

## A taxonomic guide to modern benthic shelf foraminifera of the western Mediterranean Sea

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### ABSTRACT

A total of 288 modern benthic carbonate shelf foraminifera in three areas of the Western Mediterranean Sea (Alboran Platform, Oran Bight and the southwest shelf of Mallorca) have been studied and are systematically listed. This systematic description provides a list of synonyms, short remarks about morphological features of the taxa and some annotations about taxa with problematic generic status. Most of the taxa are illustrated by SEM photographs.

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KEY WORDS: benthic foraminifera; Western Mediterranean Sea; Holocene; taxonomy; shelf

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### INTRODUCTION

Foraminifera are a widely distributed and diverse order of protists in marine environments. They play an important role in ecological and paleo-ecological studies due to their high numerical density in marine sediments and the excellent preservation potential of their shells. Benthic foraminifera show a great diversity with more than 10,000 modern taxa (Sen Gupta, 2003). An accurate knowledge of the taxonomy of foraminifera provides the basis for any applications in paleoenvironmental or biostratigraphic studies of these protozoa. In the early eighteenth century, Schuchzer was the first who identified foraminifera as animals, and he assigned them to the gastropoda

(Nuglisch, 1985). Lamarck established independent foraminiferal orders such as *Discorbis*, *Rotalia*, *Lenticulina* and *Nummulites* in 1801 and 1804 (Nuglisch, 1985). D'Orbigny, who played an important role in foraminiferal research, categorized foraminifera as their own order inside the cephalopoda in 1826, and Dujardin assigned them to the protozoa in 1841 (Nuglisch, 1985). Since the first investigations, more systematic studies were carried out by Reuss, Ehrenberg and later by Thalman. An important monograph about modern foraminifera based on the material collected during the Challenger expedition (1872-1876) was published by Brady (1884) and later republished in revised forms by Barker (1960) and Jones (1994). In the

PE Article Number: 15.2.16A

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Submission: 22 February 2011. Acceptance: 25 January 2012

early twentieth century, Cushman was one of the leading researchers of foraminiferal taxonomy. The last *magnum opus* on foraminifera dates back to 1988, when Loeblich and Tappan published a comprehensive work about the taxonomy of foraminifera with a description of 878 genera.

The Mediterranean Sea is a classical region for investigations in foraminiferal taxonomy. D'Orbigny described numerous current taxa from the Mediterranean region in 1826. Further, more scientists such as Parker (1958) and Todd (1958) investigated deep sea benthic and planktonic foraminifera from the Eastern and Western Mediterranean Sea, collected during the Swedish Deep Sea Expedition (1946-1948) and the Atlantic cruise 151 (1948). Hofker (1960) investigated the taxonomy of shallow water benthic foraminifera from the Gulf of Naples. More recent comprehensive and systematic descriptions were provided by Cimerman and Langer (1991) for the Adriatic and Tyrrhenian Seas, by Sgarrella and Moncharmont Zei (1993) from the Gulf of Naples, and by Rasmussen (2005) from the southern Aegean Sea. Besides these works, there are many additional publications about foraminiferal taxonomy from the Mediterranean Sea (among others, Alberola et al., 1987; Jorissen, 1987; Mendes et al., 2004; Frezza and Carboni, 2009), and the Sea of Marmara (e.g., Kaminski et al., 2002; Chendes et al., 2004; Avsar et al., 2006).

### OCEANOGRAPHIC SETTINGS

The surface water in the Western Mediterranean Sea consists of inflowing surface water from the Atlantic Ocean (AW). The subsurface water consists of Levantine Intermediate Water formed in the Eastern Mediterranean Sea, and the deep water consists of Western Mediterranean Deep Water (Robinson et al., 2001; Masque et al., 2003; Rixen et al., 2005). The AW enters the Alboran Basin in the form of two anticyclonic gyres - the Western Alboran Gyre (WAG) and the Eastern Alboran Gyre (EAG). These gyres are zones of enhanced vertical mixing and nutrient entrainment (L'Helguen et al., 2002; Masque et al., 2003; Velez-Belchi et al., 2005). The Oran Bight region is influenced by the variable Algerian Current, flowing along the Algerian coast. It supplies the coastal regions with elevated nutrient loads and is characterized by higher chlorophyll *a* values when compared to the more oligotrophic Algerian Basin (Millot et al., 1990; Arnone, 1994). As a consequence of these oceanographic settings, the Alboran Basin and the Oran Bight exhibits higher

annual primary production rates when compared to the more oligotrophic Balearic region (Antoine et al., 1995).

On the Alboran Platform and in the Oran Bight, surface water velocities are relatively high. Velez-Belchi et al. (2005) have measured velocities of the WAG between 124 and 140 cm/s in October 1996. In contrast, surface water velocities southwest off Mallorca are lower and ranging between < 15 cm/s and a maximum of 50 cm/s during storm events (Werner et al., 1993).

### MATERIAL AND METHODS

For this study, surface samples and sediment-cores from three areas in the Western Mediterranean Sea (Alboran Platform, Oran Bight and the southwest shelf off Mallorca), recovered during Meteor cruise M69/1 in August 2006, were investigated (Table 1, Figures 1, 2, 3, 4). Surface samples were taken with box and grab corer, and the first 1-2 cm of the sediment was stained in an ethanol-Bengal Rosa solution for three months. Three sediment cores (core 342-1 from Alboran Platform, core 367-1 from Oran Bight and core 401-1 from Mallorca Shelf) were recovered from water depths, ranging from 63 to 74 m, by vibro coring (Table 1, Figures 2, 3, 4).

All samples were wet-sieved with a 63  $\mu\text{m}$  sieve and dried in a dry oven at 40°C. For recent and fossil foraminiferal investigation, the fraction >125  $\mu\text{m}$  has been counted after dry-sieving. Samples were split into equal aliquots to generate subsamples with approximately 300 empty benthic foraminiferal tests. Due to the low contents of Rose Bengal stained foraminifera in the surface samples, higher sample volumes were investigated. The cores were analyzed in a resolution of 5 cm except core 342-1, which was analyzed in a resolution of 20 cm in its lower part. A total of 14 surface samples are from the Alboran Platform, 18 surface samples are from the Oran Bight and 14 surface samples are from the Mallorca Shelf, ranging from 20 to 235 m water depth, was investigated. The cores contain a total of 64 (core 342-1), 58 (core 367-1) and 94 (core 401-1) samples and cover the latest glacial period (core 342-1) and the Holocene (cores 367-1 and 401-1).

In order to extract dominant recent and fossil assemblages and for the investigation of species-environment relations, statistical methods (Principal Component Analysis (PCA) and Redundancy Analysis (RDA)) were applied on the recent and fossil assemblages. For a description of these methods see Milker et al. (2009). The age models

**TABLE 1.** Location and water depth of the surface samples and sediment cores (in bold). Surface samples were taken with box and grab corer (BG, KG) and from top of sediment cores recovered with vibrocorer (VC\*). All cores were drilled with vibrocorer (VC).

No.	Location	Date	Latitude	Longitude	Depth [m]	Gear
326-1	Alboran Platform	16.08.2006	35°52.450'N	3°05.150'W	102	BG
327-1	Alboran Platform	16.08.2006	35°53.890'N	3°05.950'W	115	BG
328-1	Alboran Platform	16.08.2006	35°55.130'N	3°03.311'W	69	BG
329-1	Alboran Platform	16.08.2006	35°55.200'N	3°02.820'W	60	BG
330-1	Alboran Platform	16.08.2006	35°56.200'N	3°00.690'W	63	BG
331-1	Alboran Platform	16.08.2006	35°59.300'N	2°59.500'W	86	BG
332-2	Alboran Platform	16.08.2006	35°59.510'N	2°57.210'W	83	BG
333-1	Alboran Platform	16.08.2006	36°00.655'N	2°49.732'W	161	BG
334-1	Alboran Platform	16.08.2006	35°57.500'N	2°56.020'W	97	BG
335-1	Alboran Platform	16.08.2006	35°58.035'N	2°59.890'W	73	BG
336-1	Alboran Platform	16.08.2006	35°54.450'N	3°05.535'W	91	BG
341-2	Alboran Platform	17.08.2006	35°55.103'N	3°02.194'W	53	VC*
342-1	Alboran Platform	17.08.2006	35°56.400'N	3°00.213'W	64	VC*
<b>342-1</b>	<b>Alboran Platform</b>	<b>17.08.2006</b>	<b>35°56.400'N</b>	<b>3°00.213'W</b>	<b>64</b>	<b>VC</b>
343-2	Alboran Platform	17.08.2006	35°55.588'N	3°01.915'W	38	VC*
351-1	Oran Bight	19.08.2006	35°48.490'N	0°34.000'W	70	BG
352-1	Oran Bight	19.08.2006	35°47.500'N	0°33.810'W	48	KG
353-1	Oran Bight	19.08.2006	35°47.230'N	0°37.650'W	73	BG
354-1	Oran Bight	19.08.2006	35°45.872'N	0°40.232'W	84	BG
355-1	Oran Bight	19.08.2006	35°50.696'N	0°35.306'W	127	BG
356-1	Oran Bight	19.08.2006	35°50.207'N	0°35.000'W	118	BG
357-1	Oran Bight	19.08.2006	35°51.204'N	0°33.092'W	100	BG
357-2	Oran Bight	19.08.2006	35°51.198'N	0°33.092'W	100	KG
358-1	Oran Bight	20.08.2006	35°50.802'N	0°32.700'W	85	BG

for the cores are based on various AMS<sup>14</sup>C measurements. For further information see Milker et al. (2011).

All surface samples and cores were taken from cool-water carbonates areas that are protected from major siliciclastic input. The surface and core sediments from the Alboran Platform consist of calcarenites and calcirudites with an admixture of volcanoclastic debris that contain rhodoliths, bioclasts, bryozoa, mollusc-shells and shell debris. The two shallowest samples (20 m and 40 m water depth) from Oran Bight consists of siliciclastic sands, while the other surface and core sediments also consist of calcirudites and calcarenites with rhodoliths, lithoclasts encrusted by coralline crusts, bivalves and gastropods. The surface samples from the shallower sites off the southwest shelf of Mallorca shelf have a composition similar to those from the Alboran Platform and Oran Bight, while the sediments of the deeper stations are composed of fine-grained calcarenite and contain a few sea

grass fragments. The lower core part of core 401-1 from the Mallorca Shelf consists of calcirudite with rhodoliths. The middle and upper parts of the core are composed of fine-grained calcarenites with debris and shells of bivalves, pteropods and gastropods and a *Turritella communis*-rich layer in its middle part. For detailed characterization of the surface and core sediments see Betzler et al. (2011) and Milker et al. (2009).

## SYSTEMATICS

A total of 103 living (Rose Bengal stained) species and a total of 220 species with empty tests from the fraction >125 µm were identified on taxa level in the surface samples. In the sediment-cores 342-1, 367-1 and 401-1, a total of 180, 176 and 205 fossil benthic species were identified on taxa level (Appendix 1, 2, 3, 4, 5 - available online). Very rare species, or species that were difficult to identify, have been summarized into their genera or family. The water depth distribution of the recent

TABLE 1 (continued).

359-1	Oran Bight	20.08.2006	35°50.200' N	0°32.000' W	78	BG
360-1	Oran Bight	20.08.2006	35.49.890' N	0°31.600' W	83	BG
361-1	Oran Bight	20.08.2006	35°49.990' N	0°30.510' W	67	BG
362-1	Oran Bight	20.08.2006	35°50.895' N	0°29.496' W	20	KG
363-1	Oran Bight	20.08.2006	35°52.110' N	0°30.500' W	97	BG
364-1	Oran Bight	20.08.2006	35°52.900' N	0°30.800' W	121	BG
365-1	Oran Bight	20.08.2006	35°53.900' N	0°31.297' W	130	BG
<b>367-1</b>	<b>Oran Bight</b>	<b>20.08.2006</b>	<b>35°48.000' N</b>	<b>0°33.700' W</b>	<b>63</b>	<b>VC</b>
373-1	Oran Bight	20.08.2006	35.49.664' N	0°34.673' W	90	BG
374-1	Oran Bight	20.08.2006	35°50.005' N	0°34.886' W	100	BG
375-1	Oran Bight	20.08.2006	35.51.105' N	0°35.526' W	115	BG
377-1	Mallorca Shelf	24.08.2006	39°18.879' N	2°47.827' E	47	BG
378-1	Mallorca Shelf	24.08.2006	39°21.192' N	2°47.810' E	40	BG
379-1	Mallorca Shelf	24.08.2006	39°19.601' N	2°46.208' E	48	BG
380-1	Mallorca Shelf	24.08.2006	39°18.098' N	2°44.702' E	56	BG
381-1	Mallorca Shelf	24.08.2006	39°17.005' N	2°43.300' E	67	BG
382-1	Mallorca Shelf	24.08.2006	39°16.101' N	2°42.196' E	74	BG
384-1	Mallorca Shelf	24.08.2006	39°18.095' N	2°49.013' E	61	BG
387-1	Mallorca Shelf	24.08.2006	39°15.503' N	2°41.498' E	80	BG
388-1	Mallorca Shelf	24.08.2006	39°15.214' N	2°41.089' E	94	BG
390-1	Mallorca Shelf	24.08.2006	39°14.830' N	2°40.532' E	116	BG
391-1	Mallorca Shelf	24.08.2006	39°13.610' N	2°39.090' E	163	BG
393-1	Mallorca Shelf	25.08.2006	39°10.601' N	2°40.398' E	235	KG
<b>401-1</b>	<b>Mallorca Shelf</b>	<b>25.08.2006</b>	<b>39°17.101' N</b>	<b>2°48.305' E</b>	<b>74</b>	<b>VC</b>
403-1	Mallorca Shelf	25.08.2006	39°14.798' N	2.45.524' E	94	BG
404-1	Mallorca Shelf	25.08.2006	39°13.970' N	2°44.496' E	105	BG

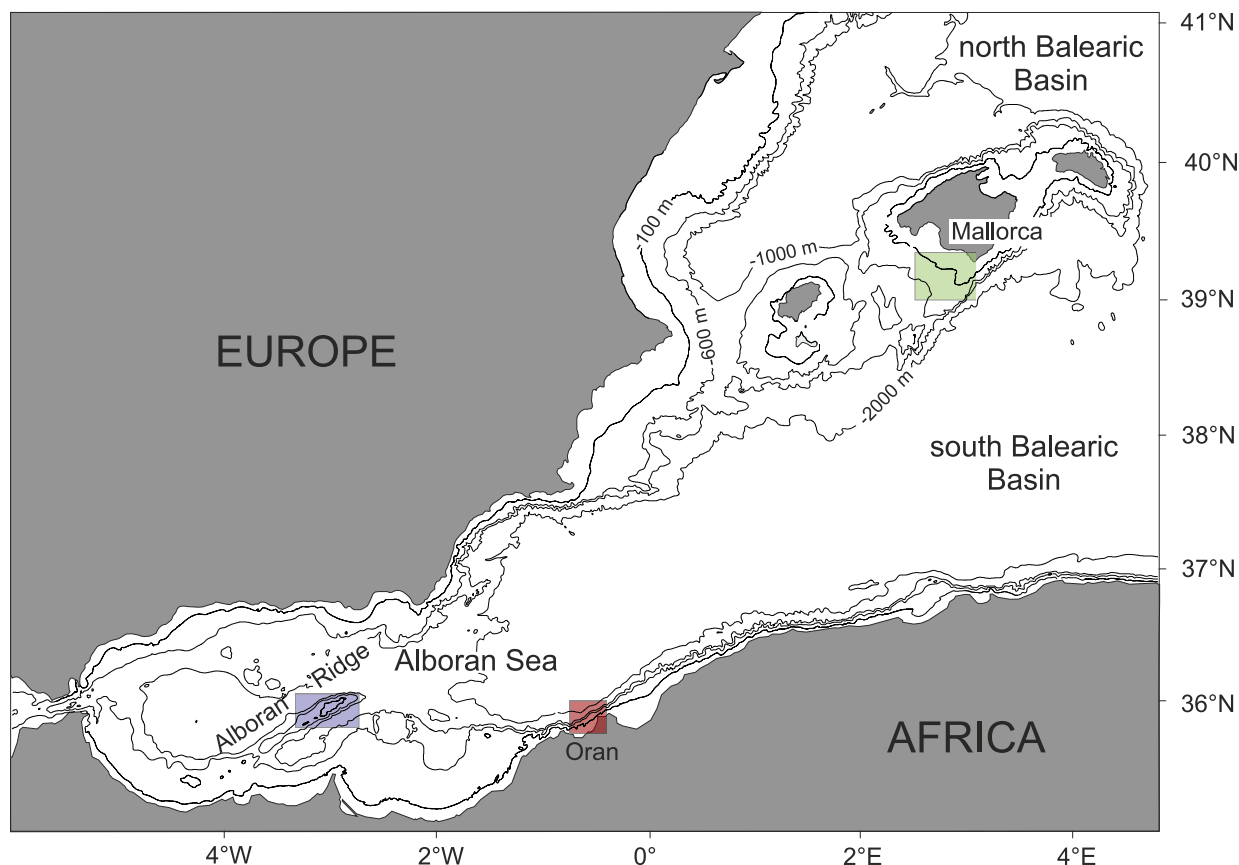
foraminifera and abundance data of the fossil foraminifera during the latest glacial period and the Holocene are provided in Table 2.

The classification of Loeblich and Tappan (1988) provides the basis for the generic classification of this study. Identification on the species level is primarily based on the publications of Cimerman and Langer (1991), Sgarrella and Moncharmont Zei (1993) and Rasmussen (2005). Furthermore, other publications about the Mediterranean Sea were studied (e.g., Parker, 1958; Hofker, 1960; Jorissen, 1987; Alberola et al., 1987; Alberola et al., 1991; Mendes et al., 2004; Debenay et al., 2005; Abu-Zied et al., 2008; Frezza and Carboni, 2009). Valuable information was also provided by comprehensive taxonomic studies from other areas, such as the Atlantic Ocean (Brady, 1884; Cushman, 1918, 1920, 1923, 1929, 1930a, 1930b and 1931; Jones, 1994), the North Pacific Ocean (Cushman, 1910, 1911, 1914, 1915 and 1917; Cushman and McCulloch, 1939) or the Red Sea (Hottinger et al., 1993). For some minor species where the original description was not available,

the reference to the original description is based on the Ellis and Messina catalogue (1940-2005). In the systematic description, species within the same genus are listed in alphabetical order. The given references include publications that have an extensive list of synonyms, useful illustrations and taxa descriptions. The given remarks contain short morphological descriptions of all species. Furthermore, annotations on controversial species classifications are given. SEM photographs of most of the species were performed at the University of Hamburg with a Zeiss LEO 1455VP. Specimens described here are deposited at the University of Hamburg, Geological-Paleontological Institute.

#### DISTRIBUTION OF RECENT AND FOSSIL BENTHIC FORAMINIFERA AND SPECIES-ENVIRONMENT RELATIONS

A detailed description of the distribution of recent and fossil benthic foraminiferal in the study areas was already given in Milker et al. (2009, 2011). In this section, we present a summary of the results and discussions given there. Further infor-



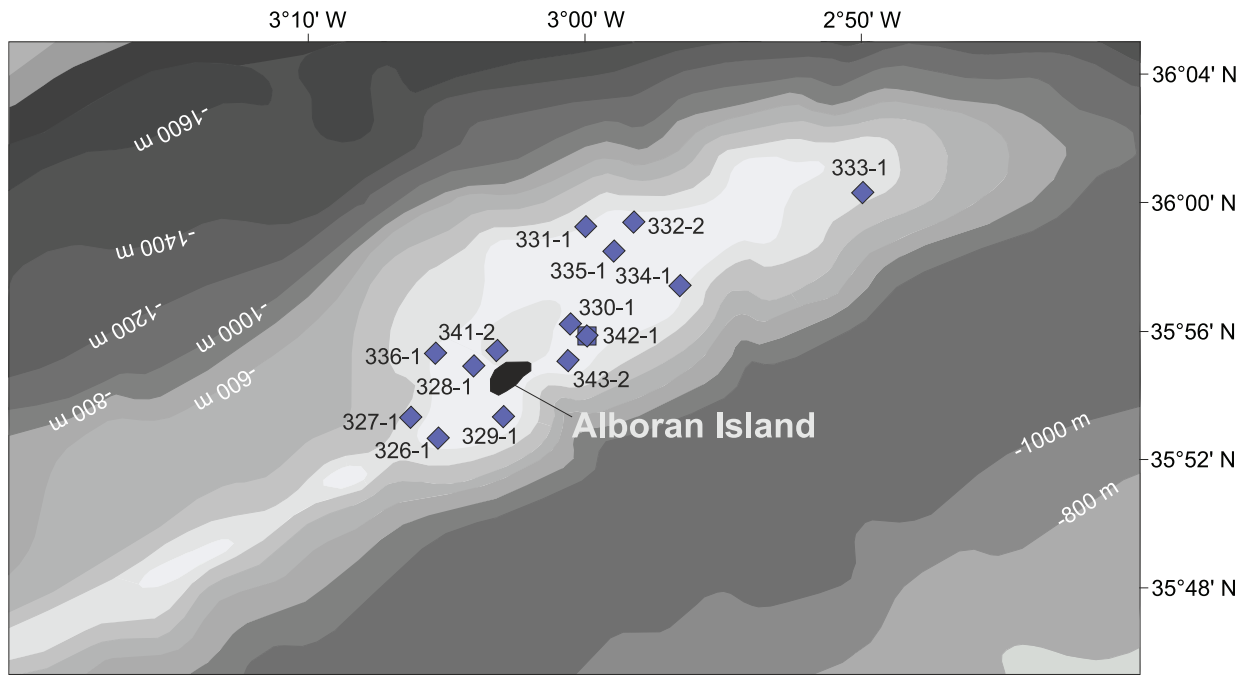
**FIGURE 1.** Overview of the Western Mediterranean Sea, showing the sampling areas Alboran Platform, Oran Bight and southwest shelf off Mallorca (see also Table 1). For detailed maps with sample and sediment core locations see Figures 2-4.

mation about the distribution of benthic foraminifera in the surface and core samples is also provided in Table 2.

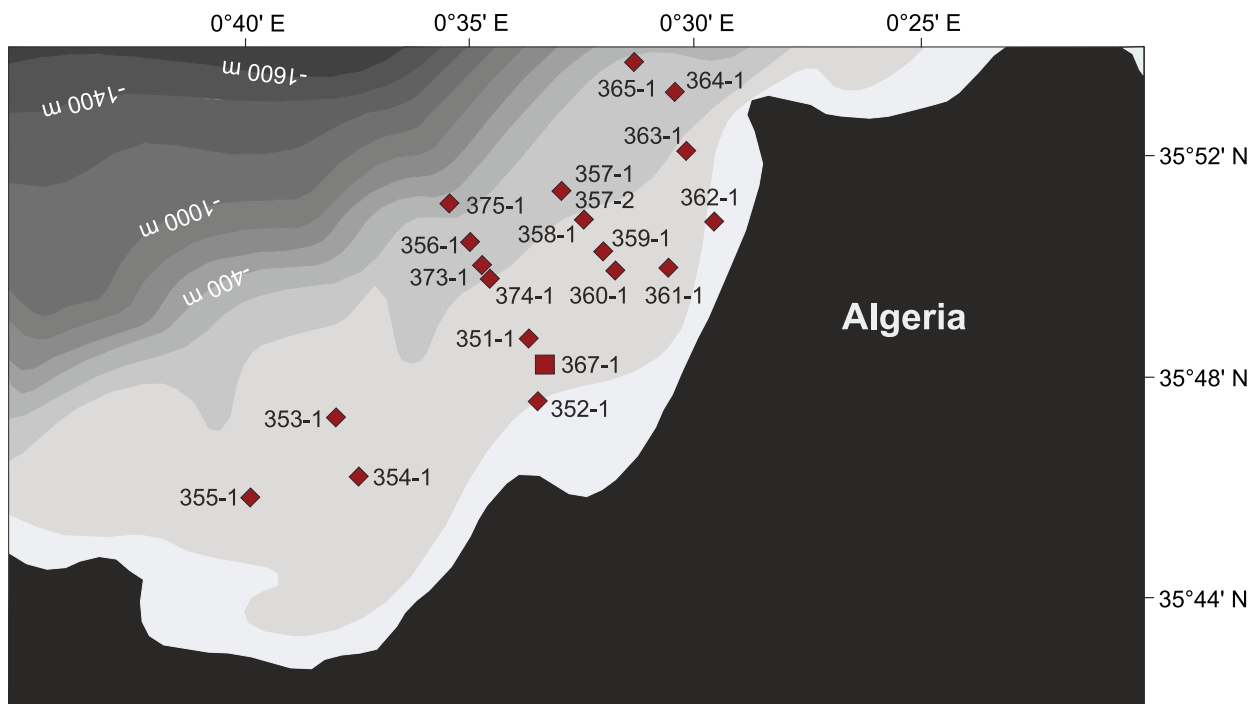
The total number of living benthic foraminifera was generally low in the study areas while the total benthic foraminiferal number (BFN) with empty tests was highly variable, ranging between 320 and ~99,000 individuals per 10 cm<sup>3</sup> (Figure 5). The highest standing stocks, with a maximum of 535 living individuals per 10 cm<sup>3</sup> sediment, were observed on the Mallorca Shelf. The highest BFN with more than 99,000 individuals was reached on the Alboran Platform and the Mallorca Shelf, respectively. In the Oran Bight and on the Alboran Platform only 298 and 52 living individuals per 10 cm<sup>3</sup> were found, respectively (Figure 5). The diversity of the live fauna from the Alboran Platform was low with a total of only 19 taxa while the number of taxa with empty tests ranged between 16 and 112 (Figure 5). The most abundant live species on the Alboran Platform were *Cassidulina obtusa* and *Lenticulina orbicularis* (Table 2, Appendix 1). The

diversity of the live fauna from the Oran Bight was higher with a total of 76 taxa, and a total of 17-115 taxa have been observed in the thanatocoenosis (Figure 5). The biocoenosis was dominated by *Cancris auriculus*. *Brizalina striatula*, *Bulimina elongata* and *Rectuvigerina phlegeri* occurred in elevated numbers (Table 2, Appendix 1). The live fauna from the Mallorca Shelf has shown the highest diversity with a total of 83 different taxa. A total of 68-98 taxa have been observed in the thanatocoenosis (Figure 5). The samples from shallower water depths mainly consisted of living miliolids, *Neoconorbina terquemi*, *Textularia pala* and *Asterigerinata mamilla* s.l. The samples from the deeper sites were characterized by elevated numbers of living *Cassidulina laevigata* s.l., *Hyalinea balthica*, *Textularia calva*, *Cassidulina obtusa* and *Melonis affinis* (Table 2, Appendix 1).

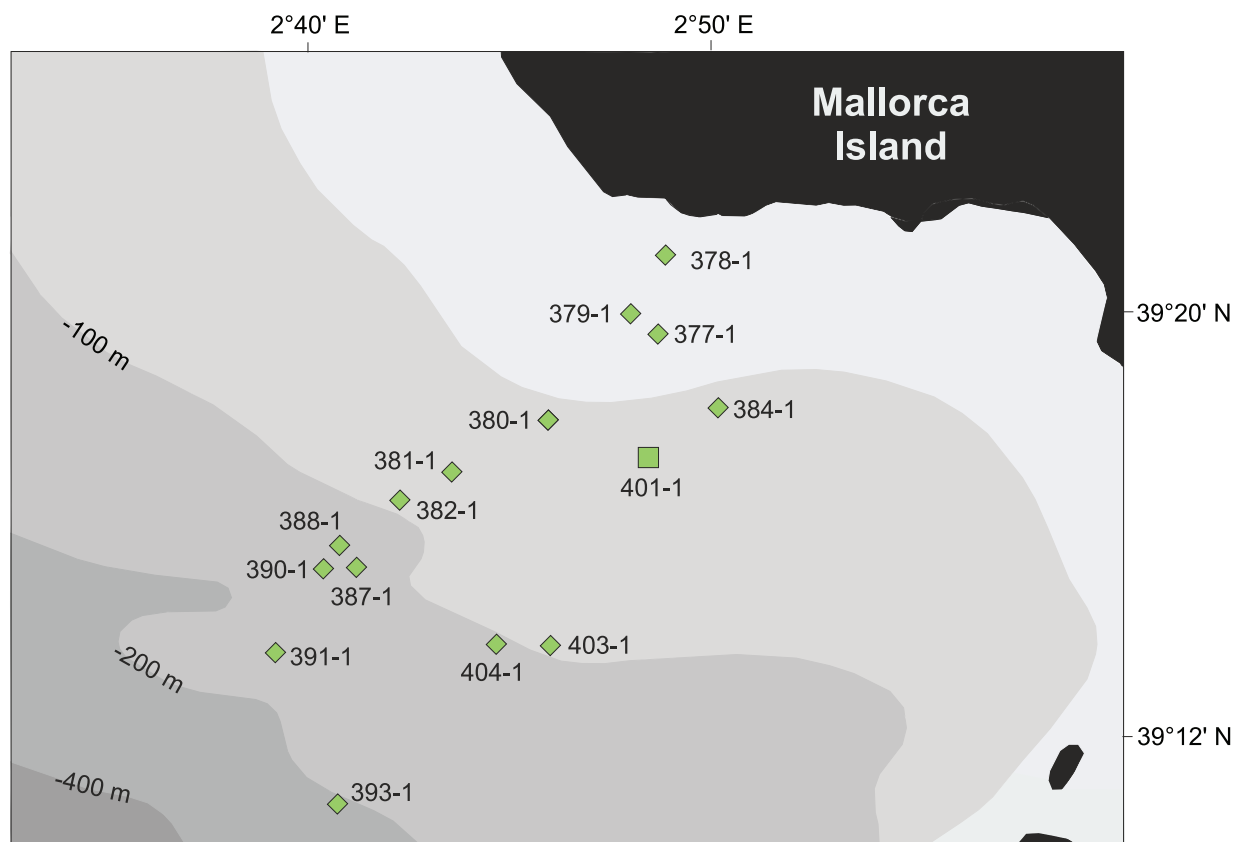
The standing stocks and live diversities in the cool-water carbonate shelf areas discussed here display generally lower values when compared to faunas from siliciclastic shelf environments of the western Mediterranean Sea, (e.g., Mojtahid et al.,



**FIGURE 2.** Map of the Alboran Platform region, showing the locations of the surface samples (blue diamonds) and sediment core 342-1 (blue square). Surface samples were taken from 38 to 161 m water depth, and the core was drilled at 64 m water depth.



**FIGURE 3.** Map of the Oran Bight region, showing the locations of the surface samples (red diamonds) and sediment core 367-1 (red square). Surface samples were taken from 20 to 130 m water depth, and the core was drilled at 63 m water depth.



**FIGURE 4.** Map of the southwest Mallorca Shelf, showing the locations of the surface samples (green diamonds) and sediment core 401-1 (green square). Surface samples were taken from 40 to 235 m water depth, and the core was drilled at 74 m water depth.

2009; Frezza and Carboni, 2009). The relatively low diversities of the living fauna may reflect seasonal population dynamics. The diversities of the dead faunas have similar or even higher numbers when compared to those from siliciclastic shelf environments of the Mediterranean (Frezza and Carboni, 2009, own unpubl. data) but are slightly lower than in mixed siliciclastic-carbonate ecosystems of the southeastern Levantine shelf (Hyams-Kaphzan et al., 2008).

A Principal Component Analysis (PCA), applied on the dead foraminiferal data set, show major faunal shifts between ~80 and ~96 m water depth in all study areas (Figure 6). Further, it provides evidence for regional differences in the faunal composition. The shallower stations of the Alboran Platform were dominated by an *Asterigerinata mamilla* s.l.-assemblage with *Elphidium complanatum* and *Lobatula lobatula* as further dominant taxa and the *Cibicidoides pseudoungerianus*-assemblage with *Cassidulina obtusa* and *A. mamilla* s.l. as associated taxa (Figure 6, Table 3). The deeper stations consisted of a *C. obtusa*-

assemblage with *Globocassidulina subglobosa* as further dominant taxon and the *E. complanatum*-assemblage with *Cibicides refulgens* as further dominant species (Figure 6). The shallowest sites in the Oran Bight were also dominated by an *A. mamilla* s.l.-assemblage with *Rosalina macropora* as further dominant taxon and a *L. lobatula*-assemblage with *Neoconorbina terquemi* as further dominant species (Figure 6, Table 3). At intermediate depths, a *Gaudryina rudis*-assemblage with *L. lobatula* as associated taxon was significant. In the deeper stations, a *G. subglobosa*-assemblage with *C. obtusa* as dominant taxon and a *Cassidulina laevigata* s.l.-assemblage with *Globocassidulina oblonga* as associated taxon dominated the thanatocoenoses (Figure 6, Table 3). The shallower sites on the Mallorca Shelf were characterized by assemblages consisting of a *Lobatula lobatula*-assemblage (with *Textularia calva* and *G. rudis* as further taxa), a *N. terquemi*-assemblage (with *A. mamilla* s.l. as further dominant taxon) and a *Spiroplectinella sagittula*-assemblage (with *A. mamilla* s.l. and *L. lobatula* as further dominant

**TABLE 2.** Recent abundance and water depth distribution and fossil abundance of the described species. Species have been classified, depending on their abundance on the total recent and fossil assemblages in percent in the three investigated areas, into the following categories: (o) = extremely rare; o = very rare (<1%); oo = rare (1-5%); ooo = frequent (5-10%), oooo = abundant (10-25%) and ooooo = dominant (>25%). The distribution of fossil species that are abundant in at least 1/3 of the core samples have been listed into the following time

intervals: late Holocene ( $\leq 3500$  cal. years BP), middle Holocene (3500 - 6500 cal. years BP), early Holocene (6500 - 11 700 cal. years BP) and the late glacial period ( $\geq 11 700$  cal. years BP). The distribution of fossil species that are extremely rare and only occur in a few core samples is not given here except for those that have been only found in the fossil assemblages (\* summarized to *Ammonia* spp., \*\* summarized to *Asterigerinata mamilla* s.l.)

Species	Area	Recent distribution			Fossil distribution			
		Abundance	Biocoenosis	Thanatocoenosis	Late Holocene	Middle Holocene	Early Holocene	Latest glacial period
<i>Acervulina inhaerens</i> Schultze	Oran	o		70				
	Mallorca	o		56-61				
<i>Adelosina colomi</i> (Le Calvez and Le Calvez)	Alboran	o		83				
	Mallorca	o		40-80				
<i>Adelosina dubia</i> (d'Orbigny)	Alboran	o		38-73		o		o
	Oran					o		
	Mallorca						o	
<i>Adelosina laevigata</i> d'Orbigny	Alboran	o		38-83				
	Oran	oo		67-130	o	o		
	Mallorca	oo		40-74	o	o	o	
<i>Adelosina longirostra</i> (d'Orbigny)	Alboran	o		38-83		o		
	Oran	o		84-118		o		
	Mallorca				o	o	o	
<i>Adelosina mediterranensis</i> (Le Calvez and Le Calvez)	Alboran	o		38-161	o		o	
	Oran	o		84-118	o	o		
	Mallorca	oo	74-94	56-116				
<i>Adelosina</i> sp. 1	Alboran	o		38	o	o	o	
	Oran	oo		48-130	o	o		
	Mallorca	o	67	56-116	o		o	
<i>Affinetrina gualtieriana</i> (d'Orbigny)	Alboran	o		38		o	o	
	Mallorca						o	
<i>Affinetrina ucrainica</i> (Serova)	Oran					o		
	Mallorca				o	o	o	
<i>Affinetrina</i> sp. 1	Alboran						(o)	
<i>Affinetrina</i> sp. 2	Alboran							o
<i>Alveophragmium scitulum</i> (Brady)	Mallorca	(o)		94-235				
<i>Ammodiscus minimus</i> Hoeglund	Alboran	o		161				
<i>Ammoglobigerina globigeriniformis</i> (Parker and Jones)	Alboran	o		60-83				
	Oran	o		48-73; 118-130				
	Mallorca	o		40-80				
<i>Ammolagena clavata</i> (Parker and Jones)	Mallorca	(o)		94-235				



TABLE 2 (continued).

<i>Ammonia beccarii</i> (Linné)	Alboran	*		97-115				o
	Oran	*	20-83	20-127				
	Mallorca	*	40-56	40-235				
<i>Ammonia parkinsonia</i> (d'Orbigny)	Alboran	*						o
	Oran	*						
	Mallorca	*						
<i>Ammosphaeroidina sphaeroidinoides</i> (Brady)	Mallorca	(o)		94-235				
<i>Amphicoryna scalaris</i> (Batsch)	Alboran	o		60-91				
	Oran	o	130	48-130	o			
	Mallorca	oo	105-161	80-235	o	o		
<i>Angulogerina angulosa</i> (Williamson)	Alboran	oo		38-161	o	o	o	
	Oran	oo		67-130	oo	oo		
	Mallorca	oo		80-235	o	o	o	
<i>Anomalinoides</i> sp. 1	Alboran	oo		38-161	o	o	o	
	Oran	oo		48-121	o	o		
	Mallorca	oo		47-163	o	o	o	
<i>Articulina mucronata</i> (d'Orbigny)	Mallorca	o		40-80	o	o	o	
<i>Asterigerinata adriatica</i> Haake	Mallorca	**			o	oo	o	
<i>Asterigerinata mamilla</i> (Williamson)	Alboran	oooo		38-161	oooo	oooo	oooo	oo
	Oran	oo	48-73	20-127	oooo	oooo		
	Mallorca	oooo	40-48	40-235	oo	oo	oo	
<i>Asterigerinata mariae</i> Sgarrella	Alboran	**			o	o	o	
	Oran	**			o	o		
	Mallorca	**			oo	oo	oo	
<i>Astrononion stelligerum</i> (d'Orbigny)	Alboran	oo		53-83	o	o	o	oo
	Oran	oo		48-115	oo	o		
	Mallorca	o		47-80			o	
<i>Bigenerina nodosaria</i> d'Orbigny	Oran	oo		84-127				
	Mallorca	oo	94; 235	94-163	o	o		
<i>Biloculinella globula</i> (Bornemann)	Alboran	o		64-161	o	o		
	Oran	o		48-127				
	Mallorca	o		40; 74-235				
<i>Biloculinella inflata</i> (Wright)	Mallorca				(o)			
<i>Biloculinella labiata</i> (Schlumberger)	Alboran	o		83-115				
	Oran	o		70-100				
	Mallorca	o		67-163	o			
<i>Bolivina cistina</i> Cushman	Oran	o		70-130				
	Alboran	o		115				
	Mallorca	o		61	o		o	
<i>Bolivina plicatella</i> Cushman	Alboran	o		60-91		o		
	Oran	o		48				
	Mallorca	o		94-235	o	o	o	
<i>Bolivina pseudoplicata</i> Heron-Allen and Earland	Oran				(o)			
<i>Bolivina subspinescens</i> Cushman	Alboran	o		60				
	Oran	o		73-130				
	Mallorca	o		94-163				

TABLE 2 (continued).

<i>Bolivina variabilis</i> (Williamson)	Alboran	o		38-60; 115	o	o	o	
	Oran	o		48-70; 118-127				
	Mallorca	oo		48-235	oo	oo	o	
<i>Bolivina</i> sp. 1	Oran	o	73	48-127				
<i>Brizalina difformis</i> (Williamson)	Alboran	oo	60; 86	53-161				
	Oran	oo		70-130				
	Mallorca	oo		48-235; <b>67-235</b>				
<i>Brizalina dilatata</i> (Reuss)	Oran	o	20; 67-118	67-118				
	Mallorca	o	94	105				
<i>Brizalina spathulata</i> (Williamson)	Alboran	o		38-91				
	Oran	oo	118	70-130; <b>100-130</b>	o			
	Mallorca	oo		47-235; <b>105-235</b>	o	o		
<i>Brizalina striatula</i> (Cushman)	Alboran	o	91-115	115				
	Oran	oo	70-127	67-130	o			
	Mallorca	o		94-235	o	o		
<i>Brizalina</i> sp. 1	Alboran				o	o	o	
	Oran				(o)	(o)		
	Mallorca						o	
<i>Buccella granulata</i> (Di Napoli Alliata)	Alboran	o		60-86				
	Oran	o		20-127	o	o		
	Mallorca	o		40-67	o			
<i>Bulimina aculeata</i> d'Orbigny	Oran	oo	67-121	48-130	o	o		
	Mallorca	oo	105-235	61-235	o	oo	o	
<i>Bulimina costata</i> d'Orbigny	Alboran	o		91-161				
	Mallorca	o	80-163	94-235; <b>163-235</b>				
<i>Bulimina elongata</i> d'Orbigny	Alboran	oo		53-69				
	Oran	oo	67-130	48-127				
	Mallorca	ooo	94-163	74-235	o	oo	o	
<i>Bulimina gibba</i> Fornasini	Alboran	o		63-97				
	Oran	oo	67-121	67-130				
	Mallorca	oo	116	94-235	o	o		
<i>Bulimina marginata</i> d'Orbigny	Alboran	o		83-91				
	Oran	o	94	118-127				
	Mallorca	oo	67	94-235; <b>163-235</b>	o			
<i>Cancris auriculus</i> (Fichtel and Moll)	Alboran	oo		60-115	o	o		
	Oran	oo	48-130	48-127	o	o		
	Mallorca	oo	80-94	94				
<i>Cassidulina laevigata</i> s.l. d'Orbigny	Alboran	o		53-161	o			
	Oran	oooo	97	20-130; <b>84-118</b>	o	o		
	Mallorca	oooo	94-116	40-235; <b>80-163</b>	oooo	ooo	o	
<i>Cassidulina obtusa</i> Williamson	Alboran	oooo	60-161	38-161; <b>83-115</b>	ooo	oo	oo	o
	Oran	oo	73-121	70-130	oo	o		
	Mallorca	oo	94-163	56-235	o	o		
<i>Cassidulinid</i> sp. 1	Oran					(o)		
<i>Cassidulinoides bradyi</i> (Norman)	Alboran	o		102				
	Oran	o	121	70; 121-130				
	Mallorca	o	94	94				

TABLE 2 (continued).

<i>Cibicidella variabilis</i> (d'Orbigny)	Alboran	o		38-115	o	o	o	o
	Oran	o		48-100	o	o		
	Mallorca	o	48	56-61	o	o	o	
<i>Cibicides cf. mayori</i> (Cushman)	Alboran	ooo		38-115	oo	oo	oo	oo
	Oran	oo		48-121	oo	oo		
	Mallorca	oo		48-163	o	o	o	
<i>Cibicides pseudobatulus</i> Perelis and Reiss	Alboran	oo	91	38-161	oo	oo	ooo	oo
	Oran	oo	48; 121	20-130	oo	o		
	Mallorca	oo	94	40-161	oo	oo	oo	
<i>Cibicides refulgens</i> Montfort	Alboran	oo		38-115; 161	o	oo	oo	oo
	Oran	oo	73	48-130		oo		
	Mallorca	oo		40-163	o	o	oo	
<i>Cibicoides pseudoungerianus</i> (Cushman)	Alboran	oooo		38-161	oooo	ooo	oo	o
	Oran	ooo		20-130	o	o		
	Mallorca	oo		40-235	o	o	o	
<i>Clavulina cylindrica</i> (Cushman)	Oran	o	127	73, 127				
	Mallorca				o	o	o	
<i>Conorbella pulvinata</i> (Brady)	Mallorca						o	
<i>Cornuspira foliacea</i> (Philippi)	Alboran	o		83		o		
	Mallorca				o	o		
<i>Cornuspira involvens</i> (Reuss)	Alboran	o		63-91	o	o		
	Oran	o		97	o	o		
	Mallorca	oo	74	61-235	oo	oo	o	
<i>Cribrostomoides jeffreysii</i> (Williamson)	Alboran	o		53-161				
	Oran	o	67-83	48-121				
	Mallorca	o	116	163				
<i>Cycloforina contorta</i> (d'Orbigny)	Alboran	o		38-115			o	
	Oran	o		97				
	Mallorca	o		40-235	o		o	
<i>Cycloforina? tenuicollis</i> (Wiesner)	Alboran	o		97				
	Oran	oo		84-127				
	Mallorca	o		56-94	o	o	o	
<i>Cycloforina villafranca</i> (Le Calvez and Le Calvez)	Oran	oo		48-73; 127				
	Mallorca	oo		40-94	o	o	o	
<i>Cycloforina</i> sp. 1	Alboran	o		38; 115				
	Oran	o		97				
	Mallorca	o		40-235			(o)	
<i>Cycloforina?</i> sp.2	Oran					o		
<i>Cymbaloporetta bulloides</i> (d'Orbigny)	Mallorca						(o)	
<i>Dentalina guttifera</i> d'Orbigny	Mallorca	o	80					
<i>Deuterammia dublinensis</i> Broennimann and Whittaker	Alboran	o		60-86				
	Oran	o	97-127	48-130				
	Mallorca	o		48				
<i>Discanomalina semipunctata</i> (Bailey)	Alboran	o		91-161				
<i>Discorbinella bertheloti</i> (d'Orbigny)	Alboran	oo	86	38-115	o	o	o	
	Oran	ooo	48-127	48-130	oo	oo		
	Mallorca	oo	235	67-235	o	o	o	
<i>Discorbinoides</i> sp. 1	Alboran				o	o	o	
	Oran					(o)		

TABLE 2 (continued).

<i>Discorbinooides?</i> sp. 2	Alboran	o		161				
	Oran	o		100-118	o	o		
	Mallorca	o		47-105		o	o	
<i>Discorbis williamsoni</i> Chapman and Parr	Alboran	o		38-91	o	oo	o	
	Oran	o		100	o	o		
	Mallorca	o		40-80; 235	o	o	o	
<i>Eggerelloides scabrus</i> (Williamson)	Oran	o	67	20				
	Mallorca	o	94	40				
<i>Elphidium aculeatum</i> (d'Orbigny)	Alboran	oo		38-97	o	o	oo	oo
	Mallorca	o		48		o	o	
<i>Elphidium advenum</i> (Cushman)	Alboran					o	o	oo
	Oran	oo		67; 83, 121	o	o		
	Mallorca	oo		40-94				
<i>Elphidium complanatum</i> (d'Orbigny)	Alboran	oooo		38-161	oo	oooo	ooo	oo
	Oran	oo		48-130	oo	oo		
	Mallorca	oo		47-163	oo	oo	oo	
<i>Elphidium complanatum</i> (d'Orbigny) var. <i>tyrrhenianum</i> Accordi	Alboran	o		86			oo	ooo
	Oran	o		48-121	o			
	Mallorca	o		48-235	o	o	o	
<i>Elphidium crispum</i> (Linné)	Alboran	oo		38-161			o	oo
	Oran	oo	67	<b>20</b> ; 48-127				
	Mallorca	oo	67	40-94	o	o	o	
<i>Elphidium decipiens</i> (Costa)	Oran	o		100		o		
	Mallorca	oo		67-116	o	o	o	
<i>Elphidium granosum</i> (d'Orbigny)	Oran	o	118	83				
	Mallorca	o	116	48-235	o	o	o	
<i>Elphidium incertum</i> (Williamson)	Oran	o		127				
	Mallorca	o		47-163	o	o	o	
<i>Elphidium macellum</i> (Fichtel and Moll)	Alboran	o	86	38; 73-105		o		
	Mallorca	oo	94	67-80	o	o	o	
<i>Elphidium margaritaceum</i> (Cushman)	Mallorca	o		40-47			o	
<i>Elphidium</i> sp. 1	Alboran				o	oo	ooo	oooo
<i>Eponides concameratus</i> (Williamson)	Alboran	oo		38-161	oo	o	o	
	Oran	ooo	85	48-130; <b>64-85</b>	o	o		
	Mallorca	o	67	67-94				
<i>Eponides</i> sp. 1	Alboran	o		38		o		
	Oran	o		48-73				
	Mallorca	o	56-74	40-80				
<i>Favulina foveolata</i> (Seguenza)	Alboran				o	o		
	Oran	o		115-130				
	Mallorca	o		94				
<i>Favulina hexagona</i> (Williamson)	Alboran	oo		53-115	o	o	o	
	Oran	o		67-130	o	o		
	Mallorca	o		48; 94-235	o			
<i>Fissurina castanea</i> (Flint)	Oran	o		90-130				
<i>Fissurina crebra</i> (Matthes)	Alboran	o		69-115				
	Oran	o	90	70-90				
	Mallorca	o		47-94				

TABLE 2 (continued).

<i>Fissurina fasciata</i> (Egger)	Alboran	o	73	63-69	o			
	Oran	o		83-130				
	Mallorca	o		61-80				
<i>Fissurina lacunata</i> (Burrows and Holland)	Alboran				(o)	(o)	(o)	
<i>Fissurina marginata</i> (Montagu)	Alboran	o	70	73-161	o			
	Oran	o		70-100				
	Mallorca	o		47-94				
<i>Fissurina orbignyana</i> Seguenza	Alboran	oo		60-115				
	Oran	oo		48-130				
	Mallorca	oo		47; 163				
<i>Floresina</i> sp. 1	Oran				(o)	(o)		
	Mallorca				(o)	(o)	(o)	
<i>Fursenkoina acuta</i> (d'Orbigny)	Alboran	o	20	115				
	Oran	o						
<i>Gaudryina rudis</i> Wright	Alboran	oo	48, 80	38-161		o		
	Oran	ooo		48-130	o	o		
	Mallorca	o		40-163				
<i>Gaudryina siciliana</i> Cushman	Alboran	o	56	63-161	o	o	o	
	Oran	oo		48-130	o	o		
	Mallorca	oo		47-105				
<i>Gavelinopsis praegeri</i> (Heron Allen and Earland)	Alboran	ooo	60	38-161	oo	oo	o	
	Oran	ooo	100-130	48-130	oo	oo		
	Mallorca	ooo		47-235	oo	oo	oo	
<i>Glabratella erecta</i> (Sidebottom)	Alboran	o		53-69	o	o	o	
	Oran	o		67-127				
	Mallorca	o		47-235	o	o	o	
<i>Glabratella hexacamerata</i> Seigle and Bermudez	Alboran	o		69				
	Oran	o		48-118				
	Mallorca				o	o	oo	
<i>Glabratella patelliformis</i> (Brady)	Alboran					o	o	
	Mallorca				o	o	o	
<i>Glaphyrammina americana</i> (Cushman)	Oran	o	84	48, 90-130				
<i>Globobulimina affinis</i> (d'Orbigny)	Oran	o	100-130	115-130				
<i>Globocassidulina oblonga</i> (Reuss)	Alboran	oo	73-130	53-115	oo	o		
	Oran	ooo		48-130	oo	o		
	Mallorca	oo		56-235	oo	o		
<i>Globocassidulina subglobosa</i> (Brady)	Alboran	oooo	60	38-161; <b>91-115</b>	oooo	oo	oo	
	Oran	oooo	70-130	48-130; <b>90-100</b>	oo	oo		
	Mallorca	oo		67-235	oo	oo		
<i>Globulina gibba</i> (d'Orbigny) var. <i>punctata</i> (d'Orbigny)	Alboran	o		86				
<i>Globulina myristiformis</i> (Williamson)	Alboran	o		63				
	Oran	oo		73-121				
<i>Gyroidinoides soldanii</i> (d'Orbigny)	Mallorca	oo		94-235				
<i>Gyroidinoides umbonata</i> (Silvestri)	Alboran	o		115				
	Oran	o		127				
	Mallorca	o		67-116	o	o		

TABLE 2 (continued).

<i>Haplophragmoides?</i> sp. 1	Oran	o	100					
<i>Haynesina depressula</i> (Walker and Jacob)	Oran					o		
	Mallorca	o		94-235	o	o	o	
<i>Haynesina simplex</i> (Cushman)	Alboran	o		63-97				
	Oran	o		70-84		o		
	Mallorca	oo		40-235	oo	o	oo	
<i>Haynesina</i> sp. 1	Mallorca				o	o	o	
<i>Hemirobulina</i> sp.1	Alboran	o		83-86				
	Mallorca	o		94-105				
<i>Heronallenia lingulata</i> (Burrows and Holland)	Alboran	o		60-115	o	o		
	Oran	o		90-130				
	Mallorca	o		67-105				
<i>Hoeglundina elegans</i> (d'Orbigny)	Alboran	o		121				
	Oran	o		67-127				
	Mallorca	o	105-163	94-235				
<i>Hyalinea balthica</i> (Schroeter)	Oran	o		127				
	Mallorca	ooo	47; 116-235	94-235	o	o		
<i>Hyalinonetrion gracillimum</i> (Costa)	Oran	o	90					
	Mallorca				o			
<i>Labrospira subglobosa</i> (Sars)	Oran	o	127					
<i>Lachlanella bicornis</i> ((Walker and Jacob) emend. Haynes)	Alboran	o		86	o			o
	Oran	o		100				
<i>Lachlanella bradyana</i> (Cushman)	Alboran	o		38-102	o	o		
	Oran	o		78-100				
	Mallorca	o		47-116	o	o	o	
<i>Lachlanella carinata</i> (d'Orbigny)	Mallorca						(o)	
<i>Lachlanella undulata</i> (d'Orbigny)	Alboran	o		38-161		o		
	Oran	o		48-121				
	Mallorca	o		48-74				
<i>Lachlanella</i> sp. 1	Alboran	o		38				
<i>Laevidentalina</i> sp. 1	Alboran				(o)			
<i>Lagena doveyensis</i> Haynes	Mallorca	o		94	o			
<i>Lagena hispida</i> Reuss var. <i>crispata</i> Matthes	Alboran						(o)	
<i>Lagena striata</i> (d'Orbigny)	Mallorca	o		67				
<i>Lagena strumosa</i> Reuss	Alboran	o		60-115	o			
	Oran	o		48-127	o			
	Mallorca	o		67-116				
<i>Lagenamma diffflugiformis</i> (Brady)	Oran	o	67	70-130				
	Mallorca	o		74-163				
<i>Lagena</i> sp. 1	Oran	o	90					
<i>Lamarckina scabra</i> (Brady)	Alboran					(o)		
	Oran					(o)		
	Mallorca				(o)	(o)		
<i>Lenticulina calcar</i> (Linné)	Alboran	o		161				
<i>Lenticulina orbicularis</i> (d'Orbigny)	Alboran	oo	83-91	53-161				
	Oran	o		48-130				
	Mallorca	o		74-116				

TABLE 2 (continued).

<i>Lobatula lobatula</i> (Walker and Jacob)	Alboran	oo		38-161	oo	oo	oooo	ooooo
	Oran	oo	48; 130	20-130	ooo	ooo		
	Mallorca	oo	40	40-235				
<i>Marginulina costata</i> (Batsch)	Mallorca	o		94				
<i>Melonis affinis</i> (Reuss)	Oran	oo		48-127				
	Mallorca	oo	67-116	40-163	o			
<i>Melonis barleeianum</i> (Williamson)	Alboran	oo		53-73	o			
	Oran	oo		67-100				
	Mallorca	oo	94; 163	94-235	o			
<i>Miliolid</i> sp. 1	Mallorca				o			
<i>Miliolid</i> sp. 2	Mallorca				o		o	
<i>Miliolinella elongata</i> Kruit	Alboran	oo		63-91				
	Oran	o		67-100	o			
	Mallorca	oo		40-80	o	o	o	
<i>Miliolinella</i> cf. <i>hybrida</i> (Terquem)	Mallorca				o	o	o	
<i>Miliolinella irregularis</i> (d'Orbigny)	Alboran	oo		38-161	o	o	o	
	Oran	oo		67-130				
	Mallorca	o	61-74	40-94	oo	oo	oo	
<i>Miliolinella labiosa</i> (d'Orbigny)	Alboran	o		38		o	o	o
	Oran	o		94	(o)			
	Mallorca				o	o	o	
<i>Miliolinella semicostata</i> (Wiesner)	Alboran	oo		38-161	oo		o	o
	Oran	oo	85	48-127	o	o		
	Mallorca	oo	47-94	40-235	o	o	o	
<i>Miliolinella subrotunda</i> (Montagu)	Alboran	oo		38-161	o	oo	oo	oo
	Oran	o		48-130	oo	oo		
	Mallorca	oo	61	40-235	oo	o	o	
<i>Miliolinella webbiana</i> (d'Orbigny)	Alboran	oo		38-115	o	o	o	o
	Oran	o	48	48-85	o	o		
	Mallorca	o	67	67-74				
<i>Miliolinella</i> sp. 1	Alboran	o		53-102	o			
	Oran	o		70-115	o			
	Mallorca	o		40-163				
<i>Miniacina miniacina</i> (Pallas)	Alboran	o			o	o		
<i>Mississippina</i> sp. 1	Alboran	o		63				
<i>Neoconorbina terquemii</i> (Rzehak)	Alboran	oo		53-105	oo	o	o	
	Oran	ooo	20	48-130	ooo	ooo		
	Mallorca	oooo	40-80	40-235	oooo	ooo	ooo	
<i>Neolenticulina peregrina</i> (Cushman)	Oran				(o)			
	Mallorca				(o)			
<i>Neouvigerina ampullacea</i> (Brady)	Alboran	(o)		161	(o)			
	Mallorca	(o)		235				
<i>Nonion fabum</i> (Fichtel and Moll)	Alboran	o	83					
	Oran	o	20; 100	84				
	Mallorca	o		67; 105-127			o	
<i>Nonionella turgida</i> (Williamson)	Oran	o	118	67-100				
	Mallorca	o	94	48-163	o	o	o	
<i>Nubecularia lucifuga</i> Defrance	Alboran	o		38-63				
	Mallorca				o	o	o	

TABLE 2 (continued).

<i>Nubeculina divaricata</i> (Brady)	Mallorca				o	o	o	
<i>Nummoloculina</i> sp. 1	Alboran	o		63				
	Oran	o		127				
	Mallorca	o		74-94				
<i>Oolina acuticosta</i> (Reuss)	Alboran	o		91-115				
	Oran	o		100-127				
	Mallorca	o		94				
<i>Parafissurina lateralis</i> (Cushman) <i>carinata</i> (Buchner)	Alboran	o		60-91	o	o		
	Oran	o		100-121				
	Mallorca	o		163	o	o		
<i>Parasorites marginalis</i> (Lamarck)	Oran	o	20	20				
<i>Parrellina verriculata</i> (Brady)	Oran	o		70	o	o		
	Mallorca	o		61-163				
<i>Patellina corrugata</i> Williamson	Alboran	o		60-115	o	o	o	
	Oran	o	130	70-118	o	o		
	Mallorca	oo		40-116	o	o	o	
<i>Peneroplis pertusus</i> (Forsk.)	Oran	oo	20	20				
<i>Planodiscorbis rarescens</i> (Brady)	Alboran	o		69	o			
	Oran	o		48-127	o			
	Mallorca	o	105-116	94-116				
<i>Planoglabratella opercularis</i> (d'Orbigny)	Alboran	ooo		38-161	o	o	oo	oo
	Oran	o		20-127	o	oo		
	Mallorca	oo		47-163				
<i>Planorbulina mediterraneensis</i> d'Orbigny	Alboran	oo		63-115	o	o	o	
	Oran	oo	100	20-127	oo	oo		
	Mallorca	oo	74-80	40-163	oo	oo	oo	
<i>Planulina ariminensis</i> d'Orbigny	Alboran					(o)		
<i>Polystommamina nitida</i> (Brady)	Alboran	o		69				
<i>Psammosphaera fusca</i> Schulze	Mallorca	(o)		94-235				
<i>Pseudoclavulina crustata</i> Cushman	Oran	o		84				
	Mallorca	o		105-116				
<i>Pseudoschlumbergerina ovata</i> (Sidebottom)	Alboran					(o)		
	Mallorca						o	
<i>Pseudotriloculina</i> sp. 1	Alboran						o	
	Mallorca					o	o	
<i>Ptychomiliola separans?</i> (Brady)	Oran				(o)	(o)		
	Mallorca						o	
<i>Pullenia quadriloba</i> Reuss	Mallorca	o	105	94-163				
<i>Pyramidulina catesbyi</i> (d'Orbigny)	Oran					(o)		
<i>Pyrgo anomala</i> (Schlumberger)	Alboran	o	115	83-161				
	Oran	oo		100-130				
	Mallorca	o		116				
<i>Pyrgo depressa</i> (d'Orbigny)	Oran	o		78				
	Mallorca	o	105					
<i>Pyrgo elongata</i> (d'Orbigny)	Alboran	o		115-161				
<i>Pyrgo oblonga</i> (d'Orbigny)	Alboran	o		63-102				
	Oran	o		85-115				



TABLE 2 (continued).

<i>Pyrgo</i> sp. 1	Alboran	o		102				
	Oran	o		70-130				
<i>Pyrgo</i> sp. 2	Alboran	o		102				
<i>Pyrgoella sphaera</i> (d'Orbigny)	Alboran	o		161				
<i>Quinqueloculina agglutinata</i> Cushman	Alboran						o	o
<i>Quinqueloculina auberiana</i> d'Orbigny	Alboran	oo		63-69			o	o
<i>Quinqueloculina berthelotiana</i> d'Orbigny	Alboran	o		38			oo	oo
	Oran	o				o		
	Mallorca	o	67; 74					
<i>Quinqueloculina boscianad</i> d'Orbigny	Alboran	o		60-115		o	o	
	Oran	o	20	84-130				
	Mallorca	oo	74	47-235			o	
<i>Quinqueloculina disparilis</i> d'Orbigny	Alboran	o		38				
	Oran	o		48		o		
<i>Quinqueloculina laevigata</i> d'Orbigny	Alboran	oo		38-86	o	o	o	o
	Oran	oo		48-127		o		
	Mallorca	oo	74;163	48-163	o		o	
<i>Quinqueloculina lata</i> Terquem	Alboran	o		48			o	o
	Oran	o	67			o		
	Mallorca	o		61-94	o		o	
<i>Quinqueloculina limbata</i> d'Orbigny	Alboran	o		38				
	Oran	oo	20	20				
	Mallorca	oo	47-67	40-47				
<i>Quinqueloculina neapolitana</i> Sgarrella and Moncharmont Zei	Alboran						(o)	
<i>Quinqueloculina padana</i> Perconig	Alboran	o		60-97				
	Oran	o		73-127				
	Mallorca	o	105	67; <b>105-235</b>	o			
<i>Quinqueloculina parvula</i> Schlumberger	Alboran	oo		38-60; 86		o	o	
	Oran	o		70-127	o	o		
	Mallorca	oo		<b>48-94</b>	oo	oo	oo	
<i>Quinqueloculina pseudobuchiana</i> Luczkowska	Alboran	o		63				
	Mallorca	o		105				
<i>Quinqueloculina seminula</i> (Linné)	Alboran	oo		38-161	o	o	oo	oo
	Oran	oooo		<b>20-130</b>	o	o		
	Mallorca	oo		40-163	o		o	
<i>Quinqueloculina stelligera</i> Schlumberger	Alboran	oo		38-91	o	o	o	
	Oran	oo	48	48-127	oo	oo		
	Mallorca	oo		40-61; 94	oo	oo	oo	
<i>Quinqueloculina viennensis</i> Le Calvez and Le Calvez	Alboran	oo		38-97	o			o
	Oran	o		70-127	o	o		
	Mallorca	oo		40-116	o	o	o	
<i>Quinqueloculina</i> sp. 1	Mallorca					o	o	
<i>Rectuvigerina bononiensis</i> (Fornasini)	Alboran	o		69				
	Oran	oo	84	84-121	o			
<i>Rectuvigerina phlegeri</i> Le Calvez	Alboran	o		73				
	Oran	o	48-121	48-130	o	o		
	Mallorca	o		116			o	

TABLE 2 (continued).

<i>Reophax scorpiurus</i> Montfort	Oran	o	67-130	67-121				
	Mallorca	o		74-94				
<i>Repmanina charoides</i> (Jones and Parker)	Alboran				(o)			
<i>Reussella spinulosa</i> (Reuss)	Oran	oo		67-100	oo	o		
	Mallorca	oo	74	48-163	oo	oo	o	
<i>Rhabdamminella cylindrica</i> (Brady)	Alboran	o		97				
<i>Robertina translucens</i> Cushman and Parker	Alboran	o		60				
	Mallorca	o		61-163	o	o		
<i>Rosalina anomala</i> Terquem	Alboran	oo		38-161	o	o	o	
	Oran	oo		67-130		o		
	Mallorca	oo		40-80	o	o		
<i>Rosalina bradyi</i> Cushman	Alboran	oo	73	<b>38-86</b> ; 86-161	o	oo	oo	
	Oran	o	40; 74	48-130	oo	oo		
	Mallorca	oo		<b>40-80</b> ; 80-235	oo	oo	oo	
<i>Rosalina globularis</i> d'Orbigny	Alboran	o		38				
	Oran	o		67	o			
	Mallorca	o		40-48; 94-235	o	o	o	
<i>Rosalina macropora</i> (Hofker)	Alboran	o		38-83; 115		o	o	
	Oran	oo	73; 100	20-121	oo	oo		
	Mallorca	oo	48; 67	40-235	o	o	oo	
<i>Rosalina</i> sp. 1	Alboran	oo		60-115	oo	o	oo	oo
	Oran	oo		70-121	o	o		
	Mallorca	oo		47-56; 163				
<i>Sahulia</i> cf. <i>kerimbaensis</i> (Said)	Alboran	oo		63-161	o	o		
	Oran	oo		70-130				
	Mallorca	o		40-116				
<i>Schackionella imperatoria</i> (d'Orbigny)	Alboran				o	o		
	Mallorca	o		<b>67-235</b>				
<i>Sejunctella</i> cf. <i>lateseptata</i> (Terquem)	Oran				(o)	(o)		
<i>Sigmavirgulina tortuosa</i> (Brady)	Alboran						(o)	
	Mallorca					(o)	(o)	
<i>Sigmavirgulina</i> sp. 1	Alboran				o	o		
	Oran	o		73				
	Mallorca	o		61-163	o	o	o	
<i>Sigmoilinita costata</i> (Schlumberger)	Alboran	oo		38-91	o		o	
	Oran	oo		48-130	oo	oo		
	Mallorca	oo		40-235	o	o	oo	
<i>Sigmoilinita distorta</i> (Phleger and Parker)	Alboran	o		73-115				
	Oran	oo		48-100				
	Mallorca	o		94-235		o	o	
<i>Sigmoilinita</i> sp. 1	Oran				(o)	(o)		
<i>Sigmoilopsis schlumbergeri</i> (Silvestri)	Alboran	o		63-115				
	Oran	oo		70-130				
	Mallorca	oo		94-235				
<i>Sigmoilopsis</i> sp. 1	Alboran	o		64-69				
	Oran	o		48-127	o			
	Mallorca	oo		105				
<i>Siphonaperta agglutinans</i> (d'Orbigny)	Mallorca						(o)	

TABLE 2 (continued).

<i>Siphonaperta aspera</i> (d'Orbigny)	Alboran	o		60				
	Oran	o		48-83				
	Mallorca	o		40-116				
<i>Siphonaperta dilatata</i> (Le Calvez and Le Calvez)	Alboran	o		38	o	o	o	
	Mallorca				oo	oo	oo	
<i>Siphonaperta horrida</i> (Cushman)	Oran	oo		20-118	o			
	Mallorca	oo		80-105				
<i>Siphonaperta irregularis</i> (d'Orbigny)	Alboran	o		38-53				
	Oran	o		48-118		o		
	Mallorca	oo	48	40-235; <b>40-47</b>			o	
<i>Siphonaperta</i> sp. 1	Alboran	o		38-97				
	Oran	o		48				
	Mallorca	o		48-94	o	o	o	
<i>Siphonaperta</i> sp. 2	Alboran				o	o		
	Oran	oo		<b>48-76</b> ; 118-130	o	o		
	Mallorca	oo		40-94	oo	o	o	
<i>Siphonina reticulata</i> (Czjzek)	Alboran	o		102				
	Oran	o	127	48-84				
	Mallorca	o		94-235				
<i>Siphoninella soluta</i> (Brady)	Mallorca				(o)	(o)	(o)	
<i>Siphotextularia concava</i> (Karrer)	Alboran	oo	86	64-115	o			
	Oran	oo		48-130	o			
	Mallorca	oo		48-163	o	o	o	
<i>Siphotextularia flintii</i> (Cushman)	Alboran	oo		63-115				
	Oran	o		48-100				
	Mallorca	o		47-48				
<i>Siphouvigerina?</i> sp. 1	Alboran					o		
	Oran					o		
	Mallorca						o	
<i>Sphaerogypsina globula</i> (Reuss)	Alboran	oo		38-161	oo	oo	o	
	Oran	oo		48-121	oo	o		
	Mallorca	oo	40	40-94			o	
<i>Sphaeroidina bulloides</i> d'Orbigny	Mallorca	o		116-163				
<i>Spirillina limbata</i> Brady	Alboran	oo	91	38-97	o			
	Oran	o		70-121				
	Mallorca	o		80-94				
<i>Spirillina vivipara</i> Ehrenberg	Alboran	oo	63	38-115	oo	oo	oo	
	Oran	oo	48; 100-130	48-121	oo	oo		
	Mallorca	oo	61	40-235	oo	oo	oo	
<i>Spirillina wrightii</i> Heron-Allen and Earland	Alboran	o		53-83				
	Oran	o		48-85				
<i>Spirillina</i> sp. 1	Oran					(o)		
<i>Spirillinid</i> sp. 1	Alboran	o		38-73	o	o	o	
	Oran	o		48-130	o	o		
<i>Spiroloculina dilatata</i> d'Orbigny	Alboran	oo		38-69	o			
	Oran	o		48-130	o			
	Mallorca	o		47-163				

TABLE 2 (continued).

<i>Spiroloculina excavata</i> d'Orbigny	Alboran	o		64-161	o			
	Oran	o		70-127				
	Mallorca	o		94-163				
<i>Spiroloculina cf. rostrata</i> Reuss	Alboran	o		64-91	o			
	Oran	o		48-130	o			
	Mallorca	o		80				
<i>Spiroloculina tenuiseptata</i> Brady	Alboran	o		63-91	o			
	Oran	oo		48-130	o	o		
	Mallorca	o		67-116				
<i>Spiroloculina</i> sp. 1	Alboran	o		53-115				
	Oran	oo		67-127				
	Mallorca	o		74-105				
<i>Spiroloculina</i> sp. 2	Alboran	o		60-115		o	o	
	Oran	o		70-121	o	o		
	Mallorca	o		40-163	o	o	o	
<i>Spiroloculina</i> sp. 3	Oran	o		90-121				
	Mallorca	o		56				
<i>Spirophthalmidium acutumargo</i> (Brady) var. <i>concava</i> (Wiesner)	Mallorca				(o)			
<i>Spirophthalmidium</i> sp. 1	Alboran	o		83	(o)			
	Oran					o		
	Mallorca						o	
<i>Spirophthalmidium</i> sp. 2	Mallorca						o	
<i>Spiroplectinella sagittula</i> s.l. (Defrance)	Alboran	oo		38-161; <b>86-91</b>	o	o	o	
	Oran	ooo		48-130; <b>73-130</b>	o			
	Mallorca	oooo	94	40-235; <b>67-94</b>	oo	o		
<i>Spiroplectinella</i> sp. 1	Alboran	oo		48-85	o	o		
	Oran	oo		53-115	o			
	Mallorca	oo		47-116	oo	oo		
<i>Spiroplectinella</i> sp. 2	Alboran	oo		60-161				
	Oran	oo	127	48-130; <b>97-121</b>				
	Mallorca	oo		67-163	o	o		
<i>Spirorbina?</i> sp. 1	Alboran	o		38		o		
	Oran	o		67				
	Mallorca	o		40-48; 105-235	oo	oo	oo	
<i>Stainforthia complanata</i> (Egger)	Oran	o	67					
	Mallorca				o	o		
<i>Stomatorbina concentrica</i> (Parker and Jones)	Alboran	oo	61; 91	38-161	o	o		
	Oran	oo	100-130	48-127	o			
	Mallorca	o		94		o		
<i>Svratkina</i> sp. 1	Alboran						o	
	Mallorca						o	
<i>Textularia agglutinans</i> d'Orbigny	Alboran	o		60-115				
	Oran	oo		20-121				
	Mallorca	oo		47-163	o			
<i>Textularia calva</i> Lalicker	Alboran	o		69-73				
	Oran	oo		40-130	oo	o		
	Mallorca	oo	40-163	47-235	oo	oo	oo	

TABLE 2 (continued).

<i>Textularia conica</i> d'Orbigny	Alboran	o		83-163				
	Oran	oo		40-130	o			
	Mallorca	oo		40-235	o	o	o	
<i>Textularia gramen</i> d'Orbigny	Alboran	o		64-97				
	Oran	oo		48-130	o	o		
	Mallorca	oo	61-105	40-235	o	o	o	
<i>Textularia pala</i> Czjzek	Alboran	oo		38-115	o	o		
	Oran	oo	78	48-130	o	oo		
	Mallorca	oo	40-94	40-235	o	o		
<i>Textularia pseudorugosa</i> Lacroix	Alboran	oo	161	53-161	o	o	o	
	Oran	ooo		70-130	o	o		
	Mallorca	o		47-116				
<i>Tretomphalus concinnus</i> (Brady)	Alboran	oo		38-69	o	oo	oo	oo
	Oran	o		73-83	o	oo		
	Mallorca	oo		94-235	oo	oo	ooo	
<i>Tretomphalus</i> sp. 1	Alboran	oo		53-69; 115	oo	oo	oo	
	Oran	o		48; 100-118	o	o		
	Mallorca	o		40-235	ooo	oo	oo	
<i>Trifarina fornasinii</i> (Selli)	Alboran				(o)			
<i>Triloculina oblonga</i> (Montagu)	Alboran	o		60				
	Oran	o		67	o	o		
<i>Triloculina plicata</i> Terquem	Alboran					o	o	(o)
	Oran	o		48-130	o	o		
	Mallorca				(o)			
<i>Triloculina marioni</i> Schlumberger	Alboran				(o)	(o)	(o)	
	Oran	o		90-127	o	o	o	
	Mallorca	o	74		o	o	o	
<i>Triloculina tricarinata</i> d'Orbigny	Alboran	o		102-161				
	Oran	oo		67-83				
	Mallorca	o		40-163	o	o		
<i>Triloculina</i> sp. 1	Alboran	o		83-115				
	Oran	oo		48-130				
	Mallorca	o		105				
<i>Trimosina</i> sp. 1	Mallorca						(o)	
<i>Trisegmentina compressa</i> Wiesner	Mallorca	o		105				
<i>Tritaxis fusca</i> (Williamson)	Mallorca	o		163				
<i>Trocholinopsis ornata</i> Sidebottom	Alboran				o	o	o	
	Oran					o		
<i>Uvigerina mediterranea</i> Hofker	Mallorca	(o)		105-235	(o)			
<i>Uvigerina peregrina</i> Cushman	Alboran	oo		102-115				
	Oran	oo	48-127	67-130				
	Mallorca	oo	94-235	94-235				
<i>Uvigerina</i> sp. 1	Mallorca						o	
<i>Vaginulina</i> cf. <i>americana</i> Cushman	Alboran	o		86-161				
	Oran	o		130				
<i>Valvulineria complanata</i> (Fornasini)	Alboran	o		53-102				
	Oran	oo	100	48-130				
	Mallorca	o	67-105	80-163	o	o		

TABLE 2 (continued).

<i>Valvulineria minuta</i> Parker	Oran	o		115				
<i>Valvulineria</i> sp. 1	Alboran	o		38		o		
<i>Vertebralina striata</i> d'Orbigny	Mallorca	o		40				
<i>Wiesnerella auriculata</i> (Egger)	Alboran	o		60				
	Oran	o		67	o			
	Mallorca	o		40-235				

taxa) (Figure 6, Table 3). A *Cassidulina laevigata* s.l.-assemblage, containing *Bulimina elongata* as further dominant taxon, and a *Gavelinopsis praegeri*-assemblage with *G. subglobosa* and *C. obtusa* as associated taxa were restricted to the deeper sites (Figure 6, Table 3).

A Redundancy Analysis (RDA), applied on the dead foraminiferal assemblages to find out species-environment relations, has shown that the water depth appeared as an important parameter. It is significantly positive correlated with RDA axis 1 (Table 4). *C. obtusa*, *G. subglobosa* and probably *G. praegeri* are correlated to deeper water depths, whereas *N. terquemi* and *A. mamilla* s.l. are clearly related to shallower water depths (Figure 7). On the other hand, *C. laevigata* s.l., *B. elongata*, *D. bertheloti* and *G. oblonga* show a close relation to a higher content of fine-grained material.

As shown by the PCA and RDA results, the dead faunas of the shallow circalittoral were dominated by epifaunal species. On the Alboran Platform, the lower limit of the distribution of the shallow-water assemblages is associated with a change in grain size composition of the substrate from coarse-grained carbonate material to finer-grained carbonate material at around 96 m water depth. Although, no bathymetric shift in substrate is present on the Alboran Platform and in the Oran Bight, a faunal shift has also been observed at around 80 m water depth in both areas. At the deeper sites, the most characteristic taxa belonged to the Cassidulinidae, with *C. obtusa*, *G. subglobosa*, *C. laevigata* s.l. and *G. oblonga*. On the Alboran Platform and in the Oran Bight, these species were often associated with typical species for high-energy shelf environments and sandy substrates such as *E. complanatum*, *C. refulgens*, *L. lobatula*, *C. pseudoungerianus* and *G. praegeri* (see Milker et al., 2009, and references therein). On the Mallorca Shelf, the higher numbers of *C. laevigata* s.l. were restricted to fine-grained carbonate material.

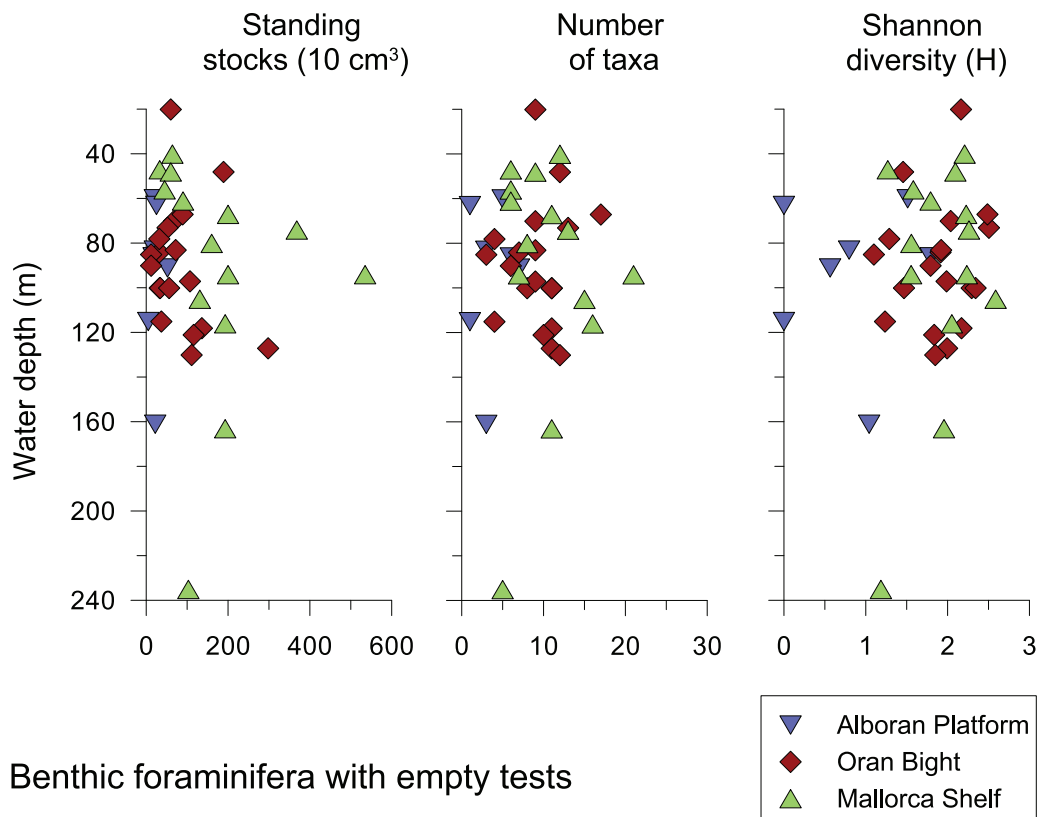
These observations suggest that the benthic ecosystems in the study areas are not only influenced by near-bottom currents and local sea floor

topography but also by winnowing and lateral transport of sediment and organic matter particles.

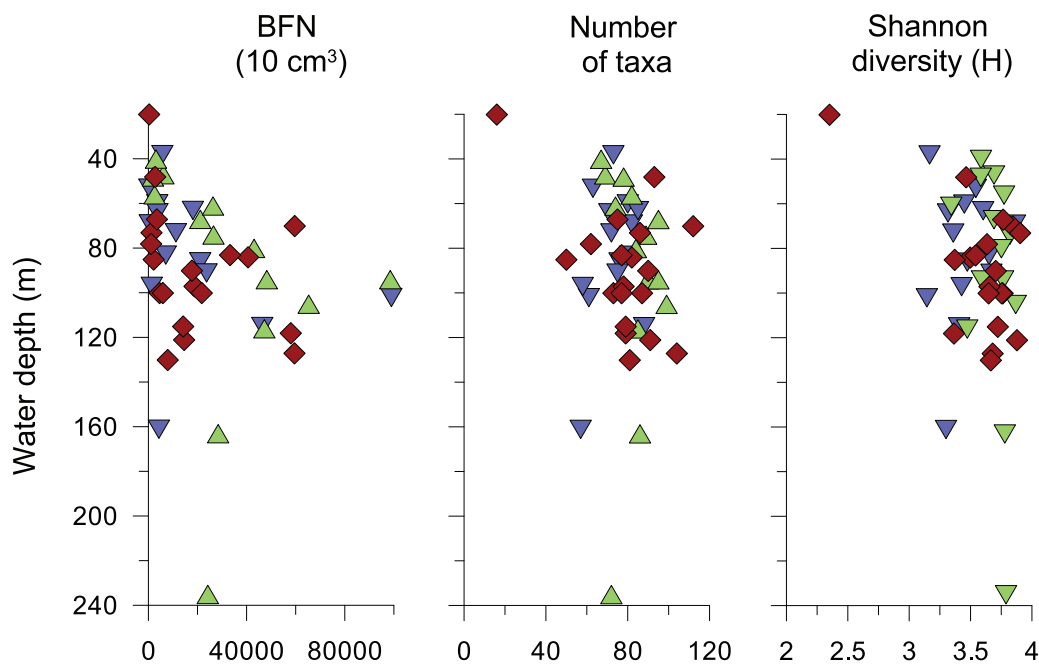
A PCA, applied on the fossil foraminifera in the core samples, provides insights in the temporal ecosystem evolution from the latest glacial period to the Holocene in the study areas. On the Alboran Platform, a *Lobatula lobatula*-assemblage with *Elphidium* sp. 1, *Elphidium complanatum* forma *tyrrhenianum* and *Elphidium aculeatum* as further taxa dominated during the latest glacial period and early Holocene (Figure 8, Table 5). An assemblage consisting of *Asterigerinata mamilla*, *E. complanatum*, *Spirillina vivipara* and *Brizalina difformis* as important taxa dominated during the early and middle Holocene and was then replaced by a *Cibicides pseudoungerianus*-assemblage with *Globocassidulina subglobosa*, *Cassidulina obtusa* and *L. lobatula* as associated species in the late Holocene (Figure 8, Table 5). In the Oran Bight core, *A. mamilla* dominates during the complete time interval preserved in the core. This species was dominant together with *L. lobatula* and *Rosalina macropora* as well as *Quinqueloculina stelligera* as further important taxa throughout the core with decreasing loadings from the middle to late Holocene (Figure 8, Table 5). An assemblage consisting of *A. mamilla* in association with *G. subglobosa* and *Discorbinella bertheloti* as well as *E. complanatum* as further taxa showed increasing loadings from the middle to the late Holocene (Figure 8). On the Mallorca Shelf, the earliest Holocene was characterized by the dominance of *Tretomphalus concinnus* with *Sigmoilinita costata*, *Spirorbina* sp. 1 and *Q. stelligera* as associated taxa (Figure 8, Table 5). A *Neoconorbina terquemi* assemblage with *Tretomphalus* sp. 1 as associated taxon, occurred during the Holocene, but was replaced by a *Cassidulina laevigata* s.l.-assemblage with *Tretomphalus* sp. 1, *Reussella spinulosa* and *Spirillina vivipara* as further dominant species during the middle to late Holocene interval (Figure 8, Table 5).

It has been shown, that the dominant fossil benthic foraminiferal assemblages in all cores gen-

## "Living" benthic foraminifera

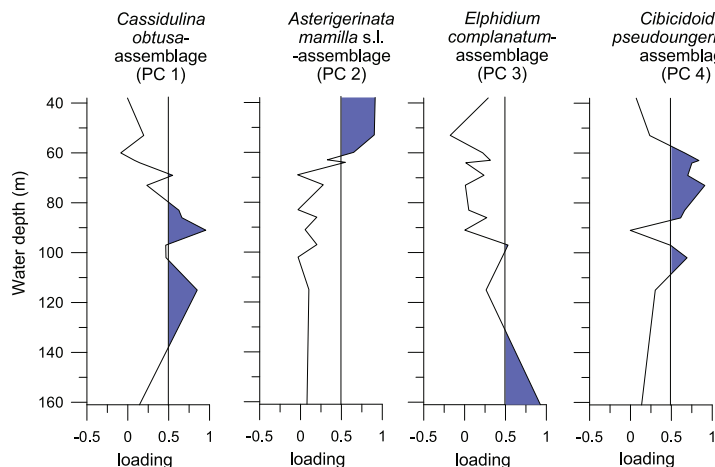


## Benthic foraminifera with empty tests

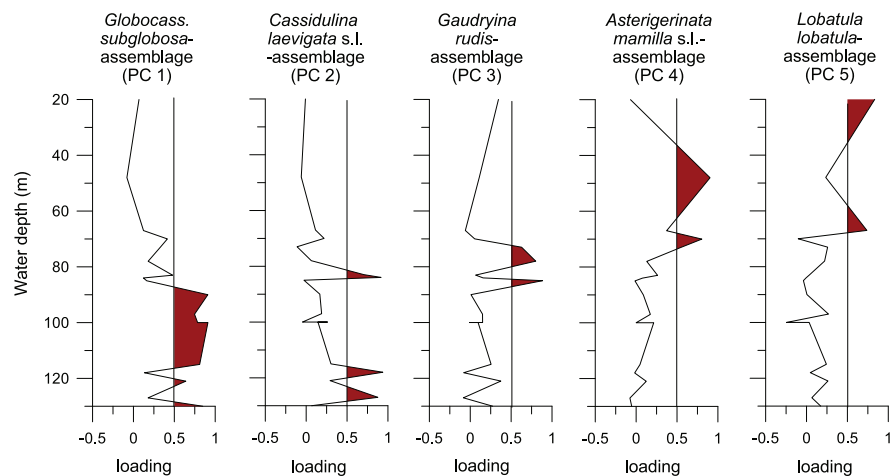


**FIGURE 5.** Standing stocks per  $10\text{ cm}^3$  in the first centimetre of the sediment, number of individual taxa and Shannon diversity (H) for the Rose Bengal-stained foraminiferal assemblages (top) and benthic foraminiferal number (BFN) per  $10\text{ cm}^3$ , number of taxa and Shannon diversity for the dead foraminiferal assemblages (bottom) in the studied areas versus water depth.

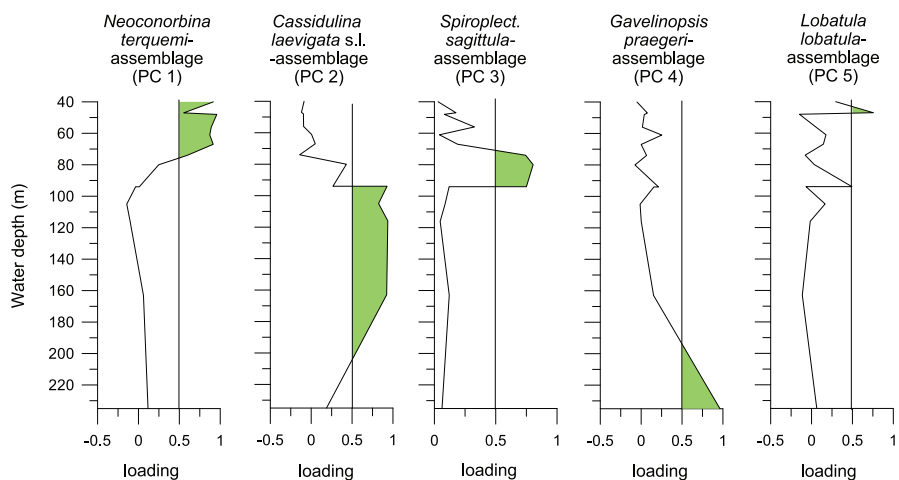
Alboran Platform



Oran Bight



Mallorca Shelf



**FIGURE 6.** Principal Component Analysis (PCA) in Q-Mode for the Alboran Platform (top), Oran Bight (middle) and Mallorca Shelf (bottom) dead assemblages in the surface samples. PC loadings higher than 0.5 are defined as significant as suggested by Malmgren and Haq (1982) and are filled. See also Table 3.



**TABLE 3.** Summary of Principal Component Analysis (PCA) in Q-Mode of the dead assemblages in the surface samples from the Alboran Platform, Oran Bight and Mallorca Shelf. Given are the dominant species and the most important associated species with their scores. Further, the explained variance for the principal components (PCs) is listed.

Alboran Platform			
PC axis	Variance [%]	Species	Score
1	56.8	<b><i>Cassidulina obtusa</i></b>	3.44
		<i>Globocassidulina subglobulosa</i>	2.96
		<i>Gavelinopsis praegeri</i>	1.65
2	16.8	<b><i>Asterigerinata mamilla</i> s.l.</b>	4.47
		<i>Elphidium complanatum</i>	1.91
		<i>Lobatula lobatula</i>	1.59
3	8.4	<b><i>Elphidium complanatum</i></b>	3.28
		<i>Cibicides refulgens</i>	3.18
		<i>Cibicoides pseudoungerianus</i>	1.36
4	7.7	<b><i>Cibicoides pseudoungerianus</i></b>	4.71
		<i>Cassidulina obtusa</i>	1.48
		<i>Asterigerinata mamilla</i> s.l.	1.26
Oran Bight			
PC axis	Variance [%]	Species	Score
1	42.2	<b><i>Globocassidulina subglobulosa</i></b>	5.03
		<i>Cassidulina obtusa</i>	2.03
		<i>Spiroplectinella sagittula</i>	1.42
2	15.1	<b><i>Cassidulina laevigata</i> s.l.</b>	5.59
		<i>Globocassidulina oblonga</i>	2.39
3	11.1	<b><i>Gaudryina rudis</i></b>	3.36
		<i>Lobatula lobatula</i>	2.52
		<i>Eponides concameratus</i>	2.20
4	8.0	<b><i>Asterigerinata mamilla</i> s.l.</b>	5.26
		<i>Rosalina macropora</i>	1.89
		<i>Discorbinella bertheloti</i>	1.64
5	5.8	<b><i>Lobatula lobatula</i></b>	4.37
		<i>Neoconorbina terquemi</i>	2.31
		<i>Cibicoides pseudoungerianus</i>	1.96

erally correspond to the recent assemblages in the study areas. It has been further shown that the assemblages of the latest glacial period and the early Holocene on the Alboran Platform and the Mallorca Shelf consist of a higher number of epifaunal species recently found in high energy environments (see Milker et al., 2009, and references therein), reflecting high energy conditions during a lower relative sea-level (Milker et al., 2011). On the Mallorca shelf, the relative sea-level rise is clearly reflected in the increasing numbers of *Cassidulina laevigata* s.l. and the accumulation of finer-grained

substrate (Milker et al., 2011), while on the Oran Bight and the Alboran Platform the environmental conditions during the Holocene should have been almost similar to the recent conditions.

#### SYSTEMATIC BENTHIC FORAMINIFERAL DESCRIPTIONS

Order FORAMINIFERIDA von Eichwald, 1830  
Suborder TEXTULARIINA  
Delage and Herouard, 1896

Family BATHYSIPHONIDAE Avnimelech, 1952

TABLE 3 (continued).

Mallorca Shelf			
PC axis	Variance [%]	Species	Score
1	35.1	<i>Neoconorbina terquemi</i>	5.18
		<i>Asterigerinata mamilla</i> s.l.	3.71
		<i>Lobatula lobatula</i>	1.45
2	25.9	<i>Cassidulina laevigata</i> s.l.	5.72
		<i>Bulimina elongata</i>	2.10
		<i>Hyalinea balthica</i>	1.45
3	14.2	<i>Spiroplectinella sagittula</i>	5.34
		<i>Asterigerinata mamilla</i> s.l.	1.66
		<i>Lobatula lobatula</i>	1.54
4	7.9	<i>Gavelinopsis praegeri</i>	5.23
		<i>Globocassidulina subglobulosa</i>	1.91
		<i>Cassidulina obtusa</i>	1.86
5	7.4	<i>Lobatula lobatula</i>	4.62
		<i>Textularia calva</i>	1.71
		<i>Gaudyrina rudis</i>	1.38

Genus RHABDAMMINELLA de Folin, 1887

*Rhabdamminella cylindrica* (Brady, 1882)

Figure 9.1

- 1882 *Marsipella cylindrica* Brady; p. 714
- 1884 *Marsipella cylindrica* Brady; Brady, p. 265, Pl. 24, figs. 20-22
- 1910 *Marsipella cylindrica* Brady; Cushman, p. 30, text-figs. 15, 16
- 1918 *Marsipella cylindrica* Brady; Cushman, p. 24, pl. 9, figs. 8, 9
- 1931 *Marsipella cylindrica* Brady; Wiesner, p. 79, pl. 3, fig. 27
- 1988 *Rhabdamminella cylindrica* (Brady); Loeblich and Tappan, p. 4, pl. 14, figs. 2, 3 [cop. Brady, 1884, figs. 21, 22]
- 1994 *Marsipella cylindrica* Brady; Jones, p. 34, pl. 24, figs. 20-22 [cop. Brady, 1884, figs. 20-22]

**Remarks:** The wall is composed of cemented sponge spicules, parallel to the side of the test in a more or less overlapping arrangement. The test is an elongate slender tube of constant diameter. The aperture is on the open end of the test.

Family PSAMMOSPHAERIDAE Haeckel, 1894  
Subfamily PSAMMOSPHAERINAE Haeckel, 1894  
Genus PSAMMOSPHAERA Schulze, 1875

*Psammosphaera fusca* Schulze, 1875

Figure 9.2-3

- 1875 *Psammosphaera fusca* Schulze; p. 113, pl. 2, fig. 8 a-f
- 1910 *Psammosphaera fusca* Schulze; Cushman, p. 35-36, figs. 25-28
- 1910 *Psammosphaera parva* Flint; Cushman, pp. 36-37, figs. 29, 30
- 1931 *Psammosphaera fusca* Schulze; Wiesner, p. 79, pl. 4, fig. 32
- 1988 *Psammosphaera fusca* Schulze; Loeblich and Tappan, p. 6, pl. 19, figs. 2, 3
- 1993 *Psammosphaera fusca* Schulze; Sgarrella and Moncharmont Zei, p. 151, pl. 1, fig. 14
- 1994 *Psammosphaera fusca* Schulze; Jones, p. 31, pl. 18, figs. 1-8
- 2005 *Psammosphaera fusca* Schulze; Rasmussen, p. 54, pl. 1, fig. 1

**Remarks:** The wall is coarsely agglutinated. The test is free or attached and spherical, with one chamber or more. The species may enclose sponge spicules. *Psammosphaera parva* was distinguished from *Psammosphaera fusca* by the spicular construction in Cushman (1910). According to Jones (1994), *Psammosphaera parva* is here regarded as a junior synonym of *P. fusca*.

**TABLE 4.** Statistical output of the Redundancy Analysis (RDA) applied on the dead fauna in the surface samples. For the analysis, binary “dummy” variables for Alboran Platform, Oran Bight and Mallorca Shelf were used as covariables (see Milker et al., 2009).

	Axis 1	Axis 2	Axis 3	Axis 4	Captured variance (%)	F value	p value
eigenvalues	0.141	0.042	0.011	0.009			
species-environment correlations	0.778	0.619	0.595	0.553			
cumulative percentage variance							
of species data	19.0	24.7	26.2	27.4			
of species-environment relation	67.1	87.2	92.4	96.7			
<b>Correlation</b>							
water depth	0.8071	-0.2602	0.1625	0.0757	12.9	6.25	<0.0002
salinity	-0.7063	-0.1551	-0.0939	0.0479	9.9	4.62	<0.0002
>1000 µm	-0.4778	-0.6811	0.3586	-0.3236	7.3	3.33	<0.0058
chlorophyll a	-0.5153	0.4498	0.6924	-0.0721	6.9	3.13	<0.0058
<63 µm	0.4628	0.3682	-0.4030	-0.4219	5.4	2.39	<0.0276
temperature	-0.2025	0.4289	0.2573	-0.6046	2.5	1.10	<0.3348

Family SACCAMMINIDAE Brady, 1884  
 Subfamily SACCAMMININAE Brady, 1884  
 Genus LAGENAMMINA Rhumbler, 1911  
*Lagenammima difflugiformis* (Brady, 1879a)  
 Figure 9.4

- 1879a *Reophax difflugiformis* Brady: p. 51, pl. 4, fig. 3
- 1910 *Proteonina difflugiformis* (Brady); Cushman, p. 41, text-figs. 40, 41
- 1918 *Proteonina difflugiformis* (Brady); Cushman, p. 47, pl. 21, figs. 1, 2
- 1931 *Proteonina difflugiformis* (Brady); Wiesner, p. 82, pl. 5, figs. 53, 54
- 1939 *Proteonina difflugiformis* (Brady); Cushman and McCulloch, p. 39, pl. 1, fig. 5
- 1945 *Proteonina difflugiformis* (Brady); Cushman, p. 545, pl. 71, fig. 1
- 1960 *Proteonina difflugiformis* (Brady); Hofker, p. 235, pl. A, fig. 7
- 1988 *Lagenammima difflugiformis* (Brady); Loeblich and Tappan, p. 6, pl. 21, figs. 7, 8
- 1992 *Reophax difflugiformis* Brady; Schiebel, p. 21, pl. 8, fig. 9
- 1992 *Lagenammima difflugiformis* (Brady); Wollenburg, p. 15, pl. 2, fig. 4

1994 *Lagenammima arenulata* (Skinner); Jones, p. 37, pl. 30, fig. 5

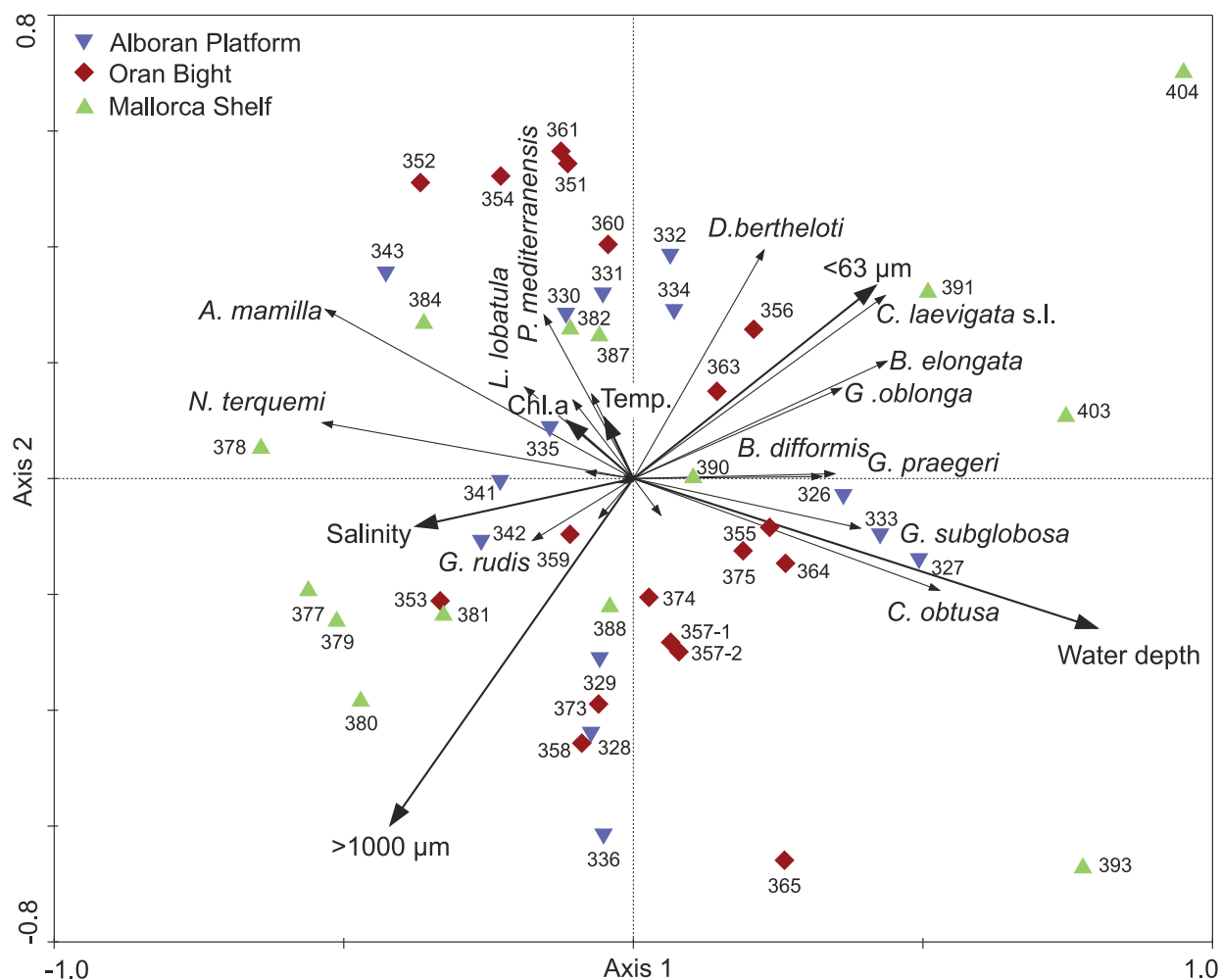
**Remarks:** The wall is composed of coarse-grained particles that are strongly cemented together. The test is unilocular and pyriform. The aperture is terminal at the end of a short neck. This species has been assigned to *Lagenammima difflugiformis* and not to *Lagenammima atlantica* due the visible short neck (compare Jones, 1994).

Family AMMODISCIDAE Reuss, 1862  
 Subfamily AMMODISCINAE Reuss, 1862  
 Genus AMMODISCUS Reuss, 1862  
*Ammodiscus minimus* Hoeglund, 1947

- 1947 *Ammodiscus minimus* Hoeglund: p. 124, pl. 8, figs., 5, 10; text-figs. 90, 105, 110
- 1960 *Ammodiscus minimus* Hoeglund; Hofker, p. 236, pl. A, fig. 13

**Remarks:** The wall is finely agglutinated and reddish-brown in color. The test is small and circular with a rounded periphery. The coils are in a single plane and increasing in size as added. The aperture, at the open end of the undivided tube, is arch-shaped. The test surface is smooth.

Subfamily TOLYPAMMINIAE Cushman, 1928  
*Ammolagena clavata* (Parker and Jones, in Jones

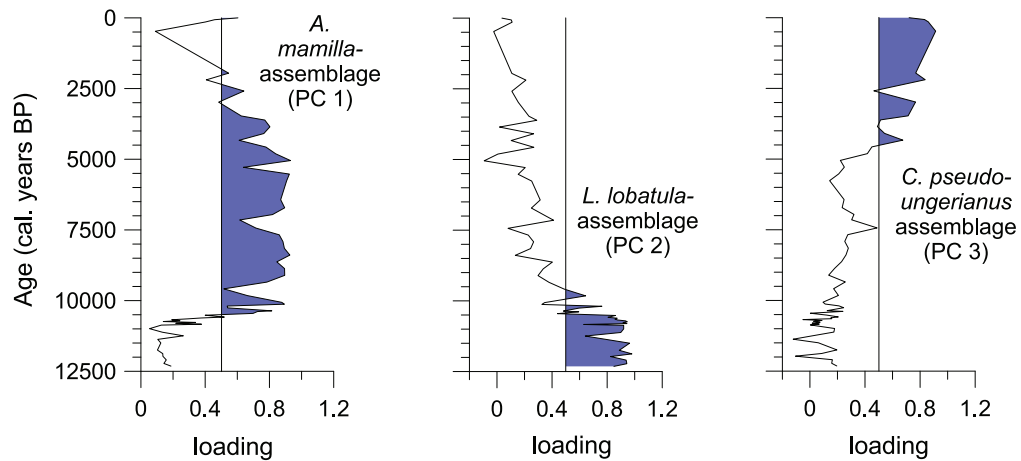


**FIGURE 7.** Redundancy Analysis (RDA) for the dead assemblages in the surface samples (excluding sample 362-1) (blue triangles: Alboran Platform samples, red diamonds: Oran Bight samples and green up triangles: Mallorca Shelf samples) (see also Table 4). "Location parameters" were included as binary "dummy variables" into analysis and used as covariables to avoid local effects and to extract environmental parameters exerting a similar influence on the benthic foraminiferal variability in all areas (see also Milker et al., 2009). Names from species with very short gradients were removed from the plot for better illustration.

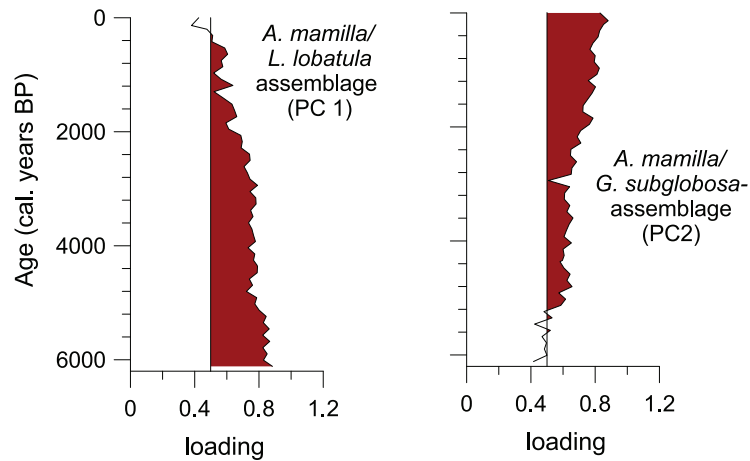
	and Parker 1865) Figure 9.5	1988	<i>Ammolagena clavata</i> (Parker and Jones); Loeblich and Tappan, p. 11, pl. 36, fig. 16
1860	<i>Trochammina irregularis</i> var. <i>clavata</i> Parker and Jones: type reference Jones and Parker, 1860: p. 304	1991	<i>Ammolagena clavata</i> (Parker and Jones); Cimernan and Langer, p. 16, pl. 3, figs. 1-3
1884	<i>Webbina clavata</i> (Parker and Jones); Brady, p. 349, pl. 14, figs. 12-16	1994	<i>Ammolagena clavata</i> (Parker and Jones); Jones, p. 46, pl. 41, figs. 12-16 [cop. Brady 1884, figs. 12-16]
1910	<i>Ammolagena clavata</i> (Parker and Jones); Cushman, pp. 68-69, text-figs. 86-88	2008	<i>Ammolagena clavata</i> (Parker and Jones); Abu-Zied et al., p. 51, pl. 1, fig. 1
1918	<i>Ammolagena clavata</i> (Parker and Jones); Cushman, p. 89, pl. 34, figs. 2-5; pl. 35, figs. 1-3		
1931	<i>Ammolagena clavata</i> (Parker and Jones); Wiesner, p. 94, pl. 11, figs. 131-134		

**Remarks:** The wall is finely agglutinated and reddish-brown in color. The attached test consists of a large ovoid proloculus, followed by a narrow rectilinear and tubular chamber. The aperture is terminal and rounded. The test surface is smooth.

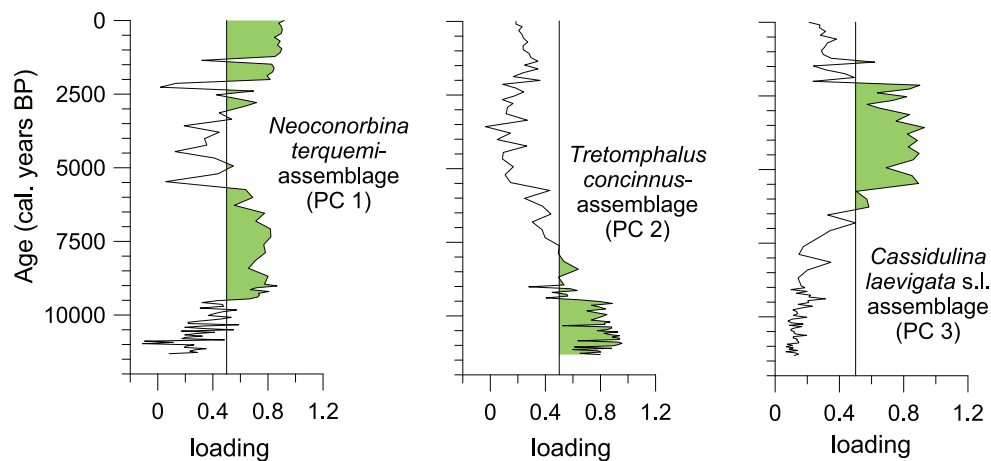
## Alboran Platform



## Oran Bight



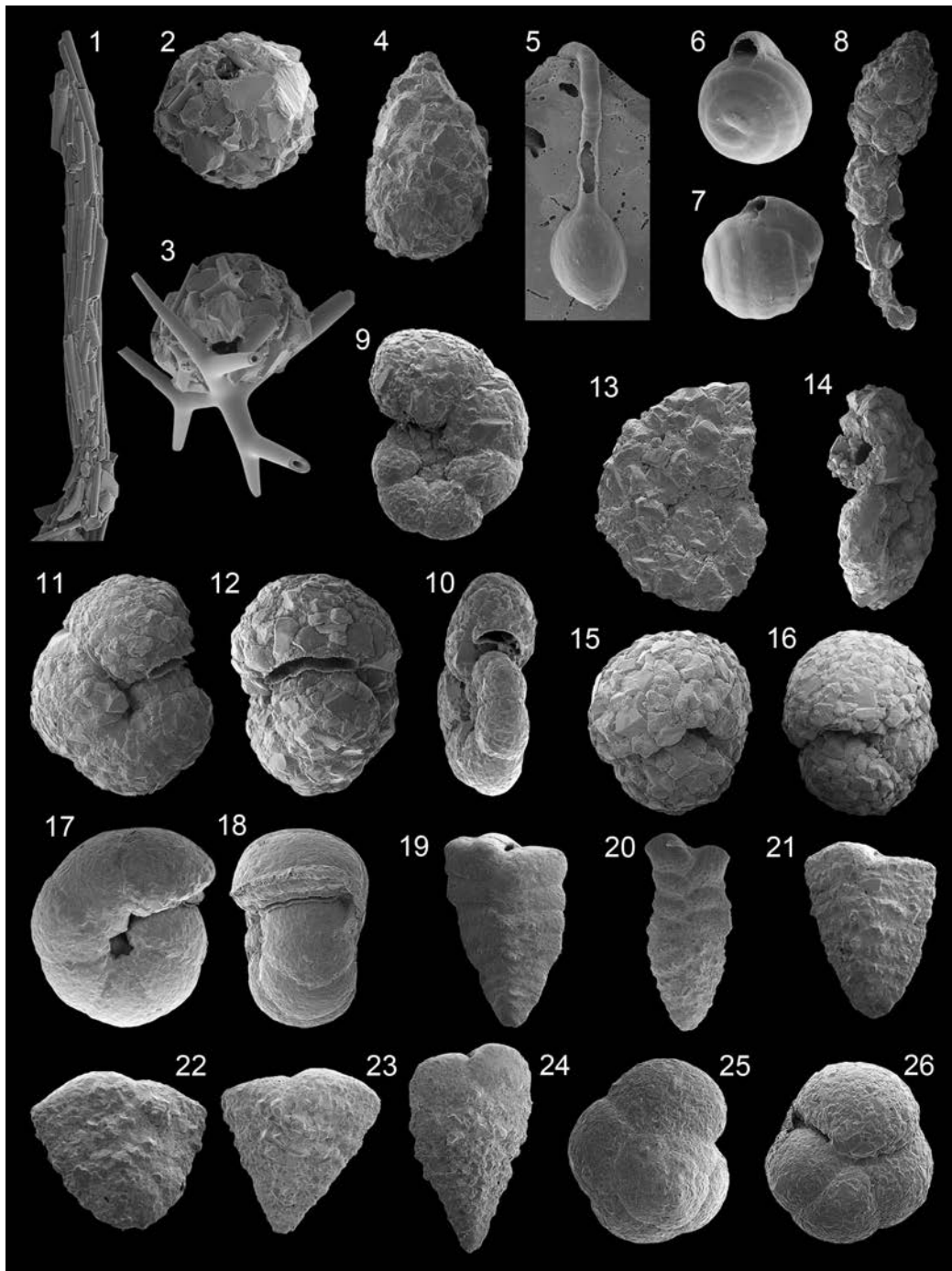
## Mallorca Shelf



**FIGURE 8.** Principal Component Analysis (PCA) in Q-Mode for the Alboran Platform (top), Oran Bight (middle) and Mallorca Shelf (bottom) fossil assemblages in the sediment cores. PC loadings higher than 0.5 are defined as significant as suggested by Malmgren and Haq (1982) and are filled. See also Table 5.

**TABLE 5.** Summary of Principal Component Analysis (PCA) in Q-Mode of the fossil assemblages in the sediment cores from the Alboran Platform, Oran Bight and Mallorca Shelf. Given are the dominant species and the most important associated species with their scores. Further, the explained variance for the principal components (PCs) is listed.

<b>Core 342-1 (Alboran Platform)</b>			
<b>PC Axis</b>	<b>Variance [%]</b>	<b>Species</b>	<b>Score</b>
1	37.8	<b><i>Asterigerinata mamilla</i></b>	5.894
		<i>Elphidium complanatum</i>	5.732
		<i>Spirillina vivipara</i>	2.389
		<i>Brizalina difformis</i>	1.372
2	33.7	<b><i>Lobatula lobatula</i></b>	7.448
		<i>Elphidium</i> sp. 1	4.296
		<i>Elphidium complanatum</i> forma <i>tyrrhenianum</i>	1.883
		<i>Elphidium aculeatum</i>	1.243
3	14.0	<b><i>Cibicidoides pseudoungerianus</i></b>	6.409
		<i>Globocassidulina subglobosa</i>	2.724
		<i>Globocassidulina obtusa</i>	2.434
		<i>Lobatula lobatula</i>	2.331
<b>Core 367-1 (Oran Bight)</b>			
<b>PC Axis</b>	<b>Variance [%]</b>	<b>Species</b>	<b>Score</b>
1	50.9	<b><i>Asterigerinata mamilla</i></b>	4.740
		<b><i>Lobatula lobatula</i></b>	3.895
		<i>Quinqueloculina stelligera</i>	1.944
		<i>Rosalina macropora</i>	1.792
2	44.9	<b><i>Asterigerinata mamilla</i></b>	5.085
		<b><i>Globocassidulina subglobosa</i></b>	2.874
		<i>Discorbinella bertheloti</i>	2.826
		<i>Elphidium complanatum</i>	2.096
<b>Core 401-1 (Mallorca Shelf)</b>			
<b>PC Axis</b>	<b>Variance [%]</b>	<b>Species</b>	<b>Score</b>
1	33.6	<b><i>Neoconorbina terquemi</i></b>	9.783
		<i>Tretomphalus</i> sp. 1	2.406
2	34.1	<b><i>Tretomphalus concinnus</i></b>	7.798
		<i>Sigmoilinita costata</i>	2.564
		<i>Spirorbina</i> sp. 1	2.412
		<i>Quinqueloculina stelligera</i>	2.369
3	17.5	<b><i>Cassidulina laevigata</i> s.l.</b>	9.227
		<i>Tretomphalus</i> sp. 1	2.374
		<i>Reussella spinulosa</i>	1.642
		<i>Spirillina vivipara</i>	1.033



**FIGURE 9.** 1 *Rhabdamminella cylindrica* (Brady), 149x, lateral view; 2 *Psammospaera fusca* Schulze, 367x, lateral view; 3 *P. fusca* Schulze, 295x, lateral view; 4 *Lagenammia difflugiformis* (Brady), 476x, lateral view; 5 *Ammolagena clavata* (Parker and Jones), 226x, lateral view; 6 *Repmanina charoides* (Jones and Parker), 510x, apertural edge view; 7 *R. charoides* (Jones and Parker), 552x, side view; 8 *Reophax scorpiurus* de Montfort, 119x, lateral view; 9 *Cribrostomoides jeffreysii* (Williamson), 635x, side view; 10 *C. jeffreysii* (Williamson), 538x, peripheral view; 11 *Labrospira subglobosa* (Sars), 355x, side view; 12 *L. subglobosa* (Sars), 288x, peripheral view; 13 *Glaphyrammina americana* (Cushman), 269x, side view; 14 *G. americana* (Cushman), 245x, apertural edge view; 15 *Ammosphaeroidina sphaeroidiniformis* (Brady), 242x, two chamber side; 16 *A. sphaeroidiniformis* (Brady), 137x, three chamber side; 17 *Alveolophragmium scitulum* (Brady), 320x, side view; 18 *A. scitulum* (Brady), 425x, peripheral view; 19 *Spiroplectinella sagittula* s.l. (Defrance), 331x, lateral view; 20 *S. sagittula* s.l. (Defrance), 339x, lateral view; 21 *S. sagittula* s.l. (Defrance), 587x, lateral view; 22 *Spiroplectinella* sp. 1, 884x, lateral view; 23 *Spiroplectinella* sp. 2, 344x, lateral view; 24 *Spiroplectinella* sp. 2, 374x, lateral view; 25 *Ammoglobigerina globigeriniformis* (Parker and Jones), 707x, spiral side; 26 *A. globigeriniformis* (Parker and Jones), 578x, umbilical side;

Subfamily USBEKISTANIINAE Vyalov, 1968  
Genus REPMANINA Suleymanov, in Arapova and Suleymanov 1966

*Repmanina charoides* (Jones and Parker, 1860)  
Figure 9.6-7

- 1860 *Trochammina squamata* (Jones and Parker) var. *charoides* Jones and Parker: p. 304
- 1884 *Ammodiscus charoides* (Jones and Parker); Brady, p. 334, pl. 38, figs. 10-16
- 1918 *Glomospira charoides* (Jones and Parker); Cushman, pp. 100-101, pl. 36, figs. 10-15 [cop. Brady, 1884, figs. 10-12, 14-16]
- 1988 *Repmanina charoides* (Jones and Parker); Loeblich and Tappan, p. 12, pl. 39, figs. 24-26 [figs. 25, 26: cop. Brady, 1884, figs. 10, 15]
- 1991 *Repmanina charoides* (Jones and Parker); Cimerman and Langer, p. 17, pl. 3, figs. 6-9
- 1993 *Glomospira charoides* (Jones and Parker); Sgarrella and Moncharmont Zei, p. 154, pl. 1, figs. 11, 12
- 1994 *Uzbekistania charoides* (Jones and Parker); Jones, p. 43, pl. 38, figs. 10-16 [cop. Brady, 1884, figs. 10-16]

**Remarks:** The wall is finely agglutinated and reddish-brown in color. The test is subglobular. The subglobular proloculus is followed by a trochospirally enrolled and undivided second tubular chamber. The aperture is at the open end of the second chamber. The test surface is smooth.

Family HORMOSINIDAE Haeckel, 1894  
Subfamily REOPHACINAE Cushman, 1910  
Genus REOPHAX de Montfort, 1808  
*Reophax scorpiurus* de Montfort, 1808  
Figure 9.8

- 1808 *Reophax scorpiurus* de Montfort: p. 331, p. 330 text-fig.
- 1910 *Reophax scorpiurus* de Montfort; Cushman, p. 83, text-figs. 114-116
- 1920 *Reophax scorpiurus* de Montfort; Cushman, p. 6, pl. 1, figs. 5-7
- 1988 *Reophax scorpiurus* de Montfort; Loeblich and Tappan, p. 13, pl. 44, figs. 1-3
- 1991 *Reophax scorpiurus* de Montfort; Cimerman and Langer, p. 17, pl. 4, figs. 1-4

- 1993 *Reophax scorpiurus* de Montfort; Sgarrella and Moncharmont Zei, p. 156, pl. 2, figs. 3, 4
- 2004 *Reophax scorpiurus* de Montfort; Chendes et al., p. 76, pl. 1, fig. 2
- 2009 *Reophax scorpiurus* de Montfort; Avsar et al., p. 134, pl. 1, figs. 3, 4
- 2009 *Reophax scorpiurus* de Montfort; Milker et al., p. 215, pl. 1, fig. 1

**Remarks:** The wall is coarsely agglutinated and mostly composed of quartz grains, whereas also other particles were observed (Cimerman and Langer, 1991). The test is elongate and arranged in a slightly irregular series. Chambers are subcylindrical and increasing in size as added. The aperture, on a short neck, is terminal and rounded.

Family HAPLOPHRAGMOIDIDAE Maync, 1952  
Genus CRIBROSTOMOIDES Cushman, 1910  
*Cribrostomoides jeffreysii* (Williamson, 1858)  
Figure 9.9-10

- 1858 *Nonionina jeffreysii* Williamson: p. 34, pl. 3, figs. 72, 73
- 1884 *Haplophragmium canariense* d'Orbigny, sp.; Brady, 1884, p. 310, pl. 35, figs. 1-3, 5
- 1991 *Cribrostomoides jeffreysii* (Williamson); Alberola et al., p. 80, pl. 1, figs. 1, 5
- 1991 *Labrospira kosterensis* Hoeglund; Cimerman and Langer, p. 18, pl. 4, figs. 11-13
- 1992 *Labrospira jeffreysii* (Williamson); Schiebel, p. 17, pl. 7, fig. 4
- 1992 *Cribrostomoides jeffreysii* (Williamson); Wollenburg, p. 27, pl. 5, figs. 1, 4
- 1993 *Labrospira jeffreysii* (Williamson); Hottinger, Halicz and Reiss, p. 29, pl. 2, figs. 5-9
- 1993 *Cribrostomoides jeffreysii* (Williamson); Sgarrella and Moncharmont Zei, p. 157, pl. 2, figs. 8, 9
- 1994 *Veleroninoides jeffreysii* (Williamson); Jones, p. 41, pl. 35, figs. 1-3, 5 [cop. Brady, 1884, figs. 1-3, 5]
- 2003 *Cribrostomoides jeffreysii* (Williamson); Murray, p. 11, fig. 2, no. 5
- 2005 *Cribrostomoides jeffreysii* (Williamson); Debenay et al., p. 332, pl. 1, fig. 4

**Remarks:** The wall is thin and finely to coarsely agglutinated. The test is nearly planispirally enrolled and flattened with a subrounded periph-



ery. Sutures are radial and slightly depressed. The umbilical region is depressed. The aperture is an equatorial arched slit, slightly above the base of the apertural face and surrounded by a narrow lip.

Genus: HAPLOPHRAGMOIDES Cushman, 1910  
*Haplophragmoides?* sp. 1

**Remarks:** The wall is coarsely agglutinated. The test is planispirally enrolled and subcircular in lateral view. Five to six chambers are visible, gradually increasing in size as added. Sutures are radial and depressed. The periphery is subrounded. The aperture is an equatorial slit at the base of the apertural face.

Genus LABROSPIRA Hoeglund, 1947  
*Labrospira subglobosa* (Sars, 1869)  
Figure 9.11-12

- 1869 *Lituola subglobosa* Sars: p. 250  
1884 *Haplophragmium latidorsatum* Bornemann, sp.; Brady, p. 307, pl. 34, figs. 8-10  
1910 *Haplophragmoides subglobosum* (Sars); Cushman, p. 105, text-figs. 162-164  
1920 *Haplophragmoides subglobosum* (Sars); Cushman, p. 45, pl. 8, fig. 5  
1939 *Haplophragmoides subglobosum* (Sars); Cushman and McCulloch, p. 80, pl. 6, figs. 7, 8  
1960 *Labrospira nitida* (Goes); Hofker, p. 236, pl. A, fig. 14  
1991 *Labrospira subglobosa* (Sars); Cimerman and Langer, p.18, pl. 5, figs. 1-3  
1993 *Cribrostomoides subglobosum* (Sars); Sgarrella and Moncharmont Zei, p. 157, pl. 2, figs. 15-16  
1994 *Cribrostomoides subglobosus* (Cushman); Jones, p. 40, pl. 34, figs. 8-10 [cop. Brady, 1884, figs. 8-10]  
2010 *Cribrostomoides subglobosum* (Sars); Milker, p. 89, pl. 1, fig. 2

**Remarks:** The wall is relatively thick and coarsely agglutinated. The test is planispirally enrolled. Chambers increasing in size as added. Sutures are radial and slightly depressed. The periphery is rounded. The aperture is a broad equatorial slit, very slightly above the apertural face and surrounded by a narrow lip.

Family DISCAMMINIDAE Mikhalevich, 1980  
Genus GLAPHYRAMMINA Loeblich and Tappan, 1984

*Glaphyrammina americana* (Cushman, 1910)  
Figure 9.13-14

- 1884 *Haplophragmium fontinense* Terquem; Brady, p. 305, pl. 34, figs. 1-4  
1910 *Ammobaculitus americanus* Cushman: p. 118, text-figs. 184, 185  
1920 *Ammobaculitus americanus* Cushman; Cushman, p. 64, pl. 12, figs. 6, 7  
1988 *Glaphyrammina americana* (Cushman); Loeblich and Tappan, p. 15, pl. 51, figs. 7-10  
1994 *Glaphyrammina americana* (Cushman); Jones, p. 40, pl. 34, figs. 1-4 [cop. Brady, 1884, figs. 1-4]

**Remarks:** The wall is coarsely agglutinated. The test is subcircular and flattened. Early chambers are planispirally enrolled with radial or oblique sutures and later chambers are uncoiled. Chambers increasing in size as added. The aperture is an elongate and ovate opening slightly above the base of the final chamber.

Family AMMOSPHAEROIDINIDAE  
Cushman, 1927

Subfamily AMMOSPHAEROIDININAE  
Cushman, 1927

Genus AMMOSPHAEROIDINA Cushman, 1910  
*Ammosphaeroidina sphaeroidiniformis*  
(Brady, 1884)  
Figure 9.15-16

- 1884 *Haplophragmium sphaeroidiniforme* Brady: p. 313  
1910 *Ammosphaeroidina sphaeroidiniformis* (Brady); Cushman, p. 128, text-fig. 202  
1988 *Ammosphaeroidina sphaeroidiniformis* (Brady); Loeblich and Tappan, p. 20, pl. 67, figs. 6-7  
1993 *Ammosphaeroidina sphaeroidiniformis* (Brady); Sgarrella and Moncharmont Zei, p. 160, pl. 4, fig. 5

**Remarks:** The test is coarsely agglutinated. The test is globular and in the early stage streptospirally enrolled. Three globular chambers are visible in the adult stage, with one larger chamber on one side and two smaller chambers on the other side. The aperture, at the base of the last chamber, is a low interiomarginal arch.

Family CYCLAMMINIDAE Marie, 1941  
Subfamily ALVEOLOPHRAGMIINAE  
Saidova, 1981

Genus ALVEOLOPHRAGMIUM Shchedrina, 1936

*Alveolophragmium scitulum* (Brady, 1881)  
Figure 9.17-18

- 1881 *Haplophragmium scitulum* Brady: p. 50  
 1884 *Haplophragmium scitulum* Brady; Brady, p. 308, pl. 34, figs. 11-13  
 1910 *Alveolophragmium scitulum* (Brady); Cushman, p. 103, pl. 6, figs. 153-155 [cop. Brady, 1884, figs. 11-13]  
 1939 *Alveolophragmium scitulum* (Brady); Cushman and McCulloch, p. 78, pl. 6, fig. 4  
 1993 *Alveolophragmium scitulum* (Brady); Sgarrella and Moncharmont Zei, p. 158, pl. 2, fig. 14  
 1994 *Veleroninoides scitulus* (Brady); Jones, p. 41, pl. 34, figs. 11-13 [cop. Brady 1884, figs. 11-13]

**Remarks:** The wall is agglutinated. The test is planispiral enrolled and compressed. Chambers gradually increasing in size as added. The umbilical region is depressed. Sutures are radial and depressed. The periphery is broadly rounded. The aperture is a broad slit at the base of the final chamber and bordered by a narrow lip. The test surface is relatively smooth.

Family SPIROLECTAMMINIDAE Cushman, 1927  
 Subfamily SPIROLECTAMMININAE  
 Cushman, 1927  
 Genus SPIROLECTINELLA Kisel'man, 1972  
*Spiroplectinella sagittula* s.l. (Defrance, 1824)  
 Figure 9.19-21

- 1824 *Textularia sagittula* Defrance: p. 177  
 1960 *Spiroplectammina sagittula* (Defrance); Hofker, p. 237, pl. A, fig. 17  
 1987 *Spiroplectammina wrightii* (Silvestri); Alberola et al., p. 304, pl. 1, figs. 11, 12  
 1987 *Textularia sagittula* Defrance; Jorissen, p. 41, pl. 3, fig. 12  
 1988 *Spiroplectinella wrightii* (Silvestri); Loeblich and Tappan, p. 30, pl. 120, figs. 1-10  
 1991 *Spiroplectinella sagittula* (d'Orbigny); Cimerman and Langer, p. 19, pl. 6, figs. 5, 6  
 1991 *Spiroplectinella wrightii* (Silvestri); Cimerman and Langer, p. 20, pl. 6, figs. 1-4  
 1992 *Spiroplectinella sagittula* (Defrance); Schiebel, p. 26, pl. 6, fig. 14  
 2002 *Spirorutilus* sp.; Kaminski et al., p. 171, pl. 1, figs. 3, 4

2005 *Textularia sagittula* Defrance; Rasmussen, p. 57, pl. 2, fig. 3

- 2009 *Spiroplectinella sagittula* (d'Orbigny); Avsar et al., p. 134, pl. 1, fig. 5  
 2009 *Spiroplectinella sagittula* (d'Orbigny); Milker et al., p. 215, pl. 1, figs. 7-9

**Remarks:** The wall is agglutinated. The test is elongate to subtriangular. The initial stage of the test is planispiral, especially in the microspheric form. Later chambers are biserially arranged and laterally compressed, gradually increasing in size as added. Sutures are depressed and slightly curved. The periphery is acute. The aperture is a low arch at the base of the final chamber. According to Rasmussen (2005) and references therein, *Spiroplectinella wrightii* (Silvestri) is identical to *Spiroplectinella sagittula* (Defrance).

*Spiroplectinella* sp. 1  
 Figure 9.22

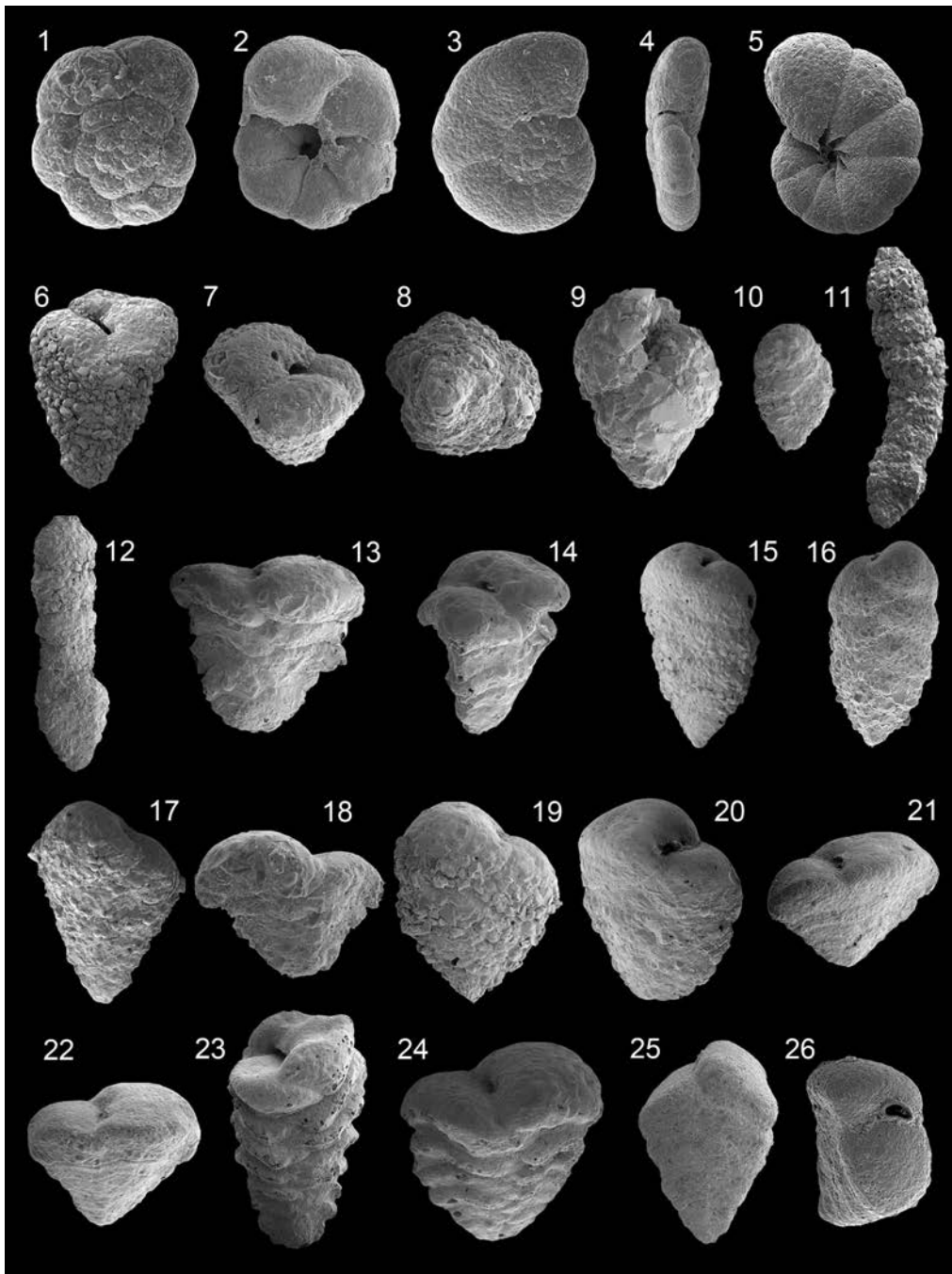
**Remarks:** The wall is agglutinated. The test is subtriangular. The initial stage of the test is planispiral, especially in the microspheric form. Chambers are biserially arranged, laterally compressed and increasing in size as added. Sutures are depressed and slightly curved. The periphery is acute. The aperture is a low arch at the base of the apertural face. This species has a more compact test than *Spiroplectinella sagittula*. It further differs from *S. sagittula* due to the lower number of chambers, whereas a juvenile stage of *S. sagittula* cannot be excluded.

*Spiroplectinella* sp. 2  
 Figure 9.23-24

- 2002 *Textularia* sp.; Kaminski et al., p. 171, pl. 1, fig. 7  
 2004 *Textularia* sp.; Chendes et al., p. 76, pl. 1, fig. 7  
 2006 *Spiroplectinella sagittula* (d'Orbigny); Avsar et al., p. 132, pl. 1, fig. 1

**Remarks:** The wall is agglutinated. The test is triangular to subtriangular. Chambers are biserially arranged, laterally compressed and rapidly increasing in size as added. Sutures are depressed and slightly curved. The periphery is acute. The aperture is a low arch at the base of the apertural face. This species has a smaller early (planispiral?) stage when compared to *Spiroplectinella sagittula* s.l. and *Spiroplectinella* sp. 1. The test is more angular than that of *S. sagittula* s.l. and chambers more rapidly increasing in size as added.

- Family TROCHAMMINIDAE Schwager, 1877  
 Subfamily TROCHAMMININAE Schwager, 1877  
 Genus AMMOGLOBIGERINA  
 Eimer and Fickert, 1899  
*Ammoglobigerina globigeriniformis*  
 (Parker and Jones, 1865)  
 Figure 9.25-26
- 1865 *Lituola nautiloidea* Lamarck var. *globigeriniformis* Parker and Jones: p. 407, pl. 15, figs. 46, 47
- 1910 *Trochammina globigeriniformis* (Parker and Jones); Cushman, p. 124, text-figs. 193-
- 1920 *Trochammina globigeriniformis* (Parker and Jones); Cushman, p. 78, pl. 16, figs. 5, 6
- 1987 *Trochammina globigeriniformis* (Parker and Jones); Alberola et al., p. 305, pl. 2, figs. 4, 5
- 1988 *Ammoglobigerina globigeriniformis* (Parker and Jones); Loeblich and Tappan, p. 33, pl. 128, figs. 9, 10
- 1991 *Ammoglobigerina globigeriniformis* (Parker and Jones); Cimerman and Langer, p. 20, pl. 7, figs. 4-6
- 1992 *Trochammina globigeriniformis* (Parker and Jones); Schiebel, p. 63, pl. 7, fig. 9
- 1993 *Trochammina globigeriniformis* (Parker and Jones); Sgarrella and Moncharmont Zei, p. 161, pl. 3, figs. 9, 10
- Remarks:** The wall is relatively thin and coarsely agglutinated. The test is trochospirally enrolled. Chambers are subglobular, rapidly increasing in size as added on the spiral side. Four chambers are visible on the umbilical side. The aperture is an interiomarginal slit at the base of the final chamber on the umbilical side.
- Genus TRITAXIS Schubert, 1921  
*Tritaxis fusca* (Williamson, 1858)
- 1858 *Rotalina fusca* Williamson: p. 55, pl. 4, figs. 114, 115
- 1884 *Valvulina fusca* (Williamson), sp.; Brady, p. 392, pl. 49, figs. 13, 14
- 1911 *Valvulina fusca* (Williamson); Cushman, p. 59, text figs. 94, 95 [cop. Brady, 1884, figs. 13, 14]
- 1964 *Tritaxis fusca* (Williamson); Hedley, Hurdle and Burdett, pp. 420-421; 425, fig. 2.1
- 1984 *Tritaxis fusca* (Williamson); Broennimann and Whittaker; p. 293, figs. 1-10, ?11-14, 19-27
- 1988 *Tritaxis fusca* (Williamson); Loeblich and Tappan, p. 33, pl. 128, figs. 1-4 [cop. Broennimann and Whittaker 1984, figs. 7-10]
- Remarks:** The wall is finely agglutinated with a few larger grains, imperforate and of yellowish-brown color except for the final chamber that is brighter. The test is slightly concavo-convex and low trochospirally enrolled with a few whorls. Earlier chambers are globular and later chambers are crescentic. Sutures are straight on the umbilical side and slightly backward curved and depressed on the spiral side. The final chamber occupies about one-half of the face of the umbilical side. The aperture is interiomarginal, present on the midway between the umbilicus and the periphery.
- Subfamily POLYSTOMAMMININAE Broennimann and Beurlen, 1977  
 Genus DEUTERAMMINA Broennimann, 1976  
*Deuterammina dublinensis* Broennimann and Whittaker, 1983  
 Figure 10.1-2
- 1983 *Deuterammina dublinensis* Broennimann and Whittaker: p. 353, figs. 21-24, 28-30
- 1988 *Deuterammina dublinensis* Broennimann and Whittaker; Loeblich and Tappan, p. 34, pl. 135, figs. 1-5 [cop. Broennimann and Whittaker, 1983, figs. 21-24, 28]
- Remarks:** The wall is thin and agglutinated. The test is low trochospirally enrolled and slightly concavo-convex. Three whorls are visible on the spiral side. Chambers increasing in size as added. Sutures are nearly radial on both sides and depressed. The periphery is rounded. The primary aperture is interiomarginal and umbilical-extraumbilical. A secondary aperture is present of the inner tip of the final chamber and opens into the umbilical region.
- Genus POLYSTOMAMMINA Seiglie, 1965a  
*Polystomammmina nitida* (Brady, 1881)  
 Figure 10.3-5
- 1881 *Trochammina nitida* Brady: pp. 55-56
- 1884 *Trochammina nitida* Brady; Brady, p. 339, pl. 41, figs. 5, 6
- 1920 *Trochammina nitida* Brady; Cushman, p. 75, pl. 15, fig. 2 [cop. Brady, 1884, fig. 5]



**FIGURE 10.** 1 *Deuterammmina dublinensis* Broennimann and Whittaker, 890x, spiral side; 2 *D. dublinensis* Broennimann and Whittaker, 858x, umbilical side; 3 *Polystommamina nitida* (Brady), 939x, spiral side; 4 *P. nitida* (Brady), 539x, peripheral view; 5 *P. nitida* (Brady), 580x, umbilical side; 6 *Gaudryina rudis* Wright, 275x, lateral view; 7 *Gaudryina siciliana* Cushman, 1020x, oblique edge view; 8 *G. siciliana* Cushman, 405x, basal view; 9 *Eggerelloides scabrus* (Williamson), 626x, lateral view; 10 *Bigenerina nodosaria* d'Orbigny, 315x, lateral view, juvenile specimen; 11 *B. nodosaria* d'Orbigny, 207x, lateral view; 12 *B. nodosaria* d'Orbigny, 242x, lateral view; 13 *Sahulia* cf. *kerimbaensis* (Said), 317x, lateral view; 14 *S.* cf. *kerimbaensis* (Said), 356x, edge view; 15 *Textularia agglutinans* d'Orbigny, 157x, lateral view; 16 *T. agglutinans* d'Orbigny, 256x, lateral view; 17 *Textularia calva* Lalicker, 246x, lateral view; 18 *Textularia conica* d'Orbigny, 477x, lateral view; 19 *Textularia gramen* d'Orbigny, 389x, lateral view; 20 *Textularia gramen* d'Orbigny, 246x, oblique lateral view; 21 *Textularia pala* Czjzek, 503x, lateral view; 22 *T. pala* Czjzek, 366x, lateral view; 23 *Textularia pseudorugosa* Lacroix, 149x, lateral view, atypical specimen; 24 *T. pseudorugosa* Lacroix, 278x, lateral view; 25 *Siphotextularia concava* (Karrer), 360x, lateral view; 26 *S. concava* (Karrer), 1120x, apertural face.

- 1939 *Trochammina nitida* Brady; Cushman and McCulloch, p. 105, pl. 11, figs. 7-9
- 1988 *Polystomammmina nitida* (Brady); Loeblich and Tappan, p. 35, pl. 135, figs. 6-9
- 1994 *Polystomammmina nitida* (Brady); Jones, p. 46, Pl. 41, figs. 5, 6 [cop. Brady, 1884, figs. 5, 6]

**Remarks:** The wall is finely agglutinated. The test is low trochospirally enrolled. Three whorls are visible on the spiral side. Chambers increasing rapidly in size as added. Sutures are gently curved on the spiral side, more radial on the umbilical side and depressed on both sides. The primary aperture is an interiomarginal and arched slit, curving slightly upward on the umbilical side. Secondary apertures are present on the inner tips of the chambers and open into the umbilical region so that relict supplementary openings of the previous chambers are present in the umbilical region.

Family VERNEUILINIDAE Cushman, 1911  
Subfamily VERNEUILININAE Cushman, 1911  
Genus GAUDRYINA d'Orbigny, 1839a  
*Gaudryina rudis* Wright, 1900  
Figure 10.6

- 1900 *Gaudryina rudis* Wright: p. 53, pl. 2, fig. 1
- 1987 *Gaudryina rudis* Wright; Alberola et al., p. 305, pl. 2, figs. 8, 9
- 1991 *Connemarella rudis* (Wright); Cimerman and Langer, p. 23, pl. 8, figs. 1-4
- 2003 *Gaudryina rudis* Wright; Murray, p.13, fig. 2, no. 12, 13
- 2009 *Connemarella rudis* (Wright); Milker et al., p. 215, pl. 1, fig. 15

**Remarks:** The wall is coarsely agglutinated. The test is elongate and conical in lateral view. Chambers are triserially arranged in the early stage. In the later stage, chambers are biserially arranged and more rounded. The aperture is a low slit on the base of the final chamber.

*Gaudryina siciliana* Cushman, 1936  
Figure 10.7-8

- 1936 *Gaudryina siciliana* Cushman: p. 9, pl. 2, fig. 1
- 1993 *Sahulia* cf. *barkeri* Hofker; Hottinger, Halicz and Reiss, p. 33, pl. 8, figs. 7-11
- 1993 *Connemarella rudis* (Wright); Sgarrella and Moncharmont Zei, p. 167, pl. 4, figs. 6-7
- 2005 *Gaudryina siciliana* Cushman; Rasmussen, p. 55, pl. 1, figs. 7, 8

- 2009 *Gaudryina siciliana* Cushman; Milker et al., p. 215, pl. 1, figs. 4, 5

**Remarks:** The wall is coarsely agglutinated. The test is low conical, triangular and broader than long in lateral view. Chambers are triserially arranged in the early stage and biserially arranged in the later stage. Sutures are nearly horizontal. The aperture is a low slit at the base of the final chamber and surrounded by a small lip. Despite of the low conical shape and the largely biserial test that is characteristic for the genus *Sahulia* (Loeblich and Tappan, 1988), this species has been included into the genus *Gaudryina* due to the triserial early stage.

Family EGGERELLIDAE Cushman, 1937  
Subfamily EGGERELLINAE Cushman, 1937  
Genus EGGERELLOIDES Haynes, 1973  
*Eggerelloides scabrus* (Williamson, 1858)  
Figure 10.9

- 1858 *Bulimina scabra* Williamson: p. 65, pl. 5, figs. 136, 137
- 1960 *Eggerella scabra* (Williamson); Hofker, p. 236, pl. A, figs. 11, 12
- 1988 *Eggerelloides scabrus* (Williamson); Loeblich and Tappan, p. 48, pl. 189, figs. 5-7
- 1991 *Eggerella scabra* (Williamson); Alberola et al., p. 80, pl. 1, fig. 2
- 1992 *Eggerelloides scabra* (Williamson); Schiebel, p. 16, pl. 8, fig. 4
- 1993 *Eggerella scabra* (Williamson); Sgarrella and Moncharmont Zei, p. 162, pl. 4, fig. 9
- 1995 *Eggerelloides scabrus* (Williamson); Coppa and Di Tuoro, p. 166, pl. 1, fig. 5
- 2003 *Eggerelloides scaber* (Williamson); Murray, p. 13, fig. 2, no. 11
- 2004 *Eggerelloides scaber* (Williamson); Chendes et al., p. 76, pl. 1, fig. 4
- 2004 *Eggerelloides scaber* (Williamson); Mendes et al., p. 178, pl. 1, fig. 3
- 2005 *Eggerelloides scabrus* (Williamson); Debenay et al., p. 332, pl. 1, fig. 2
- 2009 *Eggerelloides scabrus* (Williamson); Avsar et al., p. 134, pl. 1, fig. 7
- 2009 *Eggerelloides scabrus* (Williamson); Frezza and Carboni, p. 55, pl. 1, fig. 8; pl. 2, fig. 10

**Remarks:** The wall is coarsely agglutinated. The test is subfusiform in lateral view. Chambers are trochospirally arranged in the early stage, and later

chambers are triserially arranged. Chambers gradually increasing in size as added. The aperture is an interiomarginal arch in the center of the apertural face.

Family TEXTULARIIDAE Ehrenberg, 1838  
Subfamily TEXTULARIINAE Ehrenberg, 1838  
Genus BIGENERINA d'Orbigny, 1826  
*Bigenerina nodosaria* d'Orbigny, 1826  
Figure 10.10-12

- 1826 *Bigenerina nodosaria* d'Orbigny: p. 261, pl. 11, figs. 9-12
- 1884 *Bigenerina nodosaria* d'Orbigny; Brady, p. 369, pl. 44, figs. 14-18
- 1911 *Bigenerina nodosaria* d'Orbigny; Cushman, p. 27, text-figs. 46-48 [cop. Brady, 1884, figs. 14-18]
- 1960 *Bigenerina nodosaria* d'Orbigny; Hofker, p. 238, pl. A, figs. 19, 20
- 1987 *Bigenerina nodosaria* d'Orbigny; Alberola et al., p. 304, pl. 1, fig. 1
- 1987 *Bigenerina nodosaria* d'Orbigny; Jorissen, p. 34, pl. 1, fig. 10
- 1988 *Bigenerina nodosaria* d'Orbigny; Loeblich and Tappan, p. 48, pl. 191, figs. 1, 2
- 1991 *Bigenerina nodosaria* d'Orbigny; Cimerman and Langer, p. 21, pl. 9, figs. 1-6
- 1993 *Bigenerina nodosaria* d'Orbigny; Sgarrella and Moncharmont Zei, p. 164, pl. 4, fig. 12
- 1994 *Bigenerina nodosaria* d'Orbigny; Jones, p. 49, pl. 44, figs. 14-18 [cop. Brady 1884, figs. 14-18]
- 2002 *Bigenerina nodosaria* d'Orbigny; Kaminski et al., p. 170, pl. 1, fig. 9
- 2003 *Bigenerina nodosaria* d'Orbigny; Murray, p. 11, fig. 2, no. 4
- 2004 *Bigenerina nodosaria* d'Orbigny; Chendes et al., p. 76, pl. 1, fig. 5
- 2005 *Bigenerina nodosaria* d'Orbigny; Rasmussen, p. 56, pl. 1, figs. 12, 13
- 2008 *Bigenerina nodosaria* d'Orbigny; Abu-Zied et al., p. 51, pl. 1, fig. 6
- 2009 *Bigenerina nodosaria* d'Orbigny; Avsar et al., p. 134, pl. 1, fig. 8
- 2009 *Bigenerina nodosaria* d'Orbigny; Milker et al., p. 215, pl. 1, fig. 3

**Remarks:** The wall is coarsely agglutinated. The test is elongate and partly curved in lateral view.

Early chambers are biserially arranged, and later chambers are uniserially arranged. The terminal aperture, on a short neck, is rounded in the adult stage.

Genus SAHULIA Loeblich and Tappan, 1985  
*Sahulua* cf. *kerimbaensis* (Said, 1949)  
Figure 10.13-14

- 1915 cf. *Textularia conica* d'Orbigny var. *corrugata* Heron-Allen and Earland: p. 629, pl. 47, figs. 24-27
- 1932 cf. *Textularia corrugata* Heron-Allen and Earland; Cushman, p. 12, pl. 3, figs. 2, 4
- 1949 cf. *Textularia kerimbaensis* Said: p. 6, pl. 1, fig. 8 (fide Ellis and Messina, 1940ff)
- 1993 cf. *Sahulua kerimbaensis* (Said); Hottinger, Halicz and Reiss, p. 34, pl. 9, figs. 8-12

**Remarks:** The wall is agglutinated. The test is elongate to subtriangular with a subacute peripheral margin. Chambers increasing in size as added and are broad and low. Early chambers are indistinct triserially, and later chambers are biserially arranged. The fistulose chamberlets are mostly broken. Sutures are depressed and curved. The aperture is a slit at the base of the final chamber and bordered by a lip.

Genus TEXTULARIA Defrance, 1824  
*Textularia agglutinans* d'Orbigny, 1839a  
Figure 10.15-16

- 1839a *Textularia agglutinans* d'Orbigny: p. 144, pl. 1, figs. 17, 18, 32-34
- 1884 *Textularia agglutinans* d'Orbigny; Brady, p. 363, pl. 43, figs. 1-3
- 1911 *Textularia agglutinans* d'Orbigny; Cushman, p. 9, text-fig. 10
- 1932 *Textularia agglutinans* d'Orbigny; Cushman, p. 10, pl. 2, figs. 5-7
- 1940 *Textularia agglutinans* d'Orbigny; Lalicker and McCulloch, p. 117, pl. 13, fig. 2
- 1960 *Textularia agglutinans* d'Orbigny; Hofker, p. 237, pl. A, fig. 18
- 1987 *Textularia agglutinans* d'Orbigny; Alberola et al., p. 304, pl. 1, fig. 13; pl. 2, fig. 1
- 1991 *Textularia agglutinans* d'Orbigny; Alberola et al., p. 80, pl. 1, fig. 3
- 1991 *Textularia agglutinans* d'Orbigny; Cimerman and Langer, p. 21, pl. 10, figs. 1, 2

- 1994 *Textularia agglutinans* d'Orbigny; Jones, p. 48, pl. 43, figs. 1-3 [cop. Brady 1884, figs. 1-3]

**Remarks:** The wall is agglutinated. The test is biserially arranged, elongate and subrounded in adult stage. Chambers increasing in size as added. Sutures are slightly depressed. The aperture is a low arch at the base of the final chamber. *Textularia agglutinans* shown in Hottinger, Halicz and Reiss, (1993, p. 36, plate 13, figures 1-9) looks different to that shown by the other authors and the specimens in this work due to the slightly irregular chamber arrangement.

*Textularia calva* Lalicker, 1935  
Figure 10.17

- 1935 *Textularia calva* Lalicker: p. 1, pl. 1, figs. 1, 2  
1940 *Textularia calva* Lalicker; Lalicker and McCulloch, p. 120, pl. 13, fig. 6  
1958 *Textularia calva* Lalicker; Parker, p. 254, pl. 1, fig. 4  
1991 *Textularia bocki* (Hoeglund); Cimerman and Langer, p. 21, pl. 10, fig. 6  
1993 *Textularia calva* Lalicker; Sgarrella and Moncharmont Zei, p. 164, pl. 3, fig. 11  
2002 *Textularia bocki* (Hoeglund); Kaminski et al., p. 170, pl. 1, figs. 1, 2  
2005 *Textularia gramen* d'Orbigny; Rasmussen, p. 56, pl. 1, fig. 17  
2009 *Textularia calva* Lalicker; Milker et al., p. 215, pl. 1, fig. 12

**Remarks:** The wall is agglutinated. The test is elongate in lateral view. Chambers are biserially arranged, increasing in size as added. The aperture is a low arch at the base of the final chamber. This species is distinguished from *Textularia agglutinans* and *Textularia gramen* by its indistinct or not visible sutures under light microscope. However, indistinct sutures can be also characteristic for *G. gramen* (Cushman, 1911). According to Rasmussen (2005), the systematic of the species assigned to *T. agglutinans*, *T. gramen*, *T. pseudogramen*, *T. bocki* and *T. calva* in the literature needs revision.

*Textularia conica* d'Orbigny, 1839a  
Figure 10.18

- 1839a *Textularia conica* d'Orbigny: p. 143, pl. 1, figs. 19, 20  
1932 *Textularia conica* d'Orbigny; Cushman, p. 11, pl. 2, figs. 8-10; pl. 3, figs. 1-3

- 1940 *Textularia conica* d'Orbigny; Lalicker and McCulloch, p. 126, pl. 14, fig. 8

- 1958 *Textularia conica* d'Orbigny; Parker, p. 254, pl. 1, figs. 5, 6

- 1991 *Textularia conica* d'Orbigny; Cimerman and Langer, p. 22, pl. 10, figs. 7-9

- 1993 *Textularia conica* d'Orbigny; Sgarrella and Moncharmont Zei, p. 166, pl. 3, figs. 4, 5

- 2005 *Textularia conica* d'Orbigny; Rasmussen, p. 56, pl. 1, figs. 14, 15

**Remarks:** The wall is agglutinated. The test is triangular and broader than long in lateral view. Chambers are biserially arranged, rapidly increasing in size as added. Sutures are depressed and curved. The peripheral margin is subacute. The aperture is a slit at the base of the final chamber. No fistulose chamberlets are visible. The generic position requires further investigation. According to Loeblich and Tappan (1988), *Sahulia* species differs from *Textularia* species by the lower and more conical test as observed for *T. conica*.

*Textularia gramen* d'Orbigny, 1846  
Figure 10.19-20

- 1846 *Textularia gramen* d'Orbigny: p. 248, tab. 15, figs. 4-6  
1911 *Textularia gramen* d'Orbigny; Cushman, p. 8, text-figs. 6-9  
1940 *Textularia gramen* d'Orbigny; Lalicker and McCulloch, p. 129, pl. 14, fig. 13  
1991 *Textularia bocki* Hoeglund; Cimerman and Langer, p. 21, pl. 10, fig. 5  
2002 *Textularia* sp.; Kaminski et al., p. 170, pl. 1, fig. 8  
2009 *Textularia bocki* Hoeglund; Avsar et al., p. 134, pl. 1, figs. 9, 10

**Remarks:** The wall is agglutinated. The test is subtriangular and elongate in lateral view. Chambers are biserially arranged, increasing in size as added. The aperture is a low arch at the base of the final chamber. This species is distinguished from *Textularia agglutinans* by its less depressed sutures and more coarsely arenaceous test and from *Textularia calva* by this clearly visible sutures (see also remarks to *T. calva*). According to Rasmussen (2005), specimens having more chambers and have been therefore assigned to *Textularia pseudogramen* by other authors has been here regarded as conspecific.

*Textularia pala* Czjzek, 1848  
Figure 10.21-22

- 1848 *Textularia pala* Czjzek: p. 148, pl. 13, figs. 25-27
- 1991 *Textularia truncata* Hoeglund; Cimerman and Langer, p. 22, pl. 12, figs. 1-3
- 1993 *Textularia pala* Czjzek; Sgarrella and Moncharmont Zei, p. 166, pl. 3, fig. 8
- 2009 *Textularia pala* Czjzek; Milker et al., p. 215, pl. 1, figs. 13, 14

**Remarks:** The wall is finely agglutinated. The test is triangular in lateral view and subrhomboid in section. Chambers are biserially arranged, broad and low, and increasing in size as added. Sutures are very slightly depressed. The aperture is a low arch at the base of the final chamber. This species is clearly distinguishable from the other *Textularia* species described here by its smoother test surface and its finer arenaceous wall.

*Textularia pseudorugosa* Lacroix, 1932  
Figure 10.23-24

- 1932 *Textularia pseudorugosa* Lacroix: pp. 19-20, figs. 19-22
- 1991 *Textularia pseudorugosa* Lacroix; Cimerman and Langer, p. 22, pl. 11, figs. 5-8
- 1993 *Textularia pseudorugosa* Lacroix; Sgarrella and Moncharmont Zei, p. 166, pl. 3, figs. 6, 7
- 1995 *Textularia pseudorugosa* Lacroix; Coppa and Di Tuoro, p. 166, pl. 1, fig. 8
- 2009 *Textularia pseudorugosa* Lacroix; Milker et al., p. 215, pl. 1, figs. 10, 11

**Remarks:** The wall is agglutinated. The test is elongate in lateral view. Chambers are biserially arranged. Sutures are distinct and backwards curved. The periphery is subacute. The aperture is a low slit at the inner margin of the final chamber and bordered by a lip. The generic position needs further investigation. *Textularia pseudorugosa* in this study differs from *Sahulia* cf. *kerimbaensis* by the absence of fistulose chamberlets.

Subfamily SIPHOTEXTULARIINAE Loeblich and Tappan, 1985

Genus SIPHOTEXTULARIA Finlay, 1939  
*Siphotextularia concava* (Karrer, 1868)  
Figure 10.25-26

- 1868 *Plecanium concavum* Karrer: p. 129, pl. 1, fig. 3

- 1884 *Siphotextularia concava* (Karrer), sp.; Brady, p. 360, pl. 42, figs. 13, 14
- 1911 *Textularia concava* (Karrer); Cushman, pp. 22-23, text-fig. 38
- 1932 *Textularia concava* (Karrer); Cushman, p. 13, pl. 3, fig. 6
- 1991 *Siphotextularia concava* (Karrer); Cimerman and Langer, p. 23, pl. 12, figs. 4-6
- 1993 *Siphotextularia concava* (Karrer); Sgarrella and Moncharmont Zei, p. 166, pl. 3, fig. 12
- 1994 *Siphotextularia concava* (Karrer); Jones, p. 47, pl. 42, figs. 13, 14 [cop. Brady 1884, figs. 13, 14]
- 2005 *Siphotextularia concava* (Karrer); Rasmussen, p. 58, pl. 2, fig. 6
- 2009 *Siphotextularia concava* (Karrer); Milker et al., p. 215, pl. 1, fig. 6

**Remarks:** The wall is finely agglutinated. The test is subquadriangular in section and subtriangular in lateral view. Chambers are biserially arranged, increasing in size as added. Sutures are depressed and curved. The aperture is an elongate slit at the base of the final chamber and surrounded by a lip.

*Siphotextularia flintii* (Cushman, 1911)  
Figure 11.1-3

- 1911 *Textularia flintii* Cushman: p. 21, text-fig. 36
- 1987 *Siphotextularia flintii* (Cushman); Alberola et al., p. 304, pl. 1, figs. 9, 10
- 2003 *Siphotextularia flintii* (Cushman); Murray, p. 15, fig. 3, no. 11
- 2009 *Siphotextularia concava* (Karrer); Avsar et al., p. 134, pl. 1, fig. 11

**Remarks:** The wall is finely agglutinated. The test is subtriangular in lateral view. Chambers are biserially arranged and more inflated when compared to *Siphotextularia concava*. Chambers rapidly increasing in size as added. The periphery is subrounded. The aperture is an elongate slit, slightly above the base of the final chamber, and bordered by a lip.

Family PSEUDOGAUDRYINIDAE Loeblich and Tappan, 1985

Subfamily PSEUDOGAUDRYININAE Loeblich and Tappan, 1985  
Genus PSEUDOCLAVULINA Cushman, 1936





**FIGURE 11.** 1 *Siphotextularia flintii* (Cushman), 368x, oblique lateral view; 2 *S. flintii* (Cushman), 590x, lateral view; 3 *S. flintii* Cushman, 252x, peripheral view; 4 *Pseudoclavulina crustata* Cushman, 254x, lateral view, juvenile specimen; 5 *Pseudoclavulina crustata* Cushman, 291x, lateral view, juvenile specimen; 6 *P. crustata* Cushman, 399x, lateral view; 7 *Clavulina cylindrica* (Cushman), 165x, lateral view; 8 *Trocholinopsis ornata* Sidebottom, 607x, spiral side; 9 *T. ornata* Sidebottom, 771x, umbilical side; 10 *Spirillinid* sp. 1, 480x, convex side; 11 *Sejunctella* cf. *lateseptata* (Terquem), 683x, spiral side; 12 *S.* cf. *lateseptata* (Terquem), 925x, umbilical side; 13 *Spirillina limbata* Brady, 383x, side view; 14 *S. limbata* Brady, 415x, side view; 15 *Spirillina vivipara* Ehrenberg, 684x, side view; 16 *S. vivipara* Ehrenberg, 655x, side view; 17 *Spirillina wrightii* Heron-Allen and Earland, 361x, side view; 18 *S. wrightii* Heron-Allen and Earland, 396x, side view; 19 *Spirillina* sp. 1, 807x, side view; 20 *Spirillina* sp. 1, 801x, side view; 21 *Patellina corrugata* Williamson, 783x, spiral side; 22 *P. corrugata* Williamson, 685x, spiral side; 23 *P. corrugata* Williamson, 655x, umbilical side; 24 *Cornuspira foliacea* (Philippi), 318x, peripheral view; 25 *C. foliacea* (Philippi), 192x, side view.

*Pseudoclavulina crustata* Cushman, 1936  
Figure 11.4-6

- 1936 *Pseudoclavulina crustata* Cushman: p. 19, pl. 3, fig. 12
- 1958 *Pseudoclavulina crustata* Cushman; Parker, p. 254, pl. 1, fig. 7
- 1960 *Pseudoclavulina crustata* Cushman; Hofker, p. 239, pl. A, figs. 27, 28
- 1987 *Pseudoclavulina crustata* Cushman; Jorissen, p. 34, pl. 1, fig. 1
- 1991 *Pseudoclavulina crustata* Cushman; Cimerman and Langer, p. 23, pl. 11, figs. 9, 10
- 1993 *Clavulina crustata* (Cushman); Sgarrella and Moncharmont Zei, p. 167, pl. 4, fig. 10
- 2008 *Pseudoclavulina crustata* Cushman; Abu-Zied et al., p. 51, pl. 1, fig. 7

**Remarks:** The wall is coarsely agglutinated. The test is elongate. Early chambers are triserially arranged and triangular in basal view. Later chambers are uniserial and cylindrical. The terminal aperture is a circular and toothless opening on a short neck.

Family VALVULINIDAE Berthelin, 1880  
Subfamily VALVULININAE Berthelin, 1880  
Genus CLAVULINA d'Orbigny, 1826  
*Clavulina cylindrica* (Cushman, 1922a)  
Figure 11.7

- 1922a *Bigenerina cylindrica* Cushman: p. 26, pl. 3, figs. 7, 8
- 1960 *Goesella obscura* (Chaster); Hofker, p. 236, pl. A, fig. 15
- 1993 *Bigenerina cylindrica* Cushman; Sgarrella and Moncharmont Zei, p. 164, pl. 4, fig. 11

**Remarks:** The wall is finely agglutinated. The test is elongate. Early chambers are triserially arranged and triangular in basal view. Later chambers are uniserial and cylindrical. The terminal aperture is a circular opening. This species has been assigned to the genus *Clavulina* due to the triserial arrangement of the early chambers.

Suborder INVOLUTININA Hohenegger and Piller, 1977

Family PLANISPIRILLINIDAE Piller, 1978  
Genus TROCHOLINOPSIS Piller, 1983  
*Trocholinopsis ornata* (Sidebottom, 1908)  
Figure 11.8-9

- 1908 *Spirillina ornata* Sidebottom: p. 9, pl. 2, figs. 7, 8

- 1983 *Trocholinopsis porosuturalis* Piller; p. 195, pl. 2, figs. 12-23

- 1988 *Trocholinopsis porosuturalis* Piller; Loeblich and Tappan, p. 83, pl. 316, figs. 12-17 [cop. Piller 1983, figs. 13-15, 17-18, 20]

**Remarks:** The wall is calcareous. The test is a small and a low cone. The spiral side is slightly convex and evolute. The umbilical side is slightly concave. The aperture on the umbilical side is a broad and low opening at the end of the final chamber. Pores are present along the sutures on the spiral side. The umbilical side is ornamented with small, nearly radial and curved pustules and larger pustules in the umbilical region.

Suborder SPIRILLININA Hohenegger and Piller, 1975

Family SPIRILLINIDAE Reuss and Fritsch, 1861  
*Spirillinid* sp. 1  
Figure 11.10

- 1993 *Spirillinid* genus? sp. A; Hottinger, Halicz and Reiss, p. 75, pl. 87, figs. 1-6

**Remarks:** The wall is calcareous and imperforate. The test is a low cone. On the convex side, the initial part is composed of a prominent spherical chamber followed by an enrolled tubular chamber. The aperture is on the end of the enrolled tubular chamber. The periphery is provided with rare and short pseudospines and the initial part of the concave side is ornamented with pustules. The test surface is slightly rough. Further study is necessary for the determination of the generic position of this species.

Genus SEJUNCTELLA Loeblich and Tappan, 1957  
*Sejunctella* cf. *lateseptata* (Terquem, 1875)  
Figure 11.11-12

- 1875 cf. *Spirillina lateseptata* Terquem: p. 425, pl. 1, fig. 6
- 1908 cf. *Spirillina vivipara* Ehrenberg var. *carinata* Halkyard; Sidebottom, p. 8, pl. 2, fig. 4
- 1931 cf. *Spirillina lateseptata* Terquem; Cushman, p. 6, pl. 1, figs. 12, 13; pl. 2, fig. 1
- 1988 cf. *Sejunctella lateseptata* (Terquem); Loeblich and Tappan, p. 83, pl. 318, fig. 8
- 1991 *Sejunctella* sp. 2; Cimerman and Langer, p. 23, pl. 13, figs. 6-7
- 1993 *Sejunctella?* sp. A; Hottinger, Halicz and Reiss, p. 74, pl. 85, figs. 6-8

**Remarks:** The wall is hyaline and calcareous. The test is discoidal-ovate and flattened. The prolocu-

lus is followed by an enrolled second chamber that is separated from the previous whorl by a narrow plate-like area. The periphery is carinate and keeled. The aperture is an opening at the end of the tubular chamber. On the keel, thin pseudospines are present. The convex side is densely perforate. The flat side is almost imperforate but ornamented with oblique ripples.

Genus SPIRILLINA Ehrenberg, 1843

*Spirillina limbata* Brady, 1879b

Figure 11.13-14

- 1879b *Spirillina limbata* Brady: p. 278, pl. 8, fig. 26
- 1884 *Spirillina limbata* Brady; Brady, p. 632, pl. 85, figs. 18-21
- 1991 *Spirillina limbata* Brady; Cimerman and Langer, p. 24, pl. 14, figs. 1-3
- 1994 *Spirillina limbata* Brady; Jones, p. 92, pl. 85, figs. 18-21 [cop. Brady, 1884, figs. 18-21]

**Remarks:** The wall is calcareous and hyaline. The test is discoidal. The proloculus is followed by an enrolled second tubular chamber. The periphery is bicarinate. The aperture is rounded at the open end of the tubular chamber. The test is densely perforate on both sides. The microspheric specimens shown in Brady (1879b, 1884) differ from the megalospheric specimen shown in Cimerman and Langer (1991) and described here due to the more numerous coils.

*Spirillina vivipara* Ehrenberg, 1843

Figure 11.15-16

- 1843 *Spirillina vivipara* Ehrenberg: p. 422, pl. 3, sec. 7, fig. 41
- 1884 *Spirillina vivipara* Ehrenberg; Brady, p. 162, pl. 85, figs. 1-4
- 1916 *Spirillina vivipara* Ehrenberg; Heron-Allen and Earland, p. 268, pl. 42, figs. 21-25
- 1931 *Spirillina vivipara* Ehrenberg; Cushman, p. 3, pl. 1, figs. 1-4 [fig. 1: cop. Ehrenberg 1843, fig. 41]
- 1958 *Spirillina vivipara* Ehrenberg; Parker, p. 264, pl. 3, fig. 4
- 1960 *Spirillina vivipara* Ehrenberg; Hofker, p. 252, pl. D, fig. 109
- 1988 *Spirillina vivipara* Ehrenberg; Loeblich and Tappan, p. 83, pl. 318, figs. 4-7
- 1991 *Spirillina vivipara* Ehrenberg; Cimerman and Langer, p. 24, pl. 14, figs. 4-6

- 1992 *Spirillina vivipara* Ehrenberg; Schiebel, p. 69, pl. 5, fig. 16
- 1994 *Spirillina vivipara* Ehrenberg; Jones, p. 92, pl. 85, figs. 1-4 [cop. Brady, 1884, figs. 1-4]
- 2009 *Spirillina vivipara* Ehrenberg; Milker et al., p. 216, pl. 2, fig. 6

**Remarks:** The wall is calcareous and hyaline. The test is discoidal. The proloculus is followed by an enrolled second tubular chamber. The periphery is subrounded. The aperture is crescentic at the open end of the tubular chamber. The test is perforate on both sides, with slightly smaller pores on one side and larger pores on the other side.

*Spirillina wrightii* Heron-Allen and Earland, 1930b

Figure 11.17-18

- 1930b *Spirillina wrightii* Heron-Allen and Earland: p. 181, pl. 4, figs. 54-58 (fide Ellis and Messina 1940ff)
- 1958 *Spirillina wrightii* Heron-Allen and Earland; Parker, p. 264, pl. 3, figs. 1-3
- 2009 *Spirillina limbata* Brady; Milker et al., p. 215, pl. 1, fig. 7

**Remarks:** The wall is calcareous and hyaline. The test is discoidal. The proloculus is followed by an enrolled second tubular chamber. The periphery is bicarinate. The aperture is rounded at the open end of the tubular chamber. The test is densely perforate on one side and ornamented by large pustules on the other side. This species is looks close to *Spirillina limbata*, but it has large pustules on its nearly imperforate side.

*Spirillina* sp. 1

Figure 11.19-20

- 1951 cf. *Spirillina* sp.; Phleger and Parker, p. 25, pl. 13, figs. 5, 6

**Remarks:** The wall is calcareous and hyaline. This test is discoidal. The proloculus is followed by a second chamber. The periphery is subcarinate. The aperture is a simple opening at the end of the tubular chamber. On the keel, relatively short spines, oblique to the periphery, are present. One side is perforate with pseudospine-like features along the suture and has a rough surface. The other side is imperforate with large pustules and has a smooth test surface.

Family PATELLINIDAE Rhumbler, 1906  
Subfamily PATELLININAE Rhumbler, 1906  
Genus PATELLINA Williamson, 1858  
*Patellina corrugata* Williamson, 1858  
Figure 11.21-23

- 1858 *Patellina corrugata* Williamson: p. 46, pl. 3, figs. 86-89
- 1884 *Patellina corrugata* Williamson; Brady, p. 634, pl. 86, figs. 1-7
- 1931 *Patellina corrugata* Williamson; Cushman, p. 11, pl. 2, figs. 6, 7 [cop. Williamson, 1858, fig. 7]
- 1988 *Patellina corrugata* Williamson; Loeblich and Tappan, p. 84, pl. 320, figs. 7-14
- 1991 *Patellina corrugata* Williamson; Cimerman and Langer, p. 24, pl. 14, figs. 7-12
- 1993 *Patellina corrugata* Williamson; Hottinger, Halicz and Reiss, p. 76, pl. 87, figs. 7-11
- 1994 *Patellina corrugata* Williamson; Jones, p. 93, pl. 86, figs. 1-7 [cop. Brady, 1884, figs. 1-7]
- 2003 *Patellina corrugata* Williamson; Murray, p. 24, fig. 9, no. 6, 7

**Remarks:** The test is calcareous. The test is low conical. The proloculus is followed by an enrolled second tubular chamber. The periphery is carinate. All chambers, subdivided by radial septula, are visible on the convex spiral side. Only the final part of the final chamber is visible on the flattened umbilical side. The aperture is a low interiomarginal arch, provided with a T-shaped plate, and opens toward the umbilicus.

Suborder MILIOLINA Delage and Herouard, 1896

Family CORNUSPIRIDAE Schultze, 1854

Subfamily CORNUSPIRINAE Schultze, 1854

Genus CORNUSPIRA Schultze, 1854

*Cornuspira foliacea* (Philippi, 1844)

Figure 11.24-25

- 1844 *Orbis foliaceus* Philippi: p. 147, pl. 24, fig. 26
- 1865 *Cornuspira foliacea* (Philippi); Reuss, p. 5, pl. 1, figs. 8, 9
- 1884 *Cornuspira foliacea* (Philippi); Brady, p. 199, pl. 11, figs. 5, 6
- 1917 *Cornuspira foliacea* (Philippi); Cushman, p. 24, pl. 1, fig. 1; pl. 2, fig. 2; text fig. 4
- 1929 *Cornuspira foliacea* (Philippi); Cushman, p. 79, pl. 20, figs. 3-5
- 1931 *Cornuspira foliacea* (Philippi); Wiesner, p. 101, pl. 14, fig. 163
- 1960 *Cornuspiroides foliaceum* (Philippi); Hofker, p. 240, pl. B, fig. 34
- 1991 *Cornuspira foliacea* (Philippi); Cimerman and Langer, p. 24, pl. 15, figs. 1-3

- 1994 *Cornuspira foliacea* (Philippi); Jones, p. 27, pl. 11, figs. 5, 6 [cop. Brady, 1884, figs. 5, 6]
- 2005 *Cornuspira foliacea* (Philippi); Rasmussen, p. 59, pl. 3, fig. 3

**Remarks:** The wall is porcelaneous and imperforate. The test is discoidal and flattened. The proloculus is followed by an enrolled second tubular chamber. The final whorl enlarges continuously. The periphery is rounded. The aperture, at the end of the tubular chamber, is narrow and slightly elongate. The test surface is smooth, and transverse grow lines are present.

*Cornuspira involvens* (Reuss, 1850)

Figure 12.1

- 1850 *Operculina involvens* Reuss: p. 6, pl. 1, fig. 20
- 1884 *Cornuspira involvens* (Reuss); Brady, p. 200, pl. 11, figs. 1-3
- 1917 *Cornuspira involvens* (Reuss); Cushman, p. 25, pl. 1, fig. 2; pl. 2, fig. 2; text figs. 2, 3
- 1929 *Cornuspira involvens* (Reuss); Cushman, p. 80, pl. 20, figs. 6, 8 [fig. 6: cop. Brady, 1884, fig. 1a]
- 1931 *Cornuspira involvens* (Reuss); Wiesner, p. 101, pl. 14, figs. 161, 162
- 1932 *Cornuspira involvens* (Reuss); Cushman, p. 67, pl. 16, fig. 2
- 1991 *Cornuspira involvens* (Reuss); Cimerman and Langer, p. 25, pl. 15, figs. 4-7
- 1994 *Cornuspira involvens* (Reuss); Jones, p. 26, pl. 11, figs. 1-3 [cop. Brady, 1884, figs. 1-3]
- 1995 *Cyclogira involvens* (Reuss); Coppa and Di Tuoro, p. 166, pl. 1, fig. 9
- 2003 *Cornuspira involvens* (Reuss); Murray, p. 15, fig. 4, no. 5

**Remarks:** The wall is porcelaneous and imperforate. The test is discoidal, circular in outline and flattened. The proloculus is followed by a second enrolled and undivided tubular chamber that gradually increases in size. The periphery is subrounded. The aperture is rounded at the end of the tubular chamber. The test surface is smooth.

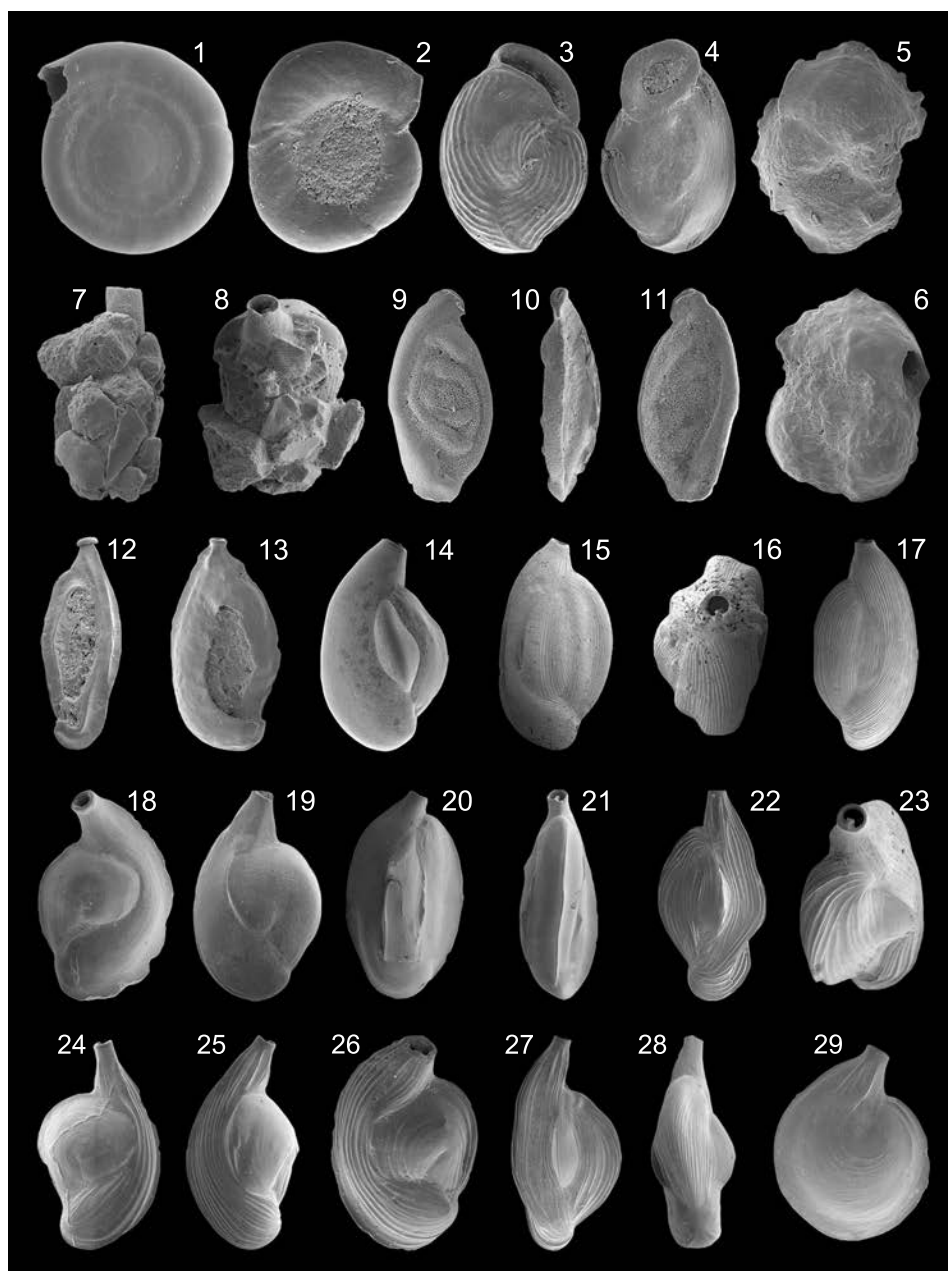
Family FISCHERINIDAE Millett, 1898

Subfamily FISCHERININAE Millett, 1898

Genus TRISEGMENTINA Wiesner, 1920

*Trisegmentina compressa* Wiesner, 1931

Figure 12.2



**FIGURE 12.** 1 *Cornuspira involvens* (Reuss), 954x, side view; 2 *Trisegmentina compressa* Wiesner, 729x, side view; 3 *Vertebralina striata* d'Orbigny, 543x, side view; 4 *Wiesnerella auriculata* (Egger), 1130x, side view; 5 *Nubecularia lucifuga* DeFrance, 541x, dorsal side; 6 *N. lucifuga* DeFrance, 631x, dorsal side; 7 *Nubeculina divaricata* (Brady), 685x, lateral view; 8 *N. divaricata* (Brady), 383x, lateral view; 9 *Spirophthalmidium acutimargo* (Brady) var. *concava* (Wiesner), 635x, lateral view; 10 *S. acutimargo* (Brady) var. *concava* (Wiesner), 396x, peripheral view; 11 *Spirophthalmidium acutimargo* (Brady) var. *concava* (Wiesner), 470x, lateral view; 12 *Spirophthalmidium* sp. 1, 757x, lateral view; 13 *Spirophthalmidium* sp. 2, 970x, lateral view; 14 *Adelosina dubia* (d'Orbigny), 638x, lateral view; 15 *Adelosina colomi* (Le Calvez and Le Calvez), 103x, four chamber side; 16 *A. colomi* (Le Calvez and Le Calvez), 137x, apertural view; 17 *A. colomi* (Le Calvez and Le Calvez), 96x, three chamber side; 18 *Adelosina laevigata* d'Orbigny, 867x, side view; 19 *A. laevigata* d'Orbigny, 394x, side view; 20 *Adelosina longirostra* (d'Orbigny), 233x, four chamber side; 21 *A. longirostra* (d'Orbigny), 426x, peripheral view; 22 *Adelosina mediterraneensis* (Le Calvez and Le Calvez), 169x, four chamber side; 23 *A. mediterraneensis* (Le Calvez and Le Calvez), 284x, apertural view; 24 *A. mediterraneensis* (Le Calvez and Le Calvez), 408x, side view; 25 *A. mediterraneensis* (Le Calvez and Le Calvez), 268x, side view; 26 *A. mediterraneensis* (Le Calvez and Le Calvez), 422x, side view; 27 *A. mediterraneensis* (Le Calvez and Le Calvez), 153x, three chamber side; 28 *A. mediterraneensis* (Le Calvez and Le Calvez), 163x, peripheral view; 29 *Adelosina* sp. 1, 293x, side view.

- 1931 *Trisegmentina compressa* Wiesner: p. 70, pl. 1, fig. 7
- 1988 *Trisegmentina compressa* Wiesner; Loeblich and Tappan, p. 87, pl. 329, figs. 7-9
- 1991 *Trisegmentina compressa* Wiesner; Cimerman and Langer, p. 25, pl. 15, figs. 9-11
- 1993 *Fischerina compressa* (Wiesner); Sgarrella and Moncharmont Zei, p. 168, pl. 6, fig. 15

**Remarks:** The wall is porcelaneous and imperforate. The test is discoidal, subrounded and flattened. The globular proloculus is followed by a planispirally enrolled chamber of about one revolution in length and then by two or three enlarging chambers per whorl. Sutures are radial and slightly curved. The aperture, at the end of the final chamber, is bordered by a rim. The test surface is smooth, and some growth ridges may be present.

Family NUBECULARIIDAE Jones, in Griffith and Henfrey 1875

Genus VERTEBRALINA d'Orbigny, 1826

*Vertebralina striata* d'Orbigny, 1826

Figure 12.3

- 1826 *Vertebralina striata* d'Orbigny: p. 283, no. 1
- 1884 *Vertebralina striata* d'Orbigny; Brady, p. 187, pl. 12, figs. 12-14
- 1917 *Vertebralina striata* d'Orbigny; Cushman, p. 38, pl. 22, figs. 3, 4
- 1932 *Vertebralina striata* d'Orbigny; Cushman, p. 73, pl. 16, figs. 8-10
- 1988 *Vertebralina striata* d'Orbigny; Loeblich and Tappan, p. 87, pl. 330, figs. 17-19
- 1991 *Vertebralina striata* d'Orbigny; Cimerman and Langer, p. 25, pl. 16, figs. 1-5
- 1993 *Vertebralina striata* d'Orbigny; Hottinger, Halicz and Reiss, p. 43, pl. 23, figs. 8-15
- 1993 *Vertebralina striata* d'Orbigny; Sgarrella and Moncharmont Zei, p. 169, pl. 6, fig. 7
- 1994 *Vertebralina striata* d'Orbigny; Jones, p. 28, pl. 12, figs. 12-14 [cop. Brady, 1884, figs. 12-14]

**Remarks:** The wall is porcelaneous and imperforate. The test is flattened and ovate to elongate. Early chambers are low trochospiral arranged and involute, later chambers are uncoiled and rectilinear. Chambers increasing in size as added. The aperture is a long and narrow slit, at the end of the final chamber, and bordered by a rim. The test sur-

face is ornamented with longitudinal and elevated ridges.

Genus WIESNERELLA Cushman, 1933b

*Wiesnerella auriculata* (Egger, 1893)

Figure 12.4

- 1893 *Planispira auriculata* Egger: p.245-246, pl. 3, figs 13-15
- 1915 *Planispirina auriculata* (Egger); Heron-Allen and Earland, p. 590, pl. 46, figs. 3-7
- 1929 *Planispirina auriculata* (Egger); Cushman, p. 93, pl. 22, fig. 3
- 1932 *Planispirina auriculata* (Egger); Cushman, p. 72, pl. 16, fig. 6
- 1988 *Wiesnerella auriculata* (Egger); Loeblich and Tappan, p. 87, pl. 330, figs. 11-13
- 1993 *Wiesnerella auriculata* (Egger); Hottinger, Halicz and Reiss, p. 43, pl. 24, figs. 1-4

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate and flattened. It slightly turns toward the more evolute side of the test. The early stage is planispirally enrolled to low trochospiral. The whorls overlap more on one side than on the other side. Sutures are distinct, and the periphery is carinate. The aperture, at the end of the final chamber, is subrounded and bordered by an elevated and broad rim. The test surface is smooth, and some fine striae may be present.

Family NUBECULARIIDAE Jones, 1875 (in Griffith and Henfrey, 1875)

Subfamily NODOBACULARIINAE Cushman, 1927

Genus NUBECULINA Cushman 1924

*Nubeculina divaricata* (Brady, 1879b)

Figure 12.7-8

- 1879b *Sagrina divaricata* Brady: p. 276, pl. 8, figs. 22-24
- 1884 *Nubeculina divaricata* (Brady); Brady, p. 136, pl. 756, figs. 11-16
- 1932 *Nubeculina divaricata* (Brady); Cushman, p. 48, pl. 11, figs. 5, 6
- 1988 *Nubeculina divaricata* (Brady); Loeblich and Tappan, p. 88, pl. 331, figs. 13, 14
- 1991 *Nubeculina divaricata* (Brady); Cimerman and Langer, p. 25, pl. 16, figs. 6-10
- 1994 *Nubeculina divaricata* (Brady); Jones, p. 88, pl. 756, figs. 11-16 [cop. Brady, 1884, figs. 11-16]

**Remarks:** The wall is porcelaneous and imperforate. The test is elongate and narrow. The rounded

aperture is terminal, on a porcelaneous tubular neck and surrounded by a rim. This species incorporates coarse-grained material of different origin, resulting in an agglutinated outer wall. Inwardly projecting teeth as described in Cimerman and Langer (1991) has not been observed.

Subfamily NUBECULARIINAE Jones, in Griffith and Henfrey 1875

Genus NUBECULARIA Defrance, 1825

*Nubecularia lucifuga* Defrance, 1825

Figure 12.5-6

- 1825 *Nubecularia lucifuga* Defrance: p. 210
- 1917 *Nubecularia lucifuga* Defrance; Cushman, p. 41, pl. 8, fig. 6
- 1931 *Nubecularia lucifuga* Defrance; Wiesner, p. 110, pl. 1, figs. 8, 9
- 1960 *Nubecularia lucifuga* Defrance; Hofker, p. 244, pl. C, fig. 62
- 1988 *Nubecularia lucifuga* Defrance; Loeblich and Tappan, p. 88, pl. 332, figs. 1-3
- 1991 *Nubecularia lucifuga* Defrance; Cimerman and Langer, p. 26, pl. 17, figs. 5-7

**Remarks:** The wall is calcareous and imperforate. The early chambers of the attached test are planispirally arranged. Later chambers are somewhat irregular or rectilinear. The aperture is an elongate slit, irregularly placed and bordered by a weakly developed rim. The test surface is rough.

Family OPHTHALMIDIIDAE Wiesner, 1920

Genus SPIROPHTHALMIDIUM Cushman, 1927

*Spirophthalmidium acutimargo* (Brady) var. *concava* (Wiesner, 1913)

Figure 12.9-11

- 1913 *Spiroloculina acutimargo* Brady var. *concava* Wiesner: p. 521, no. 22
- 1916 *Spiroloculina acutimargo* var. *concava* Wiesner; Heron-Allen and Earland, p. 208, pl. 39, figs. 1-3
- 1929 *Spirophthalmidium acutimargo* var. *concava* (Wiesner); Cushman, p. 91, pl. 22, fig. 2 [cop. Heron-Allen and Earland, 1916, figs. 1-3]
- 1991 *Spirophthalmidium acutimargo* var. *concava* Heron Allen and Earland; Rasmussen, p. 363, fig. 6, no. 1
- 1993 *Ophthalmidium concava* (Wiesner); Sgarrella and Moncharmont Zei, p. 168, pl. 5, figs. 3, 4

- 2008 *Spirophthalmidium acutimargo* var. *concava* Heron Allen and Earland; Abu-Zied et al., p. 51, pl. 1, fig. 9

**Remarks:** The wall is porcelaneous and imperforate. The test is thin and ovate, with a concave and a convex side. The proloculus is followed by a cornuspirine coil and later by two chambers per whorl. Adjacent chambers are separated by the plate-like keel. The periphery is carinate. The aperture is ovate, terminal and bordered by a lip. The test surface is slightly rough. Our specimens differ from that shown by the other authors by their shorter necks and/ or the distinct lips.

*Spirophthalmidium* sp. 1

Figure 12.12

- 1991 *Spirophthalmidium* sp. 1; Cimerman and Langer, p. 26, pl. 17, figs. 8-10

**Remarks:** The wall is porcelaneous. The test is fusiform lateral view and flattened. The proloculus is followed by a cornuspirine coil and later by two chambers per whorl. The periphery is carinate. The ovate aperture is terminal, at the end of a long neck and bordered by a distinct rim.

*Spirophthalmidium* sp. 2

Figure 12.13

**Remarks:** The wall is porcelaneous and imperforate. The test is fusiform in lateral view. The proloculus is followed by a cornuspirine coil and later by two chambers per whorl. The periphery is carinate. The rounded aperture, at the end of a neck, is bordered by a rim.

Family SPIROLOCULINIDAE Wiesner, 1920

Genus ADELOSINA d'Orbigny, 1826

*Adelosina colomi* (Le Calvez and Le Calvez, 1958)

Figure 12.15-17

- 1958 *Quinqueloculina colomi* Le Calvez and Le Calvez: p. 176, pl. 3, figs. 15, 16; pl. 4, figs. 17-19

**Remarks:** The wall is porcelaneous. The test is elongate-ovate. The proloculus of the megalospheric test is followed by a complete embraced chamber and a planispirally enrolled second chamber. The third chamber is arranged in nearly 90° change in coiling plane and later chambers with planes of coiling of 130° to 160° apart ("adelosine form"). The peripheral margin is angled. Chambers rapidly increasing in size as added. The rounded aperture is on a neck and provided with a short bifid tooth. The test surface is ornamented with fine longitudinal costae.

*Adelosina dubia* (d'Orbigny, 1826)  
Figure 12.14

- 1826 *Triloculina dubia* d'Orbigny: p. 300, no. 24  
1991 *Adelosina dubia* (d'Orbigny); Cimerman and Langer, p. 27, pl. 18, figs. 5-7

**Remarks:** The wall is porcelaneous. The test is elongate with a rounded periphery. The chamber arrangement is in "adelosine" form. Three to four chambers are visible from the exterior, rapidly increasing in size as added. The aperture is rounded on a neck and provided with a short tooth. The test surface is smooth.

*Adelosina laevigata* d'Orbigny, 1826  
Figure 12.18-19

- 1826 *Adelosina laevigata* d'Orbigny: p. 304, no. 1  
1846 *Adelosina laevigata* d'Orbigny; d'Orbigny, p. 302, pl. 20, figs. 22-24  
1988 *Adelosina laevigata* d'Orbigny; Loeblich and Tappan, p. 90, pl. 337, figs. 5-12

**Remarks:** The wall is porcelaneous. The test is elongate-ovate. The peripheral margin is acutely angled. Chambers are arranged in "adelosine form." The aperture is rounded, on a neck, bordered by a rim and provided with a short tooth. The test surface is smooth.

*Adelosina longirostra* (d'Orbigny, 1826)  
Figure 12.20-21

- 1826 *Quinqueloculina longirostra* d'Orbigny: p. 303, no. 46  
1846 *Quinqueloculina longirostra* d'Orbigny; d'Orbigny, p. 291, pl. 18, figs. 25-27  
2005 *Adelosina longirostra* (d'Orbigny); Debenay et al., p. 332, pl. 1, fig. 10  
2005 *Adelosina longirostra* (d'Orbigny); Rasmussen, p. 60, pl. 3, figs. 7, 8

**Remarks:** The wall is porcelaneous. The test is elongate-ovate, but more depressed when compared to other *Adelosina* species. The chambers are acutely keeled. The aperture is subrounded, on a neck and provided with a short tooth. The test surface is smooth.

*Adelosina mediterranensis* (Le Calvez and Le Calvez, 1958)  
Figure 12.22-28

- 1958 *Quinqueloculina mediterranensis* Le Calvez and Le Calvez: p. 177, pl. 4, figs. 29-31

- 1987 *Quinqueloculina mediterranensis* Le Calvez and Le Calvez; Alberola et al., p. 306, pl. 3, fig. 8

- 1991 *Adelosina mediterranensis* (Le Calvez and Le Calvez); Cimerman and Langer, p. 28, pl. 19, figs. 1-16

- 1993 *Adelosina mediterranensis* (Le Calvez and Le Calvez); Sgarrella and Moncharmont Zei, p. 179, pl. 7, figs. 9-11

- 2005 *Adelosina mediterranensis* (Le Calvez and Le Calvez); Rasmussen, p. 60, pl. 3, fig. 6

- 2009 *Adelosina mediterranensis* (Le Calvez and Le Calvez); Avsar et al., p. 134, pl. 1, fig. 14

- 2009 *Adelosina mediterranensis* (Le Calvez and Le Calvez); Milker et al., p. 215, pl. 1, fig. 16

**Remarks:** The wall is porcelaneous. The test is elongate to ovate. The chambers are arranged in "adelosine form." The periphery is carinate in the juvenile stage and truncate in the adult stage. The aperture is rounded, on a long neck and provided with a short bifid tooth. The test surface is ornamented with numerous longitudinal costae.

*Adelosina* sp. 1  
Figure 12.29

- 1991 *Adelosina* sp. 1; Cimerman and Langer, p. 28, pl. 21, figs. 1, 2, 4 (juvenile specimens)  
1994 *Miliolid juvenaria*; Jones, p. 19, pl. 3, fig. 11

**Remarks:** The wall is porcelaneous. This species is a juvenile *Adelosina* form with a megalospheric proloculus followed by an embracing, planispirally enrolled second chamber. The periphery is angled. The aperture is on a neck and provided with a tooth. The test surface may be partly ornamented with costae. No further determination is possible.

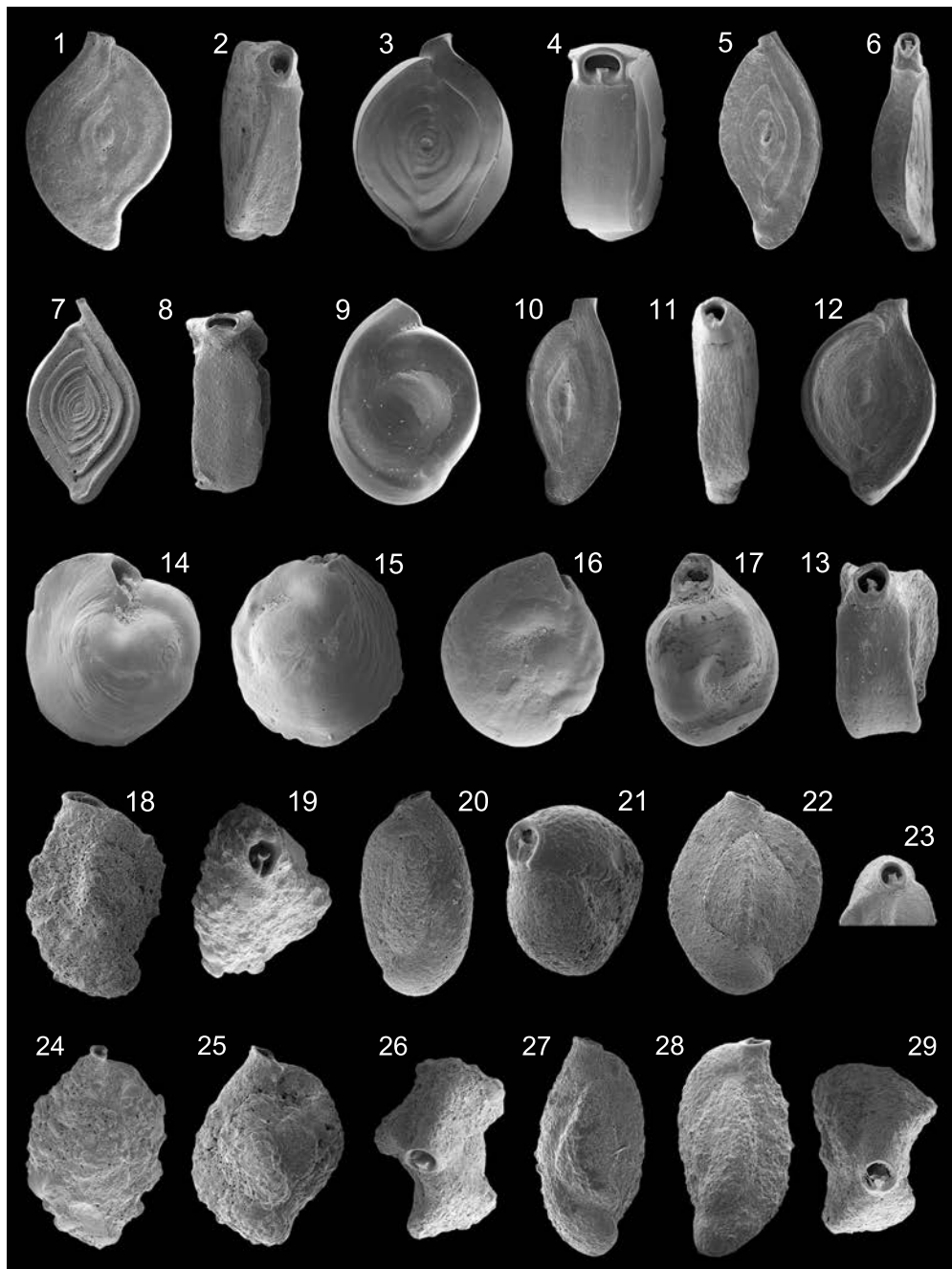
Genus SPIROLOCULINA d'Orbigny, 1826  
*Spiroloculina dilatata* d'Orbigny, 1846  
Figure 13.1-2

- 1846 *Spiroloculina dilatata* d'Orbigny: p. 271, pl. 16, figs. 16-18

- 1991 *Spiroloculina dilatata* d'Orbigny; Cimerman and Langer, p. 30, pl. 22, figs. 5-8

**Remarks:** The wall is porcelaneous. The test is fusiform and slightly longer than broad in lateral view. The initial stage is composed of a rounded proloculus and a tubular second chamber with one and a half coil in length, the third chamber is arranged with 90° change of coiling, and later





**FIGURE 13.** 1 *Spiroloculina dilatata* d'Orbigny, 153x, lateral view; 2 *S. dilatata* d'Orbigny, 250x, apertural edge view; 3 *Spiroloculina excavata* d'Orbigny, 196x, lateral view; 4 *S. excavata* d'Orbigny, 473x, apertural edge view; 5 *Spiroloculina* cf. *rostrata* Reuss, 234x, lateral view; 6 *S. cf. rostrata* Reuss, 261x, apertural edge view; 7 *Spiroloculina tenuiseptata* Brady, 355x, lateral view; 8 *S. tenuiseptata* Brady, 209x, apertural edge view; 9 *Spiroloculina* sp. 1, 1080x, lateral view; 10 *Spiroloculina* sp. 2, 204x, lateral view; 11 *Spiroloculina* sp. 2, 270x, apertural edge view; 12 *Spiroloculina* sp. 3, 322x, lateral view; 13 *Spiroloculina* sp. 3, 627x, apertural edge view; 14 *Miliolid* sp. 1, 1000x, side view; 15 *Miliolid* sp. 1, 952x, side view; 16 *Miliolid* sp. 2, 832x, side view; 17 *Miliolid* sp. 2, 1190x, apertural edge view; 18 *Siphonaperta agglutinans* (d'Orbigny), 341x, side view; 19 *S. agglutinans* (d'Orbigny), 242x, apertural view; 20 *Siphonaperta aspera* (d'Orbigny), 599x, side view; 21 *S. aspera* (d'Orbigny), 449x, apertural view; 22 *Siphonaperta dilatata* (Le Calvez and Le Calvez), 436x, side view; 23 *S. dilatata* (Le Calvez and Le Calvez), 365x, apertural view; 24 *Siphonaperta horrida* (Cushman), 479x, side view; 25 *Siphonaperta irregularis* (d'Orbigny), 339x, side view; 26 *S. irregularis* (d'Orbigny), 556x, apertural edge view; 27 *Siphonaperta* sp. 1, 455x, side view; 28 *Siphonaperta* sp. 1, 582x, side view; 29 *Siphonaperta* sp. 1, 456x, apertural edge view.

chambers are added in a single plane and with one half coil in length ("spiroloculine form"). The periphery is bicarinate. The aperture is subquadratic on a short neck, provided with a tooth and bordered by a rim. The test is ornamented with numerous grooves, leading to a rough surface.

*Spiroloculina excavata* d'Orbigny, 1846  
Figure 13.3-4

- 1846 *Spiroloculina excavata* d'Orbigny: p. 271, pl. 16, figs. 19-21
- 1960 *Spiroloculina excavata* d'Orbigny; Hofker, p. 239, pl. A, fig. 30
- 1987 *Spiroloculina excavata* d'Orbigny; Alberola et al., p. 306, pl. 2, fig. 11
- 1991 *Spiroloculina excavata* d'Orbigny; Cimerman and Langer, p. 30, pl. 23, figs. 1-3
- 1993 *Spiroloculina excavata* d'Orbigny; Sgarrella and Moncharmont Zei, p. 169, pl. 5, fig. 6
- 2002 *Spiroloculina excavata* d'Orbigny; Kaminski et al., p. 170, pl. 1, fig. 11
- 2003 *Spiroloculina excavata* d'Orbigny; Murray, p. 17, fig. 4, no. 13, 14
- 2004 *Spiroloculina excavata* d'Orbigny; Chendes et al., p. 76, pl. 1, fig. 9
- 2005 *Spiroloculina excavata* d'Orbigny; Debenay et al., p. 334, pl. 2, fig. 14
- 2005 *Spiroloculina excavata* d'Orbigny; Rasmussen, p. 61, pl. 3, fig. 11
- 2006 *Spiroloculina excavata* d'Orbigny; Avsar et al., p. 132, pl. 1, fig. 3
- 2009 *Spiroloculina excavata* d'Orbigny; Avsar et al., p. 134, pl. 1, fig. 16

**Remarks:** The wall is porcelaneous and imperforate. The test is subelliptical, slightly longer than broad in lateral view and strongly biconcave in end view. The chamber arrangement is in "spiroloculine form." The peripheral margin is truncate. The aperture is elliptical, bordered by a rim and provided with a short bifid tooth. The test surface is smooth.

*Spiroloculina* cf. *rostrata* Reuss, 1850  
Figure 13.5-6

- 1850 cf. *Spiroloculina rostrata* Reuss: p. 18, pl. 4, fig. 7
- 1993 cf. *Spiroloculina rostrata* Reuss; Sgarrella and Moncharmont Zei, p. 169, pl. 5, fig. 5

**Remarks:** The wall is porcelaneous. The test is fusiform in lateral view and slightly biconcave in end view. The chamber arrangement is in "spiroloculine form." The aperture is nearly rounded, bordered a rim, and provided with a relatively long and bifid tooth. The test is ornamented with numerous grooves, leading to a rough surface. Our specimens differ from that shown in Reuss (1850) and Sgarrella and Moncharmont Zei (1993) due to their shorter necks.

*Spiroloculina tenuiseptata* Brady, 1884  
Figure 13.7-8

- 1884 *Spiroloculina tenuiseptata* Brady: p. 153, pl. 10, figs. 5, 6
- 1952 *Spiroloculina canaliculata* d'Orbigny; Accordi and Selmi, p. 81, pl. 1, figs. 10, 11
- 1958 *Spiroloculina canaliculata* d'Orbigny; Parker, p. 257, pl. 1, figs. 26-28
- 1931 *Spiroloculina tenuiseptata* Brady; Wiesner, p. 102, pl. 14, fig. 170
- 1960 *Spiroloculina canaliculata* d'Orbigny; Hofker, p. 240, pl. A, fig. 32
- 1987 *Spiroloculina canaliculata* d'Orbigny; Alberola et al., p. 306, pl. 2, fig. 16
- 1991 *Spiroloculina tenuiseptata* Brady; Cimerman and Langer, p. 31, pl. 24, figs. 6-9
- 1993 *Spiroloculina tenuiseptata* Brady; Sgarrella and Moncharmont Zei, p. 169, pl. 5, fig. 7
- 1994 *Spiroloculina tenuiseptata* Brady; Jones, p. 26, pl. 10, figs. 5, 6 [cop. Brady, 1884, pl. 10, figs. 5, 6]
- 2002 *Spiroloculina tenuiseptata* Brady; Kaminski et al., p. 170, pl. 1, fig. 10
- 2005 *Spiroloculina tenuiseptata* Brady; Rasmussen, p. 61, pl. 3, fig. 12

**Remarks:** The wall is porcelaneous. The test is fusiform in lateral view and biconcave in end view. The chamber arrangement is in "spiroloculine form." The peripheral margins of the chambers are elevated. The aperture is elliptical, on a long and narrow neck and bordered by a rim. No tooth was visible. The test surface is rough.

*Spiroloculina* sp. 1  
Figure 13.9

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view with a relatively broad periphery. The chamber arrangement is in "spiroloculine form." The aperture, at the open

end of the final chamber, is relatively broad and ovate. The test surface is smooth. This species is likely a juvenile stage of *Spiroloculina excavata*.

*Spiroloculina* sp. 2  
Figure 13.10-11

**Remarks:** The wall is porcelaneous and imperforate. The test is fusiform in lateral view and slightly biconcave in end view. The chamber arrangement is in "spiroloculine form." The aperture is rounded, bordered by a rim and provided with a short bifid tooth. The test is ornamented with numerous grooves, leading to a rough surface.

*Spiroloculina* sp. 3  
Figure 13.12-13

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate to fusiform in lateral view and highly biconcave in end view. The aperture is rounded, bordered by a small rim and provided with a relatively short bifid tooth. The test surface is slightly rough.

Family HAUERINIDAE Schwager, 1876  
*Miliolid* sp. 1  
Figure 13.14-15

**Remarks:** The wall is porcelaneous and imperforate. The test of these small specimens is nearly rounded in lateral view. The peripheral margin is carinate. Three chambers are visible from one side and two from the other side. The terminal aperture is oval, bordered by a rim and provided with a short simple tooth. The test surface is partly ornamented with longitudinal striae. These specimens have been assigned to the Hauerinidae, and not to the Miliolidae, due to the absence of pseudopores as defined by Loeblich and Tappan (1988) for the latter family. No further determination is possible.

*Miliolid* sp. 2  
Figure 13.16-17

**Remarks:** The wall is porcelaneous and imperforate. The test of these small specimens is ovate in lateral view. The periphery is rounded. Three chambers are visible on both sides. The terminal aperture is ovate. The tooth is long, but mostly broken. These specimens have been assigned to the Hauerinidae, and not to the Miliolidae, due to the absence of pseudopores as defined by Loeblich and Tappan (1988) for the latter family. No further determination is possible.

Subfamily SIPHONAPERTINAE Saidova, 1975  
Genus SIPHONAPERTA Vella, 1957  
*Siphonaperta agglutinans* (d'Orbigny, 1839a)  
Figure 13.18-19

1839a *Quinqueloculina agglutinans* d'Orbigny: p. 195, pl. 12, figs. 11-13

1929 *Quinqueloculina agglutinans* d'Orbigny; Cushman, p. 22, pl. 1, fig. 1

1958 *Quinqueloculina agglutinans* d'Orbigny; Le Calvez and Le Calvez, p. 166, pl. 9, figs. 103, 104

1991 *Siphonaperta agglutinans* (d'Orbigny); Cimerman and Langer, p. 31, pl. 25, figs. 1-3

1993 *Siphonaperta agglutinans* (d'Orbigny); Hottinger, Halicz and Reiss, p. 62, pl. 61, figs. 10, 11; pl. 62, figs. 1-3

**Remarks:** The wall is porcelaneous and imperforate. The test is subcylindrical. The chamber arrangement is "quinqueloculine" (chambers are one half coil in length, earlier chambers are added in coil of planes that are 72° apart and later chambers are added in coil of planes of 144° apart so that five chambers are visible from the exterior). The aperture is ovate, bordered by a not agglutinated rim, and provided with a long, slender tooth with bifid termination. The outer coating is agglutinated with particles of different coarse-grained material.

*Siphonaperta aspera* (d'Orbigny, 1826)  
Figure 13.20-21

1826 *Quinqueloculina aspera* d'Orbigny: p. 301, no. 11

1958 *Quinqueloculina aspera* d'Orbigny; Le Calvez and Le Calvez, p. 168, pl. 9, figs. 101, 102

1987 *Quinqueloculina aspera* d'Orbigny; Jorissen, p. 40, pl. 3, fig. 2

1991 *Siphonaperta aspera* (d'Orbigny); Cimerman and Langer, p. 31, pl. 25, figs. 4-6

1993 *Siphonaperta aspera* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 185, pl. 6, fig. 12

1995 *Siphonaperta aspera dilatata* Le Calvez and Le Calvez; Coppa and Di Tuoro, p. 166, pl. 1, fig. 7

2005 *Siphonaperta aspera* (d'Orbigny); Debenay et al., p. 334, pl. 2, fig. 10

2005 *Siphonaperta aspera* (d'Orbigny); Ras-mussen, p. 61, pl. 4, fig. 1

2009 *Siphonaperta aspera* (d'Orbigny); Frezza and Carboni, p. 55, pl. 1, fig. 21

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view. The chamber arrangement is "quineloculine." Chambers are subrounded. The aperture is ovate, bordered by a not agglutinated rim, and provided with a relatively long, bifid tooth. The outer coating is agglutinated with fine-grained material.

*Siphonaperta dilatata* (Le Calvez and Le Calvez, 1958)

Figure 13.22-23

1958 *Quineloculina aspera* d'Orbigny var. *dilatata* Le Calvez and Le Calvez: p. 169, pl. 11, figs. 119-121

1991 *Siphonaperta dilatata* (Le Calvez and Le Calvez); Cimerman and Langer, p. 31, pl. 26, figs. 1-3

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate and nearly as broad as long. The chamber arrangement is "quineloculine." Chambers are rounded. The aperture is rounded, bordered by a not agglutinated rim and provided with a short and bifid tooth. The outer coating is agglutinated with fine-grained material.

*Siphonaperta horrida* (Cushman, 1947)

Figure 13.24

1947 *Quineloculina horrida* Cushman: p. 88, pl. 19, fig. 1

1951 *Quineloculina horrida* Cushman; Phleger and Parker, p. 7, pl. 3, fig. 18

1974 *Quineloculina horrida* Cushman; LeRoy and Levinson, p. 6, pl. 2, fig. 1

1993 *Siphonaperta horrida* (Cushman);

Hottinger, Halicz and Reiss, p. 63, pl. 63, figs. 7-12

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate with a rounded periphery. The chamber arrangement is "quineloculine." Five chambers are poorly visible from the exterior. The small and rounded aperture, at the end of a short neck, is bordered by a not agglutinated rim and provided with a short, bifid tooth. The outer coating is agglutinated with coarse-grained material of different origin.

*Siphonaperta irregularis* (d'Orbigny, 1826)

Figure 13.25-26

1826 *Quineloculina irregularis* d'Orbigny: 302, no. 25

1958 *Quineloculina irregularis* d'Orbigny; Le Calvez and Le Calvez, p. 166, pl. 3, figs. 1, 2

1991 *Siphonaperta irregularis* (d'Orbigny); Cimerman and Langer, p. 32, pl. 26, figs. 4-6

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate and nearly as broad as long. The chamber arrangement is "quineloculine." The aperture is rounded, bordered by a not agglutinated rim and provided with a short, bifid tooth. The outer coating is agglutinated with coarse-grained material of different origin. It differs from *Siphonaperta agglutinans* by a different width-length ratio and from *Siphonaperta dilatata* by the coarser-grained outer coating and from both by the short tooth.

*Siphonaperta* sp. 1

Figure 13.27-29

1991 *Siphonaperta* sp. 2; Cimerman and Langer, p. 32, pl. 26, figs. 7-9

**Remarks:** The wall is porcelaneous and imperforate. The test is fusiform in lateral view. The chamber arrangement is "quineloculine." The small and rounded aperture, at the end of a short neck, is bordered by a not agglutinated rim and provided with a short, bifid tooth. The outer coating is agglutinated with fine-grained material of different origin.

*Siphonaperta* sp. 2

Figure 14.1-4

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate to fusiform in lateral view. The chamber arrangement is "quineloculine." The rounded aperture is terminal, at the end of a short neck and provided with a short, bifid tooth. The outer coating is agglutinated with fine-grained material of different origin. This species looks close to *Siphonaperta* sp.1, but it is generally smaller and has a different width to length ratio.

Subfamily HAUERININAE Schwager, 1876

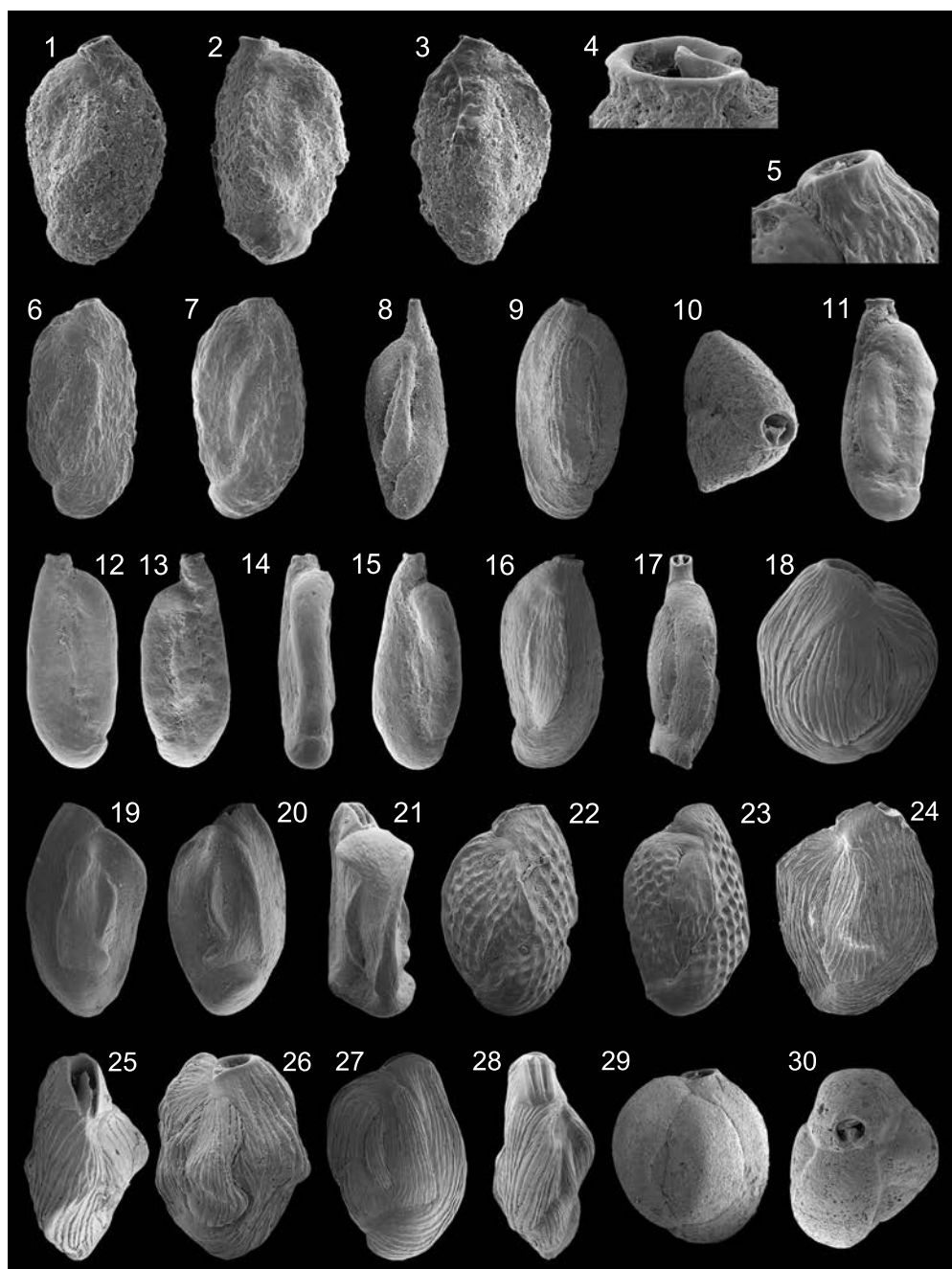
Genus CYCLOFORINA Luczowska, 1972

*Cycloforina contorta* (d'Orbigny, 1846)

Figures 14.5-7

1846 *Quineloculina contorta* d'Orbigny: p. 298, pl. 20, figs. 4-6

1929 *Quineloculina contorta* d'Orbigny; Cushman, p. 29, pl. 3, fig. 6 [cop. d'Orbigny, 1846, figs. 4-6]



**FIGURE 14.** 1 *Siphonaperta* sp. 2, 1050x, side view; 2 *Siphonaperta* sp. 2, 982x, side view; 3 *Siphonaperta* sp. 2, 818x, side view; 4 *Siphonaperta* sp. 2, 3040x, enlargement of aperture; 5 *Cycloforina contorta* (d'Orbigny), 1680x, enlargement of aperture; 6 *C. contorta* (d'Orbigny), 454x, four chamber side; 7 *C. contorta* (d'Orbigny), 969x, three chamber side; 8 *Cycloforina? tenuicollis* (Wiesner), 592x, four chamber side; 9 *Cycloforina villafranca* (Le Calvez and Le Calvez), 281x, four chamber side; 10 *C. villafranca* (Le Calvez and Le Calvez), 281x, apertural face; 11 *Cycloforina* sp. 1, 566x, four chamber side; 12 *Cycloforina* sp. 1, 603x, three chamber side; 13 *Cycloforina* sp. 1, 451x, four chamber side; 14 *Cycloforina* sp. 1, 451x, peripheral view; 15 *Cycloforina* sp. 1, 644x, three chamber side; 16 *Cycloforina?* sp. 2, 835x, four chamber side; 17 *Cycloforina?* sp. 2, 570x, peripheral view; 18 *Lachlanella bicornis* (Walker and Jacob) emend. Haynes, 297x, four chamber side; 19 *Lachlanella bradyana* (Cushman), 360x, side view; 20 *L. bradyana* (Cushman), 525x, side view; 21 *L. bradyana* (Cushman), 283x, peripheral view; 22 *Lachlanella carinata* (d'Orbigny), 463x, side view; 23 *L. carinata* (d'Orbigny), 430x, side view; 24 *Lachlanella undulata* (d'Orbigny), 207x, side view; 25 *L. undulata* (d'Orbigny), 150x, apertural edge view; 26 *L. undulata* (d'Orbigny), 376x, side view; 27 *Lachlanella* sp. 1, 185x, side view; 28 *Lachlanella* sp. 1, 190x, apertural edge view; 29 *Quinqueloculina agglutinata* Cushman, 254x, four chamber side; 30 *Q. agglutinata* Cushman, 258x, apertural view.

- 1958 *Quinqueloculina contorta* d'Orbigny; Le Calvez and Le Calvez, 171, pl. 12, figs. 140-142
- 1974 *Cycloforina contorta* (d'Orbigny); Luczkowska, p. 74, pl. 11, figs. 2, 3
- 1988 *Cycloforina contorta* (d'Orbigny); Loeblich and Tappan, p. 91, pl. 342, figs. 4-9 [figs. 7-9: cop. d'Orbigny, 1846, figs. 4-6]
- 1991 *Cycloforina contorta* (d'Orbigny); Cimerman and Langer, p. 32, pl. 27, figs. 7-11
- 1993 *Quinqueloculina contorta* d'Orbigny; Sgarrella and Moncharmont Zei, p. 170, pl. 6, figs. 5, 6

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate to subrectangular in lateral view. The chamber arrangement is "quinqueloculine." The peripheral margins are acutely angled. The aperture, on a very short neck, is rounded, bordered by a rim and provided with a short, bifid tooth. The test surface is ornamented with costae and microstriae.

*Cycloforina? tenuicollis* (Wiesner, 1923)  
Figure 14.8

- 1923 *Miliolina tenuicollis* Wiesner: p. 48, pl. 6, fig. 66
- 1958 *Quinqueloculina tenuicollis* (Wiesner); Le Calvez and Le Calvez, p. 173, pl. 11, figs. 127, 128
- 1991 *Cycloforina tenuicollis* (Wiesner); Cimerman and Langer, p. 33, pl. 28, figs. 5-6
- 1993 *Quinqueloculina tenuicollis* (Wiesner); Sgarrella and Moncharmont Zei, p. 175, pl. 6, figs. 10, 11
- 2009 *Cycloforina tenuicollis* (Wiesner); Avsar et al., p. 134, pl. 1, fig. 18

**Remarks:** The wall is porcelaneous and imperforate. The test is fusiform in lateral view. The chamber arrangement is "quinqueloculine." The peripheral margins are acutely angled. The aperture, on a long and thin neck, is rounded and provided with a tooth. The test surface is rough. The generic position is questionable due to this species has no ornamentation with striae or costae as defined for *Cycloforina* species in Loeblich and Tappan (1988) and due to its long neck.

*Cycloforina villafranca* (Le Calvez and Le Calvez, 1958)  
Figure 14.9-10

- 1958 *Quinqueloculina villafranca* Le Calvez and Le Calvez: p. 180, pl. 4, figs. 22, 23
- 1991 *Cycloforina villafranca* (Le Calvez and Le Calvez); Cimerman and Langer, p. 33, pl. 28, figs. 7-9
- 1993 *Quinqueloculina villafranca* Le Calvez and Le Calvez; Sgarrella and Moncharmont Zei, p. 176, pl. 7, figs. 3, 4
- 2005 *Cycloforina villafranca* (Le Calvez and Le Calvez); Rasmussen, p. 62, pl. 4, fig. 3

**Remarks:** The wall is porcelaneous and imperforate. The test is elongate-ovate in lateral view. The chamber arrangement is "quinqueloculine," and five chambers are visible from the exterior. The aperture, on a very short neck, is rounded, bordered by a rim and provided with a short, bifid tooth. The test surface is ornamented with costae, in particularly on the chamber's periphery.

*Cycloforina* sp. 1  
Figure 14.11-15

- 1993 cf. *Cycloforina* sp. A; Hottinger, Halicz and Reiss, p. 50, pl. 34, figs. 13-16

**Remarks:** The wall is porcelaneous. The test is elongate and laterally compressed. Chambers are slightly inflated and arranged in "quinqueloculine form." Five chambers are visible from the exterior. The periphery is rounded. The aperture is subrounded, on a neck, bordered by a rim and provided with a short, bifid tooth. The test surface is slightly rugose and ornamented with anastomosing microstriae. Our specimens have many similarities to the material shown in Hottinger, Halicz and Reiss (1993), but the specimens illustrated there have longer necks and a more rugose test surface.

*Cycloforina? sp. 2*  
Figure 14.16-17

**Remarks:** The wall is porcelaneous and imperforate. The test is elongate-ovate in lateral view. The chamber arrangement is "quinqueloculine." Four chambers are visible from one side and three chambers from the other side. The peripheral margins are acutely angled. The aperture is ovate at the end of the final chamber, bordered by a rim and provided with a relatively long and slender tooth with a short bifid termination. The test is ornamented with weak and minute longitudinal anastomosing microstriae. The generic status of this species is not clear due to *Cycloforina* species are defined by Loeblich and Tappan (1988) as species having a circular aperture with a short simple or bifid tooth.

## Genus LACHLANELLA Vella, 1957

*Lachlanella bicornis* ((Walker and Jacob) emend.  
Haynes, 1973)  
Figure 14.18

- 1798 *Serpula bicornis* Walker and Jacob: p. 633, pl. 14, fig. 2
- 1884 *Miliolina bicornis* (Walker and Jacob); Brady, p. 171, pl. 6, fig. 9 (not figs. 11, 12)
- 1973 *Quinqueloculina bicornis* (Walker and Jacob) emend. Haynes: p. 67, pl. 7, fig. 18; text-fig. 16
- 1987 *Quinqueloculina bicornis* (Walker and Jacob); Alberola et al., p. 305, pl. 2, figs. 10, 14
- 1991 *Lachlanella bicornis* ((Walker and Jacob) emend. Haynes); Cimerman and Langer, p. 34, pl. 29, figs. 1-3
- 1991 *Adelosina bicornis* ((Walker and Jacob) emend. Haynes); Jones, p. 22, pl. 6, fig. 9 [cop. Brady, 1884, fig. 9]
- 2006 *Quinqueloculina bicornis* Walker and Jacob; Avsar et al., p. 132, pl. 1, fig. 5

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view and subrectangular in apertural view. The chamber arrangement is “quinqueloculine.” Five chambers are visible from the exterior. The aperture is elongate, with subparallel sides, bordered by a rim and provided with a long, slender tooth. The test surface is ornamented with thick longitudinal costae.

*Lachlanella bradyana* (Cushman, 1917)  
Figures 14.19-21

- 1884 *Miliolina undosa* Karrer, sp.; Brady, p. 176, pl. 6, figs. 6, 7
- 1917 *Quinqueloculina bradyana* Cushman: p. 52, pl. 18, fig. 2
- 1929 *Quinqueloculina bradyana* Cushman; Cushman, p. 23, pl. 1, fig. 3
- 1958 *Quinqueloculina bradyana* Cushman; Le Calvez and Le Calvez, p. 172, pl. 11, figs. 129, 130
- 1994 *Quinqueloculina bradyana* Cushman; Jones, p. 22, pl. 6, figs. 6, 7 [cop. Brady 1884, figs. 6, 7]
- 1995 *Quinqueloculina bradyana* Cushman; Coppa and Di Tuoro, p. 166, pl. 1, fig. 12

**Remarks:** The wall is porcelaneous and imperforate. The test is elongate-ovate in lateral view and depressed in apertural view. The chamber arrange-

ment is “quinqueloculine.” Chamber peripheral margins are sinuously angled, and early chambers are prominent. The aperture is elongate, with subparallel sides, bordered by a rim and provided with a long, slender tooth. The test surface is ornamented with grooves.

*Lachlanella carinata* (d'Orbigny, 1839a)  
Figure 14.22-23

- 1839a *Triloculina carinata* d'Orbigny: p. 179, pl. 10, figs. 15, 17
- 1929 *Triloculina carinata* d'Orbigny; Cushman, p. 65, pl. 17, fig. 5
- 1958 *Quinqueloculina reticulata* (d'Orbigny) var. *carinata* d'Orbigny; Le Calvez and Le Calvez, p. 183, pl. 5, figs. 34, 35, 43

**Remarks:** The wall is porcelaneous and imperforate. The test is subelliptical in lateral view and lenticular in apertural view. The chamber arrangement is “quinqueloculine.” The periphery of the later chambers is angled. The peripheral margin is carinate. The aperture is elongate, with subparallel sides, bordered by a rim and provided with a long, slender tooth. The test surface is ornamented in a reticulate pattern.

*Lachlanella undulata* (d'Orbigny, 1826)  
Figure 14.24-26

- 1826 *Quinqueloculina undulata* d'Orbigny: p. 302, no. 27
- 1958 *Quinqueloculina undulata* d'Orbigny; Le Calvez and Le Calvez, p. 179, pl. 13, figs. 146-148
- 1991 *Lachlanella undulata* (d'Orbigny); Cimerman and Langer, p. 34, pl. 30, figs. 3-6
- 1993 *Quinqueloculina undulata* d'Orbigny; Sgarrella and Moncharmont Zei, p. 175, pl. 7, fig. 6
- 2005 *Lachlanella undulata* (d'Orbigny); Rasmussen, p. 62, pl. 4, fig. 4

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view. The chamber arrangement is “quinqueloculine.” Five chambers are visible from the exterior. The aperture is elongate, with subparallel sides, bordered by a rim and provided with a long, slender tooth. The test surface is densely ornamented with longitudinal costae. It differs from *Lachlanella bicornis* by the more irregularly shape of the chambers and the slightly thinner costae.

*Lachlanella* sp. 1  
Figure 14.27-28

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view. The chamber arrangement is "quiqueloculine." Five chambers are visible from the exterior. The aperture is elongate, with subparallel sides, bordered by a rim and provided with a long, slender tooth. The test surface is densely ornamented with longitudinal costae. It differs from *Lachlanella bicornis* by the more angled chambers periphery and the slightly thinner costae, and from *Lachlanella undulata* by the more regular chamber shape.

Genus QUINQUELOCULINA d'Orbigny, 1826  
*Quinqueloculina agglutinata* Cushman, 1917  
Figure 14.29-30

1917 *Quinqueloculina agglutinata* Cushman: p. 43, pl. 9, fig. 2

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view and subrounded in apertural view. The chamber arrangement is "quiqueloculine," with four chambers on one and three on the other side. The periphery is broadly rounded. The aperture is ovate and provided with a bifid tooth. The test surface is rough. The outer wall is agglutinated with lighter and darker sand grains.

*Quinqueloculina auberiana* d'Orbigny, 1839a  
Figure 15.1-2

1839a *Quinqueloculina auberiana* d'Orbigny: p. 193, pl. 12, figs. 1-3

1917 *Quinqueloculina auberiana* d'Orbigny; Cushman, p. 46, pl. 12, fig. 1

1991 *Quinqueloculina auberiana* d'Orbigny;

Cimerman and Langer, p. 36, pl. 32, figs. 8, 9

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view and nearly as broad as long. It is nearly triangular in apertural view. The chamber arrangement is "quiqueloculine." The aperture is ovate and provided with a short bifid tooth. The test is ornamented with minute striae. The test surface is rough.

*Quinqueloculina berthelotiana* d'Orbigny, 1839b  
Figure 15.3-6

1839b *Quinqueloculina berthelotiana* d'Orbigny: p. 142, pl. 3, figs. 25-27

1958 *Quinqueloculina berthelotiana* d'Orbigny; Le Calvez and Le Calvez, p. 173, pl. 10, figs. 115-117

1987 *Quinqueloculina berthelotiana* d'Orbigny; Alberola et al., p. 305, pl. 3, fig. 2

1991 *Quinqueloculina berthelotiana* d'Orbigny; Cimerman and Langer, p. 36, pl. 32, figs. 5-7

1993 *Quinqueloculina berthelotiana* d'Orbigny; Sgarrella and Moncharmont Zei, p. 170, pl. 6, figs. 1, 2

2005 *Quinqueloculina berthelotiana* d'Orbigny; Rasmussen, p. 62, pl. 4, fig. 6

2006 *Quinqueloculina berthelotiana* d'Orbigny; Avsar et al., p. 132, pl. 1, fig. 6

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view and nearly triangular in apertural view. The chamber arrangement is "quiqueloculine." Four chambers are visible from one side and three from the other side. The peripheral chamber margins are acutely angled. The rounded aperture, on a short neck, is bordered by rim and provided with a short, bifid tooth. The test is ornamented with longitudinal microstriae and has a rough surface.

*Quinqueloculina bosciana* d'Orbigny, 1839a  
Figure 15.7-9

1839a *Quinqueloculina bosciana* d'Orbigny: p. 191, pl. 11, figs. 22-24

1991 *Quinqueloculina bosciana* d'Orbigny; Cimerman and Langer, p. 36, pl. 33, figs. 5-7

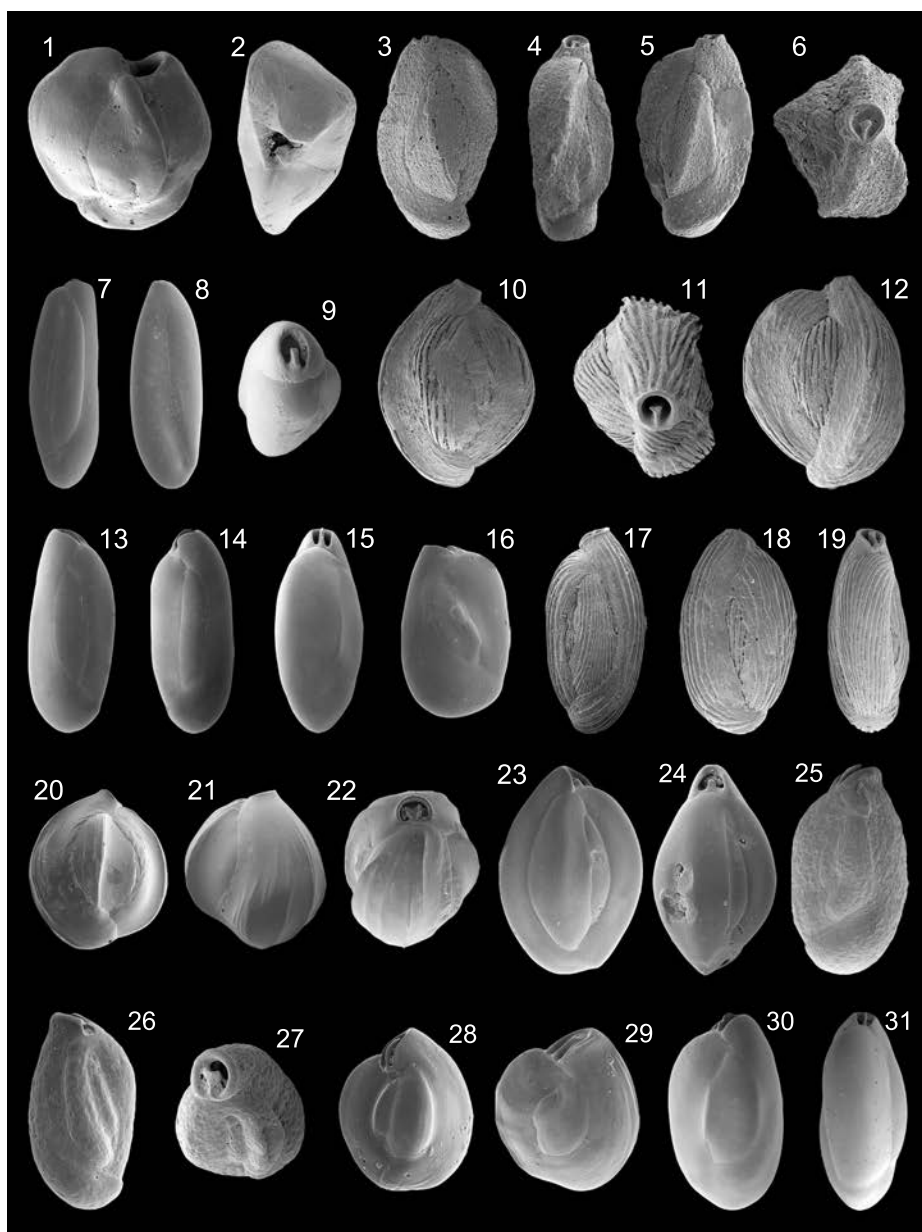
1993 *Quinqueloculina bosciana* d'Orbigny; Sgarrella and Moncharmont Zei, p. 170, pl. 6, figs. 8, 9

**Remarks:** The wall is porcelaneous, imperforate and hyaline. The test is very elongate in lateral view and suboval in apertural view. The chamber arrangement is "quiqueloculine." The earlier chambers in the middle part are slightly oblique in relation to the later chambers. The aperture is rounded, bordered by rim and provided with a primitive tooth. The test surface is smooth. Our specimens are more elongate than that shown by the other authors.

*Quinqueloculina disparilis* d'Orbigny, 1826  
Figure 15.10-12

1826 *Quinqueloculina disparilis* d'Orbigny: p. 302, no. 21





**FIGURE 15.** 1 *Quinqueloculina auberiana* d'Orbigny, 260x, side view; 2 *Q. auberiana* d'Orbigny, 217x, apertural edge view; 3 *Quinqueloculina berthelotiana* d'Orbigny, 489x, four chamber side; 4 *Q. berthelotiana* d'Orbigny, 276x, peripheral view; 5 *Q. berthelotiana* d'Orbigny, 271x, four chamber side; 6 *Q. berthelotiana* d'Orbigny, 309x, apertural edge view; 7 *Quinqueloculina bosciiana* d'Orbigny, 267x, four chamber side; 8 *Q. bosciiana* d'Orbigny, 529x, three chamber side; 9 *Q. bosciiana* d'Orbigny, 637x, apertural view; 10 *Quinqueloculina disparilis* d'Orbigny, 259x, four chamber side; 11 *Q. disparilis* d'Orbigny, 163x, apertural view; 12 *Q. disparilis* d'Orbigny, 313x, three chamber side; 13 *Quinqueloculina laevigata* d'Orbigny, 361x, four chamber side; 14 *Q. laevigata* d'Orbigny, 390x, three chamber side; 15 *Q. laevigata* d'Orbigny, 156x, peripheral view; 16 *Quinqueloculina lata* Terquem, 911x, side view; 17 *Quinqueloculina limbata* d'Orbigny, 162x, four chamber side; 18 *Q. limbata* d'Orbigny, 228x, three chamber side; 19 *Q. limbata* d'Orbigny, 129x, peripheral view; 20 *Quinqueloculina neapolitana* Sgarrella and Moncharmont Zei, 322x, four chamber side; 21 *Q. neapolitana* Sgarrella and Moncharmont Zei, 323x, three chamber side; 22 *Q. neapolitana* Sgarrella and Moncharmont Zei, 370x, apertural edge view; 23 *Quinqueloculina padana* Perconig, 880x, four chamber side; 24 *Q. padana* Perconig, 628x, peripheral view; 25 *Quinqueloculina parvula* Schlumberger, 609x, four chamber side; 26 *Q. parvula* Schlumberger, 939x, four chamber side; 27 *Q. parvula* Schlumberger, 719x, apertural edge view; 28 *Quinqueloculina pseudobuchiana* Luczowksa, 763x, four chamber side; 29 *Q. pseudobuchiana* Luczowksa, 892x, four chamber side; 30 *Quinqueloculina seminula* (Linné), 257x, side view; 31 *Q. seminula* (Linné), 113x, peripheral view.

- 1929 *Quinqueloculina disparilis* d'Orbigny; Cushman, p. 32, pl. 5, fig. 4
- 1958 *Quinqueloculina disparilis* d'Orbigny; Le Calvez and Le Calvez, p. 180, pl. 4, figs. 26, 27
- 1991 *Quinqueloculina disparilis* d'Orbigny; Cimerman and Langer, p. 36, pl. 33, figs. 1-4
- 1993 *Quinqueloculina disparilis* d'Orbigny; Sgarrella and Moncharmont Zei, p. 170, pl. 8, fig. 2
- 1995 *Quinqueloculina disparilis* d'Orbigny; Coppa and Di Tuoro, p. 168, pl. 2, fig. 2

**Remarks:** The wall is porcelaneous and imperforate. The test is subrounded in lateral view, with a width to length ratio of nearly one. The chamber arrangement is "quinqueloculine." Four chambers are visible from one side and three from the other side. The aperture is rounded, bordered by rim and provided with a relatively long, bifid tooth. The test surface is ornamented with thick, longitudinal costae on the chamber periphery and smaller costae on the lateral chamber walls.

*Quinqueloculina laevigata* d'Orbigny, 1826  
Figure 15.13-15

- 1826 *Quinqueloculina laevigata* d'Orbigny: p. 301, no. 6
- 1929 *Quinqueloculina laevigata* d'Orbigny; Cushman, p. 30, pl. 4, fig. 3
- 1958 *Quinqueloculina laevigata* d'Orbigny; Le Calvez and Le Calvez, p. 184, pl. 10, figs. 112-114
- 1965 *Quinqueloculina laevigata* d'Orbigny; Phleger, p. 53, pl. 1, fig. 23
- 1991 *Quinqueloculina laevigata* d'Orbigny; Cimerman and Langer, p. 37, pl. 33, figs. 8-11

**Remarks:** The wall is porcelaneous and imperforate. The test is elongate in lateral view and subovate in peripheral view. The chamber arrangement is "quinqueloculine." Three chambers are visible from the exterior. The aperture is ovate and provided with a long, slender tooth. The test surface is smooth.

*Quinqueloculina lata* Terquem, 1876  
Figure 15.16

- 1876 *Quinqueloculina lata* Terquem: p. 82, pl. 11, fig. 8a-c (fide Ellis and Messina, 1940ff)

- 1958 *Quinqueloculina lata* Terquem; Le Calvez, p. 158, pl. 2, figs. 26-28
- 1993 *Quinqueloculina lata* Terquem; Sgarrella and Moncharmont Zei, p. 172, pl. 5, fig. 15
- 2003 *Quinqueloculina lata* Terquem; Murray, p. 17, fig. 4, no. 9, 10

**Remarks:** The wall is porcelaneous and imperforate. The test of these small specimens is subrectangular in lateral view. The chamber arrangement is "quinqueloculine." Four chambers are visible from one side and three from the other side. The peripheral margin is rounded. The aperture is ovate and provided with a short, broad and bifid tooth. The test surface is smooth.

*Quinqueloculina limbata* d'Orbigny, 1826  
Figure 15.17-19

- 1826 *Quinqueloculina limbata* d'Orbigny: p. 302, no. 20
- 1915 *Miliolina limbata* (d'Orbigny); Heron-Allen and Earland, p. 577, pl. 44, figs. 5-8
- 1991 *Quinqueloculina limbata* d'Orbigny; Cimerman and Langer, p. 37, pl. 34, figs. 1-5

**Remarks:** The wall is porcelaneous and imperforate. The test is subelliptical in lateral view. The chamber arrangement is "quinqueloculine." Four chambers are visible from one side and three from the other side. The peripheral margin is rounded. The aperture is rounded, on a short neck and provided with a relatively slender, bifid tooth. The test surface is ornamented with longitudinal costae.

*Quinqueloculina neapolitana* Sgarrella and Moncharmont Zei, 1993  
Figure 15.20-22

- 1993 *Quinqueloculina neapolitana* Sgarrella and Moncharmont Zei: p. 173, pl. 5, figs. 10-12

**Remarks:** The wall is porcelaneous and imperforate. The test is subrounded in lateral view, with a width to length ratio of nearly one and ovate in apertural view. The chamber arrangement is "quinqueloculine." Chambers are inflated. Three to four chambers are visible from one side and two to three from the other side. The peripheral margin is broadly rounded. The aperture is ovate, bordered by a rim and provided with a short, bifid tooth. The test surface is partly ornamented with longitudinal striae with different distances from each other.

*Quinqueloculina padana* Perconig, 1954  
Figure 15.23-24

- 1954 *Quinqueloculina padana* Perconig: pp. 95-97, text-figs. 1-4
- 1987 *Quinqueloculina badenensis* d'Orbigny; Jorissen, p. 43, pl. 4, fig. 10
- 1993 *Quinqueloculina padana* Perconig; Sgarrella and Moncharmont Zei, p. 172, pl. 7, fig. 1
- 2005 *Quinqueloculina padana* Perconig; Rasmussen, p. 63, pl. 4, figs. 8, 9
- 2009 *Quinqueloculina padana* Perconig; Frezza and Carboni, p. 55, pl. 1, fig. 9

**Remarks:** The wall is porcelaneous and imperforate. The test is subelliptical in lateral view. The chamber arrangement is "quinqueloculine." Four chambers are visible from one side and three from the other side. The aperture is subtriangular and provided with a short flap-like tooth. The test surface is smooth.

*Quinqueloculina parvula* Schlumberger, 1894  
Figure 15.25-27

- 1894 *Quinqueloculina parvula* Schlumberger: p. 255, text-fig. 1, pl. 3, figs. 8, 9
- 1958 *Quinqueloculina parvula* Schlumberger; Le Calvez and Le Calvez, p. 184, pl. 11, figs. 131-133
- 1991 *Quinqueloculina parvula* Schlumberger; Cimerman and Langer, p. 37, pl. 34, figs. 6-8
- 1993 *Quinqueloculina parvula* Schlumberger; Sgarrella and Moncharmont Zei, p. 174, pl. 5, fig. 16

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view. The chamber arrangement is "quinqueloculine." Four chambers are visible from one side and three from the other side. The chamber margins are rounded. The aperture is ovate, bordered by a thickened rim and provided with a short, bifid tooth. The test is ornamented with minute anastomosing microstriae, and the test surface is rough.

*Quinqueloculina pseudobuchiana* Luczkowska, 1974  
Figure 15.28-29

- 1974 *Quinqueloculina pseudobuchiana* Luczkowska: p. 58, pl. 4, fig. 5; pl. 5, figs. 1, 2
- 1991 *Quinqueloculina pseudobuchiana* Luczkowska; Cimerman and Langer, p. 38, pl. 35, figs. 1-4

**Remarks:** The wall is porcelaneous and imperforate. The test is subrounded in lateral view. The chamber arrangement is "quinqueloculine." Four chambers are visible from one side and three from the other side. The aperture is elongate and provided with a long, bifid tooth. The test surface is smooth, with a few striae on the peripheral margin of the later chambers.

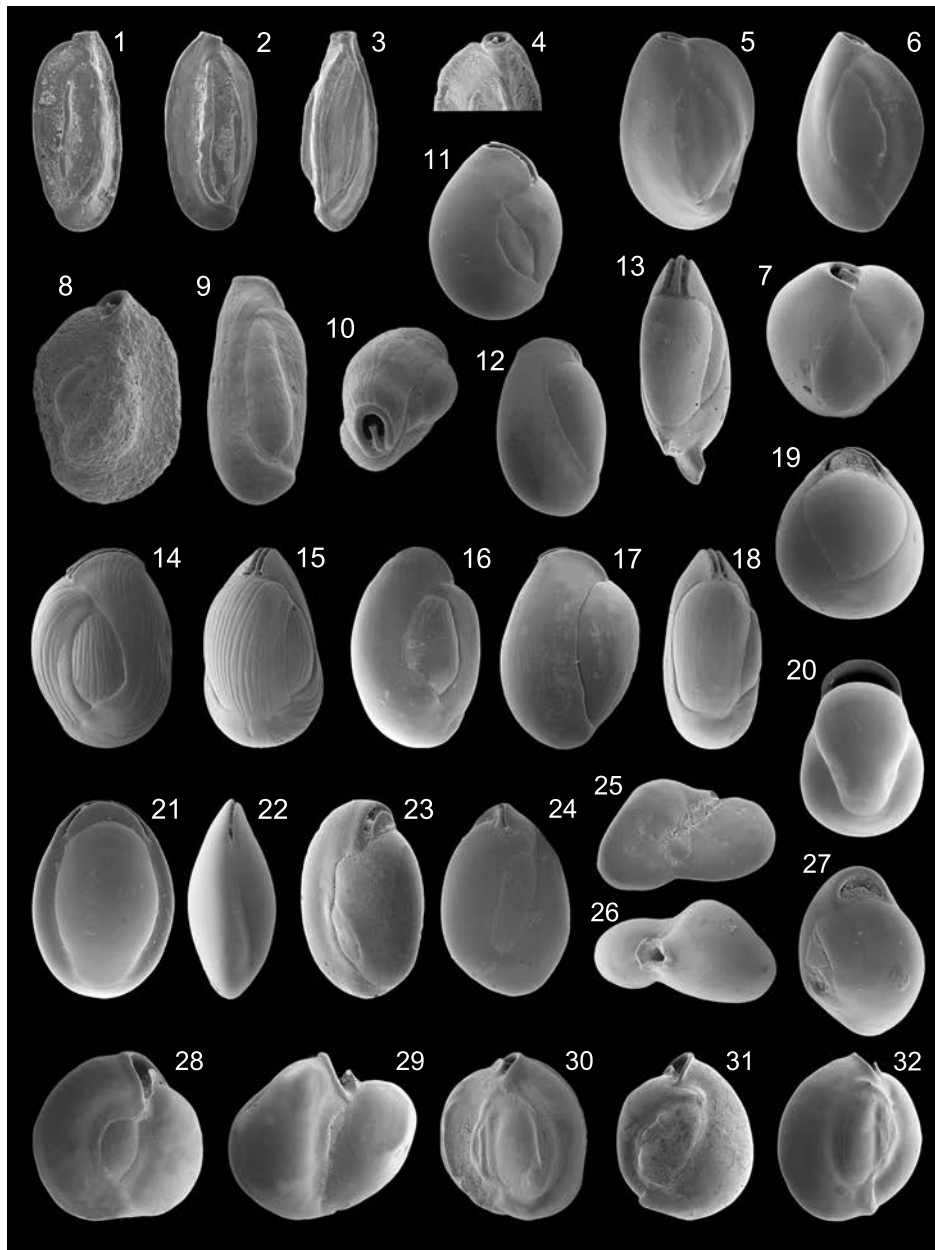
*Quinqueloculina seminula* (Linné, 1758)  
Figures 15.30-31

- 1758 *Serpula seminula* Linné: p. 786
- 1917 *Quinqueloculina seminulum* (Linné); Cushman, p. 44, pl. 11, fig. 2
- 1929 *Quinqueloculina seminulum* (Linné); Cushman, p. 24, pl. 2, figs. 1, 2
- 1960 *Quinqueloculina seminulum* (Linné); Hofker, p. 241, pl. B, fig. 41
- 1985 *Quinqueloculina seminula* (Linné); Hermelin and Scott, p. 216, pl. 2, fig. 3
- 1988 *Quinqueloculina seminula* (Linné); Loeblich and Tappan, p. 92, pl. 344, figs. 8-13
- 1991 *Quinqueloculina seminula* (Linné); Cimerman and Langer, p. 38, pl. 34, figs. 9-12
- 1992 *Quinqueloculina seminula* (Linné); Schiebel, p. 64, pl. 5, fig. 3
- 1992 *Quinqueloculina seminula* (Linné); Wollenburg, p. 40, pl. 10, fig. 8
- 1994 *Quinqueloculina seminulum* (Linné); Jones, p. 21, pl. 5, fig. 6
- 2006 *Quinqueloculina seminula* (Linné); Avsar et al., p. 132, pl. 1, fig. 7
- 2009 *Quinqueloculina seminula* (Linné); Frezza and Carboni, p. 55, pl. 1, figs. 10, 11
- 2009 *Quinqueloculina seminula* (Linné); Milker et al., p. 216, pl. 2, figs. 3, 4

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate to subrounded in lateral view and triangular in apertural view. The chamber arrangement is "quinqueloculine." Four chambers are visible from one side and three from the other side. The aperture is subrounded, bordered by a rim and provided with a relatively long, simple tooth. The test surface is smooth.

*Quinqueloculina stelligera* Schlumberger, 1893  
Figure 16.1-4

- 1893 *Quinqueloculina stelligera* Schlumberger: p. 68, pl. 2, figs. 58, 59; text-fig. 17



**FIGURE 16.** 1 *Quinqueloculina stelligera* Schlumberger, 779x, four chamber side; 2 *Q. stelligera* Schlumberger, 717x, four chamber side; 3 *Q. stelligera* Schlumberger, 777x, peripheral view; 4 *Q. stelligera* Schlumberger, 576x, enlargement of aperture; 5 *Quinqueloculina viennensis* Le Calvez and Le Calvez, 489x, four chamber side; 6 *Q. viennensis* Le Calvez and Le Calvez, 535x, four chamber side; 7 *Q. viennensis* Le Calvez and Le Calvez, 246x, four chamber side; 8 *Quinqueloculina* sp. 1, 938x, four chamber side; 9 *Affinetrina gualtieriana* (d'Orbigny), 560x, three chamber side; 10 *A. gualtieriana* (d'Orbigny), 789x, apertural edge view; 11 *Affinetrina ucrainica* (Serova), 1070x, three chamber side; 12 *A. ucrainica* (Serova), 1100x, two chamber side; 13 *A. ucrainica* (Serova), 920x, peripheral view; 14 *Affinetrina* sp. 1, 398x, three chamber side; 15 *Affinetrina* sp. 1, 291x, peripheral view; 16 *Affinetrina* sp. 2, 386x, three chamber side; 17 *Affinetrina* sp. 2, 370x, two chamber side; 18 *Affinetrina* sp. 2, 272x, peripheral view; 19 *Biloculinella globula* (Bornemann), 497x, lateral view; 20 *Biloculinella inflata* (Wright), 1100x, lateral view; 21 *Biloculinella labiata* (Schlumberger), 331x, lateral view; 22 *B. labiata* (Schlumberger), 347x, peripheral view; 23 *Miliolinella elongata* Kruit, 1640x, oblique side view; 24 *M. elongata* Kruit, 552x, side view; 25 *Miliolinella* cf. *hybrida* (Terquem), 555x, side view; 26 *M. cf. hybrida* (Terquem), 452x, apertural edge view; 27 *Miliolinella irregularis* (d'Orbigny), 770x, oblique side view; 28 *Miliolinella labiosa* (d'Orbigny), 534x, side view; 29 *M. labiosa* (d'Orbigny), 365x, side view; 30 *Miliolinella semicostata* (Wiesner), 576x, side view; 31 *Miliolinella subrotunda* (Montagu), 809x, side view; 32 *M. subrotunda* (Montagu), 996x, side view.

- 1929 *Quinqueloculina stelligera* Schlumberger; Cushman, p. 28, pl. 3, figs. 3, 4
- 1958 *Quinqueloculina stelligera* Schlumberger; Le Calvez and Le Calvez, p. 174, pl. 11, figs. 125, 126
- 1991 *Quinqueloculina stelligera* Schlumberger; Cimerman and Langer, p. 38, pl. 34, figs. 13-15
- 1993 *Quinqueloculina stelligera* Schlumberger; Sgarrella and Moncharmont Zei, p. 175, pl. 6, figs. 13, 14
- 2004 *Quinqueloculina stelligera* Schlumberger; Fiorini, p. 50, pl. 1, fig. 10

**Remarks:** The wall is porcelaneous and imperforate. The test is elongate-ovate in lateral view and star-like in apertural view. The chamber arrangement is "quinqueloculine." Four to five chambers are visible from the exterior. The peripheral chamber margins are acutely angled and thickened. The aperture is rounded and provided with a short, bifid tooth. The test surface is smooth.

*Quinqueloculina viennensis* Le Calvez and Le Calvez, 1958  
Figure 16.5-7

- 1958 *Quinqueloculina viennensis* Le Calvez and Le Calvez: p. 187, pl. 5, figs. 42, 44, 45
- 1993 *Quinqueloculina viennensis* Le Calvez and Le Calvez; Sgarrella and Moncharmont Zei, p. 176, pl. 7, fig. 8
- 2005 *Quinqueloculina viennensis* Le Calvez and Le Calvez; Rasmussen, p. 64, pl. 4, fig. 13

**Remarks:** The wall is porcelaneous and imperforate. The test is subcylindrical in lateral view and triangular in apertural view. The chamber arrangement is "quinqueloculine." Four chambers are visible from one side and three from the other side. The chamber margins are angled. The aperture is subrounded and provided with a relatively long, simple tooth. The test surface is smooth.

*Quinqueloculina* sp. 1  
Figure 16.8

**Remarks:** The wall is porcelaneous and imperforate. The test of these small specimens is ovate in lateral view. The chamber arrangement is "quinqueloculine." Five chambers are visible from the exterior. The peripheral margin is rounded. The aperture is ovate, bordered by a rim and provided with a short, bifid tooth. The test is ornamented with minute anastomosing microstriae, except for the earlier chambers, leading to a rough test surface.

Subfamily MILIOLINELLINAE Vella, 1957  
Genus AFFINETRINA Luczkowska, 1972  
*Affinetrina gualtieriana* (d'Orbigny, 1839a)  
Figure 16.9-10

- 1839a *Triloculina gualtieriana* d'Orbigny: p. 170, pl. 9, figs. 5-7
- 1974 *Affinetrina gualtieriana* (d'Orbigny); Luczkowska, p. 109, pl. 26, figs. 1, 2; text-fig. 38.3

**Remarks:** The wall is porcelaneous and imperforate. The test is elongate in lateral view and ovate in apertural view. Chambers are arranged in a triloculine pattern, with three chambers visible from the exterior. The ovate aperture is bordered by a thickened rim and provided with a relatively long, bifid tooth. The test surface is ornamented with short longitudinal and incised lines.

*Affinetrina ucrainica*  
(Serova, in Bogdanovich 1952)  
Figure 16.11-13

- 1952 *Miliolina ucrainica* Serova: type reference Bogdanovich, 1952, p. 104, pl. 8, fig. 2 (fide Luczkowska, 1974)
- 1974 *Affinetrina ucrainica* (Serova); Luczkowska, p. 111, pl. 16, fig. 3
- 2007 *Affinetrina ucrainica* (Serova); Schuetz et al., p. 453, pl. 2, fig. 2

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view and depressed in section. Three chambers are visible from the exterior, with two large outer and one small middle chamber. Sutures are slightly depressed. The peripheral margin is rounded. A keel-like feature may be present at the base of the final chamber. The aperture is slit-like, with nearly two parallel sides. The tooth is long, slender and simple, becoming slightly smaller to the end. It nearly fills the entire aperture. The test surface is very smooth.

*Affinetrina* sp. 1  
Figure 16.14-15

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in outline and subovate in section. The chamber arrangement is triloculine, and three chambers are visible from the exterior. The peripheral margin is rounded. The aperture is a long slit with a long, slender tooth, almost completely filling the slit-like opening. The test surface is ornamented with longitudinal striae.

*Affinetrina* sp. 2  
Figure 16.16-18

**Remarks:** The wall is porcelanous and imperforate. The test is ovate in outline and subovate in section. The chamber arrangement is triloculine, and three chambers are visible from the exterior. The peripheral margin is rounded. The aperture is a long slit with a long, slender tooth, almost completely filling the slit-like opening. The test surface is smooth and ornamented with some microstriae on the later chambers.

Genus BILOCULINELLA Wiesner, 1931  
*Biloculina globula* (Bornemann, 1855)

Figure 16.19

- 1855 *Biloculina globulus* Bornemann: p. 349, pl. 19, fig. 3
- 1917 *Biloculina globulus* Bornemann; Cushman, p. 78, pl. 31, fig. 2
- 1932 *Pyrgo globula* (Bornemann); Cushman, p. 65, pl. 15, figs. 6-8
- 1958 *Biloculinella globula* (Bornemann); Le Calvez and Le Calvez, p. 202, pl. 7, fig. 76
- 1991 *Biloculinella globula* (Bornemann); Cimerman and Langer, p. 40, pl. 36, figs. 1, 2
- 2002 *Biloculinella globula* (Bornemann); Kaminiski et al., p. 172, pl. 2, fig. 1
- 2005 *Biloculinella globula* (Bornemann); Rasmussen, p. 64, pl. 4, fig. 14

**Remarks:** The wall is porcelaneous and imperforate. The test is globulose. The adult chamber arrangement is "biloculine" with two chambers visible from the exterior. The periphery is broadly rounded. The terminal aperture is a slit-like opening due to it is nearly closed by a broad flap, and it is bordered by a thin rim. The test surface is smooth.

*Biloculinella inflata* (Wright, 1902)  
Figure 16.20

- 1902 *Biloculina inflata* Wright: p. 183, pl. 13, figs. 1-4
- 1993 *Biloculinella inflata* (Wright); Sgarrella and Moncharmont Zei, p. 188, pl. 10, fig. 12

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view. The adult chamber arrangement is "biloculine," and two inflated chambers are visible from the exterior. The periphery is broadly rounded. The terminal aperture is a slit-like opening due to it is nearly closed

by a broad flap, and it is bordered by a thin rim. The test surface is smooth.

*Biloculinella labiata* (Schlumberger, 1891)  
Figure 16.21-22

- 1891 *Biloculina labiata* Schlumberger: p. 556, pl. 9, figs. 60-62, text-figs. 13, 14
- 1958 *Biloculinella labiata* (Schlumberger); Parker, p. 255, pl. 1, figs. 10, 11
- 1974 *Biloculinella labiata* (Schlumberger); Luczkowska, p. 113, pl. 21, figs. 8, 9
- 1988 *Biloculinella labiata* (Schlumberger); Loeblisch and Tappan, p. 93, pl. 348, figs. 1-4
- 1991 *Biloculinella labiata* (Schlumberger); Cimerman and Langer, p. 40, pl. 36, fig. 12
- 2009 *Biloculinella labiata* (Schlumberger); Avsar et al., p. 134, pl. 1, fig. 20

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view and subelliptical in peripheral view. The adult chamber arrangement is "biloculine," and two chambers are visible from the exterior. Chambers are inflated with rounded margins and an angled periphery. The terminal aperture is a slit-like opening due to it is nearly closed by a broad, crescentic flap. The test surface is smooth.

Genus MILIOLINELLA Wiesner, 1931  
*Miliolinella elongata* Kruit, 1955  
Figure 16.23-24

- 1955 *Miliolinella circularis* (Bornemann) var. *elongata* Kruit: p. 110, pl. 1, fig. 15
- 1991 *Miliolinella elongata* Kruit; Cimerman and Langer, p. 41, pl. 37, fig. 8
- 1993 *Miliolinella circularis elongata* Kruit; Sgarrella and Moncharmont Zei, p. 187, pl. 10, fig. 5
- 2009 *Miliolinella elongata* Kruit; Avsar et al., p. 134, pl. 1, fig. 21

**Remarks:** The wall is porcelaneous and imperforate. The test is elongate-ovate in lateral view and subelliptical in peripheral view. The early stage is "quinceloculine," and later chambers are added planispirally. Three to four chambers are visible from the exterior. The periphery is subrounded. The terminal aperture is a slit-like opening, bordered by a rim, and provided with a low and crescentic flap. The test surface is smooth.

*Miliolinella* cf. *hybrida* (Terquem, 1878)  
Figure 16.25-26

- 1878 cf. *Quinqueloculina hybrida* Terquem: p. 79, pl. 9, fig. 23
- 1993 *Miliolinella* cf. *hybrida* (Terquem); Hottinger, Halicz and Reiss, p. 52, pl. 39, figs. 1-6

**Remarks:** The wall is porcelaneous. The test is ovate to subcircular in section and somewhat irregular. Chambers are strongly inflated and often distorted. Sutures are distinct and depressed. The aperture is terminal, arch-shaped, triangular, rounded or irregular. The test surface is smooth. Our specimens have no thickened rim, bordering the aperture and no basal flap (probably broken?) as described and illustrated by Hottinger, Halicz and Reiss (1993). An appendix-like feature as illustrated in Terquem (1878) has been seldom observed.

*Miliolinella irregularis* (d'Orbigny, 1839c)  
Figure 16.27

- 1839c *Biloculina irregularis* d'Orbigny: p. 67, pl. 8, figs. 20, 21
- 1884 *Biloculina irregularis* d'Orbigny; Brady, p. 140, pl. 1, figs. 17, 18
- 1929 *Nummoloculina irregularis* (d'Orbigny); Cushman, p. 46, Pl. 10, figs. 2, 3 [cop. Brady 1884, figs. 17, 18]
- 1991 *Miliolinella irregularis* (d'Orbigny); Rasmussen, p. 363, fig. 6, no. 3
- 1992 *Nummoloculina irregularis* (d'Orbigny); Wollenburg, p. 42, pl. 11, figs. 7, 8
- 1994 *Pyrgoella irregularis* (d'Orbigny); Jones, p. 18, pl. 1, figs. 17, 18 [cop. Brady 1884, figs. 17, 18]
- 2008 *Miliolinella irregularis* (d'Orbigny); Abu-Zied et al., p. 51, pl. 1, figs. 12, 13

**Remarks:** The wall is porcelaneous. The test is ovate in lateral view with a broadly rounded periphery. The early stage is "quinqueloculine" and later planispiral. Chambers are slightly inflated. Sutures are depressed. The aperture is a terminal arch, provided with a low, arched flap. The test surface is smooth.

*Miliolinella labiosa* (d'Orbigny, 1839a)  
Figure 16.28-29

- 1839a *Triloculina labiosa* d'Orbigny: p. 178, pl. 10, figs. 12-14
- 1922c *Triloculina labiosa* d'Orbigny; Cushman, p. 77, pl. 12, fig. 1

- 1958 *Triloculina labiosa* d'Orbigny; Le Calvez and Le Calvez, p. 196, pl. 14, figs. 168, 169
- 1960 *Miliolinella labiosa* (d'Orbigny); Hofker, p. 243, pl. B, fig. 54
- 1991 *Miliolinella labiosa* (d'Orbigny); Cimerman and Langer, p. 41, pl. 38, figs. 1-3

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate to subcircular in lateral view. The length to width ratio is lower than one. The early stage is "quinqueloculine," and later chambers are added planispirally. Three inflated chambers are visible from the exterior. The periphery is rounded. The terminal aperture is bordered by a rim and provided with a low and arched flap. The test surface is smooth.

*Miliolinella semicostata* (Wiesner, 1923)  
Figure 16.30

- 1923 *Miliolina semicostata* Wiesner: p. 72, pl. 14, figs. 177, 178
- 1991 *Miliolinella semicostata* (Wiesner); Cimerman and Langer, p. 42, pl. 38, figs. 10-15
- 1993 *Miliolinella semicostata* (Wiesner); Sgarrella and Moncharmont Zei, p. 187, pl. 10, fig. 7
- 2009 *Miliolinella semicostata* (Wiesner); Milker et al., p. 215, pl. 1, fig. 17

**Remarks:** The wall is porcelaneous and imperforate. The test is subcircular in lateral view and subtriangular to ovate in apertural view. The early stage is "quinqueloculine," and later chambers are added planispirally. Five chambers are visible from the exterior. The terminal aperture is bordered by a rim and provided with a low and arched flap. The chamber's periphery is ornamented with thick costae.

*Miliolinella subrotunda* (Montagu, 1803)  
Figure 16.31-32

- 1803 *Vermiculum subrotundum* Montagu: p. 521
- 1929 *Quinqueloculina? subrotunda* (Montagu); Cushman, p. 25, pl. 2, fig. 4
- 1988 *Miliolinella subrotunda* (Montagu); Loeblich and Tappan, p. 93, pl. 350, figs. 1-12
- 1991 *Miliolinella subrotunda* (Montagu); Cimerman and Langer, p. 42, pl. 38, figs. 4-9
- 1992 *Miliolinella subrotunda* (Montagu); Schiebel, p. 28, pl. 5, fig. 1

- 1994 *Miliolinella subrotunda* (Montagu); Jones, p. 20, pl. 4, fig. 3
- 2003 *Miliolinella subrotunda* (Montagu); Murray, p. 15, fig. 4, no. 6
- 2005 *Miliolinella subrotunda* (Montagu); Debenay et al., p. 334, pl. 2, fig. 8
- 2005 *Miliolinella subrotunda* (Montagu); Rasmussen, p. 64, pl. 4, fig. 15
- 2009 *Miliolinella subrotunda* (Montagu); Avsar et al., p. 134, pl. 1, figs. 22, 23
- 2009 *Miliolinella subrotunda* (Montagu); Milker et al., p. 215, pl. 1, fig. 18

**Remarks:** The wall is porcelaneous and imperforate. The test is subcircular in lateral view and ovate in apertural view. The early stage is “quiqueloculine,” and later chambers are added planispirally. Three to four inflated chambers are visible from the exterior. The chambers periphery is rounded. The terminal aperture is bordered by a rim and provided with a low, arched flap. The test surface is smooth.

*Miliolinella webbiana* (d'Orbigny, 1839b)  
Figure 17.1-2

- 1839b *Triloculina webbiana* d'Orbigny: p. 140, pl. 3, figs. 13-15
- 1958 *Triloculina webbiana* d'Orbigny; Le Calvez and Le Calvez, p. 195, pl. 15, figs. 176-178
- 1987 *Miliolinella webbiana* (d'Orbigny); Alberola et al., p. 306, pl. 2, fig. 12
- 1991 *Miliolinella webbiana* (d'Orbigny); Cimerman and Langer, p. 42, pl. 39, figs. 1-3
- 1993 *Miliolinella webbiana* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 187, pl. 10, fig. 6
- 2009 *Miliolinella webbiana* (d'Orbigny); Milker et al., p. 215, pl. 1, fig. 19

**Remarks:** The wall is porcelaneous and imperforate. The test is subcircular in lateral view and ovate in apertural view. The early stage is “quiqueloculine,” and later chambers are added planispirally. Five chambers are visible from the exterior. The chambers periphery is rounded. The terminal aperture is bordered by a rim and provided with a low and slightly arched flap. The test surface is densely ornamented with longitudinal costae.

*Miliolinella* sp. 1

- 1991 cf. *Miliolinella* sp. 2; Cimerman and Langer, p. 42, pl. 39, figs. 6, 7

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view. Early chambers are arranged in a “quiqueloculine” pattern and later nearly planispirally. Chambers are inflated and increasing in size as added. Three chambers are visible from the exterior. The peripheral margin is broadly rounded. The terminal aperture is provided with a low and arched flap. The test surface is smooth.

Genus PSEUDOTRILOCULINA Cherif, 1970  
*Pseudotriloculina* sp. 1  
Figure 17.3-4

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in outline. Three chambers are visible from the exterior. The periphery is rounded. The terminal aperture is bordered by a rim and provided with a relatively long and protruding tooth with bifid termination. The test surface is smooth.

Genus PTYCHOMILIOLA Eimer and Fickert, 1899  
*Ptychomiliola separans?* (Brady, 1881)  
Figure 17.5-6

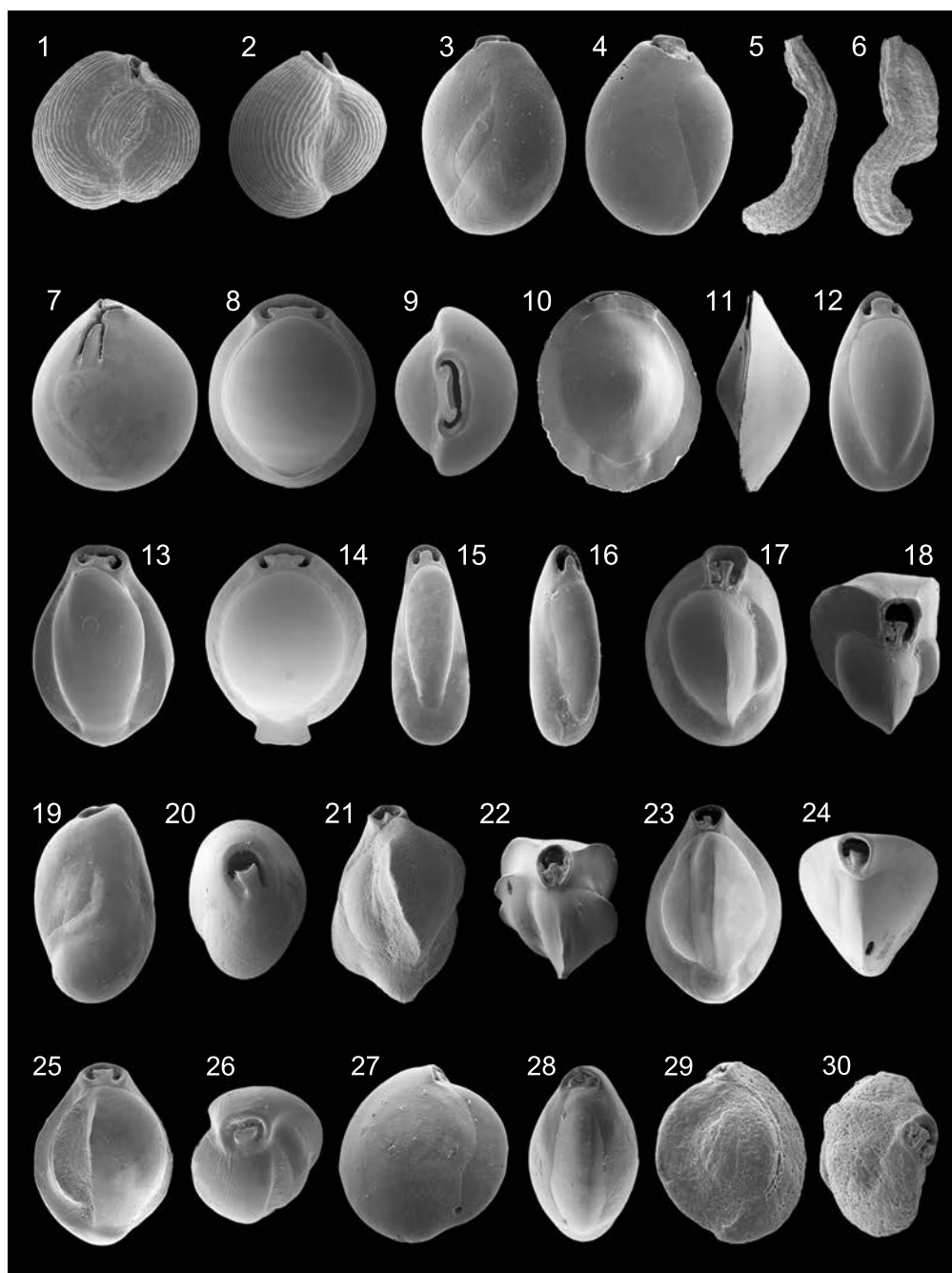
- 1881 cf. *Miliolina separans* Brady: p. 43
- 1884 cf. *Ptychomiliola separans* (Brady); Brady, p. 175, pl. 7, figs. 1-4
- 1988 cf. *Ptychomiliola separans* (Brady); Loeblich and Tappan, p. 94, pl. 353, figs. 10, 11
- 1994 cf. *Ptychomiliola separans* (Brady); Jones, p. 23, pl. 7, figs. 1-4 [cop Brady, 1884, figs. 1-4]

**Remarks:** The wall is porcelaneous and imperforate. The specimens were mostly broken and have a somewhat curved test. The aperture is terminal and bordered with a rim. The tooth was not visible. The test surface is ornamented with numerous longitudinal costae. The identification may be incorrect.

Genus PYRGO Defrance, 1824  
*Pyrgo anomala* (Schlumberger, 1891)  
Figure 17.8-9

- 1891 *Biloculina anomala* Schlumberger: p. 569, pl. 11, figs. 84-85; pl. 12, fig. 101
- 1917 *Biloculina anomala* Schlumberger; Cushman, p. 79, pl. 32, fig. 1
- 1958 *Pyrgo anomala* (Schlumberger); Le Calvez and Le Calvez, p. 200, pl. 7, fig. 77
- 1958 *Pyrgo anomala* (Schlumberger); Parker, p. 255, pl. 1, figs. 22, 23





**FIGURE 17.** 1 *Miliolinella webbiana* (d'Orbigny), 263x, side view; 2 *M. webbiana* (d'Orbigny), 241x, side view; 3 *Pseudotriloculina* sp. 1, 901x, three chamber side; 4 *Pseudotriloculina* sp. 1, 930x, two chamber side; 5 *Ptychomiliola separans?* (Brady), 512x, lateral view; 6 *P. separans?* (Brady), 338x, lateral view; 7 *Pyrgoella sphaera* (d'Orbigny), 427x, lateral view; 8 *Pyrgo anomala* (Schlumberger), 310x, side view; 9 *P. anomala* (Schlumberger), 305x, apertural edge view; 10 *Pyrgo depressa* (d'Orbigny), 314x, side view; 11 *P. depressa* (d'Orbigny), 229x, peripheral view; 12 *Pyrgo elongata* (d'Orbigny), 360x, side view; 13 *Pyrgo oblonga* (d'Orbigny), 420x, side view; 14 *Pyrgo* sp. 1, 307x, lateral view; 15 *Pyrgo* sp. 2, 753x, lateral view; 16 *Pyrgo* sp. 2, 853x, lateral view; 17 *Triloculina marioni* Schlumberger, 602x, profile view; 18 *T. marioni* Schlumberger, 574x, apertural edge view; 19 *Triloculina oblonga* (Montagu), 177x, three chamber side; 20 *T. oblonga* (Montagu), 317x, apertural edge view; 21 *Triloculina plicata* Terquem, 754x, profile view; 22 *T. plicata* Terquem, 424x, apertural edge view; 23 *Triloculina tricarinata* d'Orbigny, 778x, profile view; 24 *T. tricarinata* d'Orbigny, 701x, apertural edge view; 25 *Triloculina* sp. 1, 348x, profil view; 26 *Triloculina* sp. 1, 870x, apertural egde view; 27 *Nummoloculina* sp. 1, 437x, side view; 28 *Nummoloculina* sp. 1, 397x, peripheral view; 29 *Pseudoschlumbergerina ovata* (Sidebottom), 686x, side view; 30 *P. ovata* (Sidebottom), 725x, apertural edge view.

- 1960 *Pyrgo fischeri* (Schlumberger); Hofker, p. 243, pl. B, fig. 56
- 1991 *Pyrgo anomala* (Schlumberger); Cimerman and Langer, p. 44, pl. 41, figs. 3-5
- 1993 *Pyrgo anomala* (Schlumberger); Sgarrella and Moncharmont Zei, p. 180, pl. 9, fig. 3
- 2009 *Pyrgo anomala* (Schlumberger); Milker et al., p. 216, pl. 2, figs. 1, 2

**Remarks:** The wall is porcelaneous and imperforate. The test is subrounded in lateral view and ovate in apertural view. The adult stage is "biloculine," and two chambers are visible from the exterior. The peripheral wall is separated from the lateral wall by rounded shoulders. The aperture is subelliptical, bordered by an everted rim and provided with a broad, bifid tooth. The test surface is smooth.

*Pyrgo depressa* (d'Orbigny, 1826)  
Figure 17.10-11

- 1826 *Biloculina depressa* d'Orbigny: p. 298, no. 7
- 1884 *Biloculina depressa* d'Orbigny; Brady, p. 145, pl. 3, figs. 1, 2
- 1929 *Pyrgo depressa* (d'Orbigny); Cushman, p. 71, pl. 19, fig. 4
- 1958 *Pyrgo depressa* (d'Orbigny); Le Calvez and Le Calvez, p. 199, pl. 7, fig. 71
- 1960 *Pyrgo depressa* (d'Orbigny); Hofker, p. 243, pl. B, fig. 53
- 1990 *Pyrgo depressa* (d'Orbigny); Hasegawa et al., p. 475, pl. 2, fig. 1
- 1994 *Pyrgo depressa* (d'Orbigny); Jones, p. 19, pl. 3, figs. 1, 2 [cop Brady, 1884, figs. 1, 2]
- 2003 *Biloculinella depressa* (d'Orbigny); Murray, p. 15, fig. 4, no. 2, 3
- 2005 *Pyrgo depressa* (d'Orbigny); Rasmussen, p. 65, pl. 4, fig. 17

**Remarks:** The wall is porcelaneous and imperforate. The test is subrounded to rounded in lateral view and lenticular in apertural view. The adult stage is "biloculine," and two chambers are visible from the exterior. The peripheral wall is separated from the lateral wall by carinate shoulders. The aperture is a small slit of variable length. The test surface is smooth.

*Pyrgo elongata* (d'Orbigny, 1826)  
Figure 17.12

- 1826 *Biloculina elongata* d'Orbigny: p. 298, no. 4
- 1884 *Biloculina elongata* (d'Orbigny); Brady, p. 144, pl. 2, fig. 9
- 1917 *Biloculina elongata* d'Orbigny; Cushman, p. 78, pl. 31, fig. 1
- 1929 *Pyrgo elongata* (d'Orbigny); Cushman, p. 70, pl. 19, figs. 2, 3
- 1960 *Pyrgo elongata* (d'Orbigny); Hofker, p. 244, pl. B, fig. 58
- 1991 *Pyrgo elongata* (d'Orbigny); Cimerman and Langer, p. 44, pl. 41, figs. 6-8
- 1993 *Pyrgo elongata* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 182, pl. 9, fig. 1
- 1994 *Pyrgo elongata* (d'Orbigny); Jones, p. 18, pl. 2, fig. 9 [cop. Brady, 1884, fig. 9]

**Remarks:** The wall is porcelaneous and imperforate. The test is elongate-ovate in lateral view and lenticular in apertural view. The adult stage is "biloculine," and two chambers are visible from the exterior. Chambers are inflated. The peripheral wall is separated from the lateral wall by rounded shoulders. The aperture is subtriangular and provided with a flap-like tooth. The test surface is smooth. The specimen shown in Sgarrella and Moncharmont Zei (1993) differs from that shown by the other authors, and from that in this work, by the more ovate test in lateral view.

*Pyrgo oblonga* (d'Orbigny, 1839a)  
Figure 17.13

- 1839a *Biloculina oblonga* d'Orbigny: p. 163, pl. 8, figs. 21-23
- 1988 *Pyrgo oblonga* (d'Orbigny); Loeblich and Tappan, p. 94, pl. 351, figs. 11-13 [cop. d'Orbigny, 1839a, figs. 21-23]
- 1993 *Pyrgo oblonga* (d'Orbigny); Hottinger, Halicz and Reiss, p. 57, pl. 50, figs. 1-6

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view and in apertural view. The adult stage is "biloculine," and two chambers are visible from the exterior. Chambers are inflated. The peripheral wall is separated from the lateral wall by the broadly rounded shoulders. The ovate aperture is bordered by a rim and provided with a broad and bifid tooth. The test surface is smooth.

*Pyrgo* sp. 1  
Figure 17.14

- 2006 *Pyrgo elongata* (d'Orbigny); Avsar et al., p. 132, pl. 1, fig. 13

**Remarks:** The wall is porcelaneous and imperforate. The test is subrounded in lateral view and ovate in apertural view. The adult stage is “biloculine,” and two chambers are visible from the exterior. The peripheral wall is separated from the lateral wall by rounded shoulders. The aperture is subelliptical, bordered by a rim and provided with a broad and bifid tooth. The test surface is smooth. These specimens look close to *Pyrgo anomala* but have a rectangle-like attachment at the base of the test.

*Pyrgo* sp. 2  
Figure 17.15-16

**Remarks:** The wall is porcelaneous and imperforate. The test is very elongate in lateral view. Two chambers are visible from the exterior. Chambers are inflated. The peripheral wall is separated from the lateral wall by rounded shoulders. The aperture is ovate and provided with a flap-like tooth. The test surface is smooth. This species looks like a smaller, probably a juvenile(?) form of *Pyrgo elongata*. Further study is necessary.

Genus PYRGOELLA Cushman and White, 1936  
*Pyrgoella sphaera* (d'Orbigny, 1839c)  
Figure 17.7

- 1839c *Biloculina sphaera* d'Orbigny: p. 66, pl. 8, figs. 13-16
- 1884 *Biloculina sphaera* d'Orbigny; Brady, p. 141, pl. 2, fig. 4
- 1958 *Pyrgoella sphaera* (d'Orbigny); Le Calvez and Le Calvez, p. 198, pl. 7, fig. 72
- 1958 *Pyrgoella sphaera* (d'Orbigny); Parker, p. 256, pl. 1, fig. 14
- 1958 *Pyrgoella sphaera* (d'Orbigny); Todd, p. 188, pl. 1, fig. 4
- 1960 *Planispirina sphaera* (d'Orbigny); Hofker, p. 244, pl. B, fig. 59
- 1988 *Pyrgoella sphaera* (d'Orbigny); Loeblich and Tappan, p. 94, pl. 351, figs. 1-4
- 1991 *Pyrgoella sphaera* (d'Orbigny); Cimerman and Langer, p. 45, pl. 41, figs. 1, 2
- 1992 *Pyrgoella sphaera* (d'Orbigny); Wollenburg, p. 41, pl. 11, fig. 2
- 1994 *Pyrgoella sphaera* (d'Orbigny); Jones, p. 18, pl. 2, fig. 4 [cop. Brady, 1884, fig. 4]

**Remarks:** The wall is porcelaneous and imperforate. The test is globular. It has an early “pseudotriloculine” chamber arrangement and in the adult stage, a “biloculine” chamber arrangement, so that

in the adult stage later chambers strongly overlap the preceding chambers. Two chambers are visible from the exterior in adult stage. The aperture is a triangular slit and additionally, a sinuate opening has been observed. The test surface is smooth.

Genus TRILOCULINA d'Orbigny 1826  
*Triloculina marioni* Schlumberger, 1893  
Figure 17.17-18

- 1893 *Triloculina marioni* Schlumberger: p. 204, pl. 1, figs. 38-41; text-figs. 7, 8
- 1893 *Triloculina marioni* Schlumberger; Le Calvez and Le Calvez, p. 191, pl. 6, figs. 54-56
- 1991 *Triloculina marioni* Schlumberger; Cimerman and Langer, p. 46, pl. 43, figs. 1-5

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view and subtriangular in apertural view. Three chambers are visible from the exterior, increasing in size as added. The peripheral wall is broadly convex and separated from the lateral walls by acute shoulders. Sutures are depressed. The aperture is subrounded, bordered by a thin rim and provided with a relatively long and bifid tooth. The test is ornamented with microstriae.

*Triloculina oblonga* (Montagu, 1803)  
Figure 17.19-20

- 1803 *Vermiculum oblongum* Montagu: p. 522, pl. 14, fig. 9
- 1917 *Triloculina oblonga* (Montagu); Cushman, p. 69, pl. 26, fig. 3
- 1929 *Triloculina oblonga* (Montagu); Cushman, p. 57, pl. 13, fig. 4
- 1958 *Triloculina oblonga* (Montagu); Le Calvez and Le Calvez, p. 192 pl. 6, figs. 60, 61
- 1991 *Pseudotriloculina oblonga* (Montagu); Cimerman and Langer, p. 43, pl. 40, figs. 1-4
- 2005 *Triloculina oblonga* (Montagu); Debenay et al., p. 332, pl. 1, figs. 20, 23
- 2005 *Triloculina oblonga* (Montagu); Rasmussen, p. 67, pl. 5, fig. 4
- 2009 *Pseudotriloculina oblonga* (Montagu); Avsar et al., p. 134, pl. 1, fig. 24

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view. Three chambers are visible from the exterior. The periphery is rounded. The aperture is subrounded and provided

with a narrow and bifid tooth. The test surface is smooth. According to Cushman (1929), the tooth can also be broad and simple.

*Triloculina plicata* Terquem, 1878

Figure 17.21-22

- 1878 *Triloculina plicata* Terquem: p. 61, pl. 6, fig. 2
- 1915 *Miliolina tricarinata* (d'Orbigny) var. *plicata* (Terquem); Heron-Allen and Earland, p. 562, pl. 41, figs. 17-22
- 1958 *Triloculina plicata* Terquem; Le Calvez and Le Calvez, p. 189, pl. 14, figs. 162, 163
- 1991 *Triloculina plicata* Terquem; Cimerman and Langer, p. 46, pl. 43, figs. 8-10
- 2005 *Triloculina plicata* Terquem; Rasmussen, p. 67, pl. 5, fig. 5

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view and polygonal in apertural view. Three inflated chambers are visible from the exterior, increasing in size as added. The chambers periphery is carinate, separating one chamber from the next. The aperture is subrounded and provided with a bifid tooth. The test surface is smooth.

*Triloculina tricarinata* d'Orbigny, 1826

Figure 17.23-24

- 1826 *Triloculina tricarinata* d'Orbigny: p. 299, no. 7
- 1884 *Miliolina tricarinata* (d'Orbigny); Brady, p. 165, pl. 3; fig. 17
- 1917 *Triloculina tricarinata* d'Orbigny; Cushman, p. 66, pl. 25, fig. 2
- 1929 *Triloculina tricarinata* d'Orbigny; Cushman, p. 56, pl. 13, fig. 3
- 1932 *Triloculina tricarinata* d'Orbigny; Cushman, p. 59, pl. 13, fig. 3
- 1958 *Triloculina tricarinata* d'Orbigny; Le Calvez and Le Calvez, p. 189, pl. 5, figs. 47, 48
- 1960 *Triloculina tricarinata* d'Orbigny; Hofker, p. 242, pl. B, fig. 47
- 1985 *Triloculina tricarinata* d'Orbigny; Hermelin and Scott, p. 218, pl. 2, fig. 7
- 1990 *Triloculina tricarinata* d'Orbigny; Hasegawa et al., p. 475, pl. 2, figs. 10, 11
- 1991 *Triloculina tricarinata* d'Orbigny; Cimerman and Langer, p. 46, pl. 44, figs. 3, 4

- 1993 *Triloculina tricarinata* d'Orbigny; Sgarrella and Moncharmont Zei, p. 187, pl. 9, figs. 14, 15

- 1994 *Triloculina tricarinata* d'Orbigny; Jones, p. 20, pl. 3, fig. 17 [cop. Brady, 1884, fig. 17]

- 2004 *Triloculina tricarinata* d'Orbigny; Chendes et al., p. 76, pl. 1, fig. 11

- 2005 *Triloculina tricarinata* d'Orbigny; Rasmussen, p. 67, pl. 5, fig. 6

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view and triangular in apertural view. Three chambers are visible from the exterior. The chamber's periphery is carinate, separating one chamber from the next. The aperture is subrounded, bordered by a thin rim and provided with a short, bifid tooth. The test surface is smooth.

*Triloculina* sp. 1

Figure 17.25-26

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view. Three chambers are visible from the exterior. The final two chambers are broad, more inflated and angled on the periphery. The earlier and smaller chamber has a prominent flexuose keel on the periphery. The subrounded aperture is surrounded by a thickened peristomal rim and provided with a short, bifid tooth. The test surface is smooth.

Subfamily SIGMOILINITINAE Luczkowska, 1974

Genus NUMMOLOCULINA Steinmann, 1881

*Nummoloculina* sp. 1

Figure 17.27-28

- 1991 *Nummoloculina* sp. 1; Cimerman and Langer, p. 47, pl. 44, figs. 9-11

**Remarks:** The wall is porcelaneous and imperforate. The test is subcircular in lateral view and lenticular in peripheral view. Early chambers are arranged in a sigmoid manner, and later chambers are added in a single plane. Two chambers are visible from the exterior. Sutures are slightly depressed. The periphery is broadly rounded. The aperture is arch-shaped and provided with a flap-like tooth. The test surface is smooth.

Genus PSEUDOSCHLUMBERGERINA Cherif, 1970

*Pseudoschlumbergerina ovata* (Sidebottom, 1904)

Figure 17.29-30

- 1904 *Sigmoilina ovata* Sidebottom: pp. 6-7, text-fig. 1, pl. 2, figs. 12, 13

- 1915 *Sigmoilina ovata* Sidebottom; Heron-Allen and Earland, p. 584, pl. 45, figs. 16-18
- 1918 *Sigmoilina ovata* Sidebottom; Sidebottom, p. 9, pl. 2, figs. 3, 4
- 1988 *Pseudoschlumbergerina ovata* (Sidebottom); Loeblich and Tappan, p. 95, pl. 355, figs. 7-10 [figs. 7, 8: cop. Sidebottom, 1904, figs. 12, 13]
- 1990 *Septoculina angulata* (El Nakhal); El Nakhal, p. 91, pl. 1, figs. 1-7; pl. 2, figs. 1-3
- 1993 *Pseudoschlumbergerina ovata* (Sidebottom); Hottinger, Halicz and Reiss, p. 55, pl. 46, figs. 1-6

**Remarks:** The wall is porcelaneous and imperforate. The test is ovate in lateral view and slightly compressed in apertural view. Two chambers per whorl are added in various planes, resulting in a sigmoid chamber arrangement. Up to seven chambers are visible from the exterior, five from one side and four from the other side. The aperture is arch-shaped with a lip and provided with a bifid tooth. The test surface is ornamented with fine and irregular microstriae, making it rough. Our specimens differ from that shown by the El Nakhal (1990) and Hottinger, Halicz and Reiss (2003) by their larger teeth. According to the original description of Sidebottom (1904), the tooth can vary from a small form to a well developed bifid form.

Genus SIGMOILINITA Seiglie, 1965b  
*Sigmoilinita costata* (Schlumberger, 1893)  
 Figure 18.1-2

- 1893 *Sigmoilina costata* Schlumberger: p. 61, pl. 1, figs. 31, 32; text-fig. 4
- 1958 *Sigmoilina costata* Schlumberger; Le Calvez and Le Calvez, p. 208, pl. 7, figs. 69, 70
- 1987 *Sigmoilina costata* Schlumberger; Alberola et al., p. 306, pl. 2, fig. 15
- 1991 *Sigmoilinita costata* (Schlumberger); Cimerman and Langer, p. 47, pl. 45, figs. 1-6
- 1993 *Sigmoilina costata* Schlumberger; Sgarrella and Moncharmont Zei, p. 184, pl. 9, figs. 6-8
- 2004 *Sigmoilinita costata* (Schlumberger); Fiorini, p. 50, pl. 1, figs. 8, 9
- 2005 *Sigmoilinita costata* (Schlumberger); Debenay et al., p. 332, pl. 1, fig. 9
- 2009 *Sigmoilinita costata* (Schlumberger); Avsar et al., p. 134, pl. 1, fig. 27

**Remarks:** The wall is porcelaneous and imperforate. The test is fusiform in lateral view and flattened in peripheral view. Chambers are arranged in different planes and later become nearly planispiral. The rounded aperture is on a neck, bordered by a thin rim and provided with a short tooth. The test surface is ornamented with longitudinal costae.

*Sigmoilinita distorta* (Phleger and Parker, 1951)  
 Figure 18.3-4

- 1951 *Sigmoilina distorta* Phleger and Parker: p. 8, pl. 4, figs. 3-5
- 1958 *Sigmoilina distorta* Phleger and Parker; Parker, p. 256, pl. 1, fig. 25
- 1974 *Sigmoilina distorta* Phleger and Parker; Luczowska, p. 148, pl. 16, figs. 1-3
- 1993 *Sigmoilina distorta* Phleger and Parker; Sgarrella and Moncharmont Zei, p. 184, pl. 9, figs. 5

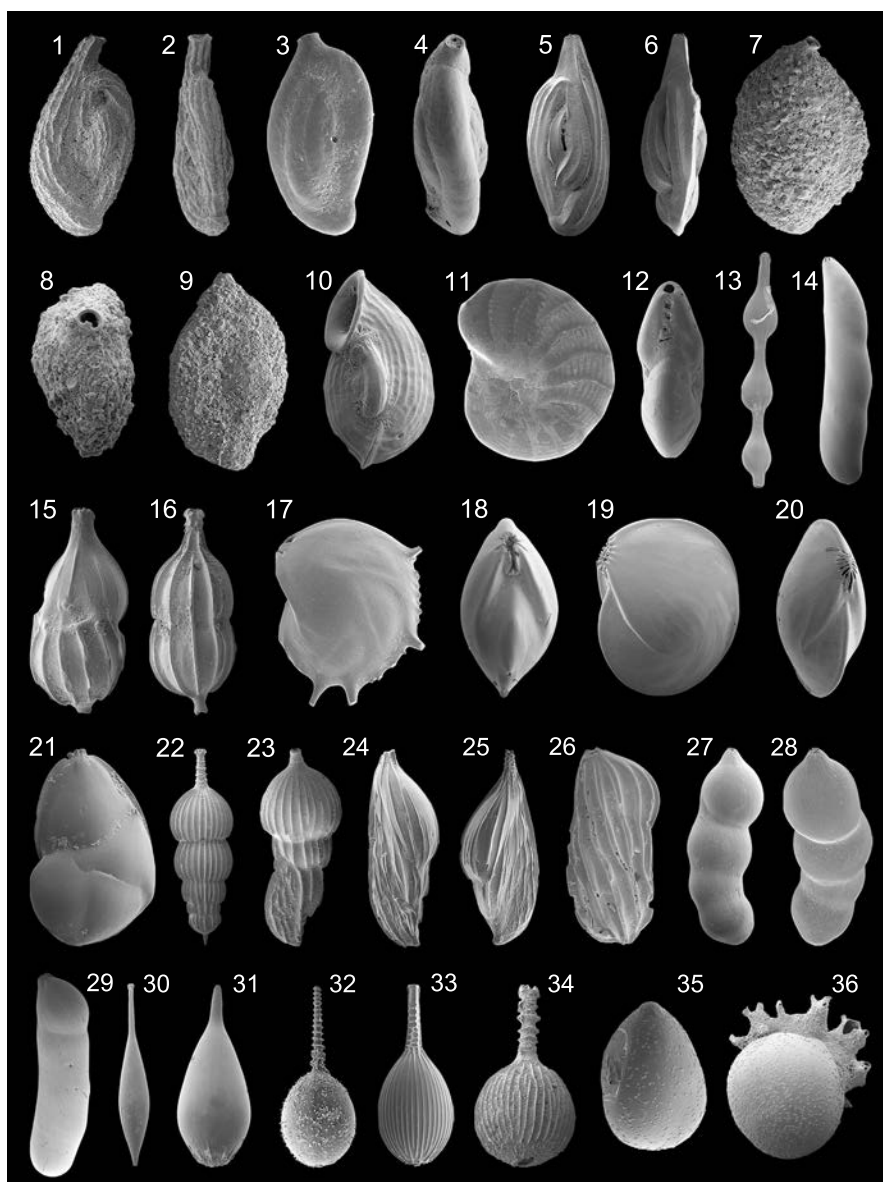
**Remarks:** The wall is porcelaneous and imperforate. The test is fusiform in lateral view and slightly irregularly biconvex and flattened in peripheral view. Early chambers are arranged in a sigmoid pattern, and later chambers are nearly planispirally arranged. The terminal aperture is rounded and provided with a short tooth. The test surface is smooth.

*Sigmoilinita* sp. 1  
 Figure 18.5-6

**Remarks:** The wall is porcelaneous and imperforate. The test is fusiform in lateral view and flattened in peripheral view. Chambers are one-half coil in length. Early chambers are arranged in a sigmoid pattern, and later chambers are nearly planispirally arranged. The periphery is acutely carinate. The aperture, at the end of the final chamber, is small and ovate to rounded. A tooth was not visible (probably broken?). The surface is ornamented with thick longitudinal costae. Our specimens look close to *Sigmoilina tricosta*, illustrated in Sgarrella and Moncharmont Zei (1993, p. 185, plate 5, figures 8, 9) but clearly differ from the specimens originally described and illustrated as *Spiroloculina tricosta* in Cushman and Todd (1994, pp. 9, 10, 21, fig. 9, plate 3, figures 26-29).

Subfamily SIGMOILOPSINAE Vella, 1957  
 Genus SIGMOILOPSIS Finlay, 1947  
*Sigmoilopsis schlumbergeri* (Silvestri, 1904)  
 Figure 18.7-8

- 1884 *Planispirina celata* Costa sp.; Brady, pp. 197-198, pl. 8, figs. 1-4



**FIGURE 18.** 1 *Sigmoilinita costata* (Schlumberger), 460x, side view; 2 *S. costata* (Schlumberger), 315x, peripheral view; 3 *Sigmoilinita distorta* (Phleger and Parker), 722x, side view; 4 *S. distorta* (Phleger and Parker), 396x, peripheral view; 5 *Sigmoilinita* sp. 1, 413x, side view; 6 *Sigmoilinita* sp. 1, 434x, peripheral view; 7 *Sigmoilopsis schlumbergeri* (Silvestri), 274x, side view; 8 *S. schlumbergeri* (Silvestri), 278x, apertural edge view; 9 *Sigmoilopsis* sp. 1, 172x, side view; 10 *Articulina mucronata* (d'Orbigny), 592x, side view; 11 *Peneroplis pertusus* (Forskal), 388x, side view; 12 *P. pertusus* (Forskal), 370x, peripheral view; 13 *Dentalina guttifera* d'Orbigny, 259x, lateral view; 14 *Laevidentalina* sp. 1, 1100x, lateral view; 15 *Pyramidulina catesbyi* (d'Orbigny), 586x, lateral view; 16 *P. catesbyi* (d'Orbigny), 516x, lateral view; 17 *Lenticulina calcar* (Linné), 438x, side view; 18 *L. calcar* (Linné), 201x, peripheral view; 19 *Lenticulina orbicularis* (d'Orbigny), 293x, side view; 20 *L. orbicularis* (d'Orbigny), 206x, peripheral view; 21 *Neolenticulina peregrina* (Schwager), 261x, side view; 22 *Amphicoryna scalaris* (Batsch), 242x, lateral view (macro-spheric specimen); 23 *A. scalaris* (Batsch), 322x, lateral view (microspheric specimen); 24 *A. scalaris* (Batsch), 293x, lateral view (microspheric specimen); 25 *A. scalaris* (Batsch), 397x, lateral view (microspheric specimen); 26 *Marginulina costata* (Batsch), 304x, side view; 27 *Hemirobulina* sp.1, 137x, lateral view; 28 *Hemirobulina* sp.1, 229x, lateral view; 29 *Vaginulina* cf. *americana* Cushman, 97x, lateral view; 30 *Hyalinonettrion gracillimum* (Costa), 419x, lateral view; 31 *Lagena doveyensis* Haynes, 720x, lateral view; 32 *Lagena hispida* Reuss var. *crispata* Matthes, 560x, lateral view; 33 *Lagena striata* (d'Orbigny), 376x, lateral view; 34 *Lagena strumosa* Reuss, 356x, lateral view; 35 *Globulina gibba* var. *punctata* D'Orbigny, 193x, side view; 36 *G. gibba* var. *punctata* D'Orbigny, 162x, side view, specimen with fistulose overgrowth.

- 1904 *Sigmoilina schlumbergeri* Silvestri: p. 267
- 1929 *Sigmoilina schlumbergeri* Silvestri; Cushman, p. 49, pl. 11, figs. 1-3
- 1960 *Sigmoilina schlumbergeri* Silvestri; Hofker, p. 244, pl. C, fig. 61
- 1987 *Sigmoilopsis schlumbergeri* (Silvestri); Jorissen, p. 43, pl. 4, fig. 9
- 1988 *Sigmoilopsis schlumbergeri* (Silvestri); Loeblich and Tappan, p. 95, pl. 356, figs. 8-13 [figs. 11-13: cop. Brady 1884, figs. 1a, 2b, 4]
- 1993 *Sigmoilopsis schlumbergeri* (Silvestri); Sgarrella and Moncharmont Zei, p. 185, pl. 9, fig. 4
- 1994 *Sigmoilopsis schlumbergeri* (Silvestri); Jones, p. 23, pl. 8, figs. 1-4 [cop. Brady, 1884, figs. 1-4]
- 2004 *Sigmoilopsis schlumbergeri* (Silvestri); Chendes et al., p. 76, pl. 1, fig. 12
- 2005 *Sigmoilopsis schlumbergeri* (Silvestri); Rasmussen, p. 68, pl. 5, fig. 8
- 2008 *Sigmoilopsis schlumbergeri* (Silvestri); Abu-Zied et al., p. 51, pl. 1, figs. 18, 19
- 2009 *Sigmoilopsis schlumbergeri* (Silvestri); Avsar et al., p. 134, pl. 1, fig. 28
- 2009 *Sigmoilopsis schlumbergeri* (Silvestri); Frezza and Carboni, p. 57, pl. 2, fig. 21

**Remarks:** The wall is porcelaneous and overlain by a layer of agglutinated fine-grained material. The test is ovate in lateral view and lenticular in peripheral view. Early chambers are arranged in a sigmoid pattern, later chambers are planispirally arranged. Four to five chambers are poorly visible from the exterior. The rounded aperture is terminal, at the end of a short neck and provided with a short tooth.

*Sigmoilopsis* sp. 1  
Figure 18.9

**Remarks:** The wall is porcelaneous and covered by a layer of irregularly arranged grains of different size. The test is ovate in lateral view and flattened in peripheral view. Early chambers are arranged in a sigmoid pattern, later chambers are planispirally arranged. Four to five chambers are poorly visible from the exterior. The rounded aperture is at the end of a short neck. This species differs from *Sigmoilopsis schlumbergeri* by the coarser-grained outer wall and by having a more inflated middle chamber.

Subfamily TUBINELLINAE Rhumbler, 1906  
Genus ARTICULINA d'Orbigny, 1826  
*Articulina mucronata* (d'Orbigny, 1839a)  
Figure 18.10

- 1839a *Vertebralina mucronata* d'Orbigny: p. 52, pl. 7, figs. 16-19
- 1922c *Vertebralina cassis* d'Orbigny var. *mucronata* d'Orbigny; Cushman, p. 63
- 1993 *Articulina mucronata* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 190, pl. 10, fig. 11

**Remarks:** The wall is porcelaneous. The test is ovate in lateral view and compressed in peripheral view. Earlier chambers are coiled, later chambers are uncoiled. The periphery is acutely carinate. The terminal and ovate aperture is bordered by an everted rim. The test surface is ornamented with longitudinal costae.

Family PENEROPLIDAE Schultze, 1854  
Genus PENEROPLIS de Montfort, 1808  
*Peneroplis pertusus* (Forskal, 1775)  
Figure 18.11-12

- 1775 *Nautilus pertusus* Forskal: p. 125
- 1917 *Peneroplis pertusus* (Forskal); Cushman, p. 86, pl. 37, figs. 1, 2, 6
- 1930a *Peneroplis pertusus* (Forskal); Cushman, p. 35, pl. 12, figs. 3-6
- 1991 *Peneroplis pertusus* (Forskal); Cimerman and Langer, p. 49, pl. 49, figs. 1-8
- 1993 *Peneroplis pertusus* (Forskal); Sgarrella and Moncharmont Zei, p. 190, pl. 10, fig. 13
- 1994 *Peneroplis pertusus* (Forskal); Jones, p. 29, pl. 13, figs. 16, 17, 23
- 2005 *Peneroplis pertusus* (Forskal); Debenay et al., p. 334, pl. 2, fig. 20
- 2009 *Peneroplis pertusus* (Forskal); Milker et al., p. 216, pl. 2, fig. 5

**Remarks:** The wall is porcelaneous. The test is planispirally enrolled, with a depressed umbilical region. Chambers are numerous, gradually increasing in size as added. The periphery is sub-rounded. Sutures are depressed. The aperture consists of numerous ovate or irregular openings. The openings are bordered by a rim. The test surface is ornamented with parallel grooves and ribs.

Family SORITIDAE Ehrenberg, 1839  
Subfamily ARCHAIASINAE Cushman, 1927  
Genus PARASORITES Seiglie and Rivera, in

Seiglie, Grove, and Rivera 1977)  
*Parasorites marginalis* (Lamarck, 1816)

- 1816 *Orbulites marginalis* Lamarck: p. 196  
 1884 *Orbitolites marginalis* (Lamarck); Brady, p. 214, pl. 15, figs. 1-3, 5  
 1930 *Sorites marginalis* (Lamarck); Cushman, p. 49, pl. 18, figs. 1-4  
 1994 *Parasorites marginalis* (Lamarck); Jones, p. 30, pl. 15, figs. 1-3, 5 [cop. Brady, 1884, figs. 1-3, 5]

**Remarks:** The wall is porcelaneous. The large test is discoidal and biplanar. Chambers are subdivided by intradermal plates. The apertures consist of openings on the peripheral margin.

Suborder LAGENINA Delage and Herouard, 1896  
 Family NODOSARIIDAE Ehrenberg, 1838  
 Subfamily NODOSARIINEA Ehrenberg, 1838  
 Genus DENTALINA Risso, 1826  
*Dentalina guttifera* d'Orbigny, 1846  
 Figure 18.13

- 1846 *Dentalina guttifera* d'Orbigny: p. 49, pl. 2, figs. 11, 13  
 1993 *Dentalina guttifera* d'Orbigny; Sgarrella and Moncharmont Zei, p. 192, pl. 11, fig. 7  
 2005 *Dentalina guttifera* d'Orbigny; Debenay et al., p. 334, pl. 2, fig. 21  
 2005 *Dentalina pyrula* (d'Orbigny); Rasmussen, p. 69, pl. 5, fig. 13

**Remarks:** The wall is calcareous and hyaline. The test is elongate in lateral view. The chamber arrangement is uniserial and slightly arcuate. Chambers are subcylindrical and separated from each other by tubular sections. Chambers increasing continuously in size as added. The aperture is terminal and radiate. The base of the chambers is partly ornamented with some striae.

Genus LAEVIDENTALINA Loeblich and Tappan, 1986  
*Laevidentalina* sp. 1  
 Figure 18.14

**Remarks:** The wall is calcareous and hyaline. The test is elongate and slightly arcuate in lateral view. Chambers are uniserially arranged. Sutures are oblique. The aperture, at the dorsal edge, is terminal and consists of a series of radial slits. The test surface is smooth.

Genus PYRAMIDULINA Fornasini, 1894  
*Pyramidulina catesbyi* (d'Orbigny, 1839a)  
 Figure 18.15-16

- 1839a *Nodosaria catesbyi* d'Orbigny: p. 16, pl. 1, figs. 8-10  
 1931 *Nodosaria catesbyi* d'Orbigny; Cushman and Parker, p. 7, pl. 3, figs. 3, 4  
 1993 *Pyramidulina catesbyi* (d'Orbigny); Hottinger, Halicz and Reiss, p. 76, pl. 88, figs. 1-19

**Remarks:** The wall is calcareous and finely perforate. The test is elongate-ovate in lateral view. The chamber arrangement is uniserial and rectilinear. The first chamber is more globular and larger than the second that is more pyriform. The terminal aperture is radiate. According to Hottinger, Halicz and Reiss (1993), this species show variable morphological features such as different number of chambers, different chamber shapes and a different ornamentation with costae. Only specimens having two chambers have been found.

Family VAGINULINIDAE Reuss, 1860  
 Subfamily LENTICULININAE Chapman, Parr and Collins, 1934  
 Genus LENTICULINA Lamarck, 1804  
*Lenticulina calcar* (Linné, 1758)  
 Figure 18.17-18

- 1758 *Nautilus calcar* Linné: p. 709  
 1846 *Robulina calcar* d'Orbigny: p. 99, pl. 4, figs. 18-20  
 1884 *Cristellaria calcar* (Linné); Brady, p. 551, pl. 70, figs. 9-12  
 1923 *Cristellaria calcar* (Linné); Cushman, p. 115, pl. 30, fig. 7; pl. 31, figs. 4, 5  
 1933c *Robulina calcar* (Linné); Cushman, p. 7, pl. 2, fig. 3  
 1991 *Lenticulina calcar* (Linné); Cimerman and Langer, p. 51, pl. 53, figs. 1-4  
 1993 *Lenticulina calcar* (Linné); Sgarrella and Moncharmont Zei, p. 194, pl. 12, fig. 11  
 1994 *Lenticulina calcar* (Linné); Jones, p. 81, pl. 70, figs. 9-12 [cop. Brady, 1884, figs. 9-12]  
 2005 *Lenticulina calcar* (Linné); Rasmussen, p. 69, pl. 6, fig. 5

**Remarks:** The wall is calcareous and hyaline. The test planispirally enrolled, rounded in lateral view and lenticular in peripheral view. The periphery is carinate, and pseudospines are present. Sutures are backward curved. The aperture is radiate, accompanied by a slit-like opening and bordered by two large flaps. The test surface is smooth.



*Lenticulina orbicularis* (d'Orbigny, 1826)

Figure 18.19-20

- 1826 *Robulina orbicularis* d'Orbigny: p. 288, pl. 15, figs. 8, 9
- 1884 *Cristellaria orbicularis* (d'Orbigny); Brady, p. 549, pl. 69, fig. 17
- 1923 *Cristellaria orbicularis* (d'Orbigny); Cushman, p. 101, pl. 21, fig. 7
- 1991 *Lenticulina orbicularis* (d'Orbigny); Cimerman and Langer, p. 51, pl. 53, fig. 12
- 1993 *Lenticulina orbicularis* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 194, pl. 12, fig. 8
- 1994 *Lenticulina orbicularis* (d'Orbigny); Jones, p. 81, pl. 69, fig. 17 [cop. Brady, 1884, fig. 17]
- 2005 *Lenticulina orbicularis* (d'Orbigny); Rasmussen, p. 70, pl. 6, fig. 8

**Remarks:** The wall is calcareous and hyaline. The test planispirally enrolled, rounded in lateral view and lenticular in peripheral view. The periphery is carinate. Sutures are backward curved. The aperture is radiate, accompanied by a slit-like opening and bordered by two small flaps. The test surface is smooth.

Genus NEOLENTICULINA McCulloch, 1977

*Neolenticulina peregrina* (Schwager, 1866)

Figure 18.21

- 1866 *Cristellaria peregrina* Schwager: p. 245, pl. 7, fig. 8
- 1884 *Cristellaria variabilis* (Reuss); Brady, p. 541, pl. 68, figs. 11-16
- 1923 *Cristellaria peregrina* Schwager; Cushman, p. 113, pl. 30, figs. 3, 4
- 1960 *Lenticulina peregrina* (Schwager); Hofker, p. 245, pl. C, fig. 71
- 1988 *Neolenticulina peregrina* (Schwager); Loeblich and Tappan, p. 115, pl. 447, figs. 9-12, 16
- 1993 *Neolenticulina peregrina* (Schwager); Sgarrella and Moncharmont Zei, p. 195, pl. 12, fig. 4
- 1994 *Neolenticulina variabilis* (Reuss); Jones, p. 80, pl. 68, figs. 11-16 [cop. Brady 1884, figs. 11-16]
- 2005 *Lenticulina peregrina* (Schwager); Rasmussen, p. 70, pl. 6, fig. 9

**Remarks:** The wall is calcareous and hyaline. The test is planispirally enrolled, ovate in lateral view and compressed in apertural view. Chambers are semicircular and of enlarging size in each whorl. Three to five chambers are visible from the exterior. The final chamber in the adult stage is uncoiled. Sutures are depressed. The periphery is carinate. The aperture consists of multiple openings, each of them on a short tubular neck. The test surface is smooth.

Subfamily MARGINULININAE Wedekind, 1937

Genus AMPHICORYNA Schlumberger, in Milne-Edwards 1881

*Amphicoryna scalaris* (Batsch, 1791)

Figure 18.22-25

- 1791 *Nautilus (Ortoceras) scalaris* Batsch: p. 2, pl. 2, fig. 4a, b
- 1884 *Nodosaria scalaris* (Batsch), sp.; Brady, p. 510, pl. 63, figs. 28-31
- 1884 *Amphycorine falx* (Jones and Parker), sp.; Brady, p. 556, pl. 65, figs. 7-9
- 1958 *Lagenonodosaria scalaris* (Batsch); Parker, p. 258, pl. 1, figs. 32, 33
- 1960 *Nodogenerina scalaris* (Batsch); Hofker, p. 244, pl. C, figs. 63-65
- 1988 *Amphicoryna scalaris* (Batsch); Loeblich and Tappan, p. 116, pl. 450, figs. 11-14
- 1991 *Amphicoryna scalaris* (Batsch); Cimerman and Langer, p. 52, pl. 54, figs. 1-9
- 1993 *Amphicoryna scalaris* (Batsch); Sgarrella and Moncharmont Zei, p. 191, pl. 11, figs. 2, 3
- 1994 *Amphicoryna scalaris* (Batsch); Jones, p. 75, pl. 63, figs. 28-31; pl. 65, figs. 7-9 [cop. Brady, 1884, figs. 28-31; 7-9]
- 2003 *Amphicoryna scalaris* (Batsch); Murray, p. 17, fig. 5, no. 1
- 2004 *Amphicoryna scalaris* (Batsch); Chendes et al., p. 76, pl. 1, fig. 14
- 2008 *Amphicoryna scalaris* (Batsch); Abu-Zied et al., p. 51, pl. 1, figs. 21, 22
- 2009 *Amphicoryna scalaris* (Batsch); Frezza and Carboni, p. 57, pl. 2, figs. 19, 20
- 2009 *Amphicoryna scalaris* (Batsch); Milker et al., p. 216, pl. 2, figs. 9, 10

**Remarks:** The wall is calcareous. The test is elongate. In the megalospheric form, the proloculus is followed by rectilinearly and uniserially arranged global chambers, increasing in size as added.

Sutures are depressed. In the microspheric form, the first chambers are arranged in astacolone coil so that they are triangular in outline, with sharp angles on the periphery and with oblique sutures. Later chambers are arranged such as in the megaspheric form. The crown-like or radiate aperture, on a long neck, is covered by concentric ridges. The test surface is ornamented with long and numerous striae. An apiculate spine may be present at the base of the test.

Genus HEMIROBULINA Stache, 1864

*Hemirobulina* sp. 1

Figure 18.27-28

**Remarks:** The wall is calcareous and hyaline. The test is elongate in lateral view and circular in section. The subglobular chambers are firstly added in a slight curve and later become rectilinear. Chambers gradually increasing in size as added. Sutures are oblique and depressed. The aperture is terminal at the dorsal edge. The test surface is smooth.

Genus MARGINULINA d'Orbigny, 1826

*Marginulina costata* (Batsch, 1791)

Figure 18.26

- 1791 *Nautilus costatus* Batsch: p. 2, pl. 1, fig. 1 a-g
- 1884 *Marginulina costata* (Batsch), sp.; Brady, p. 528, pl. 65, fig. 13
- 1923 *Marginulina costata* (Batsch); Cushman, p. 132, pl. 37, fig. 2
- 1993 *Marginulina costata* (Batsch); Sgarrella and Moncharmont Zei, p. 195, pl. 12, fig. 5
- 1994 *Marginulina costata* (Batsch); Jones, p. 77, pl. 65, fig. 13 [cop. Brady 1884, fig. 13]
- 2005 *Marginulina costata* (Batsch); Rasmussen, p. 71, pl. 6, fig. 17

**Remarks:** The wall is calcareous and hyaline. The test is elongate in lateral view. The early stage is slightly curved, and later chambers are rectilinearly arranged. Sutures are oblique and depressed. The aperture is radiate and terminal at the dorsal edge. The test surface is ornamented with thick longitudinal and slightly curved costae.

Subfamily VAGINULININAE Reuss, 1860

Genus VAGINULINA d'Orbigny, 1826

*Vaginulina* cf. *americana* Cushman, 1923

Figure 18.29

- 1884 cf. *Vaginulina linearis* Montagu; Brady, p. 532, pl. 67, figs. 10-12
- 1923 cf. *Vaginulina americana* Cushman: p. 135, pl. 38, figs. 3, 4

- 1994 cf. *Vaginulina americana* Cushman; Jones 1994, p. 79, pl. 67, figs. 10-12 [cop. Brady, 1884, figs. 10-12]

**Remarks:** The wall is calcareous. The test is elongate, slightly arcuate and laterally slightly compressed. Chambers are uniserially arranged. The dorsal chamber margin is straight and the ventral margin is slightly inflated. Sutures are oblique in the early portion and later nearly horizontal and depressed. The terminal aperture is radiate at the dorsal edge. The test is ornamented with a few, long and curved striae. In difference to the specimens shown by the Brady (1884), Cushman (1923) and Jones (1994), our specimens have only a few striae on the test.

Family LAGENIDAE Reuss, 1862

Genus HYALINONETRION Patterson and

Richardson, 1987

*Hyalinonetrion gracillimum* (Costa, 1856)

Figure 18.30

- 1856 *Amphorina gracilis* Costa: p. 125, pl. 11, fig. 11
- 1862 *Amphorina gracillima* Seguenza: p. 51, pl. 1, fig. 37
- 1884 *Lagena gracillima* (Seguenza); Brady, p. 456, pl. 56, figs. 19-22, 24-29
- 1923 *Lagena gracillima* (Seguenza); Cushman, p. 23, pl. 4, fig. 5
- 1991 *Hyalinonetrion gracillimum* (Seguenza); Cimerman and Langer, p. 52, pl. 55, figs. 1, 2
- 1993 *Hyalinonetrion gracillis* (Costa); Hottinger, Halicz and Reiss, p. 78, pl. 90, figs. 7, 8
- 1994 *Procerolagena gracillima* (Seguenza); Jones, p. 62, pl. 56, figs. 19-22, 24-29 [cop. Brady, 1884, figs. 19-22, 24-29]
- 2005 *Lagena gracillima* (Seguenza); Rasmussen, p. 72, pl. 7, figs. 4, 5
- 2009 *Hyalinonetrion gracillimum* (Seguenza); Avsar et al., p. 134, pl. 2, fig. 1

**Remarks:** The wall is calcareous and hyaline. The test is very elongate, unilocular and tapering on both ends. The aperture is terminal and rounded, on a long, tapering neck and bordered by an everted rim. The test surface is smooth.

Genus LAGENA Walker and Jacob, 1798

*Lagena doveyensis* Haynes, 1973

Figure 18.31

1973 *Lagena doveyensis* Haynes: p. 82, pl. 12, figs. 7, 8

1991 *Lagena doveyensis* Haynes; Cimerman and Langer, p. 53, pl. 55, figs. 3-5

2009 *Lagena doveyensis* Haynes; Avsar et al., p. 134, pl. 2, fig. 2

**Remarks:** The wall is calcareous and hyaline. The test is unilocular and pear-shaped. The rounded aperture is on a long, tapering neck and bordered by an everted rim. Short longitudinal striae are present at the base of the test.

*Lagena hispida* Reuss var. *crispata* Matthes, 1939  
Figure 18.32

1884 *Lagena hispida* Reuss; Brady, p. 459, pl. 63, fig. 3

1923 *Lagena hispida* Reuss; Cushman, p. 26, pl. 4, fig. 8

1939 *Lagena hispida* Reuss var. *crispata* Matthes: p. 61, pl. 3, fig. 21

1994 *Lagena aspera* var. *crispata* (Matthes); Jones, p. 63, pl. 57, fig. 3 [cop. Brady, 1884, fig. 3]

**Remarks:** The wall is calcareous and hyaline. The test is unilocular and ovate. The aperture is on a long and slender neck that is ornamented with oblique ridges. The test surface is ornamented with short pseudospines.

*Lagena striata* (d'Orbigny, 1839c)  
Figure 18.33

1839c *Oolina striata* d'Orbigny: p. 21, pl. 5, fig. 12

1884 *Lagena striata* (d'Orbigny); Brady, p. 460, pl. 57, figs. 22, 24

1923 *Lagena striata* (d'Orbigny); Cushman, p. 54, pl. 10, fig. 9

1933c *Lagena striata* (d'Orbigny); Cushman, p. 32, pl. 8, figs. 11, 13

1991 *Lagena striata* (d'Orbigny); Cimerman and Langer, p. 53, pl. 55, figs. 6-7

1992 *Lagena striata* (d'Orbigny); Wollenburg, p. 46, pl. 12, fig. 3

1993 *Lagena striata* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 198, pl. 12, figs. 2-3

1994 *Lagena striata* (d'Orbigny); Jones, p. 64, pl. 57, figs. 22, 24 [cop. Brady, 1884, figs. 22, 24]

2005 *Lagena striata* (d'Orbigny); Rasmussen, p. 73, pl. 7, fig. 8

2006 *Lagena striata* (d'Orbigny); Avsar et al., p. 134, pl. 2, figs. 3, 4

**Remarks:** The wall is calcareous and hyaline. The test is unilocular and pear-shaped. The crown-like aperture is on a long neck that is ornamented with polygonally arranged ridges. The test surface is ornamented with numerous longitudinal striae. An apical pseudospine is present.

*Lagena strumosa* Reuss, 1858  
Figure 18.34

1858 *Lagena strumosa* Reuss: p. 434

1863 *Lagena strumosa* Reuss; Reuss, p. 328, pl. 4, fig. 49

1913 *Lagena striata* (d'Orbigny) var. *strumosa* Reuss; Cushman, p. 20, pl. 7, figs. 7-10

1993 *Lagena strumosa* Reuss; Hottinger, Halicz and Reiss, p. 79, pl. 90, figs. 18-25

2002 *Amphycorina proxima* (Silvestri); Kaminski et al., p. 173, pl. 2, fig. 5

**Remarks:** The wall is calcareous. The test is unilocular with a globular chamber. The crown-like aperture is on a long neck that is covered by concentric ridges. The test surface is ornamented with longitudinal striae and perforate.

Family POLYMORPHINIDAE d'Orbigny, 1839  
Subfamily POLYMORPHININAE d'Orbigny, 1839  
Genus GLOBULINA d'Orbigny, 1839  
*Globulina gibba* d'Orbigny var. *punctata* d'Orbigny,  
1846  
Figure 18.35-36

1846 *Globulina punctata* d'Orbigny: p. 229, pl. 13, figs. 17, 18

1991 *Globulina? punctata* d'Orbigny; Cimerman and Langer, p. 54, pl. 56, figs. 5-7

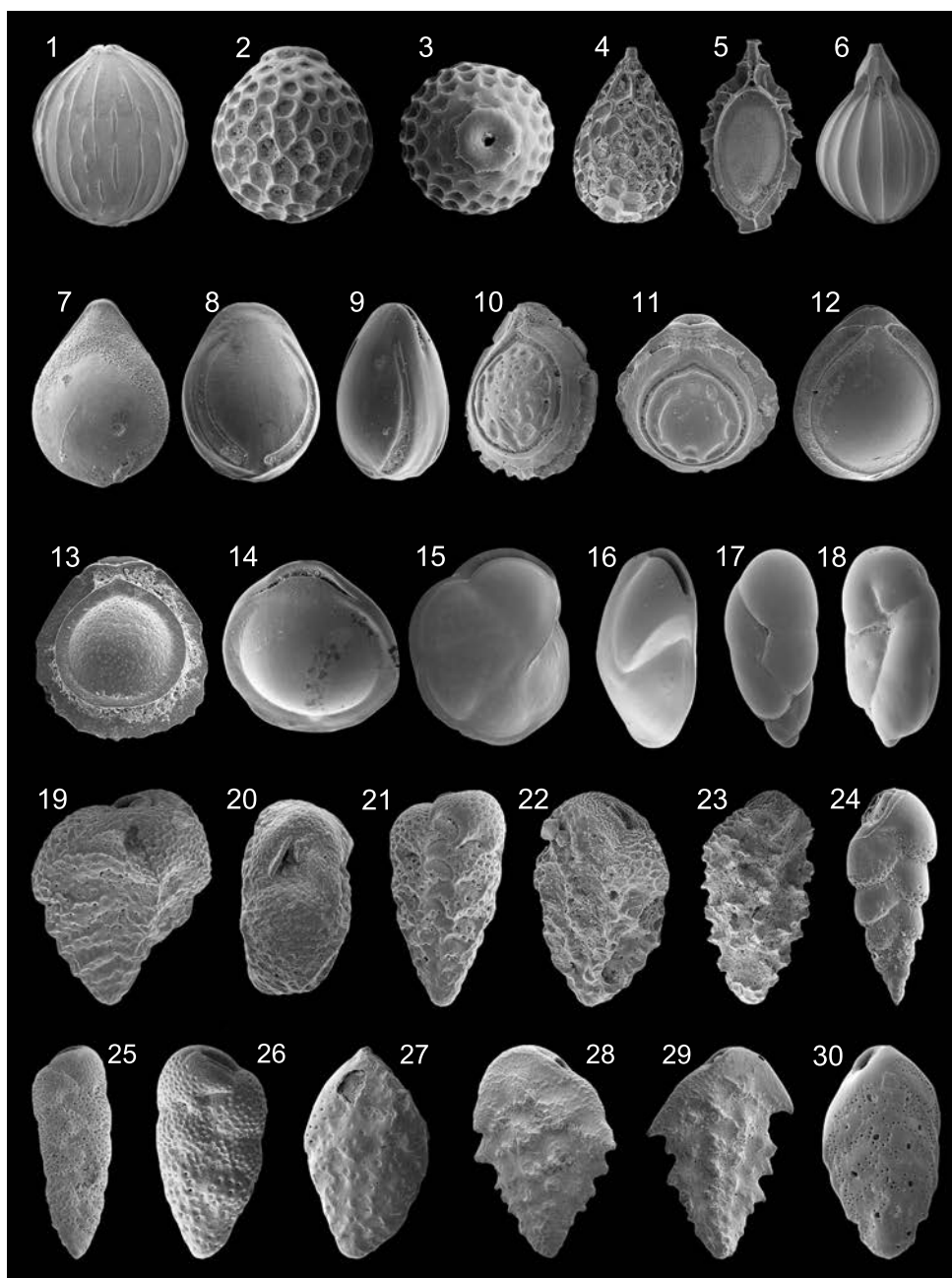
1993 *Globulina gibba* (d'Orbigny); Hottinger, Halicz and Reiss, p. 79, pl. 91, figs. 6-12

2005 *Globulina gibba* (d'Orbigny); Rasmussen, p. 74, pl. 7, fig. 12

**Remarks:** The wall is calcareous and finely perforate. The test is ovoid with a "quinteloculine" chamber arrangement. The terminal aperture is radiate and may be covered by a fistulose overgrowth. The test surface is ornamented with pustules.

*Globulina myristiformis* (Williamson, 1858)  
Figure 19.1

1858 *Polymorphina myristiformis* Williamson: p. 73, pl. 6, figs. 156, 157



**FIGURE 19.** 1 *Globulina myristiformis* (Williamson), 374x, lateral view; 2 *Favulina foveolata* (Seguenza), 446x, lateral view; 3 *F. foveolata* (Seguenza), 510x, apertural view; 4 *Favulina hexagona* (Williamson), 592x, lateral view; 5 *Lagnea* sp. 1, 588x, lateral view; 6 *Oolina acuticosta* (Reuss), 634x, lateral view; 7 *Fissurina crebra* (Matthes), 1040x, lateral view; 8 *Fissurina fasciata* (Egger), 1020x, lateral view; 9 *F. fasciata* (Egger), 749x, oblique lateral view; 10 *Fissurina lacunata* (Burrows and Holland), 506x, lateral view; 11 *F. lacunata* (Burrows and Holland), 826x, oblique lateral view; 12 *Fissurina marginata* (Montagu), 505x, lateral view; 13 *Fissurina orbignyana* Seguenza, 882x, lateral view; 14 *Parafissurina lateralis* (Cushman) var. *carinata* (Buchner), 892x, oblique lateral view; 15 *Hoeglundina elegans* (d'Orbigny), 295x, umbilical side; 16 *H. elegans* (d'Orbigny), 242x, peripheral view; 17 *Robertina translucens* Cushman and Parker, 828x, lateral view; 18 *R. translucens* Cushman and Parker, 433x, lateral view; 19 *Bolivina cistina* Cushman, 1020x, lateral view; 20 *B. cistina* Cushman, 1390x, apertural face; 21 *Bolivina plicatella* Cushman, 910x, lateral view; 22 *Bolivina pseudoplicata* Heron-Allen and Earland, 1070x, lateral view; 23 *B. pseudoplicata* Heron-Allen and Earland, 946x, lateral view; 24 *Bolivina subspinescens* Cushman, 1110x, lateral view; 25 *Bolivina variabilis* (Williamson), 549x, lateral view; 26 *B. variabilis* (Williamson), 732x, lateral view; 27 *Bolivina* sp. 1, 735x, lateral view; 28 *Brizalina difformis* (Williamson), 904x, lateral view; 29 *B. difformis* (Williamson), 722x, lateral view; 30 *Brizalina dilatata* (Reuss), 824x, lateral view.

- 1884 *Polymorphina myristiformis* Williamson; Brady, p. 571, pl. 73, figs. 9, 10
- 1923 *Polymorphina myristiformis* Williamson; Cushman, p. 158, pl. 41, figs. 9-12
- 1991 *Globulina myristiformis* (Williamson); Cimerman and Langer, p. 53, pl. 56, figs. 13, 14
- 1994 *Globulina myristiformis* (Williamson); Jones, p. 85, pl. 73, figs. 9, 10 [cop. Brady, 1884, figs. 9, 10]
- 2005 *Globulina gibba* d'Orbigny var. *myristiformis* (Williamson); Rasmussen, p. 74, pl. 7, fig. 13
- 1991 *Favulina hexagona* (Williamson); Cimerman and Langer, p. 55, pl. 58, figs. 8, 9
- 1992 *Favulina hexagona* (Williamson); Wollenburg, p. 46, pl. 12, fig. 9
- 1993 *Oolina hexagona* (Williamson); Sgarrella and Moncharmont Zei, p. 199, pl. 12, fig. 15
- 1994 *Oolina hexagona* (Williamson); Jones, p. 66, pl. 58, fig. 33 [cop. Brady, 1884, fig. 33]
- 2004 *Favulina hexagona* (Williamson); Chen-des et al., p. 76, pl. 1, fig. 16
- 2005 *Oolina hexagona* (Williamson); Rasmus-sen, p. 76, pl. 8, fig. 10
- 2010 *Oolina hexagona* (Williamson); Milker, p. 199, pl. 3, fig. 9

**Remarks:** The wall is porcelaneous. The test is ovate and circular in section. The aperture is terminal and radiate. The test surface is ornamented with longitudinal costae, extending from the aperture to the base or ending abruptly.

Family ELLPISOLAGENIDAE Silvestri, 1923  
Subfamily OOLININAE Loeblich and Tappan, 1961  
Genus FAVULINA Patterson and Richardson, 1987  
*Favulina foveolata* (Seguenza, 1862)

Figure 19.2-3

- 1862 *Orbulina foveolata* Seguenza: p. 37, pl. 1, figs. 1, 2
- 1940 *Lagena foveolata* (Seguenza); Buchner, p. 438, pl. 6, figs. 85-87
- 1993 *Oolina foveolata* (Seguenza); Sgarrella and Moncharmont Zei, p. 199, pl. 12, fig. 14

**Remarks:** The wall is calcareous and translucent. The unilocular test is globular. The terminal aperture is rounded and bordered by a thin rim. The test surface is ornamented with polygonally arranged ridges.

*Favulina hexagona* (Williamson, 1848)  
Figure 19.4

- 1848 *Entesolenia squamosa* (Montagu) var. *hexagona* Williamson: p. 20, pl. 2, fig. 23
- 1884 *Lagena hexagona* (Williamson); Brady, p. 472, pl. 58, fig. 33
- 1923 *Lagena hexagona* (Williamson); Cushman, p. 24, pl. 4, fig. 6 [cop. Williamson, 1848, fig. 23]
- 1985 *Oolina hexagona* (Williamson); Hermelin and Scott, p. 214, pl. 2, fig. 10
- 1988 *Favulina hexagona* (Williamson); Loeblich and Tappan, p. 120, pl. 463, figs. 1, 2

**Remarks:** The wall is calcareous and translucent. The unilocular test is pear-shaped. The aperture is terminal and rounded on a short neck. The test surface is ornamented with polygonally arranged ridges.

Genus LAGNEA Popescu, 1983  
*Lagena* sp. 1  
Figure 19.5

**Remarks:** The wall is calcareous, hyaline and finely perforate. The test is unilocular, flask-shaped and compressed. The periphery is broadly carinate with plate-like struts, forming polygonal and tubular structures that extend completely around the periphery. The terminal aperture, at the end of a neck, is rounded and bordered by a thickened rim.

Genus OOLINA d'Orbigny, 1839  
*Oolina acuticosta* (Reuss, 1861)  
Figure 19.6

- 1861 *Lagena acuticosta* Reuss: p. 305, pl. 1, fig. 4
- 1863 *Lagena acuticosta* Reuss; Reuss, p. 331, pl. 5, fig. 63
- 1923 *Lagena acuticosta* Reuss; Cushman, p. 5, pl. 1, figs. 1-3
- 1931 *Lagena acuticosta* Reuss; Wiesner, p. 117, pl. 18, figs. 208-210
- 1940 *Lagena acuticosta* Reuss; Buchner, p. 429, pl. 4, figs. 68, 69
- 1933c *Lagena acuticosta* Reuss; Cushman, p. 34, pl. 8, figs. 9, 10, 12
- 1983 *Oolina acuticosta* (Reuss); Boltovskoy and Guissani de Kahn, p. 301, pl. 1, figs. 8, 9

1993 *Oolina acuticosta* (Reuss); Sgarrella and Moncharmont Zei, p. 199, pl. 12, fig. 12

2006 *Oolina acuticosta* (Reuss); Avsar et al., p. 133, pl. 1, fig. 17

**Remarks:** The wall is calcareous. The unilocular test is subglobular with the greatest breadth at the middle of the test or below. The terminal aperture is rounded. The test base ends in a slightly spinose projection of long costae, covering the test surface from the aperture to the base. Wiesner (1931) figured also a specimen with two subglobular and uniserially arranged chambers.

Subfamily ELLIPSOLAGENINAE Silvestri, 1923  
Genus FISSURINA Reuss, 1850  
*Fissurina castanea* (Flint, 1899)

1899 *Lagena castanea* Flint: p. 307, pl. 54, fig. 3

1923 *Lagena castanea* Flint; Cushman, p. 9, pl. 1, figs. 12, 13

1940 *Lagena castanea* Flint; Buchner, p. 496, pl. 18, figs. 369-373

1993 *Fissurina castanea* (Flint); Sgarrella and Moncharmont Zei, p. 201, pl. 13, fig. 10

**Remarks:** The wall is calcareous, hyaline and finely perforate. The test is subrounded outline and ovate in section. The peripheral margin is carinate. The aperture is terminal and slit-like. An apical appendix with a broad slit-like opening is present.

*Fissurina crebra* (Matthes, 1939)  
Figure 19.7

1939 *Lagena crebra* Matthes: p. 72, pl. 5, figs. 66-70

1983 *Fissurina crebra* (Matthes); Boltovskoy and Guissani de Kahn, p. 301, pl. 1, figs. 1, 2

**Remarks:** The wall is calcareous, hyaline and finely perforate. The test is ovate in outline and lenticular in section. The peripheral margin is carinate. The terminal aperture is slit-like and bordered by a slightly produced rim. The test surface is smooth.

*Fissurina fasciata* (Egger, 1857)  
Figure 19.8-9

1857 *Oolina fasciata* Egger: p. 8, pl. 1, figs. 12-15

1863 *Lagena fasciata* (Egger); Reuss, p. 323, pl. 2, fig. 24

1940 *Lagena fasciata* (Egger); Buchner, p. 479, pl. 15, figs. 262-265

1983 *Fissurina fasciata* (Egger); Boltovskoy and Guissani de Kahn, p. 301, pl. 2, figs. 6, 7

2005 *Fissurina lucida* (Williamson); Debenay et al., p. 336, pl. 3, fig. 10

**Remarks:** The wall is calcareous, hyaline and finely perforate. The test is ovate in outline. Two prominent keels are visible on the periphery. The aperture is terminal and slit-like.

*Fissurina lacunata* (Burrows and Holland,  
in Jones 1895)  
Figure 19.10-11

1884 *Lagena castrensis* (Schwager): Brady, p. 485, Pl. 60, figs. 1, 2

1895 *Lagena orbignyana* Seguenza var. *lacunata* Burrows and Holland: type reference Jones, 1895, p. 202, pl. 7, fig. 12a, b

1923 *Lagena lacunata* Burrows and Holland: Cushman, p. 28, pl. 4, figs. 12, 13

1933c *Lagena orbignyana* Seguenza var. *lacunata* Burrows and Holland; Cushman, p. 27, pl. 7, figs. 1-5, 8

1994 *Fissurina castanea* (Burrows and Holland); Jones, p. 69, pl. 60, figs. 1, 2 [cop. Brady, 1884, figs. 1, 2]

2005 *Fissurina orbignyana* Seguenza var. *lacunata* (Burrows and Holland); Rasmussen, p. 77, pl. 9, fig. 4

**Remarks:** The wall is calcareous and hyaline. The test is ovate in outline and subovate in section. On the periphery, three prominent keels are present, whereby the middle is more elevated. The aperture is terminal, slit-like and bordered by a lip. The test surface is ornamented with irregularly arranged pittings and perforations.

*Fissurina marginata* (Montagu, 1803)  
Figure 19.12

1803 *Vermiculum marginatum* Montagu: p. 524

1884 *Lagena marginata* Walker and Boys; Brady, p. 476, pl. 59, figs. 21, 22

1964 *Fissurina marginata* (Montagu); Parker, p. 265, pl. 98, fig. 11

1994 *Fissurina submarginata* Boomgaard; Jones, p. 68, pl. 59, figs. 21, 22 [cop. Brady, 1884, figs. 21, 22]

2003 *Fissurina marginata* (Montagu); Murray, p. 17, fig. 5, no. 3, 4

**Remarks:** The wall is calcareous, hyaline and finely perforate. The test is subrounded in outline and subovate in section. On the periphery, three prominent keels are visible, whereby the middle is

more elevated. The aperture is terminal and slit-like. The test surface is smooth.

*Fissurina orbignyana* Seguenza, 1862  
Figure 19.13

- 1862 *Fissurina orbignyana* Seguenza: p. 66, pl. 2, figs. 25, 26
- 1933c *Lagena orbignyana* (Seguenza); Cushman, p. 26, pl. 6, figs. 7, 8, 11
- 1939 *Lagena orbignyana* (Seguenza); Matthes, p. 80, pl. 6, fig. 104
- 1991 *Palliolatella orbignyana* (Seguenza); Cimerman and Langer, p. 56, pl. 59, figs. 5-7
- 2003 *Fissurina orbignyana* Seguenza; Murray, p. 17, fig. 5, no. 5, 6
- 2005 *Fissurina orbignyana* Seguenza; Rasmussen, p. 77, pl. 9, figs. 2, 3

**Remarks:** The wall is calcareous, hyaline and densely perforate. The test is subrounded in outline and subovate in section. On the periphery, three prominent keels are present, whereby the middle is more elevated. The aperture is terminal, slit-like and bordered by a lip.

Subfamily PARAFISSURININAE Jones, 1984  
Genus PARAFISSURINA Parr, 1947  
*Parafissurina lateralis* (Cushman) var. *carinata*  
(Buchner, 1940)  
Figure 19.14

- 1940 *Lagena lateralis* Cushman var. *carinata* Buchner: p. 521, pl. 23, figs. 497-500
- 1983 *Parafissurina lateralis carinata* (Buchner); Boltovskoy and Guissani de Kahn, p. 303, pl. 1, fig. 28
- 1993 *Parafissurina lateralis* (Cushman); Sgarrella and Moncharmont Zei, p. 205, pl. 13, fig. 11
- 2004 *Parafissurina carinata* (Buchner); Popescu and Crihan, p. 412, pl. 5, figs. 3, 4

**Remarks:** The wall is calcareous and hyaline. The test is subrounded in outline and subovate in section. The peripheral margin is weakly carinate. The aperture is subterminal and crescentic. The test surface is smooth.

Family CERATOBULIMINIDAE Cushman, 1927  
Subfamily CERATOBULIMININAE Cushman, 1927  
Genus LAMARCKINA Berthelin, 1881  
*Lamarckina scabra* (Brady, 1884)

- 1884 *Pulvinulina oblonga* (Williamson) var. *scabra* Brady: p. 689, pl. 106, fig. 8

- 1931 *Lamarckina scabra* (Brady); Cushman, p. 35, pl. 7, fig. 6 [cop. Brady, 1884, fig. 8]
- 1993 *Lamarckina scabra* (Brady); Sgarrella and Moncharmont Zei, p. 242, pl. 26, figs. 3, 4
- 1994 *Ceratocancris scaber* (Brady); Jones, p. 105, Pl. 60, fig. 8 [cop. Brady, 1884, fig. 8]
- 2005 *Lamarckina scabra* (Brady); Debenay et al., p. 336 pl. 3, figs. 24, 25

**Remarks:** The wall is aragonitic and finely perforate. The test is unequally biconvex. The spiral side is much flattened, and the umbilical side is distinctly convex. Chambers rapidly increasing in size as added. In the adult stage, the final chamber on the umbilical side covers the half of the test. The peripheral margin is carinate. Sutures are depressed. The aperture is interiomarginal-umbilical. The test surface is smooth.

Family EPISTOMINIDEA Wedekind, 1937  
Subfamily EPISTOMININIAE Wedekind, 1937  
Genus HOEGLUNDINA Brotzen, 1948  
*Hoeglundina elegans* (d'Orbigny, 1826)  
Figure 19.15-16

- 1826 *Rotalia elegans* d'Orbigny: p. 272, no. 6
- 1884 *Pulvinulina elegans* (d'Orbigny); Brady, p. 699, pl. 105, figs. 3-6
- 1931 *Epistomina elegans* (d'Orbigny); Cushman, p. 65, pl. 13, fig. 6
- 1979 *Hoeglundina elegans* (d'Orbigny); Corliss, p. 12, pl. 5, figs. 11-13
- 1985 *Hoeglundina elegans* (d'Orbigny); Hermelin and Scott, p. 210, pl. 6, figs. 6, 7
- 1991 *Hoeglundina elegans* (d'Orbigny); Cimerman and Langer, p. 56, pl. 59, figs. 10-12
- 1992 *Hoeglundina elegans* (d'Orbigny); Schiebel, p. 49, pl. 5, fig. 8
- 1993 *Hoeglundina elegans* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 242, pl. 26, figs. 7, 8
- 1994 *Hoeglundina elegans* (d'Orbigny); Jones, p. 104, pl. 105, figs. 3-6 [cop. Brady, 1884, figs. 3-6]
- 2005 *Hoeglundina elegans* (d'Orbigny); Rasmussen, p. 78, pl. 9, fig. 11
- 2008 *Hoeglundina elegans* (d'Orbigny); Abu-Zied et al., p. 51, pl. 1, figs. 23, 24

**Remarks:** The wall is aragonitic. The test is trochospirally enrolled and unequally biconvex, with a lesser convex spiral side and a higher convex

umbilical side. The test is subcircular in outline. Backward curved sutures are visible on the spiral side. The periphery is carinate and keeled. The primary aperture is slit-like and parallel to the peripheral keel. A second interiomarginal, extraumbilical aperture is present on the umbilical side. The test surface is smooth.

Family ROBERTINIDAE Reuss, 1850

Subfamily ALLIATININAE McGowran, 1966

Genus ROBERTINA d'Orbigny, 1846

*Robertina translucens* Cushman and Parker, 1936  
Figure 19.17-18

- 1936 *Robertina translucens* Cushman and Parker: p. 99, pl. 16, fig. 8a, b
- 1958 *Robertina translucens* Cushman and Parker; Parker, p. 263, pl. 2, fig. 34
- 1991 *Robertinoides translucens* (Cushman and Parker); Rasmussen, p. 364, fig. 7, no. 4
- 2004 *Robertina translucens* Cushman and Parker; Chendes et al., p. 76, pl. 1, fig. 17
- 2005 *Robertina translucens* Cushman and Parker; Rasmussen, p. 79, pl. 9, fig. 12

**Remarks:** The wall is aragonitic and translucent. The test is high trochospirally coiled. Chambers increasing in size as added and are broad and inflated. Sutures are oblique and depressed. The aperture consists of two elongate slits, one reaching from the base of the final chamber into the septal face, and the other is parallel with the partition of the final chamber. An additional opening is present at the junction of the inner partition on the spiral side. The test surface is smooth.

Suborder ROTALIINA Delage and Herouard, 1896

Family BOLIVINIDAE Glaessner, 1937

Genus BOLIVINA d'Orbigny, 1839

*Bolivina cistina* Cushman, 1936

Figure 19.19-20

- 1936 *Bolivina cistina* Cushman: p. 55, pl. 8, fig. 4
- 1990 *Bolivina cistina* (Cushman); Hasegawa et al., p. 476, pl. 3, figs. 1, 2

**Remarks:** The wall is calcareous, hyaline and perforate, more densely on the later chambers. The test is triangular in lateral view and compressed in peripheral view. Chambers are biserially arranged and are low and broad, rapidly increasing in size as added. The periphery is truncate. The aperture is loop-like, at the base of the apertural face, and provided with a toothplate. Pores are surrounded by small ridges in the apertural region. The test surface is ornamented with irregular ridges.

*Bolivina plicatella* Cushman, 1930b

Figure 19.21

- 1930b *Bolivina plicatella* Cushman: p. 46, pl. 18, fig. 10a, b
- 1931 *Bolivina plicatella* Cushman; Cushman and Parker, p. 15, pl. 3, fig. 19
- 1965 *Bolivina plicatella plicatella* Cushman; Souaya, p. 323, pl. 2, fig. 22
- 1990 *Bolivina plicatella* Cushman; Hasegawa et al., p. 476, pl. 3, figs. 3, 4
- 1993 *Bolivina plicatella plicatella* Cushman; Mehrnusch, p. 11, figs. 22-27

**Remarks:** The wall is calcareous, hyaline and densely perforate. The test is subtriangular-elongate in lateral view. Chambers are biserially arranged, low and broad, and increasing in size as added. The periphery is subrounded. Sutures are depressed. The aperture is loop-like, at the base of the apertural face, and provided with a toothplate. The test surface is ornamented with sinuate ridges, covering the entire test and small irregular ridges in the apertural region.

*Bolivina pseudoplicata* Heron-Allen and Earland, 1930a

Figure 19.22-23

- 1930a *Bolivina pseudoplicata* Heron-Allen and Earland: pp. 81-82, pl. 3, figs. 36-40
- 1958 *Bolivina pseudoplicata* Heron-Allen and Earland; Parker, p. 261, pl. 2, fig. 8
- 1960 *Bolivina pseudoplicata* Heron-Allen and Earland; Hofker, p. 251, pl. D, fig. 108
- 1990 *Bolivina pseudoplicata* Heron-Allen and Earland; Hasegawa et al., p. 476, pl. 3, figs. 5, 6
- 1991 *Bolivina pseudoplicata* Heron-Allen and Earland; Cimerman and Langer, p. 58, pl. 61, figs. 1, 2
- 1991 *Bolivina pseudoplicata* Heron-Allen and Earland; Rasmussen, p. 363, fig. 6, no. 11
- 1993 *Bolivina pseudoplicata* Heron-Allen and Earland; Sgarrella and Moncharmont Zei, p. 208, pl. 14, figs. 9, 10
- 2003 *Bolivina pseudoplicata* Heron-Allen and Earland; Murray, p. 19, fig. 5, no. 17
- 2005 *Bolivina pseudoplicata* Heron-Allen and Earland; Rasmussen, p. 80, pl. 9, figs. 16, 17

**Remarks:** The wall is calcareous, hyaline and perforate. The test is triangular-elongate in lateral view



and wedge-shaped in peripheral view. Chambers are biserially arranged, low and broad, and increasing in size as added. Sutures are depressed. The periphery is subrounded. The aperture is loop-like, at the base of the apertural face, and provided with a toothplate. The test surface is ornamented with polygonal ribs and sinuate ridges, covering the entire test and small irregular ridges are present in the apertural region.

*Bolivina subspinescens* Cushman, 1922a  
Figure 19.24

- 1922a *Bolivina subspinescens* Cushman: p. 48, pl. 7, fig. 5
- 1985 *Bolivina subspinescens* Cushman; Hermelin and Scott, p. 204, pl. 3, fig. 2
- 1990 *Bolivina subspinescens* Cushman; Hasegawa et al., p. 476, pl. 3, fig. 10
- 1992 *Bolivina subspinescens* Cushman; Schiebel, p. 34, pl. 1, fig. 5
- 1993 *Bolivina subspinescens* Cushman; Sgarrella and Moncharmont Zei, p. 210, pl. 14, figs. 12, 13
- 2005 *Bolivina subspinescens* Cushman; Debenay et al., p. 336 pl. 3, fig. 9
- 2005 *Sagrina subspinescens* (Cushman); Rasmussen, p. 85, pl. 11, fig. 2
- 2008 *Bolivina subspinescens* Cushman; Leiter, p. 24, pl. 3, fig. 4

**Remarks:** The wall is calcareous, hyaline and perforate at the base of the later chambers. The test is elongate in lateral view. Chambers are biserially arranged, increasing in size as added, and are low and inflated. Chambers are slightly coiled along the vertical axis. The periphery is subrounded. Sutures are depressed. The aperture is ovate and bordered by a lip. Some fine pseudospines may be present at the base of the later chambers.

*Bolivina variabilis* (Williamson, 1858)  
Figure 19.25-26

- 1858 *Textularia variabilis* Williamson: p. 76, pl. 6, figs. 162, 163
- 1965 *Bolivina variabilis* (Williamson); Phleger, p. 51, pl. 1, fig. 8
- 1991 *Bolivina variabilis* (Williamson); Cimerman and Langer, p. 59, pl. 61, figs. 7, 8
- 1992 *Bolivina variabilis* (Williamson); Schiebel, p. 32, pl. 1, fig. 6a

- 1993 *Bolivina variabilis* (Williamson); Hottinger, Halicz and Reiss, p. 91, pl. 110, figs. 1-4; pl. 111, figs. 1, 2
- 2005 *Bolivina variabilis* (Williamson); Debenay et al., p. 336 pl. 3, fig. 4

**Remarks:** The wall is calcareous, hyaline and densely perforate. The test is triangular to elongate in lateral view. Chambers are biserially arranged, low and broad, increasing in size as added. The periphery is rounded. Sutures are depressed. The aperture is a loop-like opening and provided with a toothplate. Pores are surrounded by small polygonally ridges.

*Bolivina* sp. 1  
Figure 19.27

**Remarks:** The wall is calcareous, hyaline and less densely perforate. The test is triangular in lateral view. Chambers are biserially arranged, broad and low, increasing in size as added. The periphery is subrounded. The aperture is a narrow loop at the base of the apertural face. The test surface is ornamented with flat irregular ribs and ridges.

Genus BRIZALINA Costa, 1856  
*Brizalina difformis* (Williamson, 1858)  
Figure 19.28-29

- 1858 *Textularia variabilis* var. *difformis* Williamson: p. 77, pl. 6, figs. 166, 167
- 1958 *Bolivina difformis* (Williamson); Parker, p. 260, pl. 2, fig. 9
- 1991 *Brizalina difformis* (Williamson); Cimerman and Langer, p. 59, pl. 61, figs. 9-11
- 2003 *Brizalina difformis* (Williamson); Murray, p. 19, fig. 6, no. 2
- 2009 *Brizalina difformis* (Williamson); Milker et al., p. 216, pl. 2, fig. 11

**Remarks:** The wall is calcareous, hyaline and less densely perforate. The test is triangular in lateral view and compressed in peripheral view. Chambers are biserially arranged and have short marginal spines. The periphery is subacute. The aperture is an elongate loop-like opening, partly bordered by a lip and provided with a toothplate. The test surface is irregularly pseudo-ornamented.

*Brizalina dilatata* (Reuss, 1850)  
Figure 19.30

- 1850 *Bolivina dilatata* Reuss: p. 17, pl. 3, fig. 15
- 1911 *Bolivina dilatata* Reuss; Cushman, p. 33, text-fig. 54

- 1991 *Brizalina dilatata* (Reuss); Cimerman and Langer, p. 59, pl. 62, fig. 2
- 1992 *Bolivina dilatata* Reuss; Schiebel, p. 31, pl. 1, fig. 4a
- 2002 *Brizalina dilatata* (Reuss); Kaminski et al., p. 173, pl. 2, fig. 13
- 2004 *Bolivina dilatata* Reuss; Mendes et al., p. 180, pl. 2, fig. 1
- 2008 *Bolivina dilatata* Reuss; Leiter, p. 22, pl. 3, fig. 6

**Remarks:** The wall is calcareous, hyaline and densely perforate. The test is subtriangular in lateral view and compressed in peripheral view. Chambers are biserially arranged. Sutures are slightly depressed and oblique. The periphery is subacute. The aperture is an elongate loop-like opening, partly bordered by a lip and provided with a toothplate. The test surface is smooth.

*Brizalina spathulata* (Williamson, 1858)  
Figure 20.1-2

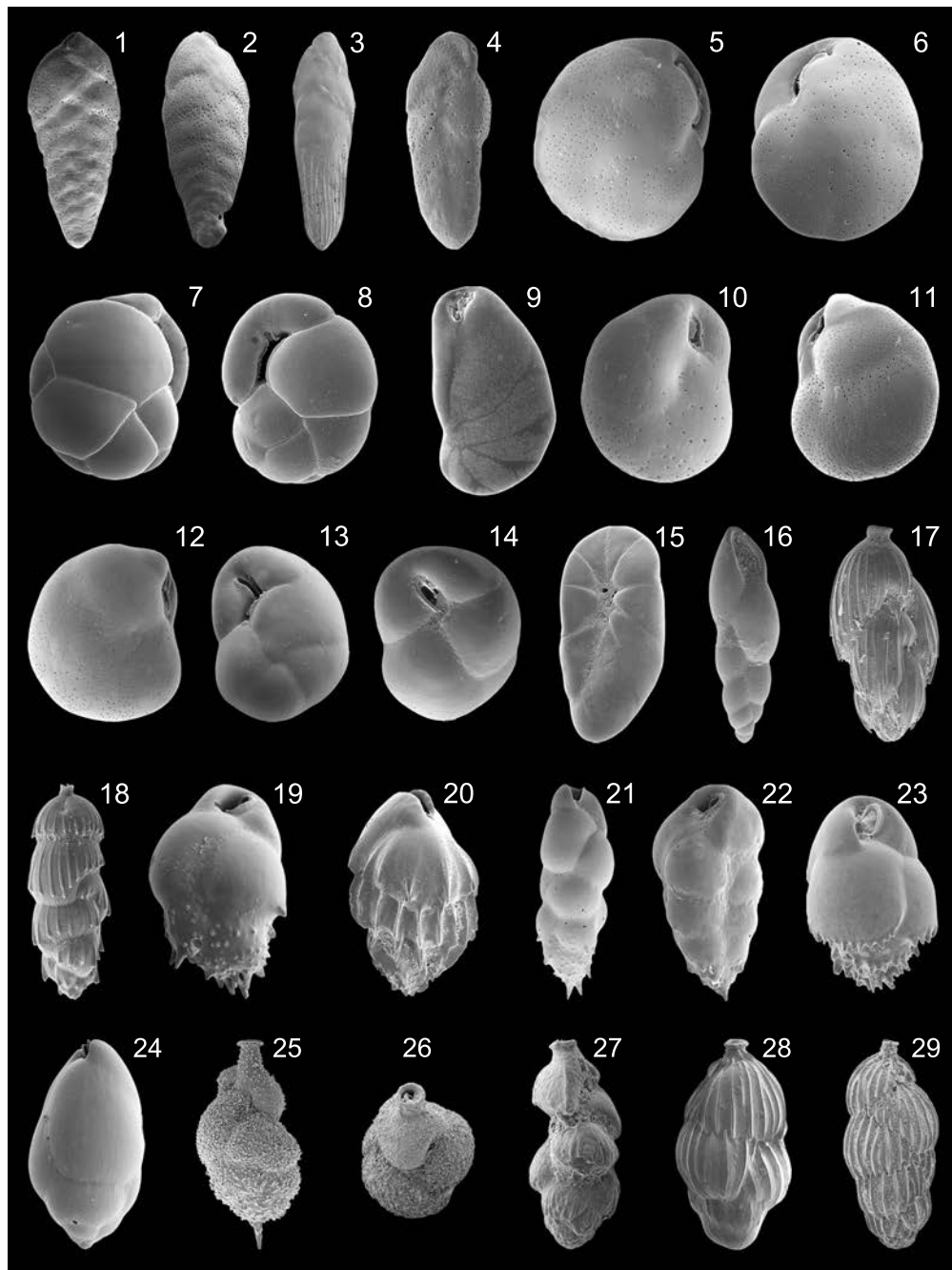
- 1858 *Textularia variabilis* var. *spathulata* Williamson: p. 76, pl. 6, figs. 164, 165
- 1884 *Bolivina dilatata* Reuss; Brady, p. 418, pl. 52, figs. 20, 21
- 1987 *Bolivina spathulata* (Williamson); Jorissen, p. 34, pl. 1, fig. 5
- 1991 *Brizalina spathulata* (Williamson); Cimerman and Langer, p. 60, pl. 62, figs. 3-5
- 1993 *Bolivina spathulata* (Williamson); Sgarrella and Moncharmont Zei, p. 210, pl. 14, fig. 3
- 1994 *Brizalina spathulata* (Williamson); Jones, p. 57, pl. 52, figs. 20, 21 [cop. Brady, 1884, figs. 20, 21]
- 2003 *Brizalina spathulata* (Williamson); Murray, p. 19, fig. 6, no. 3
- 2004 *Brizalina spathulata* (Williamson); Chen-des et al., p. 76, pl. 2, fig. 3
- 2004 *Brizalina spathulata* (Williamson); Mendes et al., p. 180, pl. 2, fig. 7
- 2005 *Brizalina spathulata* (Williamson); Rasmussen, p. 81, pl. 9, fig. 23
- 2006 *Brizalina spathulata* (Williamson); Avsar et al., p. 133, pl. 1, fig. 19
- 2008 *Brizalina spathulata* (Williamson); Abu-Zied et al., p. 51, pl. 1, fig. 29
- 2009 *Brizalina spathulata* (Williamson); Milker et al., p. 216, pl. 2, fig. 13

**Remarks:** The wall is calcareous and hyaline with dense perforation on the outer chamber margins on the outer chamber margins and near the sutures. The test is elongate-lanceolate in lateral view and compressed in peripheral view. Chambers are biserially arranged, increasing in size as added. The periphery is acute. Sutures are depressed and oblique. The aperture is an elongate loop-like opening, partly bordered by a lip and provided with a toothplate.

*Brizalina striatula* (Cushman, 1922c)  
Figure 20.3

- 1922c *Bolivina striatula* Cushman: p. 27, pl. 3, fig. 10
- 1960 *Bolivina striatula* Cushman; Hofker, p. 251, pl. D, fig. 106
- 1965 *Bolivina striatula* Cushman; Phleger, p. 51, pl. 1, fig. 4
- 1991 *Brizalina striatula* (Cushman); Cimerman and Langer, p. 60, pl. 62, figs. 6-9
- 1992 *Bolivina striatula* Cushman; Schiebel, p. 32, pl. 1, fig. 9
- 1993 *Brizalina striatula* (Cushman); Hottinger, Halicz and Reiss, p. 92, pl. 112, figs. 3-8
- 1993 *Bolivina striatula* Cushman; Sgarrella and Moncharmont Zei, p. 210, pl. 14, fig. 16
- 2002 *Brizalina striatula* (Cushman); Kaminski et al., p. 172, pl. 2, fig. 10
- 2004 *Bolivina striatula* Cushman; Fiorini, p. 50, pl. 1, fig. 12
- 2005 *Bolivina striatula* Cushman; Debenay et al., p. 336 pl. 3, fig. 3
- 2005 *Brizalina striatula* (Cushman); Rasmussen, p. 82, pl. 9, fig. 24
- 2008 *Brizalina striatula* (Cushman); Abu-Zied et al., p. 51, pl. 1, fig. 30
- 2009 *Brizalina striatula* (Cushman); Milker et al. p. 216, pl. 2, fig. 12

**Remarks:** The wall is calcareous, hyaline and densely perforate. The test is very elongate and lanceolate in lateral view and compressed in peripheral view. Chambers are biserially arranged, increasing in size as added. The periphery is acute. Sutures are depressed and oblique. The aperture is an elongate loop-like opening, partly bordered by a lip and provided with a toothplate. The test surface is ornamented with longitudinal costae at the basal and middle part of the test.



**FIGURE 20.** 1 *Brizalina spathulata* (Williamson), 599x, lateral view; 2 *B. spathulata* (Williamson), 572x, lateral view; 3 *Brizalina striatula* (Cushman), 429x, lateral view; 4 *Brizalina* sp. 1, 695x, lateral view; 5 *Cassidulina carinata* Silvestri, 655x, apertural side; 6 *C. laevigata* s.s. d'Orbigny, 1050x, apertural side; 7 *Cassidulina obtusa* Williamson, 829x, apertural side; 8 *C. obtusa* Williamson, 930x, apertural side; 9 *Cassidulinoidea bradyi* (Norman), 864x, lateral view; 10 *Globocassidulina oblonga* (Reuss), 1220x, apertural side; 11 *G. oblonga* (Reuss), 650x, apertural side; 12 *G. oblonga* (Reuss), 771x, apertural side; 13 *Globocassidulina subglobosa* (Brady), 1010x, apertural side; 14 *G. subglobosa* (Brady), 1150x, apertural side; 15 *Floresina* sp. 1, 770x, apertural side; 16 *Stainforthia complanata* (Egger), 735x, lateral view; 17 *Rectuvigerina bononiensis* (Fornasini), 854x, lateral view; 18 *Rectuvigerina phlegeri* Le Calvez, 686x, lateral view; 19 *Bulimina aculeata* d'Orbigny, 427x, lateral view; 20 *Bulimina costata* d'Orbigny, 771x, lateral view; 21 *Bulimina elongata* d'Orbigny, 407x, lateral view; 22 *Bulimina gibba* Fornasini, 509x, lateral view; 23 *Bulimina marginata* d'Orbigny, 766x, lateral view; 24 *Globobulimina affinis* (d'Orbigny), 355x, lateral view; 25 *Neouvigerina ampullacea* (Brady), 644x, lateral view; 26 *N. ampullacea* (Brady), 642x, apertural view; 27 *Siphouvigerina?* sp. 1, 576x, lateral view; 28 *Uvigerina mediterranea* Hofker, 321x, lateral view; 29 *Uvigerina peregrina* Cushman, 385x, lateral view.

*Brizalina* sp. 1  
Figure 20.4

**Remarks:** The wall is calcareous and hyaline, with a densely and coarsely perforation of the later chambers. The test is lanceolate and elongate in lateral view and compressed in peripheral view. The chambers are biserially arranged and broad, increasing in size as added. The final chamber has an irregular form. The aperture is an elongate loop-like opening, provided with an internal toothplate.

Family CASSIDULINIDAE d'Orbigny, 1839  
Subfamily CASSIDULININAE d'Orbigny, 1839  
*Cassidulinid* sp. 1

**Remarks:** The wall is calcareous and finely perforate. The test is circular and flattened. Early chambers are biserially enrolled and later chambers are uniserially enrolled. Chambers increasing in size as added. The aperture, at the base of the final chamber, is rounded. The test surface is smooth.

Genus CASSIDULINA d'Orbigny, 1826  
*Cassidulina laevigata* s.l. d'Orbigny, 1826  
Figure 20.5-6

- 1826 *Cassidulina laevigata* d'Orbigny: p. 282, pl. 15, figs. 4, 5
- 1896 *Cassidulina laevigata* d'Orbigny var. *carinata* Silvestri: p. 104, pl. 2, fig. 10a-c (fide Ellis and Messina 1940ff)
- 1911 *Cassidulina laevigata* d'Orbigny; Cushman, p. 96, text; fig. 150
- 1960 *Cassidulina laevigata* d'Orbigny; Hofker, p. 250, pl. D, fig. 103
- 1965 *Cassidulina carinata* Silvestri; Todd, p. 40, pl. 17, fig. 4
- 1988 *Cassidulina laevigata* d'Orbigny; Loeblich and Tappan, pp. 144-145, pl. 555, figs. 1, 5
- 1990 *Cassidulina carinata* Silvestri; Hasegawa et al., p. 477, pl. 4, figs. 1, 2
- 1991 *Cassidulina laevigata* d'Orbigny; Cimerman and Langer, p. 61, pl. 63, figs. 1, 3
- 1991 *Cassidulina carinata* Silvestri; Rasmussen, p. 364, fig. 7, no. 1
- 1992 *Cassidulina laevigata* d'Orbigny; Schiebel, p. 39, pl. 2, fig. 11
- 1993 *Cassidulina carinata* Silvestri; Sgarrella and Moncharmont Zei, p. 236, pl. 23, figs. 8, 9
- 2004 *Cassidulina carinata* Silvestri; Chendes et al., p. 76, pl. 2, fig. 4
- 2004 *Cassidulina laevigata* d'Orbigny; Mendes et al., p. 180, pl. 2, fig. 11
- 2005 *Cassidulina carinata* Silvestri; Rasmussen, p. 82, pl. 10, fig. 1
- 2006 *Cassidulina carinata* Silvestri; Avsar et al., p. 133, pl. 1, fig. 20
- 2008 *Cassidulina carinata* Silvestri; Abu-Zied et al., p. 52, pl. 2, figs. 1, 2
- 2009 *Cassidulina carinata* Silvestri; Frezza and Carboni, p. 57, pl. 2, fig. 12
- 2009 *Cassidulina laevigata* d'Orbigny; Milker et al., p. 216, pl. 2, fig. 15

**Remarks:** The wall is calcareous, densely and finely perforate. The test is lenticular in lateral view and flattened with a carinate periphery. Chambers are biserially arranged and planispirally enrolled. Sutures are depressed on one side and flush with the surface on the other side. The aperture is an elongate and narrow slit, provided with a toothplate. The test has a smooth surface. The species *Cassidulina laevigata* d'Orbigny and *Cassidulina carinata* Silvestri have been summarized to *Cassidulina laevigata* s.l.. *Cassidulina carinata* is characterized by having an acute and carinate periphery and a thin keel.

*Cassidulina obtusa* Williamson, 1858  
Figure 20.7-8

- 1858 *Cassidulina obtusa* Williamson: p. 69, pl. 6, figs. 143, 144
- 1884 *Cassidulina crassa* d'Orbigny, Brady, p. 429, pl. 54, figs. 4, 5
- 1911 *Cassidulina crassa* d'Orbigny; Cushman, p. 97, text-fig. 151
- 1945 *Cassidulina crassa* d'Orbigny; Cushman, p. 288, figs. 18, 19
- 1958 *Cassidulina crassa* d'Orbigny; Parker, p. 271, pl. 4, fig. 12
- 1987 *Cassidulina crassa* d'Orbigny; Jorissen, p. 41, pl. 1, fig. 3
- 1991 *Cassidulina crassa* d'Orbigny; Rasmussen, p. 364, fig. 7, no. 2
- 1994 *Cassidulina crassa* d'Orbigny; Jones, p. 60, pl. 54, figs. 4, 5 [cop. Brady 1884, figs. 4, 5]
- 2003 *Cassidulina obtusa* Williamson; Murray, p. 21, fig. 6, no. 11, 12
- 2005 *Cassidulina obtusa* Williamson; Rasmussen, p. 82, pl. 10, figs. 2-4

2008 *Cassidulina crassa* d'Orbigny; Abu-Zied et al., p. 52, pl. 2, figs. 3, 4

2009 *Cassidulina crassa* d'Orbigny; Milker et al., p. 216, pl. 2, fig. 17

**Remarks:** The wall is calcareous, finely and densely perforate. The test is ovate with a broadly rounded periphery. Chambers are biserially arranged, planispirally enrolled and inflated. Sutures are depressed. The aperture is a long and narrow slit, parallel to the periphery and provided with a long, slender tooth. A second small perpendicular slit extending between the aperture and the peripheral margin. The test has a smooth surface.

Genus CASSIDULINOIDES Cushman, 1927  
*Cassidulinoides bradyi* (Norman, in Brady 1881)  
Figure 20.9

1881 *Cassidulina bradyi* Norman: type reference Brady, 1881, p. 59

1884 *Cassidulina bradyi* Norman; Brady, p. 431, pl. 54, figs. 6-9

1993 *Cassidulinoides bradyi* (Norman); Sgarrella and Moncharmont Zei, p. 211, pl. 14, fig. 15

1994 *Cassidulinoides bradyi* (Norman); Jones, p. 60, pl. 54, figs. 6-9 [cop. Brady, 1884, figs. 6-9]

2005 *Cassidulinoides bradyi* (Norman); Rasmussen, p. 83, pl. 10, fig. 8

2008 *Cassidulinoides bradyi* (Norman); Abu-Zied et al., p. 52, pl. 2, figs. 5, 6

2009 *Cassidulinoides bradyi* (Norman); Milker et al., p. 216, pl. 2, fig. 18

**Remarks:** The wall is calcareous, densely and finely perforate. The test is elongate with a rounded periphery. Earlier chambers are biserially arranged and planispirally enrolled, later chambers are uncoiled. Sutures are slightly depressed. The terminal aperture is ovate and provided with a toothplate.

Genus GLOBOCASSIDULINA Voloshinova, 1960  
*Globocassidulina oblonga* (Reuss, 1850)  
Figure 20.10-12

1850 *Cassidulina oblonga* Reuss: p. 12, pl. 3, figs. 5, 6

1987 *Globocassidulina oblonga* (Reuss); Alberola et al., p. 308, pl. 4, fig. 12

1987 *Cassidulina oblonga* Reuss; Jorissen, p. 41, pl. 3, fig. 11

1988 *Globocassidulina oblonga* (Reuss); Loeblich and Tappan, p. 145, pl. 557, figs. 1-4

1990 *Globocassidulina subglobosa* (Brady); Hasegawa et al., p. 477, pl. 4, figs. 5, 6

2005 *Globocassidulina oblonga* (Reuss); Rasmussen, p. 83, pl. 10, figs. 9, 10

2006 *Globocassidulina subglobosa* (Brady); Avsar et al., p. 133, pl. 2, figs. 1, 2

2009 *Globocassidulina subglobosa* (Brady); Frezza and Carboni, p. 57, pl. 2, fig. 13

2009 *Cassidulina oblonga* Reuss; Milker et al., p. 216, pl. 2, fig. 14

**Remarks:** The wall is calcareous and densely perforate. The test is globular and ovate, with a broadly rounded periphery. Chambers are biserially arranged and planispirally enrolled. Sutures are oblique and flush with the surface. The aperture is elongate, partly bordered by a lip and provided with a toothplate. The test surface is a smooth.

*Globocassidulina subglobosa* (Brady, 1881)  
Figure 20.13-14

1881 *Cassidulina subglobosa* Brady: p. 60

1884 *Cassidulina subglobosa* Brady; Brady, p. 430, pl. 54, fig. 17

1911 *Cassidulina subglobosa* Brady; Cushman, p. 98, text-fig. 152

1958 *Globocassidulina subglobosa* (Brady); Parker, p. 272, pl. 4, fig. 13

1979 *Globocassidulina subglobosa* (Brady); Corliss, p. 8, pl. 3, figs. 12, 13

1988 *Globocassidulina subglobosa* (Brady); Loeblich and Tappan, p. 145, pl. 557, figs. 18-23 [figs. 21-23: cop. Brady, 1884, fig. 17]

1990 *Globocassidulina oblonga* (Reuss); Hasegawa et al., p. 477, pl. 4, figs. 3, 4

1991 *Globocassidulina subglobosa* (Brady); Cimerman and Langer, p. 61, pl. 63, figs. 4-6

1991 *Globocassidulina subglobosa* (Brady); Rasmussen, p. 364, fig. 7, no. 3

1992 *Globocassidulina subglobosa* (Brady); Schiebel, p. 47, pl. 2, fig. 14

1993 *Globocassidulina subglobosa* (Brady); Sgarrella and Moncharmont Zei, p. 236, pl. 24, figs. 1, 2

- 1994 *Globocassidulina subglobosa* (Brady); Jones, p. 60, pl. 54, fig. 17 [cop. Brady, 1884, fig. 17]
- 2003 *Globocassidulina subglobosa* (Brady); Murray, p. 24, fig. 8, no. 7
- 2005 *Globocassidulina subglobosa* (Brady); Rasmussen, p. 84, pl. 10, fig. 11
- 2009 *Globocassidulina subglobosa* (Brady); Milker et al., p. 216, pl. 2, fig. 16

**Remarks:** The wall is calcareous, and densely and finely perforate. The test is globular and ovate with a rounded periphery. Chambers are biserially arranged and planispirally enrolled. Sutures are oblique and depressed. The aperture is subelliptical, bordered by a lip and provided with a toothplate. The test surface is smooth.

Family TURRILINIDAE Cushman, 1927

Genus FLORESINA Revets, 1990

*Floresina* sp. 1

Figure 20.15

- 1991 *Floresina* sp. 1; Cimerman and Langer, p. 61, pl. 65, figs. 4-6
- 1993 *Floresina* sp. A; Hottinger, Halicz and Reiss, p. 95, pl. 117, figs. 8-11

**Remarks:** The wall is calcareous, densely and finely perforate. The test is elongate, with trochospirally arranged chambers. Sutures are oblique and flush with the test surface. The aperture is a rounded opening in the center of the apertural face and provided with a small toothplate. Radial grooves extending from the center of the apertural face to the periphery. The test surface is smooth.

Family STAINFORTHIIDAE Reiss, 1963

Genus STAINFORTHIA Hofker, 1956

*Stainforthia complanata* (Egger, 1893)

Figure 20.16

- 1893 *Virgulina schreibersiana* Czjzek var. *complanata* Egger: pp. 292-293, pl. 8, figs. 91, 92
- 1951 *Virgulina complanata* Egger; Phleger and Parker, p. 19, pl. 9, figs. 1-3
- 1958 *Virgulina complanata* Egger; Parker, p. 272, pl. 4, fig. 20
- 1993 *Stainforthia complanata* (Egger); Sgarrella and Moncharmont Zei, p. 214, pl. 15, fig. 4
- 2005 *Stainforthia complanata* (Egger); Rasmussen, p. 84, pl. 10, figs. 16, 17

**Remarks:** The wall is calcareous, hyaline and finely and densely perforate. The test is very elongate.

Chambers are inflated and ovate, increasing in size as added. Earlier chambers are triserially arranged. Later chambers are biserially arranged with more loosely biserial arranged final chambers, leading to slightly twisted chambers along a vertical axis. Sutures are oblique and depressed. The aperture is a terminal and ovate opening, partly bordered by a lip and provided with a toothplate. The test surface is smooth.

Family SIPHOGENERINOIDIDAE Saidova, 1981

Subfamily TUBULOGENERININAE Saidova, 1981

Genus RECTUVIGERINA Mathews, 1945

*Rectuvigerina bononiensis* (Fornasini, 1888)

Figure 20.17

- 1888 *Uvigerina bononiensis* Fornasini: p. 48, pl. 3, fig. 12
- 1898 *Uvigerina bononiensis* Fornasini; Fornasini, p. 27-28, pl. 1, figs. 1-8
- 1953 *Uvigerina bononiensis bononiensis* Fornasini; Papp, p. 305, pl. 1, figs. 17-20
- 1992 *Rectuvigerina bononiensis* (Fornasini); Schiebel, p. 54, pl. 3, fig. 8
- 2005 *Uvigerina bononiensis* Fornasini; Rasmussen, p. 88, pl. 11, figs. 10, 11
- 2008 *Uvigerina bononiensis* Fornasini; Leiter, p. 55, pl. 4, fig. 10
- 2009 *Rectuvigerina bononiensis* (Fornasini);

Milker et al., p. 216, pl. 2, fig. 20

**Remarks:** The wall is calcareous and finely and densely perforate. The test is elongate in lateral view and rounded in apertural view. Early chambers are triserially arranged and later chambers are biserially arranged. Chambers are inflated. Sutures are oblique and depressed. The aperture is terminal and rounded, on a short neck, bordered by a lip and provided with an internal toothplate. Chambers are ornamented with longitudinal costae.

*Rectuvigerina phlegeri* Le Calvez, in Berthois and Le Calvez 1959

Figure 20.18

- 1959 *Rectuvigerina phlegeri* Le Calvez: type reference Berthois and Le Calvez, 1959, p. 363, pl. 1, fig. 11
- 1992 *Rectuvigerina phlegeri* Le Calvez; Schiebel, p. 55, pl. 3, fig. 10

- 1993 *Rectuvigerina phlegeri* Le Calvez; Sgarrella and Moncharmont Zei, p. 215, pl. 16, figs. 3, 4
- 2004 *Rectuvigerina phlegeri* Le Calvez; Chendes et al. p. 76, pl. 2, fig. 5
- 2006 *Rectuvigerina phlegeri* Le Calvez; Avsar et al., p. 133, pl. 2, fig. 3
- 2008 *Rectuvigerina phlegeri* Le Calvez; Abu-Zied et al., p. 52, pl. 2, fig. 15
- 2009 *Rectuvigerina phlegeri* Le Calvez; Frezza and Carboni, p. 55, pl. 1, fig. 6
- 2009 *Rectuvigerina phlegeri* Le Calvez; Milker et al., p. 216, pl. 2, fig. 19
- 1994 *Bulimina aculeata* d'Orbigny; Jones, p. 56, pl. 51, figs. 7-9 [cop. Brady, 1884, figs. 7-9]
- 2002 *Bulimina aculeata* d'Orbigny; Kaminski et al., p. 174, pl. 3, fig. 3
- 2004 *Bulimina aculeata* d'Orbigny; Chendes et al., p. 76, pl. 2, fig. 8
- 2004 *Bulimina aculeata* d'Orbigny; Mendes et al., p. 180, pl. 2, fig. 8
- 2008 *Bulimina aculeata* d'Orbigny; Abu-Zied et al., p. 52, pl. 2, fig. 7
- 2008 *Bulimina aculeata* d'Orbigny; Leiter, p. 24, pl. 3, fig. 11
- 2009 *Bulimina aculeata* d'Orbigny; Milker et al., p. 216, pl. 2, fig. 21

**Remarks:** The wall is calcareous and finely and densely perforate. The test is elongate in lateral view and rounded in apertural view. Early chambers are triserially, than biserially, and later chambers are uniserially arranged. Sutures are oblique in the early stage, horizontal in the later stage, and depressed. The aperture is terminal and rounded on a short neck, bordered by a lip and provided with an internal toothplate. Chambers are ornamented with longitudinal costae.

Family BULIMINIDAE Jones, in Griffith and Henfrey 1875

Genus BULIMINA d'Orbigny, 1826

*Bulimina aculeata* d'Orbigny, 1826

Figure 20.19

- 1826 *Bulimina aculeata* d'Orbigny: p. 269, no. 7
- 1884 *Bulimina aculeata* d'Orbigny; Brady, p. 406, pl. 51, figs. 7-9
- 1911 *Bulimina aculeata* d'Orbigny; Cushman, p. 86, text-fig. 139
- 1958 *Bulimina aculeata* d'Orbigny; Parker, p. 261, pl. 2, figs. 17, 18
- 1985 *Bulimina aculeata* d'Orbigny; Hermelin and Scott, p. 204, pl. 3, fig. 7
- 1987 *Bulimina marginata* forma *aculeata* d'Orbigny; Jorissen, p. 43, pl. 4, fig. 5
- 1990 *Bulimina aculeata* d'Orbigny; Hasegawa et al., p. 476, pl. 3, figs. 14, 15
- 1991 *Bulimina aculeata* d'Orbigny; Cimerman and Langer, p. 61, pl. 63, figs. 10, 11
- 1992 *Bulimina aculeata* d'Orbigny; Schiebel, p. 35, pl. 2, fig. 1
- 1993 *Bulimina aculeata* d'Orbigny; Sgarrella and Moncharmont Zei, p. 211, pl. 15, fig. 1
- Bulimina costata* d'Orbigny, 1852  
Figure 20.20
- 1852 *Bulimina costata* d'Orbigny: p. 194
- 1958 *Bulimina costata* d'Orbigny; Parker, p. 261, pl. 2, figs. 19, 20
- 1987 *Bulimina costata* d'Orbigny; Jorissen, p. 34, pl. 1, fig. 9
- 1991 *Bulimina* cf. *alazaensis* Cushman; Cimerman and Langer, p. 62, pl. 64, figs. 1, 2
- 1991 *Bulimina costata* d'Orbigny; Rasmussen, p. 363, fig. 6, no. 5
- 1993 *Bulimina costata* d'Orbigny; Sgarrella and Moncharmont Zei, p. 211, pl. 15, fig. 3
- 2002 *Bulimina costata* d'Orbigny; Kaminski et al., p. 174, pl. 3, figs. 5, 6
- 2004 *Bulimina costata* d'Orbigny; Chendes et al., p. 76, pl. 2, fig. 6
- 2005 *Bulimina costata* d'Orbigny; Rasmussen, p. 85, pl. 11, fig. 3
- 2008 *Bulimina costata* d'Orbigny; Abu-Zied et al., p. 52, pl. 2, figs. 8, 9

**Remarks:** The wall is calcareous and densely perforate. The test is ovate in lateral view. Early chambers are triserially arranged and later chambers tend to be uniserially arranged. Sutures are oblique and depressed. The aperture is loop-shaped on the face of the final chamber, bordered by an everted rim and provided with a toothplate. The test surface is ornamented with longitudinal ridges, resulting in short spines at the base of the test. The test surface is smooth.

*Bulimina elongata* d'Orbigny, 1846  
Figure 20.21

- 1846 *Bulimina elongata* d'Orbigny: p. 187, pl. 11, figs. 19, 20
- 1884 *Bulimina elegans* d'Orbigny; Brady, p. 398, pl. 50, figs. 3, 4
- 1884 *Bulimina elongata* d'Orbigny; Brady, p. 401, pl. 51, figs. 1, 2
- 1901 *Bulimina elongata* d'Orbigny; Fornasini, p. 376, figs. 10, 20
- 1911 *Bulimina elongata* d'Orbigny; Cushman, p. 79, text-fig. 131
- 1991 *Bulimina elongata* d'Orbigny; Cimerman and Langer, p. 62, pl. 64, figs. 3-8
- 1993 *Bulimina elongata* d'Orbigny; Hottinger, Halicz and Reiss, p. 99, pl. 124, figs. 3-6
- 1993 *Bulimina elongata* d'Orbigny; Sgarrella and Moncharmont Zei, p. 211, pl. 15, figs. 10, 11
- 1994 *Bulimina elongata* d'Orbigny; Jones, p. 55, pl. 50, figs. 3, 4; pl. 51, figs. 1, 2 [cop. Brady, 1884, figs. 3, 4 and 1, 2]
- 2002 *Bulimina elongata* d'Orbigny; Kaminski et al., p. 175, pl. 3, fig. 4
- 2004 *Bulimina elongata* d'Orbigny; Chendes et al., p. 76, pl. 2, fig. 7
- 2009 *Bulimina elongata* d'Orbigny; Milker et al., p. 216, pl. 2, fig. 22

**Remarks:** The wall is calcareous and finely perforate. The test is elongate in lateral view. Chambers are triserially arranged and inflated. Later chambers are more loosely coiled. Sutures are depressed and oblique. The aperture is loop-shaped on the face of the final chamber, bordered by an everted rim, and provided with a toothplate. The test surface is smooth. Specimens often have short basal pseudospines, but differ from *Bulimina aculeata* by their more elongate test.

*Bulimina gibba* Fornasini, 1901  
Figure 20.22

- 1884 *Bulimina elegans* d'Orbigny; Brady, p. 398, pl. 50, figs. 1, 2
- 1901 *Bulimina gibba* Fornasini: p. 378, figs. 32, 34
- 1958 *Bulimina gibba* Fornasini; Parker, p. 261, pl. 2, figs. 21, 22
- 1960 *Bulimina gibba* Fornasini; Hofker, p. 248, pl. D, figs. 91-95
- 1994 *Bulimina gibba* Fornasini; Jones, p. 54, pl. 50, figs. 1, 2 [cop. Brady, 1884, figs. 1, 2]
- 2005 *Bulimina gibba* Fornasini; Rasmussen, p. 86, pl. 11, fig. 5
- 2005 *Bulimina gibba* Fornasini; Milker et al., p. 216, pl. 2, fig. 23

**Remarks:** The wall is calcareous and finely perforate. The test is elongate in lateral view. Chambers are triserially arranged and inflated. Sutures are oblique and depressed. The aperture is loop-shaped on the face of the final chamber, surrounded by an everted rim and provided with a toothplate. Basal pseudospines are present. The test surface is smooth.

*Bulimina marginata* d'Orbigny, 1826  
Figure 20.23

- 1826 *Bulimina marginata* d'Orbigny: p. 269, pl. 12, figs. 10-12
- 1911 *Bulimina marginata* d'Orbigny; Cushman, p. 83, text-fig. 136
- 1958 *Bulimina marginata* d'Orbigny; Parker, p. 262, pl. 2, fig. 23
- 1987 *Bulimina marginata* forma *marginata* d'Orbigny; Jorissen, p. 43, pl. 4, fig. 6
- 1988 *Bulimina marginata* d'Orbigny; Loeblich and Tappan, p. 150, pl. 571, figs. 1-3
- 1991 *Bulimina marginata* d'Orbigny; Cimerman and Langer, p. 62, pl. 64, figs. 9-11
- 1991 *Bulimina marginata marginata* d'Orbigny; Rasmussen, p. 363, fig. 6, no. 6
- 1992 *Bulimina marginata* d'Orbigny; Schiebel, p. 36, pl. 2, fig. 2
- 1993 *Bulimina marginata* d'Orbigny; Sgarrella and Moncharmont Zei, p. 212, pl. 15, figs. 5-7
- 1994 *Bulimina marginata* d'Orbigny; Jones, p. 55, pl. 51, figs. 3-5



- 2004 *Bulimina marginata* d'Orbigny; Mendes et al., p. 180, pl. 2, fig. 3
- 2005 *Bulimina marginata* d'Orbigny; Rasmussen, p. 86, pl. 11, fig. 6
- 2008 *Bulimina marginata* d'Orbigny; Abu-Zied et al., p. 52, pl. 2, fig. 11
- 2008 *Bulimina marginata* d'Orbigny; Leiter, p. 26, pl. 3, fig. 12
- 2009 *Bulimina marginata* d'Orbigny; Milker et al., p. 216, pl. 2, fig. 24

**Remarks:** The wall is calcareous and finely perforate. The test is ovate in lateral view. Early chambers are triserially arranged and later chambers tend to a uniserial chamber arrangement. Chambers are inflated. The aperture is loop-shaped on the face of the final chamber, surrounded by an everted rim and provided with a toothplate. Basal pseudospines are present. The test surface is smooth.

Genus GLOBOBULIMINA Cushman, 1927  
*Globobulimina affinis* (d'Orbigny, 1839a)  
 Figure 20.24

- 1839a *Bulimina affinis* d'Orbigny: p. 105, pl. 2, figs. 25, 26
- 1993 *Globobulimina affinis* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 212, pl. 15, figs. 8, 9
- 2005 *Globobulimina affinis* (d'Orbigny); Rasmussen, p. 87, pl. 11, fig. 7
- 2006 *Globobulimina affinis* (d'Orbigny); Avsar et al., p. 133, pl. 2, fig. 6
- 2008 *Globobulimina affinis* (d'Orbigny); Abu-Zied et al., p. 52, pl. 2, figs. 13, 14
- 2008 *Globobulimina affinis* (d'Orbigny); Leiter, p. 40, pl. 4, fig. 4
- 2009 *Globobulimina affinis* (d'Orbigny); Milker et al., p. 218, pl. 3, fig. 1

**Remarks:** The wall is calcareous and finely and densely perforate. The test is ovate in lateral view and circular in apertural view. Chambers are triserially arranged and inflated, rapidly increasing in size as added and strongly overlapping each other. Sutures are oblique and slightly depressed. The aperture is loop-shaped and provided with a toothplate. The test surface is ornamented with fine longitudinal grooves.

Family UVIGERINIDAE Haeckel, 1894  
 Subfamily UVIGERININAE Haeckel, 1894  
 Genus NEOUVIGERINA Thalman, 1952

*Neouvigerina ampullacea* (Brady, 1884)  
 Figure 20.25-26

- 1884 *Uvigerina asperula* Czjzek var. *ampullacea* Brady: p. 579, pl. 75, figs. 10, 11
- 1923 *Uvigerina ampullacea* Brady; Cushman, p. 162, pl. 42, figs. 5, 6
- 1958 *Uvigerina auberiana* (d'Orbigny); Parker, p. 263, pl. 2, figs. 35-36
- 1985 *Uvigerina auberiana* (d'Orbigny); Hermelin and Scott, p. 218, pl. 3, fig. 8
- 1988 *Neouvigerina ampullacea* (Brady); Loeblisch and Tappan, p. 151, pl. 573, figs. 14-17 [figs. 14-16: cop. Brady, 1884, figs. 10, 11]
- 1993 *Neouvigerina ampullacea* (Brady); Hottinger, Halicz and Reiss, p. 101, pl. 126, figs. 8-11; pl. 127, figs. 1-3
- 1993 *Uvigerina auberiana* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 214, pl. 15, fig. 13
- 1994 *Siphouvigerina ampullacea* (Brady); Jones, p. 86, pl. 75, figs. 10, 11 [cop. Brady, 1884, figs. 10, 11]
- 2005 *Uvigerina auberiana* (d'Orbigny); Rasmussen, p. 87, pl. 11, fig. 9

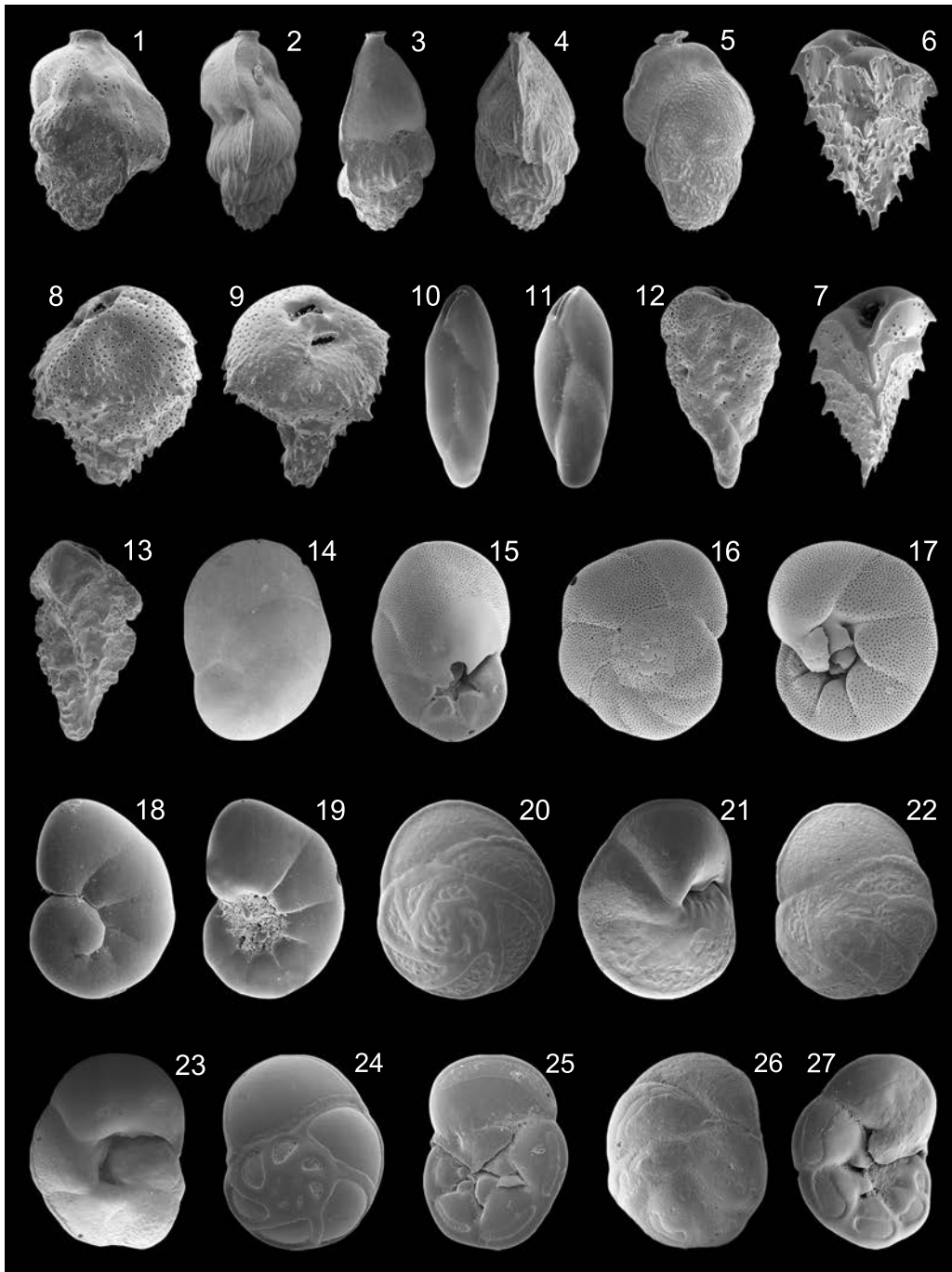
**Remarks:** The wall is calcareous. The test is elongate-ovate in lateral view. Early chambers are triserially, later chambers are biserially arranged and final chambers tend to have a uniserial chamber arrangement. Chambers are subglobular, increasing in size as added. The rounded aperture is on a short neck, bordered by an imperforate lip, and is provided with a spirally folded toothplate. The entire test is ornamented with short pseudospines. An apical pseudospine is present. We believe that species described and listed here as *U. auberiana* belong to *Neouvigerina ampullacea*.

Genus SIPHOVIGERINA Parr, 1950  
*Siphouvigerina?* sp. 1  
 Figure 20.27

- 1991 cf. *Siphouvigerina* sp. 1; Cimerman and Langer, p. 62, pl. 66, figs. 1, 2

**Remarks:** The wall is calcareous and finely perforate. The test is elongate. Earlier chambers are triserially arranged and appressed. Later chambers are more loosely triserially, then biserially, arranged and umbrella-like. The rounded aperture is terminal, at the end of a short neck and bordered by a lip. The test surface is irregularly ornamented with longitudinal ridges.

- Genus UVIGERINA d'Orbigny, 1826  
*Uvigerina mediterranea* Hofker, 1932  
 Figure 20.28
- 1884 *Uvigerina pygmaea* d'Orbigny; Brady, p. 575, pl. 74, figs. 11, 12
- 1932 *Uvigerina mediterranea* Hofker: pp. 118-121, fig. 32
- 1958 *Uvigerina mediterranea* Hofker; Parker, p. 263, pl. 2, figs. 39-40
- 1960 *Eouvigerina mediterranea* (Hofker); Hofker, p. 251, pl. D, fig. 107
- 1987 *Uvigerina mediterranea* Hofker; Jorissen, p. 214, pl. 1, fig. 2
- 1991 *Uvigerina mediterranea* Hofker; Cimerman and Langer, p. 63, pl. 65, figs. 7-9
- 1993 *Uvigerina mediterranea* Hofker; Sgarrella and Moncharmont Zei, p. 214, pl. 16, figs. 1-2
- 1994 *Uvigerina mediterranea* Hofker; Jones, p. 86, pl. 74, figs. 11, 12 [cop. Brady, 1884, figs. 11, 12]
- 2008 *Uvigerina mediterranea* Hofker; Abu-Zied et al., p. 52, pl. 2, figs. 17, 18
- 2009 *Uvigerina peregrina* Cushman; Milker et al., p. 218, pl. 3, fig. 3
- Remarks:** The wall is calcareous, finely and densely perforate. The test is elongate-ovate. Chambers are triserially arranged and inflated, increasing in size as added. Sutures are distinct, depressed and oblique. The aperture is terminal, on a short neck and provided with a toothplate. The test surface is ornamented with longitudinal costae, extending from the sutures to the base of the chambers.
- Uvigerina peregrina* Cushman, 1923  
 Figure 20.29
- 1923 *Uvigerina peregrina* Cushman: p. 166, pl. 42, figs. 7-10
- 1958 *Uvigerina peregrina* Cushman; Parker, p. 263, pl. 2, figs. 37, 38
- 1985 *Uvigerina peregrina* Cushman; Hermelin and Scott, p. 218, pl. 3, fig. 10
- 1988 *Uvigerina peregrina* Cushman; Loeblich and Tappan, p. 151, pl. 573, figs. 24-28 [figs. 24-27: cop. Cushman, figs. 7-10]
- 1991 *Uvigerina peregrina* Cushman; Rasmussen, p. 363, fig. 6, no. 9
- 1993 *Uvigerina peregrina* Cushman; Sgarrella and Moncharmont Zei, p. 215, pl. 16, fig. 5
- 2004 *Uvigerina peregrina* Cushman; Mendes et al., p. 180, pl. 2, fig. 12
- 2005 *Uvigerina peregrina* Cushman; Rasmussen, p. 88, pl. 11, figs. 14, 15
- 2008 *Uvigerina peregrina* Cushman; Abu-Zied et al., p. 52, pl. 2, figs. 19, 20
- 2009 *Uvigerina peregrina* Cushman; Frezza and Carboni, p. 57, pl. 2, fig. 15
- Remarks:** The wall is calcareous and finely perforate. The test is elongate-subovate. Chambers are triserially arranged and inflated. Sutures are distinct and depressed. The aperture is terminal, on a short neck and provided with a toothplate. The test surface is ornamented with longitudinal costae, extending from the sutures to the base of the chambers, and with pustules.
- Uvigerina* sp. 1  
 Figure 21.1
- Remarks:** The wall is calcareous and coarsely perforate. The test is ovate in outline and rounded in apertural view. Early chambers are appressed and triserially arranged. Later chambers are more loosely triserially arranged and inflated. Sutures are distinct and depressed. The aperture is terminal, bordered by a lip and provided with a toothplate. The test surface is partly ornamented with longitudinally ridges.
- Subfamily ANGULOGERININAE Galloway, 1933  
 Genus ANGULOGERINA Cushman, 1927  
*Angulogerina angulosa* (Williamson, 1858)  
 Figure 21.2-4
- 1858 *Uvigerina angulosa* Williamson: p. 67, pl. 5, fig. 140
- 1923 *Uvigerina angulosa* Williamson; Cushman, p. 170, pl. 41, figs. 17-20
- 1958 *Angulogerina angulosa* (Williamson); Parker, p. 259, pl. 2, figs. 1, 2
- 1988 *Angulogerina angulosa* (Williamson); Loeblich and Tappan, p. 151, pl. 574, figs. 5-9
- 1991 *Angulogerina angulosa* (Williamson); Cimerman and Langer, p. 63, pl. 66, figs. 3, 4
- 1992 *Trifarina angulosa* (Williamson); Schiebel, p. 56, pl. 3, fig. 1
- 1993 *Angulogerina angulosa* (Williamson); Sgarrella and Moncharmont Zei, p. 215, pl. 16, fig. 8



**FIGURE 21.** 1 *Uvigerina* sp. 1, 1280x, lateral view; 2 *Angulogerina angulosa* (Williamson), 902x, lateral view; 3 *A. angulosa* (Williamson), 877x, lateral view; 4 *A. angulosa* (Williamson), 993x, lateral view; 5 *Trifarina fornasinii* (Selli), 411x, lateral view; 6 *Reussella spinulosa* (Reuss), 804x, lateral view; 7 *R. spinulosa* (Reuss), 770x, lateral view; 8 *Trimosina* sp. 1, 1010x, lateral view; 9 *Trimosina* sp. 1, 690x, lateral view; 10 *Fursenkoina acuta* (d'Orbigny), 593x, lateral view; 11 *F. acuta* (d'Orbigny), 816x, lateral view; 12 *Sigmavirgulina tortuosa* (Brady), 657x, lateral view; 13 *Sigmavirgulina* sp. 1, 923x, lateral view; 14 *Cancris auriculus* (Fichtel and Moll), 371x, spiral side; 15 *C. auriculus* (Fichtel and Moll), 653x, umbilical side; 16 *Valvulineria complanata* (d'Orbigny), 388x, spiral side; 17 *V. complanata* (d'Orbigny), 370x, umbilical side; 18 *Valvulineria minuta* Parker, 1220x, spiral side; 19 *V. minuta* Parker, 1190x, umbilical side; 20 *Eponides concameratus* (Williamson), 188x, spiral side; 21 *E. concameratus* (Williamson), 262x, umbilical side; 22 *Eponides* sp. 1, 200x, spiral side; 23 *Eponides* sp. 1, 145x, umbilical side; 24 *Stomatorbina concentrica* (Parker and Jones), 339x, spiral side; 25 *S. concentrica* (Parker and Jones), 295x, umbilical side; 26 *Mississipina* sp. 1, 702x, spiral side; 27 *Mississipina* sp. 1, 774x, umbilical side

- 2003 *Trifarina angulosa* (Williamson); Murray, p. 26, fig. 10, no. 5
- 2005 *Angulogerina angulosa* (Williamson); Debenay et al., p. 336 pl. 3, fig. 12
- 2005 *Trifarina angulosa* (Williamson); Rasmussen, p. 89, pl. 12, fig. 1
- 2008 *Trifarina angulosa* (Williamson); Abu-Zied et al., p. 52, pl. 2, fig. 21
- 2009 *Trifarina angulosa* (Williamson); Milker et al., p. 218, pl. 3, fig. 2

**Remarks:** The wall is calcareous and finely perforate. The test is subovate-elongate in lateral view and triangular in apertural view. The chamber arrangement is triserial with a tendency to a biserial chamber arrangement in the adult stage. Sutures are depressed and limbate. The periphery is carinate. The aperture is on a short neck, bordered by a lip and provided with a toothplate. The test surface is ornamented with tubercles and longitudinal striae and costae.

Genus TRIFARINA Cushman, 1923

*Trifarina fornasinii* (Selli, 1948)

Figure 21.5

- 1948 *Angulogerina fornasinii* Selli: p. 40-44, figs. 1-4
- 1992 *Trifarina fornasinii* (Selli); Schiebel, p. 56, pl. 3, fig. 2
- 2005 *Trifarina fornasinii* (Selli); Rasmussen, p. 89, pl. 12, fig. 3

**Remarks:** The wall is calcareous. The test is ovate-elongate in lateral view and subtriangular in apertural view. Earlier chambers are triserially arranged, and later chambers are uniserially arranged and rectilinear. Chambers are inflated. Sutures are depressed. The periphery is carinate. The aperture is rounded, on an everted collar and provided with a toothplate. Short apical pseudospines are present, and the test surface is ornamented with irregularly arranged ridges.

Family REUSSELLIDAE Cushman, 1933a

Genus REUSSELLA Galloway, 1933

*Reussella spinulosa* (Reuss, 1850)

Figure 21.6-7

- 1850 *Verneuilina spinulosa* Reuss: p. 10, pl. 12, fig. 12
- 1911 *Verneuilina spinulosa* Reuss; Cushman, p. 55, text-fig. 88
- 1987 *Reussella spinulosa* (Reuss); Alberola et al., p. 322, pl. 4, fig. 14

- 1987 *Reussella spinulosa* (Reuss); Jorissen, p. 41, pl. 3, fig. 7
- 1988 *Reussella spinulosa* (Reuss); Loeblich and Tappan, p. 152, pl. 575, figs. 9-12
- 1991 *Reussella spinulosa* (Reuss); Cimerman and Langer, p. 63, pl. 66, figs. 5-8
- 1993 *Reussella spinulosa* (Reuss); Sgarrella and Moncharmont Zei, p. 214, pl. 15, fig. 14
- 2005 *Reussella spinulosa* (Reuss); Rasmussen, p. 90, pl. 12, fig. 4
- 2006 *Reussella spinulosa* (Reuss); Avsar et al., p. 133, pl. 2, fig. 7
- 2009 *Reussella spinulosa* (Reuss); Avsar et al., p. 134, pl. 2, fig. 9
- 2009 *Reussella spinulosa* (Reuss); Milker et al., p. 218, pl. 3, figs. 4, 5

**Remarks:** The wall is calcareous and perforate along the chamber margins. The test is triangular in lateral and in apertural view. Chambers are triserially arranged and acutely angled, gradually increasing in size as added. Sutures are distinct and thickened. The slit-like aperture is interior marginal and provided with an internal toothplate. The test surface is ornamented with short pseudospines along the carinate chamber margins.

Family TRIMOSINIDAE Saidova, 1975

Genus TRIMOSINA Cushman, 1927

*Trimosina* sp. 1

Figure 21.8-9

**Remarks:** The wall is calcareous, hyaline and densely and finely perforate. The test is pyramidal in lateral view and subtriangular in apertural view. Chambers are triserially arranged and inflated, strongly increasing in size as added. Sutures are depressed. The primary aperture is an arch-shaped opening at the base of the final chamber, and partly bordered by a rim. A secondary, larger and arch-shaped opening is present on the final chamber. Chambers are ornamented with lateral ribs, extending to short pseudospines on the lower chamber margin.

Family FURSENKOINIDAE Loeblich and Tappan, 1961

Genus FURSENKOINA Loeblich and Tappan, 1961

*Fursenkoina acuta* (d'Orbigny, 1846)

Figure 21.10-11

- 1846 *Polymorphina acuta* d'Orbigny: p. 234, Pl. 13, figs. 4, 5; Pl. 14, figs. 5-7

- 1991 *Fursenkoina acuta* (d'Orbigny); Cimerman and Langer, p. 64, pl. 67, figs. 1, 2
- 1993 *Fursenkoina acuta* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 235, pl. 23, fig. 7
- 2002 *Fursenkoina acuta* (d'Orbigny); Kaminski et al., p. 174, pl. 3, figs. 11, 12
- 2005 *Fursenkoina acuta* (d'Orbigny); Rasmussen, p. 90, pl. 12, fig. 8
- 2006 *Fursenkoina acuta* (d'Orbigny); Avsar et al., p. 133, pl. 2, fig. 8
- 2009 *Fursenkoina acuta* (d'Orbigny); Avsar et al., p. 135, pl. 2, fig. 10

**Remarks:** The wall is calcareous, hyaline and finely perforate. The test is elongate in lateral view. Chambers are biserially arranged and slightly twisted around a vertical axis. The test surface is smooth. Sutures are oblique and depressed. The aperture is elongate, bordered weakly developed rim and provided with a toothplate.

Genus SIGMAVIRGULINA Loeblich and Tappan, 1957

*Sigmavirgulina tortuosa* (Brady, 1881)  
Figure 21.12

- 1881 *Bolivina tortuosa* Brady: p. 57
- 1884 *Bolivina tortuosa* Brady; Brady, p. 420, pl. 52, figs. 31-34
- 1931 *Bolivina tortuosa* Brady; Cushman and Parker, p. 16, pl. 3, fig. 22
- 1988 *Sigmavirgulina tortuosa* (Brady); Loeblich and Tappan, p. 153, pl. 579, figs. 1-5
- 1994 *Sigmavirgulina tortuosa* (Brady); Jones, p. 58, pl. 52, figs. 31-34 [cop. Brady, 1884, figs. 31-34]

**Remarks:** The wall is calcareous and densely and coarsely perforate. The test is triangular-elongate in lateral view and compressed in apertural view. Chambers are biserially arranged with a sigmoid alignment. Chambers increasing in breadth as added. The periphery is acutely carinate. Sutures are slightly depressed. The subterminal aperture, at the inner margin of the final chamber, is elongate-ovate, surrounded by a lip and provided with a toothplate. The test surface is smooth.

*Sigmavirgulina* sp. 1  
Figure 21.13

- 1991 *Sigmavirgulina* sp. 1; Cimerman and Langer, p. 64, pl. 67, figs. 3-7

**Remarks:** The wall is calcareous and later chambers are coarsely perforate. The test is triangular-

elongate in lateral view and compressed in apertural view. Chambers are biserially arranged with a sigmoid alignment. The periphery is acutely angled. Sutures are weakly depressed. The oval aperture, at the inner margin of the final chamber, is surrounded by a lip and provided with a toothplate.

Family BAGGINIDAE Cushman, 1927  
Subfamily BAGGININAE Cushman, 1927  
Genus CANCRIS de Montfort, 1808  
*Cancris auriculus* (Fichtel and Moll, 1798)  
Figure 21.14-15

- 1798 *Nautilus auricula* Fichtel and Moll: p. 108, pl. 20, figs. a, c, e, f
- 1884 *Pulvinulina auricula* (Fichtel and Moll); Brady, p. 688, pl. 106, fig. 4
- 1931 *Cancris auricula* (Fichtel and Moll); Cushman, p. 72, pl. 15, fig. 1
- 1988 *Cancris auriculus* (Fichtel and Moll); Loeblich and Tappan, p. 157, pl. 591, figs. 1-3
- 1993 *Cancris auriculus* (Fichtel and Moll); Hottinger, Halicz and Reiss, p. 106, pl. 136, figs. 6-14
- 1994 *Cancris auriculus* (Fichtel and Moll); Jones, p. 105, pl. 106, fig. 4 [cop. Brady 1884, fig. 4]
- 2005 *Cancris auricula* (Fichtel and Moll); Rasmussen, p. 91, pl. 12, figs. 14, 15
- 2008 *Cancris auriculus* (Fichtel and Moll); Abu-Zied et al., p. 52, pl. 2, figs. 24, 25
- 2009 *Cancris auriculus* (Fichtel and Moll); Milker et al., p. 218, pl. 3, figs. 6, 7

**Remarks:** The wall is calcareous and finely and densely perforate except for the umbilical region. The biconvex test is auriculate in outline and lenticular in section. Chambers are trochospirally enrolled and strongly increasing in breadth as added. The spiral side is evolute, the umbilical side is involute. The periphery is acute and carinate. Sutures are depressed and arched on the spiral side and nearly radial on the umbilical side. The aperture is a low interiomarginal opening on the umbilical side and provided with a broad apertural flap. The test surface is smooth.

Genus VALVULINERIA Cushman, 1926  
*Valvulineria complanata* (d'Orbigny, 1846)  
Figure 21.16-17

- 1846 *Rosalina complanata* d'Orbigny: p.175, pl. 10, figs. 13-15

- 1958 *Valvulineria complanata* (d'Orbigny); Parker, p. 268, pl. 3, figs. 42-44
- 1987 *Valvulineria bradyana* (Fornasini); Jorissen, p. 43, pl. 4, fig. 2
- 1991 *Valvulineria bradyana* (Fornasini); Cimerman and Langer, p. 64, pl. 67, figs. 8-10
- 1993 *Valvulineria bradyana* (Fornasini); Sgarrella and Moncharmont Zei, p. 220, pl. 18, figs. 1, 2
- 1995 *Valvulineria bradyana* (Fornasini); Coppa and Di Tuoro, p. 170, pl. 3, figs. 3, 6
- 2004 *Valvulineria bradyana* (Fornasini); Chen-des et al., p. 76, pl. 2, fig. 12
- 2005 *Valvulineria complanata* (d'Orbigny); Rasmussen, p. 91, pl. 12, figs. 16, 17
- 2006 *Valvulineria complanata* (d'Orbigny); Avsar et al., p. 133, pl. 2, figs. 9, 10
- 2009 *Valvulineria bradyana* (Fornasini); Avsar et al., p. 135, pl. 2, figs. 11, 12
- 2009 *Valvulineria bradyana* (Fornasini); Frezza and Carboni, p. 55, pl. 1, figs. 1, 2
- 2010 *Valvulineria bradyana* (Fornasini); Milker, p. 117, pl. 4, figs. 6, 7

**Remarks:** The wall is calcareous and densely perforate except for the umbilical region. The test is rounded in outline. Chambers are trochospirally enrolled, gradually increasing in size as added. The spiral side is slightly convex and weakly depressed in the initial part. The umbilical side is involute with a depressed umbilicus. The periphery is subrounded. Sutures are depressed and backward curved on the spiral side, nearly radial and slightly curved on the umbilical side. The aperture is an interiomarginal, umbilical to extraumbilical arch, provided with a large flap, covering the umbilicus. The test surface is smooth. *Valvulineria bradyana* seems to be a junior synonym of *V. complanata* (see Parker, 1958 and Rasmussen, 2005).

*Valvulineria minuta* Parker, 1954  
Figure 21.18-19

- 1954 *Valvulineria minuta* Parker: p. 527, pl. 9, figs. 4-6
- 1993 *Valvulineria minuta* Parker; Sgarrella and Moncharmont Zei, p. 220, pl. 18, figs. 3, 4

**Remarks:** The wall is calcareous and densely and finely perforate except for the umbilical region. The test is subrounded in outline. Chambers are tro-

chospirally enrolled, gradually increasing in size as added. The spiral side is slightly convex and weakly appressed in the initial part. The umbilical side is involute with a depressed umbilicus. The periphery is subrounded. Sutures are depressed and slightly backwards curved on the spiral side and nearly radial on the umbilical side. The aperture is an interiomarginal, umbilical to extraumbilical arch, provided with a flap, partly covering the umbilicus. The test surface is smooth.

*Valvulineria* sp. 1

**Remarks:** The wall is calcareous, hyaline and more finely perforate compared to *Valvulineria complanata*. The test is rounded in outline. Chambers are trochospirally enrolled. Two and a half whorls are visible. Chambers are inflated, gradually increasing in size as added. Six chambers are visible in the final whorl. The periphery is rounded. The spiral side is flattened. The umbilical region is depressed. Sutures are backward curved and depressed on both sides. The aperture is an interiomarginal arch at the base of the final chamber and provided with a flap, partly covering the umbilicus. The test surface is smooth.

Family EPONIDIDAE Hofker, 1951a  
Subfamily EPONIDINAE Hofker, 1951a  
Genus EPONIDES de Montfort, 1808  
*Eponides concameratus* (Williamson, 1858)  
Figure 21.20-21

- 1858 *Rotalina concamerata* Williamson: p. 52, pl. 4, figs. 101-103 (not figs. 104, 105)
- 1931 *Eponides repanda* var. *concamerata* (Williamson); Cushman, p. 51, pl. 11, fig. 4 [cop. Williamson 1858, figs. 101-103]
- 1988 *Eponides repandus* (Fichtel and Moll); Loeblich and Tappan, p. 158, pl. 594, figs. 1-3
- 1991 *Eponides concameratus* (Williamson); Cimerman and Langer, p. 64, pl. 67, figs. 11-14
- 1993 *Eponides repandus* var. *concamerata* (Williamson); Sgarrella and Moncharmont Zei, p. 232, pl. 22, figs. 4, 5
- 1995 *Eponides repandus* (Fichtel and Moll); Coppa and Di Tuoro, p. 172, pl. 4, figs. 8, 10
- 2005 *Eponides repandus* (Fichtel and Moll); Rasmussen, p. 92, pl. 13, figs. 1, 2
- 2009 *Eponides concameratus* (Williamson); Milker et al., p. 218, pl. 3, figs. 8, 9

**Remarks:** The wall is calcareous and finely perforate except for the peripheral keel and the sutures. The test is rounded in outline and planoconvex to biconvex. Chambers are trochospirally enrolled. The spiral side is evolute, and the umbilical side is involute. The periphery is thickened and carinate. The spiral side is pustulate, with backward curved and thickened sutures. On the umbilical side, sutures are nearly radial and depressed. The aperture is an interiomarginal and extraumbilical arch, bordered by a lip on one side.

*Eponides* sp. 1  
Figure 21.22-23

**Remarks:** The wall is calcareous and finely perforate except for the peripheral keel and the sutures. The test is subrounded in outline and planoconvex to biconvex. Chambers are trochospirally enrolled. The spiral side is evolute, and the umbilical side is involute. The periphery is thickened and carinate. The spiral side is pustulate, with backward curved and thickened sutures. On the umbilical side, sutures are oblique and depressed. The aperture is an interiomarginal, extraumbilical large arched slit. This species differs from *Eponides concameratus* by the larger and curved apertural opening, and it is generally larger and more subrounded in outline than *E. concameratus*.

Family MISSISSIPPINIDAE Saidova, 1981  
Subfamily STOMATORBININAE Saidova, 1981  
Genus STOMATORBINA Dorreen, 1948  
*Stomatorbina concentrica* (Parker and Jones, in Brady 1864)  
Figure 21.24-25

- 1864 *Pulvinulina concentrica* Parker and Jones: type reference Brady, 1864, p. 470, pl. 48, fig. 14
- 1884 *Pulvinulina concentrica* Parker and Jones; Brady, p. 686, pl. 105, fig. 1
- 1931 *Eponides concentrica* (Parker and Jones); Cushman, p. 43, pl. 9, figs. 4, 5 [fig. 4: cop. Brady, 1884, fig. 1]
- 1991 *Stomatorbina concentrica* (Parker and Jones); Cimerman and Langer, p. 65, pl. 68, figs. 7-9
- 1993 *Stomatorbina concentrica* (Parker and Jones); Sgarrella and Moncharmont Zei, p. 232, pl. 26, figs. 9, 10
- 1994 *Mississippina concentrica* (Parker and Jones); Jones, p. 104, pl. 105, fig. 1 [cop. Brady. 1884, fig. 1]

- 2005 *Stomatorbina concentrica* (Parker and Jones); Rasmussen, p. 92, pl. 13, figs. 3, 4
- 2009 *Stomatorbina concentrica* (Parker and Jones); Milker et al., p. 218, pl. 3, figs. 10, 11

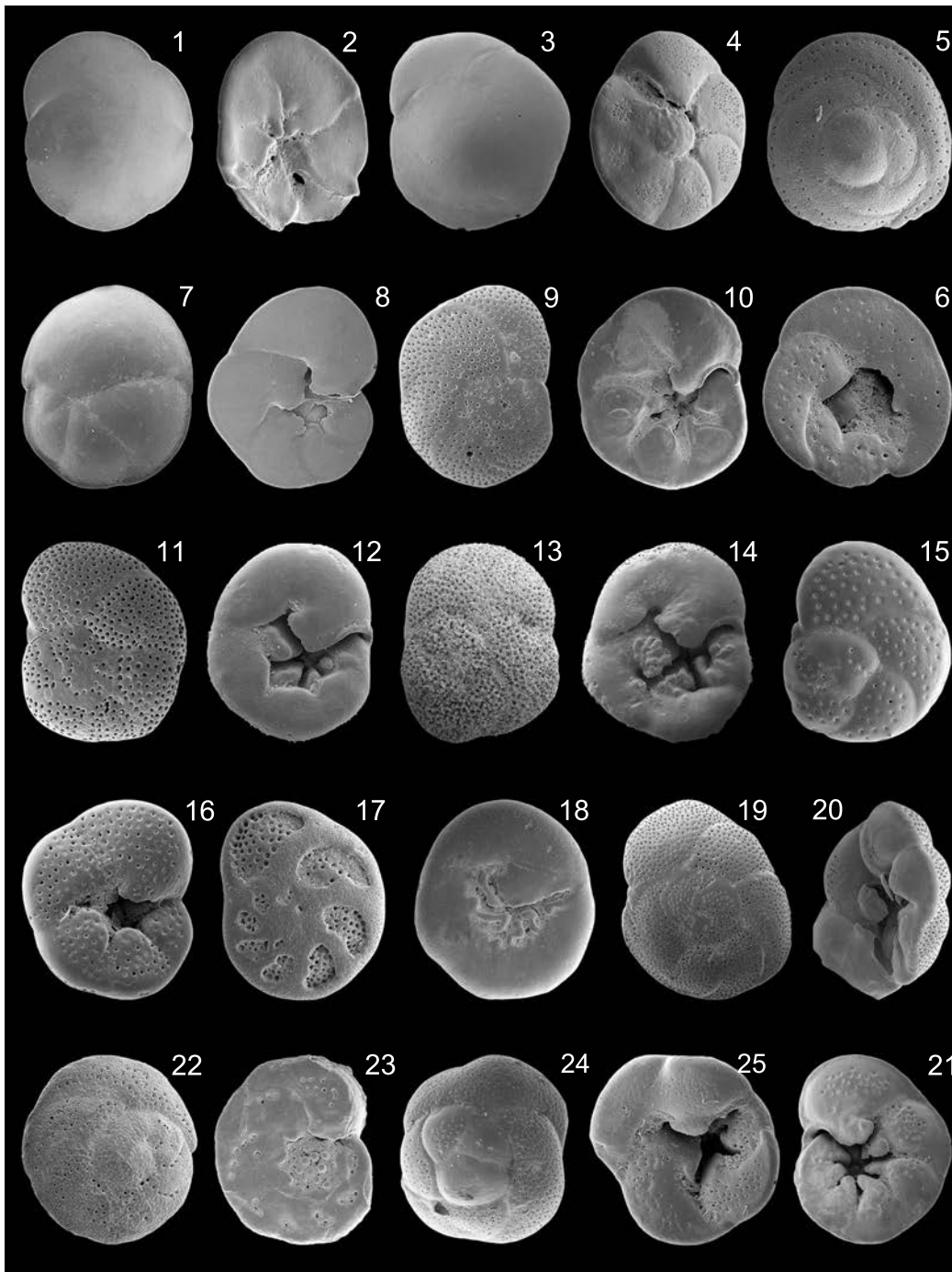
**Remarks:** The wall is calcareous. The test is subrounded in outline, low trochospirally coiled and unequally biconvex. Chambers increasing in size as added. Sutures are thickened and curved on the evolute spiral side, depressed and nearly radial on the involute umbilical side. The periphery is subangular. The aperture is an interiomarginal arch, extending into the open umbilicus. The test surface is smooth, with elliptical inframarginal areas on the umbilical side.

Subfamily MISSISSIPPININAE Saidova, 1981  
Genus MISSISSIPPINA Howe, 1930  
*Mississippina* sp. 1  
Figure 21.26-27

**Remarks:** The wall is calcareous and finely perforate. The test is subrounded in outline, low trochospirally coiled and unequally biconvex. The spiral side is evolute, and the umbilical side is involute. Six chambers are visible in the final whorl, increasing in size as added. Sutures are depressed and curved on both sides. The periphery is subacute. The aperture is an interiomarginal arch, extending into the open umbilicus, and is covered by an umbilical flap. The test surface is smooth, with elliptical inframarginal areas on both sides.

Family DISCORBIDAE Ehrenberg, 1838  
Genus DISCORBIS Lamarck, 1804  
*Discorbis williamsoni* Chapman and Parr, in Parr 1932  
Figure 22.1-2

- 1858 *Rotalina nitida* Williamson: p. 54, pl. 4, figs. 106-108
- 1916 *Discorbina nitida* (Williamson); Heron-Allen and Earland, p. 269, pl. 42, figs. 26-30
- 1931 *Discorbis nitida* (Williamson); Cushman, p. 26, pl. 6, fig. 1
- 1932 *Discorbis williamsoni* Chapman and Parr: type reference, Parr, 1932, p. 226, pl. 21, fig. 25
- 1977 *Neoconorbina williamsoni* (Chapman and Parr); Hofker, p. 244, pl. 5, fig. 2
- 2005 *Discorbis williamsoni* Chapman and Parr; Rasmussen, p. 93, pl. 13, figs. 7, 8



**FIGURE 22.** 1 *Discorbis williamsoni* Chapman and Parr, 635x, spiral side; 2 *D. williamsoni* Chapman and Parr, 1060x, umbilical side; 3 *Gavelinopsis praegeri* (Heron Allen and Earland), 758x, spiral side; 4 *G. praegeri* (Heron Allen and Earland), 987x, umbilical side; 5 *Neoconorbina terquemi* (Rzehak), 545x, spiral side; 6 *N. terquemi* (Rzehak), 732x, umbilical side; 7 *Planodiscorbis rarescens* (Brady), 341x, spiral side; 8 *P. rarescens* (Brady), 281x, umbilical side; 9 *Rosalina anomala* Terquem, 376x, spiral side; 10 *R. anomala* Terquem, 432x, umbilical side; 11 *Rosalina bradyi* Cushman, 782x, spiral side; 12 *R. bradyi* Cushman, 768x, umbilical side; 13 *R. bradyi* Cushman, 370x, spiral side; 14 *R. bradyi* Cushman, 324x, umbilical side; 15 *Rosalina globularis* d'Orbigny, 829x, spiral side; 16 *R. globularis* d'Orbigny, 824x, umbilical side; 17 *Rosalina macropora* (Hofker), 766x, spiral side; 18 *R. macropora* (Hofker), 407x, umbilical side; 19 *Rosalina* sp. 1, 243x, spiral side; 20 *Rosalina* sp. 1, 345x, umbilical side; 21 *Rosalina* sp. 1, 348x, umbilical side; 22 *Spirorbina?* sp. 1, 707x, spiral side; 23 *Spirorbina?* sp. 1, 886x, umbilical side; 24 *Tretomphalus concinnus* (Brady), 671x, spiral side; 25 *T. concinnus* (Brady), 573x, umbilical side.



**Remarks:** The wall is calcareous, thin and translucent. The test is circular in outline. Chambers are low trochospirally enrolled. The spiral side is convex and the umbilical side is flattened. Sutures are backward curved and flush with the surface on the spiral side, nearly radial, curved and depressed on the umbilical side. The periphery is subacute. The aperture is a low interiomarginal and extraumbilical arch on the umbilical side. The test surface is smooth. The umbilical side is finely perforate, and triangular chamber flaps are visible in the umbilical region.

Family ROSALINIDAE Reiss, 1963

Genus GAVELINOPSIS Hofker, 1951a

*Gavelinopsis praegeri* (Heron-Allen and Earland, 1913)

Figure 22.3-4

- 1913 *Discorbina praegeri* Heron-Allen and Earland: p. 122, pl. 10, figs. 8-10
- 1931 *Discorbis? praegeri* (Heron-Allen and Earland); Cushman, p. 30, pl. 6, fig. 4 [cop. Heron-Allen and Earland, 1913, figs. 8-10]
- 1958 *Gavelinopsis praegeri* (Heron-Allen and Earland); Parker, p. 264, pl. 3, figs. 24, 25
- 1960 *Gavelinopsis praegeri* (Heron-Allen and Earland); Hofker, p. 252, pl. D, fig. 114
- 1987 *Gavelinopsis praegeri* (Heron-Allen and Earland); Jorissen, p. 41, pl. 3, fig. 13
- 1988 *Gavelinopsis praegeri* (Heron-Allen and Earland); Loeblich and Tappan, p. 161, pl. 608, figs. 6-12
- 1991 *Gavelinopsis praegeri* (Heron-Allen and Earland); Cimerman and Langer, p. 66, pl. 70, figs. 3, 4
- 1992 *Gavelinopsis praegeri* (Heron-Allen and Earland); Schiebel, p. 46, pl. 4, fig. 6
- 1993 *Gavelinopsis praegeri* (Heron-Allen and Earland); Sgarrella and Moncharmont Zei, p. 218, pl. 17, figs. 1, 2
- 2003 *Gavelinopsis praegeri* (Heron-Allen and Earland); Murray, p. 24, fig. 8, no. 5, 6
- 2009 *Gavelinopsis praegeri* (Heron-Allen and Earland); Milker et al., p. 218, pl. 3, figs. 14, 15

**Remarks:** The wall is calcareous, hyaline and finely perforate toward the periphery on the umbilical side. The test is circular in outline. Chambers are low trochospirally enrolled. The spiral side is evolute and convex with thickened and flush sutures. The umbilical side is involute and slightly

convex with subtriangular chambers and radial and depressed sutures around an umbilical plug. The periphery is carinate. The aperture is an interiomarginal, extraumbilical slit on the umbilical side, partly bordered by a small lip.

Genus NEOCONORBINA Hofker, 1951b

*Neoconorbina terquemi* (Rzehak, 1888)

Figure 22.5-6

- 1884 *Discorbina orbicularis* Terquem; Brady, p. 647, pl. 88, figs. 5-8
- 1888 *Discorbina terquemi* Rzehak: p. 228
- 1958 *Neoconorbina terquemi* (Rzehak); Parker, p. 267, pl. 3, figs. 26, 27
- 1960 *Neoconorbina neapolitana* Hofker; Hofker, p. 252, pl. D, fig. 115
- 1987 *Neoconorbina terquemi* (Rzehak); Alberola et al., p. 308, pl. 4, fig. 9
- 1987 *Neoconorbina terquemi* (Rzehak); Jorissen, p. 40, pl. 3, figs. 3, 4
- 1988 *Neoconorbina terquemi* (Rzehak); Loeblich and Tappan, p. 161, pl. 609, figs. 8-10
- 1991 *Neoconorbina terquemi* (Rzehak); Cimerman and Langer, p. 66, pl. 70, figs. 5-7
- 1993 *Neoconorbina terquemi* (Rzehak); Sgarrella and Moncharmont Zei, p. 218, pl. 17, fig. 3
- 1994 *Neoconorbina terquemi* (Rzehak); Jones, p. 94, pl. 88, figs. 5-8 [cop. Brady, 1884, figs. 5-8]
- 2005 *Neoconorbina terquemi* (Rzehak); Rasmussen, p. 93, pl. 13, figs. 11, 12
- 2006 *Neoconorbina terquemi* (Rzehak); Avsar et al., p. 133, pl. 2, fig. 16
- 2008 *Neoconorbina terquemi* (Rzehak); Abu-Zied et al., p. 52, pl. 2, figs. 26, 27
- 2009 *Neoconorbina terquemi* (Rzehak); Milker et al., p. 218, pl. 3, figs. 16, 17

**Remarks:** The wall is calcareous. The test is circular in outline and low conical in section. Chambers are trochospirally enrolled, increasing in breadth as added. The spiral side is evolute with long and crescentic chambers. The umbilical side is involute with subtriangular chambers. Sutures are slightly backward curved and depressed on both sides. The umbilicus is open. The aperture is an elongate, interiomarginal and extraumbilical slit on the umbilical side. The spiral side is coarsely perforate along the chamber margins, and cham-

bers are finely perforate. The umbilical side is coarsely perforate.

Genus PLANODISCORBIS Bermudez, 1952

*Planodiscorbis rarescens* (Brady, 1884)

Figure 22.7-8

- 1884 *Discorbis rarescens* Brady: p. 651, pl. 90, figs. 2, 3
- 1915 *Discorbis rarescens* Brady; Cushman, p. 20, pl. 7, fig. 4 [cop. Brady, 1884, fig. 2]
- 1958 *Planodiscorbis rarescens* (Brady); Todd, p. 196, pl. 1, fig. 17
- 1994 *Planodiscorbis rarescens* (Brady); Jones, p. 94, pl. 90, figs. 2, 3 [cop. Brady, 1884, figs. 2, 3]

**Remarks:** The wall is calcareous and finely and densely perforate on both sides. The test is trochospiral and planoconvex. Chambers are broad, low and crescentic on the convex spiral side, and are subtriangular and overlapping each other on the flattened umbilical side. Early chambers have thickened sutures, flush with the surface on the spiral side. Later sutures are depressed and oblique. Sutures are curved, radial and depressed on the umbilical side. The periphery is carinate. The umbilicus is closed. The aperture is a low interiomarginal arch at the base of the final chamber. The test surface is smooth.

Genus ROSALINA d'Orbigny, 1826

*Rosalina anomala* Terquem, 1875

Figure 22.9-10

- 1858 *Rotalina concamerata* Williamson; p. 52, pl. 4, figs. 104, 105
- 1875 *Rosalina anomala* Terquem: p. 438, pl. 5, fig. 1
- 1931 *Discorbis globularis* (d'Orbigny); Cushman, p. 22, pl. 4, fig. 9
- 1973 *Rosalina anomala* Terquem; Haynes, p. 150, pl. 17, figs. 1-3; pl. 19, fig. 2; text-fig. 28
- 2003 *Rosalina anomala* Terquem; Murray, p. 26, fig. 9, no. 9, 10
- 2006 *Rosalina anomala* Terquem; Wisshak and Rueggerberg, p. 4, fig. 3J, K
- 2009 *Rosalina floridensis* (Cushman); Milker et al., p. 218, pl. 3, figs. 18, 19

**Remarks:** The wall is calcareous. The test is trochospiral and planoconvex. Chambers rapidly increasing in size as added. Chambers are crescentic and densely perforate and sutures are back-

ward curved and slightly elevated on the spiral side. Chambers are imperforate and subtriangular, with a flap at their base, on the umbilical side. The periphery is subacute. The primary aperture is an interiomarginal and extraumbilical arched slit, bordered by a lip. The test surface is smooth.

*Rosalina bradyi* Cushman, 1915

Figure 22.11-14

- 1884 *Discorbina globularis* d'Orbigny; Brady, p. 634, pl. 86, fig. 8
- 1915 *Rosalina globularis* (d'Orbigny) var. *bradyi* Cushman: p. 12, pl. 8, fig. 1
- 1987 *Rosalina bradyi* Cushman; Jorissen, p. 41, pl. 3, fig. 6
- 1991 *Rosalina bradyi* Cushman; Cimerman and Langer, p. 66, pl. 71, figs. 1-5
- 1993 *Rosalina bradyi* Cushman; Hottinger, Halicz and Reiss, p. 110, pl. 142, fig. 12; pl. 143, figs. 1-6
- 1994 *Rosalina bradyi* Cushman; Jones, p. 93, pl. 86, fig. 8 [cop. Brady, 1884, fig. 8]
- 2005 *Rosalina bradyi* Cushman; Debenay et al., p. 336 pl. 3, figs. 21, 22
- 2006 *Rosalina bradyi* Cushman; Avsar et al., p. 133, pl. 2, figs. 13, 14
- 2008 *Rosalina bradyi* Cushman; Abu-Zied et al., p. 52, pl. 2, figs. 28, 29

**Remarks:** The wall is calcareous. The test is low trochospiral with a rounded periphery. The spiral side is evolute and weakly convex with crescentic and densely and coarsely perforate chambers. Pores can be surrounded by weak polygonal ridges on which pseudospines are present in the adult stage. The umbilical side is evolute with triangular and imperforate chambers, strongly increasing in size as added and overlapping each other. The umbilicus is open. Sutures are depressed and backward curved on the spiral side. The primary aperture is an interiomarginal, extraumbilical arched slit, extending from the periphery to the umbilicus, and is provided with a thickened lip.

*Rosalina globularis* d'Orbigny, 1826

Figure 22.15-16

- 1826 *Rosalina globularis* d'Orbigny: p. 271, pl. 13, figs. 1-4
- 1988 *Rosalina globularis* d'Orbigny; Loeblich and Tappan, p. 161, pl. 610, figs. 1-5; pl. 611, figs. 1-3

2005 *Rosalina globularis* d'Orbigny; Rasmussen, p. 94, pl. 14, fig. 1

**Remarks:** The test is calcareous, hyaline and densely perforate on both sides. The test is planoconvex to concavoconvex with a rounded periphery. The spiral side is convex, the umbilical side is flattened to concave with a depressed umbilical region. About five inflated chambers are visible in the final whorl on the spiral side. Chambers are subtriangular on the umbilical side. Sutures are depressed and backward curved on the spiral side and nearly radial and oblique on the umbilical side. The aperture is an interiomarginal, extraumbilical elongate slit, extending into the open umbilicus. The test surface is smooth.

*Rosalina macropora* (Hofker, 1951a)  
Figure 22.17-18

- 1951a *Discopulvinulina macropora* Hofker: p. 460, figs. 312, 313
- 1960 *Discopulvinulina macropora* Hofker; Hofker, p. 253, pl. D, fig. 122
- 1991 *Rosalina macropora* (Hofker); Cimerman and Langer, p. 67, pl. 71, figs. 6, 7
- 1993 *Rosalina bradyi* (Cushman); Sgarrella and Moncharmont Zei, p. 218, pl. 17, figs. 4, 5
- 1995 *Rosalina bradyi* (Cushman); Coppa and Di Tuoro, p. 168, pl. 2, figs. 12, 13
- 2004 *Rosalina macropora* (Hofker); Fiorini, p. 50, pl. 1, figs. 14, 15
- 2005 *Rosalina macropora* (Hofker); Rasmussen, p. 95, pl. 14, figs. 3, 4
- 2009 *Rosalina macropora* (Hofker); Milker et al., p. 218, pl. 3, fig. 20

**Remarks:** The wall is calcareous. The test is low trochospiral and nearly planoconvex. The spiral side is evolute and slightly convex with crescentic and coarsely and densely perforate chambers and thickened and elevated sutures that are finely perforate. The umbilical side is involute with backward curved sutures that are flush with the surface. Chambers are subtriangular and partly finely perforate on the umbilical side. The periphery is carinate and imperforate. The aperture is an interiomarginal, extraumbilical arched slit.

*Rosalina* sp. 1  
Figure 22.19-21

1993 cf. *Rosalina* sp. A; Hottinger, Halicz and Reiss, p. 112, pl. 145, figs. 1-4

2009 *Rosalina* sp. 5; Milker et al., p. 216, pl. 2, fig. 21

**Remarks:** The wall is calcareous. The test is low trochospiral. The spiral side is slightly convex and evolute, the umbilical side is involute and slightly concave. The test shape is often irregular. Six to seven coarsely and densely perforate and crescentic chambers are visible in the adult coil on the spiral side, rapidly increasing in size as added. Chambers are subtriangular on the umbilical side and provided with an umbilical flap at the base. Later chambers can be coarsely perforate. Sutures are thickened, backward curved on the spiral side and depressed and curved on the umbilical side. The aperture is an interiomarginal, extraumbilical low arch with a distinct lip.

Genus SPIRORBINA Sellier de Civrieux, 1977  
*Spirorbina?* sp. 1  
Figure 22.22-23

**Remarks:** The wall is calcareous and finely perforate on the spiral side. The umbilical side is imperforate or has a few large pores parallel to the sutures. The test is circular in outline, low trochospiral and planoconvex. The spiral side is weakly convex and evolute with one and a half whorls of broad and low semilunate chambers. Six to seven chambers are visible in the final whorl. Sutures are backward curved and flush with the surface on the spiral side, except for the suture of the final chamber that is depressed. The umbilical side is flattened and partially involute with large pustules in the umbilical region. The sutures are backward curved, flush and obscure. The periphery is subacute. The aperture is a low slit, extending from near the periphery along the umbilical chamber margin to the preceding suture and then continuing along the spiral suture. The species almost resemble the morphological features described for *Spirorbina* in Loeblich and Tappan (1988) except for the large observed pustules in the umbilical region. Further study is necessary for a correct identification.

Genus TRETOMPHALUS Moebius, 1880  
*Tretomphalus concinnus* (Brady, 1884)  
Figure 22.24-25

- 1884 *Discorbina concinna* Brady: p. 646, pl. 90, fig. 7
- 1915 *Discorbis concinna* (Brady); Cushman, p. 16, pl. 5, fig. 3 [cop. Brady, 1884, fig. 7]
- 1988 *Tretomphaloides concinnus* (Brady); Loeblich and Tappan, p. 162, pl. 613, figs. 1-6

- 1991 *Tretomphalus bulloides* (d'Orbigny); Cimerman and Langer, p. 67, pl. 72, figs. 3-5
- 1993 *Tretomphalus concinnus* (Brady); Sgarrella and Moncharmont Zei, p. 219, pl. 17, figs. 11, 12
- 1994 *Tretomphalus concinnus* (Brady); Jones, p. 96, pl. 90, fig. 7 [cop. Brady, 1884, fig. 7]

**Remarks:** The wall is calcareous. The test is sub-circular in outline, low trochospiral and flattened in the benthic stage and has a floating chamber in the planktonic stage. The spiral side is evolute with densely perforate chambers and an imperforate proloculus. Sutures are slightly sinuate, backward curved and depressed on the spiral side. Chambers rapidly increasing in length as added. The umbilical side of the benthic stage is involute and slightly concave with subtriangular and perforate chambers having basal flaps that extend into the open umbilicus. The periphery is subacute in the benthic stage. The aperture is an interiomarginal, extraumbilical slit, partly bordered by a lip. The test surface is smooth.

*Tretomphalus* sp. 1  
Figure 23.1-2

**Remarks:** The wall is calcareous. The test is sub-circular in outline, low trochospiral and flattened in the benthic stage and has a floating chamber in the planktonic stage. The spiral side is evolute with imperforate chambers and periphery. Sutures are slightly sinuate, backward curved and depressed. Chambers rapidly increase in length as added. The umbilical side of the benthic stage is involute and slightly concave with subtriangular and perforate chambers, having basal flaps, extending into the umbilical region. The periphery is subacute in the benthic stage. The aperture is an interiomarginal, extraumbilical slit, bordered by an everted lip. The test surface is smooth.

Family SPHAERODINIDAE Cushman, 1927  
Genus SPHAERODINA d'Orbigny, 1826  
*Sphaeroidina bulloides* d'Orbigny, 1826  
Figure 23.3-4

- 1826 *Sphaeroidina bulloides* d'Orbigny: p. 267
- 1832 *Sphaeroidina bulloides* d'Orbigny; Deshayes, p. 966
- 1884 *Sphaeroidina bulloides* d'Orbigny; Brady, p. 620, pl. 84, figs. 1, 2
- 1914 *Sphaeroidina bulloides* d'Orbigny; Cushman, p. 18, pl. 12, fig. 1

- 1960 *Sphaeroidina bulloides* d'Orbigny; Hofker, p. 251, pl. D, fig. 107
- 1988 *Sphaeroidina bulloides* d'Orbigny; Loeblich and Tappan, p. 162, pl. 617, figs. 1-6
- 1990 *Sphaeroidina bulloides* d'Orbigny; Hasegawa et al., p. 477, pl. 4, figs. 10, 11
- 1994 *Sphaeroidina bulloides* Deshayes; Jones, p. 91, pl. 84, figs. 1, 2 [cop. Brady, 1884, figs. 1, 2]
- 2005 *Sphaeroidina bulloides* d'Orbigny; Rasmussen, p. 95, pl. 14, fig. 11

**Remarks:** The wall is calcareous with a smooth and minutely perforate surface. The test is sub-globular and spherical with a few inflated chambers. Sutures are depressed. The aperture is arched, semicircular and nearly closed by a broad flap.

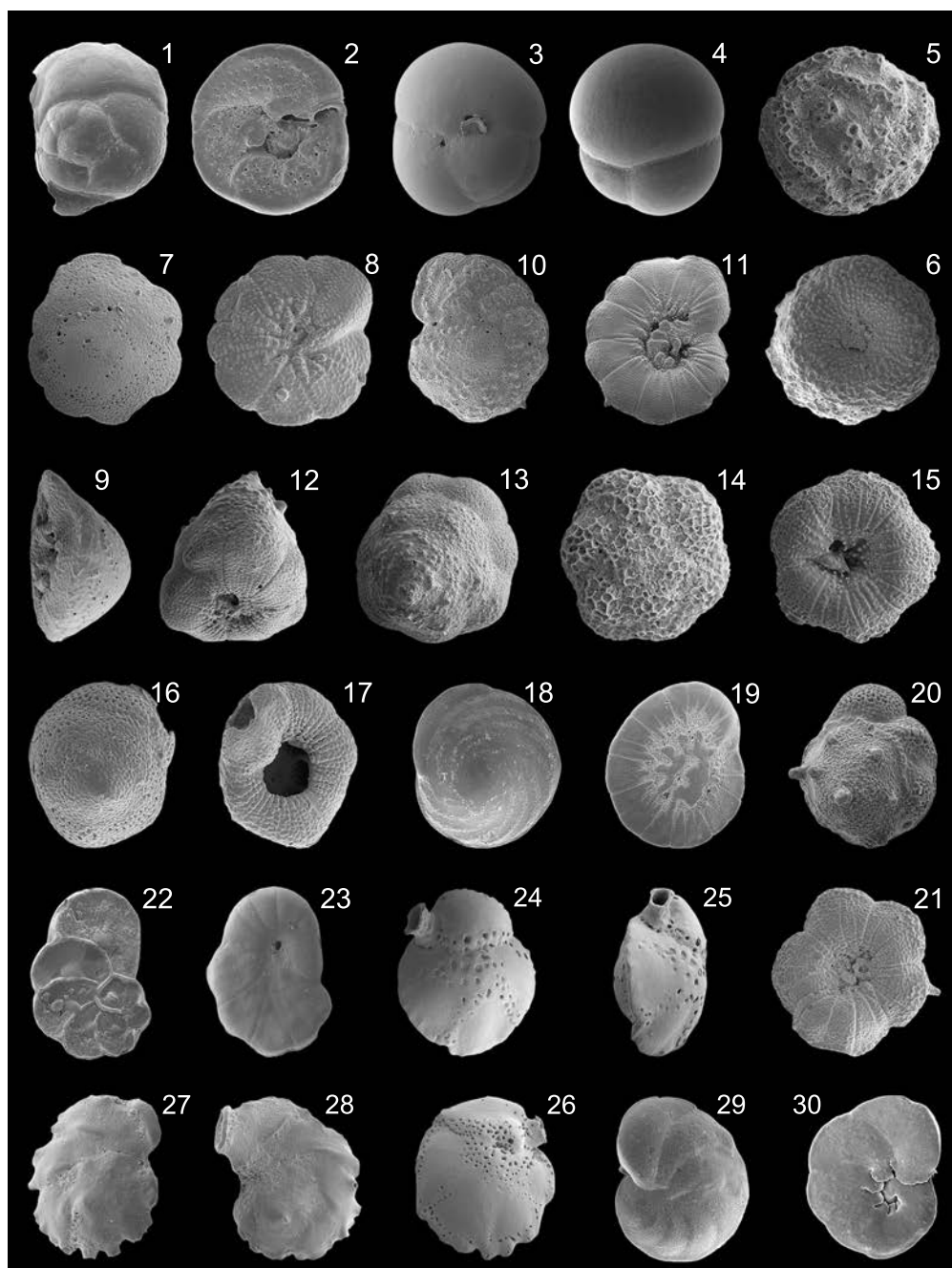
Family GLABRATELLIDAE Loeblich and Tappan, 1964

Genus CONORBELLA Hofker, 1951a  
*Conorbella pulvinata* (Brady, 1884)  
Figure 23.5-6

- 1884 *Discorbina pulvinata* Brady: p. 650, pl. 88, fig. 10
- 1915 *Discorbina pulvinata* Brady; Cushman, p. 19, pl. 7, fig. 2 [text-fig. 22: cop. Brady, 1884, fig. 10]
- 1988 *Conorbella pulvinata* (Brady); Loeblich and Tappan, p. 163, pl. 618, figs. 4-6
- 1991 *Conorbella pulvinata* (Brady); Cimerman and Langer, p. 68, pl. 73, figs. 4-7
- 1994 *Glabratella pulvinata* (Brady); Jones, p. 94, pl. 88, fig. 10 [cop. Brady, 1884, fig. 10]
- 2005 *Glabratella pulvinata* (Brady); Rasmussen, p. 96, pl. 14, figs. 12, 13

**Remarks:** The test is circular in outline, trochospiral and planoconvex. The spiral side is convex with crescentic chambers, increasing in size as added and having a rugose surface. The umbilical region is depressed on the umbilical side. Sutures are thickened, oblique, depressed and curved on the spiral side and flush and radial on the disc-like umbilical side. The umbilical side is ornamented with radially arranged pustules. The wall is calcareous. The aperture is an interiomarginal and umbilical slit.

Genus DISCORBINOIDES Saidova, 1975  
*Discorbinoides* sp. 1  
Figure 23.7-9



**FIGURE 23.** 1 *Tretomphalus* sp. 1, 990x, spiral side; 2 *Tretomphalus* sp. 1, 1060x, umbilical side; 3 *Sphaeroidina bulloides* d'Orbigny, 345x, side view; 4 *S. bulloides* d'Orbigny, 589x, side view; 5 *Conorbella pulvinata* (Brady), 936x, spiral side; 6 *C. pulvinata* (Brady), 931x, umbilical side; 7 *Discorbinooides* sp. 1, 657x, spiral side; 8 *Discorbinooides* sp. 1, 556x, umbilical side; 9 *Discorbinooides* sp. 1, 493x, peripheral side; 10 *Discorbinooides?* sp. 2, 466x, spiral side; 11 *Discorbinooides?* sp. 2, 481x, umbilical side; 12 *Glabratella erecta* (Sidebottom), 699x, oblique lateral view; 13 *G. erecta* (Sidebottom), 760x, top view; 14 *Glabratella hexacamerata* Seiglie and Bermudez, 907x, spiral side; 15 *G. hexacamerata* Seiglie and Bermudez, 727x, umbilical side; 16 *Glabratella patelliformis* (Brady), 1230x, spiral side; 17 *G. patelliformis* (Brady), 1020x, umbilical side; 18 *Planoglabratella opercularis* (d'Orbigny), 386x, spiral side; 19 *P. opercularis* (d'Orbigny), 555x, umbilical side; 20 *Schackoinella imperatoria* (d'Orbigny), 1090x, spiral side; 21 *S. imperatoria* (d'Orbigny), 755x, umbilical side; 22 *Heronallenia lingulata* (Burrows and Holland), 543x, spiral side; 23 *H. lingulata* (Burrows and Holland), 570x, umbilical side; 24 *Siphonina reticulata* (Czjzek), 633x, side view; 25 *S. reticulata* (Czjzek), 474x, peripheral view; 26 *S. reticulata* (Czjzek), 586x, side view; 27 *Siphoninella soluta* (Brady), 1020x, side view; 28 *S. soluta* (Brady), 925x, side view; 29 *Discorbinella bertheloti* (d'Orbigny), 603x, spiral side; 30 *D. bertheloti* (d'Orbigny), 500x, umbilical side.

**Remarks:** The wall is calcareous and densely and finely perforate on the spiral side. The test is low conical, trochospiral and nearly planoconvex. The spiral side is convex with three to four whorls. The umbilical side is flattened with a depressed umbilical region. Chambers are crescentic on the spiral side and subtriangular on the umbilical side. Sutures are thickened, oblique and flush with the surface on the spiral side and depressed, radial and curved on the umbilical side. The periphery is angular. The aperture is a low interiomarginal, extraumbilical slit at the periphery. Radiate grooves alternate with radiate fine pustules on the umbilical side. In the umbilical region, larger pustules are present.

*Discorbinoidea?* sp. 2  
Figure 23.10-11

**Remarks:** The wall is calcareous. The test is low conical, trochospiral and nearly planoconvex. Three whorls are visible on the spiral side. The chambers of the final whorl on the spiral side are crescentic and perforate. Sutures are thickened, oblique and flush with the surface to slightly depressed on the spiral side and radial, curved and depressed on the umbilical side. The umbilical side is ornamented with pustules and granules in the umbilical part and with radial striae, extending from the periphery to the umbilical region. The periphery is angular and a few short spines may be present there. The aperture is an interiomarginal slit near the peripheral margin on the final chamber. The test surface of the spiral side is rough.

Genus GLABRATHELLA Dorreen, 1948  
*Glabratella erecta* (Sidebottom, 1908)  
Figure 23.12-13

- 1908 *Discorbina erecta* Sidebottom: p. 16, pl. 5, figs. 6, 7
- 1991 *Conorbella erecta* (Sidebottom); Cimerman and Langer, p. 68, pl. 72, figs. 6-8
- 1993 *Glabratella erecta* (Sidebottom); Sgarrella and Moncharmont Zei, p. 220, pl. 18, figs. 7, 8

**Remarks:** The wall is calcareous. The test is high trochospiral and triangular in peripheral view. Chambers on the spiral side are inflated and globular, increasing size as added. Sutures are curved and depressed on the spiral side. The umbilical side is flattened with a depressed umbilical region. The periphery is subrounded. The aperture is a low interiomarginal slit. The spiral side is ornamented with pustules. The umbilical side is ornamented

with radial striae and pustules. The test surface is rough.

*Glabratella hexacamerata* Seiglie and Bermudez, 1965  
Figure 23.14-15

- 1965 *Glabratella hexacamerata* Seiglie and Bermudez: p. 31, pl. 1, figs. 6, 7
- 1967 *Glabratella hexacamerata* Seiglie and Bermudez; Seiglie, p. 107
- 1993 *Glabratella hexacamerata* Seiglie and Bermudez; Sgarrella and Moncharmont Zei, p. 222, pl. 18, figs. 9, 10

**Remarks:** The wall is calcareous. The test is low trochospiral and planoconvex. Chambers on the spiral side are inflated and globular, increasing in size as added. Sutures are curved and depressed on the spiral side. The umbilical side is flattened with a depressed umbilical region. The periphery is subrounded. The aperture is a low interiomarginal slit. The spiral side has a rugose surface. The umbilical side is ornamented with radial striae and pustules.

*Glabratella patelliformis* (Brady, 1884)  
Figure 23.16-17

- 1884 *Discorbis patelliformis* Brady: p. 647, pl. 88, fig. 3
- 1915 *Discorbis patelliformis* Brady; Cushman, p. 17, pl. 5, fig. 5 [text-fig. 19: cop. Brady 1884, fig. 3]
- 1991 *Glabratella patelliformis* (Brady); Cimerman and Langer, p. 68, pl. 73, figs. 1-3
- 1994 *Glabratella patelliformes* (Brady); Jones, p. 94, pl. 88, fig. 3 [cop. Brady, 1884, fig. 3]

**Remarks:** The wall is calcareous. The test is trochospiral, planoconvex and subtriangular in peripheral view. Chambers are crescentic, increasing size as added, on the convex spiral side. Sutures are curved and flush with the surface on the spiral side. The umbilical side is flattened with a depressed umbilical region. The periphery is subrounded. The aperture is a low interiomarginal slit. The spiral side has a rough surface and is perforate. The umbilical side is ornamented with radial pustules.

Genus PLANOGLABRATHELLA Seiglie and Bermudez, 1965  
*Planoglabratella opercularis* (d'Orbigny, 1826)  
Figure 23.18-19

- 1826 *Rosalina opercularis* d'Orbigny: p. 271, no. 7
- 1988 *Planoglabratella opercularis* (d'Orbigny); Loeblich and Tappan, p. 164, pl. 621, figs. 21-23
- 1993 *Planoglabratella opercularis* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 222, pl. 19, figs. 4, 5
- 2009 *Planoglabratella opercularis* (d'Orbigny); Avsar et al., p. 135, pl. 2, figs. 15, 16

**Remarks:** The wall is calcareous and perforate along the sutures on the spiral side. The test is circular in outline, trochospiral and planoconvex with a subangular periphery. Chambers are narrow, elongate and numerous. Sutures are strongly curved and flush with the surface on both sides. The aperture is an interiomarginal slit near the peripheral margin of the final chamber. The spiral side has a smooth surface. The umbilical side is ornamented with granules in the closed umbilical part and with radial striae, extending from the periphery to the umbilical region.

Genus SCHACKOINELLA Weinhandl, 1958  
*Schackoinella imperiaria* (d'Orbigny, 1846)  
Figure 23.20-21

- 1846 *Rosalina imperiaria* d'Orbigny: p. 176, pl. 10, figs. 16-18
- 1991 *Conorbella imperiaria* (d'Orbigny); Cimerman and Langer, p. 68, pl. 72, figs. 9-11
- 1993 *Schackoinella imperiaria* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 222, pl. 18, figs. 5, 6

**Remarks:** The wall is calcareous and finely perforate. The test is trochospiral, planoconvex and conical in peripheral view. Chambers are crescentic on the spiral side, gradually increasing in size as added. Sutures are curved and depressed on the spiral side. Each chamber is ornamented with a spine except for those of the final whorl. The umbilical side is ornamented with radial striae, separating radial rows of fine granules. The aperture is an interiomarginal and umbilical slit. The test surface is rough.

Family HERONALLENIIDAE Loeblich and Tappan, 1986

Genus HERONALLENIA Chapman and Parr, 1931

*Heronallenia lingulata* (Burrows and Holland, in Jones 1895)  
Figure 23.22-23

- 1884 *Discorbina biconcava* Parker and Jones; Brady, p. 653, pl. 91, fig. 3
- 1895 *Discorbina lingulata* Burrows and Holland: type reference Jones, 1895, pl. 7, fig. 33
- 1884 *Discorbina biconcava* Parker and Jones; Brady, p. 653, pl. 91, fig. 3
- 1895 *Discorbina lingulata* Burrows and Holland: type reference Jones 1895, pl. 7, fig. 33
- 1993 *Heronallenia* sp. 1; Cimerman and Langer, p. 69, pl. 73, figs. 9-10
- 1994 *Heronallenia lingulata* (Burrows and Holland); Jones, p. 96, pl. 91, fig. 3 [cop. Brady, 1884, fig. 3]
- 2005 *Heronallenia lingulata* (Burrows and Holland); Rasmussen, p. 96, pl. 14, figs. 16, 17

**Remarks:** The wall is calcareous and finely perforate. The test is very trochospirally coiled, with one to two widening coils, and auriculate in outline. Chambers are crescentic on the spiral side, rapidly increasing in size as added. Chambers are more inflated and ornamented with radial grooves on the umbilical side. Sutures are thickened, elevated and backward curved on the spiral side. The primary aperture is a low interiomarginal and umbilical arch.

Family SIPHONINIDAE Cushman, 1927  
Subfamily SIPHONININAE Cushman, 1927  
Genus SIPHONINA Reuss, 1850  
*Siphonina reticulata* (Czjzek, 1848)  
Figure 23.24-26

- 1848 *Rotalina reticulata* Czjzek: p. 145, pl. 8, figs. 7-9
- 1931 *Siphonina reticulata* (Czjzek); Cushman, p. 68, pl. 14, fig. 1
- 1958 *Siphonina reticulata* (Czjzek); Parker, p. 273, pl. 4, fig. 25
- 1988 *Siphonina reticulata* (Czjzek); Loeblich and Tappan, p. 164, pl. 624, figs. 4-6
- 1990 *Siphonina reticulata* (Czjzek); Hasegawa et al., p. 477, pl. 4, figs. 12-14
- 1991 *Siphonina reticulata* (Czjzek); Cimerman and Langer, p. 69, pl. 73, figs. 11-13
- 1993 *Siphonina reticulata* (Czjzek); Sgarrella and Moncharmont Zei, p. 222, pl. 19, figs. 7, 8
- 2004 *Siphonina reticulata* (Czjzek); Chendes et al., p. 76, pl. 2, fig. 13

2005 *Siphonina reticulata* (Czjzek); Rasmussen, p. 97, pl. 14, fig. 18

2009 *Siphonina reticulata* (Czjzek); Avsar et al., p. 135, pl. 2, figs. 17, 18

**Remarks:** The wall is calcareous and coarsely and irregularly perforate. The trochospiral test is ovate in outline, lenticular and slightly unequally biconvex in peripheral view. A few subtriangular chambers are visible. Sutures are oblique and thickened on spiral side, radial and slightly depressed on the umbilical side. The periphery is keeled and partly fimbriate. The elliptical aperture, at the base of the final chamber, is on a short neck, and bordered by a lip. The test surface is smooth.

Genus SIPHONINELLA Cushman, 1927

*Siphoninella soluta* (Brady, 1884)

Figure 23.27-28

1884 *Truncatulina soluta* Brady: p. 670, pl. 96, fig. 4

1988 *Siphoninella soluta* (Brady); Loeblich and Tappan, p. 165, pl. 624, figs. 7-9 [cop. Brady, 1884, fig. 4]

1994 *Siphoninella soluta* (Brady); Jones, p. 100, pl. 96, fig. 4 [cop. Brady, 1884, fig. 4]

**Remarks:** The wall is calcareous. The test is trochospirally coiled in the early stage and later uncoiled and uniserial. Sutures are backward curved on the spiral side, radial and depressed on the umbilical side. The periphery is carinate and fimbriate. The slit-like aperture is on a neck and bordered by a rim. The test surface is smooth.

Family DISCORBINELLIDAE Sigal,  
in Piveteau 1952

Subfamily DISCORBINELLINAE Sigal,  
in Piveteau 1952

Genus DISCORBINELLA Cushman and Martin,  
1935

*Discorbinella bertheloti* (d'Orbigny, 1839b)

Figure 23.29-30

1839b *Rosalina bertheloti* d'Orbigny: p. 135, Pl. 1, figs. 28-30

1988 *Discorbinella bertheloti* (d'Orbigny); Loeblich and Tappan, p. 166, pl. 630, figs. 4-6

1993 *Discorbinella bertheloti* (d'Orbigny); Hottinger, Halicz and Reiss, p. 114, pl. 150, figs. 1-4

1993 *Discorbinella bertheloti* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 216, pl. 16, figs. 11, 12

2004 *Discorbinella bertheloti* (d'Orbigny); Chen-des et al., p. 76, pl. 3, fig. 3

2005 *Discorbinella bertheloti* (d'Orbigny); Rasmussen, p. 98, pl. 14, figs. 25, 26

2006 *Discorbinella bertheloti* (d'Orbigny); Avsar et al., p. 133, pl. 2, fig. 15

2009 *Discorbinella bertheloti* (d'Orbigny); Avsar et al., p. 135, pl. 2, figs. 19, 20

2009 *Discorbinella bertheloti* (d'Orbigny); Milker et al., p. 218, pl. 3, figs. 1, 2

**Remarks:** The wall is calcareous and densely and finely perforate on both sides. The test is ovate in outline, planoconvex and trochospiral. Chambers are low and broad, increasing in size as added. Sutures are backward curved, more thickened and flush with the surface in the early stage on the spiral side, later thinner and depressed on both sides. The umbilical side is flattened, and chambers have an umbilical flap at the base. The periphery is carinate. The aperture is an interiomarginal arch at the periphery and bordered by a lip. The test surface is smooth.

Family PLANULINIDAE Bermudez, 1952

Genus HYALINEA Hofker, 1951a

*Hyalinea balthica* (Schroeter, 1783)

Figure 24.1-2

1783 *Nautilus balthicus* Schroeter: p. 20, pl. 1, fig. 2

1884 *Operculina ammonoides* Gronovius, sp., Brady, p. 745, pl. 112, figs. 1, 2

1931 *Anomalina balthica* (Schroeter); Cushman, p. 108, pl. 19, fig. 3

1958 *Hyalinea balthica* (Schroeter); Parker, p. 275, pl. 4, fig. 39

1960 *Hofkerinella baltica* (Schroeter); Hofker, p. 255, pl. E, fig. 137

1988 *Hyalinea balthica* (Schroeter); Loeblich and Tappan, p. 167, pl. 632, figs. 5-8

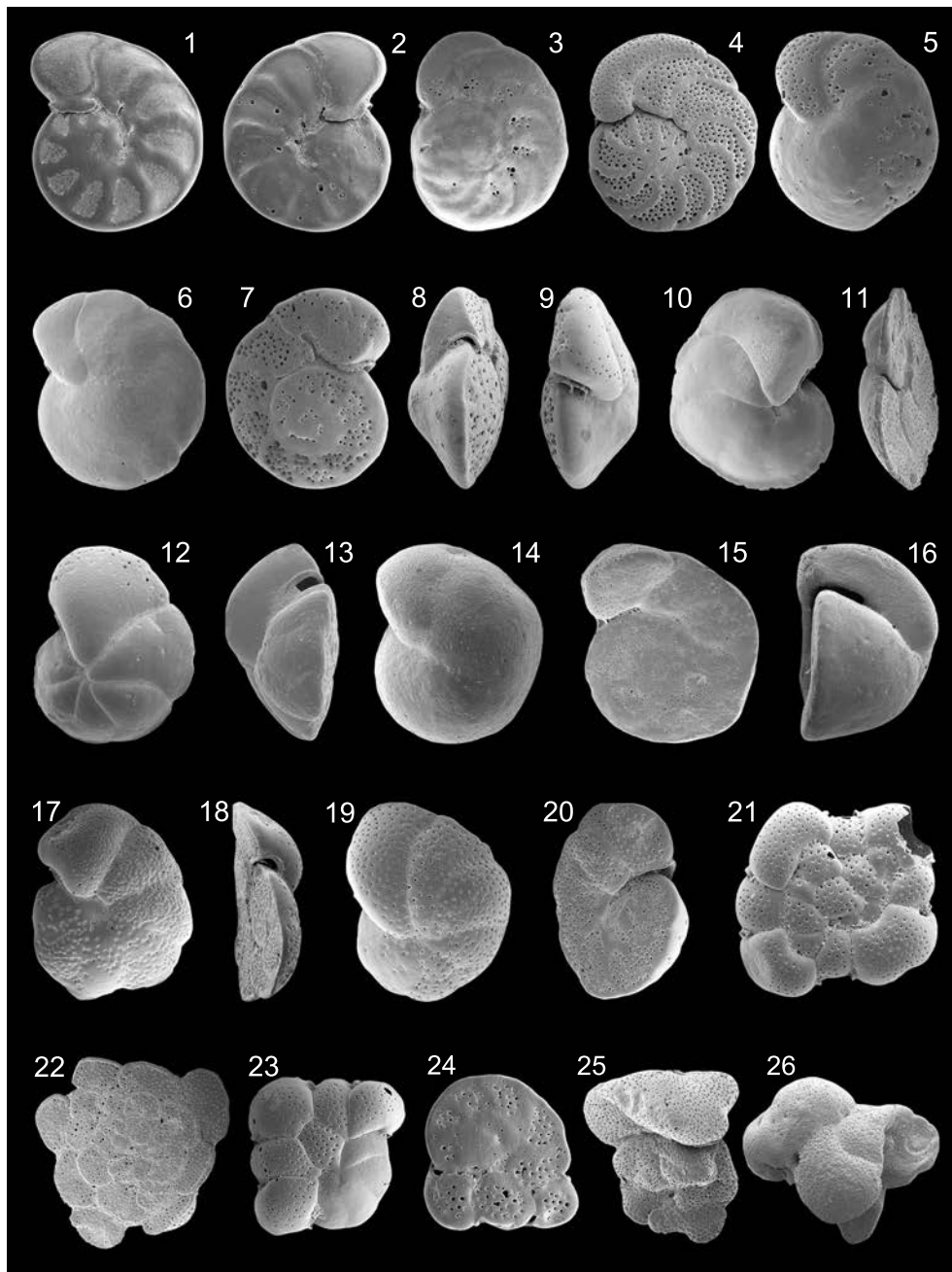
1993 *Hyalinea balthica* (Schroeter); Sgarrella and Moncharmont Zei, p. 234, pl. 22, fig. 12

1994 *Hyalinea balthica* (Schroeter); Jones, p. 110, pl. 112, figs. 1, 2 [cop. Brady, 1884, figs. 1, 2]

2002 *Hyalinea balthica* (Schroeter); Kaminski et al., p. 174, pl. 3, fig. 13

2003 *Hyalinea balthica* (Schroeter); Murray, p. 24, fig. 8, no. 8-10





**FIGURE 24.** 1 *Hyalinea balthica* (Schroeter), 493x, spiral side; 2 *H. balthica* (Schroeter), 468x, umbilical side; 3 *Planulina ariminensis* d'Orbigny, 263x, spiral side; 4 *P. ariminensis* d'Orbigny, 257x, umbilical side; 5 *Cibicoides pseudoungerianus* (Cushman), 531x, umbilical side; 6 *C. pseudoungerianus* (Cushman), 394x, umbilical side; 7 *C. pseudoungerianus* (Cushman), 409x, spiral side; 8 *C. pseudoungerianus* (Cushman), 373x, peripheral view; 9 *C. pseudoungerianus* (Cushman), 306x, peripheral view; 10 *Cibicides* cf. *mayori* (Cushman), 589x, umbilical side; 11 *C.* cf. *mayori* (Cushman), 674x, peripheral view; 12 *Cibicides pseudolobatulus* Perelis and Reiss, 528x, umbilical side; 13 *C. pseudolobatulus* Perelis and Reiss, 1060x, peripheral view; 14 *Cibicides refulgens* de Montfort, 246x, umbilical side; 15 *C. refulgens* de Montfort, 284x, spiral side; 16 *C. refulgens* de Montfort, 283x, peripheral view; 17 *Lobatula lobatula* (Walker and Jacob), 244x, umbilical side; 18 *L. lobatula* (Walker and Jacob), 184x, peripheral view; 19 *L. lobatula* (Walker and Jacob), 500x, umbilical side; 20 *L. lobatula* (Walker and Jacob), 455x, oblique peripheral view; 21 *Planorbulina mediterraneensis* d'Orbigny, 580x, unattached side; 22 *P. mediterraneensis* d'Orbigny, 767x, unattached side; 23 *P. mediterraneensis* d'Orbigny, 790x, unattached side, juvenile specimen; 24 *P. mediterraneensis* d'Orbigny, 909x, unattached side, juvenile specimen; 25 *Cibicidella variabilis* (d'Orbigny), 193x, spiral view; 26 *C. variabilis* (d'Orbigny), 314x, umbilical side

- 2005 *Hyalinea balthica* (Schroeter); Rasmussen, p. 98, pl. 14, figs. 27, 28
- 2006 *Hyalinea balthica* (Schroeter); Avsar et al., p. 133, pl. 2, fig. 17
- 2008 *Hyalinea balthica* (Schroeter); Abu-Zied et al., p. 52, pl. 2, fig. 30
- 2009 *Hyalinea balthica* (Schroeter); Frezza and Carboni, p. 57, pl. 2, fig. 18

**Remarks:** The wall is calcareous and finely perforate. The test is discoidal in outline, nearly planispiral and slightly evolute on both sides. Up to 12 chambers are visible in the final whorl. Chambers are crescentic and provided with an umbilical flap on the umbilical side. Sutures are backward curved and elevated on both sides. The periphery is angular. The aperture is a low, equatorial and interiomarginal arch, extending as a slit along the spiral sutures on both sides, and bordered by a lip. The test surface is smooth.

Genus PLANULINA d'Orbigny, 1826

*Planulina ariminensis* d'Orbigny, 1826

Figure 24.3-4

- 1826 *Planulina ariminensis* d'Orbigny: p. 280, pl. 14, figs. 1-3
- 1985 *Planulina ariminensis* d'Orbigny; Hermelin and Scott, p. 214, pl. 3, figs. 9-11
- 1988 *Planulina ariminensis* d'Orbigny; Loeblich and Tappan, p. 167, pl. 633, figs. 1-4
- 1990 *Planulina ariminensis* d'Orbigny; Hasegawa et al., p. 477, pl. 4, figs. 15, 16
- 1993 *Planulina ariminensis* d'Orbigny; Sgarrella and Moncharmont Zei, p. 234, pl. 22, fig. 9
- 2008 *Planulina ariminensis* d'Orbigny; Abu-Zied et al., p. 52, pl. 2, figs. 31, 32

**Remarks:** The wall is calcareous and densely perforate on the umbilical side and more loosely perforate on the spiral side. The test is discoidal in outline and low trochospiral. The spiral side is evolute, and the umbilical side is slightly evolute. Chambers are broad and low. Sutures are thickened, elevated, backward curved and imperforate on both sides. The periphery is truncate with a keel. The aperture is an equatorial and interiomarginal slit, extending to the umbilical side, and is bordered by a lip.

Family CIBICIDIDAE Cushman, 1927

Subfamily CIBICIDINAE Cushman, 1927

Genus CIBICIDOIDES Saidova, 1975

*Cibicoides pseudoungerianus* (Cushman, 1922b)

Figure 24.5-9

- 1922b *Truncatulina pseudoungeriana* Cushman: p. 96, pl. 10, fig. 9
- 1931 *Cibicides pseudoungeriana* (Cushman); Cushman, p. 123, pl. 22, fig. 4
- 1991 *Cibicoides pseudoungerianus* (Cushman); Cimerman and Langer, p. 69, pl. 74, figs. 2, 3
- 2005 *Cibicides ungerianus* (Cushman) "pseudoungerianus type"; Rasmussen, p. 100, pl. 15, figs. 12, 13
- 2009 *Cibicides pseudoungerianus* (Cushman); Milker et al., p. 218, pl. 3, fig. 11
- 2010 *Cibicides pseudoungerianus* (Cushman); Milker, p. 123, pl. 5, figs. 16, 17

**Remarks:** The wall is calcareous and densely and coarsely perforate on the spiral side. It is imperforate, loosely coarsely and/ or finely perforate on the umbilical side. The test is slightly biconvex and subcarinate in peripheral view. Sutures are distinct, thickened, radial and curved on the spiral side and can be slightly raised in the early stage. Sutures are oblique on the umbilical side except the final chambers where sutures are depressed. The aperture is an interiomarginal, extraumbilical arch, extending along the base of the last few chambers on the spiral side, and is bordered by a lip. The test surface is smooth. According to the descriptions and illustrations in Cushman (1931) for *C. pseudoungerianus* and in Rasmussen (2005) for *C. ungerianus*, the test morphology is variable. Our specimens almost resemble some specimens shown as *C. pseudoungerianus* in Cushman (1931) that show as "pseudoungerianus type" in Rasmussen (2005). Our specimens differ from *Cibicoides pachyderma* (Rzehak) due to the thinner carinate periphery and the thinner biconvex test in peripheral view.

Genus CIBICIDES de Montfort, 1808

*Cibicides* cf. *mayori* (Cushman, 1924)

Figure 24.10-11

- 1924 cf. *Truncatulina mayori* Cushman: p. 39, pl. 12, figs. 3, 4
- 1965 cf. *Cibicides mayori* (Cushman); Todd, p. 53, pl. 22, figs. 3, 4
- 1975 cf. *Cibicides(?) mayori* (Cushman); Perelis and Reiss, p. 77, pl. 3, figs. 1-7
- 1993 cf. *Cibicides? mayori* (Cushman); Hottinger, Halicz and Reiss, p. 116, pl. 152, figs. 1-6

**Remarks:** The wall is calcareous and densely perforate on the spiral side. The perforation on the umbilical side is almost restricted to the final chambers. The test is trochospiral and mostly planoconvex. The spiral side is flattened and evolute, the umbilical side is involute and slightly convex. Chambers may be irregularly shaped. The peripheral margin is acute with a thin fringe-like carina. Six to seven chambers are visible in the adult stage. Sutures are backward curved on both sides, limbate on the spiral side and depressed on the umbilical side. On the umbilical side, a small imperforate, umbilical knob may be present. The aperture is an interiomarginal, extraumbilical slit, bordered by a lip.

*Cibicides pseudolobatus* Perelis and Reiss, 1975  
Figure 24.12-13

- 1975 *Cibicides pseudolobatus* Perelis and Reiss: pp. 77-78, pl. 4, figs. 1-7, pl. 5, figs. 1, 2
- 1993 *Cibicides pseudolobatus* Perelis and Reiss; Hottinger, Halicz and Reiss, p. 116, pl. 152, figs. 7-11

**Remarks:** The wall is calcareous. The test is trochospiral and slightly concavoconvex with an evolute and flattened spiral side and an involute and convex umbilical side. Chambers increasing in size as added. Six to eight chambers are visible in the adult coil. Sutures are curved and limbate on the spiral side and radiate, curved and depressed on the umbilical side. The peripheral outline is weakly lobulate for the final chambers with an acute carinate peripheral margin. The aperture is a low interiomarginal, extraumbilical and equatorial opening, bordered by a thick rim, and extending into a supplementary spiral aperture, remaining open in the last few chambers of the spiral side. Both sides are perforate, with a coarser perforation on the spiral side and a finer and lesser dense perforation on the umbilical side. The test surface is smooth.

*Cibicides refulgens* de Montfort, 1808  
Figure 24.14-16

- 1808 *Cibicides refulgens* de Montfort: p. 123
- 1931 *Cibicides refulgens* de Montfort; Cushman, p. 116, pl. 21, fig. 2
- 1988 *Cibicides refulgens* de Montfort; Loeblich and Tappan, p. 167, pl. 634, figs. 1-3
- 1991 *Cibicides refulgens* de Montfort; Cimerman and Langer, p. 70, pl. 75, figs. 5-9
- 2003 *Cibicides refulgens* de Montfort; Murray, p. 21, fig 7, no. 1, 2

- 2004 *Cibicides refulgens* de Montfort; Chendes et al., p. 76, pl. 3, fig. 2
- 2005 *Cibicides refulgens* de Montfort; Rasmussen, p. 100, pl. 15, figs. 7, 8
- 2009 *Cibicides refulgens* de Montfort; Milker et al., p. 218, pl. 3, figs. 9, 10

**Remarks:** The wall is calcareous and finely perforate on both sides. The test is trochospiral and planoconvex with a weak acute and carinate periphery. The umbilical side is convex and the spiral side is flattened to slightly concave. Chambers gradually increasing in size as added. Sutures are backward curved and depressed on the umbilical side, more flush and limbate on the spiral side. The aperture is an interiomarginal, extraumbilical and equatorial opening, extending into a supplementary spiral aperture on the spiral side. The test surface is smooth. Our juvenile specimens resemble those shown by the other authors, while our adult specimens have finer pores on both sides.

Genus LOBATULA Fleming, 1828  
*Lobatula lobatula* (Walker and Jacob, 1798)  
Figure 24.17-20

- 1798 *Nautilus lobatulus* Walker and Jacob: p. 642, pl. 14, fig. 36
- 1846 *Truncatulina lobatula* d'Orbigny; d'Orbigny, p. 168, pl. 9, figs. 18-23
- 1931 *Cibicides lobatula* (Walker and Jacob); Cushman, p. 118, pl. 21, fig. 3
- 1945 *Cibicides lobatulus* (Walker and Jacob); Cushman, p. 288, fig. 21
- 1979 *Cibicidoides lobatulus* (Walker and Jacob); Corliss, p. 10, pl. 3, figs. 7-9
- 1987 *Cibicides lobatulus* (Walker and Jacob); Alberola et al., p. 308, pl. 4, fig. 11
- 1988 *Lobatula lobatula* (Walker and Jacob); Loeblich and Tappan, p. 168, pl. 637, figs. 10-13
- 1991 *Lobatula lobatula* (Walker and Jacob); Cimerman and Langer, p. 71, pl. 75, figs. 1-4
- 1991 *Lobatula lobatulus* (Walker and Jacob); Wollenburg, p. 63, pl. 19, fig. 3
- 1993 *Lobatula lobatulus* (Walker and Jacob); Hottinger, Halicz and Reiss, p. 118, pl. 154, figs. 5-11
- 1993 *Cibicides lobatulus* (Walker and Jacob); Sgarrella and Moncharmont Zei, p. 234, pl. 22,

figs. 10, 11

- 1994 *Cibicides lobatulus* (Walker and Jacob); Jones, p. 97, pl. 92, fig. 10; pl. 93, figs. 1, 4-5
- 1995 *Cibicides lobatulus* (Walker and Jacob); Coppa and Di Tuoro, p. 170, pl. 3, figs. 7, 10
- 2003 *Cibicides lobatulus* (Walker and Jacob); Murray, p. 21, fig. 6, no. 13-15
- 2005 *Cibicides lobatulus* (Walker and Jacob); Rasmussen, p. 99, pl. 15, figs. 4-6
- 2006 *Lobatula lobatula* (Walker and Jacob); Avsar et al., p. 133, pl. 3, figs. 1, 2
- 2008 *Cibicides lobatulus* (Walker and Jacob); Abu-Zied et al., p. 53, pl. 3, figs. 1, 2
- 2009 *Lobatula lobatula* (Walker and Jacob); Frezza and Carboni, p. 55, pl. 1, figs. 18-20
- 2009 *Cibicides lobatulus* (Walker and Jacob); Milker et al., p. 218, pl. 3, figs. 6-8
- 2010 *Cibicides lobatulus* (Walker and Jacob); Milker, p. 122, pl. 5, figs. 14, 15

**Remarks:** The wall is calcareous with a coarsely and uniformly perforation on both sides. The test is trochospiral and planoconvex with an evolute spiral side and an involute umbilical side and can be irregularly arranged. Chambers increasing in size as added. Sutures are raised and backward curved on the spiral side and radial, curved and depressed on the umbilical side. The peripheral margin is lobulate for the final chambers. The periphery is acute and carinate. The aperture is a low interiomarginal and equatorial opening, bordered by a rim, and continuing into a supplementary spiral opening at the base of the last two to three chambers on the spiral side. The test surface is smooth.

Family PLANORBULINIDAE Schwager, 1877

Subfamily PLANORBULININAE Schwager, 1877

Genus PLANORBULINA d'Orbigny, 1826

*Planorbulina mediterranensis* d'Orbigny, 1826

Figure 24.21-24

- 1826 *Planorbulina mediterranensis* d'Orbigny: p. 280, pl. 15, figs. 4-6
- 1846 *Planorbulina mediterranensis* d'Orbigny; d'Orbigny, p. 166, pl. 9, figs. 15-17
- 1931 *Planorbulina mediterranensis* d'Orbigny; Cushman, p. 129, pl. 24, figs. 5-8
- 1958 *Planorbulina mediterranensis* d'Orbigny; Parker, p. 276, pl. 4, fig. 44

- 1960 *Planorbulina mediterranensis* d'Orbigny; Hofker, p. 254, pl. E, figs. 128, 129
- 1988 *Planorbulina mediterranensis* d'Orbigny; Loeblich and Tappan, p. 170, pl. 645, figs. 1-4
- 1991 *Planorbulina mediterranensis* d'Orbigny; Cimerman and Langer, p. 71, pl. 78, figs. 1-8
- 1993 *Planorbulina mediterranensis* d'Orbigny; Sgarrella and Moncharmont Zei, p. 235, pl. 23, fig. 4
- 1995 *Planorbulina mediterranensis* d'Orbigny; Coppa and Di Tuoro, p. 168, pl. 2, figs. 8, 11
- 2004 *Planorbulina mediterranensis* d'Orbigny; Chendes et al., p. 76, pl. 3, fig. 5
- 2004 *Planorbulina mediterranensis* d'Orbigny; Mendes et al., p. 178, pl. 1, fig. 5
- 2005 *Planorbulina mediterranensis* d'Orbigny; Rasmussen, p. 100, pl. 15, fig. 14
- 2006 *Planorbulina mediterranensis* d'Orbigny; Avsar et al., p. 133, pl. 3, fig. 3
- 2009 *Planorbulina mediterranensis* d'Orbigny; Avsar et al., p. 135, pl. 3, figs. 2, 3
- 2009 *Planorbulina mediterranensis* d'Orbigny; Milker et al., p. 218, pl. 3, fig. 16

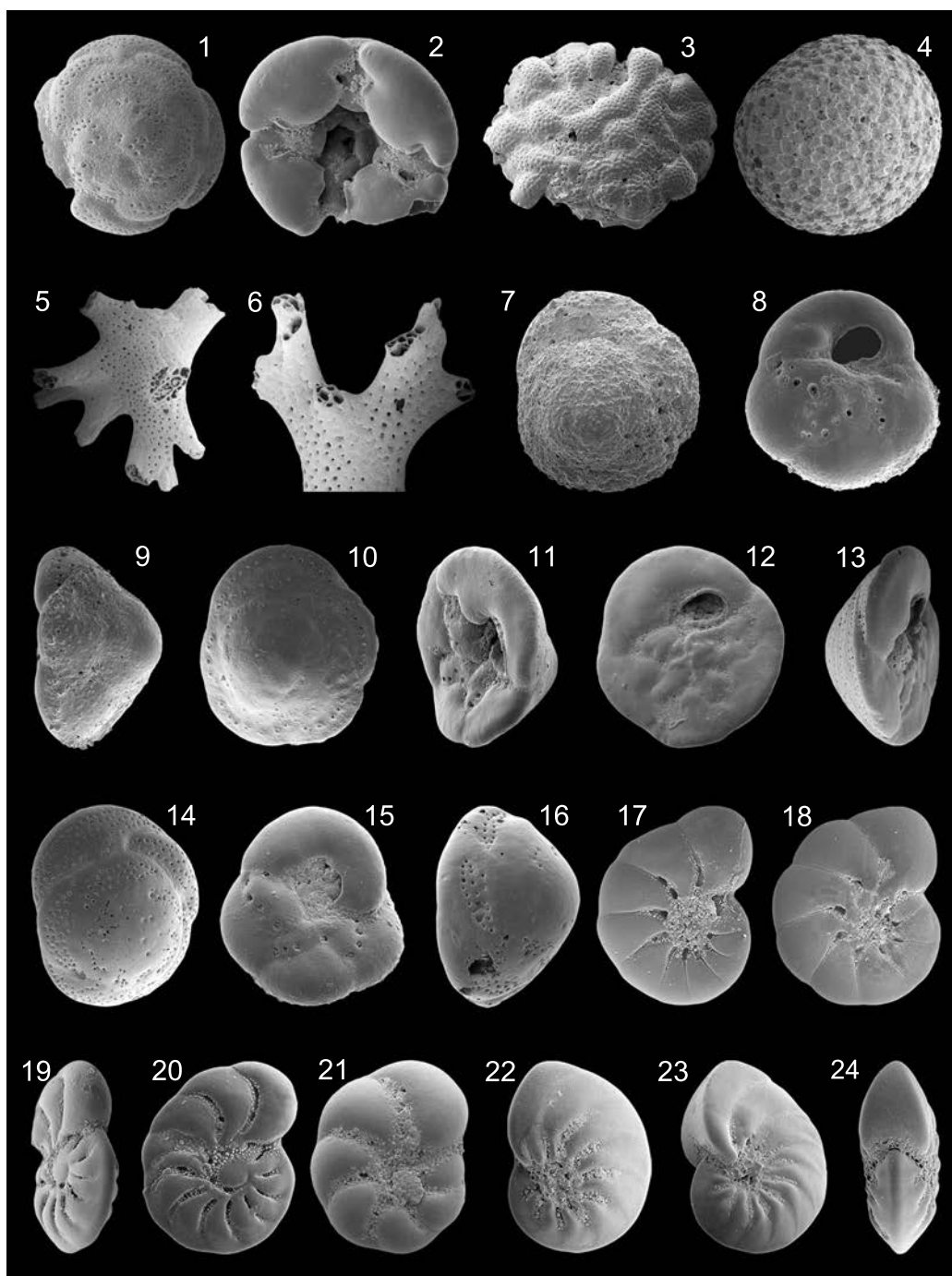
**Remarks:** The wall is calcareous and coarsely and densely perforate on both sides. The test is planoconvex. The early stage is trochospiral and later chambers are cylindrically arranged. Sutures are depressed on the unattached, umbilical side and thickened, limbate and imperforate on the attached, spiral side. The periphery is subangular. In the adult stage, each chamber has two interiomarginal and extraumbilical apertures, bordered by a lip. The test surface is smooth.

Genus CIBICIDELLA Cushman, 1927

*Cibicidella variabilis* (d'Orbigny, 1826)

Figure 24.25-26

- 1826 *Truncatulina variabilis* d'Orbigny: p. 279, no. 8
- 1988 *Planorbulina variabilis* (d'Orbigny); Loeblich and Tappan, p. 170, pl. 645, figs. 5, 6
- 1991 *Cibicidella variabilis* (d'Orbigny); Cimerman and Langer, p. 72, pl. 77, figs. 1-10
- 1993 *Cibicidella variabilis* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 234, pl. 23, figs. 2, 3



**FIGURE 25.** 1 *Cymbaloporetta bulloides* (d'Orbigny), 796x, spiral side; 2 *C. bulloides* (d'Orbigny), 926x, umbilical side; 3 *Acervulina inhaerens* Schultze, 386x, unattached side; 4 *Sphaerogypsina globula* (Reuss), 181x, top view; 5 *Miniacina miniacea* (Pallas), 56x, side view; 6 *M. miniacea* (Pallas), 97x, side view; 7 *Asterigerinata adriatica* Haake, 970x, spiral side; 8 *A. adriatica* Haake, 1010x, umbilical side; 9 *A. adriatica* Haake, 1040x, peripheral view; 10 *Asterigerinata mamilla* (Williamson), 561x, spiral side; 11 *A. mamilla* (Williamson), 1070x, oblique peripheral view; 12 *A. mamilla* (Williamson), 427x, umbilical side; 13 *A. mamilla* (Williamson), 673x, peripheral view; 14 *Asterigerinata mariae* Sgarrella, 1260x, spiral side; 15 *A. mariae* Sgarrella, 1440x, peripheral view; 16 *A. mariae* Sgarrella, 1650x, umbilical side; 17 *Haynesina depressula* (Walker and Jacob), 683x, side view; 18 *H. depressula* (Walker and Jacob), 680x, side view; 19 *Haynesina simplex* (Cushman), 500x, oblique peripheral view; 20 *H. simplex* (Cushman), 756x, side view; 21 *Haynesina* sp. 1, 1170x, side view; 22 *Nonion fabum* (Fichtel and Moll), 548x, side view; 23 *N. fabum* (Fichtel and Moll), 489x, side view; 24 *N. fabum* (Fichtel and Moll), 571x, peripheral view.

**Remarks:** The wall is calcareous and coarsely and densely perforate. The test is trochospiral in the early stage and later irregularly arranged. The periphery is subrounded to acute. Sutures are oblique and depressed on the umbilical side, oblique and slightly elevated on the spiral side. In the juvenile stage, specimens have a single aperture. In the adult stage, specimens may have two apertures per chamber, bordered by a rim.

Family CYMBALOPORIDAE Cushman, 1927  
Subfamily CYMBALOPORINAE Cushman, 1927  
Genus CYMBALOPORETTA Cushman, 1928  
*Cymbaloporetta bulloides* (d'Orbigny, 1839a)  
Figure 25.1-2

- 1839a *Rosalina bulloides* d'Orbigny: p. 98, pl. 3, figs. 2-5  
1922c *Tretomophalus bulloides* (d'Orbigny); Cushman, pp. 42-44, text-figs. 2, 3  
1988 *Cymbaloporetta bulloides* (d'Orbigny); Loeblich and Tappan, pp. 170-171, pl. 649, figs. 11-15  
1991 *Cymbaloporetta* sp.1; Cimerman and Langer, p. 72, pl. 80, figs. 1-5

**Remarks:** The wall is calcareous and is perforate on the spiral side. The test is trochospiral in the early stage and later cylindrical. The spiral side is convex and evolute with depressed and oblique sutures. Early chambers are low, crescentic, slightly inflated, and later chambers are subtriangular with radial sutures. The umbilical side in the benthic stage is concave and involute with inflated, subtriangular and imperforate chambers in the final whorl. The periphery is subacute. The primary apertures are extraumbilical arch-shaped openings, each of them bordered by a rim. Two apertures per chamber are visible in the adult stage. A third opening into the umbilical region, bordered by a rim, is present. The test surface is smooth. In the planktonic stage, a floating chamber is present on the umbilical side.

Family ACERVULINIDAE Schultze, 1854  
Genus ACERVULINA Schultze, 1854  
*Acervulina inhaerens* Schultze, 1854  
Figure 25.3

- 1854 *Acervulina inhaerens* Schultze: p. 68, pl. 6, fig. 12  
1931 *Acervulina inhaerens* Schultze; Cushman, p. 134, pl. 25, fig. 2  
1988 *Acervulina inhaerens* Schultze; Loeblich and Tappan, p. 172, pl. 659, figs. 1-6

**Remarks:** The wall is calcareous and coarsely perforate on both sides. The early stage is coiled and later irregularly arranged. Chambers are inflated, and sutures are oblique and depressed on the unattached side. Sutures are thickened and slightly appressed on the attached side. The apertures are restricted on the coarse perforations on the unattached side. The test surface is smooth.

Genus SPHAEROGYPSINA Galloway, 1933  
*Sphaerogypsina globula* (Reuss, 1848)  
Figure 25.4

- 1848 *Ceripora globula* Reuss: p. 33, pl. 5, fig. 7  
1988 *Sphaerogypsina globula* (Reuss); Loeblich and Tappan, p. 173, pl. 662, figs. 4-6  
1991 *Sphaerogypsina globula* (Reuss); Cimerman and Langer, p. 72, pl. 80, figs. 6-9  
1993 *Sphaerogypsina globula* (Reuss); Hottinger, Halicz and Reiss, p. 128, pl. 173, figs. 1-10  
1993 *Sphaerogypsina globula* (Reuss); Sgarrella and Moncharmont Zei, p. 235, pl. 23, fig. 6

**Remarks:** The wall is calcareous and perforate. The test of these large specimens is mostly spherical and globular. Chambers are small and packed. Septa are raised and imperforate. No primary aperture is present.

Family HOMOTREMATIDAE Cushman, 1927  
Genus MINIACINA Galloway, 1933  
*Miniacina miniacea* (Pallas, 1766)  
Figure 25.5-6

- 1766 *Millepora miniacea* Pallas: p. 251  
1884 *Polytrema miniaceum* Linné; Brady, p. 721, pl. 100, figs. 5-9; pl. 101, fig. 1  
1988 *Miniacina miniacea* (Pallas); Loeblich and Tappan, p. 173, pl. 663, figs. 4-6; pl. 664, figs. 1-5  
1991 *Miniacina miniacea* (Pallas); Cimerman and Langer, p. 73, pl. 81, figs. 1-6  
1993 *Miniacina miniacea* (Pallas); Hottinger, Halicz and Reiss, p. 122, pl. 175, figs. 9, 10; pl. 176, figs. 1-6; pl. 177, figs. 1-7  
1993 *Miniacina miniacea* (Pallas); Sgarrella and Moncharmont Zei, p. 235, pl. 23, fig. 5  
1994 *Miniacina miniacea* (Pallas); Jones, p. 101, pl. 100, figs. 5-9; pl. 101, fig. 1 [cop. Brady, 1884, figs. 5-9; fig. 1]

**Remarks:** The wall is calcareous and densely and finely perforate. The pink to red test is large, arborescent and attached. The apertures are on the end of the branches and are bordered by a lip. The test surface is pock-marked.

Family ASTERIGERINATIDAE Reiss, 1963

Genus ASTERIGERINATA Bermudez, 1949

*Asterigerinata adriatica* Haake, 1977

Figure 25.7-9

- 1977 *Asterigerinata adriatica* Haake: p. 69, pl. 3, fig. 1-5
- 1991 *Asterigerinata* sp. 1; Cimerman and Langer, p. 73, pl. 82, figs. 5, 6
- 1993 *Asterigerinata adriatica* Haake; Sgarrella and Moncharmont Zei, p. 224, pl. 19, figs. 11, 12
- 2004 *Asterigerinata adriatica* Haake; Chendes et al., p. 76, pl. 3, fig. 6
- 2006 *Asterigerinata adriatica* Haake; Avsar et al., p. 133, pl. 3, fig. 4

**Remarks:** The wall is calcareous. The test is low trochospiral and conical in peripheral view. The spiral side is convex and evolute. The umbilical side is flattened and involute. Chambers gradually increasing in size as added on the spiral side. The final chamber occupies approximately one third of the periphery. Sutures are curved, oblique, thickened, imperforate and slightly depressed on the spiral side. On the umbilical side, sutures are curved, oblique and slightly depressed. The periphery is subacute. The aperture is a low interiomarginal, umbilical arch at the base of the final chamber. The test surface is densely ornamented with pustules and pseudospines on the spiral side. Both sides are loosely perforate with larger pores.

*Asterigerinata mamilla* (Williamson, 1858)

Figure 25.10-13

- 1858 *Rotalina mamilla* Williamson: p. 54, pl. 4, figs. 109-111
- 1931 *Discorbis mamilla* (Williamson); Cushman, p. 23, pl. 5, fig. 1 [cop. Williamson, 1858, figs. 109-111]
- 1958 *Asterigerinata mamilla* (Williamson); Parker, p. 264, pl. 3, figs. 5, 6
- 1960 *Asterigerinata mamilla* (Williamson); Hofker, p. 252, pl. D, fig. 111
- 1987 *Asterigerinata mamilla* (Williamson); Alberola et al., p. 322, pl. 4, fig. 10

- 1987 *Asterigerinata mamilla* (Williamson); Jorissen, p. 41, pl. 3, fig. 1
- 1991 *Asterigerinata mamilla* (Williamson); Cimerman and Langer, p. 73, pl. 82, figs. 1-4
- 1993 *Asterigerinata mamilla* (Williamson); Sgarrella and Moncharmont Zei, p. 224, pl. 19, figs. 9, 10
- 1995 *Asterigerinata mamilla* (Williamson); Coppa and Di Tuoro, p. 170, pl. 3, figs. 11, 12
- 2004 *Asterigerinata mamilla* (Williamson); Mendes et al., p. 178, pl. 1, fig. 2
- 2005 *Asterigerinata mamilla* (Williamson); Rasmussen, p. 101, pl. 15, figs. 17, 18
- 2006 *Asterigerinata mamilla* (Williamson); Avsar et al., p. 133, pl. 3, figs. 5-7
- 2008 *Asterigerinata mamilla* (Williamson); Abu-Zied et al., p. 53, pl. 3, figs. 1, 2
- 2009 *Asterigerinata mamilla* (Williamson); Milker et al., p. 218, pl. 3, figs. 13-15

**Remarks:** The wall is calcareous. The test is low trochospiral and conical in peripheral view. The spiral side is convex and evolute. The umbilical side is involute. Chambers rapidly increase in breadth as added on the spiral side. The final chamber occupies approximately one third of the periphery. Sutures are curved, oblique, thickened, imperforate and flush with the surface on the spiral side. On the umbilical side, sutures are curved, oblique and slightly depressed. The periphery is acutely carinate. The aperture is a low interiomarginal, umbilical arch at the base of the final chamber. Both sides are perforate - with larger pores on the chamber margins of the spiral side and more loosely larger and irregularly arranged pores on the umbilical side. The test surface is smooth.

*Asterigerinata mariae* Sgarrella,

in Amore et al. 1990

Figure 25.14-16

- 1990 *Asterigerinata mariae* Sgarrella, type reference: Amore et al., 1990, pp. 477-478, pl. 3, figs. 1-8
- 1993 *Asterigerinata mariae* Sgarrella; Sgarrella and Moncharmont Zei, p. 224, pl. 20, fig. 1
- 2004 *Asterigerinata mariae* Sgarrella; Fiorini, p. 50, pl. 1, figs. 16-18
- 2009 *Asterigerinata mariae* Sgarrella; Milker et al., p. 218, pl. 3, figs. 21-23

**Remarks:** The wall is calcareous. The test is low trochospiral and conical in peripheral view. The spiral side is convex and evolute. The umbilical side is involute, flattened to slightly concave. Chambers gradually increasing in size as added on the spiral side. Sutures are curved, oblique, thickened, imperforate and depressed on the spiral side. On the umbilical side, sutures are curved, oblique and depressed. The periphery is subacute. The aperture is a low interiomarginal, umbilical arch at the base of the final chamber. Both sides are perforate - with larger and denser pores on the spiral side and more loosely, larger and irregularly arranged pores on the umbilical side. The test surface is smooth.

Family NONIONIDAE Schultze, 1854

Subfamily NONIONINAE Schultze, 1854

Genus HAYNESINA Banner and Culver, 1978

*Haynesina depressula* (Walker and Jacob, 1798)

Figure 25.17-18

- 1798 *Nautilus depressulus* Walker and Jacob: p. 641, pl. 14, fig. 33
- 1914 *Nonionina depressula* (Walker and Jacob); Cushman, p. 23, pl. 17, fig. 3
- 1987 *Nonion depressulum* (Walker and Jacob); Jorissen, p. 39, pl. 2, fig. 7
- 1991 *Haynesina depressula* (Walker and Jacob); Cimerman and Langer, p. 81, pl. 83, figs. 1-4
- 1993 *Nonion depressulum* (Walker and Jacob); Sgarrella and Moncharmont Zei, p. 238, pl. 24, figs. 3, 4
- 2004 *Haynesina depressula* (Walker and Jacob); Chendes et al., p. 76, pl. 3, fig. 7
- 2005 *Haynesina depressula* (Walker and Jacob); Rasmussen, p. 102, pl. 16, fig. 3
- 2009 *Nonion depressulum* (Walker and Jacob); Avsar et al., p. 135, pl. 3, figs. 7, 8

**Remarks:** The wall is calcareous and is finely and densely perforate. The test is planispiral, circular in outline, and biumbilicate with narrow and depressed umbilici in peripheral view. Up to 12 inflated chambers are visible in the final whorl, gradually increasing in size as added. The sutures are radial, backward curved and deeply incised near the umbilicus. The umbilical region is filled with pustules. The periphery is subrounded. The aperture is an interiomarginal arch, obscured by pustules. The test surface is smooth.

*Haynesina simplex* (Cushman, 1933c)

Figure 25.19-20

- 1933c *Elphidium simplex* Cushman: p. 52, pl. 12, figs. 8, 9
- 1991 *Haynesina* sp. 2; Cimerman and Langer, p. 82, pl. 83, figs. 9, 10
- 2005 *Haynesina depressulum simplex* (Cushman); Debenay et al., p. 336, pl. 3, fig. 16
- 2010 *Haynesina* sp. 2; Milker, p. 125, pl. 6, fig. 8

**Remarks:** The wall is calcareous and finely perforate. The test is planispiral, circular in outline and very compressed in peripheral view. Up to 12 narrow chambers are visible in the final whorl, slightly increasing in size as added. The umbilical region is partly filled with pustules, and an umbilical knob is present. The deeply incised sutures are backward curved and ornamented with pustules. The periphery is subangular. The aperture is an interiomarginal opening, obscured by pustules. The test surface is smooth.

*Haynesina* sp. 1

Figure 25.21

**Remarks:** The wall is calcareous, finely and densely perforate. The test is planispiral, circular in outline and biumbilicate in peripheral view. The umbilical region is depressed and completely filled with pustules. Sutures are backward curved and depressed. Seven to eight slightly inflated chambers are visible in the final whorl. Chambers slightly increasing in size as added. The periphery is subrounded. The aperture is a low interiomarginal arch at the base of the apertural face, obscured by pustules. The test surface is smooth.

Genus NONION de Montfort, 1808

*Nonion fabum* (Fichtel and Moll, 1798)

Figure 25.22-24

- 1798 *Nautilus faba* Fichtel and Moll: p. 103, pl. 19 b, c
- 1884 *Nonionina boueana* d'Orbigny; Brady, p. 729, pl. 109, figs. 12, 13
- 1988 *Nonion fabum* (Fichtel and Moll); Loeblich and Tappan, p. 179, pl. 690, figs. 1-7
- 1994 *Nonion fabum* (Fichtel and Moll); Jones, p. 108, pl. 109, figs. 12, 13 [cop. Brady, 1884, figs. 12, 13]
- 2004 *Nonion fabum* (Fichtel and Moll); Mendes et al., p. 178, pl. 1, fig. 10
- 2005 *Nonion fabum* (Fichtel and Moll); Rasmussen, p. 102, pl. 16, fig. 5



2008 *Nonion asterizans* (Fichtel and Moll); Leiter, p. 46, pl. 2, fig. 5

**Remarks:** The wall is calcareous and finely and densely perforate. The test is planispiral and biumbilicate with slightly depressed umbilici. The coiling is involute. The test is ovate in outline and compressed in peripheral view. Chambers are narrow and numerous, rapidly increasing in breadth as added. Sutures are thickened and backward curved, flush with the surface near the periphery and depressed near the umbilici. The periphery is carinate. The aperture is an interiomarginal slit, extending to the umbilici and is ornamented with pustules. The umbilici are ornamented with pustules. The test surface is smooth.

Genus NONIONELLA Cushman, 1926

*Nonionella turgida* (Williamson, 1858)

Figure 26.1-6

- 1858 *Rotalina turgida* Williamson: p. 50, pl. 4, figs. 95-97
- 1884 *Nonionina turgida* (Williamson); Brady, p. 731, pl. 109, figs. 17-19
- 1914 *Nonionina turgida* (Williamson); Cushman, p. 29, pl. 15, fig. 3 [cop. Brady, 1884, fig. 17]
- 1930a *Nonionella turgida* (Williamson); Cushman, p. 15, pl. 6, figs. 1-4 [fig. 1: cop. Williamson, 1858, figs. 95-97; fig. 2: cop. Brady, 1884, figs. 17, 18]
- 1960 *Nonionella turgida* (Williamson); Hofker, p. 258, pl. F, figs. 181, 182
- 1987 *Nonionella turgida* (Williamson); Jorissen, p. 47, pl. 4, figs. 11-13
- 1993 *Nonionella turgida* (Williamson); Sgarrella and Moncharmont Zei, p. 240, pl. 24, fig. 5
- 1991 *Nonionella turgida* (Williamson); Cimerman and Langer, p. 74, pl. 84, figs. 6-8
- 1994 *Nonionella turgida* (Williamson); Jones, p. 108, pl. 109, figs. 17-19 [cop. Brady, 1884, figs. 17-19]
- 2003 *Nonionella turgida* (Williamson); Murray, p. 24, fig. 9, no. 4, 5
- 2004 *Nonionella turgida* (Williamson); Fiorini, p. 50, pl. 1, fig. 13
- 2005 *Nonionella turgida* (Williamson); Rasmussen, p. 103, pl. 16, figs. 11, 12
- 2006 *Nonionella turgida* (Williamson); Avsar et al., p. 133, pl. 3, fig. 8

2008 *Nonionella turgida* (Williamson); Abu-Zied et al., p. 53, pl. 3, figs. 12, 13

2009 *Nonionella turgida* (Williamson); Frezza and Carboni, p. 57, pl. 2, figs. 7, 8

2010 *Nonionella* sp. 1; Milker, p. 126, pl. 6, fig. 12

**Remarks:** The wall is calcareous and finely and densely perforate. The test is very low trochospiral, slightly compressed in peripheral view and ovate in outline. The peripheral margin is subrounded. Chambers rapidly increasing in length as added in the final whorl. A flap-like projection is visible, situated on one side or is bilaterally placed and may have a fist-like extension. The aperture is an interiomarginal and equatorial arch. The test surface is smooth.

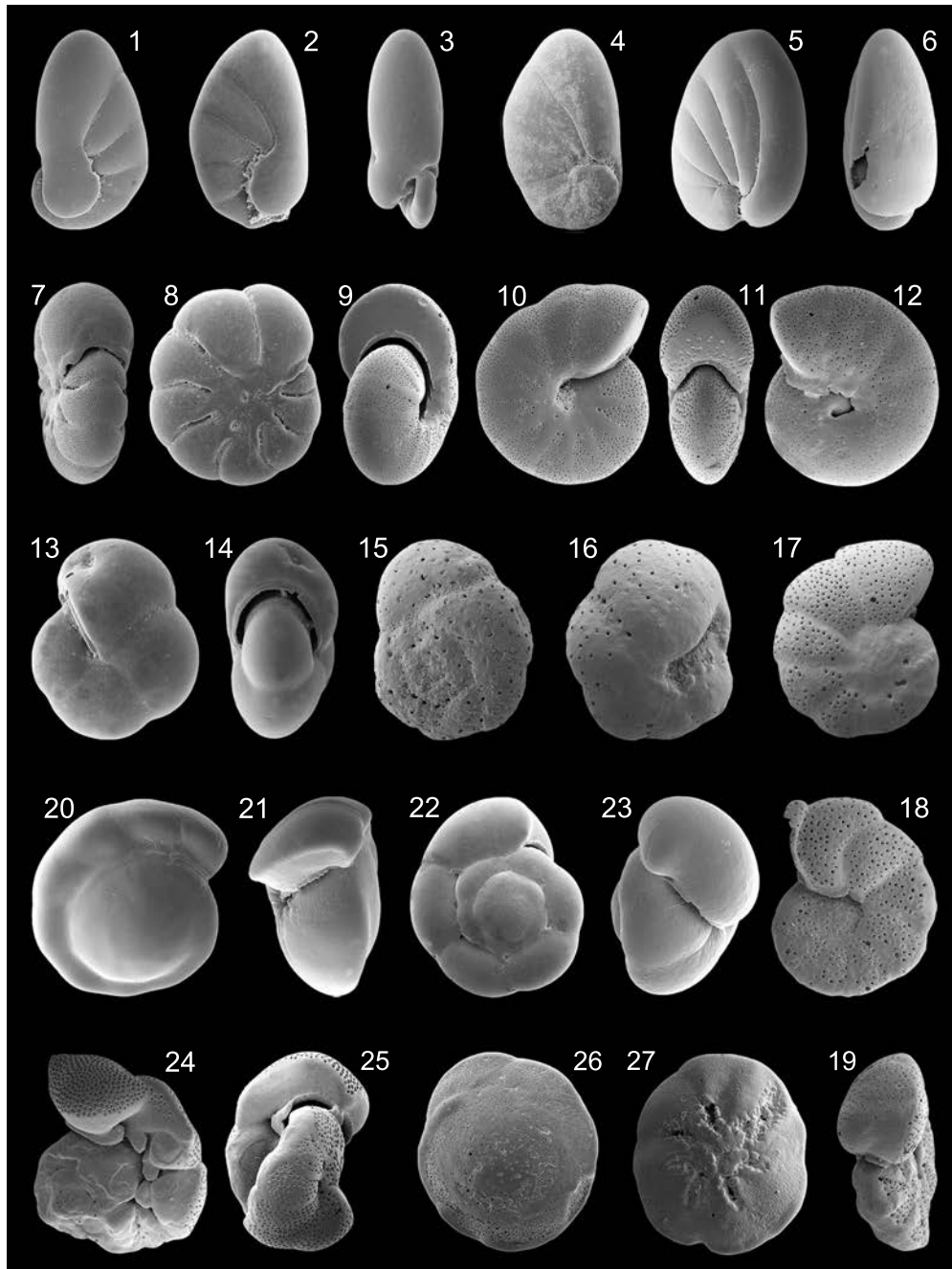
Subfamily ASTRONONIONINAE Saidova, 1981

Genus ASTRONONION Cushman and Edwards, 1937

*Astrononion stelligerum* (d'Orbigny, 1839b)

Figure 26.7-8

- 1839b *Nonionina stelligera* d'Orbigny: p. 128, pl. 3, figs. 1, 2
- 1884 *Nonionina stelligera* d'Orbigny; Brady, p. 728, pl. 109, figs. 3, 4
- 1930a *Nonion stelligerum* (d'Orbigny); Cushman, p. 7, pl. 2, figs. 8-12; pl. 3, figs. 1-3 [fig. 8: cop. Brady, 1839b; fig. 11: cop. Brady, 1884, fig. 3]
- 1958 *Astrononion stelligerum* (d'Orbigny); Parker, p. 258, pl. 1, figs. 34, 35
- 1988 *Astrononion stelligerum* (d'Orbigny); Loeblich and Tappan, p. 180, pl. 694, figs. 1, 2; figs. 20, 21
- 1990 *Astrononion stelligerum* (d'Orbigny); Sprovieri and Hasegawa, p. 457, pl. 3, figs. 1, 2
- 1991 *Astrononion stelligerum* (d'Orbigny); Cimerman and Langer, p. 74, pl. 84, figs. 13-15
- 1993 *Astrononion stelligerum* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 238, pl. 24, fig. 10
- 1994 *Astrononion stelligerum* (d'Orbigny); Jones, p. 107, pl. 109, figs. 3, 4 [cop. Brady, 1884, figs. 3, 4]
- 2006 *Astrononion stelligerum* (d'Orbigny); Avsar et al., p. 133, pl. 3, figs. 9, 10



**FIGURE 26.** 1 *Nonionella turgida* (Williamson), 852x, side view; 2 *N. turgida* (Williamson), 493x, side view; 3 *N. turgida* (Williamson), 1020x, face view; 4 *N. turgida* (Williamson), 811x, side view; 5 *N. turgida* (Williamson), 739x, side view; 6 *N. turgida* (Williamson), 620x, face view; 7 *Astrononion stelligerum* (d'Orbigny), 350x, peripheral view; 8 *A. stelligerum* (d'Orbigny), 372x, side view; 9 *Melonis affinis* (Reuss), 454x, apertural view; 10 *M. affinis* (Reuss), 446x, side view; 11 *Melonis barleeaanum* (Williamson), 597x, apertural view; 12 *M. barleeaanum* (Williamson), 538x, side view; 13 *Pullenia quadriloba* Reuss, 598x, side view; 14 *P. quadriloba* (Reuss), 552x, peripheral view; 15 *Svratkina* sp. 1, 988x, spiral side; 16 *Svratkina* sp. 1, 981x, umbilical side; 17 *Anomalinooides* sp. 1, 298x, umbilical side; 18 *Anomalinooides* sp. 1, 314x, spiral side; 19 *Anomalinooides* sp. 1, 272x, peripheral view; 20 *Gyroidinooides soldanii* (d'Orbigny), 409x, spiral side; 21 *G. soldanii* (d'Orbigny), 624x, peripheral view; 22 *Gyroidinooides umbonata* (Silvestri), 549x, spiral side; 23 *G. umbonata* (Silvestri), 776x, peripheral view; 24 *Discanomalina semipunctata* (Bailey), 230x, umbilical side; 25 *D. semipunctata* (Bailey), 234x, peripheral view; 26 *Buccella granulata* (Di Napoli Alliata), 423x, spiral side; 27 *B. granulata* (Di Napoli Alliata), 377x, umbilical side.

2009 *Astrononion stelligerum* (d'Orbigny); Avsar et al., p. 135, pl. 3, fig. 9

**Remarks:** The wall is calcareous and finely and densely perforate. The test is planispirally enrolled, biumbilicate and involute. It is circular in lateral view and compressed in peripheral view. Chambers are inflated, gradually increasing in size as added, and have a triangular, imperforate plate, extending from the umbilicus toward the preceding chamber. Sutures are incised and gently backward curved. The periphery is subrounded. The aperture is a broad and low interiomarginal and equatorial arch, bordered by a rim, and extending into the umbilical region. The test surface is smooth.

Subfamily PULLENIINAE Schwager, 1877

Genus MELONIS de Montfort, 1808

*Melonis affinis* (Reuss, 1851)

Figure 26.9-10

1851 *Nonionina affinis* Reuss: p. 72, pl. 5, fig. 32

1884 *Nonionina umbilicatula* Montagu; Brady, p. 726, pl. 109, figs. 8, 9

1978 *Nonion affine* (Reuss); Boltovskoy, p. 162, pl. 5, figs. 1, 2

1990 *Melonis affinis* (Reuss); Sprovieri and Hasegawa, p. 457, pl. 3, figs. 11, 12

1994 *Melonis affinis* (Reuss); Jones, p. 107, pl. 109, figs. 8, 9 [cop. Brady, 1884, figs. 8, 9]

2008 *Melonis affinis* (Reuss); Abu-Zied et al., p. 53, pl. 3, figs. 14, 15

2009 *Melonis pompilioides* (Fichtel and Moll); Avsar et al., p. 135, pl. 3, figs. 10, 11

2009 *Melonis affinis* (Reuss); Milker et al., p. 218, pl. 3, fig. 20

**Remarks:** The wall is calcareous and densely perforate except for the apertural face and the rim and the sutures. The test is planispirally enrolled, involute and biumbilicate, with depressed umbilici. Chambers gradually increasing in size but rapidly in thickness as added in the final whorl, resulting in a broader apertural face when compared to *Melonis barleeaanum*. Sutures are thickened, radial and gently curved and slightly raised in the early stage. The periphery is rounded. The aperture is an interiomarginal and equatorial arch, extending into the umbilical region, and is bordered by a relatively thick rim.

*Melonis barleeaanum* (Williamson, 1858)

Figure 26.11-12

1858 *Nonionina barleeana* Williamson: p. 32, pl. 3, figs. 68, 69

1930a *Nonion barleeaanum* (Williamson); Cushman, p. 11, pl. 4, fig. 5 [cop. Williamson, 1858, figs. 68, 69]

1958 *Nonion barleeaanum* (Williamson); Parker, p. 258, pl. 1, figs. 36, 37

1958 *Nonion barleeaanum* (Williamson); Todd, p. 190, pl. 1, fig. 7

1979 *Melonis barleeaanum* (Williamson); Corliss, p. 10, pl. 5, figs. 7, 8

1987 *Nonion barleeaanum* (Williamson); Jorissen, p. 43, pl. 4, fig. 8

1988 *Melonis barleeaanum* (Williamson); Loeblich and Tappan, p. 180, pl. 696, figs. 5, 6

1990 *Melonis barleeaanum* (Williamson); Sprovieri and Hasegawa, p. 457, pl. 3, figs. 7, 8

1991 *Nonion barleeaanum* (Williamson); Rasmussen, p. 364, fig. 7, no. 10

1993 *Melonis barleeaanum* (Williamson); Sgarrella and Moncharmont Zei, p. 242, pl. 26, figs. 1, 2

2003 *Melonis barleeaanum* (Williamson); Sen Gupta, p. 191, text-fig. 11.5, no. 6

2004 *Melonis barleeaanum* (Williamson); Chendes et al., p. 76, pl. 4, fig. 1

2008 *Melonis barleeaanum* (Williamson); Abu-Zied et al., p. 53, pl. 3, figs. 16, 17

2009 *Melonis barleeaanum* (Williamson); Milker et al., p. 218, pl. 3, fig. 24

**Remarks:** The wall is calcareous and densely perforate except for the apertural face and the rim and the sutures. The test is planispirally enrolled, involute and biumbilicate, with depressed umbilici. Chambers gradually increasing in size as added in the final whorl. Sutures are thickened, radial, gently curved and flush with the surface. The periphery is rounded. The aperture is an interiomarginal, equatorial arch, extending into the umbilical region, and is bordered by a thin rim.

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

*Pullenia quadriloba* Reuss, 1867

Figure 26.13-14

1867 *Pullenia compressiuscula* Reuss var. *quadriloba* Reuss: p. 87, pl. 3, fig. 8

1951 *Pullenia quadriloba* Reuss; Cushman and Stainforth, p. 161, pl. 28, fig. 5

1978 *Pullenia quadriloba* Reuss; Boltovskoy, p. 166, pl. 6, fig. 20

1990 *Pullenia quadriloba* Reuss; Sprovieri and Hasegawa, p. 457, pl. 3, figs. 19, 20

**Remarks:** The wall is calcareous. The test is planispirally enrolled, involute and compressed in peripheral view. Four moderate inflated chambers are visible. Sutures are radial and depressed. The aperture is an interiomarginal, crescentic slit, extending into the umbilical region, and is bordered by a lip. The test surface is smooth.

Family ALABAMINIDAE Hofker, 1951a  
Genus SVRATKINA Pokorny, 1956  
*Svratkina* sp. 1  
Figure 26.15-16

**Remarks:** The wall is calcareous and coarsely perforate on both sides with a denser perforation on the spiral side and less dense perforation on the umbilical side. The test is trochospirally enrolled, unequally biconvex and ovate in outline. The spiral side is evolute and rather flattened. Six crescentic chambers are visible in the final whorl on the spiral side, increasing in size as added. Sutures are oblique, curved and depressed on the spiral side. The umbilical side is involute and convex with nearly radial and slightly depressed sutures. The periphery is rounded. The aperture is an elongate, oblique opening in a slight depression, extending from near the umbilicus to the face of the final chamber. The test surface is smooth.

Family HETEROLEPIDAE Gonzales-Donoso, 1969  
Genus ANOMALINOIDES Brotzen, 1942  
*Anomalinoides* sp. 1  
Figure 26.17-19

**Remarks:** The wall is calcareous and coarsely and densely perforate. The test is low trochospirally enrolled and subcircular in outline. The spiral side is evolute with inflated chambers, increasing in size as added. Sutures on the spiral side are backward curved, thickened and slightly elevated in the early stage and later depressed. The umbilical side is involute and provided with a knob-like feature in the umbilical region. Sutures are radial, slightly curved and depressed on the umbilical side. The peripheral outline is lobulate. The aperture is a low interiomarginal arch, extending toward the spiral side along the spiral suture beneath the umbilical margin of the last few chambers, and is bordered by a lip. The test surface is smooth.

Family GAVELINELLIDAE Hofker, 1956  
Subfamily GYROIDINOIDINAE Saidova, 1981  
Genus GYROIDINIODES Brotzen, 1842

*Gyroidinoides soldanii* (d'Orbigny, 1826)  
Figure 26.20-21

- 1826 *Gyroidina soldanii* d'Orbigny: p. 278, no. 5  
1884 *Rotalia soldanii* (d'Orbigny); Brady, p. 706, pl. 107, figs. 6, 7  
1931 *Gyroidina soldanii* (d'Orbigny); Cushman, p. 38, pl. 8, figs. 3-8  
1965 *Gyroidina soldanii* (d'Orbigny); Todd, p. 19, pl. 6, fig. 4  
1968 *Gyroidina neosoldanii* Brotzen; Roegl, p. 102, pl. 4, fig. 13a-c  
1993 *Gyroidina neosoldanii* Brotzen; Sgarrella and Moncharmont Zei, p. 241, pl. 25, figs. 5, 6  
1994 *Gyroidinoides soldanii* (d'Orbigny); Jones, p. 106, pl. 107, figs. 6, 7 [cop. Brady, 1884, figs. 6, 7]  
2010 *Gyroidina neosoldanii* Brotzen; Milker, p. 127, pl. 6, figs. 20, 21

**Remarks:** The wall is calcareous and densely and finely perforate. The test is trochospirally enrolled, with an evolute and flattened spiral side and a strongly convex umbilical side. Chambers gradually increasing in size as added in the final whorl. Sutures are backward curved, flush with the surface on the umbilical side and depressed in the final whorl on the spiral side. The aperture is an interiomarginal, umbilical slit, extending toward the periphery, and is bordered by a lip. The test surface is smooth.

*Gyroidinoides umbonata* (Silvestri, 1898)  
Figure 26.22-23

- 1898 *Rotalia soldanii* d'Orbigny var. *umbonata* Silvestri: p. 329, pl. 6, fig. 14  
1958 *Gyroidina umbonata* (Silvestri); Parker, p. 266, pl. 3, figs. 19, 20  
1958 *Gyroidina umbonata* (Silvestri); Todd, p. 197, pl. 1, fig. 18  
1992 *Gyroidina umbonata* (Silvestri); Schiebel, p. 48, pl. 4, fig. 8  
1993 *Gyroidina umbonata* (Silvestri); Sgarrella and Moncharmont Zei, p. 241, pl. 25, figs. 1, 2  
2005 *Gyroidinoides umbonata* (Silvestri); Rasmussen, p. 106, pl. 17, figs. 9-11  
2010 *Gyroidina umbonata* (Silvestri); Milker, p. 127, pl. 6, figs. 18, 19

**Remarks:** The wall is calcareous and densely and finely perforate. The test is trochospirally enrolled, with a slightly evolute spiral side and a strongly convex umbilical side. The inflated chambers rapidly increasing in size as added. Sutures are nearly radial, curved and depressed on both sides. The primary aperture is an interiomarginal and umbilical slit, extending toward the periphery, and is bordered by a relatively thick lip. Secondary openings are present at the base of the later chambers on the spiral side. The test surface is smooth.

Subfamily GAVELINELLINAE Hofker, 1956

Genus DISCANOMALINA Asano, 1951

*Discanomalina semipunctata* (Bailey, 1851)

Figure 26.24-25

- 1851 *Rotalina semipunctata* Bailey: p. 11, figs. 17-19
- 1978 *Discanomalina semipunctata* (Bailey); Medioli and Scott, p. 296, pl. 1, figs. 13-16
- 1980 *Paromalina semipunctata* (Bailey); Hofker, p. 65, fig. 18e-h
- 1985 *Discanomalina semipunctata* (Bailey); Hermelin and Scott, p. 206, pl. 6, figs. 3, 4
- 1988 *Discanomalina semipunctata* (Bailey); Loeblich and Tappan, p. 185, pl. 718, figs. 1-9

**Remarks:** The wall is calcareous, coarsely perforate on the unattached side and nearly imperforate on the attached side and the apertural face. The test is low trochospiral and involute with an irregular growth. Chambers are inflated and have triangular flaps on the attached side. Sutures are curved, depressed on the attached side and flush with the surface on the unattached side. The primary aperture is a broad and low equatorial arch, extending into the umbilicus, and is bordered by a lip. Secondary openings are present beneath the umbilical flaps.

Family TRICHOHYALIDAE Saidova, 1981

Genus BUCCELLA Andersen, 1952

*Buccella granulata* (Di Napoli Alliata, 1952)

Figure 26.26-27

- 1952 *Eponidus frigidus* (Cushman) var. *granulatus* Di Napoli Alliata: p. 103, pl. 5, fig. 3
- 1987 *Buccella granulata* (Di Napoli Alliata); Alberola et al., p. 308, pl. 4, fig. 15
- 1987 *Buccella granulata* (Di Napoli Alliata); Jorissen, p. 41, pl. 3, fig. 5
- 1993 *Buccella granulata* (Di Napoli Alliata); Sgarrella and Moncharmont Zei, p. 216, pl. 16, figs. 6, 7

- 1995 *Buccella granulata* (Di Napoli Alliata); Coppa and Di Tuoro, p. 168, pl. 2, figs. 7, 14

- 2004 *Buccella granulata* (Di Napoli Alliata); Fiorini, p. 52, pl. 2, figs. 1-3

- 2005 *Buccella granulata* (Di Napoli Alliata); Rasmussen, p. 107, pl. 18, figs. 1-3

- 2009 *Buccella granulata* (Di Napoli Alliata); Milker et al., p. 218, pl. 3, figs. 12, 13

**Remarks:** The wall is calcareous and densely perforate on both sides except for the sutures on the spiral side and the periphery. The test is trochospirally enrolled and planoconvex. Three to four whorls are visible with seven to eight chambers in the final whorl. Sutures are thickened, oblique and slightly elevated on the spiral side, nearly radial and depressed to deeply incised on the umbilical side. The periphery is carinate. The aperture is an interiomarginal opening midway between the umbilicus and the periphery, and is covered by umbilical pustules. The test is ornamented with granules in the umbilical region. The test surface is smooth.

Family ROTALIIDAE Ehrenberg, 1839

Subfamily AMMONIINAE Saidova, 1981

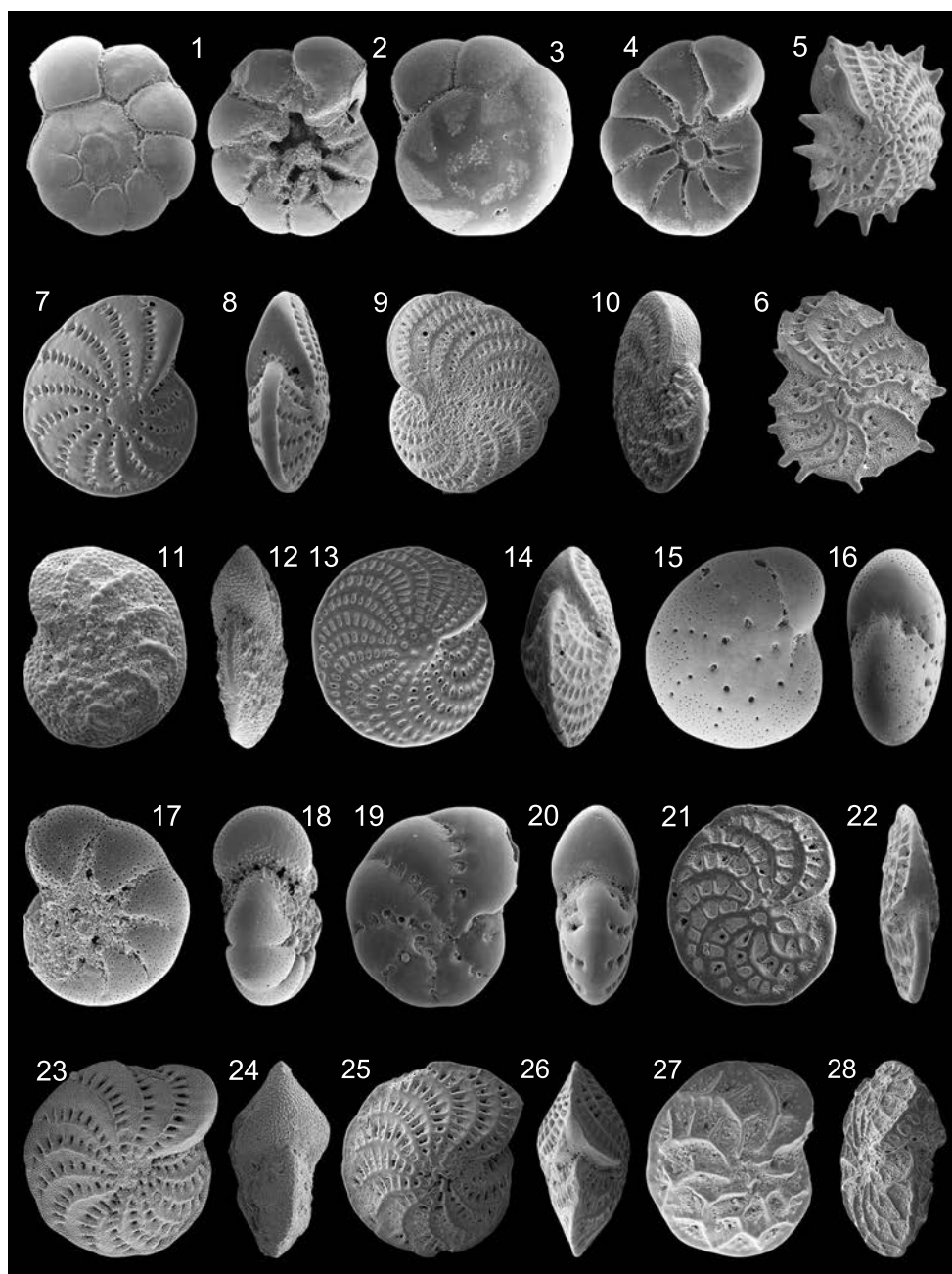
Genus AMMONIA Bruennich, 1772

*Ammonia beccarii* (Linné, 1758)

Figure 27.1-2

- 1758 *Nautilus beccarii* Linné: p. 710
- 1858 *Rotalina beccarii* Williamson: p. 48, pl. 4, figs. 90-92
- 1931 *Rotalia beccarii* (Linné); Cushman, p. 58, pl. 12, figs. 1-7; pl. 13, figs. 1, 2
- 1960 *Streblus beccarii* (Linné); Hofker, p. 255, pl. E, fig. 134
- 2005 *Ammonia beccarii* (Linné); Debenay et al., p. 334, pl. 2, fig. 17
- 2009 *Ammonia beccarii* (Linné); Frezza and Carboni, p. 55, pl. 1, figs. 5, 12

**Remarks:** The wall is calcareous and finely and densely perforate on both sides. The test is low trochospirally enrolled and biconvex, with an evolute spiral and an involute umbilical side. Chambers are inflated and subglobular. Sutures are deeply incised and nearly radial and curved on the umbilical side. In the umbilical region, an umbilical plug is present, surrounded by pustules. Sutures on the spiral side are radial and curved, thickened and imperforate, slightly raised to depressed in the early part and later incised. The aperture is an inte-



**FIGURE 27.** 1 *Ammonia beccarii* (Linné), 496x, spiral side; 2 *A. beccarii* (Linné), 431x, umbilical side; 3 *Ammonia parkinsoniana* (d'Orbigny), 703x, spiral side; 4 *A. parkinsoniana* (d'Orbigny), 591x, umbilical side; 5 *Elphidium aculeatum* (d'Orbigny), 245x, oblique side view; 6 *E. aculeatum* (d'Orbigny), 425x, side view; 7 *Elphidium advenum* (Cushman), 301x, side view; 8 *E. advenum* (Cushman), 330x, peripheral view; 9 *Elphidium complanatum* (d'Orbigny), 295x, side view; 10 *E. complanatum* (d'Orbigny), 396x, peripheral view; 11 *Elphidium complanatum* (d'Orbigny) var. *tyrrhenianum* Accordi, 1070x, side view; 12 *E. complanatum* (d'Orbigny) var. *tyrrhenianum* Accordi, 548x, peripheral view; 13 *Elphidium crispum* (Linné), 194x, side view; 14 *E. crispum* (Linné), 234x, peripheral view; 15 *Elphidium decipiens* (Costa), 889x, side view; 16 *E. decipiens* (Costa), 469x, peripheral view; 17 *Elphidium granosum* (d'Orbigny), 635x, side view; 18 *E. granosum* (d'Orbigny), 648x, peripheral view; 19 *Elphidium incertum* (Williamson), 705x, side view; 20 *Elphidium incertum* (Williamson), 996x, peripheral view; 21 *Elphidium macellum* (Fichtel and Moll), 418x, side view; 22 *E. macellum* (Fichtel and Moll), 446x, peripheral view; 23 *Elphidium margaritaceum* (Cushman), 333x, side view; 24 *E. margaritaceum* (Cushman), 452x, peripheral view; 25 *Elphidium* sp. 1, 274x, side view; 26 *Elphidium* sp. 1, 266x, peripheral view; 27 *Parrellina verriculata* (Brady), 1020x, side view; 28 *P. verriculata* (Brady), 761x, peripheral view.

riomarginal, extraumbilical arch-shaped opening. The test surface is smooth.

*Ammonia parkinsoniana* (d'Orbigny, 1839a)  
Figure 27.3-4

- 1839a *Rosalina parkinsoniana* d'Orbigny: p. 99, pl. 4, figs. 25-27
- 1960 *Streblus parkinsonianus* (d'Orbigny); Hofker, p. 254, pl. E. fig. 132
- 1991 *Ammonia parkinsoniana* (d'Orbigny); Cimerman and Langer, p. 76, pl. 87, figs. 7-9
- 1993 *Ammonia parkinsoniana* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 228, pl. 20, figs. 3, 4
- 2004 *Ammonia parkinsoniana* (d'Orbigny); Chendes et al., p. 76, pl. 4, fig. 4
- 2004 *Ammonia parkinsoniana* (d'Orbigny); Fiorini, p. 52, pl. 2, figs. 9, 10
- 2005 *Ammonia parkinsoniana* (d'Orbigny); Rasmussen, p. 107, pl. 18, figs. 5-8
- 2006 *Ammonia parkinsoniana* (d'Orbigny); Avsar et al., p. 133, pl. 3, figs. 15, 16

**Remarks:** The wall is calcareous, finely and densely perforate on the spiral side and along the peripheral margin on the umbilical side. The test is low trochospiral and planoconvex, with an evolute spiral and a flattened umbilical side. Chambers are triangular on the umbilical side and inflated and subglobular on the spiral side. Sutures are deeply incised, radial and curved on the umbilical side. In the umbilical region, an umbilical knob is present. The thickened sutures on the spiral side are slightly raised in the early part, later flush with the surface and depressed, and are radial, curved and imperforate. The aperture is an interiomarginal opening, extending slit-like along the base of the final chamber into the umbilical region. The test surface is smooth.

Family ELPHIDIIDAE Galloway, 1933  
Subfamily ELPHIDIINAE Galloway, 1933  
Genus ELPHIDIUM de Montfort, 1808  
*Elphidium aculeatum* (d'Orbigny, 1846)  
Figure 27.5-6

- 1846 *Polystomella aculeata* d'Orbigny: p. 131, pl. 6, figs. 27, 28
- 1884 *Polystomella macella* (Fichtel and Moll) (juvenile specimen); Brady, p. 737, pl. 110, fig. 10

- 1991 *Elphidium aculeatum* (d'Orbigny); Cimerman and Langer, p. 77, pl. 89, figs. 1-4
- 1994 *Elphidium aculeatum* (d'Orbigny); Jones, p. 109, pl. 110, fig. 10 [cop. Brady, 1884, fig. 10]
- 2005 *Elphidium aculeatum* (d'Orbigny); Rasmussen, p. 108, pl. 18, fig. 12

**Remarks:** The wall is calcareous. The test is planispirally enrolled, involute and lenticular in peripheral view. The peripheral margin is acute and ornamented with thick and short pseudospines. Sutures are backward curved and incised. Ponticuli are gently curved. The fossettes between the ponticuli are elongate to subelliptical. The umbilical region is covered by granules. The primary aperture consists of interioareal openings, each of them bordered by a rim. Test surface is densely ornamented with pustules.

*Elphidium advenum* (Cushman, 1922c)  
Figure 27.7-8

- 1922c *Polystomella advena* Cushman: p. 56, pl. 9, figs. 11, 12
- 1933c *Elphidium advenum* (Cushman); Cushman, p. 50, pl. 12, figs. 1-3
- 1958 *Elphidium advena* (Cushman); Parker, p. 269, pl. 4, figs. 3, 4
- 1993 *Elphidium advenum* (Cushman); Hottinger, Halicz and Reiss, p. 146, pl. 207, figs. 1-7
- 1993 *Elphidium punctatum* (Terquem); Sgarrella and Moncharmont Zei, p. 230, pl. 21, figs. 3, 4
- 1995 *Elphidium punctatum* (Terquem); Coppa and Di Tuoro, p. 172, pl. 4, fig. 11
- 2005 *Elphidium advenum* (Cushman); Rasmussen, p. 108, pl. 18, figs. 13-15

**Remarks:** The wall is calcareous and densely and finely perforate except for the periphery. The test is planispirally enrolled, involute and lenticular in peripheral view. Chambers are numerous and narrow, gradually increasing in size as added. The periphery is carinate. Sutures are backward curved and depressed. The fossettes between the ponticuli are subrounded to elliptical and ornamented with minute pseudospines. The umbilical region has a slightly developed knob. The primary aperture consists of interiomarginal and rounded openings at the base of the final chamber, each of them bordered by a rim. The test surface is smooth.

*Elphidium complanatum* (d'Orbigny, 1839b)

Figure 27.9-10

- 1839b *Polystomella complanata* d'Orbigny: p. 129, pl. 2, figs. 35, 36
- 1958 *Elphidium complanatum* (d'Orbigny); Parker, p. 270, pl. 4, fig. 5
- 1933c *Elphidium jenseni* (Cushman); Cushman, p. 48, pl. 11, figs. 6, 7
- 1991 *Elphidium jenseni* (Cushman); Cimerman and Langer, p. 78, pl. 92, figs. 1-3
- 1993 *Elphidium jenseni* (Cushman); Hottinger, Halicz and Reiss, p. 148, pl. 211, figs. 8-14
- 1993 *Elphidium complanatum* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 228, pl. 20, figs. 9, 10
- 2005 *Elphidium jenseni* (Cushman); Debenay et al., p. 336 pl. 3, figs. 26, 27
- 2005 *Elphidium complanatum* (d'Orbigny); Rasmussen, p. 109, pl. 19, fig. 2
- 2006 *Elphidium complanatum* (d'Orbigny); Avsar et al., p. 134, pl. 3, fig. 19

**Remarks:** The wall is calcareous. The test is planispirally enrolled, slightly involute and flattened in peripheral view. Chambers are numerous and narrow. The peripheral margin is acute. Sutures are backward curved and depressed. The numerous ponticuli are elongate and ornamented with minute pseudospines. The primary aperture consists of a row of interiomarginal openings. The test surface is densely ornamented with pustules that are larger in the umbilical region and smaller on the rest of the test surface and on the apertural face.

*Elphidium complanatum* (d'Orbigny) var.*tyrrhenianum* Accordi, 1951

Figure 27.11-12

- 1950 *Elphidium complanatum* (d'Orbigny) var. *tyrrhenianum* Accordi: p. 126, pl. 2, figs. a, b (fide Ellis and Messina, 1940ff)
- 2005 *Elphidium complanatum* (d'Orbigny) var. *tyrrhenianum* Accordi; Rasmussen, p. 109, pl. 19, fig. 3

**Remarks:** The wall is calcareous and finely perforate. The test is planispirally enrolled, involute and depressed (but lesser depressed than *Elphidium complanatum*) and subelliptical in peripheral view. Chambers are numerous and narrow. The peripheral margin is acute and carinate. Sutures are backward curved and depressed. The umbilical region is slightly depressed. The primary aperture

consists of a row of interiomarginal openings. The test surface is densely ornamented with pustules that are larger in the apertural region.

*Elphidium crispum* (Linné, 1758)

Figure 27.13-14

- 1758 *Nautilus crispum* Linné: p. 709
- 1846 *Polystomella crista* Lamarck; d'Orbigny, p. 125, pl. 6, figs. 9-14
- 1914 *Polystomella crista* (Linné); Cushman, p. 32, pl. 18, fig. 1
- 1933c *Elphidium crispum* (Linné); Cushman, p. 47, pl. 11, fig. 4
- 1960 *Elphidium crispum* (Linné); Hofker, p. 258, pl. F, fig. 184
- 1987 *Elphidium crispum* (Linné); Alberola et al., p. 322, pl. 4, fig. 2
- 1987 *Elphidium crispum* forma *crispum* (Linné); Jorissen, p. 41, pl. 3, fig. 8
- 1988 *Elphidium crispum* (Linné); Loeblich and Tappan, p. 199, pl. 786, figs. 8, 9; pl. 787, figs. 1-5
- 1991 *Elphidium crispum* (Linné); Cimerman and Langer, p. 77, pl. 90, figs. 1-6
- 1993 *Elphidium crispum* (Linné); Sgarrella and Moncharmont Zei, p. 228, pl. 20, fig. 11
- 2005 *Elphidium crispum* (Linné); Debenay et al., p. 334, pl. 2, fig. 23
- 2005 *Elphidium crispum* (Linné); Rasmussen, p. 109, pl. 19, fig. 4
- 2006 *Elphidium crispum* (Linné); Avsar et al., p. 134, pl. 3, fig. 20
- 2009 *Elphidium crispum* (Linné); Avsar et al., p. 135, pl. 3, figs. 19, 20
- 2009 *Elphidium crispum* (Linné); Frezza and Carboni, p. 55, pl. 1, fig. 16

**Remarks:** The wall is calcareous. The test is planispirally enrolled, involute and lenticular in peripheral view. Chambers are numerous and narrow. The peripheral margin is angular and carinate. Sutures are backward curved and depressed. Ponticuli are elongate, and fossettes between the ponticuli are rounded to elongate and ornamented with short pseudospines. The umbilical region has a plug. The primary aperture consists of a row of interiomarginal openings that are bordered by a rim. The test surface is ornamented with small pustules only in the apertural region. The test surface is smooth.



- Elphidium decipiens* (Costa, 1856)  
Figure 27.15-16
- 1856 *Polystomella decipiens* Costa: p. 224, pl. 19, figs. 13
- 1897 *Polystomella decipiens* Costa; Fornasini, p. 5, pl. 2, fig. 12
- 1916 *Polystomella decipiens* Costa; Heron-Allen and Earland, p. 282, pl. 43, figs. 20-22
- 1987 *Elphidium poeyanum* (d'Orbigny) forma *decipiens* (Costa); Jorissen, p. 38, pl. 2, fig. 6
- 1991 *Elphidium translucens* Natland; Cimerman and Langer, p. 79, pl. 92, figs. 7-11
- 1993 *Elphidium cuvilleri* Levy; Sgarrella and Moncharmont Zei, p. 239, pl. 20, fig. 13
- 2002 *Elphidium translucens* Natland; Kaminski et al., p. 176, pl. 5, fig. 12
- 2004 *Criboelphidium translucens* (Natland); Fiorini, p. 54, pl. 3, figs. 9, 10
- 2005 *Criboelphidium translucens* (Natland); Debenay et al., p. 336 pl. 3, fig. 20
- 2005 *Elphidium decipiens* (Costa); Rasmussen, p. 110, pl. 19, fig. 5
- 2009 *Elphidium translucens* Natland; Frezza and Carboni, p. 55, pl. 1, fig. 15
- Remarks:** The wall is calcareous, translucent and finely to coarsely perforate except for the apertural face. The test is planispirally enrolled and involute, with a broadly rounded periphery. Sutures are flush with the surface and backward curved. Ponticuli are only visible on the final chambers in the adult stage. The primary aperture consists of a row of interiomarginal openings. The test surface is smooth. Natland (1950) regarded *E. translucens* Natland later as a synonym of *E. poeyanum* (d'Orbigny). Jorissen (1987) regarded *E. translucens* Natland and *E. cuvilleri* Levy as synonyms of *E. poeyanum* (d'Orbigny) forma *decipiens* (Costa).
- Elphidium granosum* (d'Orbigny, 1826)  
Figure 27.17-18
- 1826 *Nonionina granosa* d'Orbigny: p. 294, no. 8
- 1958 *Elphidium granosum* (d'Orbigny); Parker, p. 270, pl. 4, figs. 10, 11
- 1987 *Elphidium granosum* forma *granosum* (d'Orbigny); Jorissen, p. 39, pl. 2, figs. 1, 2
- 1993 *Elphidium granosum* (d'Orbigny); Sgarrella and Moncharmont Zei, p. 229, pl. 21, figs. 1, 2
- 1995 *Criboelphidium granosum* (d'Orbigny); Coppa and Di Tuoro, p. 172, pl. 4, fig. 2
- 2004 *Porosononion granosum* (d'Orbigny); Chendes et al., p. 76, pl. 4, fig. 7
- 2005 *Elphidium granosum* (d'Orbigny); Rasmussen, p. 110, pl. 19, fig. 8
- 2005 *Porosononion granosum* (d'Orbigny); Debenay et al., p. 336 pl. 3, figs. 17, 18
- 2009 *Porosononion subgranosum* (Egger); Avsar et al., p. 135, pl. 3, figs. 17, 18
- 2009 *Elphidium granosum* (d'Orbigny); Frezza and Carboni, p. 57, pl. 2, fig. 5
- Remarks:** The wall is calcareous and densely and coarsely perforate except for the middle part of the apertural face. The test is planispirally enrolled and involute, with a rounded periphery and a weakly depressed umbilical region. Chambers are inflated and have a triangular plate-like feature. Sutures are incised and backward curved. The primary aperture consists of a row of interioareal openings, covered by pustules. The test surface is ornamented with pustules and granules in the umbilical region. A part of the apertural face is ornamented with pustules and pseudospines. The test surface is smooth.
- Elphidium incertum* (Williamson, 1858)  
Figure 27.19-20
- 1858 *Polystomella umbilicula* Walker var. *incertum* Williamson: p. 44, pl. 3, fig. 82
- 1884 *Polystomella striatopunctata* Fichtel and Moll; Brady, p. 733, pl. 109, fig. 23
- 1930a *Elphidium incertum* (Williamson); Cushman, p. 18, pl. 7, figs. 4-9 [fig. 4: cop. Williamson, 1858, fig. 82; fig. 5: cop. Brady, 1884, fig. 23]
- 1993 *Elphidium incertum* (Williamson); Sgarrella and Moncharmont Zei, p. 229, pl. 21, fig. 5
- 1994 *Cribrononion incertum* (Williamson); Jones, p. 108, pl. 109, fig. 23 [cop. Brady, 1884, fig. 23]
- 2005 *Elphidium excavatum* (Terquem); Rasmussen, p. 110, pl. 19, figs. 6, 7
- Remarks:** The wall is calcareous, densely and coarsely perforate except for the apertural face. The test is planispirally enrolled and involute, with a rounded periphery, and subelliptical in peripheral view. The umbilical region is slightly depressed. Chambers are inflated. Sutures are depressed and backward curved. Ponticuli are present. Fossettes are crescentic and ornamented with minute pseu-

dospines. The primary aperture consists of small and rounded interiomarginal openings, covered by small pustules. The test surface is smooth.

*Elphidium macellum* (Fichtel and Moll, 1798)

Figure 27.21-22

- 1798 *Nautilus macellus* Fichtel and Moll: p. 66, pl. 10, figs. e-g
- 1884 *Polystomella macella* (Fichtel and Moll); Brady, p. 737, pl. 110, figs. 8, 11
- 1914 *Elphidium macellum* (Fichtel and Moll); Cushman, p. 33, pl. 18, fig. 3
- 1987 *Elphidium crispum* forma *macellum* (Fichtel and Moll); Jorissen, p. 41, pl. 3, fig. 9
- 1988 *Elphidium macellum* (Fichtel and Moll); Loeblich and Tappan, p. 199, pl. 789, figs. 1-5
- 1993 *Elphidium macellum* (Fichtel and Moll); Sgarrella and Moncharmont Zei, p. 229, pl. 20, fig. 12
- 1994 *Elphidium macellum* (Fichtel and Moll); Jones, p. 109, pl. 110, figs. 8, 11 [cop. Brady, 1884, figs. 8, 11]
- 2002 *Elphidium macellum* (Fichtel and Moll); Kaminski et al., p. 179, pl. 5, fig. 11
- 2004 *Elphidium macellum* (Fichtel and Moll); Fiorini, p. 54, pl. 3, figs. 1, 2
- 2005 *Elphidium macellum* (Fichtel and Moll); Rasmussen, p. 110, pl. 19, fig. 10

**Remarks:** The wall is calcareous. The test is planispirally enrolled, involute and flattened in peripheral view. Chambers are numerous and narrow. The peripheral margin is acute and carinate. Sutures are backward curved and depressed. The number of the ponticuli increases in the later chambers. Fossettes are ornamented with minute pseudospines. The primary aperture consists of a row of interiomarginal openings. The test surface is ornamented with small pustules in the apertural region and near the periphery.

*Elphidium margaritaceum* (Cushman, 1930a)

Figure 27.23-24

- 1930a *Elphidium advenum* Cushman var. *margaritaceum* Cushman: p. 25, pl. 10, fig. 3
- 1991 *Elphidium margaritaceum* (Cushman); Cimerman and Langer, p. 79, pl. 92, figs. 4-6
- 1993 *Elphidium pulvereum* Todd; Sgarrella and Moncharmont Zei, p. 230, pl. 21, fig. 6

2005 *Elphidium margaritaceum* (Cushman);

Debenay et al., p. 336 pl. 3, fig. 11

2005 *Elphidium margaritaceum* (Cushman);

Rasmussen, p. 111, pl. 19, figs. 13, 14

**Remarks:** The wall is calcareous. The test is planispirally enrolled and involute, lenticular in peripheral view. The peripheral margin is acute. Sutures are backward curved and depressed. The umbilical region is depressed. Numerous ponticuli are present. The fossettes between the ponticuli are elongate and ornamented with minute pseudospines. The primary aperture consists of a row of interiomarginal openings. The test is densely ornamented with small pustules and with some larger pustules in the apertural region and has a rough surface.

*Elphidium* sp. 1

Figure 27.25-26

- 1991 *Elphidium* sp. 4; Cimerman and Langer, p. 80, pl. 91, figs. 5, 6

**Remarks:** The wall is calcareous and finely and densely perforate. The test is planispirally enrolled and involute, broadly lenticular in peripheral view. The peripheral margin is acute and carinate. The narrow chambers are numerous, gradually increasing in size as added. Sutures are backwards curved. Numerous ponticuli are present. The fossettes between the ponticuli are elliptical to elongate and ornamented with minute pseudospines. The primary aperture consists of a row of interiomarginal openings.

Subfamily NOTOROTALIINAE Hornibrook, 1961

Genus PARRELLINA Thalmann, 1951

*Parrellina verriculata* (Brady, 1881)

Figure 27.27-28

- 1881 *Polystomella verriculata* Brady: p. 66
- 1884 *Polystomella verriculata* Brady; Brady, p. 738, pl. 110, fig. 12
- 1958 *Parrellina verriculata* (Brady); Parker, p. 271, pl. 4, fig. 7
- 1993 *Parrellina verriculata* (Brady); Sgarrella and Moncharmont Zei, p. 232, pl. 21, fig. 7
- 1994 *Parrellina verriculata* (Brady); Jones, p. 109, Pl. 110, fig. 12 [cop. Brady, 1884, fig. 12]

**Remarks:** The wall is calcareous and finely perforate. The test is planispirally enrolled, involute and depressed in peripheral view. Chambers are numerous and increasing in size as added. Sutures are backward curved. The periphery is

acute and carinate. The aperture consists of a row of interiomarginal openings. The test surface is ornamented with pustules and with granules in the umbilical part. Irregular ridges are present in the proximal part, perpendicular to the sutures.

### ACKNOWLEDGMENTS

We thank the scientists and the ship crew of Meteor cruise 69/1 for excellent support and collaboration. We are grateful to the IFM-Geomar (Kiel) for providing storage capacities for the sediment cores and to J. Schönfeld for support during core sampling. We are grateful to C. Betzler for discussions and various support of the project. We further thank M. Theodor for making some of the SEM photographs. We greatly thank T.L. Rasmussen for her very helpful comments and suggestions, helping to improve a former version of the manuscript. We are also grateful to C. Morigi and an anonymous reviewer for their suggestions and comments helping to improve the manuscript. This project was funded by the Deutsche Forschungsgemeinschaft (DFG), Project CARBMED.

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## APPENDIX

**APPENDIX 1.** Census counts live (Rose Bengal stained) benthic foraminifera in the surface samples from Alboran Platform, Oran Bight and Mallorca Shelf, with sample splits and sample volumens (available online).

**APPENDIX 2.** Census counts dead benthic foraminifera, sum benthic and planktonic foraminifera in the surface samples from Alboran Platform, Oran Bight and Mallorca Shelf, with sample splits and sample weights (available online).

**APPENDIX 3.** Census counts dead benthic foraminifera, sum benthic and planktonic foraminifera in sediment-

core 342-1 from Alboran Platform with sample splits and sample weights (available online).

**APPENDIX 4.** Census counts dead benthic foraminifera, sum benthic and planktonic foraminifera in sediment-core 367-1 from Oran Bight with sample splits and sample weights (available online).

**APPENDIX 5.** Census counts dead benthic foraminifera, sum benthic and planktonic foraminifera in sediment-core 401-1 from Mallorca Shelf with sample splits and sample weights (available online).