A. Lagena alticostata is a rare species with few occurrences.

Recorded Distribution. Lagena alticostata was described from the Holocene of the coast of Guam. Holocene: Pacific (Cushman, 1913). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982). Miocene: Atlantic (Boltovskoy and de Kahn, 1982).

Lagena biarritzensis Hagn
Pl. 4, Fig. 7

Lagena striato-punctata Parker and Jones var. *caudata* HALKYARD, 1919, p. 59, pl. 3, figs. 12a–b.
Lagena biarritzensis HAGN, 1956, p. 142, pl. 10, fig. 21.

Description. Test free, unilocular, pyriform, circular in cross-section. Wall calcareous, hyaline, finely perforated, ornamented with several longitudinal costae that are prolonged as spines below the base of the test which is further ornamented with a basal spine. In between the basal spine and the outer spines there are long tube-like spines. Aperture terminal, round, at the end of a slender neck.

Distribution in 586A. Lagena biarritzensis is represented by a single specimen at 135.30 m.

Recorded Distribution. Lagena biarritzensis was described from the Eocene of southern France.

Lagena feildeniana Brady
Pl. 4, Fig. 8

Lagena feildeniana BRADY, 1878, p. 434, pl. 20, fig. 4.—BRADY, 1884, p. 469, pl. 58, figs. 38–39.—CUSHMAN, 1913, p. 29, pl. 15, figs. 1–2.—BARKER, 1960, p. 120, pl. 58, figs. 38–39.

Description. Test free, unilocular, elongate, rounded base, tapering towards the aperture. Wall calcareous, hyaline, ornamented with numerous longitudinal costae, furrows between costae perforated, costae ending in short spines at the basal part. Aperture terminal.

Distribution in 586A. Lagena feildeniana is a very rare species.

Recorded Distribution. Lagena feildeniana was described from the Holocene of the Arctic Ocean. Holocene: Atlantic (Brady, 1884), Pacific (Brady, 1884; Cushman, 1913), Arctic Ocean (Brady, 1878).

Lagena hispida Reuss
Pl. 4, Figs. 9–10

Lagena hispida REUSS, 1863a, p. 335, pl. 6, figs. 77–79.—BRADY, 1884, p. 459, pl. 57, figs. 1–4.—CUSHMAN, 1913, p. 13, pl.

4, figs. 4–5, pl. 5, fig. 1.—BARKER, 1960, p. 116, pl. 57, figs. 1–4.

Description. Test free, unilocular, body globular with a short neck. Wall calcareous, hyaline, finely perforate, body and neck ornamented with short spines, closely set. Aperture terminal, round, at the end of the neck.

Remarks. Lagena hispida differs from *L. hispidula* by its more globular body and coarser spines.

Distribution in 586A. Lagena hispida is very rare.

Recorded Distribution. Lagena hispida was described from the Oligocene of Germany. Holocene: Atlantic (Brady, 1884), Pacific (Brady, 1884; Cushman, 1913, 1921). Pleistocene: Pacific (McDougall, 1985). Pliocene: Pacific (McDougall, 1985). Miocene: Pacific (McDougall, 1985).

Lagena hispidula Cushman
Pl. 4, Fig. 11

Lagena laevis (Montagu).—BRADY, 1884 (part), p. 455–456, pl. 56, figs. 10–11 (not 7–9, 12–14, 30) (not *Vermiculum laeve* Montagu, 1803).
Lagena hispidula CUSHMAN, 1913, p. 14, pl. 5, figs. 2–3.—CUSHMAN and MCCULLOCH, 1950, p. 339, pl. 45, figs. 8–10.—BARKER, 1960, p. 114, pl. 56, fig. 10–11.—BOLTOVSKOY and DE KAHN, 1982, p. 437, pl. 9, figs. 26–28.

Description. Test free, unilocular, rounded to ovate body, with long apertural neck. Wall calcareous, hyaline, finely perforate, body ornamented with very fine spines while apertural neck is smooth. Aperture terminal, round at end of a long slender neck.

Remarks. Lagena hispidula differs from *L. hispida* in having a flask-shaped test rather than rounded and in having finer spines.

Distribution in 586A. Lagena hispidula is a rare species with few occurrences.

Recorded Distribution. Lagena hispidula was described from the Holocene of the western Pacific Ocean. Holocene: Pacific (Brady, 1884; Cushman, 1913; Cushman and McCulloch, 1950; Ingle and others, 1980), Antarctic Ocean (Parr, 1950). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982), Mexico (Kohl, 1985). Miocene: Atlantic (Boltovskoy and de Kahn, 1982).

Lagena meridionalis Wiesner
Pl. 4, Fig. 12

Lagena gracilis Williamson.—BRADY, 1884 (part), p. 445–446, pl. 58, fig. 19 (not 2–3, 7–10, 22–24).
Lagena gracilis Williamson var. *meridionalis* WIESNER, 1931, p. 117, pl. 18, fig. 211.
Lagena meridionalis Wiesner.—LOEBLICH and TAPPAN, 1953, p. 59.—BARKER, 1960, p. 119, pl. 58, fig. 19.—BOLTOVSKOY and De KAHN, 1982, p. 437, pl. 10, figs. 3–4.
Oolina gracilis Williamson var. *meridionalis* (Wiesner).—LEROY, 1964, p. 26–27, pl. 13, fig. 37.

Description. Test free, unilocular, elongate, circular in cross-section, both apertural and basal ends very pointed. Wall calcareous, hyaline, finely perforate, ornamented with six to nine costae which run from the pointed base to the aperture and including the apertural neck. Additional finer and less elevated costae in between the primary costae. Aperture terminal.

Distribution in 586A. Lagena meridionalis is a very rare species with few occurrences.

Recorded Distribution. Lagena meridionalis was described from the Holocene of the Antarctic Ocean. Holocene: Pacific (Brady, 1884), Antarctic Ocean (Parr, 1950; Loeblich and Tappan, 1953), Arctic Ocean (Wiesner, 1931). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982), Okinawa (LeRoy, 1964). Miocene: Atlantic (Boltovskoy and de Kahn, 1982), Okinawa (LeRoy, 1964).

Lagena paradoxa Sidebottom
Pl. 4, Fig. 13

Lagena foleolata Reuss var. *paradoxa* SIDEBOTTOM, 1912, p. 395, pl. 16, figs. 22–23.—CUSHMAN, 1913, p. 18, pl. 15, figs. 3a–b.
Sipholagena paradoxa (Sidebottom).—BOLTOVSKOY and DE KAHN, 1982, p. 447, pl. 15, figs. 23–26.

Description. Test free, unilocular, elongate, rounded base, tapering towards the apertural end, with a short neck. Wall calcareous, hyaline, ornamented with longitudinal costae running the entire length of the test, fine crossbars between the costae give the test a reticulate pattern. Aperture terminal, at the end of a short neck.

Remarks. The outer wall of *Lagena paradoxa* shows a tendency to disintegrate or flake off, leaving the inner wall of the test exposed.

Distribution in 586A. Lagena paradoxa is a rare species with scattered occurrences.

Recorded Distribution. Lagena paradoxa was described from the Holocene of the southwest Pacific Ocean. Holocene: Pacific (Sidebottom, 1912; Cushman, 1913). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982). Miocene: Atlantic (Boltovskoy and de Kahn, 1982).

Lagena stelligera Brady

Lagena stelligera BRADY, 1881, p. 60.—BRADY, 1884, p. 466, pl. 5, figs. 35–36.—SIDEBOTTOM, 1912, p. 391, pl. 15, figs. 28–29, pl. 16, figs. 1–4.—BARKER, 1960, p. 119, pl. 57, figs. 35–36.

Description. Test free, unilocular, pyriform, broadest near the middle, tapering towards the truncate base and the pointed apertural end. Wall calcareous, hyaline, finely perforate, ornamented at the base with a raised circular rim from which radiate six to 12 short costae extending a short distance up the basal portion of the test. Aperture terminal, at the end of a neck.

Distribution in 586A. Lagena stelligera occurs at low frequencies throughout the sequence.

Recorded Distribution. Lagena stelligera was described from the Holocene of the Pacific Ocean. Holocene: Pacific (Brady, 1881, 1884; Sidebottom, 1912).

Lagena striata (d'Orbigny)
Pl. 4, Fig. 14

Oolina striata D'ORBIGNY, 1839b, p. 21, pl. 5, fig. 12.
Lagena striata (d'Orbigny).—REUSS, 1863a, p. 327, pl. 3, figs. 44–45, pl. 4, figs. 46–47.—BRADY, 1884 (part), p. 460, pl. 57, figs. 22, 24 (not 28–30).—CUSHMAN, 1913, p. 19, pl. 7, figs. 4–5.—BARKER, 1960, p. 118, pl. 57, figs. 22, 24.—AKERS and DORMAN, 1964, p. 40, pl. 6, fig. 11.—SCHNITKER, 1971, p. 204, pl. 4, fig. 3.
Lagena striata (d'Orbigny) f. *typica* BOLTOVSKOY and DE KAHN, 1982, p. 439, pl. 10, fig. 35, pl. 11, fig. 1.

Description. Test free, unilocular, flask-shaped, circular in cross-section. Wall calcareous, hyaline, finely perforate, body ornamented with numerous fine costae running from the pointed base to the base of the neck. Aperture terminal, rounded, at the end of a long slender neck.

Distribution in 586A. Lagena striata is a rare species with few occurrences.

Recorded Distribution. Lagena striata was described from the Holocene off the Falkland Islands, southern Pacific Ocean. Holocene: Atlantic (Schnitker, 1971), Caribbean (Bock, 1971), Pacific (d'Orbigny, 1839b; Brady, 1884; Cushman, 1913, 1921; Ingle and others, 1980). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982), Gulf of Mexico (Akers and Dorman, 1964), Pacific (Keller, 1980; McDougall, 1985). Pliocene: Pacific (McDougall, 1985). Miocene: Pacific (McDougall, 1985).

Lagena tubulata Sidebottom
Pl. 4, Fig. 15

Lagena hispida Reuss var. *tubulata* SIDEBOTTOM, 1912, p. 385, pl. 15, figs. 3–5.

Description. Test free, unilocular, body spherical, very long cylindrical neck. Wall calcareous, hyaline, body ornamented with long delicate spines as well as long tubular ones, the neck has shorter spines. Aperture terminal, with a flaring lip, at the end of a long slender neck.

Distribution in 586A. Lagena tubulata is represented by one single specimen at 110.00 m.

Recorded Distribution. Lagena tubulata was described from the Holocene of the southwest Pacific Ocean. Holocene: Pacific (Sidebottom, 1912; Cushman, 1921).

Lagena sp. 1
Pl. 4, Fig. 16

Description. Test free, unilocular, with four wide costae running from the very basal part of the test along the test and the neck, body ornamented with four additional costae. Wall calcareous, hyaline. Aperture terminal, at the end of neck.

Distribution in 586A. Lagena sp. 1 is a rare species with few occurrences.

Lagena sp. 2
Pl. 4, Fig. 17

Description. Test free, unilocular, fusiform, base rounded, tapering towards the apertural end. Wall calcareous, hyaline, ornamented with several delicate costae. Aperture terminal on a very short neck.

Distribution in 586A. Lagena sp. 2 is a rare species with few occurrences.

Lagena sp. 3
Pl. 4, Fig. 18

Description. Test free, unilocular, rounded to elongate. Wall calcareous, hyaline, ornamented with four prominent costae originating at the base and merging into a collar at the base of the neck, two or three intervening costae terminate below the collar. Aperture terminal, at the end of a short neck.

Distribution in 586A. Lagena sp. 3 is a rare species.

Lagena sp. 4
Pl. 4, Fig. 19

Description. Test free, teardrop-shaped. Wall calcareous, hyaline, ornamented with four or five prominent costae which are very wide at the base and run up to the first collar at the base of the neck. In between is one secondary costa running from the base to the collar. In between these and the prominent costae are narrower and shorter costae. Aperture terminal at the end of a neck which is ornamented with two distinct collars.

Distribution in 586A. Lagena sp. 4 is a rare species with few occurrences.

Genus **ORTHOMORPHINA** Stainforth, 1952

Orthomorphina challengeriana (Thalmann)
Pl. 4, Fig. 20

Nodosaria perversa Schwager.—BRADY, 1884, p. 512, pl. 64, figs. 25–27.—CUSHMAN, 1921, p. 208, pl. 37, fig. 2 (not *Nodosaria perversa* Schwager, 1866).
Nodogenerina challengeriana THALMANN, 1937, p. 341.
Orthomorphina challengeriana (Thalmann).—STAINFORTH, 1952, p. 8, text-fig. 1, fig. 10.—BARKER, 1960, p. 136, pl. 64, figs. 25–27.—LEROY, 1964, p. 29, pl. 15, fig. 26.—BOLTOVSKOY, 1978a, pl. 5, figs. 16–17.

Description. Test free, uniserial, straight, chambers inflated. Sutures distinct. Wall calcareous, perforate, ornamented with numerous longitudinal costae. Aperture terminal, central, rounded, on a short neck, with a rim.

Distribution in 586A. Orthomorphina challengeriana is a rare species with scattered occurrences, all below 59.50 m.

Recorded Distribution. Orthomorphina challengeriana was described from the Holocene off the Ki Islands, south-west of Papua, southern Pacific. Holocene: Pacific (Brady, 1884; Cushman, 1921). Pliocene: Atlantic (Hermelin, 1986), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a). Miocene: Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a).

Orthomorphina jedlitschkai (Thalmann)

Nodosaria radicula var. *annulata* (Terquem and Berthelin).—BRADY, 1884, p. 496, pl. 62, figs. 1–2 (not *Glandulina annulata* Terquem and Berthelin, 1875).
Nodogenerina jedlitschkai THALMANN, 1937, p. 341.
Orthomorphina jedlitschkai (Thalmann).—STAINFORTH, 1952, p. 8–9, text-fig. 1, fig. V.—BARKER, 1960, p. 130, pl. 62, figs. 1–2.

Description. Test free, uniserial, straight, chambers inflated, often widest in the middle of the test. Chambers distinct, sudden changes in the size of the chambers occur. Wall calcareous, smooth, finely perforate. Aperture terminal, rounded.

Distribution in 586A. Orthomorphina jedlitschkai is a rare species with scattered occurrences.

Recorded Distribution. Orthomorphina jedlitschkai was described from the Holocene off the Ki Islands, south-west of Papua, southern Pacific. Holocene: Pacific (Brady, 1884). Pliocene: Atlantic (Hermelin, 1986). Miocene: Pacific (Woodruff and Douglas, 1981).

Orthomorphina sp. 1
Pl. 5, Figs. 1–3

Description. Test free, uniserial. Chambers inflated, distinct, sudden changes in the size of the chambers occur. Wall calcareous, finely perforate, ornamented with short spines. Aperture terminal, rounded.

Distribution in 586A. Orthomorphina sp. 1 is a rare species with scattered occurrences.

Genus **PSEUDONODOSARIA** Boomgaart, 1949

Pseudonodosaria sp. 1
Pl. 5, Figs. 4, 9

Description. Test free, uniserial, rectilinear throughout. Chambers strongly embracing, last chamber makes up more than half the test. Sutures horizontal, slightly depressed. Wall calcareous, smooth, finely perforate. Aperture terminal, radiate.

Distribution in 586A. Pseudonodosaria sp. 1 is a very rare species with few occurrences.

Family VAGINULINIDAE Reuss, 1860
Subfamily LENTICULININAE Chapman, Parr, and Collins, 1934
Genus **LENTICULINA** Lamarck, 1804

Lenticulina atlantica (Barker)
Pl. 5, Figs. 5–6

Cristellaria lucida CUSHMAN, 1923, p. 111, pl. 30, fig. 2.
Robulus atlanticus BARKER, 1960, p. 144, pl. 69, figs. 10–12.
Lenticulina atlantica (Barker).—AKERS and DORMAN, 1964, p. 40, pl. 4, figs. 13–14.—KOHL, 1985, p. 46–47, pl. 10, figs. 1–2.

Description. Test free, planispiral, involute, circular in side view, biconvex in cross-section, periphery with a keel. Sutures distinct, slightly curved. Wall calcareous, hyaline, smooth, finely perforate. Aperture radiate, at peripheral angle, with a vertical robuline slit extending downward in the apertural face.

Remarks. Cristellaria lucida (Cushman, 1923) is a secondary homonym to *Robulina lucida* Seguenza, 1880. Barker (1960) proposed the name *Robulus atlanticus* for *C. lucida.*

Distribution in 586A. Lenticulina atlantica is represented by scattered occurrences above 100 m.

Recorded Distribution. Lenticulina atlantica was described from the Holocene of the Atlantic Ocean. Holocene: Atlantic (Brady, 1884; Cushman, 1923). Pleistocene: Gulf of Mexico (Akers and Dorman, 1964). Miocene: Mexico (Kohl, 1985).

Lenticulina convergens (Bornemann)
Pl. 5, Figs. 7–8

Cristellaria convergens BORNEMANN, 1855, p. 327, pl. 13, figs. 16–17.—BRADY, 1884, p. 546, pl. 69, figs. 6–7.
Lenticulina convergens (Bornemann).—BARKER, 1960, p. 144, pl. 69, figs. 6–7.

Description. Test free, planispiral, involute, circular in side view, biconvex in cross-section, periphery subacute. Sutures distinct, flush with surface, slightly curved. Wall calcareous, hyaline, smooth, finely perforate. Aperture radiate, at peripheral angle, with a vertical robuline slit extending downward on the apertural face.

Distribution in 586A. Lenticulina convergens is a rare species with scattered occurrences.

Recorded Distribution. Lenticulina convergens was described from the Oligocene of Germany. Holocene: Atlantic (Brady, 1884), Pacific (Brady, 1884; Ingle and others, 1980). Miocene: Pacific (McDougall, 1985).

Family POLYMORPHINIDAE d'Orbigny, 1839a
Subfamily POLYMORPHININAE d'Orbigny, 1839a

Polymorphinidae, formae fistulosae
Pl. 5, Figs. 10–11

Description. Test free, elongate, "wild-growing" form. Wall calcareous, hyaline, densely ornamented with short spines. Aperture multiple, rounded, on short necks irregularly located on ultimate chamber.

Distribution in 586A. This form is represented by scattered occurrences.

Genus **POLYMORPHINA** d'Orbigny, 1826

? **Polymorphina** sp. 1
Pl. 5, Fig. 12

Description. Test free, elongate, somewhat compressed. Chambers biserially arranged. Wall calcareous, hyaline, finely perforate. Aperture terminal and rounded.

Remarks. ? *Polymorphina* sp. 1 differs from the genus *Polymorphina* in having a simple aperture rather than a radiate aperture. I believe that this form can be characterized as a "wild-growing" form of this genus.

Distribution in 586A. ? *Polymorphina* sp. 1 is a rare species.

Genus **PYRULINA** d'Orbigny, 1839a

Pyrulina gutta d'Orbigny
Pl. 5, Fig. 13

Polymorphina (Pyruline) gutta D'ORBIGNY, 1826, p. 267.

Description. Test free, fusiform, early chambers arranged in spiral series approximately 120° apart, later chambers biserial. Wall calcareous, hyaline. Sutures flush with surface. Aperture radiate.

Distribution in 586A. Pyrulina gutta is represented by scattered occurrences.

Recorded Distribution. Pyrulina gutta was originally described from the Pliocene of Italy. Pliocene: Italy (d'Orbigny, 1826).

Genus **PYRULINOIDES** Marie, 1941

Pyrulinoides sp. 1
Pl. 5, Fig. 14

Description. Test free, elongate, acuminate towards both ends, almost circular in cross-section. Chambers biserially arranged, embracing. Wall calcareous, hyaline. Sutures flush with surface. Aperture radiate.

Distribution in 586A. Pyrulinoides sp. 1 is represented by scattered occurrences.

Pyrulinoides sp. 2
Pl. 5, Fig. 15

Description. Test free, elongate, acuminate towards both extremities, slightly compressed. Chambers biserially arranged. Wall calcareous, hyaline. Sutures flush with surface. Aperture radiate.

Remarks. Pyrulinoides sp. 2 differs from *P.* sp. 1 in being much wider and not having parallel sides.

Distribution in 586A. Pyrulinoides sp. 2 is a rare species.

Family GLANDULINIDAE Reuss, 1860
Subfamily OOLININAE Loeblich and Tappan, 1961
Genus **FISSURINA** Reuss, 1850

Fissurina annectens (Burrows and Holland)
Pl. 5, Figs. 18–19

Lagena quadricostulata Reuss.—BRADY, 1884 (part), p. 486, pl. 59, fig. 15 (not 7).—CUSHMAN, 1913, p. 35–36, pl. 14, fig. 1 (not *Lagena quadricostulata* Reuss, 1870).
Lagena annectens BURROWS and HOLLAND in JONES, 1895, p. 203, pl. 7, figs. 11a–b.
Fissurina annectens (Burrows and Holland).—BARKER, 1960, p. 122, pl. 59, fig. 15.
Fissurina annectens annectens (Burrows and Holland).—BOLTOVSKOY and DE KAHN, 1982, p. 422, pl. 1, figs. 14–15.

Description. Test free, unilocular, pyriform, compressed, each face of the test ornamented with two narrow curved bands, parallel with the margins and flush with the surface. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, ovate, parallel to compression.

Remarks. The ornamentation is due to structural differences in the test and can be distinctly seen under the light-microscope, and less distinctly in SEM.

Distribution in 586A. Fissurina annectens occurs in the upper part of the sequence.

Recorded Distribution. Fissurina annectens was described from the early Pliocene of England. Holocene: Atlantic (Cole, 1981), Pacific (Brady, 1884; Cushman, 1913; Ingle and others, 1980; Boltovskoy and de Kahn, 1982), Indian Ocean (Corliss, 179), Antarctic Ocean (Parr, 1950). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982), England (Jones, 1895). Miocene: Atlantic (Boltovskoy and de Kahn, 1982).

Fissurina arcuata (Sidebottom)
Pl. 6, Fig. 1

Lagena auriculata Brady var. *arcuata* SIDEBOTTOM, 1912, p. 421, pl. 20, figs. 19–20.

Description. Test free, unilocular, pyriform, compressed, two tubes at the base of the test, apertural end pointed. Wall calcareous, hyaline, finely perforate, basal part ornamented with longitudinal costae-within-costae forming a semi-circle. Aperture terminal, rounded.

Distribution in 586A. Fissurina arcuata is a very rare species and exhibits scattered occurrences.

Recorded Distributon. Fissurina arcuata was described from the Holocene of the southwest Pacific Ocean. Holocene: Pacific (Sidebottom, 1912).

Fissurina auriculata (Brady)
Pl. 6, Figs. 2–3

Lagena auriculata BRADY, 1881, p. 61.—BRADY, 1884 (part), p. 487, pl. 60, fig. 29 (not 31, 33).
Fissurina auriculata (Brady).—BARKER, 1960, p. 126, pl. 60, fig. 29.
Fissurina auriculata auriculata (Brady).—BOLTOVSKOY and DE KAHN, 1982, p. 423, pl. 1, figs. 23–26.

Description. Test free, unilocular, pyriform, slightly compressed, with an elliptic tube at the periphery on each side of the base. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded.

Distribution in 586A. Fissurina auriculata is a very rare species with only a few occurrences.

Recorded Distribution. Fissurina auriculata was described from the Holocene of the South Pacific. Holocene: Atlantic (Boltovskoy and de Kahn, 1982), Pacific (Brady, 1881, 1884). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982). Miocene: Atlantic (Boltovskoy and de Kahn, 1982).

Fissurina cf. **F. capillosa** Schwager
Pl. 6, Figs. 4–5

Fissurina capillosa (Schwager).—BOERSMA, 1986, p. 1019, pl. 4, figs. 6–7.

Description. Test free, unilocular, pyriform, compressed, ovate central body, very wide peripheral keel. Wall calcareous, hyaline, inner part of keel and base of the neck ornamented with a reticulate pattern, central body has longitudinal striae. Aperture terminal, rounded.

Remarks. These specimens of *Fissurina capillosa* differ from those figured by Boersma (1986) in having ornamentation along the entire margin of the central body. The wide keel is very delicate and therefore often broken.

Distribution in 586A. Fissurina cf. *F. capillosa* is a rare species with few occurrences.

Recorded Distribution. Fissurina capillosa was described from the Pliocene of Kar Nikobar, off Sumatra. Pliocene: Pacific (Boersma, 1986), Sumatra (Schwager, 1866). Miocene: Pacific (Boersma, 1986).

Fissurina castrensis (Schwager)
Pl. 6, Figs. 6–7

Lagena castrensis SCHWAGER, 1866, p. 208, pl. 5, fig. 22.

Description. Test free, unilocular, central body circular, compressed, apertural end produced, three parallel keels encircle the test, median keel with short spines in the basal part. Wall calcareous, hyaline, finely perforate, central body ornamented with blunt spines. Aperture terminal, round, on a short ornamented neck.

Distribution in 586A. Fissurina castrensis is a very rare species with scattered occurrences.

Recorded Distribution. Fissurina castrensis was described from the Pliocene of Kar Nikobar, off Sumatra. Pliocene: Sumatra (Schwager, 1866).

Fissurina clathrata (Brady)
Pl. 6, Figs. 8–9

Lagena clathrata BRADY, 1884, p. 484, pl. 60, fig. 4.
Lagena orbignyana (Seguenza) var. *clathrata* Brady.—MILLETT, 1901, p. 628, pl. 14, fig. 23.—CUSHMAN, 1913, p. 44, pl. 11, fig. 4.—CUSHMAN, 1933c, p. 28, pl. 7, figs. 6, 7?.
Fissurina clathrata (Brady).—PARR, 1950, p. 310.—BARKER, 1960, p. 124, pl. 60, fig. 4.

Description. Test free unilocular, with a central body and a broad peripheral keel, compressed, ovate in cross-section, body circular in side view, keel thin at base, thickening toward the apertural end and forming a bulbous structure. Wall calcareous, hyaline, smooth, finely perforate, central body ornamented with longitudinal costae.

Remarks. Some authors regard *Fissurina clathrata* as a variety of *Fissurina orbignyana* (Seguenza).

Distribution in 586A. Fissurina clathrata is a rare species with scattered occurrences throughout the sequence.

Recorded Distribution. Fissurina clathrata was described from the Holocene of the central Pacific. Holocene: Pacific (Brady, 1884; Cushman, 1913, 1933c).

Fissurina crebra (Matthes)
Pl. 6, Figs. 11–12

Lagena acuta (Reuss).—BRADY, 1884, p. 474, pl. 59, figs. 6a–b.
Lagena crebra MATTHES, 1939, p. 72, pl. 5, figs. 66–70.
Fissurina crebra (Matthes).—BARKER, 1960, p. 122, pl. 59, figs. 6a–b.—BOLTOVSKOY and DE KAHN, 1982, p. 424, pl. 2, figs. 17–20.

Description. Test free, unilocular, compressed, ovate in side view, slightly produced apertural end, periphery with a narrow keel, pointed base. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, elliptical, at end of short neck.

Remarks. Fissurina crebra resembles in many features *Fissurina* sp. 2 but has a smooth, unornamented neck.

Distribution in 586A. Fissurina crebra is one of the most frequent species of this genus, with relative frequencies up to 3.7%. This species occurs throughout the studied sequence.

Recorded Distribution. Fissurina crebra was described from the Miocene of Germany. Holocene: Atlantic (Brady, 1884; Cole, 1981), Pacific (Brady, 1884), Indian Ocean (Corliss, 1979). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982). Miocene: Atlantic (Boltovskoy and de Kahn, 1982), Germany (Matthes, 1939).

Fissurina duplicata (Sidebottom)
Pl. 6, Fig. 10

Lagena auriculata Brady var. *duplicata* SIDEBOTTOM, 1912, p. 422, pl. 20, figs. 23a–b.—CUSHMAN, 1933c, p. 22–23, pl. 5, figs. 3a–b.

Description. Test free, unilocular, pyriform, central body rounded, compressed, the apertural end is pointed and has a hood-like structure, four rounded tubes at the base of the test, two on either side of the midline. Wall calcareous, hyaline, smooth except for the basal part which sometimes has a fine striate ornamentation, finely perforate. Aperture terminal, rounded.

Distribution in 586A. Fissurina duplicata is a rare species with scattered occurrences.

Recorded Distribution. Fissurina duplicata was described from the Holocene of the southwest Pacific Ocean. Holocene: Pacific (Sidebottom, 1912; Cushman, 1933c).

Fissurina echigoensis (Asano and Inomata)
Pl. 6, Figs. 13–14

Entosolenia echigoensis ASANO and INOMATA in ASANO, 1952, p. 7, text-figs. 35–36.
Fissurina echigoensis (Asano and Inomata) var.—LEROY, 1964, p. 32, pl. 13, figs. 9–10.

Description. Test free, unilocular, roundly triangular in front view, compressed, apertural end bluntly pointed, basal end broad, surrounded by a broad and low oval costa. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, elliptical, with an entosolenian tube.

Distribution in 586A. Fissurina echigoensis is a very rare species with scattered occurrences.

Recorded Distribution. Fissurina echigoensis was described from the Pliocene of Japan. Pliocene: Japan (Asano, 1952). Miocene: Okinawa (LeRoy, 1964).

Fissurina fimbriata (Brady)
Pl. 6, Figs. 15–16

Lagena fimbriata BRADY, 1881, p. 61.—BRADY, 1884, p. 486–487, pl. 60, figs. 26–28.—CUSHMAN, 1913, p. 30, pl. 14, fig. 8.
Lagena (Entosolenia) fimbriata Brady.—WIESNER, 1931, p. 122, pl. 19, fig. 232.
Fissurina fimbriata (Brady).—PARR, 1950, p. 307.—BARKER 1960, p. 126, pl. 60, figs. 16–28.
Fissurina fimbriata (Brady) f. *typica* BOLTOVSKOY and DE KAHN, 1982, p. 425, pl. 3, figs. 13–14.

Description. Test free, unilocular, pyriform, rounded, broad at the base, slightly compressed, a thin vertical structure, often with a very fine longitudinal striation, encircles the oval base. Aperture terminal, rounded.

Distribution in 586A. Fissurina fimbriata is a rare species that occurs in many samples but in low frequencies.

Recorded Distribution. Fissurina fimbriata was described from the Holocene of the Pacific. Holocene: Atlantic (Brady, 1884; Cole, 1981), Pacific (Brady, 1881, 1884; Cushman, 1913; Ingle and others, 1980), Indian Ocean (Corliss, 1979), Antarctic Ocean (Brady, 1884; Wiesner, 1931; Parr, 1950). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982). Miocene: Atlantic (Boltovskoy and de Kahn, 1982).

Fissurina kerguelenensis Parr
Pl. 6, Figs. 17–18

Lagena staphyllearia (Schwager).—BRADY, 1884, p. 474, pl. 59, figs. 8–11.—CUSHMAN, 1913, p. 31, pl. 17, figs. 3a–b (not *Fissurina staphyllearia* Schwager, 1866).
Fissurina kerguelenensis PARR, 1950, p. 305, pl. 8, figs. 7a–b.—BARKER, 1960, p. 122, pl. 59, figs. 8–11.
Fissurina staphyllearia staphyllearia (Schwager).—BOLTOVSKOY and DE KAHN, 1982, p. 431, pl. 7, figs. 13–14 (not *Fissurina staphyllearia* Schwager, 1866).

Description. Test free, unilocular, compressed, rounded in side view, slightly produced apertural end, a keel extends around the test, three to ten spines at the basal part of the test. Wall calcareous, hyaline, smooth, finely perforate, transparent. Aperture a narrow slit in the plane of compression.

Remarks. Most specimens of *Fissurina kerguelenensis* have three symmetrically arranged spines but there are others which have more and irregularly arranged spines. In this study I have placed all of these forms within *F. kerguelenensis.*

Distribution in 586A. Fissurina kerguelenensis is a rare species with scattered occurrences.

Recorded Distribution. Fissurina kerguelenensis was described from the Holocene off Kerguelen Island, South Pacific. Holocene: Atlantic (Brady, 1884; Boltovskoy and de Kahn, 1982; Cole, 1981), Pacific (Brady, 1884; Cushman, 1913), Antarctic Ocean (Brady, 1884; Parr, 1950). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982). Miocene: Atlantic (Boltovskoy and de Kahn, 1982).

Fissurina marginata (Montagu)
Pl. 7, Figs. 1–2

Serpula (Lagena) marginata WALKER and BOYS, 1784, p. 2, pl. 1, fig. 7 [nomen nudum].
Vermiculum marginatum MONTAGU, 1803, p. 524.
Lagena marginata (Walker and Boys) [sic].—BRADY, 1884 (part), p. 476–477, pl. 59, figs. 21–22 (not 23).—CUSHMAN, 1913, p. 37–38, pl. 22, figs. 1–7.
Fissurina marginata (Walker and Boys) [sic].—GALLOWAY and HEMINWAY, 1941, p. 353, pl. 11, figs. 4a–b.—FEYLING-HANSSEN, 1964, p. 315, pl. 15, fig. 22.
Entosolenia marginata (Montagu?).—CUSHMAN, 1948, p. 65, pl. 17, fig. 7.
Entosolenia submarginata BOOMGAART, 1949, p. 107, pl. 9, fig. 7.
Fissurina submarginata (Boomgaart).—BARKER, 1960, p. 124, pl. 59, figs. 21–22.—BOCK, 1971, p. 43–44, pl. 16, figs. 5–6.
Fissurina marginata (Montagu).—LOEBLICH and TAPPAN, 1953, p. 77, pl. 14, figs. 6–9.—HERMELIN and SCOTT, 1985, p. 208, pl. 2, fig. 17.—KOHL, 1985, p. 55–56, pl. 15, fig. 5 (not *Fissurina marginata* Seguenza, 1862a).
Fissurina marginata marginata (Montagu).—BOLTOVSKOY and DE KAHN, 1982, p. 427, pl. 5, figs. 1–3.

Description. Test free, unilocular, compressed, round to ovate in side view with a slightly produced apertural neck, periphery with a thin keel. Entosolenian tube running from aperture along wall of central body down to basal part of test. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, on short neck, rounded.

Remarks. Fissurina marginata has wrongly been accredited to Walker and Boys (1784) by many authors. Since Walker and Boys (1784) did not follow the convention of binominal nomenclature, their specific names should be rejected (ICZN, 1959). Montagu described the specimen figured by Walker and Boys in 1803.

Distribution in 586A. Fissurina marginata occurs in most samples but in relatively low frequencies.

Recorded Distribution. Fissurina marginata was described from the Holocene of the North Sea. Holocene: Atlantic (Montagu, 1803; Brady, 1884; Cole, 1981; Boltovskoy and de Kahn, 1982; Hermelin and Scott, 1985), Gulf of Mexico (Bock, 1971), Pacific (Brady, 1884; Cushman, 1913, 1921, 1933c; Ingle and others, 1980), Arctic Ocean (Brady, 1884; Cushman, 1948; Loeblich and Tappan, 1953), Antarctic Ocean (Brady, 1884; Parr, 1950). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982), Norway (Feyling-Hanssen, 1964). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982), Mexico (Kohl, 1985). Miocene: Atlantic (Boltovskoy and de Kahn, 1982), Puerto Rico (Galloway and Heminway, 1941)

Fissurina palliolata (Earland)
Pl. 7, Figs. 3–4

Lagena palliolata EARLAND, 1934, p. 158, pl. 7, figs. 5–6.
Fissurina palliolata (Earland).—BOLTOVSKOY and DE KAHN, 1982, p. 429, pl. 5, figs. 24–26.

Description. Test free, unilocular, pyriform, central body slightly compressed, peripheral keel thickening toward the apertural end producing a bulbous structure; basal part of central body ornamented with concentric ridges. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded.

Distribution in 586A. Fissurina palliolata is a very rare species with scattered occurrences.

Recorded Distribution. Fissurina palliolata was described from the Holocene of Drake Strait, Antarctic Ocean. Holocene: Atlantic (Boltovskoy and de Kahn, 1982), Antarctic Ocean (Earland, 1934). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982). Miocene: Atlantic (Boltovskoy and de Kahn, 1982).

Fissurina revertens (Heron-Allen and Earland)
Pl. 7, Fig. 5

Lagena revertens HERON-ALLEN and EARLAND, 1932, p. 380, pl. 11, figs. 23–28.
Fissurina revertens (Heron-Allen and Earland).—PARR, 1950, p. 308.

Description. Test free, unilocular, pyriform, compressed, body rounded, short compressed apertural neck, two parallel keels encircle the test except for the aperture. Wall calcareous, hyaline, smooth. Aperture terminal, rounded.

Remarks. There are other descriptions of fissurinids with a double-keel which might be regarded as junior synonyms for *F. revertens,* for example, *Fissurina planata* (Matthes) and *Fissurina circumfossa* (Buchner) are both described from Europe from Holocene and Miocene sediments respectively.

Distribution in 586A. Fissurina revertens is a rare species with scattered occurrences.

Recorded Distribution. Fissurina revertens was described from the Holocene off the Falkland Islands in the South Atlantic. Holocene: Atlantic (Heron-Allen and Earland, 1932), Antarctic Ocean (Parr, 1950).

Fissurina selseyensis (Heron-Allen and Earland)
Pl. 7, Fig. 6

Lagena orbignyana (Seguenza) var. *selseyensis* HERON-ALLEN and EARLAND, 1909, p. 426, pl. 17, figs. 1–2.

Description. Test free, unilocular, elongate, central body ovate, compressed, several raised edges encircle the test with a carinate keel in the middle, apertural end slightly produced. Wall calcareous, smooth, finely perforate. Aperture, terminal, slightly ovate.

Distribution in 586A. Fissurina selseyensis is present only at 113.0 m.

Recorded Distribution. Fissurina selseyensis was described as "fossil" from Sussex, England.

Fissurina seminiformis (Schwager)
Pl. 7, Fig. 7

Lagena seminiformis SCHWAGER, 1866, p. 208, pl. 5, figs. 21a–b.—BRADY, 1884, p. 478, pl. 59, figs. 28–30.
Fissurina seminiformis (Schwager).—BARKER, 1960, p. 124, pl. 59, figs. 28–30.—BOLTOVSKOY and DE KAHN, 1982, p. 431, pl. 7, fig. 1.

Description. Test free, unilocular, central body rounded, compressed, a wide wing-like keel encircles the central body from the apertural end of the long neck down to the basal end where it is extended into two spine-like structures, separated by a deep basal depression. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded, on a long tubular neck.

Distribution in 586A. Fissurina seminiformis is represented by one specimen at 119.10 m.

Recorded Distribution. Fissurina seminiformis was described from the Pliocene of Kar Nikobar, off Sumatra. Holocene: Atlantic (Boltovskoy and de Kahn, 1982), Pacific (Brady, 1884). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982), Sumatra (Schwager, 1866). Miocene: Atlantic (Boltovskoy and de Kahn, 1982).

Fissurina separans Sidebottom
Pl. 7, Figs. 8–9

Lagena alveolata Brady var. *separans* SIDEBOTTOM, 1912, p. 425, pl. 21, figs. 5a–b.
Fissurina separans (Sidebottom).—BOLTOVSKOY and DE KAHN, 1982, p. 430, pl. 6, figs. 28–29.

Description. Test free, unilocular, almost circular in outline, compressed, four separate narrow tubular wings at the base, two on either side. Wall calcareous, hyaline, smooth, finely perforate, Aperture terminal, rounded.

Distribution in 586A. Fissurina separans is a very rare species with few occurrences.

Recorded Distribution. Fissurina separans was described from the Holocene of the southwestern South Pacific. Holocene: Atlantic (Boltovskoy and de Kahn, 1982), Pacific (Sidebottom, 1912). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982). Miocene: Atlantic (Boltovskoy and de Kahn, 1982).

Fissurina wiesneri Barker
Pl. 7, Fig. 10

Lagena marginata (Walker and Boys).—BRADY, 1884 (part), p. 476–478, pl. 59, fig. 23 (not 21–22) (not *Serpula* (*Lagena*) *marginata* Walker and Boys, 1784).
Lagena (*Entosolenia*) *marginata* (Montagu) var. *carinata* WIESNER, 1931, p. 121.
Fissurina wiesneri BARKER, 1960, p. 124, pl. 59, fig. 23.

Description. Test free, unilocular, central body round, compressed, a very wide keel encircles the test. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded, on a neck as long as the keel is wide.

Remarks. Fissurina wiesneri is characterized by its very wide keel, almost as wide as the diameter of the central body.

Distribution in 586A. Fissurina wiesneri is a species

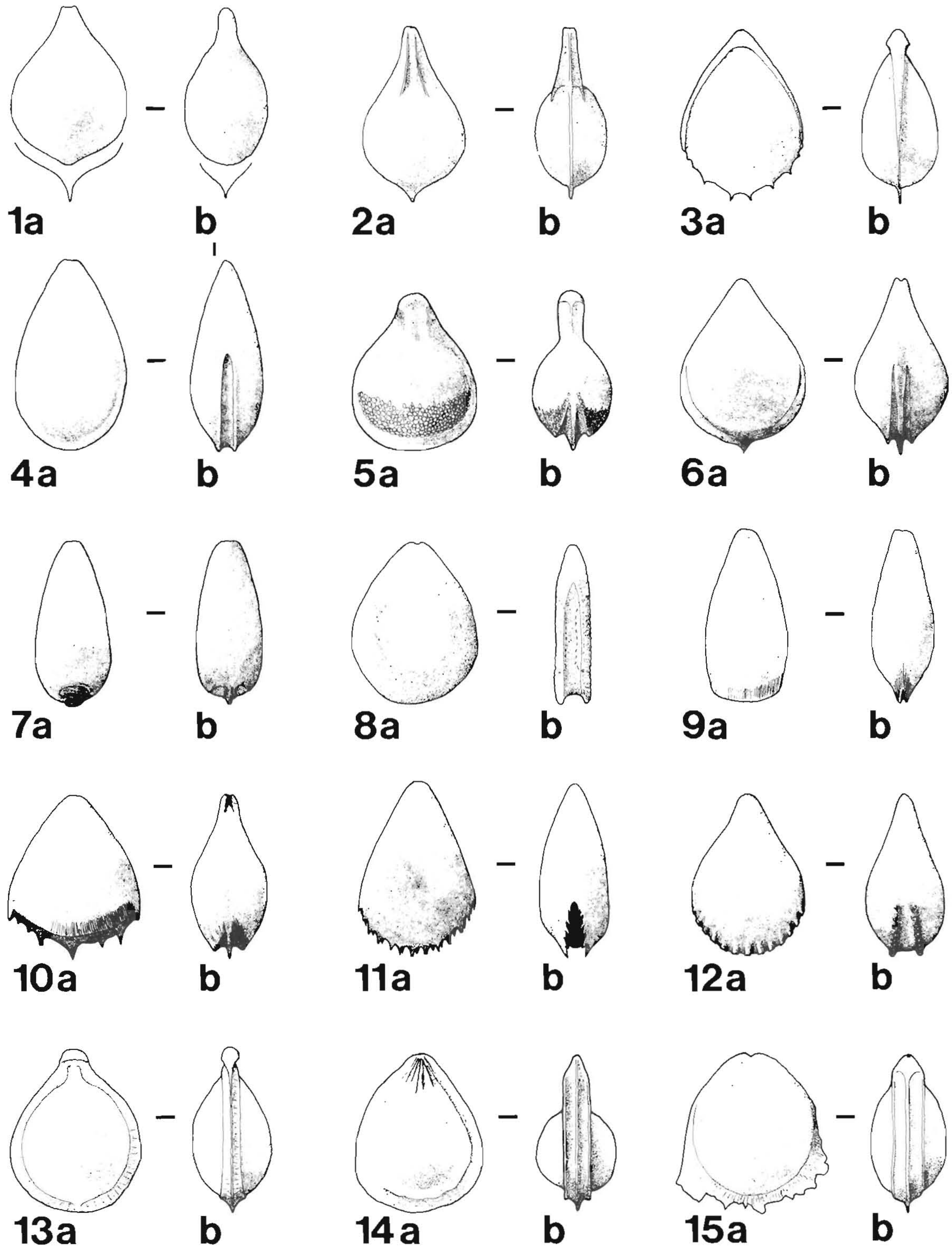

FIGURE 15. Drawings of *Fissurina* sp. 1–15; a, represents the side view and b, represents the edge view. The drawings are compilations of several specimens and are not, therefore, drawn to scale. Figure 15.1 = *Fissurina* sp. 1, 15.2 = *Fissurina* sp. 2, etc.

with scattered occurrences throughout the studied sequence.

Recorded Distribution. Fissurina wiesneri was described from the Holocene of the South Pacific. Holocene: Pacific (Brady, 1884).

Fissurina sp. 1
Pl. 7, Fig. 11; Fig. 15. 1a–b

Description. Test free, unilocular, pyriform, compressed, may have a pointed base. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded, on a short neck.

Distribution in 586A. Fissurina sp. 1 is a rare species and occurs throughout the sequence.

Fissurina sp. 2
Pl. 7, Fig. 12; Fig. 15. 2a–b

Description. Test free, unilocular, compressed, ovate in side view, slightly produced apertural end, may have a narrow peripheral keel, small spine at basal end. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded, on a short neck, apertural neck has two costae on each side extending down to the upper part of the central body.

Remarks. Fissurina sp. 2 is a very similar to *F. crebra* except for the costae at the apertural neck.

Distribution in 586A. Fissurina sp. 2 is a rare species that occurs in the uppermost part of the studied sequence and below 107.00 m.

Fissurina sp. 3
Pl. 7, Fig. 13; Fig. 15. 3a–b

Description. Test free, unilocular, pyriform, rounded in side view, compressed in edge view, test encircled by a narrow keel that widens at the apertural end producing a hood-like structure, keel jagged in the basal portion of the test. Wall calcareous, hyaline, smooth except for the basal part of the central body which has a coarser texture, finely perforate. Aperture terminal, rounded.

Distribution in 586A. Fissurina sp. 3 is rare and occurs only in the upper part of the sequence.

Fissurina sp. 4
Pl. 7, Fig. 14; Fig. 15. 4a–b

Description. Test free, unilocular, pyriform, slightly compressed, with a narrow groove along the lower part of the periphery. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, ovate.

Distribution in 586A. Fissurina sp. 4 is represented by a single specimen found at 60.50 m.

Fissurina sp. 5
Pl. 7, Figs. 15–16; Fig. 15. 5a–b

Description. Test free, unilocular, pyriform, slightly depressed, two deep and wide grooves run along the basal portion of the test. Wall calcareous, hyaline, finely perforate except for the basal part which has a fine reticulate pattern. Aperture terminal, round.

Distribution in 586A. Fissurina sp. 5 is represented by a single specimen at 109.00 m.

Fissurina sp. 6
Pl. 8, Figs. 1–2; Fig. 15. 6a–b

? *Lagena quadricostulata* Reuss.—BRADY, 1884 (part), p. 486, pl. 59, fig. 7 (not 15) (not *Lagena quadricostulata* Reuss, 1870).

? *Fissurina annectens* (Burrows and Holland).—BARKER, 1960 (part), p. 122, pl. 59, fig. 7 (not 15) (not *Lagena annectens* Burrows and Holland, in Jones, 1895).

Description. Test free, unilocular, ovate in side view, compressed, widest at middle of test, narrow keel on the lower half of the test, depressions at both sides of the keel produce four furrows extending from the short basal spine halfway to the aperture. Wall calcareous, smooth, finely perforate. Aperture terminal, rounded.

Remarks. These specimens are very close to the figure given by Brady (1884).

Distribution in 586A. Fissurina sp. 6 is a rare species with scattered occurrences.

Recorded Distribution. Brady (1884) recorded this species from the Holocene of the South Atlantic. Holocene: Atlantic (Brady, 1884).

Fissurina sp. 7
Pl. 8, Fig. 5; Fig. 15. 7a–b

Description. Test free, unilocular, elongate, slightly compressed, two very short tubes on each side of the base which is slightly pointed. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded, with an entosolenian tube.

Distribution in 586A. Fissurina sp. 7 is a rare species with scattered occurrences.

Fissurina sp. 8
Pl. 8, Figs. 3–4; Fig. 15. 8a–b

Description. Test free, unilocular, pyriform, very compressed, almost concave sides, a double keel encircles the test. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, round.

Distribution in 586A. Fissurina sp. 8 is represented by scattered occurrences.

Fissurina sp. 9
Pl. 8, Figs. 6–7; Fig. 15. 9a–b

Description. Test free, unilocular, pyriform, lensoidal in side view, a tubular vertical structure encircles the base of the test. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded.

Remarks. Fissurina sp. 9 is similar to *F. fimbriata* but the test is more elongate and the vertical structure is more compressed.

Distribution in 586A. Fissurina sp. 9 is a rare species with scattered occurrences.

Fissurina sp. 10
Pl. 8, Figs. 8–9; Fig 15. 10a–b

Description. Test free, unilocular, elongate, compressed, tapering towards the apertural end, truncated at the basal end, basal part with a tubular structure producing a basal depression at either side of the median keel, median keel with jagged margin. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded.

Remarks. Fissurina sp. 10 differs from *Fissurina alveolata plebia* (Cushman) in being more elongate and having a wider keel and wider vertical tubular structure.

Distribution in 586A. Fissurina sp. 10 is a rare species with scattered occurrences.

Fissurina sp. 11
Pl. 8, Fig. 10; Fig. 15. 11a–b

Description. Test free, unilocular, pyriform, compressed, basal end broad and encircled by a number of equally spaced spines. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded.

Remarks. Fissurina sp. 11 differs from *F. fimbriata* in having jagged basal spines.

Distribution in 586A. Fissurina sp. 11 is a rare species with scattered occurrences.

Fissurina sp. 12
Pl. 8, Figs. 11–12; Fig. 15. 12a–b

Description. Test free, unilocular, elongate, broadest at the base, compressed, a vertical structure encircles the oval base, this basal structure consists of longitudinal tubes equally arranged. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded.

Remarks. Fissurina sp. 12 differs from *F. fimbriata* in having a vertical "wing" consisting of narrow tubes rather than a thin calcitic carina.

Distribution in 586A. Fissurina sp. 12 is a rare species with scattered occurrences.

Fissurina sp. 13
Pl. 8, Fig. 13; Fig. 15. 13a–b

Description. Test free, unilocular, large, slightly ovate, compressed, a broad rim with a keel encircles the test. Wall calcareous, hyaline, smooth, finely perforate, peripheral keel with a fine radiate striation. Aperture terminal, rounded.

Distribution in 586A. Fissurina sp. 13 is a rare species with scattered occurrences.

Fissurina sp. 14
Pl. 8, Figs. 14–15; Fig. 15. 14a–b

Description. Test free, unilocular, pyriform, globular central body, apertural end produced, three almost parallel keels encircle the test. Wall calcareous, hyaline, smooth, finely perforate, a fine striation may be present at the apertural end. Aperture terminal, rounded.

Distribution in 586A. Fissurina sp. 14 is a species with low relative abundance and scattered occurrences.

Fissurina sp. 15
Pl. 8, Fig. 16; Fig. 15. 15a–b

Lagena orbignyana (Seguenza) var.—BRADY, 1884, p. 484–485, pl. 59, fig. 20.
Fissurina orbignyana Seguenza var.—BARKER, 1960 (part), p. 124, pl. 59, fig. 20 (not 18).

Description. Test free, unilocular, round, compressed, wide rim encircles the test, ornamented with a striate "wing" on each side of the mid-line. Wall calcareous, hyaline, smooth, perforate. Aperture terminal, rounded.

Distribution in 586A. Fissurina sp. 15 occurs above 81.70 m with low relative frequencies.

Fissurina sp. 16
Pl. 8, Figs. 17–18; Fig. 16. 16a–b

Description. Test free, unilocular, circular, compressed, a triple-keel encircles the test. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal on a short neck with several collars, rounded.

Distribution in 586A. Fissurina sp. 16 is a rare species with scattered occurrences.

Fissurina sp. 17
Pl. 9, Figs. 1–2; Fig. 16. 17a–b

Description. Test free, unilocular, pyriform, compressed, round central body, wide peripheral keel encircles the test, keel jagged in the basal portion, thickening towards the apertural end forming a bulbous

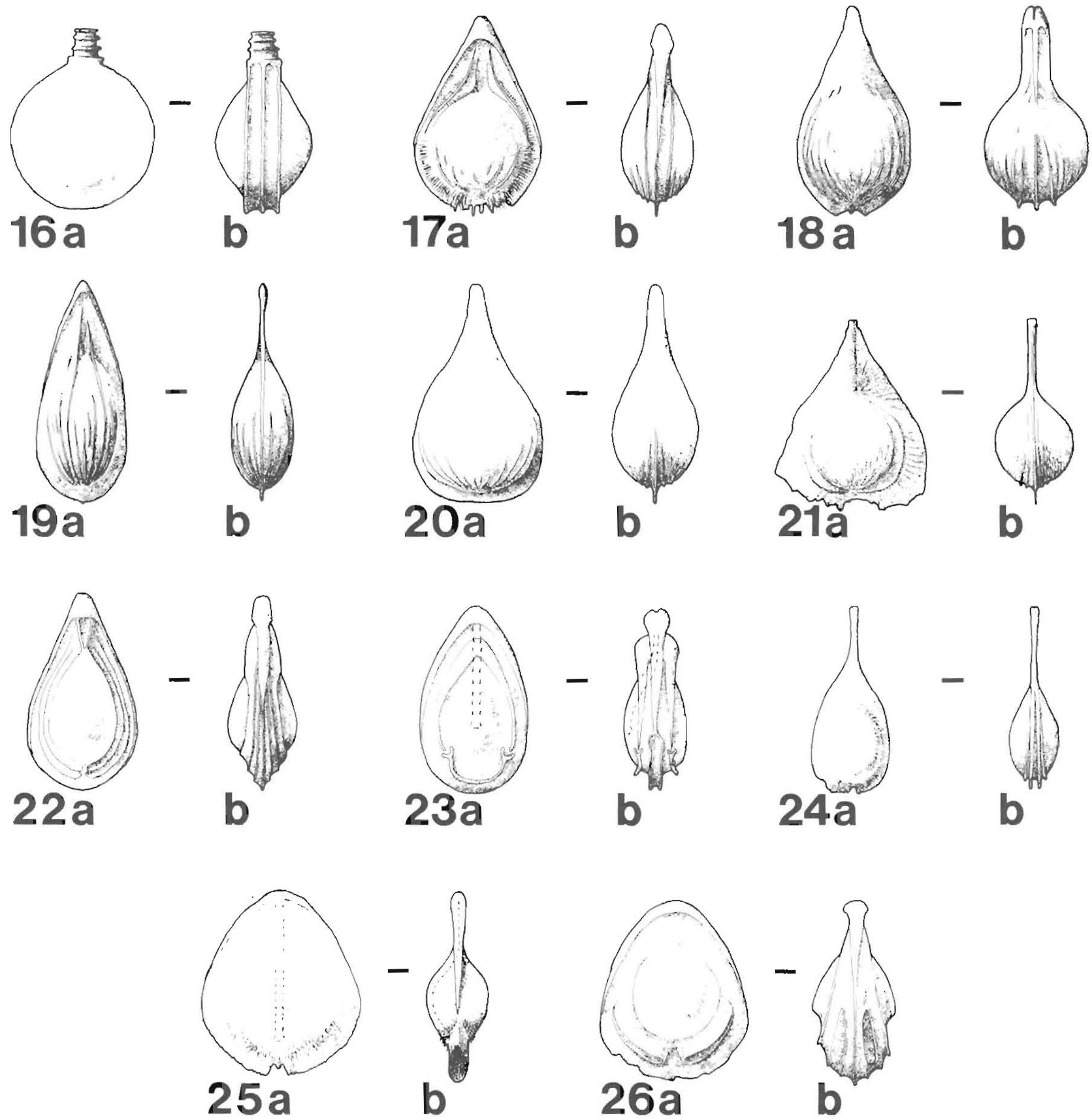

FIGURE 16. Drawings of *Fissurina* sp. 16–26; a, represents the side view and b, represents the edge view. The drawings are compilations of several specimens and are not, therefore, drawn to scale. Figure 16.16 = *Fissurina* sp. 16, 16.17 = *Fissurina* sp. 17, etc.

structure, one secondary keel on each side also encircles the test. Wall calcareous, hyaline, smooth, finely perforate, lower part of central body with irregular costae and very fine spines which also occur between the median keel and the secondary keels. Aperture terminal, rounded.

Distribution in 586A. Fissurina sp. 17 is a rare species with scattered occurrences.

Fissurina sp. 18
Pl. 9, Figs. 3–4; Fig. 16. 18a–b

Description. Test free, unilocular, pyriform, compressed, four narrow grooves at the basal part, two on each side of the median line. Wall calcareous, hyaline, finely perforate, central body ornamented with fine longitudinal costae. Aperture terminal, rounded.

Distribution in 586A. Fissurina sp. 18 is a rare species with scattered occurrences.

Fissurina sp. 19
Pl. 9, Fig. 5; Fig 16. 19a–b

Description. Test free, unilocular, elongate, slightly depressed, a keel encircles the test. Wall calcareous, hyaline, finely perforate, central body ornamented with longitudinal costae, of which two on each side extend along the apertural neck. Aperture terminal, round, on a long neck.

Distribution in 586A. Fissurina sp. 19 is represented by a single specimen at 115.00 m.

Fissurina sp. 20
Pl. 9, Fig. 6; Fig. 16. 20a–b

Description. Test free, unilocular, pyriform, slightly compressed, with a narrow keel in the lower half of the test, lower quarter with fine striae. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded, on a slightly produced neck.

Distribution in 586A. Fissurina sp. 20 is a rare species with scattered occurrences.

Fissurina sp. 21
Pl. 9, Fig. 7; Fig. 16. 21a–b

Description. Test free, unilocular, central body globular, a wide keel encircles the test, apertural end pointed, four very narrow tubes at the base of the test, two on either side of the keel. Wall calcareous, hyaline, finely perforate, central body ornamented with fine longitudinal costae. Aperture terminal, on a very long tubular neck.

Distribution in 586A. Fissurina sp. 21 is represented by one specimen at 87.80 m.

Fissurina sp. 22
Pl. 9, Figs. 8–9; Fig. 16. 22a–b

Description. Test free, unilocular, compressed, elongate, base rounded, central body ovate, seven keels encircle the test, the median one broadens above the midpoint and produces a bulbous structure at the apertural end. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded, on a short neck.

Distribution in 586A. Fissurina sp. 22 is a rare species with scattered occurrences.

Fissurina sp. 23
Pl. 9, Fig. 10; Fig. 16. 23a–b

Description. Test free, unilocular, pyriform, slightly compressed, three wide parallel keels encircle the test, the median one widens to a hood-like structure at the apertural end, at the base it is developed into a double-keel, the secondary keels have discontinuities in the basal part. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded, on a slightly produced neck, with an entosolenian tube extending along the side to about halfway down the test.

Distribution in 586A. Fissurina sp. 23 is represented by one single specimen at 58.50 m.

Fissurina sp. 24
Pl. 9, Figs. 11–12; Fig. 16. 24a–b

Lagena formosa Schwager.—BRADY, 1884 (part), p. 480, pl. 60, figs. 18–19 (not 8, 10, 17, 20) (not *Lagena formosa* Schwager, 1866).
Fissurina sp. BARKER, 1960, p. 126, pl. 60, figs. 18–19.

Description. Test free, unilocular, pyriform, compressed, ovate central body, very wide peripheral keel. Wall calcareous, finely perforate, inner part of keel ornamented with a reticulate pattern, central body smooth. Aperture terminal, rounded, on a long neck.

Remarks. Fissurina sp. 24 differs from *F. comata* in having a smooth rather than striate central body.

Distribution in 586A. Fissurina sp. 24 is a very rare species with few occurrences.

Fissurina sp. 25
Pl. 9, Figs. 13–14; Fig. 16. 25a–b

Description. Test free, unilocular, central body slightly pyriform, compressed, wide keel encircles the test except for the very basal part where the keel transforms into narrow tubular processes, keel widens at the apertural end. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded, on a neck as long as the keel is wide, with an entosolenian tube along the side of the central body.

Distribution in 586A. Fissurina sp. 25 is rare and has scattered occurrences.

Fissurina sp. 26
Pl. 9, Figs. 15–16; Fig. 16. 26a–b

Description. Test free, unilocular, pyriform, compressed, round central body, wide peripheral keel encircles the test, keel thin and often broken at base, thickening towards the apertural end forming a bulbous structure, two lens-shaped tubular processes on each side at the base of the test, one secondary keel on each side also encircles the test. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded.

Remarks. Fissurina sp. 26 shows similarities with the species *Fissurina walleriana* (Wright) figured by Boltovskoy and de Kahn (1982), although their specimens display fewer costae in the plane of compression.

Distribution in 586A. Fissurina sp. 26 is one of the most common fissurinids and it occurs throughout the studied sequence.

Genus **GLOBOFISSURELLA** Patterson, 1986

The genus *Globofissurella* was established by Patterson (1986) and differs from *Fissurina* Reuss in having a costate test.

Globofissurella quadricarinata (Sidebottom)
Pl. 9, Fig. 18

Lagena staphyllearia (Schwager) var. *quadricarinata* SIDEBOTTOM, 1912, p. 404, pl. 21, fig. 16.
Fissurina staphyllearia quadricarinata (Sidebottom).—BOLTOVSKOY and DE KAHN, 1982, p. 431, pl. 7, fig. 15.

Description. Test free, unilocular, globular, slightly compressed, costate with four "wings" oblique to each other, the "wings" widen towards the basal part. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, rounded.

Distribution in 586A. Globofissurella quadricarinata is represented by one specimen at 73.60 m.

Recorded Distribution. Globofissurella quadricarinata was described from the Holocene of the Pacific. Holocene: Atlantic (Boltovskoy and de Kahn, 1982), Pacific (Sidebottom, 1912). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982).

Globofissurella sp. 1
Pl. 9, Fig. 17

Lagena multicostata (Karrer).—BRADY, 1884, p. 466, pl. 61, figs. 4a–b (not *Fissurina multicostata* Karrer, 1877).
Oolina multicostata (Karrer).—BARKER, 1960, p. 127, pl. 61, figs. 4a–b.

Description. Test free, unilocular, slightly compressed in cross-section, circular in side-view, with a slightly produced apertural neck. Wall calcareous, hyaline, ornamented with delicate costae, originating in an apical ring, one keel-like costa extends all the way around the periphery to the aperture, one pair of dichotomically branching costae run about half the distance to the aperture on each side. Aperture terminal, round, in an ovate depression.

Remarks. Brady (1884) synonymized *Fissurina bouei* Karrer and *Fissurina multicostata* Karrer with the specimens that he found in the South Atlantic. It is doubtful whether the specimen figured by Brady is conspecific with the two species described by Karrer (1877) even though he noted (Brady, 1884, p. 466) that "In one of the shells the costae are numerous and some of them bifurcated; in the other they are fewer in number and are all in the normal unbranched condition." My specimens agree well with Brady's figure and exhibit the same distinct branching ornamentation.

Distribution in 586A. Globofissurella sp. 1 is represented by a single specimen at 41.30 m.

Recorded distribution. Brady (1884) found his specimens in the Holocene of the South Atlantic. Holocene: Atlantic (Brady, 1884).

Genus **OOLINA** d'Orbigny, 1839b

In this study the classification proposed by Parr (1947) is used, in which the genus *Oolina* is characterized by an entosolenian tube and a circular cross-section. It may or may not have an apertural neck.

Oolina alifera (Reuss)
Pl. 10, Fig. 1

Lagena alifera REUSS, 1870, p. 467, text-figs. 15–16, 21–22.
Oolina cf. *alifera* (Reuss).—KOHL, 1985, p. 57, pl. 16, fig. 2.

Description. Test free, unilocular, circular in cross-section. Wall calcareous, hyaline, ornamented with five to six prominent longitudinal costae, originating at a ring at the base and merging into a collar, one or two intervening costae also originating at the basal ring but terminating below the collar. Aperture terminal, round, on a short neck that projects from the collar, with a short entosolenian tube projecting into the chamber.

Remarks. Some of the specimens from this study differ from the original description of *Oolina alifera* in having more costae, twelve to fifteen rather than eight to nine. They resemble the form *O.* cf. *alifera* described by Kohl (1985), although the intervening costae are connected to the basal ring rather than terminating before reaching the ring.

Distribution in 586A. Oolina alifera is a rare species with scattered occurrences.

Recorded Distribution. Oolina alifera was described from the middle Oligocene of Germany. Pliocene: Mexico (Kohl, 1985).

Oolina desmophora (Jones)
Pl. 10, Figs. 2–3

Lagena vulgaris Williamson var. *desmophora* JONES, 1874, p. 54, pl. 19, figs. 23–24.
Lagena desmophora Jones.—BRADY, 1884, p. 468–469, pl. 58, figs. 42–43.—CUSHMAN, 1921, p. 27, pl. 12, figs. 5a–b, pl. 13, figs. 3a–b.—BOLTOVSKOY and DE KAHN, 1982, p. 434, pl. 9, figs. 1–3.
Oolina desmophora (Jones).—BARKER, 1960, p. 120, pl. 58, figs. 42–43.

Description. Test free, unilocular, pyriform, circular in cross-section. Wall calcareous, hyaline, ornamented with five to seven longitudinal costae with depressions at regular intervals in the lower one-half of the test, in between is a secondary costa which often branches into two. Aperture terminal, round, on a long neck, with an entosolenian tube.

Remarks. These specimens, as well as the ones figured by Brady (1884), differ from the original figures of *Oolina desmophora* given by Jones (1874) in having the depressions in the costae restricted to the lower one-half or two-thirds of the test rather than passing from the base to the neck. They also differ from the original description of *O. desmophora* in lacking the transverse crossbars between the costae.

Distribution in 586A. Oolina desmophora is a rare species with few occurrences.

Recorded Distribution. Oolina desmophora was described from the Holocene of the Java Sea. Holocene: Atlantic (Brady, 1884; Boltovskoy and de Kahn, 1982), Pacific (Jones, 1874; Brady, 1884; Cushman 1921). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982). Miocene: Atlantic (Boltovskoy and de Kahn, 1982).

Oolina globosa (Montagu)
Pl. 10, Fig. 4

Serpula (*Lagena*) *laevis globosa* WALKER and BOYS, 1784, p. 3, pl. 1, fig. 8.
Vermiculum globosum MONTAGU, 1803, p. 523.
Lagena globosa (Montagu).—CUSHMAN, 1913, p. 3, pl. 4, figs. 2a–b.—CUSHMAN, 1923, p. 20, pl. 4, figs. 1–2.
Oolina globosa (Montagu).—PARR, 1950, p. 302.—BARKER, 1960, p. 114, pl. 56, figs. 1–3.—COLE, 1981, p. 75–76, pl. 19, fig. 8.
Oolina globosa (Montagu) f. *typica* BOLTOVSKOY and DE KAHN, 1982, p. 442, pl. 12, figs. 16–18.

Description. Test free, unilocular, oval in side view, rounded in cross-section. Wall calcareous, hyaline, smooth. Aperture terminal, with an entosolenian tube extending into the chamber.

Remarks. The name given by Walker and Boys (1784) is regarded as nomen nudem.

Distribution in 586A. Oolina globosa is represented by scattered occurrences throughout the studied sequence.

Recorded Distribution. Oolina globosa was described from the Holocene of Sandwich in Kent, England. Holocene: Atlantic (Cushman, 1923; Cole, 1981; Boltovskoy and de Kahn, 1982), England (Montagu, 1803), Pacific (Brady, 1884; Cushman, 1913, 1921; Ingle and others, 1980), Antarctic Ocean (Parr, 1950). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982), Pacific (Keller, 1980). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982), Pacific (Keller, 1980). Miocene: Atlantic (Boltovskoy and de Kahn, 1982), Pacific (Keller, 1980).

Oolina hexagona (Williamson)
Pl. 10, Fig. 5

Entosolenia squamosa (Montagu) var. *hexagona* WILLIAMSON, 1848, p. 20, pl. 2, fig. 23.
Lagena hexagona (Williamson).—BRADY, 1884, p. 472, pl. 58, figs. 32–33.—CUSHMAN, 1913, p. 17, pl. 6, figs. 2–3.
Oolina hexagona (Williamson).—PARR, 1950, p. 304.—LOEBLICH and TAPPAN, 1953, p. 69, pl. 14, figs. 1–3.—BARKER, 1960, p. 120, pl. 58, figs. 32–33.—AKERS and DORMAN, 1964, p. 46, pl. 6, fig. 8.—HERMELIN and SCOTT, 1985, p. 214, pl. 2, fig. 10.

Description. Test free, unilocular, subglobular, circular in cross-section. Wall calcareous, hyaline, ornamented with a reticulate pattern of raised hexagonal cells arranged in a honeycomb pattern. Aperture terminal, rounded, on a short neck, with a narrow internal tube.

Distribution in 586A. Oolina hexagona is a rare species with few occurrences.

Recorded Distribution. Oolina hexagona was originally described from the Holocene of the eastern North Atlantic. Holocene: Atlantic (Cole, 1981; Hermelin and Scott, 1985), Pacific (Brady, 1884; Cushman, 1913; Ingle and others, 1980), Antarctic Ocean (Parr, 1950), Arctic Ocean (Loeblich and Tappan, 1953). Pleistocene: Gulf of Mexico (Akers and Dorman, 1964), Pacific (Keller, 1980).

Oolina melo d'Orbigny

Oolina melo D'ORBIGNY, 1839b, p. 20, pl. 5, fig. 9.—LOEBLICH and TAPPAN, 1953, p. 71, pl. 12, figs. 8–15.—BARKER, 1960, p. 120, pl. 58, figs. 28–31.—SCHNITKER, 1971, p. 206, pl. 4, fig. 13.—HERMELIN and SCOTT, 1985, p. 214, pl. 2, fig. 11.
Entosolenia squamosa (Montagu) var. *scalariformis* WILLIAMSON, 1858, p. 13, pl. 1, fig. 30.
Lagena squamosa (Montagu).—BRADY, 1884, p. 471, pl. 58, figs. 28–31.—CUSHMAN, 1913, p. 16, pl. 6, figs. 1a–b (not *Vermiculum squamosum* Montagu, 1803).
Lagena catenulata (Williamson).—CUSHMAN, 1913, p. 18, pl. 7, figs. 1–2 (not *Entosolenia squamosa* Montagu var. *catenulata* Williamson, 1858).
Lagena hexagona (Williamson) var. *scalariformis* (Williamson).—CUSHMAN, 1913, p. 17, pl. 6, fig. 4.
Lagena melo (d'Orbigny).—HERON-ALLEN and EARLAND, 1932, p. 370, pl. 10, figs. 25–27.

Description. Test free, unilocular, oval in side view, circular in cross-section. Wall calcareous, hyaline, ornamented with longitudinal costae running from the base to the apertural end, in between and perpendicular to these costae are raised ridges which give the test a reticulate pattern of rectangular cells arranged in vertical rows. Aperture terminal, rounded, at end of a short neck, with a short internal tube.

Distribution in 586A. Oolina melo is a very rare species with few occurrences.

Recorded Distribution. Oolina melo was described from the Holocene off the Falkland Islands, South Atlantic. Holocene: Atlantic (Williamson, 1858; Schnitker, 1971; Cole, 1981; Hermelin and Scott, 1985), Pacific (d'Orbigny, 1839b; Brady, 1884; Cushman, 1913, 1921), Antarctic Ocean (Heron-Allen and Earland, 1932; Parr, 1950), Arctic Ocean (Loeblich and Tappan, 1953). Pleistocene: Pacific (McDougall, 1985).

Oolina setosa (Earland)
Pl. 10, Fig. 6

Lagena longispina BRADY, 1881, p. 61.—BRADY, 1884 (part), p. 454, pl. 56, figs. 33–35 (not pl. 56, fig. 36 or pl. 59, figs. 13–14).
Lagena globosa (Montagu) var. *setosa* EARLAND, 1934, p. 150, pl. 6, fig. 52.
Oolina globosa (Montagu) var. *setosa* (Earland).—BARKER, 1960, p. 116, pl. 56, figs. 33–35.—BOLTOVSKOY and DE KAHN, 1982, p. 442, pl. 12, fig. 19.
Oolina globosa (Montagu) var. *setesa* [sic] (Earland).—LEROY, 1964, p. 26, pl. 13, fig. 44.
Oolina setosa (Earland).—KOHL, 1985, p. 58, pl. 16, fig. 6.

Description. Test free, unilocular, circular to ovate in side view, circular in cross-section. Wall calcareous, hyaline, smooth, the basal part of the test is covered by irregularly arranged short spines. Aperture terminal, slightly elliptical, with a short entosolenian tube that extends into the chamber.

Distribution in 586A. Oolina setosa is a very rare species with scattered occurrences.

Recorded Distribution. Oolina setosa was described from the Holocene of the Antarctic Ocean. Holocene: Atlantic (Brady, 1884; Boltovskoy and de Kahn, 1982), Pacific (Brady, 1884), Antarctic Ocean (Earland, 1934; Brady, 1884). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982), Mexico (Kohl, 1985). Miocene: Atlantic (Boltovskoy and de Kahn, 1982), Okinawa (LeRoy, 1964).

Genus **PARAFISSURINA** Parr, 1947

Parafissurina cf. **P. arctica** Green
Pl. 10, Fig. 7

Parafissurina arctica GREEN, 1959, p. 76, 78, pl. 1, figs. 2a–b.—COLE, 1981, p. 85, pl. 19, fig. 34.

Description. Test free, unilocular, rounded in side view, slightly compressed. Wall calcareous, hyaline, smooth, finely perforate, ornamented with spines along the plane of compression. Aperture hooded, with an entosolenian tube extending down to the bottom of the test, following the dorsal wall.

Remarks. This specimen differs from *Parafissurina arctica* as described by Green (1959) by its lack of a peripheral keel and in that the entosolenian tube ends at the bottom of the test rather than extending up on the opposite wall.

Distribution in 586A. Parafissurina cf. *P. arctica* is represented by a single specimen at 59.50 m.

Recorded Distribution. Parafissurina arctica was described from the Holocene of the Arctic Ocean. Holocene: Atlantic (Cole, 1981), Arctic Ocean (Green, 1959).

Parafissurina sublata Parr
Pl. 10, Fig. 8

Parafissurina sublata PARR, 1950, p. 319, pl. 10, figs. 11a–c.—BOLTOVSKOY and DE KAHN, 1982, p. 446, pl. 15, fig. 5.

Description. Test free, unilocular, rounded, compressed in cross-section, with a narrow peripheral keel. Wall calcareous, hyaline, smooth. Aperture hooded, with an entosolenian tube which extends to the base of the test along the center of the rear wall.

Distribution in 586A. Parafissurina sublata is a rare species with few occurrences.

Recorded Distribution. Parafissurina sublata was described from the Holocene of the Tasman Sea. Holocene: Atlantic (Boltovskoy and de Kahn, 1982), Pacific (Parr, 1950).

Parafissurina tectulostoma Loeblich and Tappan
Pl. 10, Fig. 9

Parafissurina tectulostoma LOEBLICH and TAPPAN, 1953, p. 81, pl. 14, figs. 17a–c.—COLE, 1981, p. 85, pl. 19, fig. 36.—BOLTOVSKOY and DE KAHN, 1982, p. 446, pl. 15, figs. 8–9.

Description. Test free, unilocular, elongate, round in cross-section, slightly pointed base, widest below the middle of the test. Wall calcareous, hyaline, smooth. Aperture hooded, with an entosolenian tube extending down the rear wall to about one-half the length of the test.

Ecology. Cole (1981) found *Parafissurina tectulostoma* in the middle and lower bathyal zones off Newfoundland where it was the most common species of *Parafissurina*.

Distribution in 586A. Parafissurina tectulostoma is a rare species with occurrences below 61 m.

Recorded Distribution. Parafissurina tectulostoma was described from the Holocene off Baffin Island, Arctic Ocean. Holocene: Atlantic (Cole, 1981), Arctic Ocean (Loeblich and Tappan, 1953). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982). Miocene: Atlantic (Boltovskoy and de Kahn, 1982).

Parafissurina tricarinata Parr
Pl. 10, Fig. 10

Parafissurina tricarinata PARR, 1950, p. 319, 320, pl. 10, figs. 16–18.

Description. Test free, unilocular, pyriform, compressed, central body encircled by a keel. Wall calcareous, smooth, finely perforate, two additional keels on the lower half of the test, one on either side. Aperture terminal, slit-like, slightly curved to one side and with a raised lip on either edge, lip on one side slightly higher than the other, with short entosolenian tube.

Distribution in 586A. Parafissurina tricarinata is represented by one single specimen at 101.90 m.

Recorded Distribution. Parafissurina tricarinata was described from the Holocene of the Tasman Sea. Holocene: Pacific (Parr, 1950).

Parafissurina uncifera (Buchner)
Pl. 10, Figs. 12–13

Lagena uncifera BUCHNER, 1940, p. 531, pl. 26, figs. 554–555.
Parafissurina uncifera (Buchner).—BOLTOVSKOY and DE KAHN, 1982, p. 446, pl. 15, figs. 10–11.

Description. Test free, unilocular, globular. Wall calcareous, hyaline, smooth, thick. Aperture rounded, with a raised rim which is higher on one side, with a short free entosolenian tube, attached to the rear wall only at the very end.

Distribution in 586A. Parafissurina uncifera is a rare species with few occurrences.

Recorded Distribution. Parafissurina uncifera was described from the Holocene of the Mediterranean. Holocene: Atlantic (Boltovskoy and de Kahn, 1982), Mediterranean (Buchner, 1940). Pleistocene: Atlantic (Boltovskoy and de Kahn, 1982). Pliocene: Atlantic (Boltovskoy and de Kahn, 1982). Miocene: Atlantic (Boltovskoy and de Kahn, 1982).

Parafissurina sp. 1
Pl. 10, Fig. 11

Description. Test free, unilocular, elongate, compressed in cross-section, rounded base, widest below the middle of the test. Wall calcareous, hyaline, smooth. Aperture hooded, with an entosolenian tube extending down along the rear wall to about one-half the length of the test.

Remarks. Parafissurina sp. 1 differs from *P. tectulostoma* in being compressed in cross-section rather than round.

Distribution in 586A. Parafissurina sp. 1 is a rare species with few occurrences.

Parafissurina sp. 2
Pl. 10, Fig. 14

Description. Test free, unilocular, pyriform, depressed in cross-section. Wall calcareous, hyaline, smooth. Aperture hooded, with an entosolenian tube that extends down the rear wall to three-quarters or more of the length of the test.

Remarks. Parafissurina sp. 2 differs from *P.* sp. 1 in being relatively shorter and having a longer entosolenian tube.

Distribution in 586A. Parafissurina sp. 2 is one of the most common parafissurinids in the studied sequence although the relative frequency never exceeds 2.8%.

Superfamily BULIMINACEA Jones, 1875
Family TURRILINIDAE Cushman, 1927a
Subfamily TURRILININAE Cushman, 1927a
Genus **BULIMINOIDES** Cushman, 1911

Buliminoides sp. 1
Pl. 10, Fig. 15

Description. Test free, elongate, early chambers a low trochospiral coil, then spire increasing rapidly in height with coiling around an open umbilicus, septal walls partially resorbed internally so that chambers open into umbilical hollow. Sutures indistinct. Wall calcareous, ornamented with numerous short spines, except for the ultimate part which is smooth. Aperture umbilical, large.

Distribution in 586A. Buliminoides sp. 1 is represented by one single specimen at 63.50 m.

Family SPHAEROIDINIDAE Cushman, 1927a
Genus **SPHAEROIDINA** d'Orbigny, 1826

Sphaeroidina bulloides d'Orbigny
Pl. 5, Figs. 16–17

Sphaeroidina bulloides D'ORBIGNY, 1826, p. 267, no. 1, mod. no. 65.—BRADY, 1884 (part), p. 620, pl. 84, figs. 1–2?, 5 (not 3–4, 6–7).—CUSHMAN, 1914, p. 18, pl. 10, fig. 7, pl. 12, figs. 1a–b.—CUSHMAN, 1924a, p. 36, pl. 7, figs. 1–6.—CUSHMAN and TODD, 1945, p. 65, pl. 11, fig. 9.—PHLEGER and others, 1953, p. 10–11, pl. 1, fig. 5.—BARKER, 1960 (part), p. 174, pl. 84, figs. 1–2?, 5 (not 3–4, 6–7).—AKERS and DORMAN, 1964, p. 54, pl. 11, figs. 9–11.—LEROY, 1964, p. 41, pl. 16, figs. 21–22.—SCHNITKER, 1971, p. 210, pl. 4, fig. 18.—LEROY and LEVINSON, 1974, p. 8, pl. 5, fig. 2.—BOLTOVSKOY, 1978a, pl. 7, fig. 11.—LOHMANN, 1978, p. 26, pl. 4, fig. 4.—CORLISS, 1979, p. 7, pl. 2, figs. 1–2.—THOMPSON, 1980, pl. 6, fig. 5.—MURRAY, 1984, pl. 3, figs. 10–11.—KOHL, 1985, p. 59–60, pl. 14, fig. 6.—MCDOUGALL, 1985, p. 398, pl. 3, fig. 2.—MEAD, 1985, p. 228, pl. 1, fig. 2.—KURIHARA and KENNETT, 1986, pl. 2, fig. 1.—MORKHOVEN and others, 1986, p. 80–83, pl. 23, figs. 1–2.

Description. Test free, subglobular, trochospiral in early stages, streptospiral in later, chambers increasing rapidly in size as added, embracing most of the preceding ones, ultimate chamber comprising most of the test. Sutures distinct, depressed. Wall calcareous, hyaline, very smooth, finely perforate. Aperture interiomarginal, a crescentic slit at basal margin of the ultimate chamber, surrounded by a narrow lip, almost closed by a tooth.

Remarks. Sphaeroidina bulloides is a long-ranging, morphologically variable form. *Bolbodium sphaerula* Ehrenberg (Recent, northeastern Atlantic), *Sexloculina haueri* Czjzek (Tertiary, Vienna Basin), *Sphaeroidina austriaca* d'Orbigny (Tertiary, Vienna Basin), *S. ciperana* Cushman and Todd (Oligocene, Trinidad), *S. compacta* Cushman and Todd (Recent, Yucatan Channel), *S. compressa* Cushman and Todd (Recent, southern Pacific), *S. japonica* Asano (Miocene, Japan), and *S. nitida* Cushman and Todd (Recent, Philippines) are all probably junior synonyms.

Ecology. Pflum and Frerichs (1976) noted a minor size increase of *S. bulloides* with increasing water depth in the Gulf of Mexico, increasing from a size of less than 500 μm in the neritic zone to about 1 mm in the lower bathyal and abyssal zones. In the Pacific it is found in the lower middle bathyal zone (Ingle, 1980).

Distribution in 586A. Sphaeroidina bulloides is a common species that occurs below 59.50 m with relative abundances up to 4.1%.

Recorded Distribution. Sphaeroidina bulloides was described from the Holocene and as fossil from the Adriatic Sea and Italy. Its known stratigraphic range is from middle Oligocene through Quaternary (Morkhoven and others, 1986). Holocene: Atlantic (Brady, 1884; Phleger and others, 1953; Schnitker, 1971; Lohmann, 1978; Mead, 1985), Pacific (Brady, 1884; Cushman, 1914, 1921; Todd, 1966; Ingle and others, 1980), Indian Ocean (Brady, 1884; Boltovskoy, 1978a; Corliss, 1979), Antarctic Ocean (Brady, 1884). Pleistocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984b; Murray, 1984), Gulf of Mexico (Akers and Dorman, 1964; LeRoy and Levinson, 1974), Pacific (Resig, 1976; Keller, 1980; Thompson, 1980; McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984b; Murray, 1984), Mexico (Kohl, 1985), Pacific (Butt, 1980; Keller, 1980; Thompson, 1980; McDougall, 1985; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a). Miocene: Atlantic (Boersma, 1984b; Murray, 1984), Caribbean (Cushman and Todd, 1945), Pacific (Resig, 1976; Butt, 1980; Keller, 1980; Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Guam (Todd, 1966), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a).

Family BOLIVINITIDAE Cushman, 1927a

Genus **ABDITODENTRIX** Patterson, 1985

The genus *Abditodentrix* was established by Patterson (1985) and differs from the genus *Bolivina* in its ornamentation. *Bolivina* is either smooth, striate, or costate, whereas *Abditodentrix* has a complex network of elevated reticulations that are somewhat independent of individual chambers. *Abditodentrix* also has a more truncate margin than *Bolivina.*

Abditodentrix asketocomptella Patterson
Pl. 10, Fig. 16

Abditodentrix asketocomptella PATTERSON, 1985, p. 140, pl. 1, figs. 1–9.

Description. Test free, biserial, elongate, twice as long as broad, slightly compressed, rectangular in section. Chambers distinct, somewhat inflated, ornamented with a network of elevated reticulations, with deep excavations in between. Sutures distinct, depressed. Wall calcareous, coarsely perforate. Aperture, an elongate loop extending from the base of the ultimate chamber to the apex, enfolded internally.

Distribution in 586A. Abditodentrix asketocomptella is a rare species with scattered occurrences.

Recorded Distribution. Abditodentrix asketocomptella was described from late Neogene sediments from the Rio Grande Rise in the southwest Atlantic. Holocene: Atlantic (Patterson, 1985). Pleistocene: Atlantic (Patterson, 1985). Miocene: Atlantic (Patterson, 1985).

Genus **BOLIVINA** d'Orbigny, 1839b

Bolivina pusilla Schwager

Bolivina pusilla SCHWAGER, 1866, p. 254, pl. 7, fig. 101.—CUSHMAN, 1911, p. 41, figs. 67a–b.—CUSHMAN, 1937c, p. 114, pl. 14, figs. 8–9.—PHLEGER and others, 1953, p. 36–37, pl. 7, fig. 23.—BOLTOVSKOY, 1978a, pl. 1, figs. 16–18.—KURIHARA and KENNETT, 1986, pl. 2, figs. 1–8.
Brizalina pusilla (Schwager).—BOERSMA, 1986, p. 988, pl. 4, figs. 1–2.

Description. Test free, biserial, elongate, often more than three times as long as wide, widest near the apertural end, chambers distinct. Sutures indistinct, slightly depressed. Wall calcareous, finely perforated, ornamented with numerous fine longitudinal costae, the last-formed chambers are often smooth. Aperture an elongate loop extending from the base of the last-formed chamber to apex, with a distinct toothplate.

Ecology. This species occurs in the lower middle and lower bathyal zones in the Gulf of Mexico (Pflum and Frerichs, 1976).

Distribution in 586A. Bolivina pusilla is a rare species with scattered occurrences.

Recorded Distribution. Bolivina pusilla was described from the upper Tertiary of Kar Nikobar, India. Holocene: Atlantic (Phleger and others, 1953), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Cushman, 1911, 1921), Indian Ocean (Boltovskoy, 1978a). Pleistocene: Pacific (Kurihara and Kennett, 1986). Pliocene: Pacific (Boersma, 1986; Kurihara and Kennett, 1986), Indian Ocean (Boltovskoy, 1978a). Miocene: Pacific (Todd, 1966; Boersma, 1986; Kurihara and Kennett, 1986), Indian Ocean (Boltovskoy, 1978a).

Bolivina seminuda Cushman
Pl. 10, Figs. 17–18

Bolivina seminuda CUSHMAN, 1911, p. 34, text-fig. 55.—HADA, 1931, p. 132, text-fig. 89.—CUSHMAN, 1937c, p. 142, pl. 18, figs. 13–15.—CUSHMAN, 1942, p. 26, pl. 7, fig. 6.—CUSHMAN and MCCULLOCH, 1942, p. 210, pl. 25, fig. 14.—SMITH, 1963, p. 15–16, pl. 29, figs. 1–7.—INGLE and others, 1980, p. 131, pl. 1, fig. 5.—RESIG, 1981, pl. 5, fig. 14.—KURIHARA and KENNETT, 1986, pl.2, figs. 9–10.

Bolivina pseudopunctata HÖGLUND, 1947, p. 273–274, pl. 24, fig. 5, pl. 32, figs. 23–24, text-figs. 280–281, 287.—PHLEGER and others, 1953, p. 36, pl. 7, figs. 20–21.

Description. Test free, biserial, elongate, slightly compressed, apical end rounded. Chambers distinct. Sutures distinct, depressed. Wall calcareous, hyaline, upper part of each chamber smooth, whereas lower two-thirds are coarsely perforate. Aperture oval, extending from base of ultimate chamber to a terminal position.

Remarks. Höglund (1947) described an Atlantic species, *Bolivina pseudopunctata,* that in most respects appears to be a junior synonym for *B. seminuda.* It appears that *B. seminuda* and *B. pseudopunctata* are virtually identical except for their reported geographical distribution; *B. seminuda* is reported mostly from the Pacific whereas *B. pseudopunctata* is reported mostly from the Atlantic. This supports a synonymization of the two forms.

Ecology. Bolivina seminuda is reported from the middle and lower bathyal zones off the west coast of Central America (Smith, 1963, 1964). Bandy (1961) reported this species in the neritic through the lower bathyal zones in the Gulf of California.

Distribution in 586A. Bolivina seminuda is a species that appears in low relative frequencies throughout the studied sequence.

Recorded Distribution. Bolivina seminuda was described from the Holocene of the Bering Sea. Holocene: Atlantic (Höglund, 1947; Phleger and others, 1953), Pacific (Cushman, 1911, 1937c, 1942; Hada, 1931; Smith, 1963, 1964; Ingle and others, 1980). Pleistocene: Atlantic (Blanc-Vernet, 1983), Pacific (McDougall, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Blanc-Vernet, 1983), Pacific (Keller, 1980; McDougall, 1985; Kurihara and Kennett, 1986). Miocene: Pacific (Burke, 1981; Resig, 1981; McDougall, 1986; Kurihara and Kennett, 1986).

Genus **RECTOBOLIVINA** Cushman, 1927a

Rectobolivina raphana (Parker and Jones)
Pl. 11, Fig. 1

Uvigerina (Sagrina) raphanus PARKER and JONES, 1865, p. 364, pl. 18, figs. 16–17.

Siphogenerina costata SCHLUMBERGER, 1883, p. 118, fig. 13.

Sagrina raphanus Parker and Jones.—BRADY, 1884, p. 585, pl. 75, figs. 21–24.

Siphogenerina raphanus (Parker and Jones).—CUSHMAN, 1913, p. 108, pl. 46, figs. 1–5.—BERMÚDEZ, 1949, p. 222, pl. 14, fig. 18.—AKERS and DORMAN, 1964, p. 53, pl. 9, fig. 25.—LEROY, 1964, p. 35, pl. 3, fig. 35, pl. 16, fig. 9.

Siphogenerina raphanus (Parker and Jones) var. *costulata* CUSHMAN, 1917b, p. 662.—CUSHMAN, 1921, p. 281–282, pl. 56, fig. 6.

Siphogenerina raphana (Parker and Jones).—CUSHMAN, 1942, p. 55, pl. 15, figs. 6–9.

Rectobolivina raphana (Parker and Jones).—LOEBLICH and TAPPAN, 1964, p. C553, text-fig. 438, figs. 9–11.

Description. Test free, elongate, uniserial, circular in cross-section. Chambers inflated. Sutures depressed. Wall calcareous, finely perforate, ornamented with longitudinal costae running from the apertural face down to the initial spine. Aperture terminal, rounded.

Distribution in 586A. Rectobolivina raphana is a rare species with few occurrences.

Recorded Distribution. Rectobolivina raphana was described from the Holocene but no type locality was designated. Holocene: Pacific (Brady, 1884; Cushman, 1913; Cushman, 1921; Todd, 1966), Indian Ocean (Loeblich and Tappan, 1964). Pleistocene: Gulf of Mexico (Akers and Dorman, 1964). Pliocene: Okinawa (LeRoy, 1964). Miocene: Dominican Republic (Bermúdez, 1949), Okinawa (LeRoy, 1964).

Family EOUVIGERINIDAE Cushman, 1927a

Genus **SIPHONODOSARIA** Silvestri, 1924

Considerable confusion exists in the nomenclature of uniserial calcareous foraminifera. I have followed

Loeblich and Tappan (1964) in this case and separated uniserial eouvigerinids into different genera depending on the shape of the phialine lip and the apertural tooth. *Siphonodosaria* Silvestri (1924) is here restricted to forms that have a neck bordered with a dentate phialine lip and a distinct bifid tooth. *Stilostomella* Guppy (1894) is here separated from *Siponodosaria* in having a single tooth or just a slight indentation of the phialine lip.

Siphonodosaria abyssorum (Brady)
Pl. 11, Figs. 2–5

Nodosaria abyssorum BRADY, 1881, p. 63.—GUPPY, 1904, p. 12, pl. 1, figs. 10–11.
Nodosaria (?) *abyssorum* Brady.—BRADY, 1884, p. 504, pl. 63, figs. 8–9.
Siphonodosaria abyssorum (Brady).—CUSHMAN, 1927a, p. 69, pl. 14, fig. 20.—STAINFORTH, 1952, p. 11, pl. 1, figs. a–b.—DOUGLAS, 1973, pl. 5, fig. 11.
Sagrinnodosaria abyssorum (Brady).—JEDLITSCHKA, 1931, p. 125, pl. 126, figs. 24–25.
Ellipsonodosaria nuttalli CUSHMAN and JARVIS, 1934, p. 72, pl. 10, figs. 6a–b.
Stilostomella abyssorum (Brady).—BOLTOVSKOY, 1978a, pl. 7, fig. 16.

Description. Test free, uniserial, straight, large. Chambers subglobose, often somewhat uneven both in size and shape, proloculus is often the largest chamber. Wall calcareous, opaque, smooth, thick, several large, stout spines on basal part of proloculus. Aperture terminal, situated on a short neck, with a wide phialine lip and a bifid tooth.

Remarks. The species named *Ellipsonodosaria nuttalli* by Cushman and Jarvis is regarded as a junior synonym to *Siphonodosaria abyssorum* (Brady) even though they stated (Cushman and Jarvis, 1934, p. 72) that "the apertural characteristics of our material seem to be very different from that figured by Brady." The main difference is in the degree of development of the collar, which I do not consider to justify a change of genus.

Distribution in 586A. Siphonodosaria abyssorum is a common species between 58 and 133 m where it has a relative abundance of up to 7.0%.

Recorded Distribution. Siphonodosaria abyssorum was described from the Holocene of the South Pacific. Holocene: Pacific (Brady, 1881, 1884). Pliocene: Atlantic (Blanc-Vernet, 1983), Indian Ocean (Boltovskoy, 1978a). Miocene: Trinidad (Guppy, 1904; Cushman and Jarvis, 1934), Pacific (Douglas, 1973; Resig, 1976; Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985), Indian Ocean (Boltovskoy, 1978a).

Siphonodosaria consobrina (d'Orbigny)
Pl. 11, Figs. 6–7

Dentalina consobrina D'ORBIGNY, 1846, p. 46, pl. 2, figs. 1–3.
Nodosaria (*D.*) *consobrina* (d'Orbigny).—BRADY, 1884, p. 501, pl. 62 figs. 23–24.
Nodogenerina consobrina (d'Orbigny).—MARKS, 1951, p. 55.
Siphonodosaria consobrina (d'Orbigny).—STAINFORTH, 1952, p. 12.
Stilostomella consobrina (d'Orbigny).—BARKER, 1960, p. 130, pl. 62, figs. 23–24.—BOERSMA, 1986, pl. 13, figs. 4–5.

Description. Test free, uniserial, slender, gradually tapering to the initial end. Chambers inflated, varying greatly in relative height. Sutures distinct, flush with surface. Wall calcareous, smooth, finely perforate. Aperture terminal, on a cylindrical neck, with a lip.

Distribution in 586A. Siphonodosaria consobrina is a rare species with scattered occurrences.

Recorded Distribution. Siphonodosaria consobrina was described from the Miocene of the Vienna Basin, Austria. Holocene: Pacific (Brady, 1884). Miocene: Central Europe (d'Orbigny, 1846; Marks, 1951), Pacific (Boersma, 1986).

Siphonodosaria lepidula (Schwager)
Pl. 11, Figs. 8–9

Nodosaria lepidula SCHWAGER, 1866, p. 210, pl. 5, figs. 27–28.—CUSHMAN, 1921, p. 203, pl. 36, fig. 6.
Nodosaria monilis SILVESTRI, 1872, p. 71, pl. 8, figs. 173–183.
Sagrina virgula BRADY, 1879, p. 61, pl. 8, figs. 19–21.—BRADY, 1884 (part), p. 583, pl. 76, figs. 9?, 10 (not 4–8).
Nodosaria lepidula Schwager var. *hispidula* CUSHMAN, 1917b, p. 654.—CUSHMAN, 1921, p. 203–204, pl. 36, fig. 7.
Nodosaria antillea CUSHMAN, 1923, p. 91, pl. 14, fig. 9.
Nodogenerina lepidula (Schwager).—CUSHMAN, 1934, p. 122, pl. 14, figs. 15–16.
Ellipsonodosaria lepidula (Schwager).—CUSHMAN, 1939b, p. 150.
Siphonodosaria lepidula (Schwager).—THALMANN, 1950, p. 12.—CUSHMAN and others, 1954, p. 356, pl. 88, figs. 27–28.
Stilostomella antillea (Cushman).—BARKER, 1960, p. 158, pl. 76, figs. 9?, 10.—SCHNITKER, 1971, p. 212, pl. 5, figs. 3a–b.—HERMELIN and SCOTT, 1985, p. 217, pl. 5, fig. 5.
Stilostomella lepidula (Schwager).—KELLER, 1980, pl. 1, fig. 7.—BOERSMA, 1984a, pl. 7, fig. 9.—BOERSMA, 1984b, pl. 2, figs. 13–14.—KOHL, 1985, p. 64–65, pl. 19, figs. 4a–d.—THOMAS, 1985, p. 678, pl. 14, fig. 8.—BOERSMA, 1986, p. 990, pl. 16, figs. 1–2.
Stilostomella lepidula (Schwager) trans. *Siphonodosaria insecta* (Schwager).—BOERSMA, 1986, p. 990, pl. 16, figs. 3–4.
Siphonodosaria insecta (Schwager).—BOERSMA, 1986, p. 990, pl. 16, figs. 5–6.

Description. Test free, uniserial, slender, initial end rounded, sometimes with a short spine. Chambers subglobular, increasing in size as added, often embracing in early portion of test, more remote in the later portion. Sutures distinct, depressed. Wall calcareous, hyaline, finely perforate, fine spines encircle the lower portion of each chamber in one or more rows, upper portion of the chambers covered with very fine spines. Aperture terminal, on a distinct neck, which is ornamented with a collar of short spines, a T-shaped tooth projects into the apertural opening from the phialine lip.

Remarks. *Siphonodosaria lepidula* exhibits great variation in the degree of spinosity and in the degree of alignment of the spines. Due to these reasons many different names, specific as well as generic, have been assigned to this species. Several species should probably be regarded as junior synonyms of *S. lepidula,* e.g., *Siphonodosaria recta* (Palmer and Bermúdez), *Siphonodosaria paucistriata* (Galloway and Morrey), *Siphonodosaria ketienziensis* (Ishizaki), and *Siphonodosaria helenae* (Samoilova).

Ecology. Ingle (1980) found this species in the lower middle bathyal zone of the eastern Pacific.

Distribution in 586A. *Siphonodosaria lepidula* appears in low frequencies throughout the studied sequence.

Recorded Distribution. *Siphonodosaria lepidula* was described from the Pliocene of Kar Nikobar, off Sumatra. Holocene: Atlantic (Brady, 1879, 1884; Cushman, 1923; Schnitker, 1971; Hermelin and Scott, 1985), Pacific (Brady, 1879, 1884; Cushman, 1921, 1934; Cushman and others, 1954; Burke, 1981), Okinawa (LeRoy, 1964). Pleistocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984b), Pacific (Keller, 1980; Thomas, 1985). Pliocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984a, b), Mexico (Kohl, 1985), Pacific (Keller, 1980; McDougall, 1985; Thomas, 1985; Boersma, 1986), Java (Saint-Marc and Suminta, 1979), Sumatra (Schwager, 1866). Miocene: Atlantic (Boersma, 1984a, b), Pacific (Douglas, 1973; McDougall, 1985; Thomas, 1985), Java (Saint-Marc and Suminta, 1979).

Siphonodosaria sp. 1
Pl. 11, Figs. 10–12

Description. Test free, uniserial, initial end rounded. Chambers subglobular, increasing in size as added, often strongly embracing in early portion of test. Sutures distinct, depressed. Wall calcareous, hyaline, finely perforate, very long and fine spines encircle the lower portion of each chamber. In well-preserved specimens the spines can be one and one-half times as long as the chambers, the upper portion of the chambers is covered with fine spines. Aperture terminal, on a distinct neck, which is ornamented with a collar of short spines, a club-formed tooth projects into the apertural opening from the dentate phialine lip.

Remarks. *Siphonodosaria* sp. 1 differs from *S. lepidula* in its more embracing chambers and strongly developed spines that cover the lower part of the last-formed chambers.

Distribution in 586A. *Siphonodosaria* sp. 1 is a rare species with few occurrences.

Siphonodosaria sp. 2
Pl. 11, Figs. 13–14

Description. Test free, uniserial, initial end pointed. Chambers subglobular, increasing in size as added, often strongly embracing in early portion of test. Sutures distinct, depressed in later stages. Wall calcareous, hyaline, finely perforate, small spines cover the later chambers. Earlier chambers ornamented with low irregular costae. Aperture terminal, on a distinct neck, which is ornamented with a collar of short spines, a club-formed tooth projects into the apertural opening from the dentate phialine lip.

Remarks. *Siphonodosaria* sp. 2 differs from *S.* sp. 1 in its less spinose test and costate early portion of the test.

Distribution in 586A. *Siphonodosaria* sp. 2 is a rare species with few occurrences.

Siphonodosaria sp. 3
Pl. 11, Figs. 15, 19

Description. Test free, uniserial, initial end pointed. Chambers subglobular, increasing in size as added, often strongly embracing in early portion of test. Sutures distinct, depressed in later stages. Wall calcareous, hyaline, finely perforate, small spines cover the later chambers. Earlier chambers ornamented with high straight costae running from the initial part to the base of the penultimate chamber. Aperture terminal, on a distinct neck, which is ornamented with an irregular collar, a club-formed tooth projects into the apertural opening from the dentate phialine lip.

Remarks. *Siphonodosaria* sp. 3 differs from *S.* sp. 2 in its high and thin costae in the initial portion of the test.

Distribution in 586A. *Siphonodosaria* sp. 3 is a rare species with few occurrences.

Family BULIMINIDAE Jones, 1875
Subfamily BULIMININAE Jones, 1875
Genus **BULIMINA** d'Orbigny, 1826

Bulimina fijiensis Cushman
Pl. 11, Fig. 18

Bulimina fijiensis CUSHMAN, 1933b, p. 79, pl. 8, figs. 7a–c.—CUSHMAN and PARKER, 1940, p. 17, pl. 3, figs. 15–16.—

CUSHMAN, 1942, p. 11–12, pl. 3, figs. 10–11.—CUSHMAN and PARKER, 1947, p. 127, pl. 29, figs. 14–15.

Description. Test free, triserial, small, stout, slightly longer than broad, rounded in cross-section. Chambers inflated, globular, increasing rapidly in size as added. Sutures distinct, slightly depressed. Wall calcareous, coarsely perforate. Aperture loop-shaped, close to the junction between the penultimate and antepenultimate chambers and extending to the apex of the test.

Distribution in 586A. Bulimina fijiensis is a rare species with scattered occurrences.

Recorded Distribution. Bulimina fijiensis was described from shallow water (22 m) off Nairari, Fiji. Holocene: Pacific (Chushman, 1933b).

Bulimina mexicana Cushman
Pl. 11, Fig. 16

Bulimina inflata Seguenza.—BRADY, 1884, p. 406–407, pl. 51, figs. 10–13 (not *Bulimina inflata* Seguenza, 1862b).
Bulimina inflata Seguenza var. *mexicana* CUSHMAN, 1922a, p. 95, pl. 21, fig. 2.
Bulimina striata d'Orbigny var. *mexicana* CUSHMAN in CUSHMAN and PARKER, 1940, p. 16, pl. 3, fig. 9.—CUSHMAN and TODD, 1945, p. 40, pl. 6, fig. 10.—CUSHMAN and PARKER, 1947, p. 119, pl. 28, fig. 4.—PHLEGER and PARKER, 1951, p. 16, pl. 7, figs. 26, 32.—BANDY, 1953, p. 176, pl. 24, fig. 13.—RESIG, 1981, pl. 1, fig. 12.
Bulimina mexicana Cushman.—PHLEGER and others, 1953, p. 33, pl. 6, fig. 27.—MCDOUGALL, 1985, p. 391, pl. 3, fig. 14.—MORKHOVEN and others, 1986, p. 59–62, pl. 19, figs. 1–4.
? *Bulimina striata* d'Orbigny var. *mexicana* Cushman.—BARKER, 1960, p. 104, pl. 51, figs. 10, 12.
? *Bulimina costata* d'Orbigny.—BARKER, 1960, p. 104, pl. 51, figs. 11, 13.
Bulimina striata mexicana Cushman.—AKERS and DORMAN, 1964, p. 29, pl. 7, fig. 15.—BOERSMA, 1984b, p. 663, pl. 2, figs. 11–12.—KOHL, 1985, p. 67, pl. 20, figs. 4a–e.
Bulimina striata mexicana Cushman and Parker [sic].—INGLE and others, 1980, p. 131, pl. 4, fig. 4.

Description. Test free, triserial, conical in outline, widest across the last-formed whorl. Chambers inflated, increasing in size as added, slightly overhanging the previous ones. Sutures distinct in the last whorl, depressed, obscured in the earlier whorls by the overlapping chambers. Wall calcareous, hyaline, ornamented with thick costae on lower half of each chamber, extending downward across the sutures of previous chambers forming spines at the chamber margins, finely perforated in the troughs between costae, often with a prominent spine in the initial part. Aperture an elongate narrow loop extending from the junction of the penultimate and antepenultimate chambers to the apex of the test, with a lip surrounding the margin of the opening.

Remarks. Bulimina mexicana was originally described by Cushman (1922a) as a variety of *Bulimina inflata* Seguenza, but has generally been regarded as a variety of *Bulimina striata* d'Orbigny. *B. striata* differs from *B. inflata* in that the costae usually are cut off at the sutures which gives a collared effect to the test, whereas in *B. inflata* the costae often cross the sutures. In addition to this feature, *B. striata* has a prominent spine on the initial end (Cushman and Parker, 1940). These characteristics are present in Cushman's variety but it differs from *B. striata* in having costae that terminate in short spines at the chamber margins. I have considered this form to be a separate taxon, *B. mexicana.* A closer study would probably reveal that several of the reports of *B. inflata* and *B. striata* from the Atlantic and the Pacific Ocean should be assigned to *B. mexicana.*

It should also be noted that species such as *B. bleeckeri* Hedberg, *B. costata* d'Orbigny, *B. inflata* Seguenza var. *renzi* Drooger, *B. macilenta* Cushman and Palmer, *B. nipponica* Asano, and *B. subacuminata* Cushman and Stewart are very similar and difficult to separate from *B. mexicana.* The differences between these species appears to be in the quantity and development of costae and the presence or absence of spines.

Ecology. In the Gulf of Mexico as well as in the eastern Pacific *Bulimina mexicana* is reported from the upper and the upper middle bathyal zones (Pflum and Frerichs, 1976; Ingle and Keller, 1980), although Smith (1964) found that this species occurs no shallower than the lower middle bathyal zone off the west coast of Central America. Bandy (1961) reported this species as dominant and representative of the upper part of the upper middle bathyal zone in the Gulf of Mexico.

Distribution in 586A. Bulimina mexicana is a rare species with few occurrences.

Recorded Distribution. Bulimina mexicana was described from the Holocene of the Gulf of Mexico. Its known stratigraphic range is from early Miocene through Pleistocene (Morkhoven and others, 1986). Holocene: Atlantic (Phleger and others, 1953), Gulf of Mexico (Cushman, 1922a; Cushman and Parker, 1940; Phleger and Parker, 1951; Pflum and Frerichs, 1976), Pacific (Smith, 1964; Resig, 1981). Pleistocene: Atlantic (Boersma, 1984b), Gulf of Mexico (Akers and Dorman, 1964), Pacific (McDougall, 1985). Pliocene: Atlantic (Boersma, 1984b), Jamaica (Cushman and Todd, 1945), Mexico (Kohl, 1985), Pacific (McDougall, 1985). Miocene: Atlantic (Boersma, 1984a, b), Jamaica (Cushman and Todd, 1945), Pacific (McDougall, 1985).

Bulimina truncana Guembel
Pl. 12, Figs. 1–3

Bulimina trucana GUEMBEL, 1868, p. 644, pl. 2, figs. 77a–b.—HANTKEN, 1875, p. 61, pl. 7, fig. 5.—CUSHMAN and PARKER, 1937, p. 66, pl. 9, fig. 3.—CUSHMAN and PARKER, 1947, p. 89, pl. 21, figs. 7–8.—BOERSMA, 1986, p. 988, pl. 5, figs. 2–5.

Description. Test free, triserial, widest near the apertural end, initial end pointed, circular in cross-section, chambers slightly inflated. Sutures indistinct, slightly depressed. Wall calcareous, hyaline, coarsely perforated, ornamented with 10–14 straight longitudinal costae running from the initial end to the base of the last-formed chamber, often with a basal spine. Aperture an elongate slit with a toothplate located in a depression in the inner margin of the ultimate chamber.

Remarks. This species exhibits great variability in the number of costae, their height, their orientation relative to the test axis, and the number of smooth chambers at the apertural end. This has resulted in a large number of names in the literature: small forms with few (10–12) costae which begin almost at the aperture have been called *Bulimina rostrata* Brady; forms with numerous (>15), slightly wave-shaped costae which do not cover the two or three last-formed chambers are usually called *Bulimina alazanensis* Cushman. *Bulimina truncana* as it was described by Cushman and Parker (1937) is close to *B. alazanensis* but with fewer and more straight costae which end at the base of the smooth ultimate chamber. My specimens are similar to the description of *B. truncana* and this older taxon is therefore used.

Distribution in 586A. Bulimina truncana is a common species with relative abundances up to 10.4%.

Recorded Distribution. Bulimina truncana was described from the Eocene of Hungary. Pliocene: Pacific (Boersma 1986). Miocene: Pacific (Boersma 1986).

Bulimina yonabaruensis LeRoy
Pl. 11, Fig. 17

Bulimina yonabaruensis LEROY, 1964, p. 30, pl. 11, fig. 1. *Bulimina* aff. *pyrula spinescens* Brady.—BUTT, 1980, pl. 8, fig. 22, pl. 9, fig. 30.

Description. Test free, about twice as long as broad, last three or four chambers making up three-fourths of the test. Sutures distinct, depressed. Wall calcareous, hyaline, smooth, finely perforate, ornamented with minute spines on the lower margins of the chambers. Aperture, a narrow loop along the suture, extending from the base of the ultimate chamber to the apex of the test.

Distribution in 586A. Bulimina yonabaruensis is represented by two specimens at 92.8 m.

Recorded Distribution. Bulimina yonabaruensis was described from the upper Miocene of Okinawa. Pleistocene: Pacific (Butt, 1980). Miocene: Okinawa (LeRoy, 1964).

Family UVIGERINIDAE Haeckel, 1894
Genus **UVIGERINA** d'Orbigny, 1826

There are three main groups of uvigerinids: smooth or finely pitted forms, coarsely spinose forms, and costate forms. The two latter intergrade with each other and display an ornamentation varying from straight longitudal costae to aligned spines. Several authors have used the type and degree of ornamentation for taxonomic purposes. For an extensive guide to Neogene uvigerinids see Boersma (1984c).

Because of the current differences in criteria used for identification of the various uvigerinids, in this study a very broad concept of the different species has been used where *U. auberiana* contains finely pitted forms, *U. hispida* coarsely hispid forms, and *U. peregrina* most forms with a costate and/or aligned hispid ornamentation. This broad concept should be kept in mind when comparing the results with other studies.

Uvigerina auberiana d'Orbigny
Pl. 12, Figs. 4–5

Uvigerina auberiana D'ORBIGNY, 1839a, p. 106, pl. 2, figs. 23–24.—CUSHMAN, 1923, p. 163, pl. 42, figs. 3–4.—PHLEGER and others, 1953, p. 37, pl. 7, figs. 30–35.—LEROY and LEVINSON, 1974, p. 9, pl. 5, fig. 12.—LOHMANN, 1978, p. 26, pl. 4, fig. 16.—INGLE and others 1980, pl. 6, fig. 1.—RESIG, 1981, pl. 2, fig. 2.—BOERSMA, 1984a, pl. 7, fig. 8.—BOERSMA, 1984b, pl. 3, fig. 4.—HERMELIN and SCOTT, 1985, p. 218, pl. 3, fig. 8.—BOERSMA, 1986, pl. 20, fig. 1.

Uvigerina proboscidea SCHWAGER, 1866, p. 250, pl. 7, fig. 96.—CUSHMAN, 1913, p. 94, pl. 42, figs. 2a–b.—CUSHMAN, 1942, p. 49–50, pl. 14, figs. 1–4.—CUSHMAN and TODD, 1945, p. 50, pl. 7, figs. 28a–b.—LEROY, 1964, p. 35, pl. 16, fig. 8.—DOUGLAS, 1973, pl. 8, fig. 8.—BOLTOVSKOY, 1978a, pl. 8, figs. 22–23.—BOERSMA, 1984a, pl. 8, fig. 3.—BOERSMA, 1984b, pl. 3, figs. 5, 8.—BOERSMA, 1986, pl. 20, fig. 2.—KURIHARA and KENNETT, 1986, pl. 3, fig. 6.

Uvigerina proboscidea Schwager var. *vadescens* CUSHMAN, 1933b, p. 85, pl. 8, figs. 14–15.—CUSHMAN, 1942, p. 50–51, pl. 14, figs. 5–9.—LEROY, 1964, p. 35, pl. 3, fig. 38.

Uvigerina ampullacea Brady.—CUSHMAN, 1913, p. 102, pl. 42, figs. 3a–b.—CUSHMAN, 1921, p. 274–275, pl. 55, fig. 7.—CUSHMAN, 1942, p. 46–48, pl. 13, figs. 2–6.

Uvigerina vadescens (Cushman).—DOUGLAS, 1973, pl. 8, fig. 7.

Siphouvigerina interrupta (Brady).—BURKE, 1981, pl. 1, fig. 16 (not *Uvigerina interrupta* Brady, 1879).

Siphouvigerina auberiana (d'Orbigny).—KOHL, 1985, p. 70–71, pl. 22, figs. 7–8, pl. 23, fig. 1.

Description. Test free, initial part triserial, later twisted biserial, circular in cross-section, about twice as long as wide, widest in middle or below, initial end blunt, sometimes with small spine, tapering towards the apertural neck. Aperture terminal, at end of a long neck with a distinct collar. Wall calcareous, hyaline, finely perforate, ornamented with small spines randomly distributed over the test.

Remarks. Numerous small, finely pitted uvigerinid species have been described in the literature and many of them seem to be conspecific with *U. auberiana* and are therefore regarded as junior synonyms to this species. Boltovskoy (1978a) described several variants of what he called *U. proboscidea.* In addition to the species in the synonymy above, some other species might after further investigation be regarded as junior synonyms of *U. auberiana*, e.g., *Uvigerina asperula* Cžjžek, *Uvigerina interrupta* Brady and *Uvigerina senticosa* Cushman. The species figured by Burke (1981) as *Siphouvigerina interrupta* (Brady) is regarded as synonymous with *U. auberiana.*

In my material there are several specimens belonging to *U. auberiana* that exhibit dual apertures, either located on the ultimate chamber or on dual ultimate chambers.

Ecology. In the Gulf of Mexico, *U. auberiana* has a bathymetric range of from the lower neritic zone to the upper middle bathyal zone (Pflum and Frerichs, 1976). Smith (1964) reported this species from the upper middle to lower bathyal zones off the west coast of Central America, whereas Boltovskoy (1978a, p. 171) described finely hispid uvigerinids as "common dwellers of great depths in the Recent and Neogene oceans."

Distribution in 586A. Uvigerina auberiana is by far the most abundant species in this material. It occurs in all samples and the relative abundance varies from 2.6 to 45.2%.

Recorded Distribution. Uvigerina auberiana was described from the Holocene of the Caribbean Sea. The known stratigraphic range of *U. auberiana* s.s. is from the middle Oligocene to the Recent. Holocene: Atlantic (Cushman, 1923; Phleger and others, 1953; Lohmann, 1978; Hermelin and Scott, 1985), Pacific (Cushman, 1913, 1921, 1933b, 1942; Smith, 1964; Ingle and others, 1980; Burke, 1981; Resig, 1981), Guam (Todd, 1966), Indian Ocean (Boltovskoy, 1978a). Pleistocene: Atlantic (Boersma, 1984b), Gulf of Mexico (LeRoy and Levinson, 1974), Pacific (Douglas, 1973). Pliocene: Atlantic (Boersma, 1984a, b; Hermelin, 1986), Mexico (Kohl, 1985), Pacific (Douglas, 1973; Boersma, 1986; Kurihara and Kennett, 1986), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a). Miocene: Atlantic (Boersma, 1984a, b; Murray, 1984), Jamaica (Cushman and Todd, 1945), Pacific (Boersma, 1986; Kurihara and Kennett, 1986), Guam (Todd, 1966), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a).

Uvigerina hispida Schwager

Uvigerina hispida SCHWAGER, 1866, p. 249, pl. 7, fig. 95.—LEROY, 1941, p. 82, pl. 2, fig. 15.—LEROY, 1964, p. 34, pl. 4, figs. 2–3.—LEROY and LEVINSON, 1974, p. 10, pl. 5, figs. 16–17.—PFLUM and FRERICHS, 1976, pl. 8, figs. 8–10.—BOLTOVSKOY, 1978a, pl. 8, figs. 12–16.—INGLE and others, 1980, pl. 8, fig. 8.—BOERSMA, 1984a, pl. 5, fig. 3.—BOERSMA, 1984b, pl. 3, figs. 6–7.—BOERSMA, 1986, pl. 20, figs. 5–6.—KURIHARA and KENNETT, 1986, pl. 3, figs. 7–8.—MORKHOVEN and others, 1986, p. 62–64, pl. 20, figs. 1–4.

Euuvigerina hispida (Schwager).—BELFORD, 1966, p. 78, pl. 7, figs. 14–16.

Description. Test free, triserial, elongate, one-and-one-half to two-and-one-half times as long as wide, initial end blunt. Sutures indistinct, depressed. Wall calcareous, perforate, ornamented with very coarse spines. Aperture terminal, on a short neck, with a phialine lip.

Remarks. Uvigerina hispida is an easily recognized species because of its very coarse, non-aligned spines. Some specimens that have been referred to *Uvigerina aculeata* d'Orbigny may belong in *U. hispida.*

Ecology. In the Gulf of Mexico, *U. hispida* has a depth range from the abyssal zone to the top of the lower middle bathyal zone (Pflum and Frerichs, 1976). In the Gulf of California, this species is representative of the upper part of the upper middle bathyal zone (Bandy, 1961).

Distribution in 586A. Uvigerina hispida is a species with very scattered occurrences and a relative abundance of up to 3.5%.

Recorded Distribution. Uvigerina hispida was described from the middle Pliocene of Kar Nikobar, off Sumatra. The known stratigraphic range of *U. hispida* s.s. is from the middle Miocene to the Recent (Boersma, 1984c). Holocene: Pacific (Ingle and others, 1980), Gulf of Mexico (Pflum and Frerichs, 1976). Pleistocene: Atlantic (Boersma, 1984b), Gulf of Mexico (LeRoy and Levinson, 1974). Pliocene: Atlantic (Boersma, 1984a, b; Hermelin, 1986), Pacific (Boersma, 1986; Kurihara and Kennett, 1986), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Sumatra (Schwager, 1866). Miocene: Atlantic (Boersma, 1984b), Pacific (Boersma, 1986; Kurihara and Kennett, 1986), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a).

Uvigerina peregrina Cushman
Pl. 12, Figs. 6–8

Uvigerina bradyana FORNASINI, 1900, p. 390, text-fig. 40.—BARKER, 1960, p. 156, pl. 74, figs. 24–26.
Uvigerina peregrina CUSHMAN, 1923, p. 166, pl. 42, figs. 7–10.—GALLOWAY and WISSLER, 1927, p. 76, pl. 12, figs. 1, 2a–b.—AKERS and DORMAN, 1964, p. 58, pl. 9, fig. 26.—SMITH, 1964, p. 84, pl. 2, figs. 15–16.—MURRAY, 1971, p. 121, pl. 50, figs. 1–7.—DOUGLAS, 1973, pl. 8, figs. 4–6, 9.—LEROY and LEVINSON, 1974, p. 10, pl. 5, fig. 18.—BOLTOVSKOY, 1978a, pl. 8, figs. 4–5.—LOHMANN, 1978, p. 26, p. 4, figs. 14–15.—COLE, 1981, p. 92, pl. 10, fig. 9.—BOERSMA, 1984a, pl. 7, fig. 6.—BOERSMA, 1984b, pl. 3, fig. 3.—HERMELIN and SCOTT, 1985, p. 218, pl. 3, fig. 10.—KOHL, 1985, p. 73–74, pl. 24, fig. 7.—MEAD, 1985, p. 229, pl. 1, figs. 7–10.—KURIHARA and KENNETT, 1986, pl. 3, figs. 1–3.
Uvigerina mediterranea HOFKER, 1932, p. 118, text-figs. 32a–g.
Uvigerina canariensis d'Orbigny var. *spinulosa* HADLEY, 1934, p. 18, pl. 2, fig. 17.
Hopkinsina bortotara FINLAY, 1939b, p. 104, pl. 12, figs. 22–24.
Uvigerina interrupta-costata LEROY, 1944, p. 31, pl. 8, fig. 44.—BOERSMA, 1986, p. 990, pl. 20, fig. 7.
Uvigerina hispido-costata CUSHMAN and TODD, 1945, p. 51, pl. 7, figs. 27, 31.—LEROY, 1964, p. 35, pl. 16, fig. 7.—BOERSMA, 1984a, pl. 7, fig. 7.—BOERSMA, 1986, pl. 20, figs. 3–4.
Uvigerina peregrina Cushman var. *dirupta* TODD in CUSHMAN and MCCULLOCH, 1948, p. 267, pl. 34, fig. 3.—LEROY, 1964, p. 34, pl. 4, fig. 4.—PFLUM and FRERICHS, 1976, pl. 8, figs. 4–5.—INGLE and others, 1980, pl. 5, figs. 16–17.
Uvigerina spinulosa (Hadley).—DOUGLAS, 1973, pl. 8, fig. 11.—BOERSMA, 1984a, pl. 3, fig. 9.
Uvigerina dirupta Cushman and Todd [sic].—BOERSMA, 1986, pl. 19, figs. 3–4.
Uvigerina hollicki THALMANN, 1950, p. 45.—PHLEGER and others, 1953, pl. 8, fig. 1.
Uvigerina bassensis PARR, 1950, p. 340–341, pl. 12, figs. 19–20.
Euvigerina peregrina (Cushman).—HOFKER, 1951, p. 219–226.—HOFKER, 1956b, p. 82–84, pl. 9, figs. 14–19.—BARKER, 1960, p. 154, pl. 74, figs. 11–12.
Uvigerina peregrina Cushman var. *mediterranea* Hofker.—PFLUM and FRERICHS, 1976, pl. 8, fig. 1.
Uvigerina peregrina Cushman var. *peregrina* Cushman.—PFLUM and FRERICHS, 1976, pl. 8, figs. 2–3.
Uvigerina peregrina var. A.—INGLE and others, 1980, pl. 3, fig. 6.
Uvigerina peregrina sp. B.—INGLE and others, 1980, p. 146, pl. 5, figs. 14–15.
Uvigerina bortotara (Finlay).—BOERSMA, 1986, p. 990, pl. 19, fig. 6.

Description. Test free, triserial, elongate, one-and-one-half to two times as long as wide, widest portion above the middle. Sutures indistinct, depressed. Wall calcareous, perforated, ornamented by numerous blade-like costae on each chamber, costae do not continue from one chamber to another. Aperture terminal, on a short neck, with a phialine lip.

Remarks. Some workers separate various species of *Uvigerina* and subspecies of *U. peregrina* on the basis of the portion of hispid or costate covering of the test. In addition to this the geographic distribution has "created" some species, for example, *U. bortotara* (Finlay) in the Pacific, *U. hollicki* Thalmann in the North Atlantic, and *U. mediterranea* Hofker in the Mediterranean. Today many workers recognize most of the morphologic variability in *U. peregrina* as due to ecophenotypic variation. The concept of *U. peregrina* used herein includes most uvigerinids with a costate and/or aligned hispid ornamentation.

Ecology. In the Gulf of Mexico, the costate form has a depth range from the lower neritic zone to the upper middle bathyal zone, whereas the more hispido-costate forms have upper depth limits within the upper middle bathyal zone and lower limits in the upper abyssal zone (Pflum and Frerichs, 1976). Mead (1985) found this species to be common in the lower bathyal zone of the South Atlantic. In the Gulf of California, *U. peregrina* is found mostly in the bathyal zone (Matoba and Yamaguchi, 1982). Off the west coast of Central America, it is found in the middle bathyal zone (Smith, 1964). *Uvigerina peregrina* is a dominant member of many faunas typically signifying upper North Atlantic Deep Water, Circum Polar Water, and Intermediate Bottom Water, lowered oxygen content, and high temperature and salinity (Streeter, 1973; Lohmann, 1978; Corliss, 1979; Schnitker, 1979, 1980).

Distribution in 586A. Uvigerina peregrina is a common species that occurs mainly above 120 m. The highest relative abundance is 17.2% which is at the level where *U. auberiana* exhibits its lowest relative abundance.

Recorded Distribution. Uvigerina peregrina was described from the Holocene of the Atlantic. The known stratigraphic range of *U. peregrina* s.s. is from the middle Pliocene to the Holocene (Boersma, 1984c), but since a wider concept of the species is used here the first occurrence probably goes back to the Oligocene. Holocene: Atlantic (Brady, 1884; Cushman, 1923; Murray, 1971; Lohmann, 1978; Cole, 1981; Hermelin and Scott, 1985; Mead, 1985), Caribbean (Brady, 1884; Hofker, 1956b), Gulf of Mexico (Wright and Hay, 1971; Pflum and Frerichs, 1976), Mediterranean (Fornasini, 1900; Hofker, 1932), Pacific (Brady, 1884; Matoba, 1976; Ingle and others, 1980), Indian Ocean (Boltovskoy, 1978a). Pleistocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984b; Murray, 1984), Gulf of Mexico (Akers and Dorman, 1964), California (Galloway and Wissler, 1927), Pacific (Douglas, 1973; Kurihara and Kennett, 1986). Pliocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984a, b; Murray, 1984; Hermelin, 1986), Mexico (Kohl, 1985), Pacific (Douglas, 1973; Boersma, 1986; Kurihara and Kennett, 1986), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Indian Ocean

(Boltovskoy, 1978a). Miocene: Atlantic (Boersma, 1984a, b; Murray, 1984), Jamaica (Cushman and Todd, 1945), Pacific (Douglas, 1973; Boersma, 1986; Kurihara and Kennett, 1986), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Sumatra (LeRoy, 1944), Indian Ocean (Boltovskoy, 1978a).

Superfamily DISCORBACEA Ehrenberg, 1838
Family DISCORBIDAE Ehrenberg, 1838
Subfamily DISCORBINAE Ehrenberg, 1838
Genus **DISCORBINELLA** Cushman and Martin, 1935

Discorbinella bertheloti (d'Orbigny)
Pl. 12, Figs. 9–10

Rosalina bertheloti D'ORBIGNY, 1839c, p. 135, pl. 1, figs. 28–30.
Discorbina bertheloti (d'Orbigny).—BRADY, 1884 (part), p. 650–651, pl. 89, figs. 11–12 (not 10).
Discorbis bertheloti (d'Orbigny).—CUSHMAN, 1915, p. 20, pl. 7, fig. 3, text-fig. 23.—CUSHMAN, 1921, p. 305–306, pl. 59, figs. 1a–c.—PHLEGER and PARKER, 1951, p. 20, pl. 10, figs. 17–19.—PHLEGER and others, 1953, p. 39, p. 8, figs. 15a–b.
Rosalina bertheloti d'Orbigny.—PARKER, 1954, p. 523, pl. 8, figs. 22–23.
Discopulvinulina bertheloti (d'Orbigny).—HOFKER, 1956b, p. 184, pl. 27, figs. 22–25, pl. 28, fig. 1.—BARKER, 1960, p. 184, pl. 89, figs. 11–12.
Discorbinella bertheloti (d'Orbigny).—LOEBLICH and TAPPAN, 1964, p. C575, text-fig. 453, figs. 3a–b.—BELFORD, 1966, p. 90–91, pl. 12, figs. 15–22, text-fig. 8:1–2, 9:1–2.—LECALVEZ, 1974, p. 59–60, pl. 14, fig. 2.—SCHNITKER, 1971, p. 196, pl. 5, figs. 17a–c.—HERMELIN and SCOTT, 1985, p. 206, pl. 3, figs. 14–15.

Description. Test free, trochospiral, compressed, concavo-convex, spiral side convex, nearly involute, umbilical side slightly concave, umbilicate but nearly involute, periphery keeled. Sutures distinct, curved, slightly depressed. Wall calcareous, hyaline, smooth, finely perforate. Aperture an interiomarginal arch, supplementary openings formed by overlapping of umbilical chamber flaps.

Remarks. As stated by Barker (1960), the species *Discorbinella subbertheloti* proposed by Cushman (1924b) is very close to *Discorbinella bertheloti* and might be considered a junior synonym of *D. bertheloti. D. bertheloti* differs from *D. floridensis* (Cushman) in having a greater number of chambers (six to eight) in the last whorl, *D. floridensis* has only four to five.

Ecology. Discorbinella bertheloti is found in the neritic zone of the Atlantic Ocean (Phleger and others, 1953, Schnitker, 1971).

Distribution in 586A. Discorbinella bertheloti is a very rare species with scattered occurrences above 90 m.

Recorded Distribution. Discorbinella bertheloti was described from the Holocene of Teneriffe in the Canaries. Holocene: Atlantic (d'Orbigny, 1839c; Brady, 1884; Phleger and others, 1953; Schnitker, 1971; Hermelin and Scott, 1985), Gulf of Mexico (Phleger and Parker, 1951; Parker, 1954), Mediterranean (Brady, 1884), Pacific (Brady, 1884; Cushman, 1915, 1921), Arctic Ocean (Brady, 1884). Pleistocene: Pacific (Kurihara and Kennett, 1986). Pliocene: Pacific (Kurihara and Kennett, 1986). Pliocene: Pacific (Kurihara and Kennett, 1986), Papua-New Guinea (Belford, 1966). Miocene: Pacific (Kurihara and Kennett, 1986), Papua-New Guinea (Belford, 1966).

Genus **EPISTOMINELLA** Husezima and Maruhasi, 1944

Epistominella exigua (Brady)

Pulvinulina exigua BRADY, 1884, p. 696, pl. 103, figs. 13–14.—CUSHMAN, 1921, p. 340, pl. 68, figs. 3a–c.
Pulvinulinella exigua (Brady).—WIESNER, 1931, p. 121.—PARR, 1950, p. 361.
Pseudoparrella exigua (Brady).—CUSHMAN and PARKER, 1931, p. 21.—PHLEGER and PARKER, 1951, p. 28, pl. 15, figs. 6a–b, 7a–b.
Eponides exigua (Brady).—CUSHMAN, 1931a, p. 44–45, pl. 10, figs. 1–2.
Eponides exiguus (Brady).—CHAPMAN and PARR, 1937, p. 107.
Epistominella exigua (Brady).—PHLEGER and others, 1953, p. 43, pl. 9, figs. 35–36.—PARKER, 1954, p. 533, pl. 10, figs. 22–25.—BARKER, 1960, p. 212, pl. 103, figs. 13–14.—SMITH, 1964, p. 43, pl. 4, figs. 6a–b.—TODD, 1965, p. 30–31, pl. 10, fig. 1.—RESIG, 1976, pl. 3, fig. 1.—BOLTOVSKOY, 1978a, pl. 3, figs. 37–38.—CORLISS, 1979, p. 7, pl. 2, figs. 7–9.—BURKE, 1981, pl. 2, figs. 1–2.—COLE, 1981, p. 95, pl. 11, fig. 2.—RESIG, 1981, pl. 6, figs. 6–7.—MURRAY, 1984, pl. 2, figs. 1–2.—HERMELIN and SCOTT, 1985, p. 208, p. 4, fig. 1.—MEAD, 1985, p. 230, pl. 2, figs. 1–4.—KURIHARA and KENNETT, 1986, pl. 3, figs. 10–12.

Description. Test free, trochospiral, all chambers visible on spiral side, only those of last whorl on umbilical side. Sutures flush with surface, oblique on spiral side, nearly radial on umbilical side. Wall calcareous, hyaline, smooth, finely perforate. Aperture an elongate vertical slit, parallel to the periphery.

Remarks. Epistominella exigua is a relatively small species. Hence, *E. exigua* is often excluded or underrepresented in studies that use the >125 μm or larger size fraction (for detailed discussion see Hermelin, 1986). *E. exigua* differs from *Epistominella vitrea* Parker in having 5 to 5½ instead of 6 to 6½ chambers per whorl and a more angled periphery.

Ecology. Schnitker (1980) considered *Epistominella exigua* as an "index species" characterizing ABW and the lower NADW. Mead (1985) reported it from the bathyal zone of the South Atlantic, whereas Smith (1964) found it in the neritic zone off the west coast of Central America. Bandy (1961) found this species in the upper middle bathyal zone in the Gulf of California, with abundances up to 22% of the total fauna.

Distribution in 586A. Epistominella exigua is a common species that occurs in most samples with a relative abundance of up to 6.9%.

Recorded Distribution. Epistominella exigua was described from the Holocene of the Atlantic. Holocene: Atlantic (Brady, 1884; Phleger and others, 1953; Schnitker, 1980; Hermelin and Scott, 1985; Mead, 1985), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Brady, 1884; Cushman, 1921; Smith, 1964; Todd, 1965; Ingle and others, 1980; Burke, 1981; Resig, 1981), Indian Ocean (Boltovskoy, 1978a; Corliss, 1979), Antarctic Ocean (Brady, 1884; Earland, 1934; Chapman and Parr, 1937; Parr, 1950). Pleistocene: Atlantic (Blanc-Vernet, 1983; Murray, 1984), Pacific (Resig, 1976; McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Murray, 1984), Pacific (Resig, 1976; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Indian Ocean (Boltovskoy, 1978a). Miocene: Atlantic (Murray, 1984), Pacific (Resig, 1976; Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986), Indian Ocean (Boltovskoy, 1978a).

Genus **GAVELINOPSIS** Hofker, 1951

Gavelinopsis lobatulus (Parr)
Pl. 12, Figs. 11–13

Discorbina isabelleana (d'Orbigny).—BRADY, 1884, p. 646, pl. 88, figs. 1a–c (not *Rosalina isabelleana* d'Orbigny, 1839b).
Discorbis lobatulus PARR, 1950, p. 354, pl. 13, figs. 23–25.
Gavelinopsis lobatulus (Parr).—BARKER, 1960, p. 182, pl. 88, figs. 1a–c.—BOLTOVSKOY, 1978a, pl. 4, figs. 12–13.—BUTT, 1980, pl. 6, figs. 21–22.

Description. Test free, trochospiral, biconvex, periphery keeled and slightly lobate. All chambers visible on spiral side, but only those of the last whorl on the more or less flat umbilical side. Prominient umbilical plug in center of umbilical side. Sutures curved backward at spiral side, nearly radial and slightly depressed on umbilical side. Wall calcareous, hyaline, finely perforate. Aperture a low interiomarginal slit a short distance from periphery on umbilical side, with a narrow lip.

Distribution in 586A. Gavelinopsis lobatulus is a rare species with scattered occurrences.

Recorded Distribution. Gavelinopsis lobatulus was described from the Holocene off the coast of Tasmania. Holocene: Pacific (Brady, 1884; Parr, 1950). Pliocene: Pacific (Kurihara and Kennett, 1986), Indian Ocean (Boltovskoy, 1978a). Miocene: Pacific (Butt, 1980; Kurihara and Kennett, 1986).

Family GLABRATELLIDAE Loeblich and Tappan, 1964

Genus **HERONALLENIA** Chapman and Parr, 1931

Heronallenia lingulata (Burrows and Holland)
Pl. 12, Figs. 14, 18

Discorbina biconcava Parker and Jones.—BRADY, 1884 (part), p. 653, pl. 91, figs. 3a–c (not 2a–c) (not *Discorbina biconcava* Parker and Jones, 1865).
Discorbina lingulata BURROWS and HOLLAND in JONES, 1895, pl. 7, figs. 33a–c.
Heronallenia wilsoni (Heron-Allen and Earland).—HERMELIN and SCOTT, 1985, p. 210, pl. 6, fig. 8 (not *Discorbina wilsoni* Heron-Allen and Earland, 1922).
Heronallenia lingulata (Burrows and Holland).—CHAPMAN and PARR, 1931, p. 236.—BARKER, 1960, p. 188, pl. 91, figs. 3a–c.—RESIG, 1976, pl. 3, figs. 4–5.—THOMAS, 1985, p. 677, pl. 13, fig. 7.

Description. Test free, trochospiral, flat or concavo-convex, periphery carinate. Sutures more or less limbate on the spiral side. Wall calcareous, finely perforate, the umbilical side has a radially striate ornament converging upon the aperture. Aperture a strongly reflected or arched opening towards the inner edge of the ultimate chamber on the umbilical side.

Distribution in 586A. Heronallenia lingulata is a very rare species with scattered occurrences.

Recorded Distribution. Heronallenia lingulata was described from the Pliocene of England. Holocene: Atlantic (Hermelin and Scott, 1985), Pacific (Brady, 1884). Pleistocene: Pacific (Thomas, 1985). Pliocene: England (Jones, 1895). Miocene: Pacific (Resig, 1976; Thomas, 1985).

Family LATICARININIDAE Hofker, 1951

Genus **LATICARININA** Galloway and Wissler, 1927

Laticarinina halophora (Stache)

Robulina halophora STACHE, 1864, p. 248, 250, pl. 23, figs. 28–29.
Pulvinulina repanda var. *menardii* subvar. *pauperata* PARKER and JONES, 1865, p. 395, pl. 16, figs. 50, 51a–b.
Pellatispira pauperata (Parker and Jones).—CUSHMAN, 1927b, p. 114, pl. 6, fig. 13.
Pulvinulina pauperata (Parker and Jones).—CUSHMAN, 1931a, p. 114, pl. 20, figs. 4a–c, pl. 21, figs. 1a–c.
Laticarinina halophora (Stache).—FINLAY, 1940, p. 467–468.—BARKER, 1960, p. 214, pl. 104, figs. 3–11.—COLE, 1981, p. 115, pl. 14, fig. 9.—HERMELIN and SCOTT, 1985, p. 212, pl. 4, figs. 2–3.
Laticarinina pauperata (Parker and Jones).—CUSHMAN and TODD, 1942, p. 15, pl. 4, figs. 1–6.—LEROY, 1964, p. 44, pl.

9, fig. 25.—PFLUM and FRERICHS, 1976, pl. 1, fig. 10.—BURKE, 1981, pl. 2, fig. 3.—KOHL, 1985, p. 77, pl. 26, fig. 1.—THOMAS, 1985, pl. 11, fig. 10.

Description. Test free, slightly trochoid, compressed, biconvex to planoconvex in edge view, periphery with broad thin transluctant keel. Wall calcareous, hyaline, finely perforate. Aperture interiomarginal, umbilical-extraumbilical with a distinct lip.

Remarks. This species is commonly called *Laticarinina pauperata* (Parker and Jones, 1865), although Brady indicated the Stache's species, named one year earlier (1864), was identical (Barker, 1960). The name *L. halophora*, therefore, is used here.

Distribution in 586A. Laticarinina halophora is a relatively common species with relative abundances up to 9.2%.

Recorded Distribution. Laticarinina halophora was originally described from the Holocene of the western South Pacific Ocean. Holocene: Atlantic (Cushman, 1931; Phleger and others, 1953; Barker, 1960; Cole, 1981; Hermelin and Scott, 1985; Mead, 1985), Gulf of Mexico (Phleger and Parker, 1951; Pflum and Frerichs, 1976), Pacific (Cushman, 1915, 1921, 1927b; Ingle and others, 1980; Burke, 1981), Antarctic Ocean (Barker, 1960). Pleistocene: Pacific (Douglas, 1973; Thomas, 1985). Pliocene: Atlantic (Murray, 1984), Mexico (Kohl, 1985), Pacific (Douglas, 1973; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Okinawa (LeRoy, 1964). Miocene: Atlantic (Murray, 1984), Pacific (Douglas, 1973; Woodruff and Douglas, 1981; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Guam (Todd, 1966), Okinawa (LeRoy, 1964).

Family EPISTOMARIIDAE Hofker, 1954
Genus NUTTALLIDES Finlay, 1939a

Nuttallides umbonifera (Cushman)
Pl. 12, Figs. 15–17

Truncatulina pygmaea Hantken.—BRADY, 1884, p. 666, pl. 95, figs. 9–10 (not *Truncatulina pygmaea* Hantken, 1875).
Pulvinulina umbonifera CUSHMAN, 1933b, p. 90, pl. 9, figs. 9a–c.
Eponides bradyi EARLAND, 1934, p. 187, pl. 8, figs. 36–38.—BARKER, 1960, p. 196, pl. 95, figs. 9–10.
Epistominella (?) *umbonifera* (Cushman).—PHLEGER and others, 1953, p. 43, pl. 9, figs. 33–34.
Nuttallides umboniferus (Cushman).—TODD, 1965, p. 29–30, pl. 11, fig. 1.
Nuttallides umbonifera (Cushman).—ECHOLS, 1971, p. 166, pl. 14, figs. 5a–c.—RESIG, 1976, pl. 3, figs. 6–7.—BURKE, 1981, pl. 2, figs. 5–6.—RESIG, 1981, pl. 6, figs. 13–15.—BOERSMA, 1984a, pl. 6, fig. 6, pl. 7, fig. 12.—HERMELIN and SCOTT, 1985, p. 214, pl. 5, figs. 11–13.—MEAD, 1985, p. 230–232, pl. 2, figs. 6–7.—THOMAS, 1985, pl. 13, figs. 1–2.
? *Epistominella umbonifera* (Cushman).—STREETER, 1973, p. 133.
Osangularia umbonifera (Cushman).—SCHNITKER, 1974, p. 385.
Nuttallides umbonifer (Cushman).—ANDERSON, 1975, p. 90, pl. 8, figs. 14a–c.
Osangularia rugosa (Phleger and Parker).—PFLUM and FRERICHS, 1976, pl. 7, figs. 2–4.—COLE, 1981, p. 114, pl. 20, figs. 12–13.
"*Epistominella*" *umbonifera* (Cushman).—LOHMANN, 1978, p. 26, pl. 3, figs. 1–6.
Epistominella umbonifera (Cushman).—CORLISS, 1979, p. 7, pl. 2, figs. 10–12.

Description. Test free, biconvex, ventral side often more strongly convex than the dorsal, often with umbilical plug, periphery acute. Chambers distinct, between six and nine in the last whorl, increasing slightly in size as added. Sutures distinct, slightly curved backward on the ventral side and more strongly on the dorsal. Wall calcareous, rough, finely perforate. Aperture interiomarginal, starting at the umbilical plug and extending nearly to the periphery.

Remarks. There is some uncertainty about the generic position of this species. I have followed Todd (1965) who placed it in *Nuttallides* rather than in *Epistominella* because of its umbilical plug and position of the aperture.

Ecology. Nuttallides umbonifera is regarded as an indicator of AABW in the Atlantic (Lohmann, 1978) Pacific, and Indian Oceans (Corliss, 1979). In the Atlantic Ocean, *N. umbonifera* occurs in the lower bathyal and abyssal zones whereas in the Pacific and Indian Oceans, it dominates the fauna where the coldest AABW occurs. *N. umbonifera* has not been reported from the Antarctic Ocean except at abyssal depths (Douglas and Woodruff, 1981).

Distribution in 586A. Nuttallides umbonifera is a frequent species below 52 m (0.5 to 5.0% of the total benthic foraminiferal fauna), especially in the interval 110 to 135 m (6.9 to 29.3% of the fauna).

Recorded Distribution. Nuttallides umbonifera was described from the Holocene off Paumotu Islands, Central Pacific. Holocene: Atlantic (Brady, 1884; Phleger and others, 1953; Streeter, 1973; Lohmann, 1978; Cole, 1981; Hermelin and Scott, 1985; Mead, 1985), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Cushman, 1933b; Todd, 1965; Burke, 1981; Resig, 1981), Antarctic Ocean (Anderson, 1975), Indian Ocean (Corliss, 1979). Pleistocene: Pacific (Resig, 1976; Thomas, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Boersma, 1984a), Pacific (Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986). Miocene: Atlantic (Boersma, 1984a), Pacific (Resig, 1976; Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986).

Superfamily CASSIDULINACEA d'Orbigny, 1839b
Family PLEUROSTOMELLIDAE Reuss, 1860
Subfamily PLEUROSTOMELLINAE Reuss, 1860
Genus **ELLIPSOGLANDULINA** Silvestri, 1900b

Ellipsoglandulina laevigata Silvestri

Ellipsoglandulina laevigata SILVESTRI, 1900a, p. 5, pl. 1, figs. 3–10, 12–13.—SILVESTRI, 1900b, p. 219.

Description. Test free, elongate, uniserial, with strongly overlapping chambers, tapering base. Wall calcareous, smooth. Sutures distinct. Aperture terminal, semilunate, with an internal entosolenian tube.

Distribution in 586A. Ellipsoglandulina laevigata is a rare species with scattered occurrences.

Recorded Distribution. Ellipsoglandulina laevigata was described from the Pliocene/Miocene of Italy. Pliocene: Italy (Silvestri, 1900a, b). Miocene: Italy (Silvestri, 1900a, b), Pacific (Thomas, 1985).

Genus **ELLIPSOIDELLA** Heron-Allen and Earland, 1910

Ellipsoidella cf. **E. pleurostomelloides** Heron-Allen and Earland

Ellipsoidella pleurostomelloides HERON-ALLEN and EARLAND, 1910, p. 413, 415, pl. 10, figs. 1–11, pl. 11, figs. 1–2.

Description. Test free, elongate, chambers cuneate and biserially arranged in early portion, later becoming less closely appressed and uniserial, but wedge-shaped and alternating. Later portion often rectilinear. Sutures depressed. Wall calcareous, smooth, finely perforate. Aperture terminal, an arched slit with overhanging lip.

Remarks. My material is close to *Ellipsoidella pleurostomelloides* but does not exhibit distinct depression of the sutures.

Distribution in 586A. Ellipsoidella cf. *E. pleurostomelloides* is a rare species with scattered occurrences below 98 m.

Recorded Distribution. Ellipsoidella pleurostomelloides was described from the upper Cretaceous of England.

Genus **ELLIPSOIDINA** Seguenza, 1859

Ellipsoidina ellipsoides Seguenza, emend. Brady

Ellipsoidina ellipsoides SEGUENZA, 1859, p. 12, pl. 1, figs. 1–3.—SEGUENZA, 1880, p. 226.
Ellipsoidina ellipsoides Seguenza.—BRADY, 1868 (emend.), p. 338, pl. 13, figs. 1–12.

Description. Test free, ovate, with completely enveloping uniserial chambers each attached to preceding ones at the base. Wall calcareous, smooth, finely perforate. Aperture terminal, small, semilunate.

Remarks. The genus *Ellipsoidina* differs from *Ellipsoglandulina* in being completely involute.

Distribution in 586A. Ellipsoidina ellipsoides is a very rare species with few occurrences.

Recorded Distribution. Ellipsoidina ellipsoides was described from the Miocene of Sicily. Pleistocene: Atlantic (Blanc-Vernet, 1983). Pliocene: Atlantic (Blanc-Vernet, 1983). Miocene: Italy (Seguenza, 1859).

Genus **ELLIPSOPOLYMORPHINA** Silvestri, 1901

Ellipsopolymorphina sp. 1

Description. Test free, elongate, ovate, early stage biserial, later uniserial, strongly overlapping chambers. Sutures slightly depressed. Wall calcareous, smooth. Aperture terminal, semi-lunate, with internal tube connecting apertures of adjacent chambers.

Remarks. My specimens differ from *Ellipsopolymorphina schlichti* (Silvestri) in having a rounded rather than pointed apertural end.

Distribution in 586A. Ellipsopolymorphina sp. 1 is a very rare speces with few occurrences.

Genus **NODOSARELLA** Rzehak, 1895
Nodosarella advena Cushman and Siegfus

Nodosarella advena CUSHMAN and SIEGFUS, 1939, p. 30, pl. 6, figs. 19–20.

Description. Test free, elongate, straight, uniserial, may show traces of biserial condition in the earliest portions, circular in cross-section. Sutures slightly depressed, almost flush with surface in early portion. Wall calcareous, smooth. Aperture terminal, a narrow elongate slit, slightly curved, with a distinct lip.

Distribution in 586A. Nodosarella advena is a rare species with scattered occurrences below 56 m.

Recorded Distribution. Nodosarella advena was described from the Eocene of California.

Genus **PLEUROSTOMELLA** Reuss, 1860

Pleurostomella acuminata Cushman
Pl. 13, Fig. 1

Pleurostomella alternans Schwager.—BRADY, 1884 (part), p. 412, pl. 51, fig. 22 (not 23) (not *Pleurostomella alternans* Schwager, 1866).
Pleurostomella acuminata CUSHMAN, 1922a, p. 50–51, pl. 19, fig. 6.—PHLEGER and others, 1953, p. 39, pl. 8, figs. 10–13.—BARKER, 1960, p. 106, pl. 51, fig. 22, BOLTOVSKOY, 1978a, pl. 5, figs. 39–41.

Description. Test free, subcylindrical or fusiform, elongate, biserial, often widest below the middle, initial end pointed, apertural end rounded in front view, acute and tapering in side view. Sutures distinct, slightly depressed. Wall calcareous, smooth, finely perforate. Aperture terminal, almost vertical at the inner face of the ultimate chamber, with a projecting hood, two upwardly projecting teeth in aperture.

Distribution in 586A. Pleurostomella acuminata has scattered occurrences between 127 and 60 m.

Remarks. Pleurostomella acuminata differs from *P. alternans* in being widest at the apical end rather than at the middle of the test.

Recorded Distribution. Pleurostomella acuminata was described from the Holocene of the Caribbean. Holocene: Atlantic (Phleger and others, 1953), Caribbean (Cushman, 1922a), Pacific (Brady, 1884). Pleistocene: Atlantic (Blanc-Vernet, 1983). Pliocene: Atlantic (Blanc-Vernet, 1983; Hermelin, 1986), Pacific (Thomas, 1985), Indian Ocean (Boltovskoy, 1978a). Miocene: Pacific (Woodruff and Douglas, 1981; Thomas, 1985), Indian Ocean (Boltovskoy, 1978a).

Pleurostomella alternans Schwager

Pleurostomella alternans SCHWAGER, 1866, p. 238, pl. 6, figs. 79–80.—CUSHMAN and HARRIS, 1927, p. 129, pl. 25, figs. 7–8.—LEROY, 1964, p. 36, pl. 5, fig. 5.—TODD, 1966, p. 29, pl. 12, figs. 14–15.—BOLTOVSKOY, 1978a, pl. 5, figs. 43–44.—BOERSMA, 1986, pl. 5, fig. 6.

Description. Test free, biserial, elongate, tapering towards the initial end, widest at the apertural end. Sutures distinct, slightly depressed. Wall calcareous, smooth, finely perforate. Aperture terminal, at the inner face of the ultimate chamber, with projecting hood an two upwardly projecting teeth.

Distribution in 586A. Pleurostomella alternans is a rare species with scattered occurrences.

Remarks. Pleurostomella alternans differs from *P. acuminata* in having a more tapering test with the widest part at the apertural end.

Recorded Distribution. Pleurostomella alternans was described from the Pliocene of Kar Nikobar, off Sumatra. Pleistocene: Atlantic (Blanc-Vernet, 1983), Pacific (McDougall, 1985). Pliocene: Atlantic (Blanc-Vernet, 1983), Pacific (McDougall, 1985; Thomas, 1985; Boersma, 1986), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964) New Guinea (Cushman and Harris, 1927), Sumatra (Schwager, 1866), Indian Ocean (Boltovskoy, 1978a). Miocene: Pacific (Resig, 1976; Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985; Boersma, 1986), Guam (Todd, 1966), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a).

Pleurostomella brevis Schwager

Pleurostomella brevis SCHWAGER, 1866, p. 239, pl. 6, fig. 81.—BRADY, 1884, p. 411, pl. 51, figs. 20a–b.—BARKER, 1960, p. 104, pl. 51, figs. 20a–b.—LEROY, 1964, p. 36, pl. 5, fig. 4.

Description. Test free, subcylindrical. Maximum width at middle of test, apical end rounded. Chambers strongly embracing, the final chamber occupying more than half the length of the test. Sutures slightly depressed. Wall calcareous, hyaline, smooth, finely perforate. Aperture a vertical slit in the depressed face of the ultimate chamber.

Distribution in 586A. Pleurostomella brevis is a rare species with few occurrences.

Recorded Distribution. Pleurostomella brevis was described from the Pliocene of Kar Nikobar, off Sumatra. Holocene: Atlantic (Hermelin and Scott, 1985), Pacific (Brady, 1884; Burke, 1981). Pleistocene: Atlantic (Blanc-Vernet, 1983), Pacific (McDougall, 1985). Pliocene: Atlantic (Hermelin, 1986), Pacific (McDougall, 1985), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Sumatra (Schwager, 1866). Miocene: Pacific (Resig, 1976; McDougall, 1985), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Guam (Todd, 1966).

Pleurostomella recens Dervieux
Pl. 13, Fig. 2

Pleurostomella rapa Guembel.—BRADY, 1884, p. 411, pl. 51, figs. 21a–b.

Pleurostomella rapa Guembel var. *recens* DERVIEUX, 1899, p. 76.—CUSHMAN, 1927d, p. 156, pl. 28, figs. 6a–b.—BARKER, 1960, p. 104, pl. 51, figs. 21a–b.

Ellipsopleurostomella pleurostomella SILVESTRI, 1904b, p. 8, figs. 4–5.

Pleurostomella pleurostomella Silvestri.—CUSHMAN and HARRIS, 1927, p. 130, pl. 25, fig. 13.

Pleurostomella bierigi PALMER and BERMÚDEZ, 1936, p. 294, pl. 17, figs. 7–8.—BOLTOVSKOY, 1978a, pl. 5, fig. 45.

Description. Test free, small. Widest in the middle of test, apical end pointed. Chambers strongly embracing, the ultimate chamber occupying most of the test. Sutures slightly depressed. Wall calcareous, hyaline, smooth, finely perforate. Aperture a vertical slit in the depressed face of the ultimate chamber.

Remarks. Pleurostomella recens differs from *P. brevis* in the distinctly pointed apical end and the much more embracing chambers. *P. bierigi* is regarded as a junior synonym to *P. recens.*

Distribution in 586A. Pleurostomella recens is a rare species with few occurrences.

Recorded Distribution. Pleurostomella recens was described from the Tertiary of Italy. Holocene: Pacific (Brady, 1884; Burke, 1981). Pleistocene: Pacific (McDougall, 1985). Pliocene: Pacific (McDougall, 1985). Miocene: Italy (Silvestri 1904b), Pacific (Woodruff and Douglas, 1981; McDougall, 1985), Indian Ocean (Boltovskoy, 1978a).

Pleurostomella subnodosa (Reuss)
Pl. 13, Fig. 7

Nodosaria nodosa REUSS, 1845 (part), p. 28, pl. 13, fig. 22.
Dentalina subnodosa (Reuss).—REUSS, 1851b (part), p. 24, pl. 1, fig. 9.
Pleurostomella subnodosa (Reuss).—REUSS, 1860, p. 204, pl. 8, figs. 2a–b.—BRADY, 1884, p. 412–413, pl. 52, figs. 12–13.—CUSHMAN, 1911, p. 51, text-fig. 82.
Pleurostomellina sp. BARKER, 1960, pl. 52, figs. 12–13.

Description. Test free, elongated, initially biserial, later uniserial. Initial end rounded, apertural end subacute in front view, rounded in side view. Chambers wedge-shaped, alternating from side to side as added. Sutures slightly depressed. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, sinus broad with slight projections at each side.

Distribution in 586A. Pleurostomella subnodosa is a rare species with scattered occurrences.

Recorded Distribution. Pleurostomella subnodosa was originally described from the upper Cretaceous of Europe. Holocene: Atlantic (Brady, 1884), Pacific (Brady, 1884; Cushman, 1911, 1921).

Pleurostomella sp. 1
Pl. 13, Figs. 3–4

Description. Test free, globular, initial chambers very small, penultimate chamber large and globular, ultimate chamber pyriform, compressed. Sutures very depressed. Wall calcareous, hyaline, smooth, finely perforate. Aperture terminal, small, on an almost necklike protrusion of the ultimate chamber.

Remarks. Pleurostomella sp. 1 is very characteristic with its small initial chambers, large globular penultimate chamber and very depressed sutures.

Distribution in 586A. Pleurostomella sp. 1 is a rare species with scattered occurrences.

Pleurostomella sp. 2
Pl. 13, Figs. 5–6

Description. Test free, pyriform, extremely embracing chambers, the ultimate chamber comprises more than four-fifths of the test, the penultimate chamber is only visible as a long narrow slit extending from the apical part to the aperture. Wall calcareous, hyaline, smooth, finely perforate. Sutures flush with the surface. Aperture terminal, small, with two small projecting teeth.

Distribution in 586A. Pleurostomella sp. 2 is a very rare species with scattered occurrences.

Family CAUCASINIDAE Bykova, 1959
Subfamily CAUSASININAE Bykova, 1959
Genus **FRANCESITA** Loeblich and Tappan, 1963

Francesita advena (Cushman)
Pl. 13, Figs. 8–10

Virgulina (?) *advena* CUSHMAN, 1922a, p. 120–121, pl. 25, figs. 1–3.—CUSHMAN, 1937c, p. 29, pl. 4, fig. 29.
Virgulina advena Cushman.—PHLEGER and others, 1953, p. 34, pl. 7, figs. 1–2.
Francesita advena (Cushman).—LOEBLICH and TAPPAN, 1953, p. 215—PFLUM and FRERICHS, 1976, pl. 4, figs. 6–7.—BOLTOVSKOY, 1978a, pl. 6, figs. 6–8.—THOMAS, 1985, p. 676, pl. 2, fig. 8.

Description. Test free, elongate, tapering, widest near the apertural end, rounded in cross-section, initial end bluntly rounded. Chambers triserially arranged in the early stage, later biserial. Sutures slightly depressed. Wall calcareous, smooth, finely perforate, pores dominately aligned in longitudinal rows. Aperture an elongate slit extending from the base of the final chamber across the top, about half the distance down the opposite side, with one margin of the aperture recurved and the opposite margin projecting slightly above in a hooded fashion.

Ecology. Pflum and Frerichs reported this species from abyssal depths in the Gulf of Mexico.

Distribution in 586A.—Francesita advena is a rare species with scattered occurrences.

Recorded Distribution. Francesita advena was described from the Holocene of the Atlantic. Holocene: Atlantic (Cushman, 1922; Phleger and others, 1953), Gulf of Mexico (Pflum and Frerichs, 1976), Indian Ocean (Boltovskoy, 1978a). Pleistocene: Atlantic (Phleger and others, 1953; Blanc-Vernet, 1983; Murray, 1984), Pacific (Thomas, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Murray, 1984), Pacific (Thomas, 1985; Kurihara and Kennett, 1986). Miocene: Pacific (Woodruff and Douglas, 1981; Thomas, 1985; Kurihara and Kennett, 1986), Indian Ocean (Boltovskoy, 1978a).

Family CASSIDULINIDAE d'Orbigny, 1839a
Genus **EHRENBERGINA** Reuss, 1850

Ehrenbergina albatrossi Cushman
Pl. 13, Fig. 11

Ehrenbergina albatrossi CUSHMAN, 1933b, p. 94, pl. 10, figs. 8a–b. TODD, 1965, p. 47, pl. 21, figs. 2-3.—TODD, 1966, p. 27, pl. 15, fig. 2.

Description. Test free, biserial, enrolled initially and then uncoiling, compressed perpendicular to the plane of coiling, early part rounded with numerous irregular spines, later part subtriangular in cross-section, dorsal side slightly convex, periphery carinate with spines at the end of each chamber. Sutures limbate, slightly depressed. Wall smooth and finely perforate. Aperture an elongate slit parallel to the dorsal side, with a thin lip.

Remarks. The specimen that Kurihara and Kennett (1986, pl. 6, fig. 4) referred to as *Ehrenbergina* sp. seems to belong to *E. albatrossi* although it does not exhibit the coarse irregular spines on the early rounded part.

Distribution in 586A. Ehrenbergina albatrossi is a rare species with scattered occurrences.

Recorded Distribution. Ehrenbergina albatrossi was described from the Holocene of the North Pacific. Holocene: Pacific (Cushman, 1933b; Todd, 1965; Burke, 1981). Pliocene: Pacific (Kurihara and Kennett, 1986, see under Remarks). Miocene: Pacific (Todd, 1966; Kurihara and Kennett, 1986, see under Remarks).

Ehrenbergina trigona Goës
Pl. 13, Fig. 13

Textularia triquetra on Münster.—GOËS, 1882, p. 83, pl. 6, figs. 183–184 (not *Textularia triquetra* von Münster, in Roemer, 1838).
Ehrenbergina serrata Reuss.—BRADY, 1884 (part), p. 434, pl. 55, figs. 2–3, 5 (not 4, 6–7) (not *Ehrenbergina serrata* Reuss, 1850).
Ehrenbergina serrata Reuss var. *trigona* GOËS, 1896, p. 49.
Ehrenbergina bradyi CUSHMAN, 1922a, p. 134-135, p. 26, fig. 5.—CUSHMAN, 1927c, p. 5, pl. 2, figs. 1a–c.—MCDOUGALL, 1985, pl. 6, fig. 8.
Ehrenbergina trigona Goës.—PHLEGER and others, 1953, p. 46, pl. 10, figs. 12–13.—CORLISS, 1979, p. 8, pl. 3, figs. 10–11.—MURRAY, 1984, pl. 1, fig. 23.—HERMELIN and SCOTT, 1985, p. 206, 208, p. 4, figs. 15–16.—MEAD, 1985, p. 232, pl. 3, figs. 4–7.

Description. Test free, biserial, trigonal in front view, enrolled initially and then uncoiling, slightly compressed perpendicular to the plane of coiling, later part triangular or subtriangular in cross-section, dorsal side slightly convex, ventral side has a median furrow with a series of fine spines at the inner angles of the chambers. Periphery carinate with spines at the end of each chamber. Sutures limbate, flush with surface in the early part of the test, slightly depressed in the later part of the test. Wall smooth and finely perforate. Aperture an elongate slit parallel to the dorsal side, with a thin lip.

Distribution in 586A. Ehrenbergina trigona is a very rare species with few occurrences.

Recorded Distribution. Ehrenbergina trigona was described from the Holocene of the Caribbean. Holocene: Atlantic (Cushman, 1922; Hermelin and Scott, 1985; Mead, 1985), Caribbean (Goës, 1882), Pacific (Brady, 1884; Goës, 1896; Ingle and others, 1980; Thompson, 1980; Burke, 1981), Indian Ocean (Corliss, 1979). Pleistocene: Atlantic (Phleger and others, 1953), Pacific (Resig, 1976; McDougall, 1985). Pliocene: Atlantic (Murray, 1984; Hermelin, 1986). Miocene: Atlantic (Murray, 1984), Pacific (Woodruff and Douglas, 1981; McDougall, 1985).

Ehrenbergina undulata Parker
Pl. 13, Fig. 12

Ehrenbergina serrata Reuss.—BRADY, 1884 (part), p. 434, pl. 55, figs. 4, 6–7 (not 2–3, 5).—MURRAY, 1984, pl. 1, fig. 22 (not *Ehrenbergina serrata* Reuss, 1850).
Ehrenbergina trigona Goës.—CUSHMAN, 1922a, p. 135, pl. 26, fig. 4.—CUSHMAN, 1927c, p. 6, pl. 2, fig. 3 (not *Ehrenbergina trigona* Goës, 1896).
Ehrenbergina pacifica CUSHMAN, 1927c, p. 5–6, pl. 2, figs. 2a–c.—BARKER, 1960, p. 122, pl. 55, figs. 4, 6–7.
Ehrenbergina undulata PARKER in PHLEGER and others, 1953, p. 46–47, pl. 10, figs. 14–16.—GIANELLI and others, 1968, pl. 2, figs. 1a–b.—NISHIMURA and others, 1977, pl. 4, figs. 1–2.—KOHL, 1985, p. 87, pl. 31, fig. 3.
Ehrenbergina sp. LOHMANN, 1978, pl. 2, figs. 16–17.
Ehrenbergina compressa Cushman.—KELLER, 1980, pl. 2, fig. 4 (not *Ehrenbergina compressa* Cushman, 1927b).

Description. Test free, biserial, trigonal in front view, enrolled initially and then uncoiling, compressed perpendicular to the plane of coiling, later part triangular or subtriangular in cross-section, dorsal side slightly convex, ventral side has a very narrow central furrow formed by the carinated margins of the chambers merging into a single keel, periphery carinate with spines at the end of each chamber. Sutures limbate, flush with surface in the early part of the test, slightly depressed in the later part of the test. Wall smooth and finely perforate. Aperture an elongate slit parallel to the dorsal side, with a thin lip.

Remarks. Ehrenbergina undulata differs from *E. trigona* in not having the deep, rather broad central furrow on the ventral side. LeRoy (1964) reported *E. bradyi* Cushman (=*E. trigona* Goës) from the upper Miocene of Okinawa, but the figured specimens more closely resemble *E. undulata.*

Distribution in 586A. Ehrenbergina undulata is a rare species with scattered occurrences.

Recorded Distribution. Ehrenbergina undulata was described from the Pleistocene of the North Atlantic. Holocene: Atlantic (Lohmann, 1978), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Brady, 1884; Ingle and others, 1980). Pleistocene: Atlantic (Phleger and others, 1953), Pacific (Keller, 1980). Pliocene: Atlantic (Murray, 1984), Italy, (Gianelli and others, 1968), Mexico (Kohl, 1985), Pacific (Nishimura and others, 1977; Keller, 1980). Miocene: Atlantic (Murray, 1984), Pacific (Keller, 1980), Okinawa (LeRoy, 1964, see under Remarks).

Genus **FAVOCASSIDULINA** Loeblich and Tappan, 1957

Favocassidulina favus (Brady)
Pl. 13, Figs. 14, 17

Pulvinulina favus BRADY, 1877, p. 535.—BRADY, 1884, p. 701, pl. 104, figs. 12–16.
Cassidulina favus (Brady).—CUSHMAN, 1926b, p. 70–71.
Cassidulina sp. 2 PHLEGER and others, 1953, p. 45–46, pl. 10, figs. 8–9.
Favocassidulina favus (Brady).—LOEBLICH and TAPPAN, 1957, p. 230, pl. 73, figs. 7–11.—BARKER, 1960, p. 214, pl. 104, figs. 12–16.—BELFORD, 1966, p. 145–146, pl. 26, figs. 28–31, text-fig. 18:6.—DOUGLAS, 1973, pl. 6, figs. 4–5.—BOLTOVSKOY, 1978a, pl. 4, fig. 20.—NOMURA, 1984, p. 94–98, pl. 1, figs. 1–10, pl. 2, figs. 1–8.—BURKE, 1981, pl. 3, figs. 3–4.—RESIG, 1981, pl. 7, fig. 8.—KURIHARA and KENNETT, 1986, pl. 6, figs. 1–2.

Description. Test free, lenticular, periphery acute, biconvex. The spiral chamber arrangement is concealed by the honeycomb-like secondary ornamentation which covers the entire test, except for the aperture. Aperture elongate, a slightly curved slit, parallel to margin of chamber, bordered by a narrow lip.

Ecology. Favocassidulina favus seems to be restricted to the Pacific. The only report outside this area that has come to my attention is by Phleger and others (1953) who found this species at two equatorial sites in the mid-Atlantic. Cushman (1915) reported this species as widely distributed in the western Pacific and most common at depths between 2,700 m and 3,600 m.

Distribution in 586A. Favocassidulina favus is a rare species that occurs in the upper part of the sequence.

Recorded Distribution. Favocassidulina favus was described from the Holocene of the Pacific. Holocene: Pacific (Brady, 1877, 1884; Cushman, 1915; Burke, 1981; Resig, 1981; Nomura, 1984). Pleistocene: Pacific (Douglas, 1973; Kurihara and Kennett, 1986). Pliocene: Pacific (Douglas, 1973; Kurihara and Kennett, 1986; Boersma, 1986). Miocene: Atlantic (Phleger and others, 1953), Pacific (Douglas, 1973; Woodruff and Douglas, 1981; Thomas, 1985; Boersma, 1986), Papua-New Guinea (Belford, 1966), Indian Ocean (Boltovskoy, 1978a).

Genus **GLOBOCASSIDULINA** Voloshinova, 1960

Globocassidulina decorata Sidebottom
Pl. 13, Figs. 15–16

Cassidulina decorata SIDEBOTTOM, 1910, p. 107, pl. 4, figs. 2a–c.—CUSHMAN, 1925b, p. 53, pl. 8, figs. 20–22.
Globocassidulina decorata (Sidebottom).—THOMAS, 1985, p. 676, pl. 7, fig. 5.

Description. Test free, broadly rounded, only slightly compressed, periphery slightly lobate. Chambers slightly inflated. Sutures indistinct, curved, slightly depressed. Wall calcareous, hyaline, ornamented with a network of irregular costae, somewhat independent of the chambers, later portion smooth. Aperture an elongate slit perpendicular to the suture between the ultimate and penultimate chambers.

Distribution in 586A. Globocassidulina decorata is a rare species that occurs below 70 m.

Recorded Distribution. Globocassidulina decorata was described from the Holocene of the Pacific. Holocene: Pacific (Sidebottom, 1910). Pliocene: Pacific (Thomas, 1985).

Globocassidulina subglobosa (Brady)

Cassidulina subglobosa BRADY, 1881, p. 60.—BRADY, 1884, p. 430, pl. 54, figs. 17a–c.—CUSHMAN, 1911, p. 98, text-fig. 152.—CUSHMAN, 1921, p. 171–172, pl. 32, fig. 2.—CUSHMAN, 1922a, p. 127–128, pl. 24, fig. 6.—CUSHMAN, 1925b, p. 54, pl. 8, figs. 48–50.—GALLOWAY and HEMINWAY, 1941, p. 425, pl. 32, figs. 2a–b.—CUSHMAN and TODD, 1945, p. 61, pl. 10, figs. 8a–b.—PHLEGER and PARKER, 1951, p. 27, pl. 14, figs. 11–12.—PHLEGER and others, 1953, p. 45, pl. 10, fig. 4.—BUTT, 1980, pl. 6, fig. 9.—BURKE, 1981, pl. 2, fig. 11.—RESIG, 1981, pl. 7, fig. 7.
Islandiella subglobosa (Brady). AKERS and DORMAN, 1964, p. 39, pl. 11, fig. 19.—SCHNITKER, 1971, p. 204, pl. 5, figs. 1a–c.
Globocassidulina subglobosa (Brady).—BELFORD, 1966, p. 149, pl. 25, figs. 11–16, text-figs. 17:1–7, 18:1–4.—LOHMANN, 1978, p. 26, pl. 2, figs. 8–9.—CORLISS, 1979, p. 8, pl. 3, figs. 12–13.—MEAD, 1985, p. 232, 234, pl. 3, fig. 8.—KOHL, 1985, p. 88, pl. 30, figs. 3–4.—THOMAS, 1985, pl. 7, fig. 4.—KURIHARA and KENNETT, 1986, pl. 5, figs. 4–8.

Cassidulina subglobosa subglobosa Brady.—BOLTOVSKOY, 1978a, p. 155, pl. 2, fig. 34.—INGLE and others, 1980, p. 132, pl. 1, figs. 13–14.

Description. Test free, subglobular in side view, coiled biserial, peripheral margin rounded, ovate to globular in cross-section. Chambers inflated. Sutures distinct, sometimes slightly depressed, slightly curved. Wall calcareous, hyaline, smooth, finely perforate. Aperture narrow, in a depression of the apertural face, varying in shape from a straight narrow slit to a chevron-shaped opening, with a lip attached to the outer margin, toothplate formed by infolding of apertural face.

Ecology. Globocassidulina subglobosa has been regarded as a marker for "warm AABW" in the Indian Ocean (Corliss, 1979) and NADW in the North Atlantic (Streeter, 1973; Schnitker, 1979). In the Gulf of Mexico, *G. subglobosa* occurs in the upper bathyal zone (Pflum and Frerichs, 1976). Ingle and others (1980) observed the same bathymetric distribution in the Peru-Chile Trench area. In the gulf of California, this species is found in the middle bathyal zone (Bandy, 1961).

Distribution in 586A. Globocassidulina subglobosa is a common species throughout the sequence with relative abundances up to 8.2%.

Recorded Distribution. Globocassidulina subglobosa was described from the Holocene of the Atlantic. Holocene: Atlantic (Cushman, 1922; Phleger and others, 1953), Streeter, 1973; Lohmann, 1978; Schnitker, 1979; Mead, 1985), Gulf of Mexico (Phleger and Parker, 1951; Pflum and Frerichs, 1976), Pacific (Cushman, 1911, 1921; Todd, 1966; Douglas, 1973; Butt, 1980; Burke, 1981; Resig, 1981; Kurihara and Kennett, 1986), Gulf of California (Bandy, 1961), Indian Ocean (Boltovskoy, 1978a; Corliss, 1979). Pleistocene: Atlantic (Phleger and others, 1953), Gulf of Mexico (Akers and Dorman, 1964), Pacific (Douglas, 1973; Resig, 1976; Keller, 1980; McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984a; Hermelin, 1986), Mexico (Kohl, 1985), Pacific (Douglas, 1973; Keller, 1980; McDougall, 1985; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a). Miocene: Atlantic (Boersma, 1984a), Pacific (Douglas, 1973; Resig, 1976; Butt, 1980; Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Guam (Todd, 1966), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Papua-New Guinea (Belford, 1966), Indian Ocean (Boltovskoy, 1978a).

Genus **RUTHERFORDOIDES** McCulloch, 1981

Rutherfordoides tenuis (Phleger and Parker)
Pl. 14, Figs. 3–4

Cassidulinoides tenuis PHLEGER and PARKER, 1951, p. 27, pl. 14, figs. 14–17.—PARKER, 1958, p. 272, pl. 4, figs. 18–19.—MATSUNAGA, 1963, pl. 49, figs. 6a–b.—LEROY, 1964, p. 41, pl. 12, figs. 1–2.—BOLTOVSKOY, 1978a, pl. 3, fig. 2.
Rutherfordoides tenuis (Phleger and Parker).—KOHL, 1985, p. 89–90 pl. 18, figs. 5a–f.

Description. Test free, circular to ovate in cross-section, early portion coiled, chambers biserially enrolled, later portion uncoiled. Chambers distinct, slightly inflated, increasing gradually in size. Sutures distinct, slightly depressed. Wall calcareous, hyaline, smooth, perforated with small, narrow pores, about 1 micrometer long and only a fraction of a micrometer wide. Aperture a broad loop in a depression, extending from base of ultimate chamber to apex of test.

Ecology. Smith (1964) reported this species from the upper bathyal zone off western Central America.

Distribution in 586A. Rutherfordoides tenuis is a very rare species with scattered occurrences above 64 m.

Recorded Distribution. Rutherfordoides tenuis was described from the Pleistocene of the gulf of Mexico. Holocene: Gulf of Mexico (Phleger and Parker, 1951). Pleistocene: Atlantic (Boersma, 1984b), Gulf of Mexico (Phleger and Parker, 1951; Pflum and Frerichs, 1976), Mediterranean (Parker, 1958), Pacific (Resig, 1976). Pliocene: Atlantic (Boersma, 1984b), Mexico (Kohl, 1985), Okinawa (LeRoy, 1964). Miocene: Pacific (Resig, 1976; Burke, 1981), Okinawa (LeRoy, 1964), Indiana Ocean (Boltovskoy, 1978a).

Rutherfordoides bradyi (Cushman)
Pl. 14, Figs.7–8

Virgulina subsquamosa Egger.—BRADY, 1884 (part), p. 415, pl. 52, figs. 9a–c (not figs. 7–8, 10–11) (not *Virgulina subsquamosa* Egger, 1857).
Virgulina bradyi CUSHMAN, 1922, p. 115, pl. 24, fig. 1.—CUSHMAN, 1937c, p. 29, pl. 5, figs. 1a–c.—PHLEGER and others, 1953, p. 34, pl. 7, figs. 4–5.—BARKER, 1960, p. 106, pl. 52, figs. 9a–c.

Description. Test free, slender, circular to ovate in cross-section, early portion coiled, chambers biserially enrolled, later portion uncoiled. Chambers distinct, slightly inflated, increasing gradually in size. Sutures distinct, flush with surface. Wall calcareous, hyaline, smooth, perforated by small, narrow pores less than a micrometer long and only a fraction of a micrometer wide. Aperture a narrow loop in a depression along the suture, extending from base of ultimate chamber to apex of test.

Remarks. Rutherfordoides bradyi differs from *R. tenuis* in its more slender appearence.

Distribution in 586A. Rutherfordoides bradyi is a very rare species with few occurrences.

Recorded Distribution. Rutherfordoides bradyi was described from the Holocene of the North Atlantic. Holocene: Atlantic (Cushman, 1922; Phleger and others, 1953), Pacific (Brady, 1884).

Superfamily NONIONACEA Schultze, 1854
Family NONIONIDAE Schultze, 1854
Subfamily CHILOSTOMELLINAE Brady, 1881
Genus **CHILOSTOMELLA** Reuss in Cžjžek, 1849

Chilostomella oolina Schwager
Pl. 14, Fig. 5

Chilostomella oolina SCHWAGER, 1878, p. 527, pl. 1, fig. 16.—CUSHMAN, 1926a, p. 74, pl. 11, figs. 3–10.—PHLEGER and others, 1953, p. 47, pl. 10, fig. 18.—BARKER, 1960, p. 112, pl. 55, figs. 12–14, 17–18.—SCHNITKER, 1971, p. 196, pl. 10, figs. 3a–b.—INGLE and others, 1980, p. 132, pl. 6, figs. 9–10.—KURIHARA and KENNETT, 1986, pl. 6, fig. 10.

Chilostomella ovoidea Reuss.—BRADY, 1884 (part), p. 436, pl. 55, figs. 12–14, 17–18 (not 15–16, 19–23).—CUSHMAN, 1924a, p. 2, pl. 1, figs. 8–10 (not *Chilostomella ovoidea* Reuss, 1850).

Description. Test free, elongate, about three times as long as broad, both ends broadly rounded, sides nearly parallel. Ultimate chamber comprises more than half of the test. Wall calcareous, hyaline, thin, translucent, finely perforated. Aperture a narrow curved slit at the suture between the ultimate and penultimate chambers.

Ecology. In the Gulf of Mexico, the length of *Chilostomella oolina* increases from about 400 micrometers near its upper depth limit in the lower neritic zone to approximately 600 micrometers in the lower middle and lower bathyal and abyssal zones (Pflum and Frerichs, 1976).

Distribution in 586A. Chilostomella oolina is a rare species with scattered occurrences.

Recorded Distribution. Chilostomella oolina was described from the Pliocene of Sicily. Holocene: Atlantic (Cushman, 1924a; Schnitker, 1971), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Brady, 1884; Parr, 1950; Matoba, 1976; Ingle and others, 1980). Pleistocene: Atlantic (Phleger and others, 1953; Blanc-Vernet, 1983), Pacific (Resig, 1976; Thompson, 1980; McDougall, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Hermelin, 1986), Sicily (Schwager, 1878), Pacific (Thompson, 1980; Kurihara and Kennett, 1986). Miocene: Pacific (McDougall, 1985; Kurihara and Kennett, 1986), Okinawa (LeRoy, 1964).

Genus **ALLOMORPHINA** Reuss, in Cžjžek, 1849

Allomorphina pacifica Cushman and Todd
Pl. 14, Figs. 1–2

Allomorphina trigona (Reuss).—BRADY, 1884, p. 438, pl. 55, figs. 24–26.—CUSHMAN, 1914, p. 3, pl. 1, figs. 6–8.—CUSHMAN, 1925a, p. 133, pl. 17, fig. 2.

Valvulineria aff. *allomorphinoides* LEROY, 1944, p. 87, pl. 3, figs. 21–23.

Allomorphina pacifica CUSHMAN and TODD, 1949, p. 68–69, pl. 12, figs. 6–9.—HOFKER, 1951, p. 138, figs. 86a–f.—BARKER, 1960, p. 112, pl. 55, figs. 24–26.—BOLTOVSKOY, 1978a, pl. 1, fig. 1.—KURIHARA and KENNETT, 1986, pl. 6, fig. 9.

Valvulineria sp. BUTT, 1980, pl. 6, figs. 19–20.

Description. Test free, trochospiral, involute, ovate in side view, periphery slightly triangular, ovate in cross section, three chambers visible in the last whorl with the ultimate chamber comprising most of the test in ventral view, earlier chambers visible through the test on the ventral side. Sutures distinct, slightly depressed. Wall calcareous, hyaline, smooth. Aperture a low narrow opening at the sides of a V-shaped lip, the lip extends from the suture between ultimate and penultimate chamber and partly covers the antepenultimate chambers, edge of lip saw-toothed.

Remarks. Allomorphina pacifica seems to be restricted to the Pacific Ocean.

Distribution in 586A. Allomorphina pacifica is a rare species with scattered occurrences.

Recorded Distribution. Allomorphina pacifica was described from the Pliocene of Fiji. Holocene: Pacific (Brady, 1884; Cushman 1914, 1921, 1925a). Pleistocene: Pacific (Kurihara and Kennett, 1986). Pliocene: Pacific (Cushman and Todd, 1949; Kurihara and Kennett, 1986), Indian Ocean (Boltovskoy, 1978a). Miocene: Pacific (Butt, 1980; Woodruff and Douglas, 1981; Kurihara and Kennett, 1986), Papua-New Guinea (Belford, 1966), Sumatra (LeRoy, 1944), Indian Ocean (Boltovskoy, 1978a).

Genus **QUADRIMORPHINA** Finlay, 1939c

Quadrimorphina allomorphinoides (Reuss)
Pl. 14, Fig. 6

Valvulina allomorphinoides REUSS, 1860, p. 223, pl. 11, fig. 6.

Valvulineria allomorphinoides (Reuss).—CUSHMAN, 1931b, p. 43, pl. 6, fig. 2.

Quadrimorphina allomorphinoides (Reuss).—FINLAY, 1939c, p. 325, pl. 28, figs. 128–129.—CUSHMAN and TODD, 1949, p. 69–70, pl. 12, figs. 10–12.

Description. Test free, trochospiral, periphery rounded, all chambers visible on the spiral side, four chambers in the last whorl. Sutures flush with surface. Wall calcareous, hyaline, smooth, finely perforate. Aperture interiomarginal, umbilical, partly covered by a protecting umbilical flap.

Distribution in 586A. Quadrimorphina allomorphinoides is a very rare species with scattered occurrences.

Recorded Distribution. Quadrimorphina allomorphinoides was described from the Cretaceous of Germany.

Quadrimorphina glabra (Cushman)
Pl. 14, Fig. 9

Valvulineria vilardeboana (d'Orbigny) var. *glabra* CUSHMAN, 1927b, p. 161, pl. 4, figs. 5–6.
Valvulineria laevigata PHLEGER and PARKER, 1951, p. 25, pl. 13, figs. 11–12.—BOLTOVSKOY, 1978a, pl. 8, figs. 42–43.—INGLE and others, 1980, p. 146, pl. 8, figs. 5–7.
Rotamorphina glabra (Cushman).—ANDERSEN, 1961, p. 104, pl. 23, figs. 2a–c.
Quadrimorphina vilardeboana glabra (Cushman).—AKERS and DORMAN, 1964, p. 50, pl. 11, figs. 28–29.
Quadrimorphina laevigata (Phleger and Parker).—BELFORD, 1966, p. 155, pl. 37, figs. 21–25.
Quadrimorphina glabra (Cushman).—KOHL, 1986, p. 90–91, pl. 31, figs. 8a–c.

Description. Test free, trochospiral, biconvex, circular in outline and slightly lobate, periphery rounded. Chambers distinct, five to six in the last whorl, ultimate chamber with a lobe-like plate covering the umbilicus. Wall calcareous, hyaline, smooth, finely perforate. Aperture interiomarginal, umbilical and covered by the umbilical plate.

Distribution in 586A. Quadrimorphina glabra is represented by a single specimen at 69.60 m.

Recorded Distribution. Quadrimorphina glabra was described from Holocene sediments off the west coast of North America. Holocene: Gulf of Mexico (Phleger and Parker, 1951), Pacific (Cushman, 1927b; Ingle and others, 1980), Antarctic Ocean (Andersen 1961). Pleistocene: Gulf of Mexico (Akers and Dorman, 1964). Pliocene: Mexico (Kohl, 1986). Miocene: Indian Ocean (Boltovskoy, 1978a).

Subfamily NONOININAE Schultze, 1854
Genus **ASTRONONION** Cushman and Edwards, 1937

Astrononion gallowayi Loeblich and Tappan

Astrononion australe CUSHMAN and EDWARDS, 1937, p. 33–34, pl. 3, figs. 13–14.—CUSHMAN, 1939a, p. 37–38, pl. 10, figs. 7–8.
Astrononion tumidum CUSHMAN and EDWARDS, 1937, p. 33, pl. 3, fig. 17.—CUSHMAN, 1939a, p. 37, pl. 10, fig. 11.
Astrononion sidebottomi CUSHMAN and EDWARDS, 1937, p. 31–32, pl. 3, fig. 8.—CUSHMAN, 1939a, p. 36, pl. 10, fig. 2.
Astrononion stellatum CUSHMAN and EDWARDS, 1937, p. 32, pl. 3, figs. 9–11.—CUSHMAN, 1939a, p. 36, pl. 10, figs. 3–5.—SCHNITKER, 1971, p. 193, pl. 10, figs. 7a–b (not *Nonionina stellata* Terquem, 1882).
Astrononion viragoense CUSHMAN and EDWARDS, 1937, p. 32–33, pl. 3, fig. 12.—CUSHMAN, 1939a, p. 36, pl. 10, fig. 6.
Astrononion gallowayi LOEBLICH and TAPPAN, 1953, p. 90, pl. 17, figs. 4–7.—FEYLING-HANSSEN, 1964, p. 332, pl. 18, fig. 4.—COLE, 1981, p. 109, pl. 13, fig. 6.—HERMELIN and SCOTT, 1985, p. 203, pl. 5, figs. 1a–c.—KOHL, 1985, p. 91, pl. 32, fig. 1.

Description. Test free, planispiral, involute, compressed, umbilical region slightly concave, periphery slightly lobate, chambers inflated, supplementary wedge-shaped chambers surrounding umbilicus on each side, tapering outward to suture about two-thirds the distance to the periphery. Sutures depressed. Wall calcareous, smooth, finely perforated. Aperture a low arch at base of final chamber, supplementary apertures at outer posterior margin of each supplementary chamber.

Remarks. Cushman and Edwards (1937) described several species within the genus *Astrononion.* These species were characterized by differences in the width and the length of the supplementary chambers and different geographic ranges: *A. sidebottomi* from the Mediterranean (Holocene); *A. stellatum* from the North Atlantic (Holocene); *A. tumidum* from the South Atlantic (Holocene); *A. viragoensis* from the northeastern Pacific (Holocene); and *A. australis* from Australia (Pliocene-Miocene). I do not consider a separation into different species based on these features meaningful and regard these species as synonyms of *A. gallowayi.*

Distribution in 586A. Astrononion gallowayi is a very rare species with few occurrences.

Recorded Distribution. Astrononion gallowayi was described from the Holocene of the North Atlantic. Holocene: Atlantic (Cushman and Edwards, 1937; Schnitker, 1971; Cole, 1981; Hermelin and Scott, 1985), Gulf of Mexico (Wright and Hay, 1971; Pflum and Frerichs, 1976), Mediterranean (Cushman and Edwards, 1937), Pacific (Cushman and Edwards, 1937). Pleistocene: Norway (Feyling-Hanssen, 1964). Pliocene: Atlantic (Hermelin, 1986), Mexico (Kohl, 1985), Australia (Cushman and Edwards, 1937), Indian Ocean (Boltovskoy, 1978a). Miocene: Australia (Cushman and Edwards, 1937).

Astrononion novozealandicum Cushman and Edwards
Pl. 14, Figs. 10–11

Astrononion novozealandicum CUSHMAN and EDWARDS, 1937, p. 35, pl. 3, figs. 18a–b.—CUSHMAN, 1939a, p. 37, pl. 10, fig. 12.—THOMAS, 1985, pl. 4, fig. 9.

Astrononion umbilicatulum UCHIO, 1952, p. 36, text-fig. 1.—BOLTOVSKOY, 1978a, pl. 1, fig. 15.
Astrononion echolsi Kennett.—CORLISS, 1979, p. 8, pl. 3, figs. 16–17.—MEAD, 1985, p. 235, pl. 4, figs. 3–4 (not *Astrononion echolsi* Kennett, 1967).
Astrononion schwageri (Cushman).—RESIG, 1981, pl. 7, fig. 11.
Astrononion guadelupae (Parker).—MURRAY, 1984, pl. 1, figs. 1–2.

Description. Test free, planispiral, involute, compressed, periphery slightly lobate, supplementary tube-like chambers extend from the umbilical region on each side about two-thirds of the distance to the periphery. Sutures depressed. Wall calcareous, smooth, finely perforated. Aperture a low arch at the base of the final chamber, supplementary apertures at outer end of the supplementary chambers where small pits are formed in the sutural line.

Remarks. This species has probably been reported as *Melonis guadelupae* Parker. Woodruff in Mead (1985) found that *M. guadelupae* is actually an *Astrononion.* the type figure of *M. guadelupae* is too poor to make this relationship clear. Murray (1984) figured *Astrononion guadelupae* from the Neogene of the North Atlantic. This figure is virtually identical to the type figure of *A. novozealandicum. M. guadelupae* is regarded, therefore, as a junior synonym to *A. novozealandicum.* Specimens referred by Corliss (1979) and Mead (1985) to *A. echolsi* Kennett agree well with the type-figures of *A. novozealandicum* with tube-like supplementary chambers extending from the umbilicus to about two-thirds of the distance to the periphery. The supplementary apertures of *A. echolsi* extend only about one-third of the distance to the periphery. *A. echolsi* might be a junior synonym of *A. novozealandicum.* The form described by Cushman and Edwards (1937) from the Pliocene of Italy as *A. italicum* is also probably synonymous with *A. novozealandicum.* The specimen figured as *A. schwageri* (Cushman) by Resig (1981) is considered to be identical to *A. novozealandicum.* The species *A. umbilicatulum* as described by Uchio (1952) is virtually identical to *A. novozealandicum* and is, therefore, also regarded as a junior synonym.

Distribution in 586A. Astrononion novozealandicum is one of the most common species recorded in this sequence with relative abundances up to 11.3%.

Recorded Distribution. Astrononion novozealandicum was described from the Holocene off the coast of New Zealand. Holocene: Atlantic (Mead, 1985), Pacific (Cushman and Edwards, 1937; Burke, 1981; Resig, 1981), Indian Ocean (Boltovskoy, 1978a; Corliss, 1979). Pleistocene: Atlantic (Murray, 1984), Pacific (McDougall, 1985; Thomas, 1985). Pliocene: Atlantic (Murray, 1984), Pacific (McDougall, 1985; Thomas, 1985), Indian Ocean (Boltovskoy, 1978a). Miocene: Atlantic (Murray, 1984), Pacific (Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985), Indian Ocean (Boltovskoy, 1978a).

Genus **FLORILUS** Montfort, 1808

Florilus sp. 1
Pl. 14, Figs. 12–16

Description. Test free, compressed, asymmetrical in edge view, about one and one-half times as high as broad in side view, dorsal side evolute, ventral side involute, umbilical region depressed, periphery lobate. Chambers inflated, nine to 11 in the last whorl, increasing in height as added. Sutures distinct, slightly depressed, curved. Wall calcareous, hyaline, smooth, finely perforate. Aperture a narrow, interiomarginal, equatorial opening.

Distribution in 586A. Florilus sp. 1 is a rare species with scattered occurrences.

Genus **NONIONELLINA** Voloshinova, 1958

Nonionellina sp. 1
Pl. 15, Figs. 1–3

Description. Test free, slightly compressed, slightly asymmetrical in edge view, less than one and one-half times as high as broad in side view, both sides involute, umbilical region depressed, periphery lobate. Chambers inflated, seven to nine in the last whorl, increasing in width and height as added. Sutures distinct, slightly depressed, curved. Wall calcareous, hyaline, smooth, finely perforate. Aperture an interiomarginal, equatorial opening.

Distribution in 586A. Nonionellina sp. 1 is a rare species with scattered occurrences.

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

Pullenia bulloides (d'Orbigny)
Pl. 15, Figs. 4–5

Nonionina bulloides D'ORBIGNY, 1826, p. 293, model no. 2 (nomen nudum).—D'ORBIGNY, 1846, p. 107, pl. 5, figs. 9–10.
Pullenia sphaeroides PARKER and JONES, in CARPENTER, PARKER and JONES, 1862, p. 184, pl. 12, fig. 12.
Pullenia sphaeroides (d'Orbigny).—BRADY, 1884, p. 615–616, pl. 84, figs. 12–13.—CUSHMAN, 1914, p. 20–21, pl. 11, fig. 2 (not *Nonionina sphaeroides* d'Orbigny, 1826).
Pullenia bulloides (d'Orbigny).—REUSS, 1866, p. 150.—CUSHMAN and TODD, 1943, p. 13–14, pl. 2, figs. 15–18.—PHLEGER and others, 1953, p. 47, pl. 10, fig. 19.—BARKER, 1960, p. 174, pl. 84, fig. 12–13.—AKERS and DORMAN, 1964, p. 49, pl. 11, figs. 11-12.—LEROY, 1964, p. 41, pl. 10, figs. 30–

31.—DOUGLAS, 1973, pl. 8, figs. 1–2.—BOLTOVSKOY, 1978a, pl. 6, fig. 12.—LOHMANN, 1978, pl. 1, figs. 10–11.—CORLISS, 1979, p. 8, pl. 4, figs. 1–2.—BURKE, 1981, pl. 3, figs. 5–6.—COLE, 1981, p. 111, pl. 14, fig. 5.—RESIG, 1981, pl. 7, fig. 13.—MURRAY, 1984, pl. 2, figs. 19–20.—HERMELIN and SCOTT, 1986, p. 216, pl. 5, figs. 3–4.—KOHL, 1985, p. 92–93, pl. 32, fig. 5.—MEAD, 1985, p. 236, pl. 4, fig. 6.—KURIHARA and KENNETT, 1986, pl. 6, figs. 5–6.

Pullenia miocenica Kleinpell.—LEROY, 1964, p. 41, pl. 10, figs. 26–27.

Description. Test free, planispiral, involute, sphaeroidal, circular in side view, chambers distinct, four to five in final whorl. Sutures distinct, radial, flush with surface. Wall calcareous, hyaline, smooth, finely perforate. Aperture a narrow interiomarginal slit extending from one umbilicus to the other, with a thin lip.

Remarks. D'Orbigny named this species in 1826 from Pliocene material from the Sienna region of Italy. Since it lacked both a type figure and a type description, *Nonionina bulloides* d'Orbigny 1826 is a nomen nudum. D'Orbigny (1846) later described and figured *N. bulloides* from the Miocene of the Vienna Basin, thus validating the name. Several names have been commonly applied to this species. *P. sphaeroides,* described by d'Orbigny in 1826, differs significantly from the subsequent records of this species. *P. sphaeroides* is wider than long and has three chambers in the last whorl. The species that Parker and Jones (in Carpenter, Parker, and Jones, 1862) figured under the name *Pullenia sphaeroides* Parker and Jones has five chambers in the last whorl and is in all other respects more similar to *P. bulloides* (d'Orbigny) than to the original model of *N. sphaeroides* (=*P. sphaeroides*). Since then authors have referred specimens to *P. sphaeroides* that do not agree with the original description of that species. Therefore, both *P. sphaeroides* Parker and Jones and *P. sphaeroides* (d'Orbigny) (as described by most authors) are regarded as junior synonyms of *P. bulloides. P. miocenica* Kleinpell and *P. reussi* Cushman and Todd also should probably be regarded as junior synonyms to *P. bulloides.*

Ecology. Pullenia bulloides is found in the lower middle bathyal zone in the Pacific (Smith, 1964; Ingle and Keller, 1980) and is reported from the neritic zone down to the abyssal zone in the Gulf of Mexico (Pflum and Frerichs, 1976).

Distribution in 586A. Pullenia bulloides is a common species and occurs at relative abundances varying from 0.0 to 5.3%.

Recorded Distribution. Pullenia bulloides was described from the Tertiary of the Vienna Basin. Holocene: Atlantic (Brady, 1884; Phleger and others, 1953; Lohmann, 1978; Cole, 1981; Hermelin and Scott, 1985; Mead, 1985), Gulf of Mexico (Brady, 1884; Pflum and Frerichs, 1976), Pacific (Brady, 1884; Cushman, 1914, 1921; Smith, 1964; Ingle and others, 1980; Burke, 1981; Resig, 1981), Indian Ocean (Boltovskoy, 1978a; Corliss, 1979), Antarctic Ocean (Brady, 1884). Pleistocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984b; Murray, 1984), Gulf of Mexico (Akers and Dorman, 1964), Pacific (Douglas, 1973; Resig, 1976; Keller, 1980; McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984b; Murray, 1984), Mexico (Kohl, 1985), Pacific (Douglas, 1973; Keller, 1980; McDougall, 1985; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a). Miocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984b; Murray, 1984), Pacific (Douglas, 1973; Resig, 1976; Keller, 1980; Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Guam (Todd, 1966), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a).

Pullenia subcarinata (d'Orbigny)
Pl. 15, Figs. 6–7

Nonionina subcarinata D'ORBIGNY, 1839a, p. 28, pl. 5, figs. 23–24.

Nonionina quinqueloba REUSS, 1851, p. 71, pl. 5, figs. 31a–b.

Pullenia simplex RHUMBLER in WIESNER, 1931, p. 132, pl. 22, fig. 263.—CORLISS, 1979, p. 9, pl. 4, figs. 5–6.

Pullenia subcarinata (d'Orbigny).—HERON-ALLEN and EARLAND, 1932, p. 403–404, pl. 13, figs. 14–18.—BARKER, 1960, p. 174, pl. 84, figs. 14–15.

Pullenia quinqueloba (Reuss).—CUSHMAN, 1914, p. 21–22, pl. 13, fig. 2.—CUSHMAN and TODD, 1943, p. 10–11, pl. 2, fig. 5, pl. 3, fig. 8.—SCHNITKER, 1971, p. 206, pl. 10, fig. 11.—DOUGLAS, 1973, pl. 9, figs. 4–5.—RESIG, 1981, pl. 7, fig. 14.—MURRAY, 1984, pl. 3, figs. 1–2.—KOHL, 1985, p. 93, pl. 32, fig. 6.

Pullenia subcarinata subcarinata (d'Orbigny).—BOLTOVSKOY, 1978a, p. 167, pl. 6, figs. 21–22.

Pullenia subcarinata quinqueloba (Reuss).—BOLTOVSKOY, 1978a, p. 166, pl. 6, figs. 23–24.

Pullenia cf. *subcarinata* (d'Orbigny).—MEAD, 1985, p. 236, pl. 4, figs. 9a–10b.

Description. Test free, planispiral, involute, compressed, periphery rounded or subrounded, lobate. Chambers distinct, four to six in the last whorl, increasing rather rapidly in size as added giving the test a high apertural face. Sutures distinct, slightly depressed, slightly curved. Wall calcareous, hyaline, smooth, finely perforate. Aperture a narrow interiomarginal slit that extends from one umbilicus to the other, with a lip.

Remarks. The type figures of *Pullenia quinqueloba* (Reuss) and *Pullenia subcarinata* (d'Orbigny) exhibit five and six chambers in the last whorl respectively. There is an uninterrupted chain of transitional forms in between these two end-members (Heron-Allen and Earland, 1932; Boltovskoy, 1978a). I have followed Heron-Allen and Earland (1932) and synonymized the two forms.

Ecology. This species is found in the upper middle bathyal zone of the Pacific (Ingle, 1980) and Gulf of Mexico (Pflum and Frerichs, 1976).

Distribution in 586A. Pullenia subcarinata occurs in most samples with relative abundances of about 1%.

Recorded Distributions. Pullenia subcarinata was described from the Holocene of the Falkland Island. (*Pullenia quinqueloba* (Reuss) was described from the Eocene of Germany). Holocene: Atlantic (Brady, 1884; Heron-Allen and Earland, 1932; Schnitker, 1971; Cole, 1981; Mead, 1985), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Brady, 1884; Cushman, 1921; Ingle and others, 1980; Burke, 1981; Resig, 1981), Indian Ocean (Wiesner, 1931; Boltovskoy, 1978a; Corliss, 1979), Antarctic Ocean (Brady, 1884; Anderson, 1975). Pleistocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984b; Murray, 1984), Pacific (Douglas, 1973; Resig, 1976; Keller, 1980; McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984a; Murray, 1984), Mexico (Kohl, 1985), Pacific (Douglas, 1973; Keller, 1980; McDougall, 1985; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Indian Ocean (Boltovskoy, 1978a). Miocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984a; Murray, 1984), Pacific (Douglas, 1973; Resign, 1976; Keller, 1980; Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Indian Ocean (Boltovskoy, 1978a).

Pullenia sp. 1
Pl. 15, Figs. 8–10

Pullenia osloensis Feyling-Hanssen.—BOLTOVSKOY, 1978a, pl. 4, figs. 15–18 (not *Pullenia osloensis* Feyling-Hanssen, 1954).

Description. Test free, planispiral, involute, sphaeroidal, slightly compressed in side view, chambers distinct, four to five in final whorl. Sutures distinct, slightly curved, slightly depressed. Wall calcareous, hyaline, smooth, finely perforate. Aperture a narrow interiomarginal slit extending from one umbilicus to the other, with a thin lip.

Remarks. Pullenia sp. 1 resembles *P. osloensis* in many ways but exhibits an asymmetrical arrangement of the later chambers. This was also noted by Boltovskoy (1978a). Boltovskoy (1978a) regarded this form as belonging to *P. osloensis.*

Distribution in 586A. Pullenia sp. 1 is a relatively common species with relative abundances up to 5.1%.

Recorded Distribution. Pullenia sp. 1 was first recorded by Boltovskoy (1978a) in Neogene samples from the Indian Ocean. Holocene: Indian Ocean (Boltovskoy, 1978a). Pliocene: Indian Ocean (Boltovskoy, 1978a). Miocene: Indian Ocean (Boltovskoy, 1978a).

Pullenia sp. 2
Pl. 15, Figs. 11–12

Description. Test free, planispiral, involute, compressed in side view, chambers distinct, four to five in final whorl, periphery lobate. Sutures distinct, slightly curved, deeply depressed. Wall calcareous, hyaline, smooth, finely perforate. Aperture a narrow interiomarginal slit extending from one umbilicus to the other, with a thin lip.

Remarks. Pullenia sp. 2 differs from *P. subcarinata* in having a less compressed test and a more lobate periphery.

Distribution in 586A. Pullenia sp. 2 is a rare species with scattered occurrences.

Family ALABAMINIDAE Hofker, 1951

Genus **GYROIDINA** d'Orbigny, 1826

The two genera *Gyroidina* d'Orbigny (1826) and *Gyroidinoides* Brotzen (1942) are morphologically very close and the validity of a generic separation is unclear. Belford (1966) considered the differences between the two forms of no taxonomic significance; he considered *Gyroidinoides* to be a junior synonym of *Gyroidina.* This conclusion differs from that of Hofker (1951) who stated that these two genera have no real relation to each other. Later, however, Hofker (1957) referred both *Gyroidina* and *Gyroidinides* to the family Alabaminidae.

For this study I have followed Loeblich and Tappan (1964) who separated the two genera on the basis of the apertural characteristics. *Gyroidinoides* (placed in family Osangularidae) differs from *Gyroidina* (placed in the family Alabaminidae) in having a single apertural opening extending almost from the periphery to the umbilicus, whereas *Gyroidina* has a restricted aperture at the midportion of the apertural face, and a second aperture opening into the umbilicus.

Gyroidina altiformis Stewart and Stewart
Pl. 15, Figs. 13–15

Gyroidina soldanii d'Orbigny var. *altiformis* STEWART and STEWART, 1930, p. 67, pl. 9, figs. 2a–c.—PARKER, 1954, p. 527, pl. 9, figs. 7–8.

Gyroidina neosoldanii Brotzen var. *acuta* BOOMGAART, 1949, p. 125, pl. 14, figs. 1a–c.

Gyroidina acuta Boomgaart.—BELFORD, 1966, p. 165, 167, pl. 28, figs. 1–9, text-fig. 21:6–7.—KURIHARA and KENNETT, 1986, pl. 7, fig. 7.

Gyroidina altiformis acuta Boomgaart.—PFLUM and FRERICHS, 1976, pl. 4, figs. 8–9, pl. 5, fig. 1.

Gyroidina altiformis Stewart and Stewart.—LEROY, 1964, p. 37, pl. 7, figs. 7–9.—INGLE and others, 1980, p. 138, pl. 7, figs. 5–6.

Gyroidinoides altiformis (Stewart and Stewart).—KOHL, 1985, p. 95–96, pl. 34, figs. 3a–c.

Gyroidinoides acutus (Boomgaart).—THOMAS, 1985, p. 676, pl. 6, figs. 4–6.

Description. Test free, trochospiral, peripheral part of spiral side flat while inner part is slightly convex, umbilical side strongly convex with deep umbilicus. Circular in outline, peripheral edge subacute. Sutures distinct, limbate, slightly depressed on the umbilical side, raised and oblique on the spiral side. Wall calcareous, hyaline, smooth, finely perforate. Aperture a low interiomarginal slit from periphery to umbilicus.

Remarks. Pflum and Frerichs (1976) divided *Gyroidina altiformis* into different subspecies and regarded *Gyroidina altiformis acuta* Boomgaart, as representing a lower bathyal and abyssal member of a cline which also included the upper bathyal to neritic subspecies *Gyroidina altiformis cushmani* Boomgaart.

It is possible that the form Douglas [1973, pl. 12, figs. 4–7 (not 8–9)] described as *Gyroidina zealandica* Finlay could be synonymized with *G. altiformis.*

Ecology. Off the west coast of America, Smith (1964) found *Gyroidina altiformis* in the lower bathyal zone, whereas Ingle and others (1980) and Ingle (1980) found it in the upper middle bathyal zone.

Distribution in 586A. Gyroidina altiformis is a common species with relative abundances up to 4.1%.

Recorded Distribution. Gyroidina altiformis was described from the Pliocene of California. Holocene: Gulf of Mexico (Parker, 1954; Pflum and Frerichs, 1976), Pacific (Smith, 1964; Ingle, 1980; Ingle and others, 1980). Pleistocene: Pacific (McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986). Pliocene: Pacific (Boomgaart, 1949; McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986), California (Stewart and Stewart, 1930), Okinawa (LeRoy, 1964). Miocene: Mexico (Kohl, 1985), Pacific (McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986), Okinawa (LeRoy, 1964), Papua-New Guinea (Belford, 1966).

Gyroidina neosoldanii Brotzen
Pl. 15, Figs. 16–18

Rotalia soldanii d'Orbigny.—BRADY, 1884, p. 706–707, pl. 107, figs. 6–7 (not *Gyroidina soldanii* d'Orbigny, 1826).

Gyroidina soldanii d'Orbigny.—TODD, 1965, p. 19, pl. 6, fig. 4.—HERMELIN and SCOTT, 1985, p. 210, pl. 5, figs. 6–8.

Gyroidina neosoldanii BROTZEN, 1936, p. 158.—BARKER, 1960, p. 220, pl. 107, figs. 6–7.—LEROY, 1964, p. 37, pl. 7, figs. 4–6.—RESIG, 1981, pl. 8, fig. 5.

Gyroidinoides neosoldanii (Brotzen).—LOHMANN, 1978, p. 26, pl. 1, figs. 4–9.

Gyroidina neosoldani Brotzen [sic].—INGLE and others, 1980, p. 138, pl. 7, figs. 10–11.

Description. Test free, trochospiral, spiral side slightly convex, umbilical side strongly convex. Chambers have umbilical shoulders. Sutures distinct, radial or pointing slightly backward, slightly depressed. Wall calcareous, perforate, granular in structure. Aperture a low interiomarginal slit in the middle of the apertural face and opening into the wide umbilicus.

Remarks. According to Brotzen (1936) Brady's (1884) figures of *Rotalia soldanii* differ from the original description of *Gyroidina soldanii* (d'Orbigny, 1826) and he proposed a new name for this species, *Gyroidina neosoldanii.* Subsequent to this, authors have either followed Brotzen (1936) and named specimens identical to Brady's figures as *G. neosoldanii* or have disliked Brotzen's subdivision of the species and retained the name *G. soldanii.* I have followed Brotzen (1936) and used *G. neosoldanii.* For a more extensive discussion of the *G. soldanii—G. neosoldanii* group see Mead (1985).

Distribution in 586A. Gyroidina neosoldanii is a rare species with scattered occurrences.

Recorded Distribution. Gyroidina neosoldanii was originally described from the Cretaceous of southern Sweden. Holocene: Atlantic (Brady, 1884; Lohmann, 1978; Hermelin and Scott, 1985; Mead, 1985), Gulf of Mexico (Pflum and Frerichs, 1976), Mediterranean (Brady, 1884), Pacific (Brady, 1884; Todd, 1965; Ingle and others, 1980; Burke, 1981; Resig, 1981), Antarctic Ocean (Brady, 1884). Pleistocene: Atlantic (Blanc-Vernet, 1983), Gulf of Mexico (Akers and Dorman, 1964), Pacific (McDougall, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Blanc-Vernet, 1983), Pacific (Kurihara and Kennett, 1986). Miocene: Pacific (Kurihara and Kennett, 1986), Guam (Todd, 1966), Okinawa (LeRoy, 1964).

Genus **ORIDORSALIS** Andersen, 1961

Oridorsalis umbonatus (Reuss)
Pl. 16, Figs. 1–5

Rotalina umbonata REUSS, 1851, p. 75, pl. 5, fig. 35a–c.

Pulvinulina umbonata (Reuss).—BRADY, 1884, p. 695–696, pl. 105, figs. 2a–c.—CUSHMAN, 1915, p. 60, pl. 27, fig. 2.—CUSHMAN, 1921, p. 339–340, 1. 71, figs. 1a–c.—HERON-ALLEN and EARLAND, 1932, p. 430, pl. 15, figs. 16–18.

Truncatulina tenera BRADY, 1884, p. 665, pl. 95, figs. 11a–c.—CUSHMAN, 1915, p. 37, pl. 15, fig. 2.—CUSHMAN, 1921, p. 318, pl. 64, figs. 2a–c.

Eponides umbonata (Reuss).—CUSHMAN, 1931a, p. 52, pl. 11, figs. 1–3.

Eponides umbonatus (Reuss).—CHAPMAN and PARR, 1937, p. 108.—BERMÚDEZ, 1949, p. 249, pl. 17, figs. 22–24.—PARKER, 1952, p. 419, pl. 6, fig. 13. PHLEGER and others, 1953, p. 42, pl. 9, figs. 9–10.—BARKER, 1960, p. 216, pl. 105, figs. 2a–c.

Pseudoeponides umbonatus (Reuss).—UCHIO, in KAWAI and others, 1950, p. 190.—PARKER, 1958, p. 267, pl. 3, figs. 30–32.—LEROY, 1964, p. 39, pl. 7, figs. 33–38.—SMITH, 1964, p. 43, pl. 4, figs. 8a–c.—BELFORD, 1966, p. 172, pl. 30, figs. 1–6.

Gyroidina tenera (Brady).—HOFKER, 1951, p. 403, text-figs. 279–280.

Pseudoeponides tenera (Brady).—PARKER, 1954, p. 530, pl. 9, figs. 20–21.

Eponides tenera (Brady).—CUSHMAN and others, 1954, p. 359, pl. 89, fig. 20.

Eponides (?) *tenera* (Brady).—BARKER, 1960, p. 196, pl. 95, figs. 11a–c.

Oridorsalis umbonatus (Reuss).—TODD, 1965, p. 23, pl. 6, fig. 2.—BELFORD, 1966, p. 172–173, pl. 30, figs. 1–6, text-figs. 22:4–5.—TODD, 1966, p. 29, pl. 6, fig. 5, pl. 13, fig. 5.—DOUGLAS, 1973, pl. 13, figs. 1–6, pl. 24, figs. 9–12.—BOLTOVSKOY, 1978a, pl. 5, figs. 5–6.—LOHMANN, 1978, p. 26, pl. 4, figs. 1–3.—BUTT, 1980, pl. 7, fig. 15, pl. 7, fig. 21.—BURKE, 1981, pl. 3, figs. 9–10.—COLE, 1981, p. 113, pl. 14, fig. 8.—RESIG, 1981, pl. 8, fig. 8.—BOERSMA, 1984b, pl. 4, figs. 10–13.—HERMELIN and SCOTT, 1985, p. 214, pl. 5, fig. 10.—KOHL, 1985, p. 95, pl. 33, fig. 6, pl. 34, figs. 1–2. MCDOUGALL, 1985, p. 396, pl. 6, fig. 11.—MEAD, 1985, p. 237, pl. 5, figs. 8a–13.—KURIHARA and KENNETT, 1986, pl. 6, figs. 11–13.

Eponides tener tener (Brady).—HERB, 1971, p. 298.

Oridorsalis tenera (Brady).—ECHOLS, 1971, p. 166, pl. 15, figs. 3a–b.

Oridorsalis tener tener (Brady).—PFLUM and FRERICHS, 1976, pl. 6, figs. 2–4.

Oridorsalis tener umbonatus (Reuss).—PFLUM and FRERICHS, 1976, p. 108, pl. 6, figs. 5–7.

Oridorsalis tener (Brady).—LOHMANN, 1978, p. 26, pl. 4, figs. 5–7.—CORLISS, 1979, p. 9, pl. 4, figs. 10–15.—INGLE and others, 1980, p. 142, pl. 5, figs. 5–6.

Description. Test free, trochospiral, lenticular, compressed, periphery keeled, circular in side view. All chambers visible on spiral side, only those of the last whorl on the umbilical side, last chambers slightly lobate, ultimate chamber projecting into the center of the test on the umbilical side. Sutures radial and slightly curved on spiral side, strongly sinusoidal on umbilical side. Wall calcareous, hyaline, smooth, finely perforate. Aperture an interiomarginal slit extending from the periphery to the umbilical area, supplementary openings on spiral side at proximal end of the sutures of the last-formed chambers, similar openings on the umbilical side along the suture between the ultimate and penultimate chambers.

Remarks. Oridorsalis umbonatus and *O. tener* are similar, with morphological characteristics that are nearly identical. *O. umbonatus* is described as having straight sutures on the spiral side, chambers of equal size in the last whorl and a trochoidal cross-sectional outline, whereas *O. tener* has curved sutures, a more rapid whorl expansion, and a more compressed outline (Lohmann, 1978; Corliss, 1979; Mead, 1985). A comparison of the type figures of *Rotalina umbonata* Reuss (1851) and *Truncatulina tenera* Brady (1884) reveals that they are almost identical. Brady (1884) noted this already in the type description of *T. tenera* and stated (p. 665) that he had "... considerable hesitation in admitting this little Foraminifer to a position as an independent species, owing to its extreme resemblance to *Pulvinulina umbonata* Reuss; ..." but he was "... convinced by the passage forms with which it is found associated that the case is one of isomorphism, not of specific identity, ..." Because of the difficulties of consistently differentiating the two forms, I have treated them as the same species, with *O. tener* as a junior synonym to *O. umbonatus.*

Ecology. Pflum and Frerichs (1976) suggested that species of *Oridorsalis* represent a cline where *O. tener umbonatus* is the largest form with an upper depth limit in the upper middle bathyal zone and *O. tener tener* has an upper limit slightly below but also in the upper bathyal zone; both forms range down to the abyssal zone. According to Pflum and Frerichs (1976), another member of this cline is *O. tener stellatus,* ranging from the middle neritic zone down through the upper middle bathyal zone. In the Chile-Peru Trench *O. umbonatus* is found through the whole bathyal zone (Ingle and others, 1980), while Smith (1964) reported that it is limited to the middle bathyal zone.

Distribution in 586A. Oridorsalis umbonatus is one of the most common species in this study with relative abundances up to 12.3%.

Recorded Distribution. Oridorsalis umbonatus was described from the Tertiary of Germany. Holocene: Atlantic (Brady, 1884; Cushman, 1931a; Parker, 1952; Phleger and others, 1953; Lohmann, 1978; Cole, 1981; Hermelin and Scott, 1985; Mead, 1985), Gulf of Mexico (Parker, 1954; Bock, 1971; Pflum and Frerichs, 1976), Pacific (Brady, 1884; Cushman, 1915, 1921; Cushman and others, 1954; Smith, 1964; Ingle and others, 1980; Burke, 1981; Resig, 1981), Indian Ocean (Boltovskoy, 1978a), Antarctic Ocean (Brady, 1884; Heron-Allen and Earland, 1932; Chapman and Parr, 1937; Todd, 1965; Echols, 1971; Herb, 1971). Pleistocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984b; Murray, 1984), Pacific (Douglas, 1973; Resig, 1976; Butt, 1980; Keller, 1980; McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984a, b; Murray, 1984), Mexico (Kohl, 1985), Pacific (Douglas, 1973; Resig, 1976; Butt, 1980; Keller, 1980; McDougall, 1985; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a). Miocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984a, b; Murray, 1984), Pacific (Douglas, 1973; Resig, 1976; Butt, 1980; Keller, 1980; Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Guam (Todd, 1966), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Papua-New Guinea (Belford, 1966), Indian Ocean (Boltovskoy, 1978a).

Family OSANGULARIIDAE Loeblich and Tappan, 1964

Genus **GYROIDINOIDES** Brotzen, 1942

See discussion under the genus *Gyroidina*.

Gyroidinoides broeckhiana (Karrer)

Rotalia broeckhiana KARRER, 1878, p. 98, pl. 5, fig. 26.—BRADY, 1884, p. 705, pl. 107, figs. 4a–c.—CUSHMAN, 1915 (part), p. 68, pl. 27, figs. 4a–c (not pl. 30, figs. 2a–c, text-figs. 61a–c.
Gyroidina broeckhiana (Karrer).—HOFKER, 1951, p. 403, figs. 281–282.—BARKER, 1960, p. 220, pl. 107, figs. 4a–c.—BELFORD, 1966, p. 167–168, pl. 29, figs. 1–7, text-fig. 21:10–11.

Description. Test free, trochoid, strongly biconvex, almost circular in side view. Sutures slightly depressed on the spiral side, umbilical region filled with clear shell material. Wall calcareous, hyaline, smooth. Aperture an elongate slit running from near the umbilical region almost to the peripheral margin.

Distribution in 586A. Gyroidinoides broeckhiana is a rare species with few occurrences.

Recorded Distribution. Gyroidinoides broeckhiana was described from the Tertiary of the island Luzon in the Philippines. Holocene: Pacific (Brady, 1884; Cushman, 1915; Burke, 1981). Pleistocene: Pacific (Kurihara and Kennett, 1986). Pliocene: Pacific (Kurihara and Kennett, 1986), Java (Saint-Marc and Suminta, 1979). Miocene: Pacific (Woodruff and Douglas, 1981; McDougall, 1985; Kurihara and Kennett, 1986), Java (Saint-Marc and Suminta, 1979), Papua-New Guinea (Belford, 1966).

Gyroidinoides lamarckianus (d'Orbigny)
Pl. 16, Figs. 6, 10

Rotalina lamarckiana D'ORBIGNY, 1839c, p. 131, pl. 2, figs. 13–15.
Gyroidina lamarckiana (d'Orbigny).—PHLEGER and others, 1953, p. 41, pl. 8, fig. 33–34.—LECALVEZ, 1974, p. 72, 74, pl. 17, figs. 1–3.—BOLTOVSKOY, 1978a, pl. 4, figs. 14–15.—BURKE, 1981, pl. 3, figs. 7–8.—RESIG, 1981, pl. 8, figs. 1–2.
Gyroidina orbicularis d'Orbigny.—PFLUM and FRERICHS, 1976, pl. 5, figs. 5–7 (not *Gyroidina orbicularis* d'Orbigny, 1826).
Gyroidinoides orbicularis (d'Orbigny).—CORLISS, 1979, p. 9, pl. 5, figs. 1–3 (not *Gyroidina orbicularis* d'Orbigny, 1826).
Gyroidinoides sp. A. MEAD, 1985, p. 238, pl. 5, figs. 1–3.
Gyroidinoides lamarckianus (d'Orbigny).—THOMAS, 1985, p. 677, pl. 5, figs. 1–2.

Description. Test free, trochospiral, spiral side flat, umbilical side strongly convex, circular in outline, periphery rounded. Chambers indistinct, all visible on spiral side. Sutures flush with surface, radial on spiral and umbilical side. Wall calcareous, hyaline, smooth, finely perforate. Aperture an interiomarginal slit in the apertural face midway between the periphery and umbilicus.

Remarks. The forms referred to as *Gyroidina orbicularis* by Phleger and others (1953), Pflum and Frerichs (1976), and Corliss (1979) are probably this species. D'Orbigny's modele no. 13 (*Gyroidina orbicularis*) has a much more acute periphery and a more convex spiral side.

Distribution in 586A. Gyroidinoides lamarckianus is a rare species with scattered occurrences below 65 m.

Recorded Distribution. Gyroidinoides lamarckianus was described from the Holocene of Teneriffe in the Canaries. Holocene: Atlantic (d'Orbigny, 1839c; Phleger and others, 1953), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Ingle and others, 1980; Burke, 1981; Resig, 1981), Indian Ocean (Boltovskoy, 1978a; Corliss, 1979). Pleistocene: Atlantic (Phleger and others, 1953), Pacific (Resig, 1976; Keller, 1980; McDougall, 1985; Thomas, 1985; Kennett and Kurihara, 1986). Pliocene: Pacific (Keller, 1980; McDougall, 1985; Thomas, 1985; Kennett and Kurihara, 1986). Miocene: Pacific (Keller, 1980; McDougall, 1985; Thomas, 1985; Kennett and Kurihara, 1986), Guam (Todd, 1966), Indian Ocean (Boltovskoy, 1978a).

Gyroidinoides orbicularis (d'Orbigny)
Pl. 16, Figs. 7–9

Rotalia (Gyroidina) orbicularis D'ORBIGNY, 1826, p. 278, modele no. 13.
Rotalia orbicularis d'Orbigny.—BRADY, 1884, p. 706, pl. 107, figs. 5a–c, pl. 115, figs. 6a–c.—CUSHMAN, 1915, p. 68–69, pl. 29, figs. 3a–c, text-figs. 62a–c.

Description. Test free, trochoid, unequally biconvex, spiral side slightly convex whereas umbilical side is strongly convex, with umbilical depression. Periphery subacute. Chambers distinct, eight to 12 in the last whorl, all visible on the spiral side. Sutures distinct, radial, flush with the surface. Wall calcareous, hyaline, smooth, finely perforate. Aperture an interiomarginal slit in the apertural face midway between the periphery and umbilicus, with a narrow lip.

Ecology. Cole (1981) found *Gyroidinoides orbicularis* in the lower bathyal zone off Newfoundland whereas Schnitker reported it from neritic depths on the North Carolina continental shelf. In the Gulf of Mexico, Pflum and Frerichs (1976) found this species to have an upper depth limit in the upper bathyal zone and to be present down to abyssal depths. Corliss (1979) found *G. orbicularis* in the lower bathyal and abyssal zones of the Indian Ocean.

Distribution in 586A. Gyroidinoides orbicularis is a very rare species with scattered occurrences.

Recorded Distribution. Gyroidinoides orbicularis was described from the Holocene of the Adriatic Sea. Holocene: Atlantic (Schnitker, 1971; Cole, 1981), Gulf of Mexico (Pflum and Frerichs, 1976), Mediterranean (d'Orbigny, 1826), Pacific (Brady, 1884; Cushman, 1921), Indian Ocean (Corliss, 1979). Pleistocene: Pacific (Keller, 1980). Pliocene: Atlantic (Hermelin, 1986), Mexico (Kohl, 1985), Pacific (Keller, 1980). Miocene: Pacific (Keller, 1980). Papua-New Guinea (Belford, 1966).

Genus **OSANGULARIA**, Brotzen 1940
Osangularia culter (Parker and Jones)
Pl. 16, Figs. 11–13

Planorbulina farcta (Fichtel and Moll) var. *ungeriana* (d'Orbigny) subvar. *culter* PARKER and JONES, 1865, p. 421, pl. 19, figs. 1a–c.
Anomalina bengalensis SCHWAGER, 1866, p. 259, pl. 7, fig. 111.
Truncatulina culter (Parker and Jones).—BRADY, 1884, p. 668, pl. 96, figs. 3a–c.—CUSHMAN, 1921, p. 320–321, pl. 62, figs. 4a–c.
Pulvinulinella culter (Parker and Jones).—CUSHMAN, 1927b, p. 164, pl. 5, figs. 8–9.
Parrella culter (Parker and Jones).—FINLAY, 1939a, p. 523.—HOFKER, 1951, p. 336, text-figs. 229–232.
Osangularia bengalensis (Schwager).—THALMANN and GRAHAM, 1952, p. 31–32.—BARKER, 1960, p. 198, pl. 96, figs. 3a–c.—BURKE, 1981, pl. 3, figs. 11, 14.
Osangularia culter (Parker and Jones).—BELFORD, 1966, p. 175–176, pl. 35, figs. 1–5.—TODD, 1966, p. 29, pl. 13, fig. 7.—BOLTOVSKOY, 1978a, pl. 5, figs. 29–34.—LOHMANN, 1978, p. 26, pl. 3, figs. 7–9.—KOHL, 1985, p. 96, pl. 34, figs. 6a–c.—BOERSMA, 1986, p. 989, pl. 12, figs. 4–6.—KURIHARA and KENNETT, 1986, pl. 7, figs. 4–6.
Osangularia culter [sic] (Parker and Jones).—PHLEGER and others, 1953, p. 42, pl. 9, figs. 11, 16.—PARKER, 1954, p. 530, pl. 9, figs. 29–30.—BOCK, 1971, p. 65, pl. 24, figs. 4–5.
Osangularia culteri [sic] (Parker and Jones).—MCDOUGALL, 1985, p. 396, pl. 6, figs. 12.

Description. Test free, trochospiral, unequally biconvex, umbilical side more convex than spiral side, periphery with irregular saw-toothed keel. Chambers distinct. Sutures oblique on spiral side, almost radial and depressed on umbilical side. Wall calcareous, hyaline, smooth, finely perforate. Aperture an interiomarginal slit along the base of the ultimate chamber on the umbilical side, additional aperture a horizontal slit with lip, located closer to the umbilicus.

Remarks. Osangularia bengalensis may represent a shallow-water form of *O. culter* and although some authors distinguish between the two forms, I have regarded *O. bengalensis* as a junior synonym of *O. culter.*

Ecology. Boersma (1986) noted that *O. culter* demonstrates inverse latitudinal and depth-related frequency gradients to those of *O. bengalensis.* In the Gulf of Mexico *O. culter* is found in the upper middle bathyal zone (Pflum and Frerichs, 1976).

Distribution in 586A. Osangularia culter is a rare species with scattered occurrences.

Recorded Distribution. Osangularia culter was described from the Holocene of the equatorial Atlantic. Holocene: Atlantic (Parker and Jones, 1865; Brady, 1884; Phleger and others, 1953; Lohmann, 1978; Blanc-Vernet, 1983), Gulf of Mexico (Bock, 1971; Pflum and Frerichs, 1976), Pacific (Brady, 1884; Cushman, 1921, 1927b; Burke, 1981), Indian Ocean (Schwager, 1866; Boltovskoy, 1978a). Pleistocene: Pacific (Kurihara and Kennett, 1986). Pliocene: Atlantic (Boersma, 1984a, b), Mexico (Kohl, 1985), Pacific (Boersma 1986; Kurihara and Kennett, 1986), Okinawa (LeRoy, 1964), Indian Ocean (Schwager, 1866; Boltovskoy, 1978a). Miocene: Atlantic (Boersma, 1984a; Murray, 1984), Pacific (Woodruff and Douglas, 1981; McDougall, 1985; Boersma 1986; Kurihara and Kennett, 1986), Guam (Todd, 1966), Okinawa (LeRoy, 1964), Indian Ocean (Boltovskoy, 1978a).

Family ANOMALINIDAE Cushman, 1927a
Subfamily ANOMALININAE Cushman, 1927a
Genus **ANOMALINOIDES** Brotzen, 1942

Anomalinoides globulosus (Chapman and Parr)
Pl. 17, Figs. 1, 5

Truncatulina grosserugosa GUEMBEL, 1868, p. 660, pl. 2, fig. 104.
Truncatulina granosa HANTKEN, 1875, p. 74, pl. 19, fig. 2.
Anomalina grosserugosa (Guembel).—BRADY, 1884, p. 673, pl. 94, figs. 4–5.—CUSHMAN, 1915, p. 45, pl. 20, fig. 1.—CUSHMAN, 1921, p. 323, pl. 62, fig. 3.

Anomalina globulosa CHAPMAN and PARR, 1937, p. 117, pl. 9, fig. 27.—BARKER, 1960, p. 194, pl. 94, figs. 4–5.—RESIG, 1981, pl. 8, figs. 11–12.—HERMELIN and SCOTT, 1985, p. 203, pl. 6, figs. 1–2.

Anomalina sp. PHLEGER and others, 1953, p. 48, pl. 10, figs. 26–28.

Anomalinoides sp. 1 Douglas.—RESIG, 1976, pl. 4, figs. 10–11.

Anomalinoides sp.—LOHMANN, 1978, pl. 2, figs. 13–15.

Anomalinoides globulosa (Chapman and Parr).—BOERSMA, 1986, pl. 2, figs. 1–3.

Anomalinoides globulosus (Chapman and Parr).—THOMAS, 1985, pl. 12, figs. 6–7.—KURIHARA and KENNETT, 1986, pl. 9, fig. 9.—MORKHOVEN and others, 1986, p. 36–38, pl. 9, figs. 1–3.

Description. Test free, trochospiral, periphery rounded, six to seven chambers in the last whorl, spiral side strongly convex, umbilicus depressed. Chambers distinctly globular. Sutures depressed and slightly curved back. Wall coarsely perforated, especially on the umbilical side. Aperture a low interiomarginal slit which begins at approximately the midpoint of the periphery and extends into the umbilicus, with a narrow lip.

Remarks. Anomalinoides globulosus is the youngest member of a lineage containing *A. rubiginosus* (Cushman) (ranging from Campanian through Paleocene), *A. capitatus* (Guembel) (late Paleocene to early Oligocene), and *A. semicribratus* (Beckmann) (middle Eocene to middle Miocene). It differs from its immediate ancestor in having an aperture that begins at approximately the midpoint of the periphery rather than at the edge of the periphery as in *A. semicribratus.*

Ecology. Anomalinoides globulosus is a cosmopolitan species that is considered to be a good marker for middle bathyal to abyssal water depth (Berggren and others, 1976; Pflum and Frerichs, 1976).

Distribution in 586A. Anomalinoides globulosus is an abundant species with relative abundances up to 7.4%.

Recorded Distribution. Anomalinoides globulosus is described from Holocene brown terrigenous sand from 1,200 m depth between Antarctica and Australia. The known stratigraphic range of this species is late Miocene through Quaternary (Morkhoven and others, 1986). Holocene: Atlantic (Brady, 1884; Phleger and others, 1953; Lohmann, 1978; Hermelin and Scott, 1985), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Brady, 1884; Cushman, 1915, 1921; Burke, 1981; Resig, 1981). Pleistocene: Atlantic (Hermelin, 1986), Pacific (McDougall, 1985; Kurihara and Kennett, 1986). Pliocene: Pacific (Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986). Miocene: Pacific (Resig, 1976; Keller, 1980; McDougall, 1985; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986).

Genus **CIBICIDOIDES** Thalmann, 1939

Cibicidoides bradyi (Trauth)
Pl. 17, Figs. 2–4

Truncatulina dutemplei (d'Orbigny).—BRADY, 1884, p. 665, pl. 95, figs. 5a–c (not *Rotalina dutemplei* d'Orbigny, 1846).

Truncatulina bradyi TRAUTH, 1918, p. 235.

Cibicides bradyi (Trauth).—THALMANN, 1942, p. 464.—BARKER, 1960, p. 196, pl. 95, figs. 5a–c.—SCHNITKER, 1971, p. 196, pl. 10, figs. 12a–c.—PFLUM and FRERICHS, 1976, pl. 3, figs. 6–7.—BOLTOVSKOY, 1978a, pl. 3, figs. 6–8.

Cibicides hyalina HOFKER, 1951, p. 359, figs. 244–245.

Cibicides robertsonianus (Brady).—PHLEGER and others, 1953 (part), p. 51, pl. 11, figs. 15–16 (not 17) (not *Truncatulina robertsonianus* Brady, 1881).

Eponides hyalinus (Hofker).—LEROY, 1964, p. 37, pl. 7, figs. 24–26.

Parelloides bradyi (Trauth).—BELFORD, 1966, p. 100–102, pl. 11, figs. 10–19.

Cibicidoides bradyi (Trauth).—CORLISS, 1979, p. 9-10, pl. 3, figs. 1–3.—INGLE and others, 1980, pl. 6, figs. 11–12.—BOERSMA, 1984b, pl. 5, figs. 1–7.—MURRAY, 1984, pl. 1, figs. 14–16.—MEAD, 1985, p. 242, pl. 7, figs. 1–2, 4.—THOMAS, 1985, pl. 10, figs. 7–8.—BOERSMA, 1986, pl. 6, figs. 1–3.—KURIHARA and KENNETT, 1986, pl. 9, figs. 1–3.—MORKHOVEN and others, 1986, p. 100–102, pl. 30, figs. 1–2.

Gyroidina cf. *gemma* Bandy.—CORLISS, 1979, p. 9, pl. 4, figs. 7–9 (not *Gyroidina gemma* Bandy, 1953).

Description: Test free, biconvex, periphery broadly rounded, 4 to 5 whorls visible on the spiral side, 9 to 11 chambers in the final whorl. Sutures slightly depressed. Wall calcareous, coarsely perforate on spiral side, finely perforate on umbilical side. Aperture small and peripheral.

Remarks. Cibicidoides bradyi has been referred in the literature to several genera and species. Hofker (1951), in proposing the species *Cibicides hyalina,* stated that this species previously had been confused with *C. bradyi* and that it exhibited a much higher spiral side. Hofker (1956a) placed *C. hyalina* together with *Cibicidoides wuellerstorfi* in a new genus, *Parrelloides.* Loeblich and Tappan (1964) placed *Parrelloides* in the synonymy of *Cibicidoides.*

Cibicidoides bradyi differs from *C. robertsonianus* in its smaller size and in not having an angular periphery nor an imperforate keel.

Ecology. In the western Pacific Ocean, *Cibicidoides bradyi* has its upper depth limit in the upper middle bathyal zone (Ingle and Keller, 1980). It appears to have the same upper depth limit in the Gulf of Mexico, near the upper boundary of the upper middle bathyal zone (Pflum and Frerichs, 1976). There are some reports of *C. bradyi* in the neritic zone (e.g., Schnitker, 1971).

Distribution in 586A. Cibicidoides bradyi is an abundant species that occurs in low relative abundances.

Recorded Distribution. Cibicidoides bradyi was described from Holocene sediments from the Atlantic, Pacific and Indian Oceans. It has a known stratigraphic range from the middle Eocene through the Holocene (Morkhoven and others, 1986). Holocene: Atlantic (Brady, 1884; Phleger and others, 1953; Schnitker, 1971; Mead, 1985), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Brady, 1884; Hofker, 1951; Ingle and others, 1980; Burke, 1981), Indian Ocean (Boltovskoy, 1978a; Corliss, 1979). Pleistocene: Atlantic (Boersma, 1984b; Murray, 1984), Pacific (McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Boersma, 1984b; Murray, 1984), Pacific (Keller, 1980; McDougall, 1985; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Java (Saint-Marc and Suminta, 1979), Papua-New Guinea (Belford, 1966), Indian Ocean (Boltovskoy, 1978a). Miocene: Atlantic (Boersma, 1984b; Murray, 1984), Pacific (Resig, 1976; Keller, 1980; Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Papua-New Guinea (Belford, 1966), Indian Ocean (Boltovskoy, 1978a).

Cibicidoides mundulus (Brady, Parker and Jones)
Pl. 17, Figs. 9–11

Truncatulina sp., intermediate from near *Truncatulina haidingerii* (d'Orbigny).—BRADY, 1884, pl. 95, figs. 6a-c.
Truncatulina mundula BRADY and others, 1888, p. 228, pl. 45, figs. 25a–c.
Cibicides kullenbergi PARKER, in PHLEGER and others, 1953, p. 49, pl. 11, figs. 7–8.—BOLTOVSKOY, 1978a, pl. 3, figs. 9–12.
Cibicidoides mundulus (Brady, Parker and Jones).—BARKER, 1960, p. 196, pl. 95, figs. 6a–c.—RESIG, 1981, pl. 8, figs. 15, 18.—KURIHARA and KENNETT, 1986, pl. 8, figs. 7–9.—MORKHOVEN and others, 1986, p. 65–67, pl. 21, figs. 1a–c.

Description. Test free, trochospiral, biconvex, periphery angular with a narrow, thickened keel. Chambers distinct, 9 to twelve in last whorl, increasing gradually in size, all chambers visible on spiral side. Sutures oblique on the spiral side, slightly curved on the umbilical side. Wall calcareous, hyaline, smooth, coarsely perforate. Aperture an interiomarginal equatorial arch, extending along the spiral suture the length of one or two chambers.

Remarks. Cibicidoides mundulus is a relatively common species in Neogene deep sea sediments, it is often recorded under the name *C. kullenbergi* (Parker). Examination of a large number of specimens of the two forms revealed that the *C. mundulus/C. kullenbergi* complex is characterized by a considerable size variation but no other essential difference (Morkhoven and others, 1986). *C. kullenbergi*, therefore, is considered to be a junior synonym of *C. mundulus.*

Distribution in 586A. Cibicidoides mundulus is a common species with relative abundances up to 11.7%.

Recorded Distribution. Cibicidoides mundulus was described from the Holocene off the coast of Brazil. Its known stratigraphic range is the late Oligocene through the Holocene (Morkhoven and others, 1986). Holocene: Atlantic (Brady and others, 1888; Phleger and others, 1953), Pacific (Brady, 1884; Burke, 1981; Resig, 1981), Indian Ocean (Boltovskoy, 1978a), Antarctic Ocean (Chapman and Parr, 1937). Pleistocene: Pacific (Thomas, 1985; Kurihara and Kennett, 1986). Pliocene: Pacific (Thomas, 1985; Kurihara and Kennett, 1986), Indian Ocean (Boltovskoy, 1978a). Miocene: Pacific (Resig, 1976; Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986), Indian Ocean (Boltovskoy, 1978a).

Cibicidoides robertsonianus (Brady)

Truncatulina robertsoniana BRADY, 1881, p. 65.—BRADY, 1884, p. 664–665, pl. 95, figs. 4a–c.
Cibicides robertsoniana (Brady).—CUSHMAN, 1931a, p. 121, pl. 23, figs. 6a–c.
Cibicides robertsonianus (Brady).—PFLUM AND FRERICHS, 1976, pl. 3, figs. 3–5.—MORKHOVEN and others, 1986, p. 41–43, pl. 11, figs. 1a–c.

Description. Test free, trochospiral, plano-convex to biconvex, peripheral margin rounded. Chambers numerous, up to 12 to 14 in the last whorl, all chambers visible on the spiral side, almost involute on the umbilical side. Sutures distinct, slightly curved, flush with surface. Wall calcareous, hyaline, smooth, coarsely perforate on the spiral side, imperforate on the umbilical side. Aperture an interiomarginal arch with a lip, continuing along the spiral suture.

Remarks. Cibicidoides robertsonianus differs from *Cibicidoides bradyi* by its less rounded periphery, imperforate umbilical side and larger test.

Ecology. Cibicidoides robertsonianus appears to have the same upper depth limit as *Cibicidoides bradyi* in the Gulf of Mexico, near the upper boundary of the upper middle bathyal zone (Pflum and Frerichs, 1976). Cole (1981) observed this species in the upper middle bathyal through upper abyssal zones off Newfoundland.

Distribution in 586A. Cibicidoides robertsonianus is a rare species with scattered occurrences.

Recorded Distribution. Cibicidoides robertsonianus was described from the Holocene of the West Indies. Holocene: Atlantic (Brady, 1881, 1884; Cushman, 1931a), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Burke, 1981). Pleistocene: Atlantic (Blanc-Vernet, 1983; Murray, 1984). Pliocene: Atlantic (Murray, 1984), Pacific (Thomas, 1985). Miocene: Atlantic (Murray, 1984), Pacific (Keller, 1980; Thomas, 1985).

Cibicidoides wuellerstorfi (Schwager)

Anomalina wuellerstorfi SCHWAGER, 1866, p. 258, pl. 7, fig. 105, 107.

Truncatulina wuellerstorfi (Schwager).—BRADY, 1884, p. 662, pl. 93, figs. 8–9.—CUSHMAN, 1915, p. 34, pl. 12, figs. 3a–c.—CUSHMAN, 1921, p. 314–315, pl. 64, figs. 1a–c.

Planorbulina wuellerstorfi (Schwager).—GOËS, 1894, p. 89, pl. 15, fig. 777.

Planulina wuellerstorfi (Schwager).—CUSHMAN, 1929b, p. 104, pl. 15, figs. 1–2.—CUSHMAN, 1931a, p. 110, pl. 19, figs. 5–6.—PHLEGER and others, 1953, p. 49, pl. 11, figs. 1–2.—BARKER, 1960, p. 192, pl. 93, figs. 9a–c.—TODD, 1965, p. 51, pl. 23, figs. 3–5.—BELFORD, 1966, p. 120–121, pl. 20, figs. 1–6.—LOHMANN, 1978, p. 26, pl. 2, figs. 1–4.—CORLISS, 1979, p. 7–8, pl. 2, figs. 13–16.—COLE, 1981, p. 103, pl. 12, fig. 9. —MURRAY, 1984, pl. 2, figs. 16–18.—HERMELIN and SCOTT, 1985, p. 216, pl. 4, figs. 12–13.—MORKHOVEN and others, 1986, p. 48–50, pl. 14, figs. 1–2.

Cibicides wuellerstorfi (Schwager).—PARKER, 1958, p. 275, pl. 4, figs. 41–42.—AKERS and DORMAN, 1964, p. 31–32, pl. 15, figs. 16–17.—LEROY, 1964, p. 45, pl. 8, figs. 25–26.—DOUGLAS, 1973, pl. 18, figs. 7–9, pl. 25, figs. 15–16.—PFLUM and FRERICHS, 1976, pl. 4, figs. 2–4.—BOLTOVSKOY, 1978a, pl. 3, figs. 19–21.

Cibicidoides wuellerstorfi (Schwager).—PARKER, 1964, p. 624–625, pl. 100, fig. 29.—RESIG, 1981, pl. 8, figs. 16–17.—MEAD, 1985, p. 240, pl. 6, figs. 1a–2.—THOMAS, 1985, pl. 11, figs. 1–4.—KURIHARA and KENNETT, 1986, pl. 9, figs. 4–6.

Description. Test free, plano-convex, periphery with a distinct keel. Sutures strongly recurved on both sides, distinctly limbate on the dorsal side. Wall calcareous, coarsely and densely perforate. Aperture a low arch at the base of the final chamber.

Remarks. Cibicidoides wuellerstorfi was referred by Hofker (1956a) to the genus *Parrelloides,* a genus which is synonymized with *Cibicidoides* by Loeblich and Tappan (1964). Forms intermediate between *C. wuellerstorfi* and *Cibicidoides kullenbergi* (=*Cibicidoides mundulus*) have been observed by Lohmann (1978).

Ecology. Cibicidoides wuellerstorfi is a common and well-known species which is cosmopolitan at bathyal to abyssal depths. In the Pacific Ocean this species seems to have an upper depth limit close to the upper boundary of the upper middle bathyal zone (Brady, 1884; Bagg, 1908; Cushman, 1915; Goës, 1894). On the U.S. continental margin, this species has a slightly deeper upper depth limit, located in the lower middle bathyal zone (Miller and Lohmann, 1982). In the Gulf of Mexico it is most characteristic of the lower middle bathyal and deeper zones (Pflum and Frerichs, 1976), but also has scattered occurrences in the upper middle bathyal zone. In the Gulf of California, this species seems to be one of the most dominant in the lower middle and lower bathyal zones (Bandy, 1961). Lohmann (1978) found that this species was characteristic for the NADW in the western South Atlantic.

Distribution in 586A. Cibicidoides wuellerstorfi is a common species with relative abundances up to 13.2%.

Recorded Distribution. Cibicidoides wuellerstorfi was described from the Pliocene of Kar Nikobar, off Sumatra. Its known stratigraphic range is from the middle Miocene through the Holocene (Morkhoven and others, 1986). Holocene: Atlantic (Brady, 1884; Goës, 1894; Cushman, 1931, Phleger and others, 1953; Lohmann, 1978; Cole, 1981; Hermelin and Scott, 1985; Mead, 1985), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Brady, 1884; Cushman, 1915, 1921; Todd, 1965; Ingle and others, 1980; Burke, 1981; Resig, 1981), Indian Ocean (Boltovskoy, 1978a; Corliss, 1979), Antarctic Ocean (Brady, 1884). Pleistocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984b; Murray, 1984), Gulf of Mexico (Akers and Dorman, 1964), Pacific (Douglas, 1973; Resig, 1976; Keller, 1980; Thompson, 1980; McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984a, 1984b; Murray, 1984), Mexico (Kohl, 1985), Pacific (Douglas, 1973; Keller, 1980; Thompson, 1980; McDougall, 1985; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Sumatra (Schwager, 1866), Indian Ocean (Boltovskoy, 1978a). Miocene: Atlantic (Boersma, 1984a, b; Murray, 1984), Mexico (Kohl, 1985), Pacific (Douglas, 1973; Keller, 1980; Thompson, 1980; Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986), Guam (Todd, 1966), Java (Saint-Marc and Suminta, 1979), Okinawa (LeRoy, 1964), Papua-New Guinea (Belford, 1966), Indian Ocean (Boltovskoy, 1978a).

? **Cibicidoides** sp. 1
Pl. 17, Figs. 6–8

Description. Test free, small, plano-convex, periphery with a distinct keel, umbilical side with a deep depression around which the chambers exhibit short protruding spines. Sutures recurved. Wall calcareous, perforate. Aperture a low arch at the base of the final chamber.

Remarks. ? *Cibicidoides* sp. 1 resembles *Cibicidoides* *wuellerstorfi* except for the depressed umbilicus and spiny extensions of the chambers on the umbilical side.

Distribution in 586A. ? *Cibicidoides* sp. 1 is a rare species with scattered occurrences.

Genus **MELONIS** de Montfort, 1808

Melonis barleeanum (Williamson)
Pl. 17, Fig. 12

Nonionina barleeana WILLIAMSON, 1858, p. 32, pl. 3, figs. 68–69.

Nonionina umbilicatula (Montagu).—BRADY, 1884, p. 726, pl. 109, figs. 8–9.—CUSHMAN, 1914, p. 24–25, pl. 17, fig. 1.

Nonion barleeanum (Williamson).—CUSHMAN, 1930, p. 11, pl. 4, fig. 5.—CUSHMAN, 1939a, p. 23, pl. 6, figs. 11.—PHLEGER, 1952, p. 85, pl. 14, fig. 6.—PHLEGER and others, 1953, p. 30, pl. 6, fig. 4.—HERMELIN and SCOTT, 1985, p. 212, 214, pl. 5, fig. 2.

Anomalinoides barleeanum (Williamson) var. *zaandamae* VOORTHUYSEN, 1952, p. 681.

Nonion zaandamae (Voorthuysen).—LOEBLICH and TAPPAN, 1953, p. 87, pl. 16, figs. 11-12.

Gavelinonion barleeanum (Williamson).—BARKER, 1960, p. 224, pl. 109, figs. 8–9.

Melonis zaandamai [sic] (Voorthuysen).—LOEBLICH and TAPPAN, 1964, p. C761–C763.

Nonion barleanum [sic] (Williamson).—BOERSMA, 1984b, pl. 3, figs. 11–13.

Melonis barleeanus (Williamson).—PFLUM and FRERICHS, 1976, pl. 7, figs. 5–6.—MURRAY, 1984, pl. 2, figs. 8–9.—THOMAS, 1985, pl. 12, fig. 3

Melonis barleeanum (Williamson).—CORLISS, 1979, p. 10, 12, pl. 5, figs. 7–8.—THOMPSON, 1980, pl. 7, figs. 4a–b.—KURIHARA and KENNETT, 1986, pl. 9, figs. 10–11.

Description. Test free, planispiral, involute, compressed, deeply biumbilicate, periphery rounded, chambers distinct, usually more than ten in the last whorl. Sutures gently curved, flush with surface. Wall calcareous, hyaline, smooth, coarsely perforate, except for the apertural face. Aperture an interiomarginal slit that extends to umbilicus on both sides.

Remarks. This species has been placed by several authors in the genus *Nonion,* but because the umbilical region is open rather than closed it has been retained in the genus *Melonis.* A commonly used synonym for this species is *Nonionina umbilicatula* (Montagu).

It is questionable whether or not *M. parkeri* described from the Gulf of Biscay (Berthois and LeCalvez, 1959) is synonymous. According to Rouvillois (1970), *M. parkeri* has an imperforate apertural face, whereas *M. barleeanum* has a perforate one. This question needs further study because most specimens figured in the literature as *M. barleeanum* have imperforate apertural faces.

Ecology. Melonis barleeanum is generally considered a bathyal species. In the Gulf of Mexico it is found in the neritic zone and down through the middle bathyal zone (Pflum and Frerichs, 1976).

Distribution in 586A. Melonis barleeanum is a common species with relative abundances up to 15.4%.

Recorded Distribution. Melonis barleeanum was described from the Holocene of the British Isles. Holocene: Atlantic (Phleger and others, 1953; Hermelin and Scott, 1985), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Cushman, 1914, 1939a), Indian Ocean (Corliss, 1979). Pleistocene: Atlantic (Blanc-Vernet, 1983; Murray, 1984), Pacific (Thompson, 1980; Thomas 1985; Kurihara and Kennett, 1986). Pliocene: Atlantic (Blanc-Vernet, 1983; Boersma, 1984b; Murray, 1984; Hermelin, 1986), Pacific (Thompson, 1980; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986). Miocene: Atlantic (Murray, 1984), Pacific (Woodruff and Douglas, 1981; Thomas, 1985; Boersma, 1986; Kurihara and Kennett, 1986).

Melonis pompilioides (Fichtel and Moll)
Pl. 17, Figs. 13–14

Nautilus pompilioides (FICHTEL and MOLL, 1798, p. 31, pl. 2, figs. A–C.

Nonionina pompilioides (Fichtel and Moll).—D'ORBIGNY, 1826, p. 294, no. 15.—BRADY, 1884, p. 727, pl. 109, figs. 10–11.—CUSHMAN, 1914, p. 25–26, pl. 17, fig. 2.—PHLEGER and others, 1953, p. 30, pl. 6, figs. 7–8.

Nonionina umbilicatulata D'ORBIGNY, 1826, p. 293, pl. 15, figs. 10–12.

Nonion pompilioides (Fichtel and Moll).—CUSHMAN, 1930, p. 4, pl. 1, figs. 7–11, pl. 2, figs. 1–2.—CUSHMAN, 1946, p. 6, pl. 1, figs. 1–2.—PHLEGER and PARKER, 1951, p. 11, pl. 5, figs. 19–20.—BOLTOVSKOY, 1978a, pl. 5, figs. 3–4.

Melonis sphaeroides VOLOSHINOVA, 1958, p. 153, pl. 3, figs. 1a–b.—MEAD, 1985, p. 242, 244, pl. 7, figs. 3a–b.

Melonis pompilioides (Fichtel and Moll).—VOLOSHINOVA, 1958, p. 158, pl. 3, figs. 8–9.—BELFORD, 1966, p. 183–184, pl. 30, figs. 17–20.—DOUGLAS, 1973, pl. 9, figs. 8–9.—PFLUM and FRERICHS, 1976, pl. 7, figs. 7–8.—LOHMANN, 1978, p. 29, pl. 1, figs. 12-13.—CORLISS, 1979, p. 12, pl. 5, figs. 9–10.—INGLE and others, 1980, pl. 9, figs. 14–15.—KELLER, 1980, pl. 3, figs. 11–12.—THOMPSON, 1980, pl. 7, figs. 4a–b.—MURRAY, 1984, pl. 2, figs. 10–11.—HERMELIN and SCOTT, 1985, p. 212, pl. 6, fig. 5.—KOHL, 1985, p. 114–115, pl. 14, fig. 9.—THOMAS, 1985, pl. 12, figs. 1–2.—KURIHARA and KENNETT, 1986, pl. 9, figs. 7–8.—MORKHOVEN and others, 1986, p. 72–80, pl. 23A, figs. 1–2, pl. 23C, figs. 1a–d, pl. 23D, figs. 1a–d, pl. 23E, figs. 1a–c.

Nonion (?) *pompilioides* (Fichtel and Moll).—BARKER, 1960, p. 224, pl. 109, figs. 10–11.

Description. Test free, planispiral, involute, periphery broadly rounded, eight to ten chambers in the last whorl. Walls calcareous, hyaline, smooth, coarsely perforate. Sutures slightly curved, flush with surface. Aperture a low arch extending from umbilicus to umbilicus.

Remarks. Melonis pompilioides has been recorded under many different names: *M. soldanii* (d'Orbigny); *M. sphaeroides* (Voloshinova); *Nonionina umbilicatula* d'Orbigny; and *Nonion halkyardi* Cushman. I believe that these records represent ecophenotypic variants and that they should be regarded as junior synonyms of *M. pompilioides*. The significant coexistence with *M. barleeanum* might also suggest that these two species are to be regarded as ecophenotypic variants, but until further investigations show that they are the same species they are separated. *M. pompilioides* is a truly cosmopolitan deeper-water species that has been widely recorded in the literature.

Ecology. Melonis pompilioides is recorded from the lower bathyal zone in the eastern Pacific (Ingle, 1980; Ingle and Keller, 1980). It occurs in the bathyal zone in the Gulf of Mexico (Pflum and Frerichs, 1976).

Distribution in 568A. Melonis pompilioides is an abundant species with relative abundances up to 7.1%.

Recorded Distribution. Melonis pompilioides was described from Italy (as fossil) and from the Holocene of the Mediterranean. Holocene: Atlantic (Phleger and others, 1953; Lohmann, 1978; Cole, 1981; Hermelin and Scott, 1985; Mead, 1985), Gulf of Mexico (Pflum and Frerichs, 1976), Pacific (Cushman, 1914, 1939a; Burke, 1981), Indian Ocean (Corliss, 1979). Pleistocene: Atlantic (Blanc-Vernet, 1983; Murray, 1984), Pacific (Douglas, 1973; Resig, 1976; Keller, 1980; Thompson, 1980; McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986), Java (Saint-Marc and Suminta, 1979). Pliocene: Atlantic (Murray, 1984), Pacific (Douglas, 1973; Keller, 1980; Thompson, 1980; McDougall, 1985; Thomas 1985; Kurihara and Kennett, 1986), Papua-New Guinea (Belford, 1966), Indian Ocean (Boltovskoy, 1978a). Miocene: Atlantic (Murray, 1984), Pacific (Keller, 1980; Woodruff and Douglas, 1981; McDougall, 1985; Thomas, 1985; Kurihara and Kennett, 1986), Guam (Todd, 1966), Java (Saint-Marc and Suminta, 1979), Papua-New Guinea (Belford, 1966), Indian Ocean (Boltovskoy, 1978a).

REFERENCES

AKERS, W. H., and DORMAN, J. H., 1964, Pleistocene foraminifera of the Gulf Coast: Tulane Studies in Geology, v. 3, p. 9–93.

ANDERSEN, H. V., 1961, Genesis and paleontology of the Mississippi River mudlumps, lower Mississippi River Delta, Louisiana: Louisiana Geological Society Bulletin 35, p. 1–208.

ANDERSON, J. B., 1975, Ecology and distribution of foraminifera in the Weddell Sea of Antarctica: Micropaleontology, v. 21, p. 69–96.

ASANO, K., 1950, Part 3: Textulariidae, *in* Stach, L. W. (ed.), Illustrated Catalogue of Japanese Tertiary Smaller Foraminifera: Hosokawa Printing Co., Tokyo, p. 1–7.

———, 1952, Supplement No. 1, *in* Stach, L. W. (ed.), Illustrated Catalogue of Japanese Tertiary Smaller Foraminifera: Hosokawa Printing Co., Tokyo, p. 1–7.

BACKMAN, J., 1979, Pliocene biostratigraphy of DSDP Sites 111 and 116 from the North Atlantic Ocean and the age of the Northern Hemisphere glaciation: Stockholm Contributions in Geology, v. 35, p. 115–137.

———, and PESTIAUX, P., 1986, Pliocene *Discoaster* abundance variations, Deep Sea Drilling Project Site 606: biochronology and paleoenvironmental implications, *in* Ruddiman, W. F., Kidd, R. B., Thomas, E., and others, Initial Reports of the Deep Sea Drilling Project, Leg 94: United States Printing Office, Washington, D.C., v. 94, p. 903–910.

———, and SHACKLETON, N. J., 1983, Quantitative biochronology of Pliocene and early Pleistocene calcareous nannofossils from the Atlantic, Indian and Pacific Oceans: Marine Micropaleontology, v. 8, p. 141–170.

BAGG, R. M., JR., 1908, Foraminifera collected near the Hawaiian Islands by the Steamer *Albatross* in 1902: Proceedings of the United States National Museum, v. 34, p. 113–172.

BAILEY, L. W., 1861, Notes on new species of microscopical organisms, chiefly from the Para River, South America: Boston Journal of Natural History, v. 7 (1859–1863), p. 329–352.

BANDY, O. L., 1953, Ecology and paleoecology of some California foraminifera. Pt. 1, The frequency distribution of Recent foraminifera off California: Journal of Paleontology, v. 27, p. 161–182.

———, 1961, Distribution of foraminifera, radiolaria and diatoms in sediments of the Gulf of California: Micropaleontology, v. 7, p. 1–26.

———, and ARNAL, R. E., 1957, Distribution of Recent foraminifera off the west coast of Central America: American Association of Petroleum Geologists Bulletin, v. 41, p. 2027–2053.

———, and ECHOLS, R. J., 1964, Antarctic foraminiferal zonation, *in* Lee, M. O. (ed.), Biology of the Antarctic Seas: Antarctic Research Series, American Geophysical Union, v. 1, p. 73–91.

BARKER, R. W., 1960, Taxonomic notes on the species figured by H. B. Brady in his report on the foraminifera dredged by H.M.S. *Challenger* during the years 1873–1876: Society of Economic Paleontologists and Mineralogists Special Publication no. 9, p. 1–238.

BELANGER, P. E., and STREETER, S. S., 1980, Distribution and ecology of benthic foraminifera in the Norwegian-Greenland Sea: Marine Micropaleontology, v. 5, p. 401–428.

BELFORD, D. J., 1966, Miocene and Pliocene smaller foraminifera from Papua and New Guinea: Department of Natural Development, Bureau of Mineral Resources, Geology, and Geophysics, Bulletin 79, p. 1–305.

BERGER, W. H., BONNEAU, M.-C., and PARKER, F. L., 1982, Foraminifera on the deep-sea floor: lysocline and dissolution rate: Acta Oceanologica, v. 5, p. 249–258.

———, JOHNSON, T. C., and HAMILTON, E. L., 1977, Sedimentation on Ontong-Java Plateau: observations on a classic "carbonate monitor," *in* Anderson, N. R., and Malahoff, A. (eds.), The Fate of Fossil CO_2 in the Oceans: Plenum Publication Corporation, New York, p. 543–567.

———, and WEFER, G., 1988, Benthic deep-sea foraminifera: Possible consequences of infaunal habitat for paleoceanographic interpretation: Journal of Foraminiferal Research, v. 18, p. 147–150.

BERGGREN, W. A., KENT, D. V., and VAN COUVERING, J. A., 1985, The Neogene: Part 2. Neogene geochronology and chronostratigraphy, *in* Snelling, N. J. (ed.), The Chronology of the Geological Record: The Geological Society of London Memoir no. 10, p. 211–260.

BERMÚDEZ, P. J., 1949, Tertiary smaller foraminifera of the Dominican Republic: Cushman Laboratory for Foraminiferal Research, Special Publication no. 24, p. 1–322.

BÉRTHELIN, G., 1880, Memoire sur les foraminifères de l'étage Albien de Moncley (Doubs): Mémoires de la Société Géologique de France, series 3, v. I, p. 1–84.

BERTHOIS, L., and LECALVEZ, Y., 1959, Deuxième contribution a l'étude de la sédimentation dans le Golfe de Gascogne: Revue des Travaux de la Institut Peches Maritime, v. 23, p. 325–375.

BLAINVILLE, H. M. DE, 1824, Dictionnaire des sciences naturelles: F. G. Levrault, Paris, 567 p.

———, 1825, Manuel de malacologie et de conchyologie: F. G. Levrault, Paris, 664 p.

BLANC-VERNET, L., 1958, Les milieux sédimentaires littoraux de la Provence occidentale (côte rocheuse). Relations entre la microfaune et la granulométrie du sédiment: Bulletin de la Institute Océanographique de Monaco, v. 1112, p. 1–45.

———, 1983, Benthic foraminifers of Site 533, Leg 76 of the Deep Sea Drilling Project—Faunal variations during the Pliocene and Pleistocene on the Blake Outer Ridge (Western North Atlantic), *in* Sheridan, R. E., Gradstein, F. M., and others, Initial Reports of the Deep Sea Drilling Project, Leg 76: United States Government Printing Office, Washington, D.C., v. 76, p. 497–507.

BOCK, W. D., 1971, A handbook of the benthonic foraminifera of Florida Bay and adjacent waters, *in* Jones, J. I., and Bock, W. D. (eds.), A Symposium of Recent South Florida Foraminifera: Miami Geological Society Memoir 1, p. 1–72.

BOERSMA, A., 1984a, Oligocene and other Tertiary benthic foraminifers from a depth traverse down Walvis Ridge, Deep Sea Drilling Project Leg 75, southeast Atlantic, *in* Hay, W. W., Sibuet, J. C., and others, Initial Reports of the Deep Sea Drilling Project, Leg 75: United States Government Printing Office, Washington, D.C., v. 75, p. 1273–1300.

———, 1984b, Pliocene planktonic and benthic foraminifers from the southeastern Atlantic Angola Margin: Leg 75, Site 532, Deep Sea Drilling Project, *in* Hay, W. W., Sibuet, J. C., and others, Initial Reports of the Deep Sea Drilling Project, Leg 75: United States Government Printing Office, Washington, D.C., v. 75, p. 657–669.

———, 1984c, Handbook of common Tertiary *Uvigerina*: Microclimates Press, New York, 207 p.

———, 1986, Biostratigraphy and biogeography of Tertiary bathyal benthic foraminifers: Tasman Sea, Coral Sea, and on the Chatham Rise (Deep Sea Drilling Project, Leg 90), *in* Kennett, J. P., von der Borch, C. C., and others, Initial Reports of the Deep Sea Drilling Project, Leg 90, pt. 2: United States Government Printing Office, Washington, D.C., v. 90, pt. 2, p. 961–1036.

BOLTOVSKOY, E., 1978a, Late Cenozoic benthonic foraminifera of the Ninetyeast Ridge (Indian Ocean): Marine Geology, v. 26, p. 139–175.

———, 1978b, Estudio bioestratigráfico y paleontológico (foraminíferos bentónicos) del Cenozoico Superior al Este de las Islas Malvinas (DSDP, Crucero 36, Sitios 327 y 329): Revista del Museo Argentino de Ciencias Naturales "Bernardino Rivadivia" e Instituto Nacional de Investigacion de las Ciencias Naturales, Ciencias Geologicas, v. 8, p. 19–95.

———, 1980a, On the benthonic bathyal zone foraminifera as stratigraphic guide fossils: Journal of Foraminiferal Research, v. 10, p. 163–172.

———, 1980b, Benthonic foraminifera of the bathyal zone from Oligocene through Quaternary: Revista Espanola de Micropaleontologia, v. 12, p. 283–304.

———, 1981, Foraminíferos bentónicos del Sitio 360 del "Deep Sea Drilling Project" (Eoceno medio-Plioceno inferior): Revista de la Asociacion Geologica Argentina, v. 36, p. 389–423.

———, and DE KAHN, G. G., 1982, Foraminíferos bentónicos calcareos uniloculares del Cenozoico superios de Atlantico sur: Revista de la Asociacion Geologica Argentina, v. 37, p. 408–448.

BOOMGAART, L., 1949, Smaller foraminifera from Bodjonegoro (Java): Unpublished Ph.D. Dissertation, University of Utrecht, p. 1–175.

BORNEMANN, J. G., 1855, Die mikroskopische Fauna des Septarien-thones von Hermsdorf bei Berlin: Zeitschrift der Deutschen Geologischen Gesellschaft, v. 7, p. 307–371.

BRADY, H. B., 1868, On *Ellipsoidina*, a new genus of foraminifera, by Giuseppe Seguenza; with further notes on its structures and affinities: Annals and Magazine of Natural History, series 4, v. 1, p. 333–343.

———, 1877, Supplementary note on the foraminifera of the Chalk (?) of the New Britain group: Geological Magazine, new series, Decade 2, v. 4, p. 534–536.

———, 1878, On the reticularian and radiolarian Rhizopoda (foraminifera and polycystina) of the North-Polar Expedition of 1875–1876: Annals and Magazine of Natural History, series 5, v. 1, p. 425–440.

———, 1879, Notes on some of the reticularian Rhizopoda of the "Challenger" Expedition: Part II, Additions to the knowledge of porcellanous and hyaline types: Quarterly Journal of Microscopical Science, new series, v. 19, p. 261–299.

———, 1881, Notes on some of the reticularian Rhizopoda of the "Challenger" Expedition: Part III, 1—Classification, 2—Further notes on new species, 3—Note on *Biloculina* mud: Quarterly Journal of Microscopical Science, new series, v. 21, p. 31–71.

———, 1884, Report on the foraminifera dredged by HMS Challenger, during the years 1873–1876: Report of Scientific Results of the Exploration Voyage of HMS Challenger, Zoology, v. 9 (2 vols), p. 1–814.

———, PARKER, W. K., and JONES, T. R., 1888, On some foraminifera from the Abrohlos Bank: Transactions of the Zoological Society of London, v. 12, pt. 7, p. 211–239.

BROTZEN, F., 1936, Foraminiferen aus den schwedischen, untersten Senon von Eriksdal in Schonen: Avhandlingar och Uppsatser från Sveriges Geologiska Undersökning, v. 30, (serie C, no. 396), p. 1–206.

———, 1940, Flintrännans och Trindelrännans geologi: Avhandlingar och Uppsatser från Sveriges Geologiska Undersökning, v. 34, (serie C, no. 435), p. 1–33.

———, 1942, Die Foraminiferengattung *Gavelinella* nov. gen. und die Systematik der Rotaliiformes: Avhandlingar och Uppsatser från Sveriges Geologiska Undersökning, v. 36, (serie C, no. 451), p. 1–60.

BUCHNER, P., 1940, Die Lagenen des Golfes von Neapel und der marinen Ablagerungen auf Ischia: Nova Acta Leopoldiana, new serie, v. 9, p. 363–560.

BURKE, S. C., 1981, Recent benthic foraminifera of the Ontong-Java Plateau: Journal of Foraminiferal Research, v. 11, p. 1–19.

BUTT, A., 1980, Biostratigraphic and paleoenvironmental analysis of the sediments at the Emperor Seamounts, DSDP Leg 55, northwestern Pacific: Cenozoic foraminifers, *in* Jackson, E. D., Koisumi, I., and others, Initial Reports of the Deep Sea Drilling

Project, Leg 55: United States Government Printing Office, Washington, D.C., v. 55, p. 289–325.
BYKOVA, N. K., 1959, *in* Rauzer-Chernovsova, D. M., and Fursenko, A. V. Osnovy, (eds.), Paleontologii. Obshchaya chast prosteyshei. (Principles of Paleontology. Part I, Protozoa): Akademiya Nauk SSSR, p. 1–368.
CARPENTER, W. B., PARKER, W. K., and JONES, T. R., 1862, Introduction to the study of the foraminifera: Ray Society, p. 1–319.
CHAPMAN, F., and PARR, W. J., JR., 1931, Notes on new and aberrant types of foraminifera: Proceedings of the Royal Society of Victoria, new series, v. 43, pt. 2, p. 236–240.
———, and ———, 1937, Foraminifera: Australasian Antarctic Expedition 1911–1914, Scientific Results—Series C (Zoology and Botany), v. 1, p. 1–190.
———, ———, and COLLINS, A. D., 1934, Tertiary foraminifera of Victoria, Australia—the Balcombian deposits of Port Phillip, Part III: Journal of the Linnean Society of London, Zoology, v.38 (1932–1934), p. 553–557.
CHAPPELL, J. M., and SHACKLETON, N. J., 1986, Oxygen isotopes and sea level: Nature, v. 324, p. 137–140.
COLE, F. E., 1981, Taxonomic notes on the bathyal zone benthonic foraminiferal species off northeast Newfoundland: Bedford Institute of Oceanography, Report Series, BI-R-81-7, p. 1–121.
COLOM, G., 1946, Los foraminíferos de las margas Vindoboniens de Mallorca: Estudios Geológicos, Instituto de Investigaciónes Geológicos de "Lucas Mallada," no. 3, p. 113–180.
CORLISS, B. H., 1979, Taxonomy of Recent deep-sea benthonic foraminifera from the southeast Indian Ocean: Micropaleontology, v. 25, p. 1–19.
———, 1982, Linkage of North Atlantic and Southern Ocean deepwater circulation during glacial intervals: Nature, v. 298, p. 458–460.
———, 1985, Microhabitats of benthic foraminifera within deepsea sediments: Nature, v. 314, p. 435–438.
COSTA, O. G., 1855, Foraminiferi fossili delle marine Terziarie di Messina: Memoire della Reale Accademia Scienza Napoli, v. 2, p. 128–147, 367–373.
CULP, S. K., 1977, Recent benthic foraminifera of the Ontong Java Plateau: M.S. Thesis, University of Hawaii, Honolulu, Hawaii, p. 1–146.
CULVER, S. J., and BUZAS, M. A., 1981, Recent benthic foraminiferal provinces on the Atlantic continental margin of North America: Journal of Foraminiferal Research, v. 11, p. 217–240.
———, and ———, 1982, Recent benthic foraminiferal provinces between Newfoundland and Yucatan: Geological Society of America Bulletin, v. 93, p. 269–277.
CUSHMAN, J. A., 1910, A monograph of the foraminifera of the North Pacific Ocean, Part II. Astrorhizidae and Lituolidae: United States National Museum Bulletin 71, pt. 1, p. 1–134.
———, 1911, A monograph of the foraminifera of the North Pacific Ocean, Part II. Textulariidae: United States National Museum Bulletin 71, pt. 2, p. 1–108.
———, 1913, A monograph of the foraminifera of the North Pacific Ocean, Part III. Lagenidae: United States National Museum Bulletin 71, pt. 3, p. 1–125.
———, 1914, A monograph of the foraminifera of the North Pacific Ocean, Part IV. Chilostomellidae, Globigerinidae, Nummulitidae: United States National Museum Bulletin 71, pt. 4, p. 1–46.
———, 1915, A monograph of the foraminifera of the North Pacific Ocean, Part V. Rotaliidae: United States National Museum Bulletin 71, pt. 5, p. 1–87.
———, 1917a, A monograph of the foraminifera of the North Pacific, Part VI. Miliolidae: United States National Museum Bulletin 71, pt. 6, p. 1–108.
———, 1917b, New species and varieties of foraminifera from the Philippines and adjacent waters: Proceedings of the United States National Museum, v. 51, p. 651–662.
———, 1921, Foraminifera of the Philippine and adjacent seas—contributions to the biology of the Philippine Archipelago and adjacent regions: United States National Museum Bulletin 100, v. 4, p.1–608.
———, 1922, The foraminifera of the Atlantic Ocean, Part 3. Textulariidae: United States National Museum Bulletin 104, pt. 3, p. 1–149.
———, 1923, The foraminifera of the Atlantic Ocean, Part 4. Lagenidae: United States National Museum Bulletin 104, pt. 4, p. 1–228.
———, 1924a, The foraminifera of the Atlantic Ocean, Part 5. Chilostomellidae and Globigerinidae: United States National Museum Bulletin 104, pt. 5, p. 1–55.
———, 1924b, Samoan foraminifera: Publication of the Carnegie Institution of Washington, no. 342, p.1–75.
———, 1925a, Foraminifera of tropical Central Pacific: Bernice Payahi Bishop Museum Bulletin 27, Tanager Expedition Publication no. 1, p. 121–144.
———, 1925b, Notes on the genus *Cassidulina*: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 1, p. 51–60.
———, 1926a, The genus *Chilostomella* and related genera: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 1, p. 73–80.
———, 1926b, The generic position of "*Pulvinulina favus* H. B. Brady": Contributions from the Cushman Laboratory for Foraminiferal Research, v. 2, p. 70–71.
———, 1927a, An outline of a re-classification of the foraminifera: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 3, p. 1–105.
———, 1927b, Recent foraminifera from off the west coast of America: Bulletin of the Scripps Institution of Oceanography, Technical Series, v. 1, p. 119–188.
———, 1927c, Foraminifera of the genus *Ehrenbergina* and its species: Proceedings of the United States National Museum, v. 70, art. 16, p. 1–8.
———, 1927d, Additional notes on the genus *Pleurostomella*: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 3, p. 156–157.
———, 1927e, New and interesting foraminifera from Mexico and Texas: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 3, p. 111–119.
———, 1929a, The foraminifera of the Atlantic Ocean, Part 6. Miliolidae, Ophthalmidiidae, and Fischerinidae: United States National Museum Bulletin 104, pt. 6, p. 1–129.
———, 1929b, *Planulina ariminensis* d'Orbigny and *P. wuellerstorfi* (Schwager): Contributions from the Cushman Laboratory for Foraminiferal Research, v. 5, p. 102–105.
———, 1930, The foraminifera of the Atlantic Ocean, Part 7. Nonionidae, Camerinidae, Peneroplidae and Alveolinellidae: United States National Museum Bulletin 104, pt. 7, p. 1–79.
———, 1931a, The foraminifera of the Atlantic Ocean, Part 8. Rotaliidae, Amphisteginidae, Calcarinidae, Cymbaloporettidae, Globorotaliidae, Anomalinidae, Planorbulinidae, Rupertiidae, and Homotremidae: United States National Museum Bulletin 104, pt. 8, p. 1–179.
———, 1931b, Cretaceous foraminifera from Antigua B.W.I.: Con-

tributions from the Cushman Laboratory for Foraminiferal Research, v. 7, p. 33–46.
———, 1932a, The foraminifera of the tropical Pacific collections of the "Albatross," 1899–1900, Part 1. Astrorhizidae to Trochamminidae: United States National Museum Bulletin 161, v. 1, pt. 1, p. 1–88.
———, 1932b, The genus *Vulvulina* and its species: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 8, p.75–85.
———, 1933a, The foraminifera of the tropical Pacific collections of the "Albatross," 1899–1900, Part 2. Lagenidae to Alveolinellidae: United States National Museum Bulletin 161, v. 1, p. 1–79.
———, 1933b, Some new Recent foraminifera from the tropical Pacific: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 9, p. 77–95.
———, 1933c, The foraminifera of the tropical Pacific collections of the "Albatross," 1899–1900, Part 2. Lagenidae to Alveolinellidae: United States National Museum Bulletin 161, v. 1, p. 1–79.
———, 1933d, Foraminifera—their classification and economic use: Cushman Laboratory for Foraminiferal Research, Special Publication no. 4, p. 1–349.
———, 1934, Smaller foraminifera from Vitilevu, Fiji, *in* Ladd, H. S., Geology of Vitilevu, Fiji: Bernice Payahi Bishop Museum Bulletin 119, p. 102–142.
———, 1937a, A monograph of the foraminiferal family Verneuilinidae: Cushman Laboratory for Foraminiferal Research, Special Publication no. 7, p.1–157.
———,1937b, A monograph of the foraminiferal family Valvulinidae: Cushman Laboratory for Foraminiferal Research, Special Publication no. 8, p. 1–210.
———, 1937c, A monograph of the subfamily Virgulininae of the foraminiferal family Buliminidae: Cushman Laboratory for Foraminiferal Research, Special Publication no. 9, p. 1–228.
———, 1939a, A monograph of the foraminiferal family Nonionidae: United States Geological Survey Professional Paper no. 191, p. 1–100.
———, 1939b, Notes on some foraminifera described by Schwager from the Pliocene of Kar Nicobar: Journal of the Geological Society of Japan, v. 46, p.149–154.
———, 1942, The foraminifera of the tropical Pacific collections of the "Albatross," 1899–1900, Part 3. Heterohelicidae and Buliminidae: United States National Museum Bulletin 161, v. 1, pt. 3, p. 1–67.
———, 1946, The species of foraminifera named and figured by Fichtel and Moll in 1798 and 1803: Cushman Laboratory for Foraminiferal Research, Special Publication no. 17, p. 3–16.
———, 1948, Arctic foraminifera: Cushman Foundation for Foraminiferal Research, Special Publication no. 23, p. 1–79.
———, and Bermúdez, P. J., 1936, New genera and species of foraminifera from the Eocene of Cuba: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 12, p. 27–38.
———, and ———, 1937, Further new species of foraminifera from the Eocene of Cuba: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 13, p. 1–28.
———, and Edwards, P. G., 1937, *Astrononion*, a new genus of the Foraminifera, and its species: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 13, p. 29–36.
———, and Harris, R. W., 1927, Notes on the genus *Pleurostomella*: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 3, p. 128–135.
———, and Jarvis, P. W., 1934, Some interesting new uniserial foraminifera from Trinidad: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 10, p. 71–75.
———, and Martin, L. T., 1935, A new genus of foraminifera, *Discorbinella*, from Monterey, California: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 11, p. 89–90.
———, and McCulloch, I., 1942, Some Virgulininae in the collections of the Allan Hancock Foundation: Allan Hancock Pacific Expeditions, v. 6, p. 179–230.
———, and ———, 1948, The species of *Bulimina* and related genera in the collections of the Allan Hancock Foundation: Allan Hancock Pacific Expeditions, v. 6, p. 1–294.
———, and ———, 1950, Some Lagenidae in the collections of the Allan Hancock Foundation: Allan Hancock Pacific Expeditions, v. 6, p. 295–364.
———, and Parker, F. L., 1931, Recent foraminifera from the Atlantic coast of South America: Proceedings of the United States National Museum, v. 8, p. 1–34.
———, and ———, 1937, Notes on some of the early described Eocene species of *Bulimina* and *Buliminella*: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 13, p. 65–73.
———, and ———, 1940, The species of the genus *Bulimina* having Recent types: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 16, p. 7–23.
———, and ———, 1947, *Bulimina* and related foraminiferal genera: United States Geological Survey Professional Paper 210-D, p. 55–176.
———, and Renz, H. H., 1941, New Oligocene-Miocene foraminifera from Venezuela: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 17, p. 1–27.
———, and Siegfus, S. S., 1939, Some new and interesting foraminifera from the Kreyenhagen Shale of California: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 15, p. 23–33.
———, and Todd, R., 1942, The Recent and fossil species of *Laticarinina*: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 18, p. 14–20.
———, and ———, 1943, The genus *Pullenia* and its species: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 19, p. 1–24.
———, and ———, 1945, Miocene foraminifera from Buff Bay, Jamaica: Cushman Laboratory for Foraminiferal Research, Special Publication no. 15, p. 1–73.
———, and ———, 1949, Species of the genera *Allomorphina* and *Quadrimorphina*: Contributions from the Cushman Laboratory for Foraminiferal Research, v. 25, p. 59–72.
———, ———, and Post, R. J., 1954, Recent foraminifera from the Marshall Islands, Bikini and nearby atolls, Part 2. Oceanography (Biologic): United States Geological Survey Professional Paper 260-H, p. 319–384.
Čžížek, J., 1848, Beitrag zur Kenntniss der fossilen Foraminiferen des Wiener Beckens: Haidinger's Naturwissenschaftliche Abhandlungen, v. 2, pt. 1, p. 137–150.
———, 1849, Über zwei neue Arten von Foraminiferen aus dem Tegel von Baden und Mollersdorf: Berichte über die Mitteilungen der Freunde der Naturwissenschaften in Wien, v. 5 (1848–1849), p. 50–51.
David, M., Campiglio, C., and Darling, R., 1974, Processes in R- and Q-mode analysis: Correspondence analysis and its application to the study of geological processes: Canadian Journal of Earth Sciences, v. 11, p. 131–146.

DAVIES, T. A., and WORSLEY, T. R., 1981, Paleoenvironmental implications of oceanic carbonate sedimentation rates, *in* Warme, J. E., Douglas, R. G., and Winterer, E. L. (eds.),The Deep Sea Drilling Project: A Decade of Progress: Society of Economic Paleontologists and Mineralogists, Special Publication 32, p. 169–179.

DELAGE, Y., and HÉROUARD, E., 1896, Traitré de zoologie concrète. Tome I: La Cellule et les Protozoaires, Paris, 584 p.

DERVIEUX, E., 1894, Le Nodosarie terziarie del Piemonte: Bollettino della Società Geologica Italiana, v. 3, p. 597–626.

———, 1899, Foraminiferi terziarii del Piemonte e specialmente sul gen. *Polymorphina* d'Orbigny: Bollettino della Società Geologica Italiana, v. 18, p. 76–78.

DOUGLAS, R. G., 1973, Benthonic foraminiferal biostratigraphy in the central North Pacific, Leg 17, Deep Sea Drilling Project, *in* Winterer, E. L., Ewing, J. I., and others, Initial Reports of the Deep Sea Drilling Project, Leg 90: United States Government Printing Office, Washington, D.C., v. 17, p. 607–672.

———, 1981, Paleoecology of continental margin basins: a modern case history from the borderland of southern California, *in* Douglas, R. G., Colburn, I. P., and Gorsline, D. S. (eds.), Depositional Systems of Active Continental Marginal Basins: Short Course Notes, Pacific Section of the Society of Economic Paleontologists and Mineralogists, p. 121–156.

———, and WOODRUFF, F. 1981, Deep-sea benthic foraminifera, *in* Emiliani, C. (ed.), The Oceanic Lithosphere. The Sea: Wiley-Interscience, New York, v. 7, p. 1233–1327.

EARLAND, A., 1934, Foraminifera, part III. The Falklands sector of the Antarctic (excluding South Georgia): Discovery Reports, v. 10, p. 1–208.

ECHOLS, R. J., 1971, Distribution of foraminifera in sediments of the Scotia Sea area, Antarctic waters, *in* Reid, J. L. (ed.), Antarctic Oceanology I: Antarctic Research Series, American Geophysical Union, v. 15, p. 93–168.

———, 1980, Foraminifer biostratigraphy North Philippine Sea, Deep Sea Drilling Project, Leg 58, *in* Vries-Klein, G. de, Kobayashi, K., and others, Initial Reports of the Deep Sea Drilling Project, Leg 58: United States Government Printing Office, Washington, D.C., v. 58, p. 567–585.

EGGER, J. G., 1857, Die Foraminiferen der Miozän-Schichten bei Ortenburg in Nieder-Bayern: Neues Jahrbuch für Mineralogie, Geognosie, Geologie und Petrefaktenkunde, p. 266–311.

EHRENBERG, C. G., 1838, Ueber dem blossen Auge unsichtbare Kalkthierchen und Kieselthierchen als Hauptbestandteile der Kreidegebirge: Berichte der Koniglich-Preussischen Akademie der Wissenschaften zu Berlin, v. 3, p. 192–200.

———, 1839, Ueber die Bildung der Kreidefelsen und des Kreidemergels durch unsichtbare Organismen: Abhandlungen der Koniglich-Preussischen Akademie der Wissenschaften zu Berlin, p. 59–147.

EICHWALD, E. VON, 1830, Zoologia Specialis: Wilna, v. 2, p. 1–323.

ELMSTROM, K. M., and KENNETT, J. P., 1986, Late Neogene paleoceanographic evolution of Site 590: southwest Pacific, *in* Kennett, J. P., von der Borch, C. C., and others, Initial Reports of the Deep Sea Drilling Project, Leg 90: United States Printing Office, Washington, D.C., v. 90, pt. 2, p. 1361–1381.

FEYLING-HANSSEN, R. W., 1954, Late Pleistocene foraminifera from the Oslofjord area, south east Norway: Norsk Geologisk Tidskrift, v. 33, p. 109–150.

———, 1964, Foraminifera in late Quaternary deposits from the Oslofjord area: Norges Geologiske Undersøkelse, no. 225, p. 1–383.

FICHTEL, L., VON, and MOLL, J. P. C., VON, 1798, Testacea microscopica aliaque minuta ex generibus *Argonauta* et *Nautilus* (Microscopische und andere kleine Schalthiere aus den Geschlechtern Argonaute und Schiffer): Camesina, Wien, vii + 123 pp. [Reprinted 1803.]

FILLON, R. H., 1972, Late Cenozoic geology, paleo-oceanography and paleo-climatology of the Ross Sea, Antarctica: Unpublished Ph.D. Dissertation, University of Rhode Island, p. 1–183.

FINLAY, H. J., 1939a, New Zealand foraminifera, key species in stratigraphy, No. 1: Transactions of the Royal Society of New Zealand, v. 68, p. 504–543.

———, 1939b, New Zealand foraminifera, key species in stratigraphy, No. 2: Transactions of the Royal Society of New Zealand, v. 69, p. 89–128.

———, 1939c, New Zealand foraminifera, key species in stratigraphy, No. 3: Transactions of the Royal Society of New Zealand, v. 69, p. 309–329.

———, 1940, New Zealand foraminifera, key species in stratigraphy, No. 4: Transactions of the Royal Society of New Zealand, v. 69, p. 448–472.

———, 1947, New Zealand foraminifera, key species in stratigraphy, No. 5: New Zealand Journal of Science and Technology, v. 28, p. 259–292.

FORNASINI, C., 1886, Di alcune bilocune fossile negli strati a *Pecten hystrix* del Bolognese: Bollettino della Società Geologica Italiana, v. 5, p. 255–263.

———, 1900, Intorno ad alcuni esemplari di foraminiferi Adriatici: Memoire della Reale Accademia delle Scienze dell'Instituto di Bologna, Classe di Scienze Naturali, serie 5, v. 8 (1899–1900), p. 357–402.

FURUMATO, A. S., WEBB, J. P., ODEGARD, M. E., and HUSSONG, D. M., 1976, Seismic studies on the Ontong Java Plateau, 1970: Tectonophysics, v. 34, p. 71–90.

GALLOWAY, J. J., and HEMINWAY, C. E., 1941, Tertiary foraminifera of Porto Rico: New York Academy Sciences, Scientific Survey of Porto Rico and the Virgin Islands, v. 3, p. 275–491.

———, and WISSLER, S. G., 1927, Pleistocene foraminifera from the Lomita Quarry, Palos Verdes Hills, California: Journal of Paleontology, v. 1, p. 35–87.

GARDNER, J. V., DEAN, W. E., BISAGNO, L., and HEMPHILL, E., 1986, Late Neogene and Quaternary coarse-fraction and carbonate stratigraphies for Site 586 on Ontong-Java Plateau and Site 591 on Lord Howe Rise, *in* Kennett, J. P., von der Borch, C. C., and others, Initial Reports of the Deep Sea Drilling Project, Leg 90: United States Printing Office, Washington, D.C., v. 90, pt. 2, p. 1201–1224.

GIANELLI, L., MENESINI, E., SALVATORINI, G., and TAVANI, G., 1968, L'affioramento Pliocenio di punta Ristola (Capo di Leuca—Puglia): Memoire della Società Toscana di Scienze Naturali Residente in Pisa, ser. A, v. 75, p. 539–567.

GOËS, A., 1882, On the reticularian Rhizopoda of the Caribbean Sea: Kongliga Svenska Vetenskaps-Akademiens Handlingar, v. 19, p. 1–151.

———, 1894, A synopsis of the Arctic and Scandinavian Recent foraminifera hitherto discovered: Kongliga Svenska Vetenskaps-Akademiens Handlingar, v. 25, p. 1–128.

———, 1896, The foraminifera, *in* Reports on the dredging operations off the west coast of Central America, to the Galapagos, to the west coast of Mexico and to the Gulf of California, in the charge of Alexander Agassiz carried on by the U.S. Fish Commission Steamer "Albatross" during 1891, Lieut. Commander Z. L. Tanner U.S.N. commanding: Bulletin of the Harvard Museum of Comparative Zoology, v. 29, p. 1–104.

GREEN, K. E., 1959, Ecology of some Arctic foraminifera, *in* Bushnell, V. (ed.), Scientific studies at Fletcher's Ice Island, T-3 (1952–1955). v. 1: United States Air Force, Cambridge Research Center, Geophysical Research Papers, no. 63, p. 59–81.

GREINER, G. O. G., 1974, Environmental factors controlling the distribution of Recent benthonic foraminifera: Brevoria, Museum of Comparative Zoology, no. 420, p. 1–35.

GUEMBEL, C. W., 1868, Beitrage zur Foraminiferenfauna der nordalpinen Eozängebilde: Abhandlungen der Mathematisch-Physikalischen Klasse der Kaiserlich-Bayerischen Akademie der Wissenschaften, v. 10 (1870), pt. 2, p. 581–730.

GUPPY, R. J. L., 1894, On some foraminifera from the Microzoic deposits of Trinidad, West Indies: Proceedings of the Zoological Society of London, p. 647–652.

HADA, Y., 1931, Report of the biological survey of Mutsu Bay. 19, Notes on the Recent foraminifera from Mutsu Bay: Science Reports of the Tohoku Imperial University, 4th serie (Biology), v. 6, p. 45–148.

HADLEY, W. H., JR., 1934, Some Tertiary foraminifera from the North Coast of Cuba: Bulletins of American Paleontology, v. 20, p. 1–40.

HAECKEL, E., 1894, Systematische Phylogenie. Entwürf eines naturlichen Systems der Organismen auf Grund ihrer Stammesgeschichte. Teil I: Systematische Phylogenie der Protisten und Pflanzen. Georg Reimer, Berlin, 400 p.

HAGN, H., 1956, Geologische und Palaontologische untersuchungen im Tertiär des Monte Brione und seiner Umgebung: Palaeontographica, v. 107, p. 67–210.

HALKYARD, E., 1919, The fossil foraminifera of the Blue Marl of the Cote des Basques, Biarritz. Edited with additions by E. Heron-Allen and A. Earland: Memoirs and Proceedings of the Manchester Literary and Philosophical Society, v. 62 (1917–1918), pt. 2, no. 6, p. 1–145.

HANTKEN, M., VON, 1875, Die Fauna der *Clavulina Szaboi*-Schichten; Teil I—Foraminiferen: Jahrbuch der Kaiserlich-Ungarischen Geologischen Anstalt, v. 4, p. 1–93.

HERB, R., 1971, Distribution of Recent benthonic foraminifera in the Drake Passage, *in* Llano, G. A., and Wallen, I. E. (eds.), Biology of the Antarctic Seas IV: Antarctic Research Series, American Geophysical Union, v. 17, p. 251–300.

HERMELIN, J. O. R., 1986, Pliocene benthic foraminifera from the Blake Plateau: faunal assemblages and paleocirculation: Marine Micropaleontology, v. 10, p. 343–370.

———, 1987, Errata—Pliocene benthic foraminifera from the Blake Plateau: faunal asemblages and paleocirculation: Marine Micropaleontology, v. 11, p. 363–365.

HERON-ALLEN, E., and EARLAND, A., 1909, On the Recent and fossil foraminifera of the shore-sands of Selsey Bill, Sussex, Part III: Journal of the Royal Microscopical Society of London, p. 422–446.

———, and ———, 1910, On the Recent and fossil foraminifera of the shore-sands of Selsey Bill, Sussex, Part V, The Createaceous foraminifera: Journal of the Royal Microscopical Society of London, p. 401–426.

———, and ———, 1915, The foraminifera of the Kerimba Archipelago (Portugese East Africa), Part 2: Transactions from the Zoological Society of London, v. 20, p. 543–794.

———, and ———, 1922, Protozoa, part II. Foraminifera: British Antarctic ("Terra Nova") Expedition 1910, Zoology, v. 6, p. 25–268.

———, and ———, 1930, The foraminifera of the Plymouth district; Part 1: Journal of the Royal Microscopical Society of London, ser. 3, p. 46–84.

———, and ———, 1932, Foraminifera, Part 1. The ice-free area of the Falkland Islands and adjacent seas: Discovery Reports, v. 4, p. 291–460.

HODELL, D. A., KENNETT, J. P., and LEONARD, K. A., 1983, Changes in vertical water mass structure of the Vema Channel during Pliocene: evidence from Deep Sea Drilling Project Holes 516A, 517, 518, *in* Barker, P. F., Anderson, P. L., and others, Initial Reports of the Deep Sea Drilling Project, Leg 72: United States Government Printing Office, Washington, D.C., v. 72, p. 907–919.

HOFKER, J., 1932, Notizen ueber die Foraminiferen des Golfes von Neapel; III—Die Foraminiferenfauna der Ammontatura: Pubblicazioni della Stazione Zoologica, Napoli, v. 12, p. 66–144.

———, 1951, The foraminifera of the Siboga expedition, part 3. Siboga-Expeditie 1899–1900, Monograph 4a: E. J. Brill, Leiden, 513 p.

———, 1954, Über die Familie Epistomariidae (Foram): Palaeontographica, v. 105, pt. A, p. 166–206.

———, 1956a, Tertiary foraminifera of coastal Ecuador, part II, additional notes on the Eocene species: Journal of Paleontology, v. 30, p. 891–958.

———, 1956b, Foraminifera dentata: Foraminifera of Santa Cruz and Tatch-Island Virginia-Archipelago West-Indies: Skrift udgivet af Universitetets Zoologiske Museum, Kobenhavn, v. 15, p. 1–237.

———, 1957, Foraminiferen der Oberkreide von Nordwestdeutschland und Holland: Beihefte Geologischer Jahrbuch, no. 27, p. 1–464.

HÖGLUND, H., 1947, Foraminifera in the Gullmar Fjord and Skagerak: Zoologiska Bidrag från Uppsala Universitet, v. 276, p. 1–328.

HORNIBROOK, N., DE B., 1961, Tertiary foraminifera from Oamaru District (N.Z.) Part 1—Systematics and distribution: New Zealand Geological Survey Paleontological Journal, v. 24, p. 1–249.

HUSEZIA, R., and MARUHASI, M., 1944, A new genus and thirteen new species of foraminifera from the core-sample of Kasiwazaki oil-field, Nigata-ken: Sigenkagaku Kenkyusyo, Journal (Research Institute for Natural Resources), v. 1, p. 391–400.

ICZN (INTERNATIONAL COMMISSION ON ZOOLOGICAL NOMENCLATURE), 1959, Opinion 558, Rejection for nomenclatorial purposes of the work entitled Testacea Minuta Rariora by William Boys as augmented by George Walker published 1784: Opinions and declarations rendered by the International Commission on Zoological Nomenclature, v. 20, p. 277–282.

INGLE, J. C., JR., 1975, Pleistocene and Pliocene foraminifera from the Sea of Japan, Leg 31, *in* Kavig, D. E., Ingle, J. C. Jr., and others, Initial Reports of the Deep Sea Drilling Project, Leg 31: United States Government Printing Office, Washington, D.C., v. 31, p. 693–701.

———, 1980, Cenozoic paleobathymetry and depositional history of selected sequences within the southern California continental borderland, *in* Sliter, W. V. (ed.), Studies in Marine Micropaleontology and Paleoecology: A memorial volume to Orville L. Bandy: Cushman Foundation for Foraminiferal Research, Special Publication no. 19, p. 163–195.

———, and KELLER, G., 1980, Benthic foraminiferal biofacies of western Pacific margin between 40 S and 32 N, *in* Field, M., Douglas, R. G., Bouma, A. H., and others (eds.), Quaternary depositional environments of the Pacific coast: Pacific Coast Paleogeography Symposium 4. Pacific Section of the Society of Economic Paleontologists and Mineralogists, p. 341–355.

———, ———, and KOLPACK, R. L., 1980, Benthic foraminiferal biofacies, sediment and water masses of the southern Peru-Chile

Trench area, southeastern Pacific Ocean: Micropaleontology, v. 26, p. 113–150.

JEDLITSCHKA, H., 1931, Neue Beobachtungen über *Dentalina Verneuilli* (d'Orb.) und *Nodosaria abyssorum* (Brady): Firgenwald, Reichenberg, Liberec, Czechoslovakia, v. 4, p. 121–127.

JONES, F. W., 1874, On some Recent forms of Lagenae from deep-sea soundings in the Java Sea: Transactions from the Linnean Society of London, v. 30, p. 45–69.

JONES, T. R., 1875, *in* Griffith, J. W., and Henfrey, A. (eds.), The Micrographic Dictionary. Edition 3, v. 1: Van Voorst, London, p. 316–320.

———, 1895, A monograph of the foraminifera of the Crag, Part 2: Memoirs of the Palaeontographical Society, p. 73–210.

———, and PARKER, W. K., 1860, On the rhizopodal fauna of the Mediterranean, compared with that of the Italian and some other Tertiary deposits: Quarterly Journal of the Geological Society of London, v. 16, p. 292–307.

KARRER, F. 1868, Die Miocene Foraminiferenfauna von Kostej im Batat: Sizungsberichte der Mathematisch-Naturwissenschaftlichen Klasse der Kaiserlichen Akademie der Wissenschaften zu Wien, v. 58, p. 121–193.

———, 1878, Die foraminiferen der Tertiären Thone von Luzon, *in* Drasche, R., von, Fragmente zu einer Geologie der Insel Luzon (Philippinen): K. Gerold's Sonn, Vienna, p. 75–99.

KAWAI, K., UCHIO, T., UENO, M., and HOZUKI, M., 1950, Natural gas in the vicinity of Otaki, Chiba-ken. (Japanese with English summary): Journal from the Association of Petroleum Geologists, v. 15, p. 151–219.

KEIGWIN, L. D., JR., 1979, Late Cenozoic stable isotope stratigraphy and paleoceanography of DSDP sites from the east equatorial and central North Pacific: Earth and Planetary Science Letters, v. 45, p. 361–382.

———, 1982, Neogene planktonic foraminifera from Deep Sea Drilling Project Sites 502 and 503, *in* Prell, W. L., Gardner, J. V., and others, Initial Reports of the Deep Sea Drilling Project, Leg 68: United States Printing Office, Washington, D.C., v. 68, p. 269–288.

———, and THUNELL, R. C., 1980, Middle Pliocene climate change from faunal and oxygen isotopic trends: western Mediterranean: Nature, v. 282, p. 294–296.

KELLER, G., 1980, Benthic foraminifers and paleobathymetry of the Japan Trench area, Deep Sea Drilling Project, *in* Scientific Party, Initial Reports of the Deep Sea Drilling Project, Leg 56–57. pt. 2: United States Government Printing Office, Washington, D.C., v. 56–57, pt. 2, p. 835–869.

KENNETT, J. P., 1967, New foraminifera from the Ross Sea, Antarctica: Contributions from the Cushman Foundation for Foraminiferal Research, v. 8, p. 133–135.

———, 1986, Miocene and early Pliocene oxygen and carbon isotope stratigraphy in the southwest Pacific, Deep Sea Drilling Project Leg 90, *in* Kennett, J. P., von der Borch, C. C., and others, Initial Reports of the Deep Sea Drilling Project, Leg 90: United States Printing Office, Washington, D.C., v. 90, pt. 2, p. 1383–1411.

KOHL, B., 1985, Early Pliocene benthic foraminifera from the Salina Basin, southeastern Mexico: Bulletins of American Paleontology, v. 88, p. 1–173.

KROENKE, L. W., 1972, Geology of the Ontong-Java Plateau: Hawaii Institute for Geophysics, Publication HIG 72-5.

KÜBLER, J., and ZWINGLI, H., 1870, Die Foraminiferen des schweizerischen Jura: Steiner, Winterthur, p. 5–49.

KURIHARA, K., and KENNETT, J. P., 1986, Neogene benthic foraminifers: distribution in depth traverse, southwest Pacific, *in* Kennett, J. P., von der Borch, C. C., and others, Initial Reports of the Deep Sea Drilling Project, Leg 90, pt. 2: United States Government Printing Office, Washington, D.C., v. 90, pt. 2, p. 1037–1077.

LABEYRIE, L. D., DEPLESSY, J. C., and BLANC, P. L., 1987, Variations in mode of formation and temperature of oceanic deep waters over the past 125,000 years: Nature, v. 327, p. 477–482.

LALICKER, C. G., and MCCULLOCH, I., 1940, Some Textulariidae of the Pacific Ocean: Allan Hancock Pacific Expeditions, v. 6, p. 1–143.

LAMARCK, J. P. B. A. DE M. DE, 1804, Suite des mémoires sur les fossiles des environs de Paris: Annales Museum National d'Historie Naturelle de Paris, v. 5, p. 179–188.

LECALVEZ, Y., 1974, Revision des foraminifères de la collection d'Orbigny: Part I, Foraminifères de Isles Canaries: Cashiers de Micropaleontologie, v. 2, p. 1–108.

LEROY, D. O., and LEVINSON, S. A., 1974, A deep-water Pleistocene microfossil assemblage from a well in the northern Gulf of Mexico: Micropaleontology, v. 20, p. 1–37.

LEROY, L. W., 1941, Small foraminifera from the Late Tertiary of the Nederlands East Indies. Part I, Small foraminifera from the late Tertiary of Siberoet Island: Quarterly Journal from the Colorado School of Mines, v. 36, p. 63–105.

———, 1944, Miocene foraminifera from Sumatra and Java, Nederlands East Indies. Part I—Miocene foraminifera of central Sumatra: Quarterly Journal from the Colorado School of Mines, v. 39, p. 7–69.

———, 1964, Smaller foraminifera from the Late Tertiary of southern Okinawa: United States Geological Survey Professional Paper 454-F, p. 1–58.

LOEBLICH, A. R., JR., and TAPPAN, H., 1953, Studies of Arctic foraminifera: Smithsonian Miscellaneous Collections, v. 121, p. 1–150.

———, and ———, 1957, Eleven new genera of foraminifera: United States National Museum Bulletin 215, p. 223–232.

———, and ———, 1961, Remarks on the systematics of the Sarcodina (Protozoa), renamed homonyms, and new and validated genera: Proceedings of the Biological Society of Washington, v. 74, p. 213–234.

———, and ———, 1963, Four new Recent genera of Foraminifera: Journal of Protozoology, v. 10, p. 212–215.

———, and ———, 1964, Sarcodina—chiefly "Thecamoebians" and Foraminiferida: Treatise on invertebrate paleontology, pt. C, Protista 2, (2 vols.): Geological Society of America and University of Kansas Press, 900 p.

LOHMANN, G. P., 1978, Abyssal benthonic foraminifera as hydrographic indicators in the western South Atlantic Ocean: Journal of Foraminiferal Research, v. 8, p. 6–34.

LUTZE, G. F., 1962, Variationsstatistik und Okologie bei rezenten Foraminiferen: Palaontologische Zeitschrift, v. 36, p. 252–264.

———, and THIEL, H., 1987, *Cibicidoides wuellerstorfi* and *Planulina ariminensis,* elevated epibenthic foraminifera: Berichte aus dem Sonderforschungsbereich, v. 313, p. 17–30.

MACKENSEN, A., SEJRUP, H. P., and JANSEN, E., 1985, The distribution of living benthic foraminifera on the continental slope and rise off southwest Norway: Marine Micropaleontology, v. 9, p. 275–306.

MARIE, P., 1941, Les Foraminifères de la Craie à *Belemnitella mucronata* du Bassin de Paris: Memoires de la Museum National d'Historie Naturelle, new serie, v. 12, p. 1–296.

MARKS, P. JR., 1951, A revision of the smaller foraminifera from the Miocene of the Vienna Basin: Contributions from the Cushman Foundation for Foraminiferal Research, v. 2, p. 33–73.

MATOBA, Y., 1976, Recent foraminiferal assemblages of Sedai, northeast Japan, *in* Schafer, C. T., Pelletier, B. R. (eds.), First International Symposium on Benthonic Foraminifera of Continental Margins: Maritime Sediments Special Publication no. 1, p. 205–220.

———, and YAMAGUCHI, A., 1982, Late Pliocene-to-Holocene benthic foraminifers of the Guaymas Basin, Gulf of California: Sites 477 through 481, *in* Curray, J. R., Moore, D. G., and others, Initial Reports of the Deep Sea Drilling Project, Leg 64: United States Government Printing Office, Washington, D.C., v. 64, p. 1027–1056.

MATSUNAGA, T., 1963, Benthonic smaller foraminifera from the oil fields of northern Japan: Science Reports of the Tohoku University, 2nd ser. (Geology), v. 35, p. 1–122.

MATTHES, H. W., 1939, Die lagenen des deutschen Tertiärs: Palaeontographica, v. 90, pt. A, p. 49–108.

MCCULLOCH, I., 1977, Qualitative observations on Recent foraminiferal tests with emphasis on the eastern Pacific: Publications of the University of Southern California, 3 parts, p. 1–1078.

MCDOUGALL, K., 1985, Miocene to Pleistocene benthic foraminifers and paleoceanography of the middle America slope, Deep Sea Drilling Project Leg 84, *in* von Huene, R., Aubouin, J., and others, Initial Reports of the Deep Sea Drilling Project, Leg 84: United States Government Printing Office, Washington, D.C., v. 84, p. 363–418.

MEAD, G. A., 1985, Recent benthic foraminifera in the Polar Front region of the southwest Atlantic: Micropaleontology, v. 31, p. 221–248.

MILLER, K. G., and LOHMANN, G. P., 1982, Environmental distribution of Recent benthic foraminifera on the northeast United States continental slope: Geological Society of America Bulletin, v. 93, p. 200–206.

MILLETT, F. W., 1901, Reports on the Recent foraminifera of the Malay Archipelago, contained in anchor-mud, collected by M. A. Durrand: Journal of the Royal Microscopical Society, pt. 12, p. 619–628.

MOBERLY, R., SCHLANGER, S. O., BALTUCK, M., BERGER, J. A., DEAN, W., FLOYD, P. A., FUJII, N., HAGGERTY, J. A., OGG, J. G., PREMOLI SILVA, I., SCHAAF, A., SCHAEFER, R. G., SLITER, W. V., and WHITMAN, J. M., 1986, Site 586, *in* Moberly, R., Schlanger, S. O., and others, Initial Report of the Deep Sea Drilling Project, Leg 89: United States Printing Office Washington, D.C., v. 89, p. 213–281.

MONTAGU, G., 1803, Testacea Britannica, or natural history of British shells, marine, land, and fresh water, including the most minute: J. S. Hollis, England, 606 p.

MONTFORT, D. DE, 1808, Conchyliologie systèmatique et classification méthodique des coquilles. v. 1: F. Schoell, Paris, 409 p.

MOORE, T. C., JR., RABINOWITZ, P. D., and SHIPBOARD SCIENTIFIC PARTY, 1983, The Walvis transect, Deep Sea Drilling Project Leg 74: the geological evolution of an oceanic plateau in the southern Atlantic Ocean: The Geological Society of America Bulletin, v. 94, p. 907–925.

MORKHOVEN, F. R. C. M. VAN, 1981, Cosmopolitan Tertiary bathyal benthic foraminifera (abstract with accompanying range charts): Transactions of the Gulf Coast Association of Geological Societies, Supplement 31, p. 1–445.

———, BERGGREN, W. A., and EDWARDS, A. S., 1986, Cenozoic cosmopolitan deep-water benthic foraminifera: Bulletin des Centres de Recherches Exploration-Production Elf-Aquitaine, Mem. 11, p. 1–421.

MURRAY, J. W., 1969, Recent foraminifers from Atlantic continental shelf of the United States: Micropaleontology, v. 14, p. 83–96.

———, 1971, An atlas of British Recent foraminiferids: Heinemann Educational Books, London, 244 p.

———, 1984, Paleogene and Neogene benthic foraminifers from Rockall Plateau, *in* Roberts, D. G., Schnitker, D., and others, Initial Reports of the Deep Sea Drilling Project, Leg 81: United States Government Printing Office, Washington, D.C., v. 81, p. 503–534.

NEUMAYR, M., 1889, Die Stämme des Thierreiches; wirbellose thiere. v. 1: F. Temsky, Vienna, 603 p.

NISHIMURA, A., KONDA, I., MATSUOKA, K., NISHIDA, S., and OHNO, T., 1977, Microfossils of the core sample GDP-11 from the Amani Plateau, the northern margin of the Philippine Sea: Memoirs of Faculty of Science, Kyoto University, Series of Geology and Mineralogy, v. 43, p. 111–130.

NOMURA, R., 1984, Scanning electron microscopy of *Favocassidulina favus* (Brady): Journal of Foraminiferal Research, v. 14, p. 93–100.

OLSSON, R. K., 1960, Foraminifera of latest Cretaceous and earliest Tertiary age in the New Jersey coastal plain: Journal of Paleontology, v. 34, p. 1–58.

D'ORBIGNY, A. D., 1826, Tableau méthodique de la classe des céphalopodes: Annales des Sciences Naturelles, Paris, serie 1, v. 7, p. 245–314.

———, 1839a, Foraminifères, *in* Sagra, R. de la, Historie Physique, Politique et Naturelle de L'ile de Cuba: Arthus Bertrand, Paris, 86 p.

———, 1839b, Voyage dans l'Amérique Méridionale-Foraminifères. v. 5, pt. 5: V. Levrault, Strasbourg, 86 p.

———, 1839c, Foraminifères des iles Canaries, *in* Barker-Webb, P., and Berthelot, S., Historie naturelle des iles Canaries. v. 2: Béthune, Paris, p. 119–146.

———, 1840, Mémoire sur les Foraminifères de la craie blanche du basin de Paris: Mémoires de la Société Géologique de France, v. 4, p. 1–51.

———, 1846, Foraminifères fossiles du Bassin Tertiare de Vienne (Autriche): Gide et Comp., Paris, 312 p.

PALMER, D. K., and BERMÚDEZ, P. J., 1936, An Oligocene foraminiferal fauna from Cuba: Memoiras de la Sociedad Cubana de Historia Natural, v. 10, p. 273–316.

PARKER, F. L., 1952, Foraminiferal species off Portsmouth, New Hampshire: Bulletin of the Harvard Museum of Comparative Zoology, v. 106, p. 391–423.

———, 1954, Distribution of foraminifera in the northeast Gulf of Mexico: Bulletin of the Harvard Museum of Comparative Zoology, v. 111, p. 453–588.

———, 1958, Eastern Mediterranean foraminifera. Sediment cores from the Mediterranean Sea and the Red Sea: Reports of the Swedish Deep Sea Expedition 1947–1948, v. 8, p. 217–283.

———, 1964, Foraminifera from the experimental Mohole drilling near Guadalupe Island, Mexico: Journal of Paleontology, v. 38, p. 617–636.

———, and BERGER, W. H., 1971, Faunal and solution patterns of planktonic foraminifera in surface sediments: Deep-Sea Research, v. 18, p. 73–107.

PARKER, W. K., and JONES, T. R., 1865, On some foraminifera from the North Atlantic and Arctic Oceans, including Davis Straits and Baffin's Bay: Philosophical Transactions of the Royal Society of London, v. 155, p. 325–441.

PARR, W. J., 1950, Foraminifera: British and New Zealand Antarctic Research Expedition, 1929–1931, Reports—Serie B, (Zoology and Botany), v. 5, p. 233–392.

PATTERSON, R. T., 1985, *Abditodentrix,* a new foraminiferal genus in family Bolivinitidae: Journal of Foraminiferal Research, v. 15, p. 138–140.

———, 1986, *Globofissurella* and *Cerebrina,* two new foraminiferal genera in the family Lagenidae: Journal of Micropaleontology, v. 5, p. 65–69.

PFLUM, C. E., and FRERICHS, W. D., 1976, Gulf of Mexico deep-water foraminifera: Cushman Foundation for Foraminiferal Research, Special Publication no. 14, p. 1–125.

PHLEGER, F. B, 1951, Ecology of foraminifera, northwest Gulf of Mexico. Part I, Foraminifera distribution: Geological Society of America Memoir 46, pt. 1, p. 1–88.

———, 1952, Foraminifera distribution in some sediment samples from the Canadian and Greenland Arctic: Contributions from the Cushman Foundation for Foraminiferal Research, v. 3, p. 80–89.

———, and BRADSHAW, S. J., 1966, Sedimentary environments in a marine marsh: Science, v. 154, p. 1551–1553.

———, and PARKER, F. L. 1951, Ecology of foraminifera, northwest Gulf of Mexico. Part II, Foraminifera species: Geological Society of America Memoir 46, pt. 2, p.1–64.

———, PARKER, F. L., and PIERSON, J. F., 1953, North Atlantic foraminifera: Reports of the Swedish Deep Sea Expedition, v. 7, p. 3–122.

PRELL, W. L., 1984, Covariance patterns of foraminiferal $\delta^{18}O$: an evaluation of Pliocene ice volume changes near 3.2 million years ago: Science, v. 206, p. 692–693.

———, 1985, Pliocene stable isotope and carbonate stratigraphy (Holes 572C and 573A): paleoceanographic data bearing on the question of Pliocene glaciation, *in* Mayer, L., Theyer, F., and others, Initial Reports of the Deep Sea Drilling Project, Leg 85: United States Printing Office, Washington, D.C., v. 85, p. 723–734.

REID, J. L., JR., 1965, Intermediate waters of the Pacific Ocean: Johns Hopkins Oceanographic Studies, v. 2, p. 7–85.

RESIG, J. M., 1976, Benthic foraminiferal stratigraphy, eastern margin, Nazca Plate, *in* Yeats, R. S., Hart, R. S., and others, Initial Reports of the Deep Sea Drilling Project, Leg 34: United States Government Printing Office, Washington, D.C., v. 34, p. 743–759.

———, 1981, Biogeography of benthic foraminifera of the northern Nasca plate and adjacent continental margin, *in* Kulm, L. D., Dymond, J., Dasch, E. J., and Hussong, D. M. (eds.), Nazca Plate: Crustal Formation and Andean Convergence: Geological Society of America, Memoir 154, p. 467–507.

———, BUYANNANONTH, V., and ROY, K. J., 1976, Foraminiferal stratigraphy and depositional history in the area of the Ontong Java Plateau: Deep-Sea Research, v. 23, p. 441–456.

REUSS, A. E., 1845, Die Versteinerungen der böhmischen Kreideformation. Pt. 1: E. Schweizerbart, Stuttgart, p. 1–58.

———, 1850, Neue Foraminiferen aus dem österreichischen Tertiärbecken: Denkschriften der Mathematisch-Naturwissenschaftliche Klasse der Kaiserlichen Akademie der Wissenschaften zu Wien, v. 1, p. 365–390.

———, 1851a, Ueber die fossilen Foraminiferen und Entomostraceen der Septarientone der Umgegend von Berlin: Zeitschrift der Deutschen Geologischen Gesellschaft, v. 3, p. 49–91.

———, 1851b, Die Foraminiferen und Entomostraceen des Kreidemergels von Lemberg: Haidinger's Naturwissenschaftliche Abhandlungen, v. 4, p. 17–52.

———, 1860, Die Foraminiferen der Westphälischen Kreide-formation: Sitzungsberichte der Mathematisch-Naturwissenschaftlichen Klasse der Kaiserlichen Akademie der Wissenschaften zu Wien, v. 40, p. 147–238.

———, 1863a, Die Foraminiferen-Familie der Lagenideen: Sitzungsberichte der Mathematisch-Naturwissenschaftlichen Klasse der Kaiserlichen Akademie der Wissenschaften zu Wien, v. 46, pt. 1, p. 308–342.

———, 1863b, Beitrage zur Kenntniss der tertiären Foraminiferen-Fauna (Zweite Folge): Sitzungsberichte der Mathematisch-Naturwissenschaftlichen Klasse der Kaiserlichen Akademie der Wissenschaften zu Wien, v. 48, pt. 1, p. 36–71.

———, 1870, Die Foraminiferen des Septarientones von Pietzpuhl: Sitzungsberichte der Mathematisch-Naturwissenschaftlichen Klasse der Kaiserlichen Akademie der Wissenschaften zu Wien, v. 62, pt. 1, p. 446–487.

ROEMER, F. A., 1838, Die Cephalopoden des Nord-deutschen tertiären Meeresandes: Neues Jahrbuch für Mineralogie, Geognosie, Geologie und Petrefakenkunde, p. 391–394.

ROUVILLOIS, A., 1970, Biocoenoses et taphocoenoses de Foraminifères sur le plateau continental atlantique an large de l'île d'Yeu: Revue de Micropaléontologie, v. 13, p. 188–204.

RZEHAK, A. 1895, Ueber einige merkwurdige Foraminiferen aus österreichischen Tertiär: Annales des Naturhistorische Hofmuseum Wien, v. 3, p. 257–270.

SAID, R., 1953, Foraminifera of Great Pond, East Falmouth, Massachusetts: Contributions from the Cushman Foundation for Foraminiferal Research, v. 2, p. 7–14.

SAINT-MARC, P., and SUMINTA, 1979, Biostratigraphy of late Miocene and Pliocene deep water sediments of eastern Java (Indonesia): Journal of Foraminiferal Research, v. 9, p. 106–117.

SAVIN, S. M., ABLE, L., BARRERA, E., HODELL, D., KELLER, G., KENNETT, J. P., KILLINGLEY, J., MURPHY, M., and VINCENT, E., 1985, The evolution of Miocene surface and near-surface marine temperatures: oxygen isotopic evidence, *in*: Kennett, J. P. (ed.), The Miocene Ocean: paloeoceanography and biogeography: Geological Society of America Memoir 163, p. 49–82.

SCHLUMBERGER, C., 1883, Note sur quelques Foraminifères nouveaux ou peu connus du Golfe de Gascogne: Feuille de Jeunes Naturalistes, v. 13 (1882–1883), p. 21–28.

———, 1887, Note sur le genre *Planispirina*: Bulletin de la Société Zoologique de France, v. 12, p. 105–118.

SCHNITKER, D., 1971, Distribution of foraminifera on the North Carolina continental shelf: Tulane Studies in Geology and Paleontology, v. 8, p. 169–215.

———, 1974, West Atlantic abyssal circulation during the past 120,000 years: Nature, v. 248, p. 385–387.

———, 1979, The deep waters of the western North Atlantic during the past 24,000 years, and the re-initiation of the Western Boundary Undercurrent: Marine Micropaleontology, v. 4, p. 265–280.

———, 1980, Quaternary deep-sea benthic foraminifers and bottom-water masses: Annual Review of Earth and Planetary Sciences, v. 8, p. 343–370.

SCHULTZE, M. S., 1854, Ueber der Organismus der Polythalamien (Foraminiferen) nebst Bemerkungen über die Rhizopoden in Allgemeinen: Wilhelm Engelmann, Leipzig, 68 p.

SCHWAGER, C. 1866, Fossile Foraminiferen von Kar-Nikobar: Reise der Österreichischen Fregatte Novara um die Erde in Jahren 1857, 1858, 1859, Geologischer Teil, v. 2, pt. 2, p. 187–268.

———, 1877, Quadro del proposto sistema de classificazione dei foraminiferi con guscio: Bollettino della Reale Comitato Geologia Italiana, v. 8, p. 18–27.

———, 1878, Nota su alcuni foraminiferi nuovi del tufo di Stretto presso Girgenti: Bollettino della Reale Comitato Geologia Italiana, v. 9, p. 511–514, 519–529.

SCHUBERT, R. J., 1907, Beitrage zu einer naturlichen Systematik der Foraminiferen: Neues Jahrbuch für Mineralogie, Geologie und Palaontologie, Beilage-Band 25, p. 232–260.

SCIENTIFIC PARTY LEG 7, 1971, Site 68, *in* Winterer, E. L., Riedel, W. R., and others, Initial Reports of the Deep Sea Drilling Project, Leg 7: United States Government Printing Office, Washington, D.C., v. 7, p. 473–606.

SCIENTIFIC PARTY LEG 30, 1975, Site 289, *in* Andrews, J. E., Packham, G., and others, Initial Reports of the Deep Sea Drilling Project, Leg 30: United States Printing Office, Washington, v. 30, p. 231–398.

SCIENTIFIC PARTY LEG 68, 1982, Site 502: Colombia Basin, western Caribbean Sea, *in* Prell, W. D., Gardner, J. W., and others, Initial Reports of the Deep Sea Drilling Project, Leg 68: United States Printing Office, Washington, D.C., v. 68, p. 15–162.

SCIENTIFIC PARTIES LEGS 89 AND 90, 1986, Site 586: western equatorial Pacific, *in* Kennett, J. P., von der Borch, C. C., and others, Initial Reports of the Deep Sea Drilling Project, Leg 90: United States Printing Office, Washington, D.C., v. 90, pt. 1, p. 19–114.

SEGUENZA, G., 1859, Intorno ad un nuovo genere di foraminiferi fossili de, torreno miocenico di Messina: Eco Peloritano, Giornale di Scienze, Lettre ed Arti, ser. 2, v. 5, pt. 9, p. 1–12.

———, 1862a, Dei terreni Terziarii del distretto di Messina: Parte II—Descrizione dei foraminiferi monotalamici delle marne mioceniche del distretto di Messina: T. Capra, Messina, p. 1–84.

———, 1862b, Prime recherche intorno ai rizopodi fossili delle argille Pleistoceniche dei dintorni di Catania: Atti della Accademia Gioenia della Scienze Naturali di Catania, ser. 2, v. 18, p. 84–126.

———, 1880, Le formazioni terziarie nella provincia di Reggio (Calabria): Memoire della Reale Accademia dei Lincei, Classe di Scienze Fisiche, Matematiche e Naturali, serie 3, v. 6, p. 3–446.

SEJRUP, H. P., FJAERAN, T., HALD, M., BECK, L., HAGEN, J., MILJETEIG, I., MORVIK, I., and NORVIK, O., 1981, Benthonic foraminifera in the surface samples from the Norwegian continental margin between 62°N and 65°N: Journal of Foraminiferal Research, v. 11, p. 277–295.

SEN GUPTA, B. K., TEMPLES, T. J., and DALLMEYER, M. D. G., 1982, Late Quaternary benthic foraminifera of the Granada Basin: stratigraphy and paleoceanography: Marine Micropaleontology, v. 7, p. 297–309.

SHACKLETON, N. J., and CITA, M. B., 1979, Oxygen and carbon isotope stratigraphy of benthic foraminifers at Site 397: detailed history of climatic change during the late Neogene, *in* von Rad, U., Ryan, W. R. F., and others, Initial Reports of the Deep Sea Drilling Project, Leg 47: United States Printing Office, Washington, D.C., v. 47, pt. 1, p. 433–445.

———, and KENNETT, J. P., 1975, Late Cenozoic oxygen and carbon isotopic changes at DSDP Site 284: implications for glacial history of the Northern hemisphere and Antarctica, *in* Kennett, J. P., Houtz, R. E., and others, Initial Reports of the Deep Sea Drilling Project, Leg 29: United States Printing Office, Washington, D.C., v. 29, p. 801–806.

———, and OPDYKE, N. D., 1973, Oxygen isotope and palaeomagnetic stratigraphy of equatorial Pacific core V28-238: oxygen isotope temperature and ice volumes on a 10^5 year and 10^6 year scale: Quaternary Research, v. 3, p. 39–55.

———, BACKMAN, J., ZIMMERMAN, H., KENT, D. V., HALL, M. A., ROBERTS, D. G., SCHNITKER, D., HUDDLESTUN, P., KEENE, J. B., KALTENBACK, A. J., KRUMSIEK, K. A. O., MORTON, A. C., MURRAY, J. W., and WESTBERG-SMITH, J., 1984, Oxygen isotope calibration of the onset of ice rafting and the history of glaciation in the North Atlantic region: Nature, v. 307, p. 620–623.

SIDEBOTTOM, H., 1910, Two new species of *Cassidulina*: Journal of the Quekett Microscopical Club, series 2, v. 11 (1910–1912), p. 105–108.

———, 1912, Lagenae of the southwest Pacific Ocean: Journal of the Quekett Microscopical Club, series 2, v. 11 (1910–1912), p. 375–434.

SILVESTRI, A., 1900a, Sul genera *Ellipsoglandulina*: Memoire della Reale Accademia delle Scienze, Lettere et Arte degli Zelanti, new serie, v. 10 (1898–1900), p. 1–9.

———, 1900b, Memoire e note a proposito di due note pubblicate in questi Atti Accademici: Atti della Accademia Pontificia dei Nuovi Lincei, v. 53 (1899–1900), p. 217–223.

———, 1904a, Richerche strutturali su alcune forme dei Trubi dei Bonfornello (Palermo): Memorie della Accademia Pontificia dei Nuovi Lincei, v. 22, p. 235–276.

———, 1904b, Formae nuove o poco consociute di Protozoi miocenici piemontesi: Atti della Reale Accademia delle Scienze di Torino, v. 39 (1903–1904), p. 4–15.

———, 1924, Fauna Paleogenica di Vasciano presso Todi: Bollettino della Società Geologica Italiana, v. 42 (1923), pt. 1, p. 7–29.

SILVESTRI, O., 1872, Saggio di studi sulla fauna microscopia fossile appartenente al terreno sunappenino italiano. Mem. I—Monografia delle Nodosarie: Bollettino della Accademia Gioenia delle Scienze Naturali di Catania, serie 3, v. 7, p. 1–108.

SMITH, P. B., 1963, Recent foraminifera off Central America, quantitative and qualitative studies of the family Bolivinidae: United States Geological Survey Professional Paper 429-A, p. 1–39.

———, 1964, Ecology of benthonic species: United States Geological Survey Professional Paper 429-B, p. 1–55.

SOLDANI, A., 1780, Saggio orittografico, ovvero osservazioni sopra le terre nautiliche ed ammonitiche della Toscana: Vicenzo Pazzini Carli e Figli, Siena, 146 p.

STACHE, G., 1864, Die Foraminiferen der Whaingaroa-Hafens (Prov. Auckland): Reise der Osterreichischen Fregatte Novara um die Erde in Jahren 1857, 1858, 1859, Geologischer Teil, v. 1, pt. 2, p. 159–304.

STAINFORTH, R. M., 1952, Classification of uniserial calcareous foraminifera: Contributions from the Cushman Foundation for Foraminiferal Research, v. 3, p. 6–14.

STEWART, R. E., and STEWART, K. C., 1930, Post-Miocene foraminifera from the Ventura Quadrangle, Ventura County, California: Journal of Paleontology, v. 4, p. 60–72.

STREETER, S. S., 1973, Bottom water and benthonic foraminfera in the North Atlantic: glacial-interglacial contrasts: Quaternary Research, v. 3, p. 131–141.

———, and SHACKLETON, N. J., 1979, Paleocirculation of the deep North Atlantic: a 150,000 yr. record of benthic foraminifer and oxygen-18: Science, v. 203, p. 168–170.

STUCKEY, C. W., JR., 1946, Some Textulariidae from the Gulf Coast Tertiary: Journal of Paleontology, v. 20, p. 163–166.

TEIL, H., 1975, Correspondence factor analysis: an outline of its method: Mathematical Geology, v. 7, p. 3–12.

TERQUEM, O., 1882, Les foraminifères de l'Eocene des environs de Paris: Mémoires de la Société Géologique de France, serie 3, v. 2, p. 1–187.

———, and BERTHELIN, G., 1875, Étude microscopique des marnes du Lias moyen d'Essey-lès-Nancy, zone inférieure de l'assise à *Ammonites margeritatus*: Mémoires de la Société Géologique du France, serie 2, v. 10, p. 1–126.

THALMANN, H. E., 1937, Mitteilungen über Foraminiferen, Part III: Ecologae Geologicae Helvetiae, v. 3, p. 337–356.

———, 1939, Bibliography and index to new genera, species and varieties of foraminifera for the year 1936: Journal of Paleontology, v. 21, p. 355–395.

———, 1942, Nomina Bradyana mutata: The American Midland Naturalist, v. 28, p. 463–464.

———, 1950, New names and homonyms in Foraminifera: Contributions from the Cushman Foundation for Foraminiferal Research, v. 1, p. 41–45.

———, and GRAHAM, J. J., 1952, Reinstatement of *Osangularia* Brotzen, 1940, for *Parrella* Finlay, 1939, (non Ginsburg, 1938): Contributions from the Cushman Foundation for Foraminiferal Research, v. 3, p. 31–32.

THIEDE, J., 1983, Skeletal plankton and nekton in upwelling water masses of northwestern South America and northwest Africa, *in* Suess, E. and Thiede, J. (eds.), Coastal Upwelling, its Sediment Record: Plenum Press, New York, p. 183–207.

THOMAS, E., 1985, Late Eocene to Recent deep-sea benthic foraminifers from the central equatorial Pacific Ocean, *in* Mayer, L., Theyer, F., and others, Initial Reports of the Deep Sea Drilling Project, Leg 85: United States Printing Office, Washington, D.C., v. 85, p. 655–694.

THOMPSON, P. R., 1980, Foraminifers from the Deep Sea Drilling Project Sites 434, 435, and 436, Japan Trench, *in* Scientific Party, Initial Reports of the Deep Sea Drilling Project, Leg 56–57: United States Government Printing Office, Washington, D.C., v. 56/57, pt. 2, p. 775–807.

TJALSMA, L. C., 1983, Eocene to Miocene benthic foraminifera from DSDP Site 516, Rio Grande Rise, South Atlantic, *in* Barker, P. F., Carlson, R. L., and others, Initial Reports of the Deep Sea Drilling Program, Leg 72: United States Government Printing Office, Washington, D.C., v. 72, p. 731–755.

TODD, R., 1965, The foraminifera of the tropical Pacific collections of the "Albatross," 1899–1900, Part 4,—Rotaliform families and planktonic families: United States National Museum Bulletin 161, p. 1–139.

———, 1966, Smaller foraminifera from Guam: United States Geological Survey Professional Paper 403-I, p. 1–41.

UCHIO, S. S., 1960, Benthonic foraminifera of the Antarctic Ocean; biological results of the Japanese Antarctic Research Expedition: Seto Marine Biological Laboratory, Special Publication 11, p. 1–9.

VOLOSHINOVA, N. A., 1958, O novoy sistematike Nonoinid. (On a new systematics of the Nonionidae): Mikrofauna SSSR, Sbornik 9, VNIGRI, no. 115, p. 117–223.

———, 1960, Uspekhi mikropaleontologii v dele izucheriya vhutrennego stroeniya foraminifer. (Progress in micropaleontology in the work of studying the inner structure of foramimifera): Trudy Pervogo Seminara po Mikrofaune, VNIGRI, p.48–87.

WALCH, C., 1978, Recent abyssal benthic foraminifera from the eastern equatorial Pacific: Unpublished M.S. Thesis, University of Southern California, Los Angeles, p. 1–117.

WALKER, G., and BOYS, W., 1784, Testacea Minuta Rariora, nuperrinae detecta in arena littoris Sandvicensis a Gul. Boys, arm S.A.S. multa addidit, et omnium figuras ope microscopii amplitatas accurate delineavit Geo. Walker (A collection of the minute and rare shells lately discovered in the sand of the seashore near Sandwich by William Boys): J. March, London, 25 p.

———, and JACOB, E., 1798, *in* Kanmacher, F., Adams' Essays on the microscope. Edition 2, with considerable additions and improvements: Dillon and Keating, London, 712 p.

WEISSERT, H. J., MCKENZIE, J. A., WRIGHT, R. C., CLARK, M., OBERHANSLI, H., and CASEY, M., 1984, Paleoclimatic record of the Pliocene at Deep Sea Drilling Projects Sites 519, 521, 522, and 523 (Central South Atlantic), *in* Hsu, K. J., LaBrecque, J. L., and others, Initial Reports of the Deep Sea Drilling Project, Leg 73: United States Government Printing Office, Washington, D.C., v. 73, p. 701–715.

WESTON, J. F., 1982, Distribution and ecology of Recent benthic foraminifera in the Northeast Atlantic Ocean: Unpublished Ph.D. Dissertation, University of Exeter, p. 1–442.

———, and MURRAY, J. W., 1984, Benthic foraminifera as deep-sea water mass indicators, *in* Oertli, H. J. (ed.), Benthos '83: Second International Symposium on Benthic Foraminifera, Pau, p. 605–610.

WIESNER, H., 1920, Zur Systematik der Miliolidee: Zoologischer Anzeiger, v. 51, p. 13–20.

———, 1931, Die Foraminiferen, *in* Drygalski, E., von: Deutsche Südpolar Expedition 1901–1903, v. 20, Zoologische v. 12, p. 53–165.

WILLIAMSON, W. C., 1848, On the Recent British species of the genus *Lagena*: Annals and Magazine of Natural History, series 2, v. 1, p. 1–20.

———, 1858, On the Recent foraminifera of Great Britain: Ray Society, p. 1–107.

WOODRUFF, F., 1979, Deep sea benthic foraminiferal changes associated with the middle Miocene oxygen isotopic event, DSDP Site 289, equatorial Pacific: Unpublished M.S. Thesis, University of Southern California, Los Angeles, p. 1–120.

———, and DOUGLAS, R. G., 1981, Response of deep-sea foraminifera to Miocene paleoclimatic events, DSDP Site 289: Marine Micropaleontology, v. 6, p. 617–632.

WRIGHT, R. C., and HAY, W. W., 1971, The abundance and distribution of foraminifers in a back-reef environment, Molasses Reef, Florida, *in* Jones, J. I., and Bock, W. D. (eds.), A Symposium of Recent South Florida Foraminifera: Miami Geological Society Memoir 1, p. 121–174.

WYRTKI, K., 1962, The subsurface water masses in the western Pacific Ocean: Australian Journal of Marine and Freshwater Research, v. 13, p. 18–47.

APPENDIX 1

Census data for the benthic foraminiferal species in the >125 micrometer fraction. Frequencies are expressed as percent of the total benthic foraminiferal fauna in each sample.

CORE	SECTION	INTERVAL (cm)	DEPTH (mbsf)	Abditodentrix asketocomptella	Allomorphina pacifica	Alveolophragmium subglobosum	Alveolophragmium sp. 1	Ammobaculites sp. 1	Anomalinoides globulosus	Astacolus sp. 1	Astacolus sp. 2	Astacolus sp. 3	Astrononion gallowayi	Astrononion novozealandicum	Bolivina minuta	Bolivina pusilla	Bolivina seminuda	Bolivina sp. 1	Bulimina fijiensis	Bulimina mexicana	Bulimina truncana	Bulimina yonabaruensis	Bulimina sp. 1	Bulimina sp. 2	Buliminoides sp. 1	Cassidulina sp 1	Cassidulina sp. 2	Chilostomella oolina	Chrysalogonium lanceolum	Chrysalogonium longocostatum	Chrysalogonium tenuicostatum	Cibicidoides bradyi	Cibicidoides mundulus
1	1	1-2	39.31	1.1	-	-	-	-	1.4	-	-	-	.7	.7	-	.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	-
		100-101	40.30	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	6.2	-	-	-	-	-	-	-	-	-	-	1.7	-
	2	50-51	41.30	-	.5	-	-	-	3.5	-	-	-	-	2.0	-	-	-	-	-	-	1.0	-	-	-	-	.5	-	-	-	-	-	1.5	1.0
		149-150	42.29	-	-	-	-	-	1.6	-	-	-	-	1.6	-	-	-	-	-	-	1.6	-	-	-	-	.8	-	-	.6	-	.8	1.6	1.6
	3	100-101	43.30	-	.6	-	-	-	2.8	-	-	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	-	-	1.7	1.1
	4	50-51	44.30	-	-	-	-	-	2.5	-	-	-	-	-	-	.8	-	-	-	-	3.3	-	-	-	-	-	-	-	-	-	-	.8	.8
		149-150	45.29	-	-	-	-	-	2.0	-	-	-	-	1.3	-	-	-	-	-	-	.7	-	-	-	-	1.3	.7	-	-	-	1.3	.7	.7
	5	100-101	46.30	-	-	-	-	-	1.1	-	-	-	-	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	.5
	6	50-51	47.30	-	1.1	-	-	-	1.6	-	-	-	-	1.6	-	.5	.5	-	-	-	1.6	-	-	-	-	.5	.5	-	-	-	.5	1.1	.5
		149-150	48.29	.9	-	-	-	-	-	-	-	-	-	5.3	-	-	.3	-	-	-	-	-	-	-	-	.9	-	.3	-	-	-	-	.9
2	1	50-51	49.40	.8	-	-	-	-	.8	-	-	-	-	4.2	-	-	.8	-	-	-	-	-	-	-	-	.8	-	.8	-	-	-	3.4	1.7
	2	0-1	50.40	-	-	-	-	-	3.0	-	-	-	-	3.0	-	-	-	-	-	-	3.0	-	-	-	-	-	-	-	-	-	-	12.1	3.0
	3	50-51	52.40	-	-	-	-	-	-	-	-	-	-	7.8	-	-	-	-	-	-	.9	-	-	-	-	.9	.9	-	-	-	-	-	.9
		100-101	54.40	.7	-	-	-	-	2.2	-	-	-	-	5.8	-	.7	-	-	-	-	.7	-	-	-	-	.7	-	-	-	-	-	1.4	-
	5	50-51	55.40	-	-	-	-	-	1.8	-	-	-	-	.5	-	-	-	-	-	-	1.8	-	-	-	-	-	-	-	-	-	-	-	-
	6	0-1	56.40	-	-	-	-	-	1.2	-	-	-	-	9.6	-	-	-	-	-	-	-	-	-	-	-	.8	.6	-	.6	-	.6	.6	1.8
		100-101	57.40	-	-	-	-	-	.6	-	-	-	-	5.8	-	-	-	-	-	-	-	-	.6	-	-	-	1.3	-	-	-	.6	-	1.9
3	1	0-1	58.50	-	-	-	-	-	.7	-	-	-	-	1.4	-	-	-	-	-	-	1.4	-	-	-	-	-	-	.7	-	-	-	-	.7
		100-101	59.50	-	-	-	-	-	.6	-	-	-	-	2.5	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	-	-	3.7	2.5
	2	50-51	60.50	-	-	-	-	-	1.0	-	-	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.8	-	.3	2.3	1.6
	3	1-2	61.51	-	.6	-	-	-	1.2	-	-	-	-	4.4	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	.6	-	-	2.5	1.9
		100-101	62.50	-	-	-	-	-	2.6	-	-	-	-	6.1	-	-	-	.5	.5	-	.5	-	-	-	-	-	-	-	.5	-	-	-	2.0
	4	50-51	63.50	-	-	-	-	-	5.2	-	-	.7	-	6.7	-	-	.7	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	1.5
	5	0-1	64.50	-	-	-	-	-	3.1	-	-	-	-	1.8	-	-	-	-	-	-	3.9	-	-	-	-	-	-	-	.8	-	.8	1.6	.8
		100-101	65.50	-	-	-	-	-	1.4	-	-	-	-	4.1	-	-	-	-	-	-	-	-	-	-	-	-	-	.7	1.4	-	-	1.4	-
	6	50-51	66.50	-	-	-	-	-	-	-	-	-	-	7.8	-	-	-	-	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2
	7	0-1	67.50	-	-	-	-	-	.9	-	-	-	-	9.3	-	-	-	.4	.4	-	.9	-	-	-	-	-	-	-	-	-	1.3	-	3.5
4	1	50-51	68.60	-	-	-	-	-	1.7	-	-	-	-	8.7	-	-	.4	.4	-	-	.4	-	-	-	-	-	-	-	-	-	.8	.4	.4
	2	0-1	69.60	.5	-	-	-	-	3.7	-	-	-	-	9.2	-	-	.5	-	-	-	-	-	.5	-	-	.5	-	.5	-	.5	.5	-	1.4
		100-101	70.60	-	-	-	-	-	1.4	-	-	-	-	5.9	-	-	.7	-	-	-	1.4	-	-	-	-	.3	-	-	-	.3	.3	1.7	.3
	3	50-51	71.60	-	.9	-	-	-	1.9	-	-	-	-	5.7	-	-	-	-	-	-	3.8	-	-	-	-	-	-	-	-	-	-	-	.9
	4	0-1	72.60	.5	-	-	-	-	4.0	-	-	-	-	3.0	-	-	-	-	-	-	1.0	-	.5	-	-	-	-	-	.5	-	-	2.0	6.0
		100-101	73.60	-	.3	-	-	-	1.4	-	.3	-	-	-	-	-	-	-	.3	-	1.7	-	-	.3	-	-	-	-	-	-	.3	.6	2.0
	5	50-51	74.60	-	.5	-	-	-	3.8	-	-	-	.5	2.9	-	.5	-	-	-	-	1.9	-	-	-	-	-	-	-	-	-	-	1.4	1.9
	6	0-1	75.60	-	-	-	-	-	1.4	-	-	-	-	8.0	-	-	-	-	-	-	3.3	-	-	-	-	-	-	-	-	-	-	.9	4.2
		100-101	76.60	-	1.4	-	-	-	.7	-	-	-	-	9.0	-	-	-	-	-	-	5.5	-	-	-	-	-	-	-	-	-	-	-	.7
5	1	0-1	77.70	-	-	.6	-	-	-	-	-	-	-	10.7	-	-	-	-	-	-	3.1	-	-	.6	-	-	-	-	-	-	-	-	3.8
		100-101	78.70	-	-	-	-	-	3.0	-	-	-	-	7.8	-	-	-	-	-	-	6.6	-	-	.6	-	-	-	.6	-	-	-	-	1.8
	2	50-51	79.70	-	.5	-	-	-	2.5	-	-	-	-	6.5	-	-	-	-	-	-	4.5	-	.5	-	-	-	-	.5	-	-	.5	.5	2.0
	3	1-2	80.71	-	-	-	-	-	2.1	-	-	-	1.1	3.2	-	-	-	-	-	-	4.3	-	-	-	-	-	-	-	-	-	-	-	3.2
		100-101	81.71	-	-	-	-	-	4.8	-	-	-	.8	8.0	-	.8	-	-	-	-	10.4	-	-	-	-	-	-	-	-	-	-	1.6	4.8
	4	50-51	82.70	-	1.6	-	-	-	2.3	-	-	-	-	7.8	-	.8	-	-	-	-	3.1	-	-	.8	-	-	-	-	-	-	-	-	.8
	5	0-1	83.70	.6	-	-	-	-	1.2	-	-	-	-	3.0	-	1.2	1.2	.6	-	-	.6	-	-	-	-	-	1.2	-	-	-	-	-	1.8
		100-101	84.70	-	-	-	-	-	.9	-	-	-	-	4.3	-	.9	.9	-	-	-	3.4	-	-	-	-	-	-	-	-	-	-	.9	2.6
	6	50-51	85.70	-	-	-	-	-	.8	-	-	-	-	5.4	-	-	-	.8	.8	-	4.7	-	-	-	-	-	.8	-	-	-	-	-	-
	7	0-1	86.70	-	.4	-	-	-	1.2	-	-	-	-	3.6	-	.4	.4	-	-	-	2.4	-	.4	-	-	-	-	.4	-	-	-	.4	1.6
6	1	50-51	87.80	-	.5	-	-	-	.5	-	-	-	-	3.2	-	-	-	-	-	-	5.3	-	-	-	-	-	-	-	-	-	-	2.1	4.3
	2	0-1	88.80	-	-	-	-	-	3.8	-	-	-	-	1.9	-	1.4	.5	-	.5	-	1.9	-	-	1.0	-	-	-	.5	-	-	-	3.3	3.3
		100-101	89.80	-	-	-	-	-	2.7	-	-	-	-	5.4	-	-	.7	.7	-	-	3.4	-	.7	-	-	-	-	.7	-	-	-	1.3	2.7
	3	50-51	90.80	-	-	-	-	-	2.8	-	-	-	-	5.0	-	-	-	-	.3	-	2.5	-	.6	-	-	-	-	-	-	-	1.6	1.6	2.8
	4	0-1	91.80	-	-	-	-	-	1.4	-	-	-	-	9.5	-	-	.5	.5	-	-	2.3	.9	-	-	-	-	-	-	-	-	.9	1.8	1.8
		100-101	92.80	1.0	-	-	-	-	2.6	-	-	-	-	4.7	-	-	-	.5	-	-	2.6	-	-	-	-	-	.5	2.6	-	-	-	.5	3.6
	5	50-51	93.80	-	.5	-	-	-	5.1	-	-	-	-	1.8	-	-	.5	-	-	-	-	-	.5	-	-	-	.5	-	-	-	.9	.5	1.4
	6	0-1	94.80	-	-	-	-	-	2.0	-	-	-	-	5.4	-	-	-	.5	-	-	1.5	-	-	-	-	-	-	-	-	-	-	1.5	3.4
		100-101	95.80	-	.6	-	-	.6	3.9	-	-	-	.6	2.2	-	-	.6	-	-	-	1.1	-	1.1	-	-	-	-	-	-	-	.6	.6	6.7
7	1	0-1	96.90	-	.5	-	-	-	2.0	-	-	-	.5	5.1	-	.5	-	-	1.0	-	3.6	-	-	-	-	-	-	-	.5	-	-	4.1	2.0
		100-101	97.90	-	.5	-	-	-	1.0	-	-	-	.5	8.2	-	-	-	.5	1.0	-	.5	-	-	-	-	-	.5	.5	-	-	1.0	1.0	1.0
	2	50-51	98.90	-	-	-	-	-	2.3	-	-	-	-	9.9	-	-	-	1.2	-	-	1.2	-	-	-	-	-	-	-	-	-	.6	1.2	4.1
	3	0-1	99.90	-	-	-	-	-	3.2	-	-	-	-	5.7	-	-	-	.4	2.1	-	1.1	-	.4	-	-	-	-	.4	-	-	.4	1.1	1.8
		100-101	100.90	-	-	-	-	-	2.6	-	-	-	-	6.3	-	-	.4	.4	-	-	.9	-	-	-	-	-	.4	-	-	-	.4	3.1	5.3
	4	50-51	101.90	.3	-	-	-	-	2.8	-	-	-	-	1.4	.3	-	.3	-	.3	-	2.8	-	-	-	-	-	-	.3	-	-	.3	2.1	4.9
	5	0-1	102.90	-	-	-	-	-	1.9	-	-	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	.6	-	-	-	1.2	3.1
		100-101	103.90	-	-	-	-	-	1.8	-	-	-	-	3.1	-	-	-	-	.4	-	1.8	-	.9	-	-	-	-	-	-	-	-	2.2	4.0
	6	50-51	104.90	-	-	-	-	-	2.0	-	-	-	-	1.0	-	-	-	-	.5	-	1.6	-	.5	-	-	-	-	.5	-	-	-	-	5.1
	7	0-1	105.90	-	.4	-	-	-	2.9	-	-	-	-	7.3	-	-	.4	.4	-	-	.7	-	.7	-	-	-	-	-	-	-	.4	2.2	5.8
8	1	50-51	107.00	-	-	-	-	-	4.5	-	-	-	-	1.5	-	-	-	-	-	-	.8	-	1.5	-	-	-	-	-	-	-	.8	.8	5.3
	2	0-1	108.00	-	-	-	.4	-	5.4	-	-	-	-	4.2	-	-	.4	.4	-	-	1.7	-	.4	-	-	-	-	.4	-	-	-	1.2	3.7
		100-101	109.00	-	-	-	-	-	7.4	-	-	-	-	7.4	-	-	-	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.2
	3	50-51	110.00	.9	-	-	-	-	2.3	-	-	-	-	3.2	-	-	.5	-	-	-	-	-	1.4	-	-	-	-	.5	-	-	-	2.8	1.4
	4	0-1	111.00	-	-	-	-	-	.6	-	-	-	-	3.0	-	-	-	-	-	-	2.4	-	.6	-	-	-	-	-	.6	-	.6	.8	3.0
		100-101	112.00	-	-	-	-	-	.6	-	-	-	-	4.2	-	-	-	-	.6	-	.6	-	-	-	-	-	-	-	-	-	-	1.2	1.8
	5	50-51	113.00	-	-	-	.4	-	.5	-	-	-	-	4.1	-	-	-	.5	.5	-	1.5	-	-	-	-	-	-	-	-	-	-	-	3.1
	6	0-1	114.00	-	.6	-	-	-	1.7	.6	-	-	-	3.5	-	-	-	1.2	.6	-	2.3	-	.6	-	-	-	.6	-	-	-	-	-	4.8
		100-101	115.00	-	.4	-	-	-	1.8	-	-	-	-	3.6	-	-	-	-	-	-	3.6	-	-	-	-	-	.4	-	.4	-	-	1.4	3.6
9	1	0-1	116.10	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-	-	-	-	.7	8.0
		100-101	117.10	-	.7	-	-	-	1.4	-	-	-	-	2.0	-	-	-	-	-	-	.7	-	.3	-	-	-	-	.7	-	.3	-	1.7	1.7
	2	50-51	118.10	-	-	-	-	-	2.3	-	-	-	-	1.5	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	.8	.6	.8	1.5
	3	0-1	119.10	-	.9	-	-	-	-	-	-	-	-	2.6	-	-	-	-	-	.9	-	-	-	-	-	-	-	-	-	-	-	.9	3.4
		100-101	120.10	-	-	-	-	-	2.5	-	-	-	-	1.3	-	-	-	-	-	-	.8	-	.4	-	-	-	-	.4	-	.4	-	.8	3.4
	4	50-51	121.10	1.4	-	-	-	-	1.4	-	-	-	-	.7	-	-	-	.7	-	-	.7	-	-	-	-	-	-	-	-	-	.7	-	6.3
	5	0-1	122.10	-	-	-	-	-	-	-	-	-	-	2.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4	1.4	-	2.7
		100-101	123.10	-	-	-	-	-	2.5	-	-	-	-	.8	-	-	-	-	-	-	3.4	-	2.5	-	-	-	-	-	-	-	-	2.5	4.2
	6	50-51	124.10	-	-	-	-	-	1.1	-	-	-	-	2.2	-	-	-	-	-	-	4.3	-	-	-	-	-	-	-	-	-	1.1	1.1	3.3
	7	0-1	125.20	-	-	-	-	-	.6	-	-	-	-	2.8	-	-	-	-	-	-	-	-	-	-	-	-	-	.6	-	-	-	1.1	1.1
10	1	50-51	126.20	-	-	-	-	-	.8	-	-	-	-	3.1	-	-	-	-	-	-	2.3	-	.8	-	-	-	-	-	-	-	.8	.8	2.3
	2	0-1	127.20	-	-	-	-	-	2.6	-	-	-	-	2.6	-	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	1.3	1.3	1.3
		100-101	128.20	-	-	-	-	-	-	-	-	-	-	11.3	-	-	-	-	-	-	3.2	-	1.6	-	-	-	-	-	-	-	-	-	3.2
	3	50-51	129.20	-	-	-	-	-	-	-	-	-	-	3.4	-	-	-	-	-	-	3.4	-	-	-	-	-	-	-	-	-	-	1.7	8.6
	4	0-1	130.20	-	-	-	-	-	-	-	-	-	-	3.3	-	-	-	-	-	1.7	1.7	-	1.7	-	-	-	-	-	-	-	1.7	6.7	11.7
		100-101	131.20	-	-	-	-	-	-	-	-	-	-	5.1	-	-	-	-	-	-	5.1	-	2.6	-	-	-	-	-	-	-	-	-	7.7
	5	50-51	132.20	-	1.0	-	-	-	1.0	-	-	-	1.0	2.0	-	-	1.0	-	-	-	1.0	-	1.0	-	-	-	-	-	-	-	-	3.0	5.0
	6	0-1	133.20	-	-	-	-	-	.7	-	-	-	-	1.5	-	-	2.2	-	-	-	-	-	-	-	-	-	.7	.7	-	-	-	1.5	3.7
		100-101	134.20	-	-	-	-	-	2.4	-	-	-	-	3.7	-	-	-	-	-	-	1.2	-	-	-	-	-	-	-	-	-	-	1.2	7.3
11	1	0-1	135.30	-	-	-	-	-	-	-	-	-	-	6.0	-	-	-	1.0	-	-	2.0	-	-	-	-	-	-	-	-	-	-	3.0	1.0
		100-101	136.30	-	-	-	-	-	3.9	-	-	-	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3	6.6
	2	50-51	137.30	-	-	-	-	-	5.1	-	-	-	-	2.0	-	-	-	-	-	1.0	2.0	-	-	-	-	-	-	-	-	-	-	2.0	11.2
	3	0-1	138.30	-	-	-	-	-	1.7	-	-	-	-	2.6	-	-	-	.9	-	-	.9	-	-	-	-	-	-	-	-	-	-	-	7.8
		100-101	139.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-	1.4	-	-	-	1.4	-	4.1
	4	50-51	140.30	-	-	-	-	-	3.0	-	-	-	-	5.3	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	.8	.8	2.3
	5	0-1	141.30	-	1.0	-	-	-	.5	-	-	-	-	8.7	-	-	-	.5	-	-	1.4	-	.5	-	-	-	-	-	-	-	-	1.0	1.0
		100-101	142.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3	2.7

CORE	SECTION	INTERVAL (cm)	DEPTH (mbsf)	*Cibicidoides robertianus*	*Cibicidoides wuellerstorfi*	*Cibicidoides* sp. 1	*Cyclammina cancellata*	? *Cystammina* sp. 1	*Denatalina communis*	*Dentalina* cf. *D. communis*	*Dentalina intorta*	*Dentalina subemaciata*	*Discopulvinulina* sp. 1	*Discopulvinulina* sp. 2	*Discorbinella bertheloti*	*Eggerella bradyi*	*Eggerella bradyi* x *K. bradyi*	*Eggerella* sp. 1	*Eggerella* sp. 2	*Eggerella* sp. 3	*Ehrenbergina albatrossi*	*Ehrenbergina trigona*	*Ehrenbergina undulata*	*Ellipsoglandulina laevigata*	*Ellipsoidella* cf. *E. pleurostomelloides*	*Ellipsoidina ellipsoides*	*Epistominella exigua*	*Favocassidulina favus*	*Fissurina annectens*	*Fissurina arcuata*	*Fissurina auriculata*	*Fissurina* cf. *F. capillosa*
1	1	1-2	39.31	-	6.8	-	-	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	40.30	-	4.0	-	-	-	.6	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	1.7	.6	-	-	-	.6
	2	50-51	41.30	-	4.5	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-	-	-	-	-	-	1.0	3.5	-	-	-	-
		149-150	42.29	-	4.7	-	-	-	-	-	-	-	-	-	1.1	-	3.1	-	-	-	-	-	-	-	-	-	3.1	-	-	-	-	-
	3	100-101	43.30	-	3.9	-	-	-	-	-	-	-	-	-	-	.6	-	.6	-	-	-	-	-	-	-	.6	1.7	-	-	-	-	-
	4	50-51	44.30	-	5.7	-	-	-	.8	-	-	-	-	-	-	2.5	-	.8	-	-	.8	-	.8	-	-	-	-	3.3	-	-	-	-
		149-150	45.29	-	4.6	-	-	-	-	-	-	-	-	-	-	3.3	1.3	-	-	-	-	-	-	.7	-	-	6.5	-	-	-	-	-
	5	100-101	46.30	.5	7.0	-	-	-	-	-	-	-	-	-	-	1.1	-	-	-	-	-	-	.5	-	-	-	1.5	.5	-	-	-	-
	6	50-51	47.30	1.1	2.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.7	1.1	-	-	-	-
		149-150	48.29	-	3.5	.3	-	-	-	-	-	-	-	-	-	.6	-	.3	-	-	-	-	-	-	-	-	5.6	-	-	-	-	-
2	1	50-51	49.40	-	6.8	-	-	-	-	-	-	-	-	-	-	4.2	.8	-	-	-	-	-	-	-	-	-	1.7	.8	-	-	-	-
	2	0-1	50.40	-	5.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	50-51	52.40	-	5.2	-	-	-	-	-	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	-	-	6.9	-	-	-	-	-
		100-101	54.40	1.4	.7	.7	-	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-
	5	50-51	55.40	-	2.7	-	-	-	-	-	-	-	-	-	-	1.8	-	-	-	-	-	-	-	-	-	-	3.6	1.4	1.4	-	-	-
	6	0-1	56.40	-	2.4	-	-	-	1.2	-	-	-	-	-	.6	3.8	-	-	-	-	-	-	-	-	-	-	2.4	-	-	-	-	-
		100-101	57.40	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-
3	1	0-1	58.50	.7	5.0	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-	-	-	2.9	-	-	-	.7	-
		100-101	59.50	.6	1.6	-	-	-	.6	-	-	-	-	-	-	3.1	-	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-
	2	50-51	60.50	.3	1.9	-	-	-	-	-	-	-	-	-	-	1.5	.6	-	-	-	-	-	-	-	-	-	1.9	.3	1.9	-	.3	-
	3	1-2	61.51	.6	2.5	.6	-	-	-	-	-	-	-	-	-	1.2	.6	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-
		100-101	62.50	-	-	-	-	-	-	-	-	-	-	-	-	3.1	-	-	-	-	-	-	-	-	-	-	4.1	-	-	-	-	-
	4	50-51	63.50	-	3.7	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-	-	-	-	-	-	.7	-	-	-	-	-
	5	0-1	64.50	.8	5.5	-	-	-	.6	.8	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	.8	2.3	-	-	-
		100-101	65.50	-	4.1	-	-	-	-	-	-	-	-	-	-	2.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.7	-
	6	50-51	66.50	.6	2.4	-	-	-	-	-	-	-	-	-	-	4.6	-	-	-	-	-	-	.6	-	-	-	1.2	-	-	-	-	-
	7	0-1	67.50	-	.9	-	-	-	-	-	-	-	-	-	-	2.6	-	-	-	-	-	-	.4	-	-	-	2.2	-	-	-	-	-
4	1	50-51	68.60	-	.8	-	-	-	.4	-	.4	-	-	-	-	2.5	1.7	-	-	-	.8	-	.4	-	-	-	.4	-	-	-	.8	-
	2	0-1	69.60	-	.5	-	-	-	.5	-	-	-	-	-	-	1.8	-	-	-	-	-	-	-	-	.5	-	.9	.5	-	-	-	-
		100-101	70.60	1.4	2.8	-	-	-	-	-	-	-	-	-	-	1.7	.3	-	-	-	-	-	-	-	-	-	1.7	.7	-	-	-	-
	3	50-51	71.60	-	2.8	-	-	-	-	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	-	-	-	.9	-	.9	-	-	-
	4	0-1	72.60	.5	2.5	-	-	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-
		100-101	73.60	.6	2.8	-	-	-	.3	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	-	-	1.4	.6	-	-	-	-
	5	50-51	74.60	1.0	2.9	-	-	-	.5	-	-	-	-	-	-	4.3	-	-	-	-	1.0	-	-	.5	-	-	-	.5	-	-	-	-
	6	0-1	75.60	1.4	1.4	-	-	-	-	-	-	-	-	-	-	1.9	-	-	-	-	.9	-	-	-	-	-	.5	-	-	-	-	-
		100-101	76.60	-	4.8	-	-	-	1.4	-	-	-	-	-	-	.7	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	-
5	1	0-1	77.70	-	3.1	-	-	-	.6	-	-	-	-	-	-	4.4	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	-	1.3
		100-101	78.70	.6	2.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.6	-	-	-	4.2	-	-	-	-	-
	2	50-51	79.70	.5	2.0	-	.5	-	.5	-	-	-	-	-	-	1.5	-	-	-	-	-	-	.5	-	-	-	4.0	-	-	-	-	-
	3	1-2	80.71	1.1	6.5	-	-	-	-	-	-	-	-	-	-	3.2	-	-	-	-	-	-	-	-	-	-	3.2	-	-	-	-	-
		100-101	81.71	-	.8	-	-	-	-	-	-	-	-	-	-	3.2	-	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	-
	4	50-51	82.70	.8	5.4	-	-	-	-	-	-	-	-	-	-	.8	.8	-	-	-	-	-	.8	-	-	-	3.9	-	-	-	-	-
	5	0-1	83.70	.6	4.2	-	-	-	-	-	-	-	-	-	.6	1.2	-	-	-	-	-	.6	2.4	-	-	-	1.2	-	-	-	-	-
		100-101	84.70	1.7	5.2	-	-	-	-	-	-	-	-	-	-	.9	.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6	50-51	85.70	-	4.7	-	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-
	7	0-1	86.70	.4	5.7	-	-	-	-	-	-	-	-	-	-	2.4	-	-	-	-	-	-	2.0	-	-	-	.4	-	-	-	-	-
6	1	50-51	87.80	-	4.8	.5	-	-	.5	-	-	-	-	-	-	3.2	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-
	2	0-1	88.80	-	2.9	-	-	-	.5	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	-	1.0	-	-	.5	-	-
		100-101	89.80	.7	4.7	-	-	-	-	-	-	-	-	-	.7	1.3	-	-	-	-	-	-	-	-	-	.7	.7	-	-	-	-	-
	3	50-51	90.80	.9	5.7	-	-	-	.3	-	-	-	-	-	-	1.3	.3	-	-	-	-	-	.3	-	-	-	.3	-	-	-	-	-
	4	0-1	91.80	.9	5.9	.9	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-	.5	-	.9	-	.5	-	-	-
		100-101	92.80	-	7.8	-	-	-	-	-	-	-	-	-	-	2.1	-	-	-	-	-	-	-	-	-	-	2.6	-	-	-	-	-
	5	50-51	93.80	-	10.6	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6	0-1	94.80	.5	3.9	-	-	-	.5	.5	-	-	-	-	-	1.5	.5	-	-	-	-	-	.5	-	-	-	-	-	-	-	-	-
		100-101	95.80	-	5.6	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
7	1	0-1	96.90	.5	3.6	-	-	-	-	-	-	-	-	-	-	4.1	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-
		100-101	97.90	-	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	4.1	-	-	-	-	.5
	2	50-51	98.90	-	5.4	.6	-	-	-	-	-	-	-	-	-	1.2	-	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-
	3	0-1	99.90	-	4.6	-	-	.4	.4	-	-	-	-	-	-	1.1	.4	-	-	.4	-	-	-	-	-	-	.7	-	-	-	-	-
		100-101	100.90	-	5.3	.4	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-	-	-	.4	-	-	.4	-	-	-	-	-
	4	50-51	101.90	-	4.2	-	-	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	1.4	-	1.7	.3	-	-	-	-
	5	0-1	102.90	.6	4.3	-	-	-	-	-	-	-	-	-	-	1.2	-	-	-	-	-	-	-	-	-	-	2.5	-	-	-	-	-
		100-101	103.90	-	1.3	.9	-	-	.4	-	-	-	-	-	-	1.3	-	-	-	-	-	-	-	-	-	-	1.3	-	.4	-	-	-
	6	50-51	104.90	-	4.5	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-
	7	0-1	105.90	-	4.4	.4	-	-	-	-	.4	-	-	-	-	2.2	-	-	-	-	-	-	.4	-	-	-	.4	-	-	-	-	-
8	1	50-51	107.00	-	5.3	-	-	-	.8	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-
	2	0-1	108.00	.4	5.0	-	-	-	-	-	-	-	-	-	-	1.7	-	-	.8	-	-	-	-	-	-	-	.4	-	-	-	-	-
		100-101	109.00	-	3.2	-	-	-	-	-	-	-	-	-	-	3.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	50-51	110.00	-	3.2	-	-	-	-	-	-	-	-	-	-	1.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4	0-1	111.00	-	6.0	-	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	112.00	-	3.6	-	-	-	-	-	-	-	-	-	-	3.0	-	-	-	-	-	-	-	-	-	-	1.8	-	-	-	-	-
	5	50-51	113.00	-	4.6	-	-	-	.5	-	-	-	-	-	-	2.6	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-
	6	0-1	114.00	-	2.9	-	-	-	-	-	-	-	-	.6	-	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	115.00	-	3.2	-	-	-	-	-	.4	-	-	-	-	1.8	-	-	-	.4	-	-	-	-	-	-	.4	-	-	-	-	-
9	1	0-1	116.10	-	2.7	.7	-	-	.7	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	.7	.7	-	2.7	-	1.3	-	-	.7
		100-101	117.10	-	7.8	.7	-	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-	-	-	-	-	-	-	.3	-	-	-	-
	2	50-51	118.10	-	7.6	.3	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	-	.8	-	-	-
	3	0-1	119.10	-	3.4	-	-	-	.8	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	-	1.7	.9	-	-	.9	-
		100-101	120.10	-	3.8	-	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	.4	-	.4	-	.4	-	.4	-
	4	50-51	121.10	-	4.9	-	-	-	-	.4	-	-	-	-	-	3.5	-	-	-	-	.7	-	-	-	-	-	1.4	-	-	-	-	-
	5	0-1	122.10	-	8.1	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	123.10	-	3.4	-	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	.8	-	-	-	-	-	1.7	-	-	-	-	-
	6	50-51	124.10	-	5.4	-	-	-	-	-	-	-	-	1.1	-	1.1	-	-	-	-	-	-	-	-	-	-	3.3	-	-	-	-	-
	7	0-1	125.20	-	5.0	-	-	-	-	-	-	-	-	-	-	1.1	-	-	-	-	-	-	-	-	-	-	1.7	-	.6	-	-	-
10	1	50-51	126.20	-	6.9	-	-	-	-	-	-	-	-	-	-	3.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	0-1	127.20	-	1.3	-	-	-	-	-	-	-	-	-	-	2.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	128.20	-	8.1	-	-	-	-	-	-	-	1.6	-	-	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	50-51	129.20	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-
	4	0-1	130.20	-	6.7	-	-	-	-	-	1.7	-	-	-	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	131.20	-	2.6	-	-	-	-	-	-	-	-	-	-	2.5	-	-	-	-	-	-	-	-	-	-	2.6	-	2.8	-	-	2.6
	5	50-51	132.20	-	3.0	-	-	-	-	-	-	-	-	-	-	3.0	-	-	-	-	-	-	-	-	-	-	2.0	-	1.0	-	-	-
	6	0-1	133.20	-	4.5	-	.7	-	-	-	-	-	-	-	-	3.0	-	-	-	-	.7	-	-	-	1.5	-	3.0	-	.7	-	-	-
		100-101	134.20	1.2	6.1	-	-	-	-	-	-	1.2	-	-	-	2.4	-	-	-	-	-	-	1.2	-	-	-	2.4	-	-	-	-	-
11	1	0-1	135.30	-	8.0	-	-	-	-	-	-	-	-	-	-	3.0	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-
		100-101	136.30	-	13.2	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-	1.3	-	-	-	-	1.3	-	-	-	-	-
	2	50-51	137.30	-	5.1	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-	1.0	-	-	-	-	1.0	-	-	-	-	-
	3	0-1	138.30	-	4.3	-	-	-	-	-	-	.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	-	-	-	-	-
		100-101	139.30	-	6.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-
	4	50-51	140.30	-	6.8	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-
	5	0-1	141.30	-	6.2	-	-	-	-	-	-	.5	-	-	-	1.9	-	-	-	-	-	-	-	-	-	-	1.9	-	-	-	-	-
		100-101	142.30	1.3	10.7	-	-	-	-	-	-	-	-	-	-	4.0	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-

CORE	SECTION	INTERVAL (cm)	DEPTH (mbsf)	Fissurina castrensis	Fissurina clathrata	Fissurina crebra	Fissurina duplicata	Fissurina echigoensis	Fissurina fimbriata	Fissurina kerguelenensis	Fissurina marginata	Fissurina palliolata	Fissurina revertens	Fissurina selseyensis	Fissurina seminiformis	Fissurina separans	Fissurina wiesneri	Fissurina sp. 1	Fissurina sp. 2	Fissurina sp. 3	Fissurina sp. 4	Fissurina sp. 5	Fissurina sp. 6	Fissurina sp. 7	Fissurina sp. 8	Fissurina sp. 9	Fissurina sp. 10	Fissurina sp. 11	Fissurina sp. 12	Fissurina sp. 13	Fissurina sp. 14	Fissurina sp. 15	Fissurina sp. 16
1	1	1-2	39.31	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-
		100-101	40.30	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	.6	.6	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	50-51	41.30	-	-	-	-	-	-	1.0	1.5	-	-	-	-	-	.5	.5	1.0	.5	-	-	-	-	-	-	-	-	-	-	-	-	-
		149-150	42.29	-	-	.8	-	-	.8	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	100-101	43.30	-	1.1	1.7	-	-	.6	.6	-	-	-	-	-	-	.6	.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4	50-51	44.30	-	-	.8	-	-	-	1.6	-	-	-	-	-	-	.8	.8	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-
		149-150	45.29	-	.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	100-101	46.30	-	.5	-	-	-	.5	-	1.1	-	.5	-	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	1.1	.5	-	-
	6	50-51	47.30	-	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	-	-	.5	-	.5	-
		149-150	48.29	-	.3	-	-	-	.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
2	1	50-51	49.40	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	.8	-	-	-
	2	0-1	50.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	50-51	52.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	54.40	-	-	.7	-	-	-	-	.7	-	-	-	-	-	.7	.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	50-51	55.40	-	-	-	-	-	.5	.5	.9	-	.5	-	-	-	-	.5	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-
	6	0-1	56.40	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.6	-	-	-
		100-101	57.40	-	-	-	-	-	-	.6	-	.6	.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.6	-	-
3	1	0-1	58.50	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.7	-	.7	-	-	-	-	-
		100-101	59.50	-	-	-	-	-	-	-	-	-	.6	-	-	-	.6	.6	-	-	-	-	-	-	-	-	-	-	-	-	1.8	-	-
	2	50-51	60.50	-	.3	.3	-	-	.3	-	1.3	-	.3	-	-	-	.6	.3	-	-	.3	-	-	-	-	.3	-	-	-	-	.6	.3	.6
	3	1-2	61.51	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.6	-
		100-101	62.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4	50-51	63.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	-	-	.7	-	-
	5	0-1	64.50	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	65.50	-	-	-	-	-	-	-	.7	-	-	-	-	.7	-	-	-	.7	-	-	-	-	-	.7	-	-	-	-	-	-	.7
	6	50-51	66.50	-	-	-	-	-	-	.6	.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.6	.6	-
	7	0-1	67.50	-	-	-	-	-	-	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
4	1	50-51	68.60	-	.4	1.2	-	-	-	-	.4	-	-	-	-	.4	-	-	-	-	-	-	-	-	-	-	-	-	-	.4	-	-	-
	2	0-1	69.60	-	-	-	-	-	-	.5	.9	-	-	-	-	-	.5	.5	-	-	-	-	-	-	-	.5	.5	-	-	.5	-	-	-
		100-101	70.60	-	.7	.3	-	.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.3	-	-	.7	-	-	-	.3	.7	-	-
	3	50-51	71.60	-	-	-	-	-	-	-	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4	0-1	72.60	-	-	.5	-	-	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	73.60	-	-	.6	-	-	-	-	.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.3
	5	50-51	74.60	-	-	-	-	-	-	-	.5	-	-	-	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6	0-1	75.60	-	-	1.9	-	.5	-	-	.9	-	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	76.60	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	.7	-	-	-
5	1	0-1	77.70	-	-	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	-	-
		100-101	78.70	-	-	.6	-	-	1.2	-	.6	-	.6	-	-	-	-	.6	-	-	-	-	-	-	-	-	-	-	-	-	.6	-	-
	2	50-51	79.70	-	-	-	-	-	-	.5	.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	1-2	80.71	-	-	1.1	-	-	-	-	-	-	-	-	-	-	-	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	81.71	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.8	-
	4	50-51	82.70	-	.9	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	0-1	83.70	-	-	.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	84.70	-	-	-	-	-	-	.9	.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.9	-	-
	6	50-51	85.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-
	7	0-1	86.70	-	-	-	-	-	.4	-	.4	-	-	-	-	-	.4	.4	-	-	-	-	-	-	-	-	-	-	-	.4	-	-	-
6	1	50-51	87.80	-	-	1.6	-	-	-	-	.5	-	.5	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	-	-	-
	2	0-1	88.60	-	.5	2.4	-	-	.5	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	-
		100-101	89.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	50-51	90.80	-	.6	.3	-	-	.3	-	.9	-	.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.3	-	-
	4	0-1	91.80	-	-	-	-	-	.5	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	92.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	50-51	93.80	-	-	9.8	-	-	-	-	-	-	-	-	-	-	.5	-	-	.9	-	-	-	-	.5	-	-	-	-	-	-	-	-
	6	0-1	94.80	-	-	1.0	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	95.80	-	-	.6	.6	-	-	-	1.1	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	-	.6	-	-	-	.6	-	-
7	1	0-1	96.90	-	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	97.90	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	-
	2	50-51	98.90	-	.6	-	-	-	.6	-	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	0-1	99.90	-	-	1.1	-	-	.4	-	.4	-	.4	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	-	.4	.7	-	-
		100-101	100.90	-	-	.4	-	-	-	-	.4	-	-	-	-	-	-	.4	-	-	-	-	-	.4	-	-	.4	-	-	-	-	-	-
	4	50-51	101.90	.3	-	.3	.3	-	.3	-	.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	0-1	102.90	-	-	2.5	.6	-	.6	-	-	-	.6	-	-	-	1.2	-	-	-	-	-	-	-	.6	-	.6	-	-	-	-	-	-
		100-101	103.90	-	-	.9	-	-	.4	-	.4	-	.4	-	-	-	.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6	50-51	104.90	-	-	1.0	1.0	-	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	7	0-1	105.90	-	-	-	-	.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
8	1	50-51	107.00	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	0-1	108.00	-	-	.4	.4	-	-	-	-	-	-	-	-	-	-	-	.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	109.00	-	-	-	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1	-	-	-	-	-	-	-	-	-	-	1.1
	3	50-51	110.00	-	-	.5	-	.5	-	-	.5	.5	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4	0-1	111.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	112.00	-	-	.6	-	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	-	-
	5	50-51	113.00	-	-	.5	-	-	-	-	.5	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6	0-1	114.00	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.6	-	-
		100-101	115.00	-	.4	1.4	-	-	-	-	.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
9	1	0-1	116.10	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-
		100-101	117.10	-	.7	.3	-	.3	-	-	-	.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.3
	2	50-51	118.10	-	-	-	-	-	-	-	-	-	.8	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	.8	.8	-	-	-
	3	0-1	119.10	-	-	-	-	-	-	-	-	-	-	-	.9	-	-	.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	120.10	-	-	.4	-	-	-	.8	-	-	.4	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	.4	-	-	-	-
	4	50-51	121.10	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	0-1	122.10	-	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	123.10	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	6	50-51	124.10	-	1.1	-	-	-	-	1.1	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2
	7	0-1	125.20	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
10	1	50-51	126.20	-	-	-	-	-	.8	-	.8	-	-	-	-	-	1.5	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-
	2	0-1	127.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	128.20	-	-	-	-	-	-	-	1.6	-	-	-	-	-	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	50-51	129.20	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4	0-1	130.20	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-
		100-101	131.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	-	-
	5	50-51	132.20	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-
	6	0-1	133.20	-	-	-	-	-	-	-	1.5	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	134.20	-	-	3.7	-	-	-	-	-	-	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
11	1	0-1	135.30	-	-	2.0	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	136.30	-	-	-	-	-	-	-	1.3	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-
	2	50-51	137.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	0-1	138.30	-	-	-	-	-	-	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	-	-
		100-101	139.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4	50-51	140.30	-	-	.8	.8	-	-	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	0-1	141.30	-	-	-	-	-	-	.5	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	-
		100-101	142.30	-	-	1.3	-	-	1.3	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

Core	Section	Interval (cm)	Depth (mbsf)	*Fissurina* sp. 17	*Fissurina* sp. 18	*Fissurina* sp. 19	*Fissurina* sp. 20	*Fissurina* sp. 21	*Fissurina* sp. 22	*Fissurina* sp. 23	*Fissurina* sp. 24	*Fissurina* sp. 25	*Fissurina* sp. 26	*Florilus* sp. 1	*Francesita advena*	*Fursenkoina* sp. 1	*Fursenkoina* sp. 2	*Gaudryina* sp. 1	*Gavelinopsis lobatulus*	*Globocassidulina decorata*	*Globocassidulina subglobosa*	*Globocassidulina* sp. 1	*Globofissurella quadricarinata*	*Globofissurella* sp. 1	*Globulina* sp. 1	*Globulina* sp. 2	*Gyroidina altiformis*	*Gyroidina neosoldanii*	*Gyroidina* sp. 1	*Gyroidina* sp. 2	*Gyroidina* sp. 3	*Gyroidina* sp. 4	*Gyroidinoides broekhiana*
1	1	1-2	39.31	-	-	-	-	-	.7	-	-	-	.7	.7	-	-	-	-	-	-	.7	-	-	-	-	-	2.7	1.4	2.7	-	-	-	-
		100-101	40.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-	1.1	-	1.7	-	-	4.0	-
	2	50-51	41.30	-	-	-	-	-	-	-	-	-	2.0	1.0	-	-	-	-	-	-	3.5	-	-	-	-	-	.5	-	2.5	-	2.5	1.0	-
		149-150	42.29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.1	-	-	-	-	-	1.6	.8	3.1	-	-	-	-
	3	100-101	43.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1	-	-	-	-	-	1.1	-	3.9	-	-	-	-
	4	50-51	44.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.9	-	-	-	-	-	4.1	-	4.1	-	-	-	-
		149-150	45.29	-	-	-	-	-	-	-	-	-	-	-	.7	-	-	-	1.3	-	2.6	-	-	.7	-	-	.7	-	1.3	-	-	-	-
	5	100-101	46.30	.5	-	-	-	-	-	-	-	-	1.1	-	-	-	-	-	.5	-	2.1	-	-	-	-	-	2.7	-	2.7	-	-	-	-
	6	50-51	47.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	-	-	-	-	-	2.7	-	3.3	-	-	-	-
		149-150	48.29	-	-	-	-	-	-	-	-	.3	.6	-	-	-	-	-	-	-	4.1	-	-	-	-	-	.6	-	-	-	-	-	-
2	1	50-51	49.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.8	-	3.4	-	-	-	-	-	-	-	-	-	-	-	-
	2	0-1	50.40	-	-	-	-	-	-	-	-	-	3.0	-	-	-	-	-	-	-	3.0	-	-	-	-	-	-	-	3.0	-	-	-	-
	3	50-51	52.40	-	-	-	-	-	-	-	-	-	2.6	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	54.40	-	-	-	-	-	-	-	-	-	1.4	-	.7	-	-	-	-	-	2.9	-	-	-	-	-	2.2	-	.7	-	-	-	-
	5	50-51	55.40	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-	.5	-	.5	-	-	-	-
	6	0-1	56.40	-	-	-	.6	-	-	-	-	-	.6	-	-	-	-	-	-	-	3.0	-	-	-	-	-	-	-	3.0	-	-	-	-
		100-101	57.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.2	-	-	-	-	-	1.9	.6	1.3	-	-	-	-
3	1	0-1	58.50	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	2.2	-	-	-	-	-	2.2	-	.7	-	-	-	-
		100-101	59.50	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	1.2	-	1.8	-	-	-	.6	-	-	-	4.3	-	-	-	-
	2	50-51	60.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.9	-	-	-	-	-	1.0	.3	1.9	-	-	-	-
	3	1-2	61.51	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.4	-	-	-	-	-	.6	-	3.1	-	-	-	-
		100-101	62.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-	-	-	1.5	-	2.6	-	-
	4	50-51	63.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2	-	-	-	-	-	-	-	1.5	-	-	-	.7
	5	0-1	64.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	-	-	-	-	-	-	2.3	-	-	-	-	-
		100-101	65.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	.7	2.1	-	-	-	-
	6	50-51	66.50	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	1.8	-	-	-	-	-	-	-	4.2	-	-	-	.6
	7	0-1	67.50	-	-	-	-	-	-	-	-	-	.9	-	-	-	-	-	.4	-	1.3	-	-	-	-	-	-	.4	.4	-	-	-	-
4	1	50-51	68.60	-	-	-	-	-	-	-	-	-	.4	-	-	-	-	-	-	-	1.7	-	-	-	-	-	.4	-	3.3	-	-	-	-
	2	0-1	69.60	-	-	-	-	-	-	-	-	-	1.4	-	.5	-	-	-	-	.9	2.3	-	-	-	-	-	-	.9	1.4	-	-	-	-
		100-101	70.60	-	-	-	-	-	-	-	-	.3	.3	-	-	-	-	-	-	.3	3.1	-	-	-	-	-	.3	-	1.4	-	-	-	.3
	3	50-51	71.60	-	-	-	-	-	-	-	-	-	-	-	.9	-	-	-	-	-	3.8	-	-	-	-	-	.9	-	.9	-	-	-	-
	4	0-1	72.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.5	2.0	-	-	-	-	-	1.0	1.0	.5	-	-	-	.5
		100-101	73.60	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	.3	3.1	-	.3	-	-	-	.3	.3	2.0	-	-	.3	.3
	5	50-51	74.60	-	-	-	-	-	-	-	-	-	.5	-	.5	-	-	-	-	-	1.4	-	-	-	-	-	.5	.5	1.9	-	-	-	-
	6	0-1	75.60	-	-	-	-	-	-	-	-	-	.9	-	.5	-	-	-	-	-	1.4	-	-	-	-	-	.9	.5	.5	-	-	-	-
		100-101	76.60	-	-	-	-	-	-	-	-	-	2.1	-	-	-	-	-	-	-	.7	-	-	-	-	-	.7	.7	.7	-	-	-	-
5	1	0-1	77.70	-	-	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	1.3	8.2	-	-	-	-	-	-	.6	1.3	-	-	-	.6
		100-101	78.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.8	-	-	-	-	-	-	1.8	.6	-	-	-	-
	2	50-51	79.70	-	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	.5	-	-	-	-	-
	3	1-2	80.71	-	-	-	-	-	-	-	-	-	3.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	81.71	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	.8	.8	-	-	-	-	-	.8	.8	1.6	-	-	.8	-
	4	50-51	82.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-
	5	0-1	83.70	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	2.4	-	-	-	-	-	-	1.2	1.8	-	-	-	-
		100-101	84.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	-	-	2.6	-	-	-	-
	6	50-51	85.70	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	-	-	-	-	-	-	-	1.5	-	-	-	-
	7	0-1	86.70	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	1.6	-	-	-	-	-	.4	.8	1.6	-	-	-	-
6	1	50-51	87.80	-	-	-	-	.5	-	-	-	-	.5	-	-	-	-	-	-	.5	1.1	-	-	-	-	-	.5	-	2.7	-	-	-	.5
	2	0-1	88.80	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	1.0	-	-	-	-	-	.5	-	1.9	-	-	.5	-
		100-101	89.80	-	-	-	-	-	-	-	-	-	-	-	-	-	.7	.7	-	-	1.3	-	-	-	-	-	-	.7	2.0	-	-	-	-
	3	50-51	90.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.3	1.6	-	-	-	-	-	.6	2.2	1.6	-	-	-	.6
	4	0-1	91.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	2.7	-	-	-	-	-	1.4	.9	.9	-	.9	-	-
		100-101	92.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	1.0	-	-	-	-	-	2.6	-	1.6	-	-	-	1.0
	5	50-51	93.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.8	-	-	-	-	-	.9	-	.9	-	-	-	-
	6	0-1	94.80	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	1.5	2.5	-	-	-	-	-	-	-	3.9	-	-	-	.5
		100-101	95.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.2	-	-	-	.6	.6	1.1	.6	2.8	-	-	.6	.6
7	1	0-1	96.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.1	-	-	-	-	-	1.0	.5	1.5	-	-	-	-
		100-101	97.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.5	.5	-	-	-	-	-	1.5	.5	.5	-	1.0	-	-
	2	50-51	98.90	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	1.2	-	-	-	-	-	1.2	.6	1.7	-	-	-	-
	3	0-1	99.90	-	-	-	.4	-	-	-	-	-	.4	-	-	-	-	-	-	-	1.8	-	-	-	-	-	-	.4	1.4	-	-	-	.4
		100-101	100.90	-	-	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	.4	3.5	-	-	-	-	-	-	.4	1.3	-	.4	-	-
	4	50-51	101.90	-	-	-	-	-	-	-	.3	-	-	-	-	-	-	-	-	.3	2.8	-	-	-	-	-	1.0	.3	1.7	-	1.4	-	-
	5	0-1	102.90	-	-	-	.6	-	-	-	.6	-	.6	-	-	-	-	-	-	.6	2.5	-	-	-	-	-	-	.6	.6	-	-	-	-
		100-101	103.90	-	-	-	-	-	-	-	-	.4	-	-	.4	-	-	-	-	.4	1.3	-	-	-	-	-	1.8	-	1.8	-	.9	-	-
	6	50-51	104.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-	-	-	1.0	-	-	-	-
	7	0-1	105.90	-	.4	-	-	-	-	-	-	.4	-	-	-	-	-	-	-	.7	1.5	-	-	-	-	-	.4	.7	-	-	.7	-	1.1
8	1	50-51	107.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	1.5	-	-	-	-	-
	2	0-1	108.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	.4	.4	-	-	-	.8
		100-101	109.00	-	-	-	1.1	-	-	-	-	-	1.1	-	-	-	-	-	-	-	1.1	-	-	-	-	-	2.1	-	2.1	-	-	1.1	-
	3	50-51	110.00	-	.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.5	2.8	-	-	-	-	-	-	1.8	.9	-	1.4	-	.5
	4	0-1	111.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2	1.8	-	-	-	-	.6
		100-101	112.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2	1.8	-	-	-	-	-	1.2	1.2	-	-	-	-	.6
	5	50-51	113.00	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	1.0	-	-	-	-	-	.5	1.5	1.5	-	-	-	-
	6	0-1	114.00	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	2.3	-	-	-	-	-	-	.6	.6	-	-	-	-
		100-101	115.00	-	-	.4	.4	-	-	-	-	-	1.1	-	-	-	-	-	-	-	1.1	-	-	-	.4	-	-	-	2.9	-	-	-	-
9	1	0-1	116.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.7	2.0	-	-	-	-	-	4.8	-	-	-	-	.7	-
		100-101	117.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-	.7	.3	3.4	-	1.0	-	-
	2	50-51	118.10	-	-	-	.8	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.8	1.5	-	-	.8	-
	3	0-1	119.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.9	-	1.7	.9	-	-	-	-	-	1.7	2.6	-	-	-	-
		100-101	120.10	-	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	.8	-	-	-	-	-	.8	.8	1.3	-	.4	-	.4
	4	50-51	121.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.8	.7	-	-	-	-	-	.7	2.1	.7	-	-	-	.7
	5	0-1	122.10	-	-	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-	-	-	2.7	-	-	-	-	-	1.4
		100-101	123.10	-	-	-	.8	-	-	-	-	-	.8	-	-	-	-	-	.8	-	3.4	-	-	-	-	-	-	2.5	-	-	.8	-	-
	6	50-51	124.10	-	-	-	-	-	-	-	-	-	1.1	1.1	-	-	-	-	-	-	2.2	-	-	-	-	-	-	-	2.2	-	-	3.3	-
	7	0-1	125.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1	-	2.8	-	-	-	-	-	.6	-	.6	-	-	1.1	-
10	1	50-51	126.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.6	-	-	-	-	-	1.5	1.5	1.5	-	-	.8	-
	2	0-1	127.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.9	-	-	-	-	-	-	1.3	9.2	-	-	1.3	-
		100-101	128.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.2	-	1.6	-	-	1.6	-
	3	50-51	129.20	1.7	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	1.7	1.7	-	-	-	-	-	1.7	1.7	5.2	-	-	-	-
	4	0-1	130.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.3	-	-	-	-	-	1.7	-	5.0	-	-	-	-
		100-101	131.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	-	-	-	-	-	-	-	-	-	2.6	-
	5	50-51	132.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	2.0	2.0	-	-	-	-	1.0	-	1.0	-	-	1.0	-
	6	0-1	133.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5	-	4.5	1.5	-	-	-	-	1.5	-	.7	-	.7	-	-
		100-101	134.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2	6.1	-	-	-	-
11	1	0-1	135.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-	-	-	-	-	2.0	3.0	-	-	-	-
		100-101	136.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.9	-	-	-	-	-	-	-	-	-	-	-	-
	2	50-51	137.30	1.0	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	4.1	-	-	-	-	-	2.0	-	2.0	-	-	-	-
	3	0-1	138.30	-	-	-	-	-	-	-	-	.9	-	.9	-	-	-	-	.9	-	.9	-	-	-	-	-	-	-	-	-	-	1.7	-
		100-101	139.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.7	-	-	-	-	-	-	-	1.4	-	-	-	-
	4	50-51	140.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-	-	-	1.5	-	-	.8	-
	5	0-1	141.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.9	-	-	-	-	-	-	1.0	-	-	.5	-	-
		100-101	142.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.0	-	-	-	-	-	-	-	-	1.3	1.3	-	-

CORE	SECTION	INTERVAL (cm)	DEPTH (mbsf)	*Gyroidinoides lamarckiana*	*Gyroidinoides orbicularis*	*Gyroidinoides* sp. 1	*Heronallenia lingulata*	*Karreriella bradyi*	*Lagena advena*	*Lagena alticostata*	*Lagena biarritzensis*	*Lagena feildeniana*	*Lagena hispida*	*Lagena hispidula*	*Lagena meridionalis*	*Lagena paradoxa*	*Lagena stelligera*	*Lagena striata*	*Lagena sulcata*	*Lagena tubulata*	*Lagena* sp. 1	*Lagena* sp. 2	*Lagena* sp. 3	*Lagena* sp. 4	*Laticarinina halophora*	*Lenticulina atlantica*	*Lenticulina convergens*	*Lenticulina* sp. 1	*Marginulina obesa*	*Martinottiella communis*	*Martinottiella petrosa*	*Melonis barleeanum*	*Melonis pompilioides*
1	1	1-2	39.31	-	-	-	-	-	.7	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	5.4	-	-	-	-	-	-	-	.7
		100-101	40.30	-	-	-	-	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	7.3	-	-	-	-	-	-	-	-
	2	50-51	41.30	-	-	-	-	-	-	-	-	-	-	.5	-	.5	-	.5	-	-	-	-	-	-	3.5	-	-	-	-	.5	1.5	-	3.5
		149-150	42.29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.9	-	-	-	-	-	-	4.7	-
	3	100-101	43.30	.6	-	-	-	-	-	-	-	-	.6	.6	-	-	-	-	-	-	-	-	-	-	5.6	-	-	-	-	.6	.6	2.2	3.9
	4	50-51	44.30	-	-	-	-	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	11.5	-	-	-	-	-	-	.8	.8
		149-150	45.29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.3	-	-	-	-	-	-	5.9	-
	5	100-101	46.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.4	-	-	-	-	-	-	8.0	1.6
	6	50-51	47.30	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	.5	-	-	-	-	-	-	7.1	-	-	-	-	-	-	6.6	5.5
		149-150	48.29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.7	-	-	-	-	.3	-	.9	4.1
2	1	50-51	49.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.9	.8	.8	-	-	-	-	9.3	4.2
	2	0-1	50.40	-	-	-	-	-	-	-	-	-	3.0	-	-	3.0	-	-	-	-	-	-	-	-	21.2	-	-	-	-	-	-	3.0	-
	3	50-51	52.40	-	-	-	-	-	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	-	-	11.2	-	-	-	-	-	-	2.6	6.9
		100-101	54.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	16.5	-	.7	-	-	-	-	10.1	2.9
	5	50-51	55.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	11.7	-	-	-	-	-	-	2.7	6.8
	6	0-1	56.40	.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	19.2	-	-	-	-	-	-	7.2	3.6
		100-101	57.40	-	-	-	-	.6	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	12.3	-	-	-	-	-	-	7.8	.6
3	1	0-1	58.50	-	-	-	-	-	-	-	-	-	-	-	-	-	.7	-	-	-	.7	-	-	-	6.5	-	-	-	-	-	-	8.6	1.4
		100-101	59.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.3	-	-	-	-	-	-	6.1	3.1
	2	50-51	60.50	-	-	-	.3	.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.1	-	-	-	-	-	-	6.1	7.1
	3	1-2	61.51	-	-	-	-	.6	-	-	-	-	-	-	-	.6	.8	-	-	-	-	-	-	-	10.6	-	.6	-	-	-	-	6.9	2.5
		100-101	62.50	.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.7	-	-	-	-	.5	-	10.2	2.6
	4	50-51	63.50	-	-	-	-	.7	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	8.2	-	-	-	-	3.0	-	9.0	-
	5	0-1	64.50	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	7.8	-	-	-	-	-	-	5.5	4.7
		100-101	65.50	1.4	-	-	-	.7	-	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	4.1	-	-	-	-	-	-	6.2	3.4
	6	50-51	66.50	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	-	-	-	4.8	-	-	-	-	-	-	9.0	1.2
	7	0-1	67.50	-	-	-	.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.7	.4	-	-	-	-	-	10.1	4.8
4	1	50-51	68.60	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.7	-	-	-	-	.8	.4	7.5	3.7
	2	0-1	69.60	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.3	-	-	-	-	-	-	10.8	-
		100-101	70.60	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.9	.3	-	-	-	-	-	4.8	1.7
	3	50-51	71.60	1.9	-	-	-	-	-	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	-	8.5	-	-	-	-	-	-	12.3	-
	4	0-1	72.60	.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.0	-	-	-	-	-	-	4.5	1.5
		100-101	73.60	-	-	-	-	.3	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	6.6	-	-	-	-	.3	-	5.7	4.0
	5	50-51	74.60	.5	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	1.9	-	-	-	-	.5	-	4.3	.5
	6	0-1	75.60	-	.5	-	-	-	-	-	-	-	-	-	-	.5	.5	-	-	-	-	-	-	-	8.5	-	-	-	-	-	-	8.0	2.4
		100-101	76.60	-	-	-	-	-	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	4.1	-	-	-	-	-	-	5.5	.7
5	1	0-1	77.70	-	-	-	-	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	4.4	-	-	-	-	-	-	3.8	5.7
		100-101	78.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.2	-	-	-	-	.6	-	7.8	1.2
	2	50-51	79.70	-	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	11.5	-	-	-	.5	-	-	9.5	1.0
	3	1-2	80.71	-	-	-	-	-	1.1	-	-	-	-	-	-	1.1	-	-	-	-	-	-	-	-	5.3	-	-	-	-	1.1	-	8.5	2.1
		100-101	81.71	-	-	-	-	.8	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	3.2	-	-	-	-	-	-	4.0	-
	4	50-51	82.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.0	.6	-	-	-	-	-	2.3	3.1
	5	0-1	83.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.6	-	-	-	-	.6	-	5.4	6.0
		100-101	84.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.8	-	-	-	-	-	-	5.2	4.3
	6	50-51	85.70	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.7	.8	-	-	-	-	-	4.7	2.3
	7	0-1	86.70	.4	-	-	.4	.4	-	.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.6	.4	-	-	-	-	-	2.4	2.8
6	1	50-51	87.80	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.9	-	.5	-	-	.5	-	4.3	1.6
	2	0-1	88.60	.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.8	.5	-	-	-	-	1.0	3.8	1.0
		100-101	89.80	-	.7	-	-	-	-	-	-	-	-	.7	-	-	.7	-	-	-	-	-	-	-	3.4	-	-	-	-	-	-	4.0	2.7
	3	50-51	90.80	.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.9	-	-	-	-	.3	.3	1.9	2.5
	4	0-1	91.80	.5	-	-	-	.5	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	3.2	.5	-	-	-	-	.5	2.3	1.4
		100-101	92.80	.5	-	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	-	6.7	-	-	-	-	-	.5	1.6	1.0
	5	50-51	93.80	.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.1	-	.9	-	-	-	-	7.4	.9
	5	0-1	94.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.9	-	-	.5	-	-	-	3.9	6.4
		100-101	95.80	1.1	.6	-	-	-	-	-	-	-	-	-	-	1.7	1.7	-	-	-	-	-	-	-	3.9	-	-	-	-	-	-	3.4	.6
7	1	0-1	96.90	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.1	-	.5	-	-	-	-	3.0	2.0
		100-101	97.90	.5	-	-	-	1.0	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	-	4.1	1.0	-	-	-	-	-	5.1	3.1
	2	50-51	98.90	.6	-	-	-	.6	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	.6	-	3.5	-	-	-	-	-	-	2.9	1.7
	3	0-1	99.90	.7	-	-	-	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	4.3	-	-	-	-	.7	.4	2.8	.7
		100-101	100.90	.9	-	-	-	.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.3	.4	-	-	-	-	-	3.1	2.2
	4	50-51	101.90	-	-	-	-	-	-	-	-	-	-	.3	-	.3	-	-	-	-	-	-	-	-	3.5	-	.3	-	-	-	-	2.1	2.8
	5	0-1	102.90	1.2	.5	-	-	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	5.6	-	.6	-	-	-	-	2.5	1.9
		100-101	103.90	.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	10.6	-	.9	-	-	-	.4	4.0	1.8
	6	50-51	104.90	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.1	-	-	-	-	-	-	2.5	1.5
	7	0-1	105.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.2	-	-	-	-	-	-	6.9	5.5
8	1	50-51	107.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	13.6	-	-	-	-	-	-	6.1	2.3
	2	0-1	108.00	-	.4	-	-	-	-	-	-	-	-	-	-	-	-	.4	-	-	-	-	-	-	3.7	-	-	-	-	-	-	4.6	5.0
		100-101	109.00	-	1.1	-	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.4	-
	3	50-51	110.00	-	-	.5	-	-	-	-	-	-	-	-	-	-	.5	-	-	.5	-	-	-	-	6.0	-	-	-	-	-	-	2.8	3.7
	4	0-1	111.00	.6	-	-	-	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	.6	7.7	-	.6	-	-	-	1.2	3.0	-
		100-101	112.00	.5	-	-	-	-	-	-	-	-	.6	-	-	.8	-	-	-	-	-	-	-	-	1.8	-	-	-	-	-	-	4.2	1.6
	5	50-51	113.00	1.0	-	-	-	-	-	-	-	-	-	-	-	-	.5	.5	-	-	-	-	-	-	5.1	-	-	-	-	-	-	4.1	.5
	6	0-1	114.00	-	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.0	-	-	-	-	-	-	6.4	1.2
		100-101	115.00	.7	.4	-	-	.7	-	-	-	-	-	-	-	.4	-	-	-	-	.4	-	-	-	6.1	-	-	-	-	-	-	3.2	1.1
9	1	0-1	116.10	.7	-	-	-	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	4.0	-	-	-	-	-	-	7.3	1.3
		100-101	117.10	-	-	-	-	-	.3	-	-	-	-	-	-	-	.3	-	-	-	-	-	-	-	3.4	-	-	-	-	-	.3	2.0	2.0
	2	50-51	118.10	.8	-	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-	-	-	4.6	-	.8	-	-	-	-	1.5	.8
	3	0-1	119.10	-	-	-	.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	1.7	-	-	-	-	6.8	2.6
		100-101	120.10	-	-	-	-	.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.2	-	-	-	-	-	-	1.7	2.5
	4	50-51	121.10	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.7	-	2.8	-	.7	-	-	-	-	2.1	-
	5	0-1	122.10	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.8	1.4
		100-101	123.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	4.2	-
	6	50-51	124.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.2	-
	7	0-1	125.20	-	-	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	4.4	-
10	1	50-51	126.20	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.8	-	-	-	-	-	-	1.5	4.6
	2	0-1	127.20	-	-	-	-	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.2	-	-	-	-	-	-	11.8	-
		100-101	128.20	-	-	-	-	-	-	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.7	-	-	-	-	-	-	1.5	1.6
	3	50-51	129.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4	-	-	-	-	-	-	12.1	-
	4	0-1	130.20	-	1.7	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	10.0	-	-	-	-	-	-	3.3	-
		100-101	131.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	-	-	-	-	-	-	15.4	5.1
	5	50-51	132.20	-	-	2.0	-	1.0	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	-	3.0	-	-	-	-	-	-	5.0	5.0
	6	0-1	133.20	.7	-	1.5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.7	-	-	6.7	-	.7	-	-	-	-	6.0	4.5
		100-101	134.20	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2	-	-	4.9	-	-	-	-	-	-	6.1	3.7
11	1	0-1	135.30	-	1.0	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	1.0	-	-	-	6.0	-	-	-	-	-	-	3.0	2.0
		100-101	136.30	1.3	-	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-	-	-	3.9	-	-	-	-	-	-	2.6	2.6
	2	50-51	137.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-	-	4.1	1.0
	3	0-1	138.30	-	.9	-	-	.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	6.1	-	-	-	-	-	-	5.2	6.1
		100-101	139.30	1.4	1.4	-	-	-	-	-	-	-	-	-	1.4	-	2.7	-	-	-	-	-	-	-	2.7	-	-	-	-	-	1.4	2.7	2.7
	4	50-51	140.30	1.5	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.3	-	-	-	-	-	-	7.5	2.3
	5	0-1	141.30	1.0	-	-	-	-	-	-	-	-	.5	-	-	-	.5	-	-	-	-	-	-	-	5.8	-	-	-	-	-	-	5.8	1.4
		100-101	142.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.0	-	-	-	-	-	-	1.3	5.3

CORE	SECTION	INTERVAL (cm)	DEPTH (mbsf)	*Miliolinella subrotunda*	*Nodosarella advena*	*Nodosaria* cf. *N. albatrossi*	*Nodosaria calomorpha*	*Nodosaria glandulinoides*	*Nodosaria longiscala*	*Nodosaria simplex*	*Nodosaria* sp. 1	*Nodosaria* sp. 2	*Nodosaria* sp. 3	*Nonionellina* sp. 1	*Nuttallides umbonifera*	*Oolina alifera*	*Oolina desmophora*	*Oolina globosa*	*Oolina hexagona*	*Oolina melo*	*Oolina setosa*	*Oolina* sp. 1	*Oolina* sp. 2	*Ophthalmidium pusillum*	*Oridorsalis umbonatus*	*Oridorsalis* sp. 1	*Orthomorphina challengeriana*	*Orthomorphina jedlitschkai*	*Orthomorphina* sp. 1	*Orthomorphina* sp. 2	*Orthomorphina* sp. 3	*Osangularia culter*	*Parafissurina* cf. *P. arctica*
1	1	1-2	39.31	-	-	-	-	-	-	-	-	-	-	-	-	.7	-	.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	40.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1	-	-	.6	-	-	-	5.6	-	-	.6	-	-	-	.6	-
	2	50-51	41.30	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	.5	3.5	-	-	-	-	-	-	1.0	-
		149-150	42.29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.8	9.3	-	-	-	-	-	-	.8	-
	3	100-101	43.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.6	5.1	-	-	-	-	-	-	.6	-
	4	50-51	44.30	-	-	-	-	-	-	-	-	-	-	.8	-	-	-	1.6	-	-	-	-	-	-	5.7	-	-	-	-	-	-	-	-
		149-150	45.29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.2	-	-	.7	-	-	-	-	-
	5	100-101	46.30	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	1.1	-	-	-	-	-	-	6.6	-	-	-	-	-	-	-	-
	6	50-51	47.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	7.1	-	-	-	-	-	-	-	-
		149-150	48.29	-	-	-	-	-	-	-	-	-	-	.3	.3	-	-	.6	-	-	-	-	-	-	11.4	-	-	-	-	-	-	-	-
2	1	50-51	49.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	7.6	-	-	-	-	-	-	1.7	-
	2	0-1	50.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	12.1	-	-	-	-	-	-	-	-
	3	50-51	52.40	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	.9	-	-	-	-	-	-	6.9	-	-	-	-	-	-	.9	-
		100-101	54.40	-	-	-	-	-	-	-	-	-	-	2.9	1.4	-	-	-	-	-	-	-	-	-	7.9	-	-	.7	-	-	-	-	-
	5	50-51	55.40	-	-	-	-	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	-	-	-	5.9	-	-	.5	-	-	-	-	-
	6	0-1	56.40	-	.6	-	-	-	-	-	-	-	-	-	3.6	-	.6	-	-	-	-	-	-	-	5.4	-	-	.6	-	-	-	-	-
		100-101	57.40	-	-	-	-	-	-	-	-	-	-	-	1.9	-	.6	-	-	-	-	-	-	.6	7.8	-	-	.6	-	-	-	-	-
3	1	0-1	58.50	-	-	-	-	-	-	-	-	-	.7	1.4	3.6	-	-	1.4	-	-	-	-	-	-	7.2	-	-	1.4	-	-	-	-	-
		100-101	59.50	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	.6	-	-	-	-	11.0	-	.6	-	-	-	-	-	.6
	2	50-51	60.50	-	-	-	-	-	-	-	-	-	-	-	2.9	-	-	.6	-	-	-	-	-	.3	12.3	-	-	-	-	-	-	-	-
	3	1-2	61.51	-	-	-	-	-	-	-	-	-	.6	-	5.6	.6	-	.6	-	-	-	-	-	.6	9.4	-	-	.6	-	-	-	1.2	-
		100-101	62.50	-	2.0	-	-	-	-	-	-	-	-	-	1.5	.5	-	.5	-	-	-	-	-	-	10.2	-	-	.5	-	-	-	-	-
	4	50-51	63.50	-	1.5	-	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	6.7	-	-	2.2	-	-	-	.7	-
	5	0-1	64.50	-	.8	-	-	-	-	-	-	-	-	-	1.6	.8	-	-	-	-	-	-	-	-	4.7	-	-	-	-	-	-	-	-
		100-101	65.50	-	-	-	-	-	-	-	-	1.4	-	1.4	3.4	.7	-	-	.7	-	-	-	-	-	7.5	-	-	-	-	-	-	-	-
	6	50-51	66.50	-	2.4	-	-	-	-	-	-	-	-	-	1.2	-	.6	-	-	-	-	-	-	-	4.8	-	-	-	-	-	-	.6	-
	7	0-1	67.50	-	-	-	-	-	-	-	-	-	-	-	1.8	-	-	-	-	-	-	-	-	-	7.0	-	-	-	-	-	-	-	-
4	1	50-51	68.60	-	.4	-	-	-	-	-	-	-	-	-	1.2	-	-	-	-	-	-	-	-	1.2	4.6	-	-	-	-	-	-	-	-
	2	0-1	69.60	-	.5	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-	-	6.0	-	.5	-	-	-	-	-	-
		100-101	70.60	-	-	-	-	-	-	-	-	-	-	.3	3.5	.3	-	.3	-	-	-	-	-	-	6.5	-	.3	-	-	-	-	.3	-
	3	50-51	71.60	-	-	-	-	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	-	-	-	5.7	-	-	-	-	-	-	-	-
	4	0-1	72.60	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	.5	-	-	-	-	-	.5	9.5	-	.5	-	-	-	-	-	-
		100-101	73.60	.3	-	-	-	-	-	-	-	-	-	-	.6	-	-	1.1	-	-	.3	-	-	-	9.4	-	.3	.3	-	-	-	-	-
	5	50-51	74.60	-	-	-	-	-	-	-	-	-	-	1.0	1.4	-	-	-	-	-	-	-	-	.5	4.8	-	.5	-	-	-	-	.5	-
	6	0-1	75.60	-	1.4	-	-	-	-	-	-	-	-	1.4	1.4	-	-	-	-	-	-	-	-	-	7.1	-	.5	-	-	-	-	-	-
		100-101	76.60	-	.7	-	-	-	-	-	-	-	-	-	2.1	-	-	.7	-	-	.7	-	.7	-	7.6	-	-	-	-	-	-	-	-
5	1	0-1	77.70	-	.6	-	-	-	-	-	-	-	-	1.3	1.3	-	-	-	-	-	-	-	-	-	5.0	-	-	-	-	-	-	-	-
		100-101	78.70	-	-	-	-	-	-	-	-	-	-	1.2	3.6	.6	-	-	-	-	-	-	-	-	6.0	-	.6	-	-	-	-	-	-
	2	50-51	79.70	-	-	-	-	-	-	.5	-	-	-	1.0	1.0	-	.5	-	-	-	-	-	-	.5	5.5	-	.5	-	-	-	-	-	-
	3	1-2	80.71	-	-	-	-	-	-	-	-	-	-	-	1.1	-	-	-	-	-	-	-	-	-	5.3	-	-	-	-	-	-	-	-
		100-101	81.71	-	-	-	-	.8	-	-	-	-	-	-	3.2	-	-	-	-	-	-	-	-	-	6.4	-	-	-	-	-	-	-	-
	4	50-51	82.70	-	.8	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	3.9	-	-	.8	-	-	-	-	-
	5	0-1	83.70	-	.6	-	-	-	-	-	-	-	-	-	3.0	-	-	-	-	-	-	-	-	.6	6.0	-	-	-	-	-	-	-	-
		100-101	84.70	-	-	-	-	-	-	-	-	-	-	-	2.6	-	-	2.6	-	-	-	-	-	-	6.9	-	-	.9	-	-	-	-	-
	6	50-51	85.70	-	-	-	-	-	-	-	-	-	-	-	1.6	-	-	-	-	-	-	-	-	-	7.0	-	-	-	-	-	-	-	-
	7	0-1	86.70	-	-	-	-	-	-	-	-	-	-	.8	.6	-	-	-	.4	-	-	-	-	.4	6.5	-	-	-	-	-	-	-	-
6	1	50-51	87.80	-	1.1	-	-	-	-	-	-	-	-	-	1.1	.5	-	-	-	-	-	-	-	-	5.9	-	-	-	-	-	-	.5	-
	2	0-1	88.80	-	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-	-	10.5	-	.5	.5	-	-	-	-	-
		100-101	89.80	-	-	-	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-	-	-	-	-	3.4	-	.7	-	-	-	-	.7	-
	3	50-51	90.80	-	1.3	-	-	-	-	-	-	-	-	-	4.4	-	-	-	-	-	-	-	-	.3	4.7	-	.3	.3	-	-	-	.3	-
	4	0-1	91.80	-	.5	-	-	-	-	.5	-	-	-	.9	1.4	-	-	-	-	-	-	-	.5	-	5.0	-	.5	.5	-	-	-	-	-
		100-101	92.80	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.2	-	-	-	-	-	-	-	-
	5	50-51	93.80	-	1.4	-	-	-	-	-	-	-	-	.9	2.3	.5	-	.5	-	-	-	-	-	-	7.4	1.4	-	-	-	-	-	-	-
	6	0-1	94.80	-	-	-	-	-	-	-	-	-	-	-	2.5	1.0	-	-	-	-	-	-	-	-	8.4	-	-	-	-	-	-	.5	-
		100-101	95.80	-	.6	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	.6	-	-	-	6.2	-	-	-	-	-	-	.6	-
7	1	0-1	96.90	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	-	-	-	-	-	-	3.6	-	-	-	-	-	-	-	-
		100-101	97.90	-	-	-	-	-	-	-	-	-	-	.5	1.0	-	-	1.0	-	-	-	-	-	-	4.6	-	.5	-	-	-	-	-	-
	2	50-51	98.90	-	.6	-	-	-	-	-	-	-	-	-	2.3	-	.6	-	-	-	-	-	-	-	4.1	.6	-	-	-	-	-	-	-
	3	0-1	99.90	-	-	-	-	-	-	-	-	-	-	-	2.8	-	-	.7	-	-	-	-	-	-	6.0	1.1	-	-	.4	-	-	-	-
		100-101	100.90	-	-	.4	-	-	-	-	-	-	-	-	1.3	-	-	.4	-	-	-	-	-	-	7.0	-	.4	-	-	-	-	-	-
	4	50-51	101.90	-	-	-	-	-	-	-	-	-	-	.3	3.1	.3	-	.3	-	-	-	-	-	-	8.0	1.0	-	-	-	.3	-	.7	-
	5	0-1	102.90	-	-	-	-	-	-	-	-	-	-	.6	1.2	.6	-	-	-	-	-	-	-	-	4.3	-	-	.6	-	-	-	-	-
		100-101	103.90	-	-	-	.4	-	-	-	-	-	-	-	2.6	-	-	-	-	-	-	-	.4	-	9.3	-	.4	-	-	-	-	-	-
	6	50-51	104.90	-	-	-	-	-	-	-	-	-	-	-	6.1	-	.5	-	-	-	-	-	-	.5	5.6	-	-	-	-	-	-	.5	-
	7	0-1	105.90	-	-	-	.7	-	-	-	-	-	-	1.1	2.2	-	-	-	-	-	-	-	-	-	5.8	-	-	-	-	-	.4	-	-
8	1	50-51	107.00	-	-	-	-	-	-	-	.8	-	-	-	3.8	-	-	-	-	-	-	-	-	.9	6.6	-	.8	-	-	-	-	-	-
	2	0-1	108.00	-	.4	-	-	-	-	-	-	-	-	-	3.3	-	.4	.4	-	-	-	-	-	-	6.7	-	-	-	-	-	-	-	-
		100-101	109.00	-	-	-	-	-	-	-	-	-	-	-	7.4	1.1	-	2.1	-	-	-	-	-	-	3.2	-	1.1	-	-	-	-	-	-
	3	50-51	110.00	-	-	-	-	-	-	-	-	-	-	.9	15.6	-	-	-	-	-	-	-	-	-	6.4	-	-	-	-	-	-	.5	-
	4	0-1	111.00	-	-	-	-	-	-	-	-	-	-	1.8	13.1	-	-	1.2	-	-	-	-	-	-	6.3	-	-	-	-	-	-	-	-
		100-101	112.00	-	-	-	-	-	-	-	.6	-	-	-	9.6	.6	-	-	.6	-	-	-	-	-	6.0	-	-	-	-	-	-	-	-
	5	50-51	113.00	-	-	-	-	-	-	-	-	-	-	-	15.3	-	-	-	-	-	-	-	-	-	10.7	-	-	.5	-	-	-	.5	-
	6	0-1	114.00	-	-	-	-	-	-	-	-	-	-	-	9.2	-	-	-	-	-	-	-	-	-	6.4	-	-	-	-	-	-	-	-
		100-101	115.00	-	.4	-	-	-	-	-	.4	-	-	-	13.9	.4	-	-	-	-	-	-	-	-	3.9	-	-	-	-	-	-	-	-
9	1	0-1	116.10	-	-	-	-	-	-	-	-	-	-	-	14.0	-	-	-	-	-	-	-	-	-	6.7	-	-	-	-	-	-	.7	-
		100-101	117.10	-	-	-	-	.3	-	-	-	-	-	-	16.3	.3	-	.3	-	-	-	-	-	-	3.1	-	-	-	-	-	-	.3	-
	2	50-51	118.10	-	-	-	-	.8	-	-	-	-	-	-	7.6	-	-	-	.8	-	-	-	-	-	3.8	-	-	-	-	-	.8	-	-
	3	0-1	119.10	-	.9	-	-	-	-	-	-	-	-	-	19.7	-	-	-	-	-	-	-	-	-	.9	-	.9	-	-	-	-	-	-
		100-101	120.10	-	-	-	-	-	-	-	-	-	-	-	9.3	-	-	.8	-	-	-	.4	-	.8	4.6	-	-	-	-	-	-	-	-
	4	50-51	121.10	-	-	-	-	1.4	1.4	.7	-	-	-	-	17.5	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-
	5	0-1	122.10	-	-	-	-	-	-	-	-	-	-	-	14.9	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-
		100-101	123.10	-	-	-	-	-	-	-	-	-	-	-	13.6	-	-	-	-	-	-	-	-	.8	7.6	-	-	-	-	-	-	-	-
	6	50-51	124.10	-	-	-	-	-	-	-	-	-	-	-	20.7	-	-	-	-	-	-	-	-	-	5.4	-	-	-	-	-	-	-	-
	7	0-1	125.20	-	-	-	-	-	-	-	-	-	-	-	29.3	-	-	-	-	-	-	-	-	-	3.9	-	-	.6	-	-	-	-	-
10	1	50-51	126.20	-	.8	-	-	-	-	-	-	-	-	-	9.2	-	-	-	-	-	-	-	-	-	6.1	-	-	-	-	-	-	-	-
	2	0-1	127.20	-	-	-	-	-	-	-	-	-	-	-	9.2	-	-	1.3	-	-	-	-	-	-	5.3	-	-	-	-	-	-	-	-
		100-101	128.20	-	-	-	-	-	-	-	-	-	-	-	8.1	-	-	-	-	-	-	-	-	-	9.7	-	-	-	-	-	-	-	-
	3	50-51	129.20	-	-	-	-	-	-	-	-	-	-	-	6.9	-	-	1.7	-	-	-	-	-	-	10.3	-	-	-	-	-	-	-	-
	4	0-1	130.20	-	1.7	-	-	-	-	-	-	-	-	-	6.7	-	-	1.7	-	-	1.7	-	-	-	1.7	-	-	-	-	-	-	-	-
		100-101	131.20	-	-	-	-	-	-	-	-	-	-	-	5.1	-	-	-	-	-	-	-	-	-	10.3	-	-	-	-	-	-	-	-
	5	50-51	132.20	-	-	-	-	-	-	-	-	-	-	-	11.9	-	-	-	-	-	-	-	-	-	3.0	-	-	1.0	-	-	-	1.0	-
	6	0-1	133.20	-	-	-	-	-	-	-	-	-	-	-	9.0	-	-	-	.7	-	-	-	-	-	3.7	-	-	-	-	-	-	-	-
		100-101	134.20	-	-	-	-	-	-	-	-	-	-	-	3.7	-	-	-	-	-	-	-	-	-	3.7	-	-	-	-	-	-	-	-
11	1	0-1	135.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	8.0	-	-	-	-	-	-	1.0	-
		100-101	136.30	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-	-	-	-
	2	50-51	137.30	-	-	-	-	-	-	-	-	-	-	1.0	1.0	-	-	-	-	-	-	-	-	-	2.0	-	-	-	-	-	-	-	-
	3	0-1	138.30	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	.9	-
		100-101	139.30	-	-	-	-	-	-	-	-	-	-	-	5.5	-	-	-	-	-	-	-	-	-	5.5	-	-	-	-	-	-	-	-
	4	50-51	140.30	-	.8	-	-	-	-	-	-	-	-	-	2.3	-	-	-	-	-	-	-	-	-	3.8	-	.8	-	-	-	-	-	-
	5	0-1	141.30	-	.5	-	-	-	-	-	-	-	-	-	3.8	-	-	.5	-	-	-	-	-	-	6.2	-	.5	-	-	-	-	-	-
		100-101	142.30	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-	2.7	-	-	1.3	-	-	-	8.0	-	-	-	-	-	-	4.0	-

CORE	SECTION	INTERVAL (cm)	DEPTH (mbsf)	Parafissurina sublata	Parafissurina tectulostoma	Parafissurina tricarinata	Parafissurina uncifera	Parafissurina sp. 1	Parafissurina sp. 2	Parafissurina sp. 3	Pleurostomella acuminata	Pleurostomella alternans	Pleurostomella brevis	Pleurostomella recens	Pleurostomella subnodosa	Pleurostomella sp. 1	Pleurostomella sp. 2	Polymorphina sp. 1	Polymorphinidae formae fistulosae	Pseudonodosaria sp. 1	Pullenia bulloides	Pullenia subcarinata	Pullenia sp. 1	Pullenia sp. 2	Pullenia sp. 3	Pullenia sp. 4	Pyrgo murrhina	Pyrgo cf. P. murrhina	Pyrgo serrata	Pyrgo sp. 1	Pyrgo sp. 2	Pyrulina gutta	Pyrulinoides sp. 1
1	1	1-2	39.31	-	-	-	.7	.7	-	-	.7	-	-	.7	-	-	-	-	-	-	5.4	-	-	-	-	-	3.4	-	-	.7	-	-	-
		100-101	40.30	.6	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	4.5	5.6	2.8	-	-	-	1.1	-	-	.6	-	-	-
	2	50-51	41.30	-	-	-	1.0	-	-	-	-	-	.5	-	-	-	-	-	-	-	3.5	.5	-	-	-	-	.5	-	-	-	-	4.5	-
		149-150	42.29	-	-	-	-	-	-	-	-	-	1.6	-	-	-	-	-	-	-	3.9	1.6	1.6	-	-	-	3.9	-	.8	-	-	-	-
	3	100-101	43.30	-	-	-	-	-	-	-	-	.6	1.7	-	-	-	-	-	-	-	1.1	1.7	-	-	-	-	1.7	-	-	-	-	1.1	.6
	4	50-51	44.30	-	-	-	-	-	-	-	.8	-	1.6	-	-	-	-	-	-	-	4.9	-	1.6	.8	-	-	.8	-	-	.6	-	-	-
		149-150	45.29	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	2.6	-	.7	-	-	-	1.3	-	-	.7	-	-	-
	5	100-101	46.30	-	-	-	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	3.7	.5	-	-	-	-	1.6	-	-	1.1	-	-	-
	6	50-51	47.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	2.2	1.6	1.6	-	-	-	1.1	-	-	.5	-	-	-
		149-150	48.29	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.3	1.8	.3	1.5	.3	-	-	.9	.3	-	-	-	-	-
2	1	50-51	49.40	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4	.8	4.2	-	-	-	-	.8	-	-	-	-	1.7
	2	0-1	50.40	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-	-	-	-	-	-	-	-	-	-	3.0	-	-	-	-	-
	3	50-51	52.40	-	-	-	-	-	.9	-	-	-	-	-	-	.9	-	-	.9	.9	3.4	.9	1.7	-	-	-	5.2	-	-	-	-	-	-
		100-101	54.40	-	-	-	-	-	-	-	-	.7	-	-	.7	-	-	-	.7	-	3.6	.7	.7	.7	2.2	.7	.7	-	-	-	-	.7	.7
	5	50-51	55.40	-	-	-	-	-	-	-	-	-	-	-	.5	-	.5	-	-	-	2.3	.9	.9	-	-	.5	2.3	.9	-	1.8	-	-	-
	6	0-1	56.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4.2	.6	.6	-	-	-	.6	-	-	-	-	-	-
		100-101	57.40	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	4.5	.6	1.9	-	1.9	1.3	.6	-	-	-	-	-	-
3	1	0-1	58.50	-	-	-	-	-	-	-	-	1.4	-	-	.7	-	-	-	-	-	3.6	-	.7	.7	.7	-	2.9	.7	-	.7	-	-	-
		100-101	59.50	-	-	-	-	-	-	-	-	.6	-	.6	1.8	-	-	-	-	-	2.5	.6	1.8	-	-	-	1.8	-	-	.6	-	-	-
	2	50-51	60.50	-	-	-	.3	-	-	-	1.0	.3	.3	.3	-	-	-	-	.6	.3	2.6	.6	.3	1.0	.3	-	.3	.3	-	.3	-	-	-
	3	1-2	61.51	-	1.2	-	-	-	-	-	-	.6	-	-	.6	-	.6	-	.6	-	.6	1.9	.6	.6	.6	-	-	-	-	-	-	-	-
		100-101	62.50	-	.5	-	-	-	-	-	1.0	1.0	-	-	-	-	-	-	-	-	1.0	1.5	1.0	-	1.0	-	1.0	-	-	-	-	-	-
	4	50-51	63.50	.7	.7	-	-	-	-	-	-	1.5	-	-	-	-	-	-	-	-	3.0	1.5	1.5	-	2.2	1.5	-	-	-	.7	-	-	-
	5	0-1	64.50	.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	.8	1.6	-	-	-	6.2	.8	-	.6	-	1.6	-
		100-101	65.50	.7	-	-	-	-	-	-	-	.7	-	-	.7	-	-	-	-	-	4.1	1.4	2.7	-	-	-	-	.7	-	.7	-	-	-
	6	50-51	66.50	-	-	-	-	-	.6	-	-	.6	.6	-	-	-	-	-	-	-	2.4	.6	1.2	-	1.8	.6	1.8	-	-	-	-	-	-
	7	0-1	67.50	-	-	-	-	-	-	-	-	.9	.4	.4	-	-	.4	-	-	-	2.6	2.2	2.6	-	-	.9	.4	-	-	-	-	-	-
4	1	50-51	68.60	-	.4	-	-	-	-	-	-	-	-	.4	-	.8	.8	-	-	-	1.7	.8	2.1	-	.4	1.7	1.7	.4	-	-	-	-	-
	2	0-1	69.60	.5	-	-	.9	-	-	-	-	.5	.5	.9	-	-	-	-	-	-	2.3	2.3	2.3	-	.5	-	.5	-	-	-	-	-	-
		100-101	70.60	-	-	-	.3	-	.3	.3	.3	2.1	.3	.3	-	-	-	-	.3	-	4.8	1.4	1.0	-	.3	.3	1.4	.3	.3	.3	-	-	-
	3	50-51	71.60	-	-	-	2.8	-	-	-	-	.9	-	-	-	-	-	-	-	-	2.8	1.9	.9	-	-	-	-	-	-	-	-	-	-
	4	0-1	72.60	-	-	-	.5	-	-	-	-	1.5	-	.5	-	-	-	-	-	-	5.0	-	.5	-	.5	-	-	.5	-	-	-	-	-
		100-101	73.60	-	-	-	-	-	.3	-	-	.3	-	.3	-	-	-	-	-	-	2.8	-	1.1	-	.3	-	.6	.3	-	.6	-	-	-
	5	50-51	74.60	-	-	-	-	-	-	-	-	1.9	-	-	-	-	-	-	.5	-	3.3	1.0	.5	-	-	-	1.9	-	-	.5	-	-	-
	6	0-1	75.60	-	-	-	-	-	-	-	.5	.5	-	-	-	-	-	-	-	-	1.4	1.4	-	-	.9	-	-	-	-	-	-	-	-
		100-101	76.60	-	-	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	1.4	1.4	-	-	1.4	-	-	-	-	2.1	-	-	-
5	1	0-1	77.70	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	2.5	-	1.9	-	.6	-	1.3	-	-	-	-	-	-
		100-101	78.70	-	-	-	-	-	-	-	-	1.8	-	1.2	.6	-	-	-	-	-	1.2	.6	1.2	-	.6	.6	1.2	-	-	.6	-	1.8	.6
	2	50-51	79.70	-	-	-	.5	-	-	-	-	1.0	-	-	-	-	-	-	-	-	4.0	1.5	1.5	-	.5	-	1.5	-	-	1.0	-	-	-
	3	1-2	80.71	-	-	-	-	-	-	-	-	2.1	-	-	1.1	-	-	-	-	-	5.3	1.1	2.1	-	-	-	1.1	-	-	-	-	-	-
		100-101	81.71	-	-	-	1.6	-	-	-	-	.8	-	-	.8	-	-	-	-	-	2.4	.8	3.2	-	1.6	-	.8	-	-	-	-	.8	-
	4	50-51	82.70	-	-	-	.8	-	-	-	.8	-	-	1.6	.8	-	-	-	-	-	2.3	-	.8	-	-	-	.8	-	-	.8	-	-	-
	5	0-1	83.70	-	-	-	-	-	-	-	.6	.6	.6	.6	-	-	-	-	-	-	2.4	.6	.6	-	1.2	-	1.8	1.2	-	.6	-	-	-
		100-101	84.70	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	1.7	-	.9	-	.9	-	-	-	-	.9	-	.9	-
	6	50-51	85.70	-	-	-	-	-	-	-	2.3	-	-	1.6	.8	.8	-	-	.8	-	-	-	.8	-	.8	.8	.6	-	-	-	-	-	-
	7	0-1	86.70	.4	-	-	-	-	-	-	.8	.4	.8	-	-	-	-	-	-	-	1.6	.8	.8	-	.4	-	1.6	-	-	2.0	-	.4	-
6	1	50-51	87.80	-	-	-	-	-	-	-	1.6	.5	-	-	-	-	-	-	-	-	1.6	-	2.1	-	-	-	.5	-	-	.5	-	-	-
	2	0-1	88.80	-	-	-	.5	-	-	-	.5	1.0	-	-	-	-	-	-	-	-	1.0	1.4	1.0	-	-	1.4	.5	-	-	-	-	-	.5
		100-101	89.80	-	-	-	-	-	.7	-	.7	.7	-	.7	.7	.7	-	-	-	-	4.7	1.3	-	-	2.7	-	1.3	-	-	2.7	-	-	-
	3	50-51	90.80	-	-	-	-	-	-	-	.3	-	-	-	.3	.6	-	-	-	-	4.7	1.3	.6	-	1.3	-	1.9	-	-	.3	-	.3	-
	4	0-1	91.80	-	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	.5	-	3.2	-	.9	-	.5	-	.5	.9	-	.5	-	-	-
		100-101	92.80	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	-	-	1.6	1.0	1.6	-	1.6	-	1.0	-	-	2.1	-	.5	-
	5	50-51	93.80	.5	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	-	-	.5	2.3	3.7	-	.5	.9	-	-	-	-	-	.5	-
	6	0-1	94.80	-	-	-	-	-	-	-	1.0	-	-	-	1.0	-	-	-	-	-	1.0	.5	2.0	-	1.5	-	.5	-	-	-	-	-	.5
		100-101	95.80	-	-	-	-	-	-	-	-	-	.6	-	.6	-	-	-	-	-	1.7	-	-	-	1.1	-	.6	-	-	1.1	-	1.1	.6
7	1	0-1	96.90	-	-	-	.5	-	-	-	.5	.5	-	.5	.5	-	-	-	-	-	1.0	1.0	2.0	-	1.5	1.0	1.0	-	-	2.0	-	-	-
		100-101	97.90	-	-	-	.5	-	-	-	1.0	.5	-	-	-	-	-	-	.5	-	2.0	1.5	1.5	-	1.5	-	.5	-	-	2.0	-	1.5	-
	2	50-51	98.90	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	.6	1.2	2.9	-	.6	.6	-	-	-	-	-	.6	-
	3	0-1	99.90	-	-	-	.4	-	-	-	.4	.4	-	-	-	-	-	-	-	-	-	.7	1.4	-	.7	.4	.7	-	-	.7	.4	-	-
		100-101	100.90	-	-	-	-	-	-	.4	.4	-	.4	-	-	-	-	-	.4	-	1.3	.4	1.8	-	1.8	.4	-	-	-	1.3	-	-	-
	4	50-51	101.90	-	-	.3	-	-	-	-	-	.7	-	-	.3	-	-	-	-	-	.7	1.4	1.7	-	1.4	.7	.7	-	-	1.7	-	.3	-
	5	0-1	102.90	-	.6	-	-	-	-	-	.6	.6	-	-	.6	.6	-	-	-	-	1.2	1.9	1.2	-	1.2	-	1.2	-	.6	.6	-	-	-
		100-101	103.90	-	-	-	-	.4	-	-	-	.9	.4	-	-	.4	-	-	-	-	.4	1.3	2.6	-	.4	-	.4	.4	-	-	-	-	-
	6	50-51	104.90	.5	-	-	-	-	-	-	.5	.5	-	-	-	-	-	-	-	-	1.0	2.0	3.0	-	1.0	.5	1.5	-	-	-	-	-	-
	7	0-1	105.90	.4	-	-	-	-	-	-	-	-	-	-	.4	-	-	-	.4	-	.7	.4	2.2	-	.7	-	.4	.4	-	.4	-	-	.4
8	1	50-51	107.00	-	-	-	-	-	-	-	-	-	-	-	1.5	-	-	-	.8	-	.8	-	3.0	-	.8	-	1.5	-	-	.8	-	1.5	-
	2	0-1	108.00	-	-	-	-	-	-	-	.4	.8	-	-	-	-	-	.4	-	-	-	.6	1.7	-	.4	-	.8	.8	-	-	-	-	-
		100-101	109.00	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.2	-	-	-	1.1	-	-	-	-	-	-
	3	50-51	110.00	-	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	.5	-	.5	1.4	.9	-	.5	-	1.4	-	-	.9	-	-	-
	4	0-1	111.00	-	-	-	.6	-	-	-	-	.6	-	-	-	-	-	-	-	-	.6	-	1.2	-	.6	-	.6	-	-	-	-	-	-
		100-101	112.00	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	.6	-	3.0	-	-	-	1.8	-	-	-	-	-	-
	5	50-51	113.00	-	-	-	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	3.1	2.6	2.0	-	1.0	.5	-	.5	-	.5	-	-	-
	6	0-1	114.00	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	.6	-	1.7	.6	.6	-	1.2	2.3	-	-	-	-	-	-	-
		100-101	115.00	-	-	-	-	-	-	-	-	-	-	-	.4	-	-	-	-	-	3.6	.7	1.1	-	.4	-	.4	-	.4	.4	-	.4	.4
9	1	0-1	116.10	-	-	-	-	-	-	-	.7	.7	-	-	-	-	-	-	.7	-	.7	.7	2.0	-	.7	-	-	.7	-	-	-	-	-
		100-101	117.10	-	-	-	-	-	-	-	-	-	-	-	.3	-	-	-	-	-	1.0	1.4	5.1	-	1.0	.3	-	-	-	-	-	-	-
	2	50-51	118.10	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	.8	-	2.3	1.5	3.1	-	1.5	-	-	.8	-	-	-	-	-
	3	0-1	119.10	-	-	-	.9	-	-	-	-	-	-	-	-	-	-	-	-	-	.9	.9	-	-	1.7	1.7	1.7	-	-	.9	-	-	-
		100-101	120.10	-	-	-	.4	-	-	-	-	-	-	.4	.4	-	-	-	.4	-	2.5	.4	1.3	-	.4	-	.4	.4	-	.4	-	.4	-
	4	50-51	121.10	-	.7	-	.7	-	-	-	1.4	-	-	-	.7	-	-	-	-	-	1.4	1.4	.7	-	.7	.7	1.4	-	-	-	-	2.1	-
	5	0-1	122.10	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4	-	-	1.4	-	-	1.4	-	1.4	-	-	-	-	-	-
		100-101	123.10	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	2.5	1.7	-	2.5	-	2.5	-	-	-	-	-	-
	6	50-51	124.10	-	-	-	-	-	-	-	-	2.2	-	-	-	-	-	-	-	-	-	-	-	-	3.3	-	2.2	-	-	-	-	-	-
	7	0-1	125.20	-	-	-	-	-	-	-	.6	-	-	-	-	-	.6	-	-	-	2.2	2.2	.6	-	.6	-	-	1.1	-	-	-	.6	-
10	1	50-51	126.20	-	-	-	.8	-	.8	-	.8	1.5	2.3	-	-	-	-	-	-	-	2.3	.8	2.3	1.5	-	-	.8	-	-	-	-	2.3	-
	2	0-1	127.20	-	-	-	-	-	-	-	1.3	-	-	-	-	-	-	-	-	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	128.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	3.2	1.6	-	-	-	1.6	1.6	-	-	-	-	-
	3	50-51	129.20	-	-	-	-	-	-	-	-	1.7	-	-	1.7	-	-	-	-	-	1.7	-	-	-	-	-	3.4	-	-	-	-	3.4	-
	4	0-1	130.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-
		100-101	131.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	-	-	-	-	-	-	-	2.6	-	-	-
	5	50-51	132.20	-	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-	1.0	-	-	-	1.0	-	-	-	-	-	-	-	-	-	-
	6	0-1	133.20	-	-	-	-	-	-	-	-	.7	-	-	.7	-	-	-	-	-	-	.7	1.5	-	.7	-	-	-	-	-	-	-	-
		100-101	134.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.2	-	2.4	-	1.2	1.2	-	-	-	-	-	1.2	-
11	1	0-1	135.30	-	-	-	-	-	-	-	-	1.0	-	1.0	-	-	-	-	-	-	2.0	-	1.0	-	2.0	-	-	1.0	-	2.0	-	-	-
		100-101	136.30	-	-	-	-	-	-	-	-	1.3	1.3	-	-	-	-	-	-	-	-	-	2.6	-	1.3	-	1.3	-	-	-	-	-	-
	2	50-51	137.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	2.0	2.0	-	-	-	-	-	-	-	-	-	-	-
	3	0-1	138.30	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	-	-	-	.9	.9	-	-	1.7	-	.9	.9	-	-	-	-	-
		100-101	139.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-	1.4	-	1.4	-	-	-	-	-	-
	4	50-51	140.30	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.8	-
	5	0-1	141.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	-	-	1.0	-	-	-	-	-	-	-	-	-	-
		100-101	142.30	-	-	-	-	-	-	-	-	1.3	-	-	-	-	1.3	-	-	-	-	-	2.7	-	-	-	-	-	-	-	-	-	-

CORE	SECTION	INTERVAL (cm)	DEPTH (mbsf)	*Pyrulinoides* sp. 2	*Pyrulinoides* sp. 3	*Pyrulinoides* sp. 4	*Quadrimorphina allomorphinoides*	*Quadrimorphina glabra*	*Quinqueloculina lamarckiana*	*Quinqueloculina seminulina*	*Quinqueloculina venusta*	*Quinqueloculina* sp. 1	*Quinqueloculina* sp. 2	*Rectobolivina raphana*	*Rutherfordoides bradyi*	*Rutherfordoides tenuis*	*Sigmoilina edwardsi*	*Sigmoilinopsis schlumbergeri*	*Siphoeggerella siphonella*	*Siphonodosaria abyssorum*	*Siphonodosaria fistuca*	*Siphonodosaria* sp. 1	*Siphonodosaria* sp. 2	*Siphonodosaria* sp. 3	*Siphonodosaria* sp. 4	*Siphonodosaria* sp. 5	*Siphonodosaria* sp. 6	*Siphonodosaria* sp. 7	*Siphonodosaria* sp. 8	*Siphotextularia catenata*	*Siphotextularia curta*	*Siphotextularia* sp. 1	*Sphaeroidina bulloides*
1	1	1-2	39.31	-	-	-	-	-	-	-	6.1	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-	-	-	.7	-	1.4	-	-	-
		100-101	40.30	-	-	-	-	-	-	-	-	-	-	-	-	-	3.4	-	-	-	-	-	-	-	-	-	-	-	-	.6	-	-	-
	2	50-51	41.30	-	-	-	-	-	-	-	.5	-	-	.5	-	-	1.5	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	-
		149-150	42.29	-	-	-	-	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	100-101	43.30	-	-	-	-	-	-	-	1.7	-	-	-	-	-	1.1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.6
	4	50-51	44.30	-	-	-	-	-	-	-	-	1.7	-	-	-	-	2.5	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-
		149-150	45.29	-	-	-	-	-	-	-	-	-	-	-	-	-	4.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	100-101	46.30	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	-	-
	6	50-51	47.30	-	-	-	-	-	-	-	-	-	.5	-	-	-	2.7	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	-	-
		149-150	48.29	-	-	-	.3	-	.3	-	-	.8	-	-	-	.3	.6	.9	-	.3	-	-	-	-	-	-	-	-	-	.6	.3	-	-
2	1	50-51	49.40	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	0-1	50.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	3	50-51	52.40	-	-	-	-	-	.9	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	54.40	-	-	-	.7	-	-	-	-	-	-	-	.7	-	.7	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-
	5	50-51	55.40	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-	-	-	.5	-	.5	-	-	-
	6	0-1	56.40	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.6	-	-	-	-	-	-	-	-	-	.6	-	-	-
		100-101	57.40	-	-	-	-	-	-	-	.6	-	-	-	-	-	.6	-	.6	-	-	-	-	-	-	-	-	-	-	.6	-	-	.6
3	1	0-1	58.50	-	-	-	-	-	-	-	.7	.7	-	-	-	-	1.4	-	-	.7	-	-	-	-	-	-	-	1.4	-	1.4	-	-	-
		100-101	59.50	-	-	-	-	-	-	-	1.8	-	-	-	-	-	-	-	-	1.8	-	-	-	-	-	-	-	-	-	1.2	-	.6	1.2
	2	50-51	60.50	-	-	-	-	-	-	-	-	-	-	-	.3	.6	.6	.3	-	-	-	-	-	-	-	-	-	-	-	.3	-	-	2.6
	3	1-2	61.51	-	-	-	-	-	-	-	-	-	-	-	-	-	2.5	-	-	1.9	-	-	-	-	-	-	-	-	-	-	-	-	.6
		100-101	62.50	-	-	-	.5	-	-	-	-	-	-	.5	-	-	.5	-	-	3.1	-	-	-	-	-	-	-	.5	-	-	-	-	1.5
	4	50-51	63.50	-	-	-	-	-	-	-	.7	-	-	-	-	.7	.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	0-1	64.50	-	-	-	.8	-	-	-	.8	-	-	-	-	-	-	-	-	4.7	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	65.50	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-	-	-	-	-	-	.7	-	-	4.8
	6	50-51	66.50	-	-	-	-	-	-	-	-	.6	-	-	-	-	1.2	-	-	.6	-	.6	-	-	-	-	-	-	-	-	-	-	3.0
	7	0-1	67.50	-	-	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-	.4	-	-	-	-	-	.9	-	.4	-	-	-	-	.4
4	1	50-51	68.60	.4	-	-	-	-	-	-	-	-	-	.4	-	-	1.7	-	-	.8	-	-	-	-	-	.4	-	.8	-	-	-	-	1.2
	2	0-1	69.60	-	-	-	-	.5	.9	-	-	-	-	-	-	-	.9	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	-	.9
		100-101	70.60	-	-	-	-	-	-	-	-	-	-	.3	-	-	.3	-	-	3.1	-	-	-	-	-	-	-	-	-	-	-	-	1.4
	3	50-51	71.60	-	-	-	-	-	.9	-	-	.9	-	-	-	-	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	4	0-1	72.60	-	-	-	.5	-	1.0	-	-	1.0	-	-	-	-	.5	-	-	2.5	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	73.60	-	-	-	.6	-	.3	-	-	-	-	-	-	-	.6	-	-	.6	-	.3	-	.3	.3	-	-	.3	-	.3	-	-	.3
	5	50-51	74.60	-	.5	-	-	-	.5	-	-	-	-	-	-	-	1.4	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	.5
	6	0-1	75.60	-	-	-	-	-	.5	-	-	-	-	-	-	-	1.9	-	-	1.4	-	-	-	-	-	-	-	-	-	-	-	-	1.9
		100-101	76.60	-	-	-	-	-	.7	-	.7	-	-	-	-	-	.7	.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.7
5	1	0-1	77.70	-	-	-	-	-	.6	-	.6	-	-	-	-	-	1.3	-	-	.6	-	-	-	-	-	-	-	-	-	1.9	-	-	1.9
		100-101	78.70	-	-	-	-	-	.6	-	1.2	-	-	-	-	-	1.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	2	50-51	79.70	-	-	-	-	-	1.0	-	-	-	-	-	-	-	2.0	-	-	1.5	-	-	-	-	-	-	-	-	-	-	-	-	.5
	3	1-2	80.71	-	-	-	-	-	-	-	-	-	-	-	-	-	2.1	-	-	1.9	-	-	-	-	-	-	-	-	-	-	-	-	-
		100-101	81.71	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	1.8	-	-	-	-	-	-	-	-	-	-	-	-	1.6
	4	50-51	82.70	-	-	-	-	-	.8	-	1.6	.8	-	-	-	-	-	-	-	7.0	-	-	.8	-	1.6	.8	.8	.8	-	-	-	-	-
	5	0-1	83.70	-	-	-	-	-	.6	-	.6	-	-	-	-	-	.6	-	.6	1.8	-	-	-	-	-	-	-	-	-	-	-	-	3.0
		100-101	84.70	-	-	-	-	-	-	-	.9	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	.9
	6	50-51	85.70	-	-	-	-	-	-	-	-	.8	-	-	-	-	1.6	-	-	2.3	-	-	-	-	-	-	-	-	-	-	-	-	-
	7	0-1	86.70	-	-	-	-	-	.4	.4	-	-	-	-	-	-	.4	-	-	-	-	-	-	-	-	-	-	-	-	.4	-	-	-
6	1	50-51	87.80	-	-	-	-	-	.5	-	-	-	-	-	-	-	2.7	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	-	1.1
	2	0-1	86.80	-	-	-	-	-	.5	-	1.0	-	-	-	-	-	.5	-	-	2.4	-	-	-	-	-	-	-	-	-	-	-	-	1.4
		100-101	89.80	-	-	-	-	-	-	-	-	-	-	.7	-	-	1.3	-	-	.7	-	-	-	-	-	-	-	-	-	.7	-	-	.7
	3	50-51	90.80	-	-	-	-	-	.3	-	.3	-	-	-	-	-	.3	-	.3	1.9	-	-	-	-	-	-	-	-	-	-	-	-	1.3
	4	0-1	91.80	-	-	-	-	-	.5	-	-	.5	-	-	-	-	1.4	.9	-	.9	-	-	-	-	-	-	-	-	-	-	-	-	2.7
		100-101	92.80	-	-	-	-	-	.5	-	1.6	-	-	-	-	-	-	-	-	1.6	-	-	-	-	-	.5	-	-	-	-	-	-	-
	5	50-51	93.80	-	-	-	-	-	-	-	-	-	-	-	-	-	.9	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	1.4
	6	0-1	94.80	-	-	-	-	-	-	-	-	-	-	-	-	-	.5	-	-	.5	-	-	-	-	.5	-	-	-	-	-	-	-	3.4
		100-101	95.80	-	-	-	.6	-	-	-	-	-	-	.6	-	-	1.7	.6	-	1.1	-	-	-	-	-	-	-	-	-	-	-	-	.6
7	1	0-1	96.90	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	-	1.0	-	-	-	-	-	-	-	-	-	-	-	-	2.0
		100-101	97.90	-	-	-	-	-	-	-	.5	-	-	-	-	-	.5	-	.5	1.5	-	-	-	-	-	-	-	-	-	.5	-	-	1.0
	2	50-51	98.90	-	-	-	-	-	-	-	-	-	-	-	-	-	.6	-	-	.6	-	-	-	-	-	-	-	-	-	1.2	-	-	.6
	3	0-1	99.90	-	-	-	.4	-	.4	-	-	.4	-	-	-	-	-	-	-	2.1	-	-	-	-	-	-	-	-	-	-	-	-	1.4
		100-101	100.90	-	-	-	-	-	.4	-	-	.4	-	-	-	-	-	-	-	.4	-	-	-	-	-	-	-	-	-	.9	-	-	.4
	4	50-51	101.90	-	-	-	-	-	.7	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4
	5	0-1	102.90	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.9	-	-	-	-	-	-	-	-	-	.6	-	-	1.9
		100-101	103.90	-	-	-	-	-	-	-	-	-	-	-	-	-	.4	-	-	.4	-	-	-	-	-	-	-	-	-	.9	-	-	.9
	6	50-51	104.90	-	-	-	-	-	-	-	-	.5	-	-	-	-	-	.5	-	1.5	-	-	-	-	-	-	-	-	-	.5	-	-	1.5
	7	0-1	105.90	.4	.4	-	-	-	-	-	-	-	-	-	-	-	.4	-	-	-	-	-	-	-	-	-	-	-	-	.7	-	-	.4
8	1	50-51	107.00	-	-	.8	-	-	-	-	-	.8	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	.8	-	-	-
	2	0-1	108.00	-	-	-	-	-	.4	-	-	-	-	-	-	-	-	-	-	.4	-	-	-	-	-	-	-	-	-	.4	-	-	-
		100-101	109.00	-	-	-	-	-	-	-	-	1.1	-	-	-	-	3.2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1
	3	50-51	110.00	.5	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	.5
	4	0-1	111.00	-	-	-	-	-	.6	-	-	-	-	-	-	-	1.2	-	-	1.2	-	-	-	-	-	.6	-	-	-	1.2	-	-	-
		100-101	112.00	-	-	-	-	-	-	-	-	-	-	-	-	-	2.4	-	-	1.8	-	-	-	-	-	-	-	-	-	-	-	-	2.4
	5	50-51	113.00	-	-	-	-	-	-	-	.5	-	-	-	-	-	1.0	-	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	1.5
	6	0-1	114.00	-	-	-	-	-	.6	-	-	-	-	-	-	-	.6	-	-	1.2	-	-	-	-	-	1.7	-	-	-	-	-	-	4.6
		100-101	115.00	-	-	-	-	-	-	-	-	-	-	-	-	-	1.1	-	-	-	-	-	-	-	-	1.1	-	-	-	-	-	-	3.2
9	1	0-1	116.10	-	-	-	-	-	-	-	-	-	-	-	-	-	.7	-	-	-	-	-	-	-	-	-	-	-	-	.7	-	-	-
		100-101	117.10	-	-	-	-	-	-	-	-	.3	-	-	-	-	.7	-	-	1.4	-	-	-	-	-	-	-	-	-	-	-	-	1.0
	2	50-51	118.10	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	-	.8	-	-	-	-	-	-	-	-	-	.8	-	-	2.3
	3	0-1	119.10	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	1.7	-	-	.9
		100-101	120.10	.4	-	-	-	-	-	-	-	-	-	-	-	-	1.3	-	-	.4	-	-	-	-	-	-	-	-	-	-	-	-	1.3
	4	50-51	121.10	-	-	-	-	-	.7	-	.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
	5	0-1	122.10	-	-	-	-	-	-	-	-	-	-	1.4	-	-	1.4	-	-	2.7	-	-	-	-	1.4	-	-	-	-	-	-	-	4.1
		100-101	123.10	-	-	-	-	-	-	-	.8	-	-	-	-	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.8
	6	50-51	124.10	-	-	-	-	-	-	-	1.1	-	-	-	-	-	1.1	-	-	2.2	-	-	-	-	-	-	-	-	-	-	-	-	1.1
	7	0-1	125.20	-	.6	-	-	-	-	-	1.1	-	-	-	-	-	1.1	.6	-	.8	-	-	-	-	-	-	-	-	-	-	-	-	1.7
10	1	50-51	126.20	-	-	-	-	-	-	-	-	.8	-	-	-	-	.8	-	-	-	.8	-	-	-	-	-	-	-	-	.8	-	-	2.3
	2	0-1	127.20	-	-	-	-	-	-	-	-	1.3	-	-	-	-	1.3	-	-	-	-	-	1.3	-	-	-	-	-	-	1.3	-	-	-
		100-101	128.20	-	-	-	-	-	-	-	-	1.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.6	-	-	1.6
	3	50-51	129.20	-	-	-	-	-	-	-	-	1.7	-	-	-	-	1.7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7
	4	0-1	130.20	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7
		100-101	131.20	-	-	-	-	-	2.6	-	-	-	-	-	-	-	-	-	-	-	-	-	2.6	-	-	-	-	-	-	-	-	-	2.6
	5	50-51	132.20	-	-	-	-	-	1.0	-	-	-	-	-	-	-	1.0	-	-	3.0	-	-	-	-	-	-	-	-	-	-	-	-	1.0
	6	0-1	133.20	-	-	-	-	-	-	-	.7	-	-	-	-	-	2.2	-	-	.7	-	-	-	-	-	-	-	-	-	.7	-	-	2.2
		100-101	134.20	-	-	-	-	-	-	-	-	-	-	-	1.2	-	2.4	-	-	-	-	-	1.2	1.2	-	-	-	-	1.2	-	-	-	1.2
11	1	0-1	135.30	1.0	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.0
		100-101	136.30	-	-	-	-	-	-	-	-	1.3	-	-	-	-	2.6	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.9
	2	50-51	137.30	1.0	-	-	-	-	-	-	-	-	-	-	1.0	-	1.0	-	-	-	-	1.0	-	-	-	-	-	-	-	2.0	-	-	2.0
	3	0-1	138.30	-	-	-	-	-	-	-	-	.9	-	-	-	-	.9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.7
		100-101	139.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4	-	-	-	-
	4	50-51	140.30	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	.8	-	-	.6	-	-	-	-	-	-	-	-	-	.8
	5	0-1	141.30	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4	-	.5	-	-	-	-	-	-	-	-	-	-	-	-	-	1.4
		100-101	142.30	1.0	-	-	-	-	-	-	1.3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

CORE	SECTION	INTERVAL (cm)	DEPTH (mbsf)	*Spiroloculina* sp. 1	*Stilostomella consobrina*	*Stilostomella lepidula*	*Textularia lythostrota*	*Textularia secasensis*	*Textularia* sp. 1	*Textularia* sp. 2	*Textularia* sp. 3	*Textularia* sp. 4	*Triloculina tricarinata*	*Triloculina trigonula*	*Triloculina* sp. 1	*Uvigerina auberiana*	*Uvigerina hispida*	*Uvigerina peregrina*	*Uvigerina* sp. 1	*Uvigerina* sp. 2	*Verneuilina* sp. 1	? *Virgulina* sp. 1	*Vulvulina spinosa*	UNIDENTIFIED
1	1	1-2	39.31	-	.7	-	-	-	-	-	-	-	-	-	-	37.4	-	6.6	-	-	-	-	-	5.4
		100-101	40.30	-	-	1.7	-	-	-	-	-	-	-	-	1.1	28.8	2.8	-	-	-	-	-	-	7.3
	2	50-51	41.30	-	-	-	-	-	.5	-	-	-	-	-	-	31.7	.5	-	-	-	-	-	-	3.5
		149-150	42.29	-	.8	-	-	-	-	-	-	-	-	-	-	27.1	-	-	-	-	-	-	-	10.9
	3	100-101	43.30	-	-	-	-	-	-	-	-	-	-	-	-	40.4	-	-	-	-	-	-	-	5.6
	4	50-51	44.30	-	-	-	-	-	-	-	-	-	-	-	-	19.7	.8	-	-	-	-	-	-	11.5
		149-150	45.29	-	-	-	-	-	-	-	-	-	-	-	1.3	32.0	-	-	-	-	-	-	-	9.2
	5	100-101	46.30	-	-	-	-	-	-	-	-	-	-	-	.5	33.7	-	1.1	-	-	-	-	-	6.4
	6	50-51	47.30	-	-	-	-	-	-	-	-	-	-	-	-	31.3	-	-	-	-	-	-	-	7.1
		149-150	48.29	-	-	-	-	-	-	-	-	-	-	-	-	34.6	3.5	3.2	-	-	-	-	-	5.7
2	1	50-51	49.40	-	-	-	-	-	-	-	-	-	-	-	-	13.6	-	4.2	-	-	-	-	-	5.9
	2	0-1	50.40	-	-	-	-	-	-	-	-	-	-	-	-	3.0	-	9.1	-	-	-	-	-	21.2
	3	50-51	52.40	-	-	.9	-	-	.9	-	-	-	-	-	-	2.6	.9	17.2	-	-	-	-	-	11.2
		100-101	54.40	-	-	2.2	-	-	.7	-	-	-	-	-	-	6.5	.7	2.9	-	-	-	-	-	16.5
	5	50-51	55.40	-	1.4	-	-	-	-	-	-	-	-	-	-	28.6	-	8.1	-	-	-	-	-	11.7
	6	0-1	56.40	-	-	-	-	-	-	-	-	-	-	-	.6	13.2	-	3.6	-	-	-	-	-	19.2
		100-101	57.40	-	-	-	-	-	-	-	-	-	-	-	-	19.5	.6	6.5	-	-	-	-	-	12.3
3	1	0-1	58.50	-	.7	-	-	-	-	-	-	-	-	-	-	15.1	-	7.2	-	-	-	-	-	6.5
		100-101	59.50	-	-	-	-	-	-	-	-	-	-	-	-	13.5	-	5.5	-	-	-	-	-	12.3
	2	50-51	60.50	-	-	-	-	-	.6	.3	-	-	-	-	-	13.9	-	4.8	-	-	-	-	-	7.1
	3	1-2	61.51	-	-	-	-	-	-	.6	-	-	-	-	-	11.9	-	5.0	-	-	-	-	-	10.6
		100-101	62.50	-	.5	.5	-	-	-	-	-	-	.5	-	-	16.8	.5	2.0	-	-	-	-	-	9.7
	4	50-51	63.50	-	-	1.5	-	-	1.5	-	-	-	.7	-	-	15.7	-	3.7	-	-	-	-	-	8.2
	5	0-1	64.50	-	-	1.6	-	-	1.6	-	-	-	.8	-	-	14.1	-	5.5	-	-	-	-	-	7.8
		100-101	65.50	-	-	-	-	-	1.4	-	-	-	-	-	.7	21.2	-	3.4	-	-	-	-	-	4.1
	6	50-51	66.50	-	-	-	-	-	1.2	-	-	-	-	-	.6	22.3	.6	3.6	-	-	-	-	-	4.8
	7	0-1	67.50	-	-	-	-	-	.9	-	-	-	-	-	-	18.1	.9	7.5	-	-	-	-	-	5.7
4	1	50-51	68.60	-	-	2.1	-	-	-	1.2	-	-	.4	-	.4	19.9	-	4.1	-	-	-	-	-	3.7
	2	0-1	69.60	-	-	-	-	-	-	-	-	-	-	-	-	22.5	-	1.8	-	-	-	-	-	7.3
		100-101	70.60	-	-	.3	-	-	.3	-	-	-	-	-	.3	17.0	-	1.0	-	-	-	-	-	6.9
	3	50-51	71.60	-	-	-	-	-	2.8	-	-	-	-	-	-	25.5	-	.9	-	-	-	-	-	8.5
	4	0-1	72.60	-	-	-	-	-	-	-	-	-	-	-	.5	26.6	-	-	-	-	-	-	-	9.0
		100-101	73.60	-	-	.9	-	-	.3	-	-	-	-	-	-	27.6	.8	6.8	-	-	-	-	-	6.6
	5	50-51	74.60	-	-	-	-	-	.5	-	-	-	-	-	-	31.4	1.0	7.1	-	-	-	-	-	1.9
	6	0-1	75.60	-	-	-	-	-	2.4	-	-	-	-	-	-	20.3	.5	1.4	-	-	-	-	-	8.5
		100-101	76.60	-	-	.7	-	-	-	-	-	-	-	-	.7	26.3	.7	4.1	-	-	-	-	-	4.1
5	1	0-1	77.70	-	-	.6	-	-	-	-	-	-	-	-	-	19.5	-	-	-	-	-	-	-	4.4
		100-101	78.70	-	-	-	-	-	-	-	-	-	-	-	-	22.3	-	-	-	-	-	-	-	4.2
	2	50-51	79.70	-	-	-	-	-	-	.5	-	-	-	-	-	20.5	-	-	-	-	-	-	-	11.5
	3	1-2	80.71	-	-	-	-	-	-	-	-	-	-	-	-	22.3	-	-	-	-	-	-	-	5.3
		100-101	81.71	-	-	-	-	-	-	-	-	-	-	-	.8	17.6	-	-	-	-	-	-	.8	3.2
	4	50-51	82.70	-	-	.8	-	-	-	-	-	-	-	-	-	24.8	-	-	-	-	-	-	-	7.0
	5	0-1	83.70	-	-	-	-	-	-	-	-	-	-	-	-	28.0	-	-	-	-	-	-	-	3.6
		100-101	84.70	-	-	.9	-	-	-	-	-	-	-	-	-	35.3	-	-	-	-	-	-	-	2.6
	6	50-51	85.70	-	-	-	-	-	.8	-	-	-	-	.8	-	34.9	.8	3.9	-	-	-	-	-	4.7
	7	0-1	86.70	-	-	-	-	-	1.2	-	-	-	-	-	-	34.4	.8	2.8	-	-	-	-	-	3.6
6	1	50-51	87.80	-	-	-	-	-	-	-	-	-	-	-	-	25.5	1.1	2.7	-	-	-	-	-	5.9
	2	0-1	88.80	-	-	-	1.0	.5	-	-	-	-	-	-	.5	28.1	-	1.0	-	-	-	-	-	3.6
		100-101	89.80	-	-	-	-	-	-	-	-	-	-	-	-	28.2	-	-	-	-	-	-	-	3.4
	3	50-51	90.80	-	-	.3	-	-	-	-	-	-	.3	-	.6	20.8	.6	.6	-	-	-	-	-	6.9
	4	0-1	91.80	-	-	.5	-	-	.5	-	-	-	-	-	-	24.8	3.2	-	-	-	-	-	-	3.2
		100-101	92.80	-	.5	-	-	-	-	-	-	-	-	-	-	30.1	1.0	-	-	-	-	-	-	6.7
	5	50-51	93.80	-	-	-	-	-	-	-	-	-	-	-	.9	26.7	-	.5	-	-	-	-	-	5.1
	6	0-1	94.80	-	-	-	-	-	.5	-	-	-	.5	.5	-	24.1	-	.5	-	-	-	-	-	4.9
		100-101	95.80	-	-	.6	-	-	-	-	-	-	-	-	-	21.8	-	-	-	-	-	-	-	3.9
7	1	0-1	96.90	-	-	-	-	-	-	-	-	-	-	-	-	26.9	-	-	-	-	-	-	-	7.1
		100-101	97.90	-	-	.5	-	-	-	-	-	-	-	-	-	29.1	-	-	-	-	-	-	-	4.1
	2	50-51	98.90	-	-	-	-	-	-	-	-	-	-	-	-	32.0	-	-	-	-	-	-	-	3.5
	3	0-1	99.90	-	-	-	1.8	-	-	-	-	-	-	-	.7	30.9	-	2.1	-	-	-	-	-	4.3
		100-101	100.90	-	-	-	.9	-	-	-	-	-	-	-	.9	28.2	.4	-	-	-	-	-	-	5.3
	4	50-51	101.90	-	-	.7	-	-	-	-	.3	-	-	-	-	28.1	-	-	-	-	-	-	-	3.5
	5	0-1	102.90	-	-	-	.6	-	-	-	-	-	.6	-	-	33.5	-	-	-	-	-	-	-	5.6
		100-101	103.90	-	-	-	.9	-	-	-	-	-	-	-	-	27.3	-	-	-	-	-	-	-	10.6
	6	50-51	104.90	-	-	-	.5	-	-	-	-	-	-	-	-	33.8	-	-	-	-	-	-	-	8.1
	7	0-1	105.90	-	-	.4	-	.5	-	-	-	-	-	-	-	26.2	-	-	-	-	-	-	-	6.2
8	1	50-51	107.00	-	-	-	-	-	-	-	-	-	-	-	-	24.2	-	-	-	-	-	-	-	13.6
	2	0-1	108.00	-	-	.4	-	-	-	-	-	-	-	-	-	35.0	-	.4	-	-	-	-	-	3.7
		100-101	109.00	-	-	-	-	-	-	-	-	-	-	-	-	25.4	-	-	-	-	-	-	-	-
	3	50-51	110.00	-	-	-	-	.9	-	-	-	-	-	-	-	23.4	.5	-	-	-	-	-	-	8.0
	4	0-1	111.00	-	-	-	-	-	-	-	-	-	-	-	-	30.4	-	-	-	-	-	-	-	7.7
		100-101	112.00	-	-	-	-	-	-	-	-	-	-	-	-	35.3	-	-	-	-	-	-	-	1.8
	5	50-51	113.00	-	-	-	.5	-	-	-	-	-	-	-	-	19.4	-	.5	-	-	-	-	-	5.2
	6	0-1	114.00	-	-	-	-	-	-	-	-	-	-	-	.6	27.2	-	.6	-	-	-	-	-	4.0
		100-101	115.00	-	-	-	-	-	-	-	-	-	-	-	-	24.3	.4	.4	-	-	-	-	-	6.1
9	1	0-1	116.10	-	-	-	-	-	-	-	-	-	-	-	-	22.7	.7	.7	-	-	-	-	-	4.0
		100-101	117.10	-	-	.7	-	.3	-	-	-	-	-	-	-	22.4	.3	5.6	-	-	-	-	-	3.4
	2	50-51	118.10	-	-	-	-	-	-	-	-	-	-	-	-	29.0	.8	3.8	-	-	-	-	-	4.6
	3	0-1	119.10	-	-	-	-	-	-	-	-	-	-	-	-	21.4	1.7	-	-	-	-	-	-	1.7
		100-101	120.10	-	-	-	-	-	-	-	-	-	.4	-	.4	34.2	2.1	1.3	-	-	-	-	-	4.2
	4	50-51	121.10	-	-	-	.7	-	-	-	-	-	-	-	-	23.8	1.4	-	-	-	-	-	-	2.8
	5	0-1	122.10	-	-	-	1.4	-	-	-	-	-	1.4	-	-	31.1	-	-	-	-	-	-	-	-
		100-101	123.10	-	-	-	-	-	-	-	-	-	-	-	-	25.4	-	-	-	-	-	-	-	1.7
	6	50-51	124.10	-	-	1.1	-	-	-	-	-	-	-	-	-	16.5	-	-	-	-	-	-	-	-
	7	0-1	125.20	-	-	-	-	-	5.0	-	-	-	-	-	-	19.9	-	-	-	-	-	-	-	1.7
10	1	50-51	126.20	-	-	-	-	-	-	-	-	-	-	-	-	16.6	-	-	.8	-	-	-	-	3.8
	2	0-1	127.20	-	-	-	-	-	-	-	-	-	1.3	-	-	21.1	-	-	-	-	-	-	-	9.2
		100-101	128.20	-	-	-	-	1.6	1.6	-	-	-	-	-	-	6.5	-	-	-	3.2	-	-	-	9.7
	3	50-51	129.20	1.7	-	-	-	1.7	-	-	-	-	-	-	-	6.9	-	-	-	-	-	-	-	3.4
	4	0-1	130.20	-	-	-	1.7	-	-	-	-	-	-	-	-	13.3	-	-	-	-	-	-	-	10.0
		100-101	131.20	-	-	-	-	-	-	-	-	-	-	-	-	7.7	-	-	-	-	-	-	-	2.6
	5	50-51	132.20	-	-	-	-	-	1.0	-	-	-	-	-	-	19.8	1.0	-	-	-	-	-	-	3.0
	6	0-1	133.20	-	-	-	-	-	-	-	-	-	-	-	-	14.9	-	-	-	-	.7	-	-	6.7
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11	1	0-1	135.30	1.0	-	-	-	-	1.0	-	-	-	-	-	-	27.0	-	-	-	-	-	-	-	6.0
		100-101	136.30	-	-	-	-	-	1.3	-	-	-	-	-	-	26.3	-	-	-	-	-	-	-	3.9
	2	50-51	137.30	-	-	-	-	-	-	-	-	-	-	-	-	32.7	-	-	-	-	-	-	-	2.0
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	5	0-1	141.30	-	-	-	-	-	-	-	-	-	-	-	-	38.0	-	-	-	-	-	-	-	5.8
		100-101	142.30	-	-	-	-	-	-	-	-	-	-	-	-	29.3	-	-	-	-	-	-	-	4.0

PLATE 1

1 *Cyclammina cancellata* Brady. Side view of a specimen with the last chambers broken off, 79.70 m, ×220.
2, 5 *Textularia lythostrota* (Schwager). **2** Apertural view, 130.20 m, ×160. **5** Side view, 110.00 m, ×130.
3, 6 *Textularia secasensis* Lalicker and McCulloch. **3** Apertural view, 140.00 m, ×220. **6** Side view, 128.80 m, ×160.
4 *Siphotextularia curta* (Cushman). Side view with the last chamber broken off, 48.29 m, ×220.
7, 10 *Siphotextularia* sp. 1. **7** Enlargement of aperture, 59.50 m, ×100. **10** Side view of same specimen, 59.50 m, ×2,000.
8, 11 ? *Cystammina* sp. 1. **8** Enlargement of aperture, 99.90 m, ×1,800. **11** Apertural view of same specimen, 99.90 m, ×320.
9, 12 *Siphoeggerella siphonella* (Reuss). **9** Enlargement of aperture, 83.70 m, ×1,000. **12** Side view of same specimen, 83.70 m, ×200.

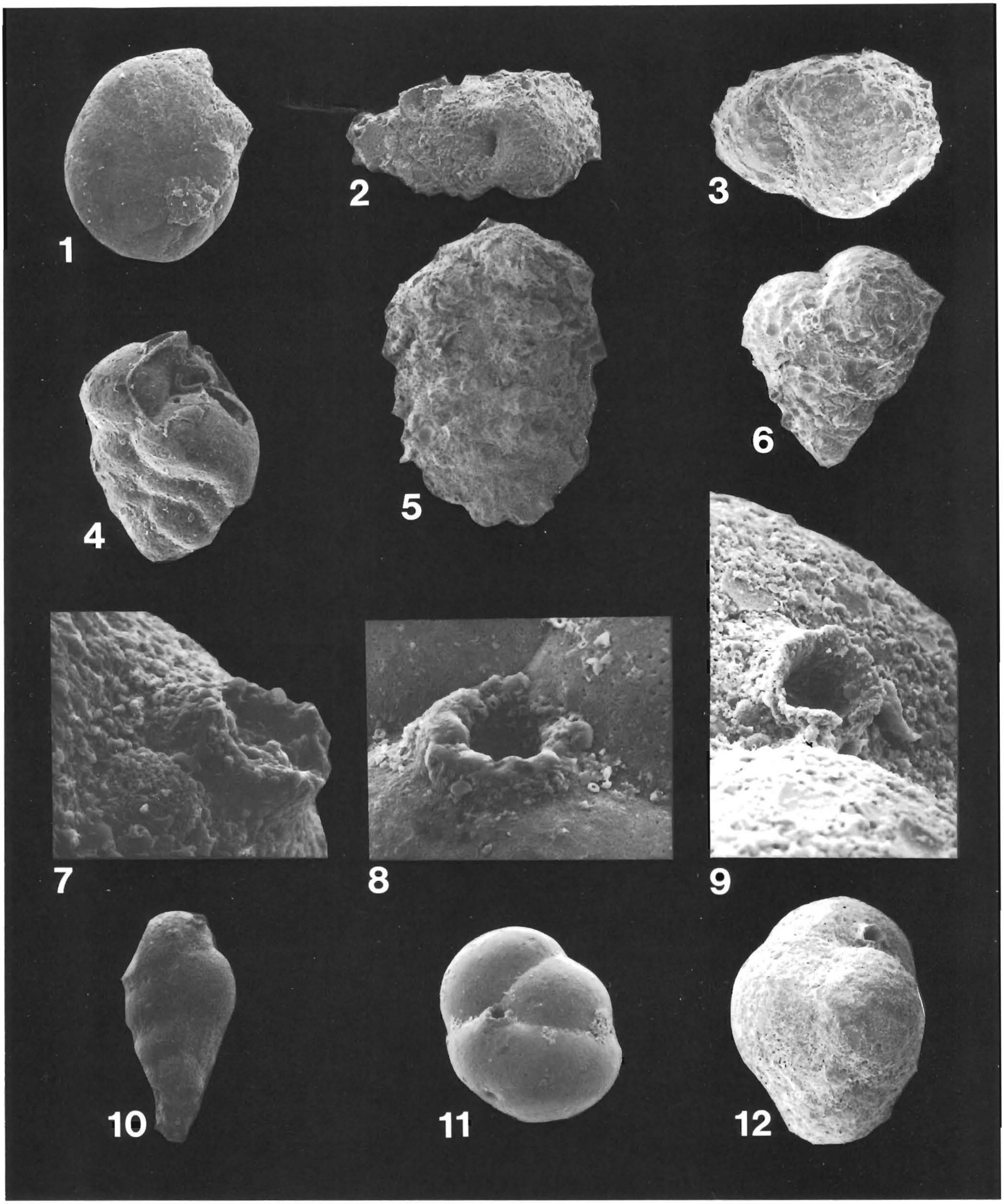
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PLATE 2

1, 2 *Eggerella bradyi* (Cushman). **1** Apertural view, 125.10 m, ×120. **2** Side view, 124.10 m, ×110.
3 *Verneuilina* sp. 1. Side view, 133.20 m, ×120.
4, 9 *Quinqueloculina lamarckiana* d'Orbigny. **4** Side view, 52.40 m, ×180. **9** Apertural view, 48.29 m, ×260.
5, 6 *Martinottiella communis* (d'Orbigny). **5** Apertural view, 41.30, ×100. **6** Side view, 73,60 m, ×54.
7 *Martinottiella petrosa* (Cushman and Bermúdez). Side view, 41.30 m, ×130.
8 *Spiroloculina* sp. 1. Side view, 129.20 m, ×220.
10 *Ophthalmidium pusillum* (Earland). Side view, 41.30 m, ×150.
11, 14 *Quinqueloculina venusta* Karrer. **11** Side view, 39.31 m, ×130. **14** Apertural view, 41.30 m, ×260.
12, 15, 16 *Pyrgo murrhina* (Schwager). **12** Side view, 39.31 m, ×78. **15** Apertural view, 39.31 m, ×100. **16** Side-edge view, 39.31 m, ×100.
13 *Pyrgo* cf. *P. murrhina* (Schwager). Side view, 49.40 m, ×150.

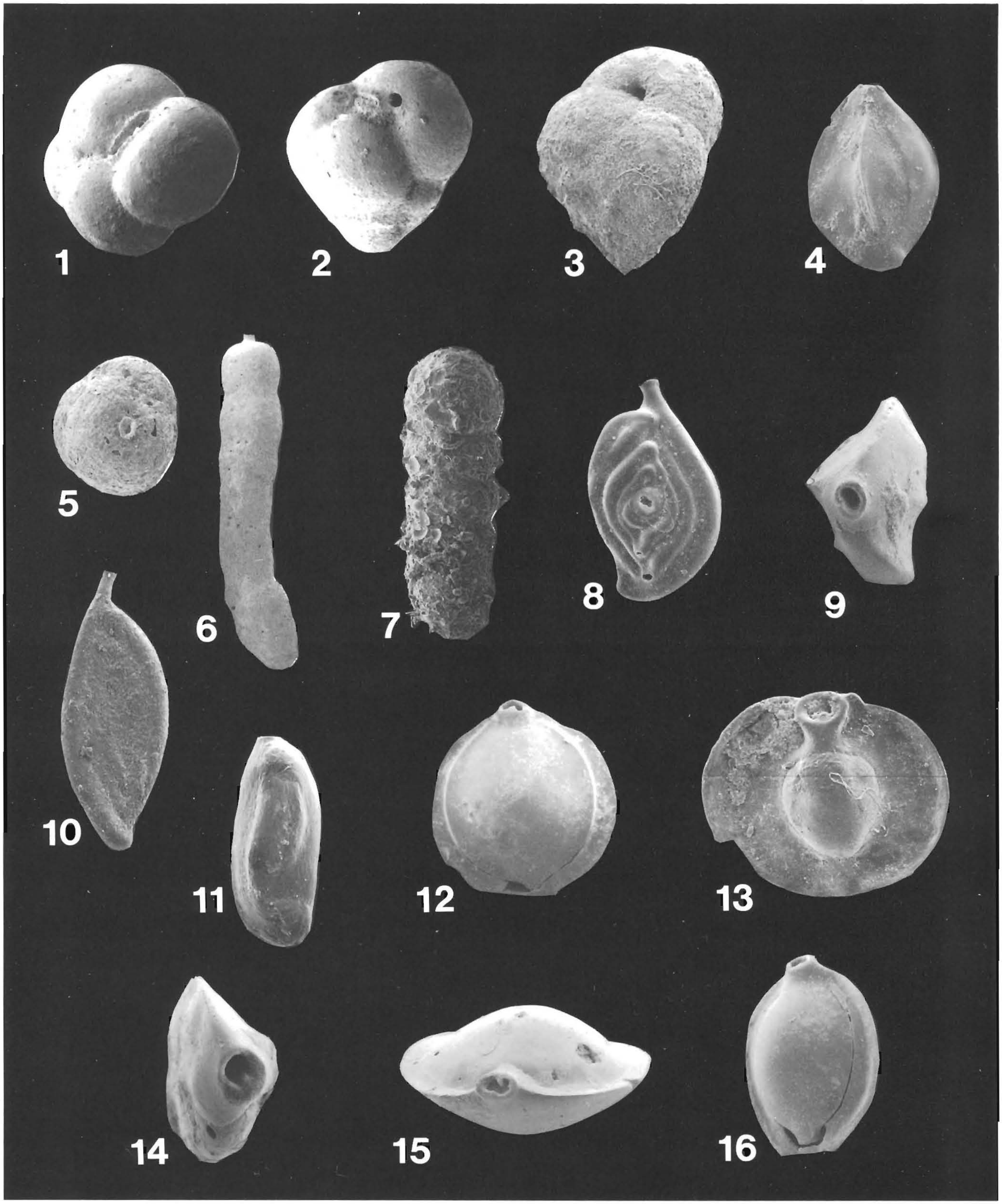
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PLATE 3

1, 2 *Pyrgo* sp. 1. **1** Side view, 76.69 m, ×200. **2** Edge view, 43.31 m, ×200.
3 *Pyrgo* sp. 2. Side view, 99.90 m, ×40.
4, 5, 9 *Sigmoilina edwardsi* (Schlumberger). **4** Side view, 39.31 m, ×160. **5** Side view of an abraded specimen, 40.30 m, ×180. **9** Apertural view of an abraded specimen, 40.30 m, ×300.
6, 7 *Triloculina tricarinata* d'Orbigny. **6** Side view, 116.10 m, ×180. **7** Apertural view, 116.10 m, ×220.
8 *Triloculina trigonula* (Lamarck). Apertural view, 85.70 m, ×78.
10, 11 *Triloculina* sp. 1. **10** Side view, 40.30 m, ×180. **11** Apertural view, 40.30 m, ×320.
12, 13 *Chrysalogonium lanceolum* Cushman and Jarvis. **12** Side view, 96.90 m, ×48. **13** Enlargement of aperture, side view of same specimen, 96.90 m, ×440.
14, 15 *Chrysalogonium longicostatum* Cushman and Jarvis. **14** Enlargement of aperture, side view, 70.60 m, ×360. **15** Side view of same specimen, 70.60, ×36.
16-18 *Chrysalogonium tenuicostatum* Cushman and Bermúdez. **16** Side view, 130.20 m, ×110. **17** Enlargement of aperture, side view of same specimen, 130.20 m, ×400. **18** Enlargement of fine striation, side view of same specimen, 130.20 m, ×370.

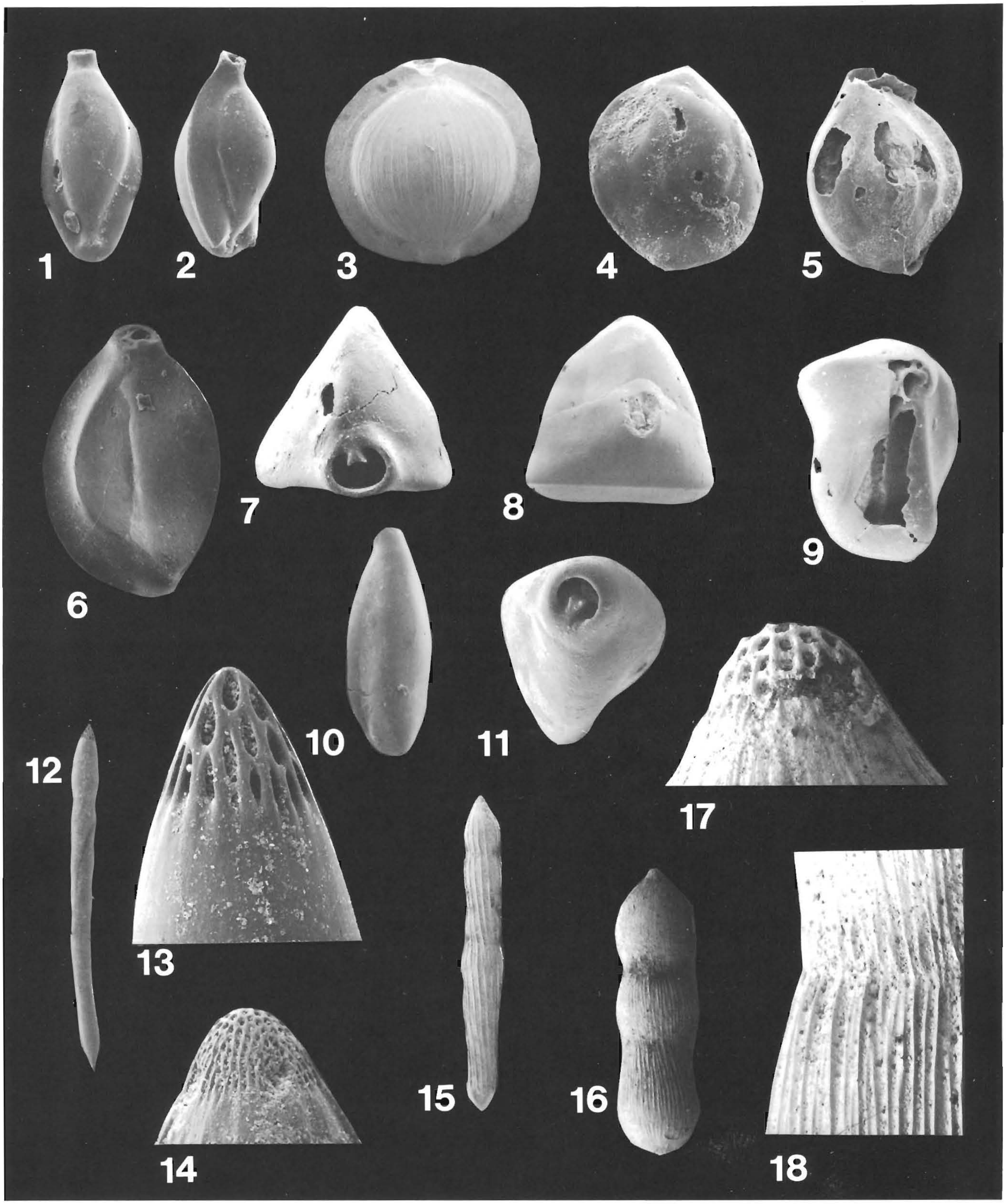
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PLATE 4

1, 2 *Dentalina communis* d'Orbigny. **1** Side view of a microspheric specimen, 120.10 m, ×160. **2** Side view of a megalospheric specimen, 103.90 m, ×110.
3 *Dentalina* cf. *D. communis* d'Orbigny. Side view, 120.10 m, ×150.
4 *Dentalina intorta* (Dervieux). Side view, 141.30 m, ×120.
5 *Lagena advena* Cushman. Side view of a specimen with borings of parasitic organisms through the test, 39.31 m, ×120.
6 *Lagena alticostata* Cushman. Oblique view, 87.80 m, ×360.
7 *Lagena biarritzensis* Hagn. Side view, 135.30 m, ×120.
8 *Lagena feildeniana* Brady. Side view, 122.10 m, ×130.
9, 10 *Lagena hispida* Reuss. **9** Side view, 43.30 m, ×220. **10** Enlargement of test surface of same specimen, 43.30 m, ×2,000.
11 *Lagena hispidula* Cushman. Side view, 41.30 m, ×130.
12 *Lagena meridionalis* Wiesner. Side view, 134.20 m, ×120.
13 *Lagena paradoxa* Sidebottom. Side view, 116.10 m, ×200.
14 *Lagena striata* (d'Orbigny). Side view, 108.00 m, ×150.
15 *Lagena tubulata* Sidebottom. Side view, 109.00 m, ×180.
16 *Lagena* sp. 1. Side view, 64.50 m, ×240.
17 *Lagena* sp. 2. Side view, 134.20 m, ×220.
18 *Lagena* sp. 3. Side view, 121.10 m, ×320.
19 *Lagena* sp. 4. Side view, 111.00 m, ×240.
20 *Orthomorphina challengeriana* (Thalmann). Side view, 72.60 m, ×120.

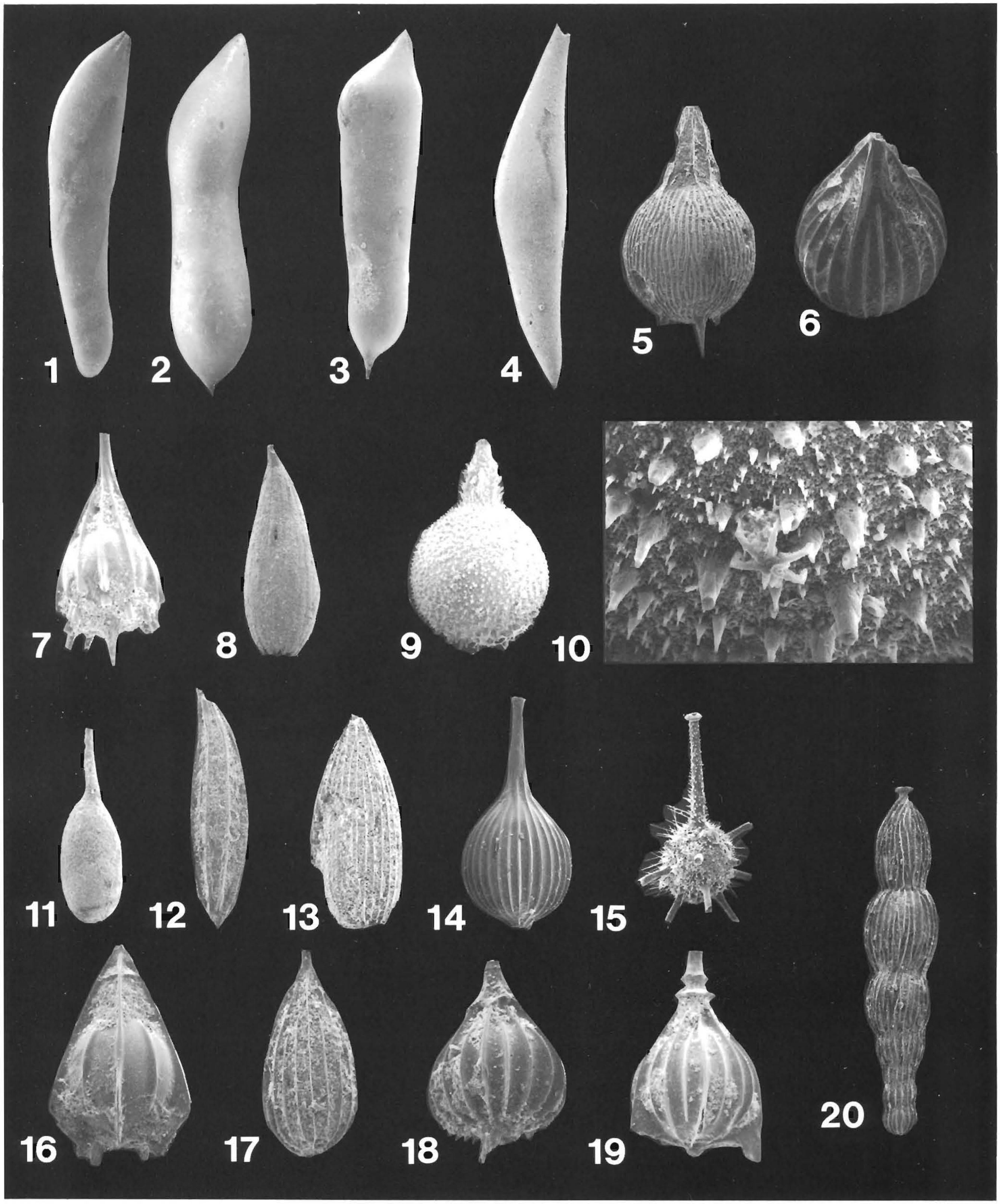
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PLATE 5

1-3 *Orthomorphina* sp. 1. **1** Side view, 118.10 m, ×160. **2** Apertural view, 105.90 m, ×240. 3 Enlargement of aperture of same specimen, 105.90 m, ×1,600.

4, 9 *Pseudonodosaria* sp. 1. **4** Side view, 93.80 m, ×94. **9** Apertural view, 60.50 m, ×180.

5, 6 *Lenticulina atlantica* (Barker). **5** Side view, 97.90 m, ×150. **6** Edge view, 100.90 m, ×180.

7, 8 *Lenticulina convergens* (Bornemann). **7** Side view, 103.90 m, ×300. **8** Edge view, 121.10 m, ×260.

10, 11 Polymorphinidae *formae fistulosae.* **10** Side view, 74.70 m, ×94. **11** Side view, 61.51 m, ×130.

12 ? *Polymorphina* sp. 1. Side view, 108.00 m, ×130.

13 *Pyrulina gutta* d'Orbigny. Side view, 43.30 m, ×180.

14 *Pyrulinoides* sp. 1. Side view, 115.00 m, ×180.

15 *Pyrulinoides* sp. 2. Side view, 141.30 m, ×100.

16, 17 *Sphaeroidina bulloides* d'Orbigny. **16** Side view, 122.10 m, ×100. **17** Apertural view, 118.10 m, ×100.

18, 19 *Fissurina annectens* (Burrows and Holland). **18** Side view, 56.40 m, ×240. **19** Edge view, 56.40 m, ×260.

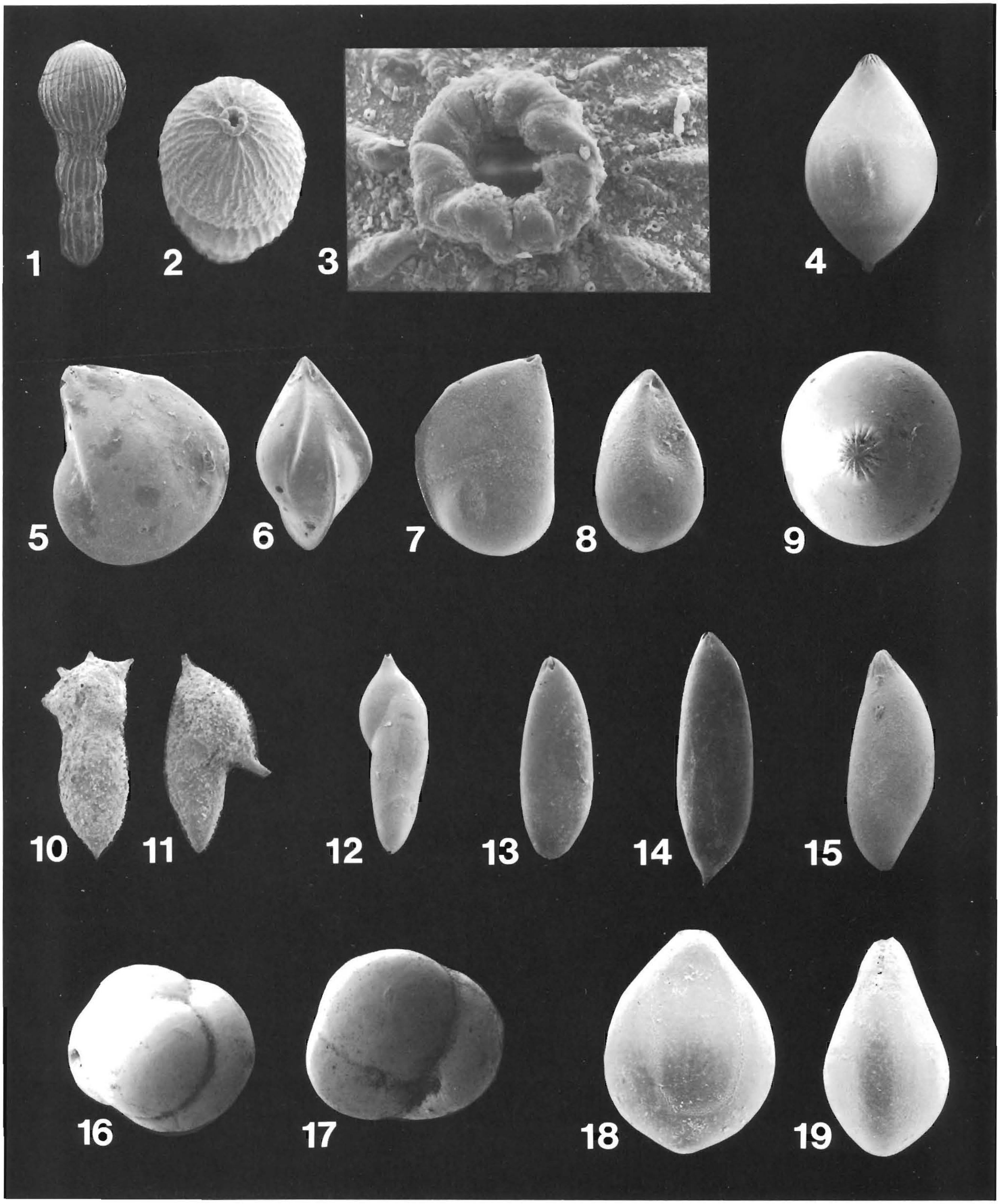
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PLATE 6

1 *Fissurina arcuata* (Sidebottom). Side view, 116.10 m, ×160.
2, 3 *Fissurina auriculata* (Brady). **2** Side view, 65.50 m, ×240. **3** Edge view, 60.50 m, ×260.
4, 5 *Fissurina* cf. *F. capillosa* Schwager. **4** Side view, 104.90 m, ×130. **5** Enlargement of ornamentation between the central body and the encircling keel on same specimen, 104.90 m, ×540.
6, 7 *Fissurina castrensis* (Schwager). **6** Enlargement of ornamentation on apertural neck, side view, 77.70 m, ×540. **7** Side view, 77.70 m, ×86.
8, 9 *Fissurina clathrata* (Brady). **8** Side view, 50.60 m, ×260. **9** Edge view, 43.30 m, ×260.
10 *Fissurina duplicata* (Sidebottom). Edge view, 77.70 m, ×160.
11, 12 *Fissurina crebra* (Matthes). **11** Side view, 43.70 m, ×180. **12** Oblique view, 43.70 m, ×240.
13, 14 *Fissurina echigoensis* (Asano and Inomata). **13** Side view, 70.60 m, ×220. **14** Edge view, 75.60 m, ×220.
15, 16 *Fissurina fimbriata* (Brady). **15** Side view, 43.30 m, ×200. **18** Edge view, 43.30 m, ×180.
17, 18 *Fissurina kerguelensis* Parr. **17** Side view, 41.30 m, ×300. **18** Side view, 55.50 m, ×180.

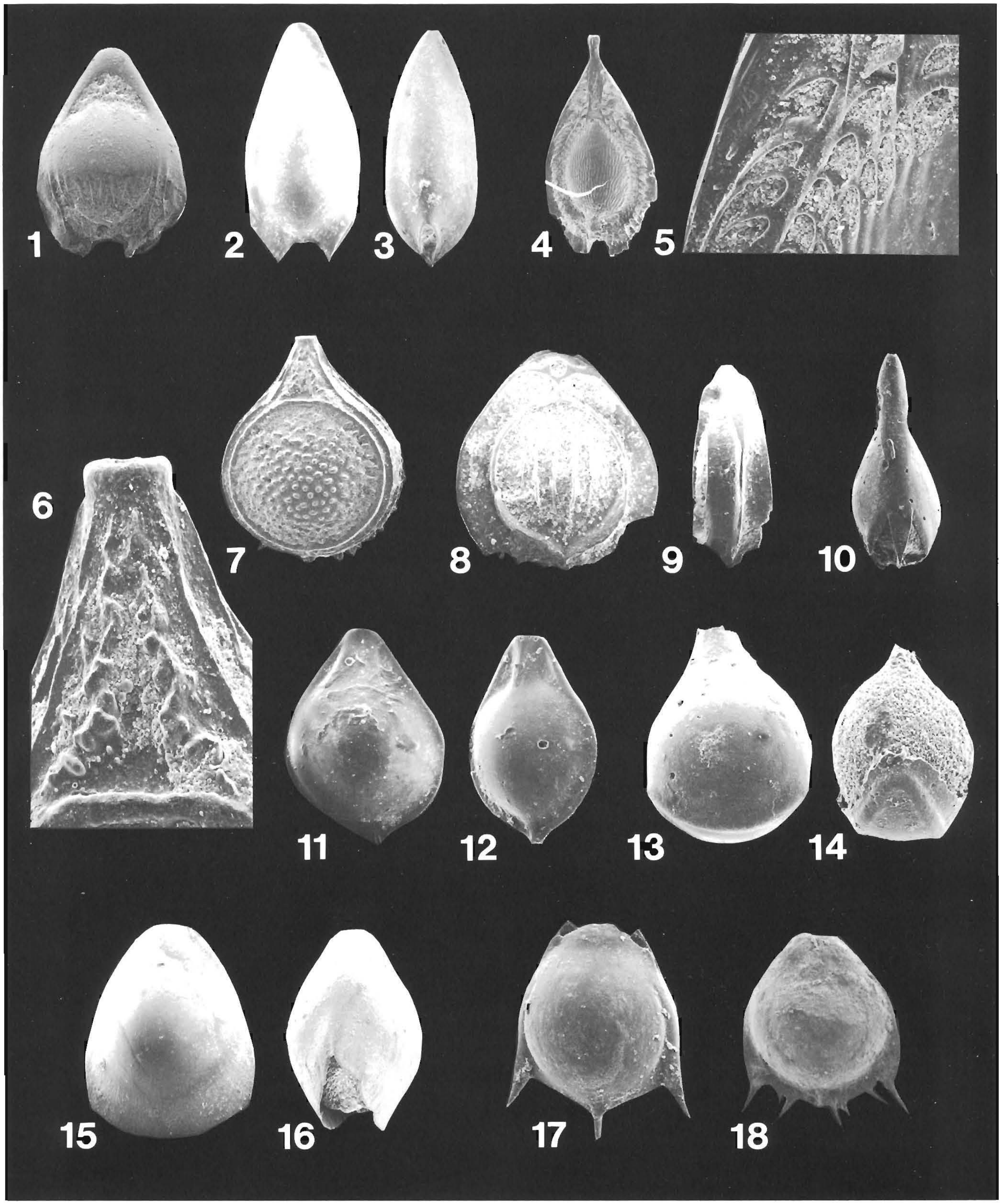
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PLATE 7

1, 2 *Fissurina marginata* (Montagu). **1** Side view, 41.30 m, ×220. **2** Edge view, 41.30 m, ×240.
3, 4 *Fissurina palliolata* (Earland). **3** Side view, 110.00 m, ×220. **4** Edge view, 117.10 m, ×300.
5 *Fissurina revertens* (Heron-Allen and Earland). Side view, 40.30 m, ×300.
6 *Fissurina selseyensis* (Heron-Allen and Earland). Side view, 113.00 m, ×78.
7 *Fissurina seminiformis* (Schwager). Side view, 119.10 m, ×120.
8, 9 *Fissurina separans* Sidebottom. **8** Side view, 65.50 m, ×360. **9** Edge view, 67.60 m, ×360.
10 *Fissurina wiesneri* Barker. Side view, 41.30 m, ×320.
11 *Fissurina* sp. 1. Side view, 41.30 m, ×180.
12 *Fissurina* sp. 2. Side view, 41.30 m, ×240.
13 *Fissurina* sp. 3. Side view, 40.30 m, ×220.
14 *Fissurina* sp. 4. Side view, 60.50 m, ×160.
15, 16 *Fissurina* sp. 5. **15** Side view, 109.00 m, ×150. **16** Enlargement of the honeycomb pattern present on the lower part of the central body of the same specimen, 109.00 m, ×600.

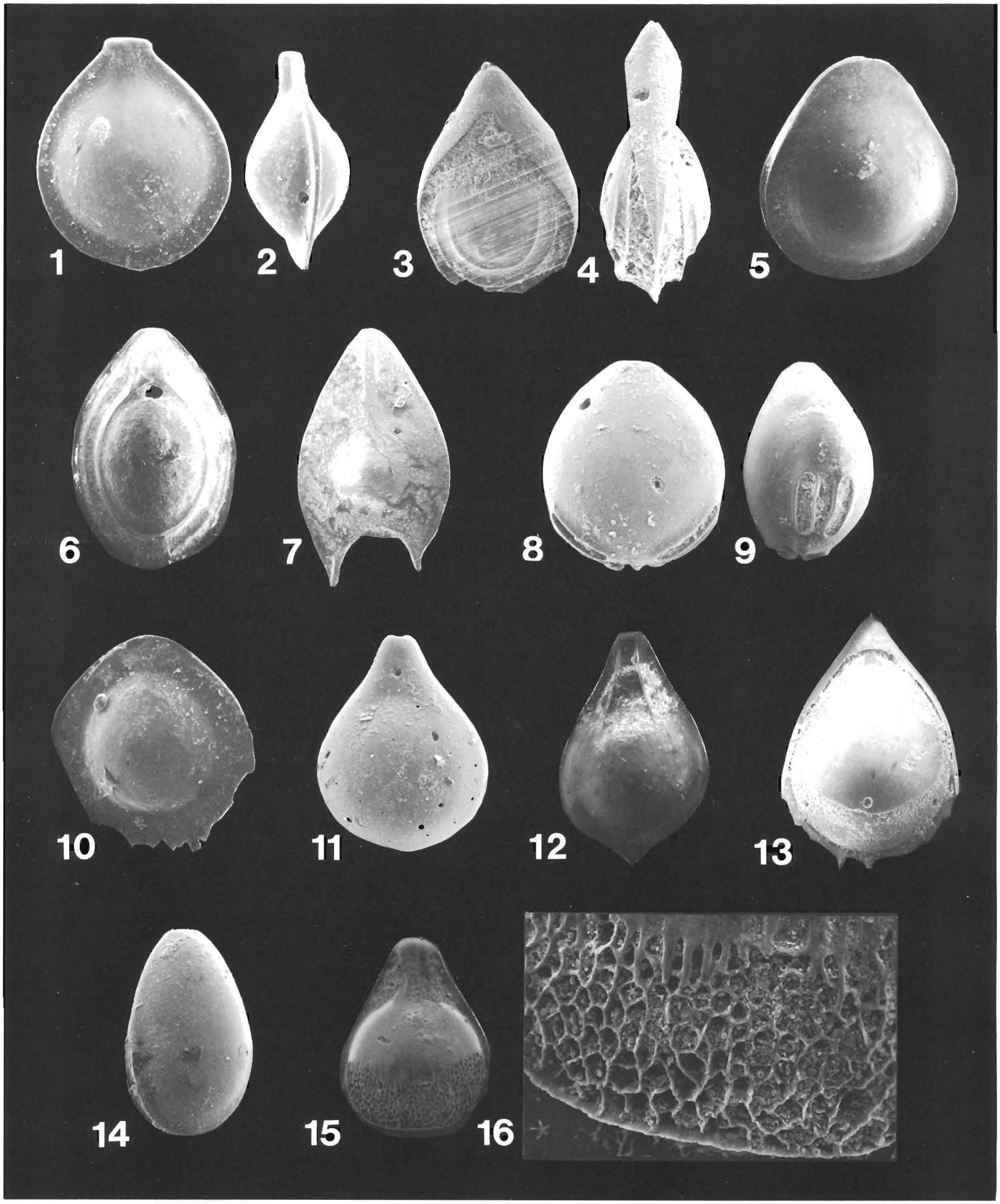
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PLATE 8

1, 2 *Fissurina* sp. 6. **1** Side view, 70.60 m, ×150. **2** Edge view, 39.30, ×130.
3, 4 *Fissurina* sp. 8. **3** Side view, 93.80 m, ×160. **4** Enlargement of ornamentation around the periphery, side view of same specimen, 93.80 m, ×780.
5 *Fissurina* sp. 7. Edge view, 100.90 m, ×240.
6, 7 *Fissurina* sp. 9. **6** Side view, 55.40 m, ×240. **7** Edge view, 58.50, ×240.
8, 9 *Fissurina* sp. 10. **8** Side view, 95.80 m, ×150. **9** Edge view, 69.60 m, ×180.
10 *Fissurina* sp. 11. Side view, 125.10 m, ×240.
11, 12 *Fissurina* sp. 12. **11** Side view, 118.10 m, ×180. **12** Enlargement of the basal part of the test, edge view of the same specimen, 118.10 m, ×480.
13 *Fissurina* sp. 13. Side view, 46.30 m, ×100.
14, 15 *Fissurina* sp. 14. **14** Side view, 46.30 m, ×200. **15** Edge view, 57.40 m, ×200.
16 *Fissurina* sp. 15. Side view, 47.30 m, ×320.
17, 18 *Fissurina* sp. 16. **17** Side view, 109.00 m, ×200. **18** Edge view, 124.10 m, ×210.

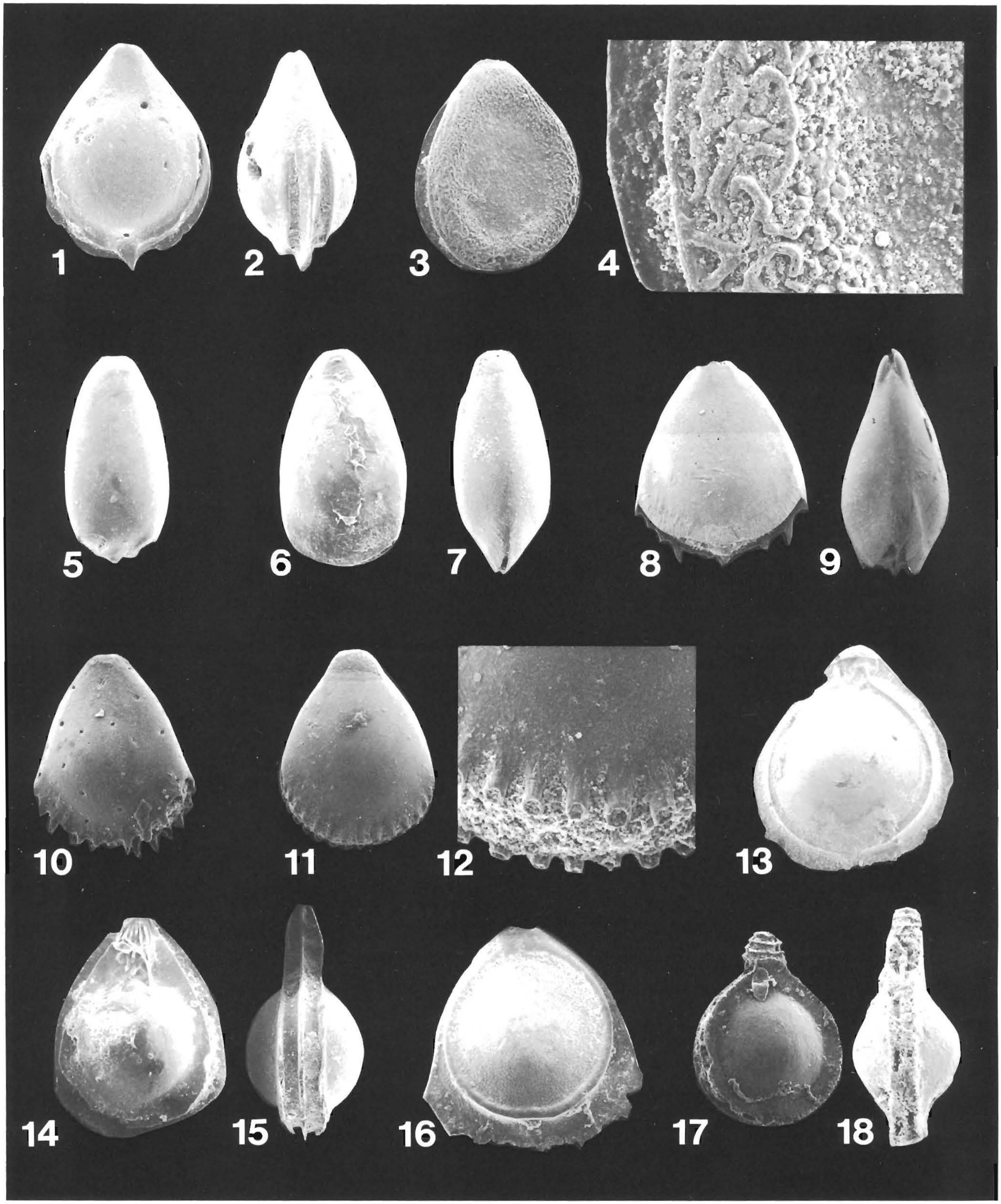
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PLATE 9

1, 2 *Fissurina* sp. 17. **1** Side view, 46.30 m, ×240. **2** Enlargement of small spines ornamenting the basal part of the test, side view of the same specimen, 46.30 m, ×1,000.
3, 4 *Fissurina* sp. 18. **3** Side view, 105.90 m, ×200. **4** Edge view, 110.00 m, ×220.
5 *Fissurina* sp. 19. Side view, 115.00 m, ×300.
6 *Fissurina* sp. 20. Side view, 110.00 m, ×220.
7 *Fissurina* sp. 21. Side view, 87.80 m, ×150.
8, 9 *Fissurina* sp. 22. **8** Side view, 58.50 m, ×180. **9** Edge view, 49.39 m, ×180.
10 *Fissurina* sp. 23. Side view, 58.50 m, ×260.
11, 12 *Fissurina* sp. 24. **11** Side view, 101.90 m, ×130. **12** Edge view, 81.70 m, ×160.
13, 14 *Fissurina* sp. 25. **13** Side view, 48.19 m, ×240. **14** Edge view, 73.60 m, ×260.
15, 16 *Fissurina* sp. 26. **15** Side view, 39.31 m, ×180. **16** Edge view, 41.30 m, ×180.
17 *Globofissurina* sp. 1. Side view, 41.30 m, ×320.
18 *Globofissurina quadricarniata* (Sidebottom). Side view, 73.60 m, ×400.

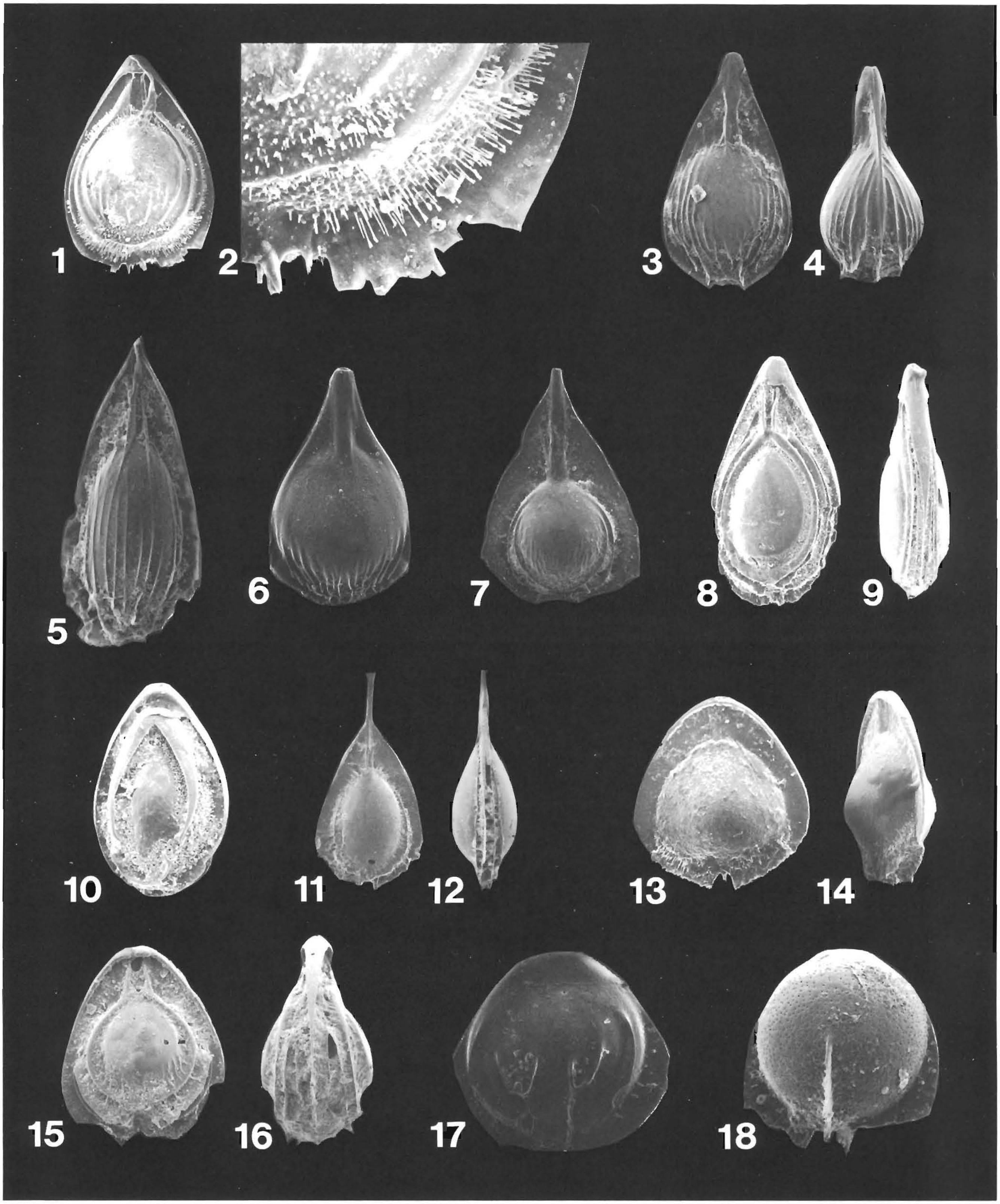
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PLATE 10

1 *Oolina alifera* (Reuss). Side view, 117.10 m, ×220.
2, 3 *Oolina desmophora* (Jones). **2** Side view, 79.70 m, ×180. **3** Enlargement of the basal part of the test, side view of same specimen, 79.70 m, ×480.
4 *Oolina globosa* (Montagu). Side view, 39.31 m, ×260.
5 *Oolina hexagona* (Williamson). Side view, 118.10 m, ×400.
6 *Oolina setosa* (Earland). Side view, 142.30 m, ×180.
7 *Parafissurina* cf. *P. arctica* Green. Side view, 59.50 m, ×400.
8 *Parafissurina sublata* Parr. Side view, 83.70 m, ×94.
9 *Parafissurina tectulostoma* Loeblich and Tappan. Side view, 63.50 m, ×150.
10 *Parafissurina tricarinata* Parr. Side view, 101.90 m, ×160.
11 *Parafissurina* sp. 1. Side view, 39.31 m, ×150.
12, 13 *Parafissurina uncifera* (Buchner). **12** Side view, 73.60 m, ×180. **13** Edge view, 58.50 m, ×320.
14 *Parafissurina* sp. 2. Side view, 41.30 m, ×200.
15 *Buliminoides* sp. 1. Side view, 63.50, ×180.
16 *Abditodentrix asketocomptella* Patterson. Side view, 40.30 m, ×220.
17, 18 *Bolivina seminuda* Cushman. **17** Side view, 141.30 m, ×180. **18** Edge view, 140.30 m, ×200.

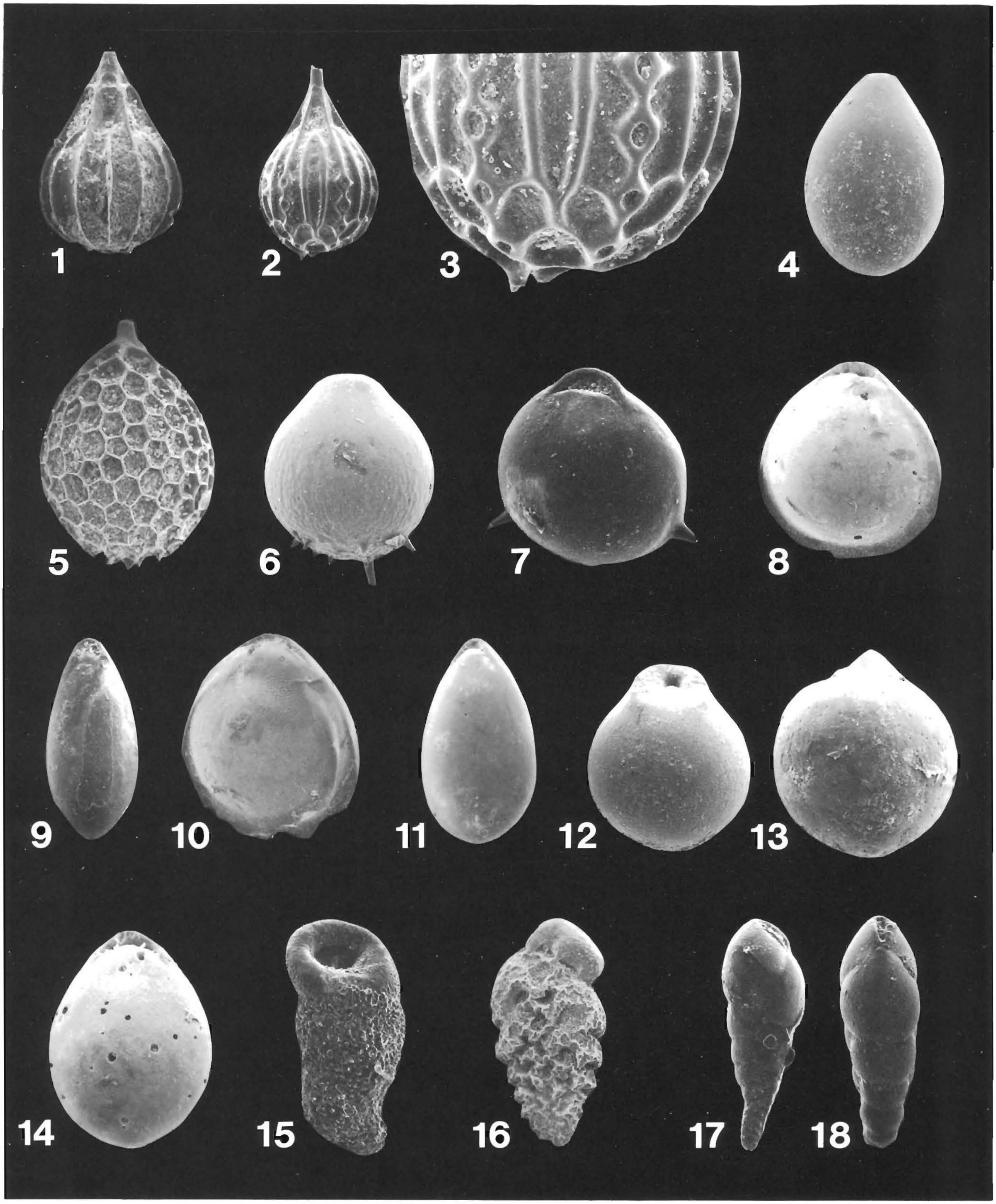
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PLATE 11

1 *Rectobolivina raphana* (Parker and Jones). Side view, 41.30 m, ×160.
2-5 *Siphonodosaria abyssorum* (Brady). **2** Side view, 43.30 m, ×60. **3** Side view of specimen with two proloculi, 70.60 m, ×36. **4** Apertural view, 82.70 m, ×100. **5** Apertural view, 97.90 m, ×72.
6, 7 *Siphonodosaria consobrina* (d'Orbigny). **6** Side view, 92.80, ×78. **7** Apertural view, 39.30 m, ×240.
8, 9 *Siphonodosaria lepidula* (Schwager). **8** Side view, 82.60 m, ×72. **9** Enlargement of ultimate chamber, side view of same specimen, 82.60 m, ×360.
10, 12 *Siphonodosaria* sp. 1. **10** Side view, 44.30 m, ×120. **11** Apertural view, 66.51 m, ×400. **12** Side view, 73.60 m, ×110.
13, 14 *Siphonodosaria* sp. 2. **13** Apertural view, 71.60 m, ×540. **14** Side view, 134.20 m, ×130.
15, 19 *Siphonodosaria* sp. 3. **15** Side view, 82.70 m, ×94. **19** Oblique apertural view, 140.30 m, ×660.
16 *Bulimina mexicana* Cushman. Side view, 119.10 m, ×260.
17 *Bulimina yonabarensis* LeRoy. Side view, 92.80 m, ×180.
18 *Bulimina fijiensis* Cushman. Side view, 113.00 m, ×320.

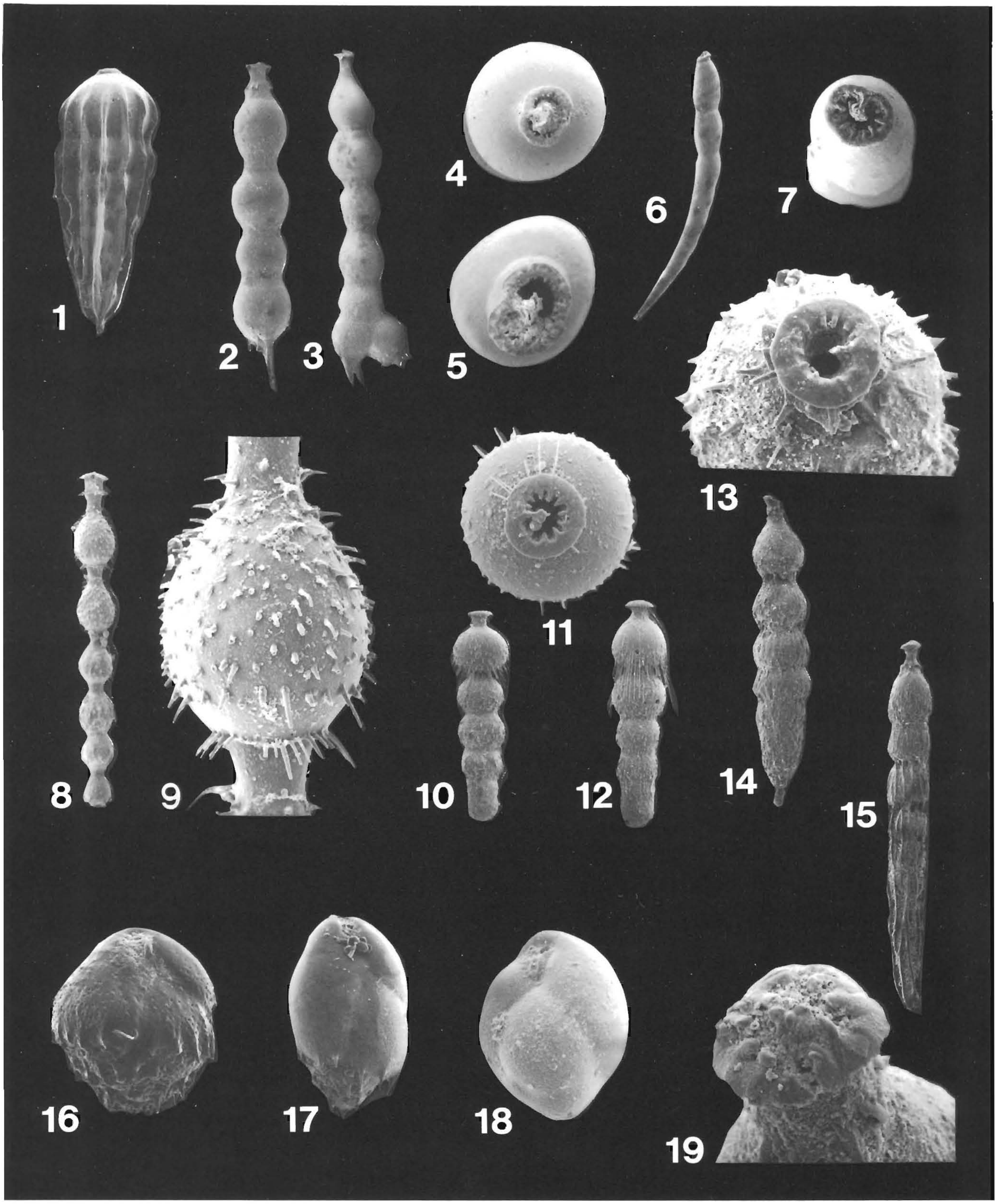
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PLATE 12

1-3 *Bulimina truncana* Guembel. **1** Side view, 40.30 m, ×160. **2** Side view, 40.30 m, ×150. **3** Apertural view, 40.30 m, ×220.

4, 5 *Uvigerina auberiana* d'Orbigny. **4** Side view of specimen with two apertures, 108.00 m, ×180. **5** Side view of specimen with two apertures, 105.90 m, ×180.

6-8 *Uvigerina peregrina* Cushman. **6** Side view, 120.10 m, ×100. **7** Side view, 126.60 m, ×220. **8** Side view, 120.10 m, ×110.

9, 10 *Discorbinella bertheloti* (d'Orbigny). **9** Spiral view, 43.30 m, ×240. **10** Umbilical view, 83.70 m, ×260.

11-13 *Gavelinopsis lobatulus* (Parr). **11** Spiral view, 67.50 m, ×220. **12** Edge view, 125.10 m, ×220. **13** Umbilical view, 119.10 m, ×260.

14, 18 *Heronallenia lingulata* (Burrows and Holland). **14** Spiral view, 119.10 m, ×320. **18** Umbilical view, 67.60 m, ×260.

15-17 *Nuttallides umbonifera* (Cushman). **15** Spiral view, 40.30 m, ×300. **16** Edge view, 40.30 m, ×360. **17** Umbilical view, 40.30 m, ×400.

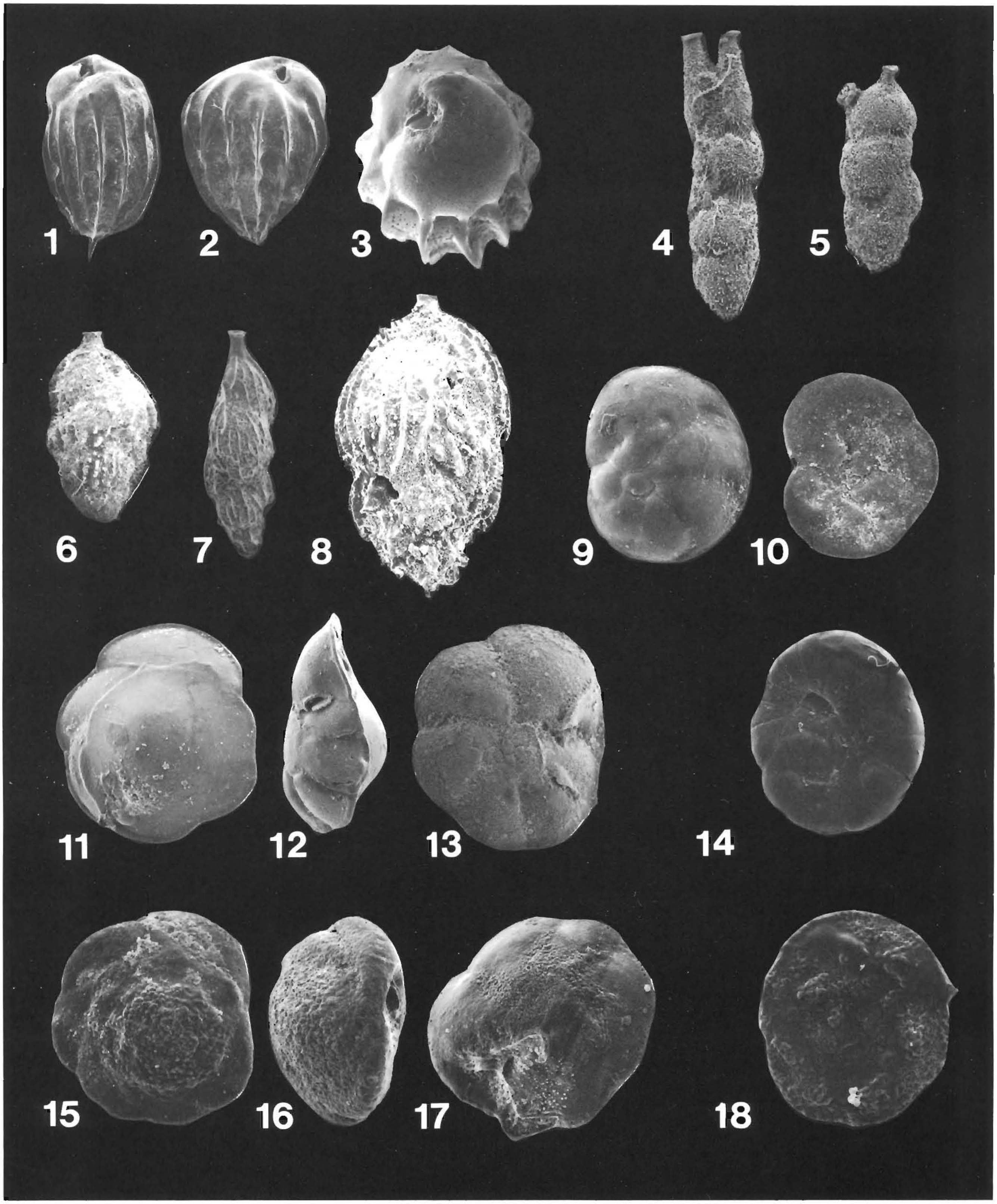
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PLATE 13

1 *Pleurostomella acuminata* Cushman. Edge view, 39.31 m, ×160.
2 *Pleurostomella recens* Dervieux. Side view, 69.60 m, ×130.
3, 4 *Pleurostomella* sp. 1. **3** Side view, 110.00 m, ×180. **4** Edge view, 107.00 m, ×180.
5, 6 *Pleurostomella* sp. 2. **5** Side view, 67.60 m, ×200. **6** Edge view, 124.90 m, ×200.
7 *Pleurostomella subnodosa* (Reuss). Side view, 54.40 m, ×180.
8-10 *Francesita advena* (Cushman). **8** Side view, 77.70 m, ×220. **9** Edge view, 74.60 m, ×220. **10** Enlargement of the perforate surface of the specimen in Fig. 8, 77.70 m, ×2,200.
11 *Ehrenbergina albatrossi* Cushman. Ventral view, 44.30 m, ×130.
12 *Ehrenbergina undulata* Parker. Ventral view, 44.30 m, ×260.
13 *Ehrenbergina trigona* Goës. Ventral view, 90.80 m, ×260.
14, 17 *Favocassidulina favus* (Brady). **14** Edge view, 73.60 m, ×200. **17** Spiral view, 70.60 m, ×180.
15, 16 *Globocassidulina decorata* Sidebottom. **15** Side view, 69.60 m, ×180. **16** Opposite side view, 90.40 m, ×170.

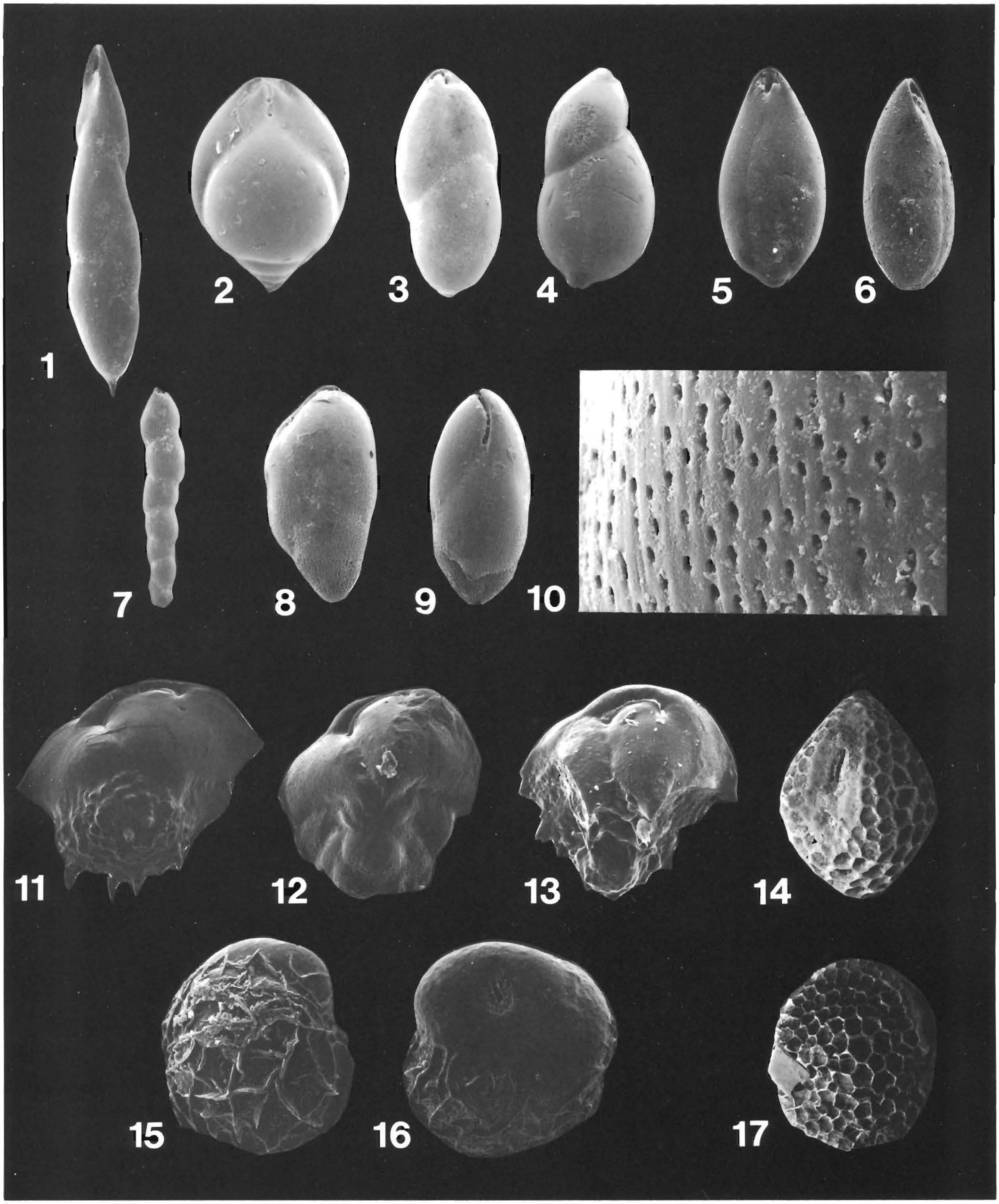
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PLATE 14

1, 2 *Allomorphina pacifica* Cushman and Todd. **1** Ventral view, 141.30 m, ×200. **2** Dorsal view, 41.30 m, ×220.
3, 4 *Rutherfordoides tenuis* (Phleger and Parker). **3** Side view, 63.50 m, ×120. **4** Enlargement of the test surface showing the elongate pores, 63.50 m, ×7,200.
5 *Chilostomella oolina* Schwager. Dorsal view, 104.90 m, ×120.
6 *Quadrimorphina allomorphinoides* (Reuss). Dorsal view, 48.29 m, ×200.
7, 8 *Rutherfordoides bradyi* (Cushman). **7** Ventral view, 137.50 m, ×160. **8** Enlargement of test surface showing the elongate pores, 137.30 m, ×7,200.
9 *Quadrimorphina glabra* (Cushman). Umbilical view, 69.60 m, ×180.
10, 11 *Astrononion novozealandicum* Cushman and Edwards. **10** Side view, 91.80 m, ×250. **11** Edge view, 39.31 m, ×300.
12-16 *Florilus* sp. 1. **12** Umbilical view, 120.10 m, ×260. **13** Umbilical view, 40.30 m, ×300. **14** Edge view, 41.30 m, ×320. **15** Spiral view, 124.20 m, ×320. **16** Enlargement of umbilical area of same specimen as in 12, 120.10 m, ×920.

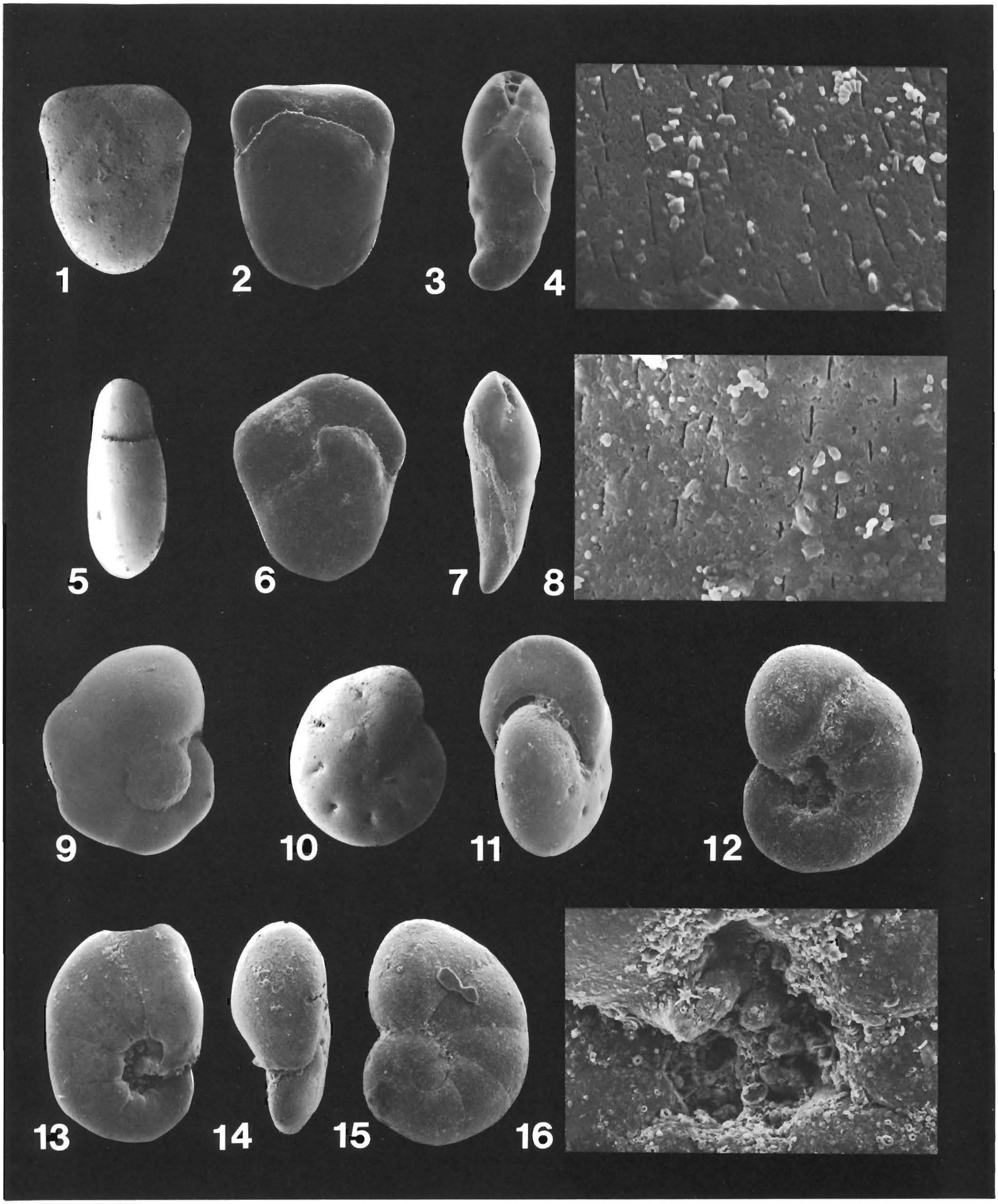
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PLATE 15

1-3 *Nonionellina* sp. 1. **1** Umbilical view, 111.00 m, ×300. **2** Edge view, 111.00 m, ×360. **3** Spiral view, 105.90 m, ×260.
4, 5 *Pullenia bulloides* (d'Orbigny). **4** Side view, 57.40 m, ×120. **5** Edge view, 59.50 m, ×110.
6, 7 *Pullenia subcarinata* (d'Orbigny). **6** Side view, 69.60 m, ×150. **7** Edge view, 47.30 m, ×120.
8-10 *Pullenia* sp. 1. **8** Side view, 117.10 m, ×210. **9** Edge view, 117.10 m, ×220. **20** Edge view showing the asymmetrical development of the last chamber, 117.10 m, ×200.
11, 12 *Pullenia* sp. 2. **11** Side view, 58.50 m, ×130. **12** Edge view, 48.29 m, ×150.
13-15 *Gyroidina altiformis* Stewart and Stewart. **13** Spiral view, 113.00 m, ×110. **14** Edge view, 39.31 m, ×110. **15** Umbilical view, 39.31 m, ×78.
16-18 *Gyroidina neosoldanii* Brotzen. **16** Spiral view, 39.31 m, ×200. **17** Edge view, 111.00 m, ×200. **18** Umbilical view, 39.31 m, ×220.

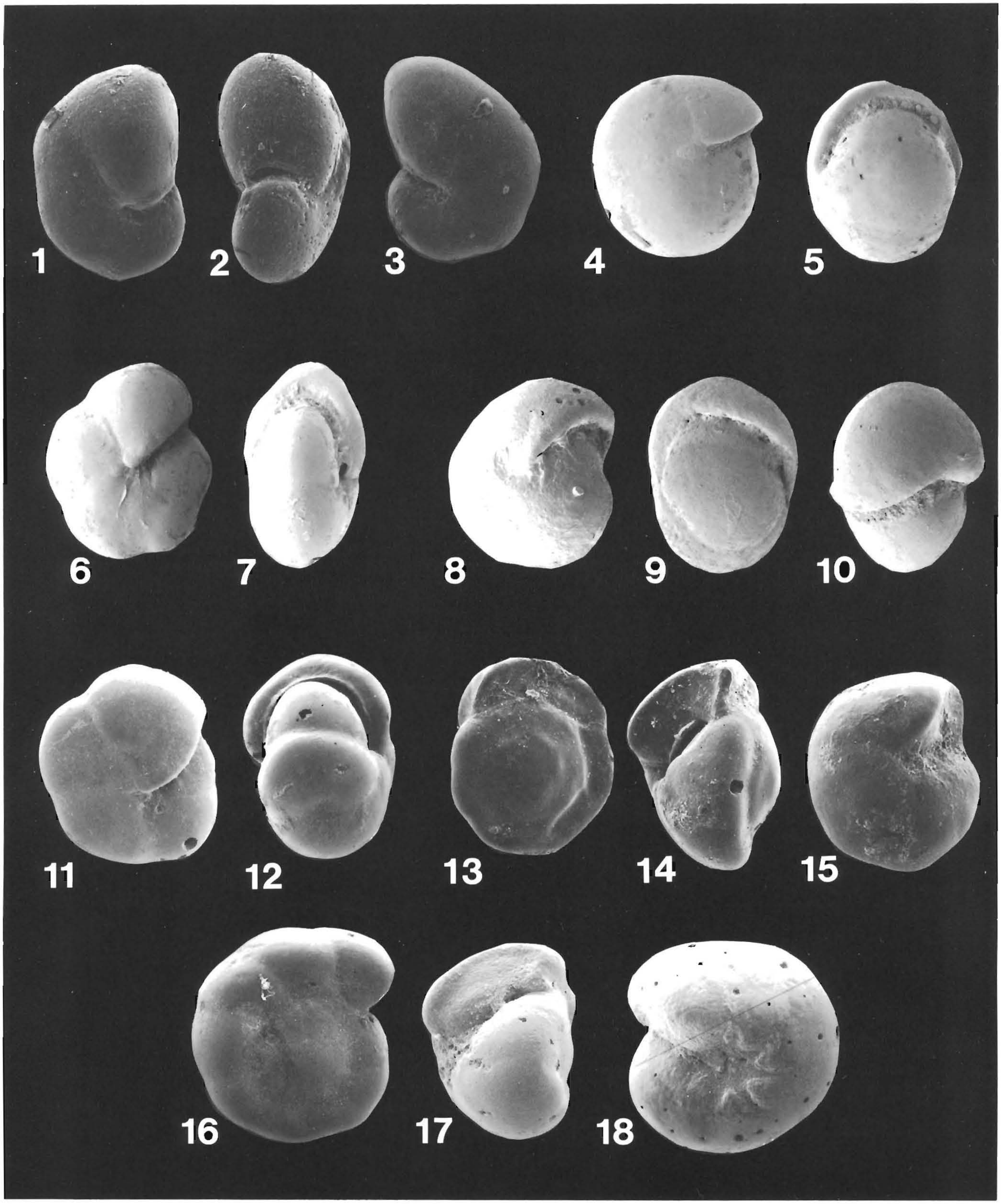
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PLATE 16

1-5 *Oridorsalis umbonatus* (Reuss). **1** Spiral view, 39.31 m, ×120. **2** Enlargement of supplemental aperture on spiral side, 39.31 m, ×120. **3** Edge view, 39.31 m, ×120. **4** Umbilical side, 39.31 m, ×540. **5** Enlargement of supplemental aperture on umbilical side, 39.31 m, ×860.

6, 10 *Gyroidinoides lamarckianus* (d'Orbigny). **6** Spiral view, 141.30 m, ×130. **10** Edge view, 141.30 m, ×150.

7-9 *Gyroidinoides orbicularis* (d'Orbigny). **7** Spiral view, 139.30 m, ×94. **8** Edge view, 138.30 m, ×94. **9** Umbilical view, 115.00 m, ×260.

11-13 *Osangularia culter* (Parker and Jones). **11** Umbilical view, 41.30 m, ×180. **12** Edge view, 41.30 m, ×200. **13** Spiral view, 40.30 m, ×150.

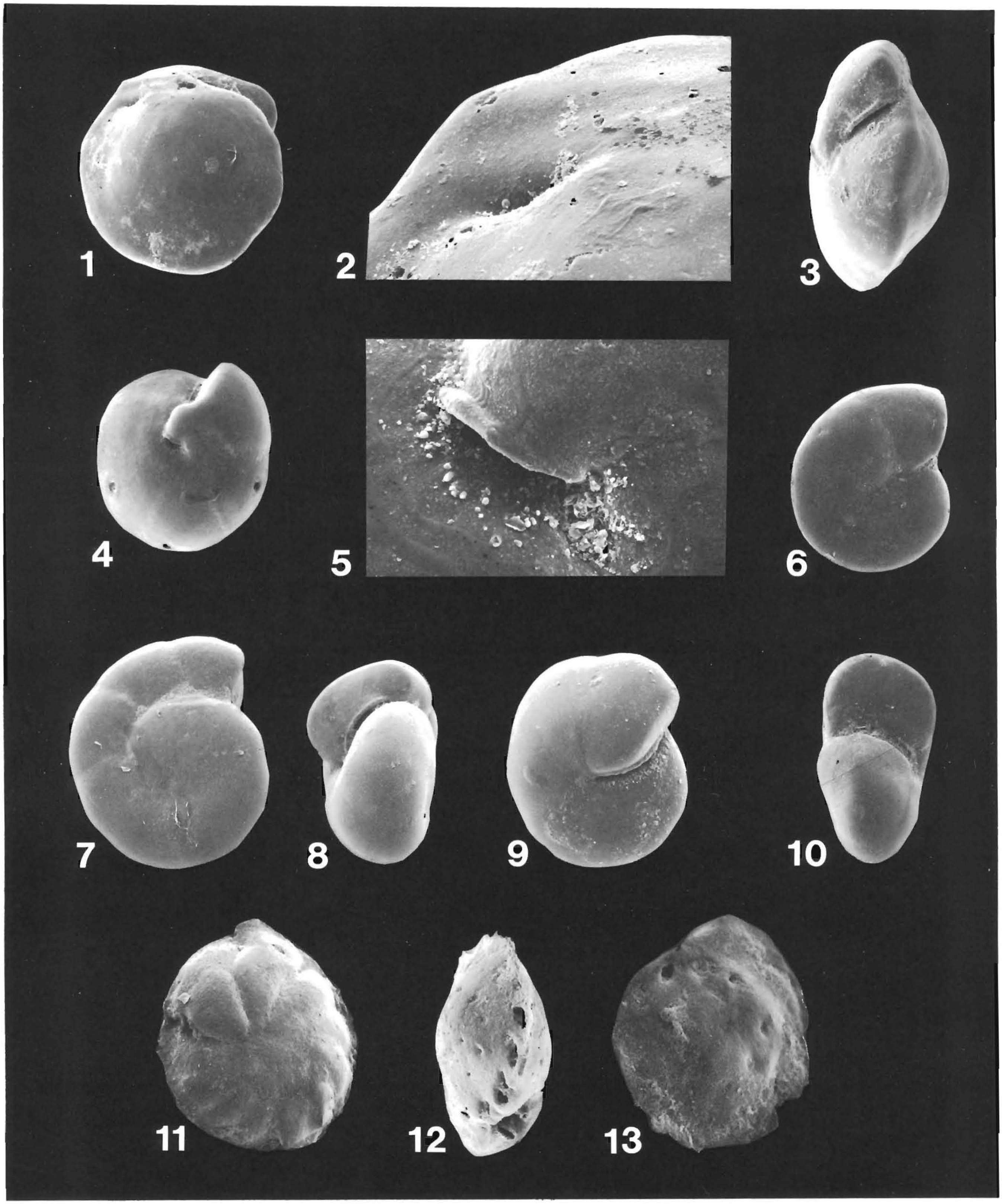
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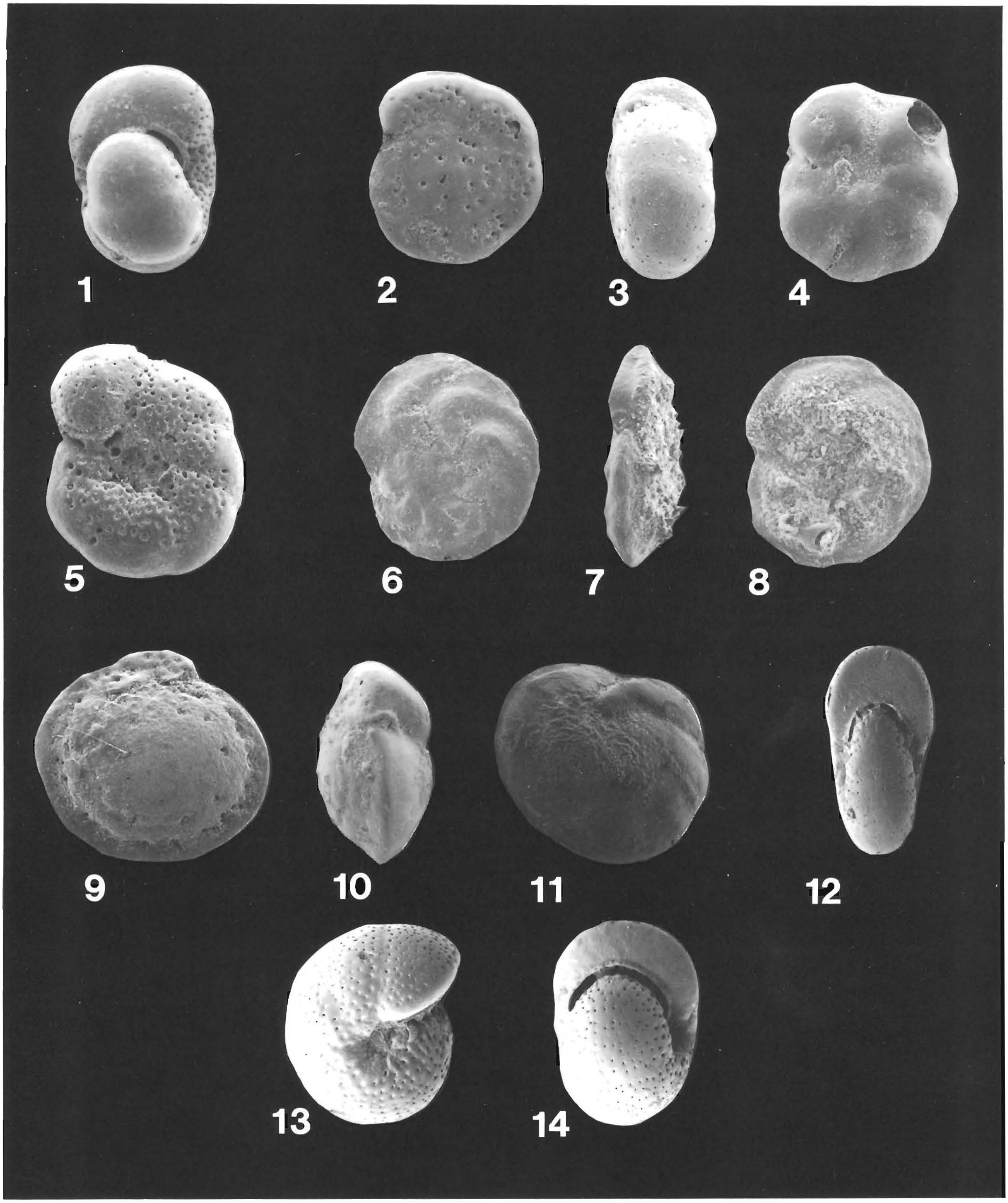
PLATE 17

1, 5 *Anomalinoides globulosus* (Chapman and Parr). **1** Edge view, 39.31 m, ×150. **5** Umbilical view, 39.31 m, ×160.
2-4 *Cibicidoides bradyi* (Trauth). **2** Spiral view, 132.20 m, ×180. **3** Edge view, 39.31 m, ×160. **4** Umbilical view, 39.31 m, ×180.
6-8 ? *Cibicidoides* sp. 1. **6** Spiral view, 115.00 m, ×320. **7** Edge view, 117.10, ×320. **8** Umbilical view, 109.10 m, ×260.
9-11 *Cibicidoides mundulus* (Brady, Parker and Jones). **9** Spiral side, 41.30 m, ×180. **10** Edge view, 41.30 m, ×180. **11** Umbilical view, 41.30 m, ×180.
12 *Melonis barleeanum* (Williamson). Edge view, 48.29 m, ×170.
13, 14 *Melonis pompiloides* (Fichtel and Moll). **13** Side view, 50.30 m, ×150. **14** Edge view, 50.30 m, ×160.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