Dr. Péter Ozsvárt is geologist and paleontologist. He is a member of the Research Group for Paleontology at the Hungarian Academy of Sciences and Hungarian Natural History Museum in Budapest. His doctoral thesis is on paleoecology of Eocene benthic foraminifera and their paleoceanographic applications from the Hungarian Paleogene Basin. Currently his research is focused on taxonomy, biostratigraphy and paleoecology of Triassic and Jurassic radiolarians from Hungary, Greece and Turkey.

Middle and Late Eocene benthic foraminiferal fauna from the Hungarian Paleogene Basin: systematics and paleoecology presents a synthesis about the well-preserved and in most cases incredibly diverse Eocene benthic foraminiferal faunas from the Hungarian Paleogene Basin. This report provides a brief review of geological setting and biostratigraphy of the Paleogene Basin and provides comprehensive coverage of the systematic analysis, paleoecology and paleoenvironmental interpretations of the Eocene benthic foraminiferal fauna from Hungary.

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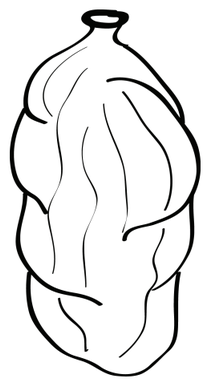
Middle and Late Eocene benthic foraminiferal fauna, Hungarian Paleogene Basin

Geologica Pannonica Special Publication 2

Middle and Late Eocene benthic foraminiferal fauna from the Hungarian Paleogene Basin: systematics and paleoecology

Péter Ozsvárt



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Geologica Pannonica Special Publications

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Contents

Introduction

The well-preserved and in most cases extremely diverse Eocene benthic foraminiferal faunas of the Hungarian Paleogene Basin (HPB) have been studied for more than a century. This report is the third in a series of studies dealing with systematic analysis, paleoecology and paleoenvironmental interpretations of Middle and Late Eocene benthic foraminifera from the HPB by the author. The first part of the series was the paleoenvironmental analysis in a Middle Eocene transgressive sequence by benthic foraminiferal fauna from Csordakút Basin, Gerecse Mountains, Hungary (OZSVÁRT, 1999). The second is on describing new benthic foraminiferal species from the HPB (OZSVÁRT, 2003a). The principal objective of this third study, which is the main part of author's PhD Thesis (OZSVÁRT, 2003b), is a comprehensive systematic analysis of benthic foraminiferal fauna providing paleoenvironmental interpretation based on multiple faunal parameters. The present paper contains brief taxonomic descriptions of 232 benthic foraminiferal species, including three new species, based on investigation of 665 samples from 12 boreholes and from two outcrops.

Previous work

Paleogene benthic foraminifera of the HPB have been known to paleontologists since the the late 19th century, when the Eocene–Oligocene transition sequences were first investigated by HANTKEN. The highly diverse and well-preserved benthic foraminiferal association from "*Clavulina Szabói*" layers, chiefly from Buda Mountains were published in 1868 and 1875. In these works HANTKEN described 97 and 213 species, from Kiscell Clay and from Buda Marl, respectively, including numerous new species. Further investigations in the Paleogene sequences were undertaken by VOGL (1910), who studied the micro- and macrofaunas of Piszke Marl Formation (= Buda Marl Formation) and listed 16 Upper Eocene benthic foraminifera species.

In 1956, SZŐTS published a synthesis of Eocene sediments in Hungary listing 356 species in a voluminous list without any description or illustration.

MAJZON (1966) listed 265 benthic species from the HPB, but did not include systematic analysis. However, he re-illustrated some species from HANTKEN's publications (1875).

VITÁLIS-ZILAHY (1967) studied the Upper Eocene benthic foraminiferal species from the Bükk Mountains. She published systematical descriptions and illustrations of 33 species from a borehole.

Further benthic species investigation by NYIRŐ (1970) provided systematical description and illustration of 58 species from the Bakony Mountains.

MAJZON (1972) published a systematic study of *Clavulinoides* from Hungary, including systematic descriptions and illustrations in two plates.

SZTRÁKOS (1982) described 30 foraminiferal species, including six new benthic foraminifera and illustrated 471 species from Buda Marl Formation. In 1987, SZTRÁKOS illustrated 483 species from Bartonian and Priabonian formations of Bakony Mountains and Buda Hills, but he did not offer paleoecological results.

HORVÁTH-KOLLÁNYI (1988) described 63 benthic foraminifera in detail, including one new species from shell-fill of gastropods from Dudar, Bakony Mountains collected by SZŐTS.

GELLAI-NAGY (1988) and HORVÁTH (2002, 2003) revised HANTKEN's collections; they illustrated 77 species and described 48 benthic foraminifera.

Geological setting

Geographically, preserved sediments of the the HPB comprise a relatively narrow (less than 100 km wide) and about 300 km long SW to NE oriented belt, extending from the Zala Basin in the south-west to the Bükk Mountains in the north-east (Fig. 1). Geologically, the HPB belongs to Pelsonia Composite Terrane (KOVÁCS et al., 2000, which is part of the ALCAPA Mega-Terrane

(CSONTOS et al., 1992). The evolution of the HPB was understood as the product of transtensional (BÁLDI and BÁLDI-BEKE, 1985) or retroarc flexural tectonic processes (TARI et al., 1993) and more recently, as forearc basin migration (KÁZMÉR et al., 2003). Initiation of subsidence displays a conspicuous south-west to north-east shift from Early Lutetian to Priabonian. The Paleogene sedimentation in the HPB began in early Lutetian time with terrigenous clastic sequence interbedded with shallow marine limestone, calcareous marl (KECSKEMÉTI and VÖRÖS, 1975) and coal measures (KOPEK, 1980). The littoral and shelf sediments of the HPB has been studied intensively due to economical (coal, bauxite) and paleontological (outstanding subtropical shelf fauna) interest. These sequences pass upward into the shallow marine platform and sublittoral limestone with rich larger foraminifera fauna in the SW part of Bakony Mountains (VÖRÖS, 1989). Sedimentation grades into shallow-marine marl and calcareous marl in the NE part of Bakony Mountains and in Vértes Mountains. The shallow-marine or littoral sequences are overlain by shallow pelagic to bathyal glauconitic calcareous marl along the length of the basin, characterised by mass occurrence of coccoliths (BÁLDI and BÁLDI-BEKE, 1991).

Localities

Four main subbasins were recognized in the HPB (Fig. 1). The *SW Bakony – Zala Paleogene Subbasin* includes a kilometre-thick calc-alkaline stratovolcanic sequence in the present-day Zala Subbasin which overlies undivided Eocene fossiliferous limestone and is interfingering with Eocene pelagic marl (KÁZMÉR et al., 2003). In this basin transgression began in Early Lutetian with thin conglomerate and paralic coal (*Darvastó Formation*). Sedimentaion grades into shallow-marine carbonate rocks (*Szőc Limestone Formation*) and later into bathyal calcareous marl (*Padrag Marl Formation*). Sedimentation continued until the NP 19 (calcareous nannoplankton zone, presumably even to the NP 20 zone or later, but the Eocene sequences are topped by erosional unconformity. See Fig. 2 for detailed lithostratigraphy of this subbasin. Benthic foraminiferal assemblages and their taxonomy and paleoecology of 337 picked samples from four boreholes (Devecser 4: DV 4; Halimba 1: Hal 1; Somlóvásárhely 1: Sv 1 and Padrag 5: Pa 5) in *SW Bakony – Zala Paleogene Subbasin* were investigated (See Table 1).

Geographically, the *NE Bakony – Vértes Paleogene Subbasin* is between the *SW Bakony - Zala Paleogene Subbasin* and *Gerecse Paleogene Subbasin* (see Fig. 1). In this subbasin transgression began some five million years later than in the *NE Bakony – Vértes Paleogene Subbasin*, while the end of the sedimentation is unknown. Sedimentation started with alluvial and lacustrine sequences of coal seams (*Dorog Formation*) and continued as shallow marine marl, calcareous marl, and siltstone with rich subtropical coral, gastropod and bivalve fauna (*Csernye Formation*). This sequence passes upward into shallow marine clay marl, marl with mass occurrences of larger foraminifera (*Csolnok Clay Marl Formation*). Small, isolated, shallow-marine carbonate banks (*Szőc Limestone Formation*) interfinger with clay marl. A continous, wide carbonate platform did not grow on the area. Shallow marine sequences are overlain by glauconitic, calcareous marl (*Padrag Marl Formation*). I have examined the benthic foraminiferal assemblages and their taxonomy and paleoecology in 250 samples from 6 boreholes (Balinka 285: Ba 285; Csetény 61: Cset 61; Dudar 240: D 240; Bakonyszentkirály 3: Bszk 3; Bakonycsernye 18: Bkcs 18 and Csákberény 89: Csbr 89) in the *NE Bakony - Vértes Paleogene Subbasin* (See Table 1).

The *Gerecse Paleogene Subbasin* situated in NW part of the HPB between the *NE Bakony – Vértes Paleogene Subbasin* in the SW and *North Hungarian Paleogene Subbasin* in the NE. This subbasin is represented by several tiny, isolated subbasins with individual subsidence and tectonic history (BERNHARDT, 1984). Generally, Paleogene sequences begin with paralic coal formations (*Dorog Formation*) in the uppermost Lutetian (NP 16 nannoplankton Zone). Similarly to the *NE Bakony – Vértes Paleogene Subbasin* numerous, small, isolated carbonate platforms built up on topographic highs (*Szőc Limestone Formation*) meanwhile the calcareous marl, siltstone with rich subtropical fauna was deposited (*Csernye Formation*) in topographic lows. Calcareous marl grade into shallow marine clay marl (*Csolnok Clay Marl Formation*).

Alternatively, fluvial sand and calcareous sandstone (*Tokod Formation*) are interbedded in clay marl. This marl and calcareous marl is overlain by calcareous marl (*Padrag Marl Formation*) on

the northern edges of *Gerecse Paleogene Subbasin.* Slumps, gravitational redeposition and mass flow deposits were described by SZTANÓ and FODOR (1997) within the uppermost part of the succession. I have examined the benthic foraminiferal assemblages and their taxonomy and paleoecology in 56 samples from 2 boreholes (Tarján 13: Tj 13 and Tarján 14: Tj 14) and from an open-cast mine of Csordakút Basin (See Table 1).

The *North Hungarian Paleogene Subbasin* includes numerous basins from the Buda Mountains to the southern edge of the Bükk Mountains. The northwestern border of subbasin is the Buda line, the southernmost part of the basin was sheared by Mid-Hungarian Line and the southward continuation of Paleogene sequences corresponds with the Paleogene succession of Slovenian Paleogene Basin (NAGYMAROSY, 1990). Sedimentation started with terrestrial breccias and conglomerates in the Buda Hills (western part of the *North Hungarian Paleogene Subbasin)* in the Priabonian stage and continued with shallow-marine carbonates (*Szépvölgy Limestone Formation*). Sediments were deposited on the so-called Buda slope, the southeastward dipping flank of a complex upper Eocene anticline system, trending obliquely to the southern border fault of the escaping wedge (Fig. 10) (FODOR et al., 1992). The shallow water limestone is overlain by shallow pelagic to bathyal calcareous marl, marl which is characterised by mass occurrence of bryozoans (*Buda Marl Formation*) (ZÁGORŠEK & KÁZMÉR, 2001). I have examined the benthic foraminiferal fauna in 12 surface samples from a classical Upper Eocene section of Mátyás-hegy, Budapest (Fig. 19).

Biostratigraphy

In this paper, the Paleogene biostratigraphy of the HPB is based on biochronological analysis of calcareous nannoplankton (BÁLDI-BEKE, 1972, 1977, 1984; NAGYMAROSY, 1983) and planktonic foraminifera (TOUMARKINE, 1971; SZTRÁKOS, 1974; HORVÁTH–KOLLÁNYI, 1983). Based on the published results of BÁLDI-BEKE and HORVÁTH-KOLLÁNYI the depositional time of Eocene sequences corresponds to NP14–21 nannoplankton zones. Fig. 2 summarises the stratigraphy of the HPB, with data from BÁLDI-BEKE (nannoplankton; 1984, HORVÁTH-KOLLÁNYI (planktonic foraminifera; 1983) and BERNHARDT et al. (lithostratigraphy; 1988).

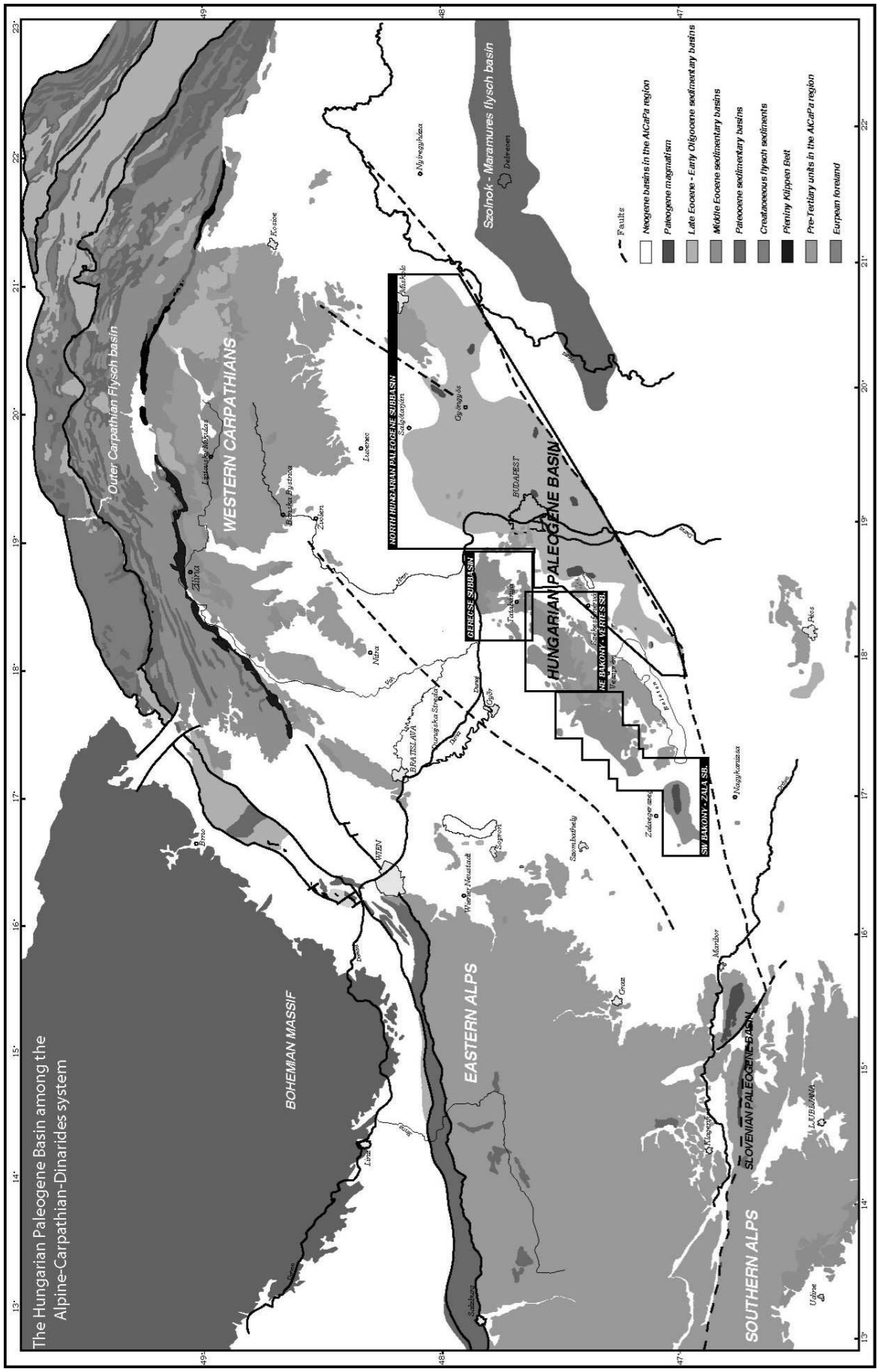

Fig. 1. Position of the Hungarian Palaeogene Basin in the Eastern Alpine-Western Carpathian junction. Base map: OZSVÁRT *in* KÁZMÉR et al. (2003).

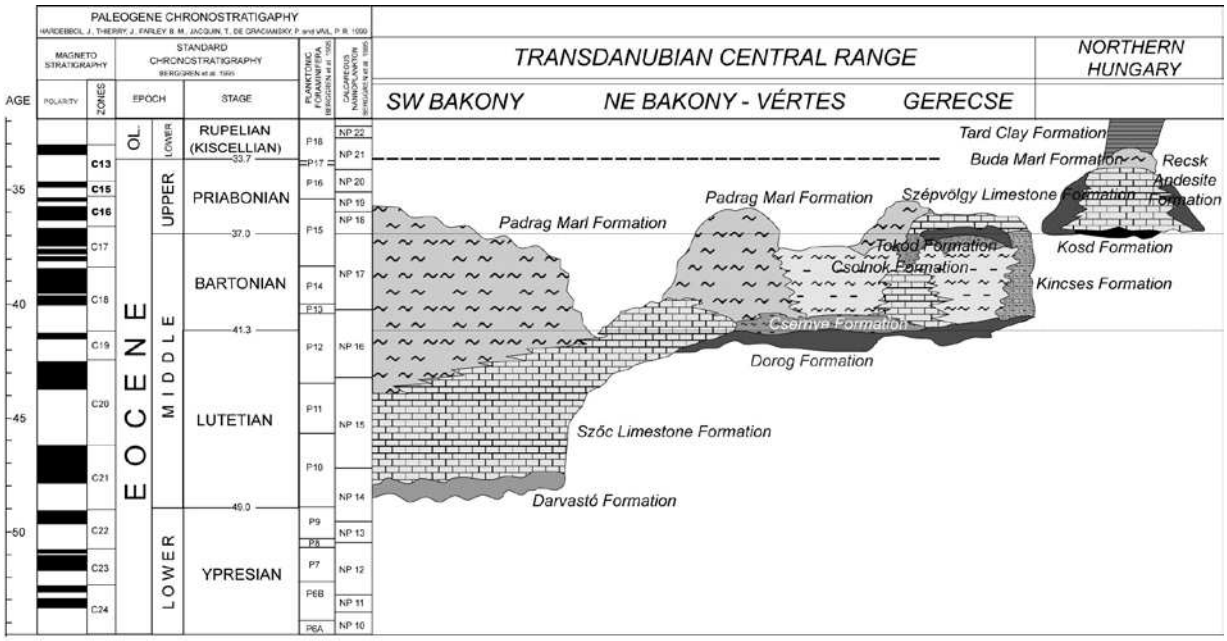

Fig. 2. Eocene lithostratigraphy (after BÁLDI-BEKE, 1984; NAGYMAROSY and BÁLDI-BEKE, 1988; BERNHARDT et al., 1988 and CSÁSZÁR, G., 1997) and chronostratigraphy (after HARDENBOL et al., 1998) in the Hungarian Paleogene Basin.

Methods

Benthic foraminifera from 12 boreholes and from two outcrops from the HPB were examined. All samples from boreholes were obtained from the Geological Institute of Hungary. Each sample from outcrops was collected by the author and approximately 250–300 g from each sample was cleaned using 25% hydrogen-peroxide. The residues were washed over a 50 μm sieve and dried. Samples were divided into the grain-size fractions of 50–500 μm and >500 μm. Faunal analysis was performed only on the 50–500 μm fraction. Prior to separation and counting, the samples were divided into parts of 1/2, 1/4, 1/8 etc., using a micro-splitter. For faunal analysis, ~200–250 specimens were picked, unless their numbers were less than 200, in which case all specimens were picked. For paleoecological and paleoceanographical studies, the Benthic Foraminiferal Number (BFN), Diversity H(S), Dominance, Fisher alpha (α) index and faunal composition were calculated. The detailed description of calculation for H(S) is given in BUZAS and GIBSON (1969), for Dominance, Fisher index and faunal composition is given in MURRAY (1991). The BFN parameter is the number of specimens per gram sediments (SCHOTT, 1935) and gives an indication of the sedimentation rate, productivity and carbonate dissolution (DOUGLAS and WOODRUFF, 1981).

Foraminifera specimens were identified under a reflected light binocular microscope. All species were identified, described and photographed with a scanning electron microscope in Eötvös University of Budapest (ELTE).

Sections

SW Bakony – Zala Paleogene Subbasin

Devecser 4 borehole

The DV 4 borehole is located in the middle part of *SW Bakony – Zala Paleogene Subbasin* (Fig. 3). This borehole penetrated to 910 m depth, in which a 267 m thick Eocene succession was recovered. A 49.1 m continous core from the top of the Eocene succession was investigated. Eighty-three samples yielded a total of 5136 specimens of 132 benthic foraminiferal species (see Table 2). The studied sequence is composed of clay, clay-marl and marl units. Diversity shows strong fluctuations (Fig. 4) in lower part (H(S) = 1–2; Fisher (α) = 5–15) and continued with diversity increasing in middle and upper part with moderate fluctuation (H(S) = 2.5–3.5 Fisher (α) = 10–30). More than 50% of benthic foraminifera test are agglutinated in the lower part of the section (between 95 m and 90 m). Upward this value varies between 0 and 10 % in the upper part of the section and hyaline tests dominate. The benthic foraminiferal fauna is distributed differently through the succession. Dominant species are: *Dentalina elegans, Gyroidionides soldanii, Lenticulina arcuatostriata, Nodosaria longiscata, Stilostomella elegans* (see Table 2).

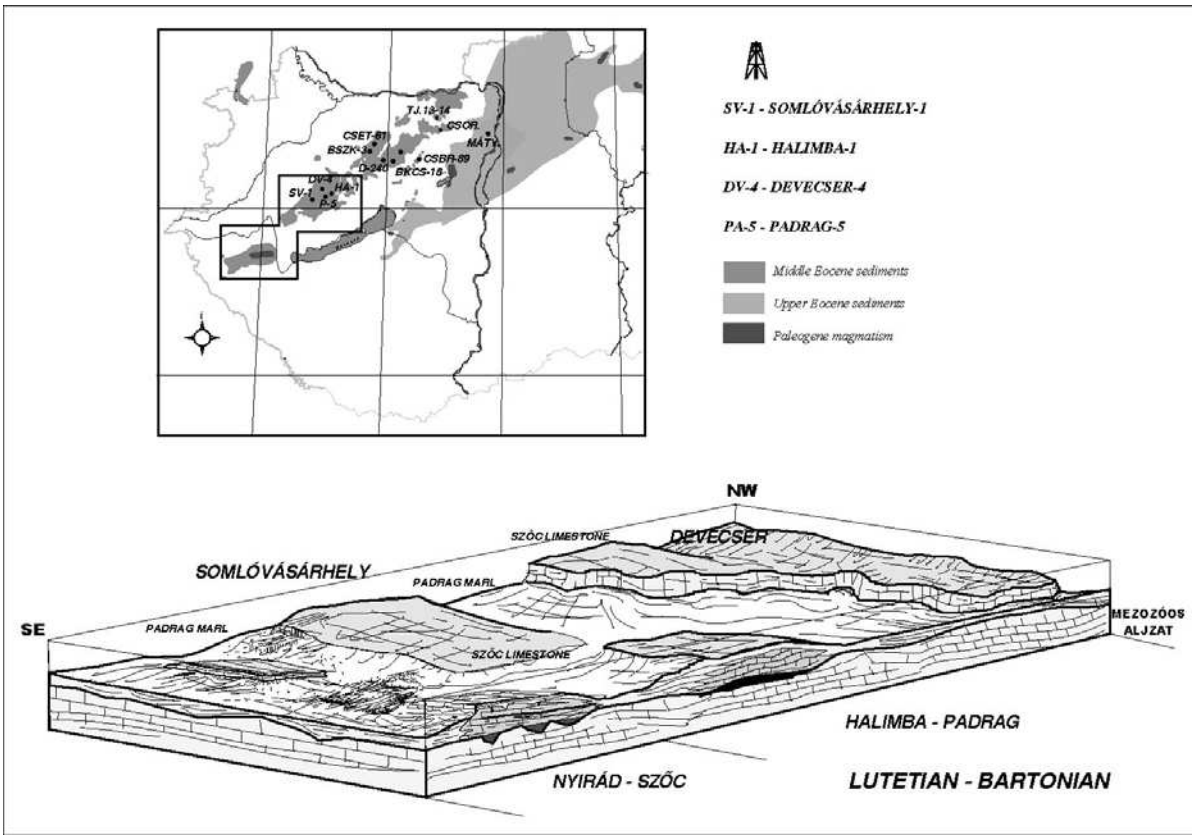

Fig. 3. Position and hypothetical configuration of the *SW Bakony – Zala Paleogene Subbasin* in the Hungarian Paleogene Basin.

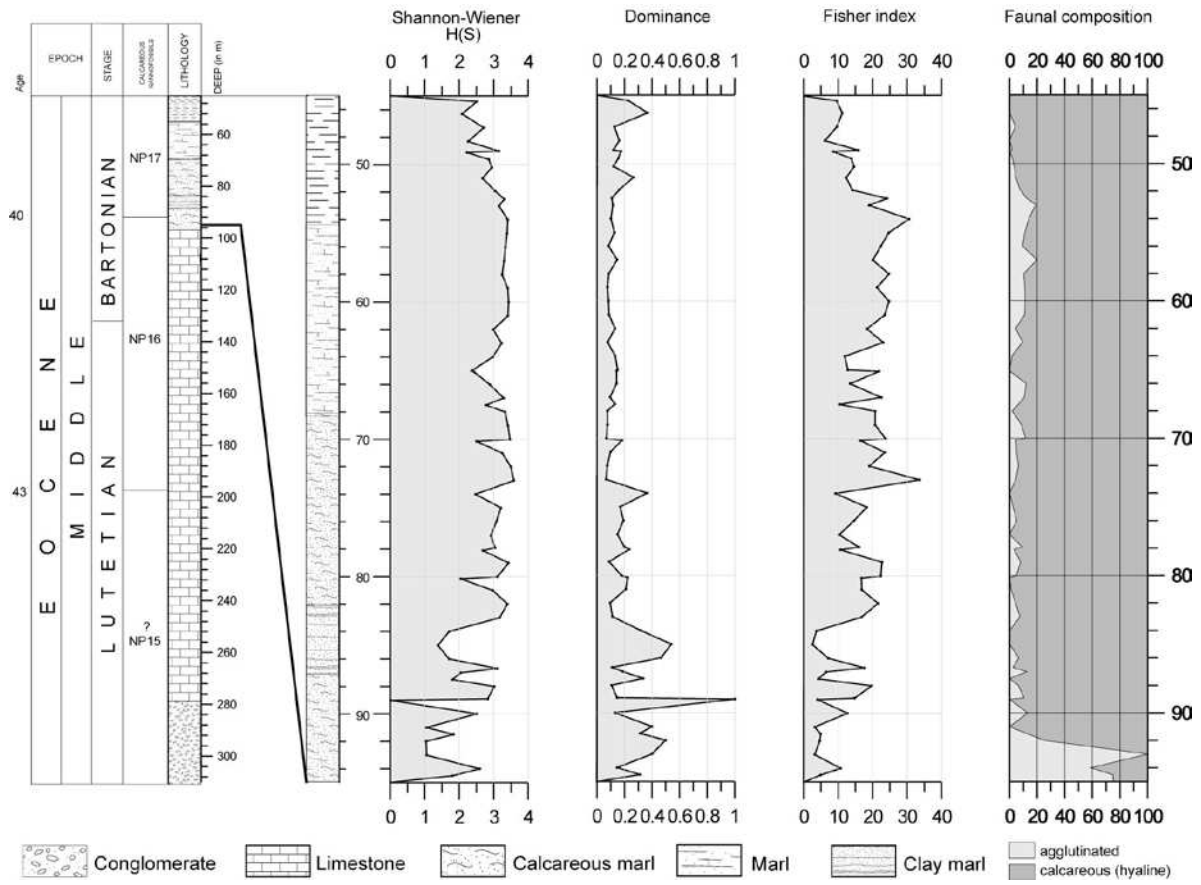

Fig. 4. Shannon-Wiener, Dominance, Fisher index and faunal composition of the Devecser 4 borehole.

Halimba 1 borehole

Hal 1 borehole penetrated 161.5 m thick Eocene succession, located on the south-eastern part of *SW Bakony – Zla Paleogene Subbasin* (Fig. 3). Sedimentation started with terrestrial breccia and conglomerate. Upwards this succession changes into shallow marine carbonates. These carbonates are overlain by the shallow pelagic to bathyal calcareous marl and marl. Thirty-five samples yielded 2813 specimens of 60 benthic foraminiferal species (see Table 2). The Shannon-Wiener H(S) diversity index of the benthic foraminiferal association increases continuously from the lower part to top of the succession (Fig. 5). Diversity varies between 0.67 and 3.15. Fisher (α) varies from 0.5 to 10. All foraminifera tests are hyaline along the whole section, except in the upper part (between 44 m and 60 m, where the ratio of agglutinated foraminifera increases (5–20%). Dominant benthic foraminifera are *Eponides polygonus, Heterolepa dutemplei, Cibicides* spp., *Dentalina* sp. and *Lenticulina* sp. (see Table 2).

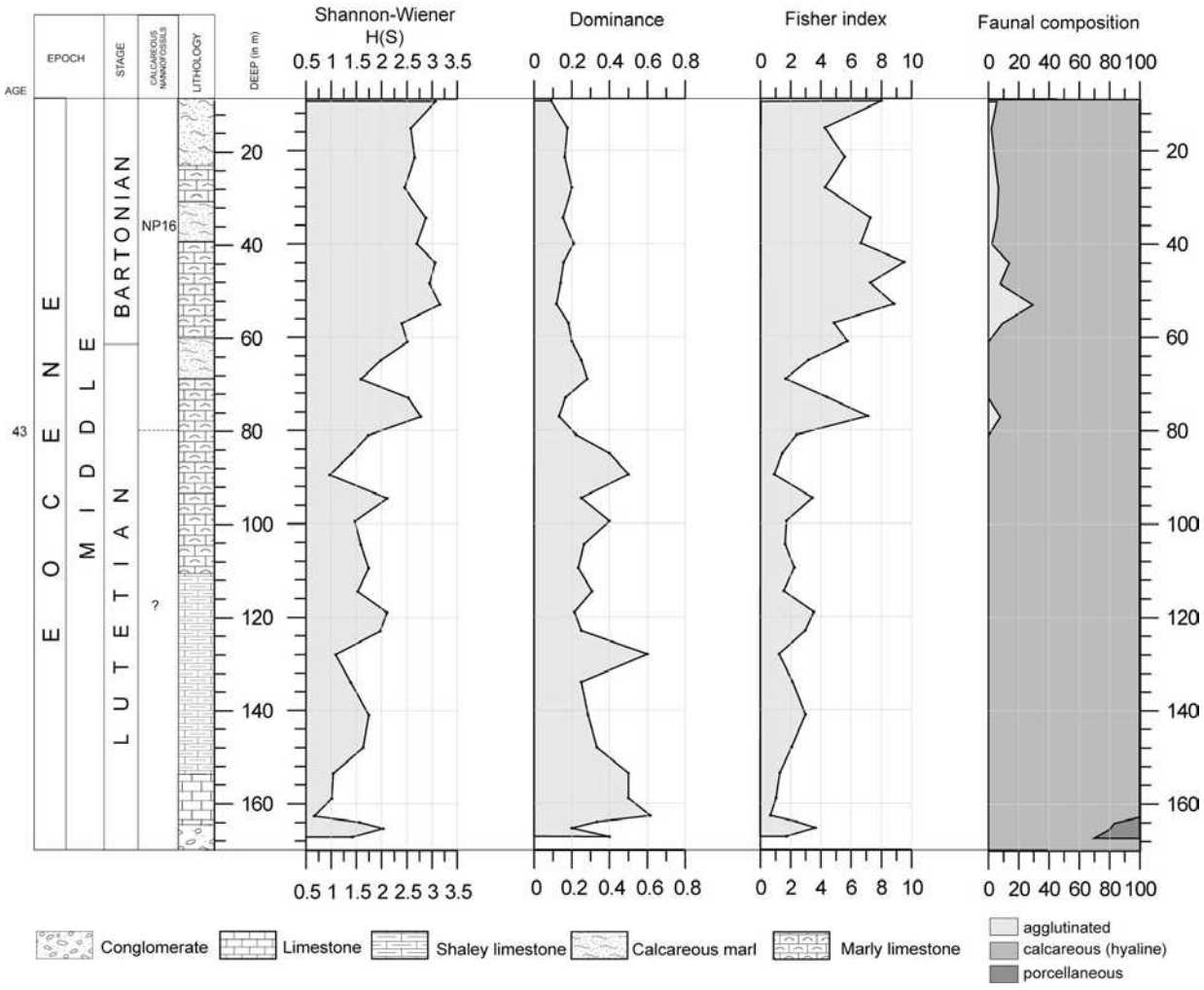

Fig. 5. Shannon-Wiener, Dominance, Fisher index and faunal composition of the Halimba 1 borehole.

Padrag 5 borehole

The Pa 5 borehole is located in the central part of the subbasin (Fig. 3). A 58.2 m continuos core of the 244 m thick Eocene succession was investigated (see Fig. 6). 13 samples contained enough specimens for statistical analysis. 1705 specimens of 55 species were analysed (see Table 2). Diversity is low (Fig. 6), H(S) varies continuously (between 2.5 and 3; Fisher (α) = 5–10). At 34 m, the diversity is 0 and the dominant species is *Heterolepa simplex.* Calcareous, hyaline tests dominate the section. Benthic foraminifera assemblage is dominated by *Uvigerina eocaena, Lenticulina arcuatostriata* and *Heterolepa simplex* (see Table 2).

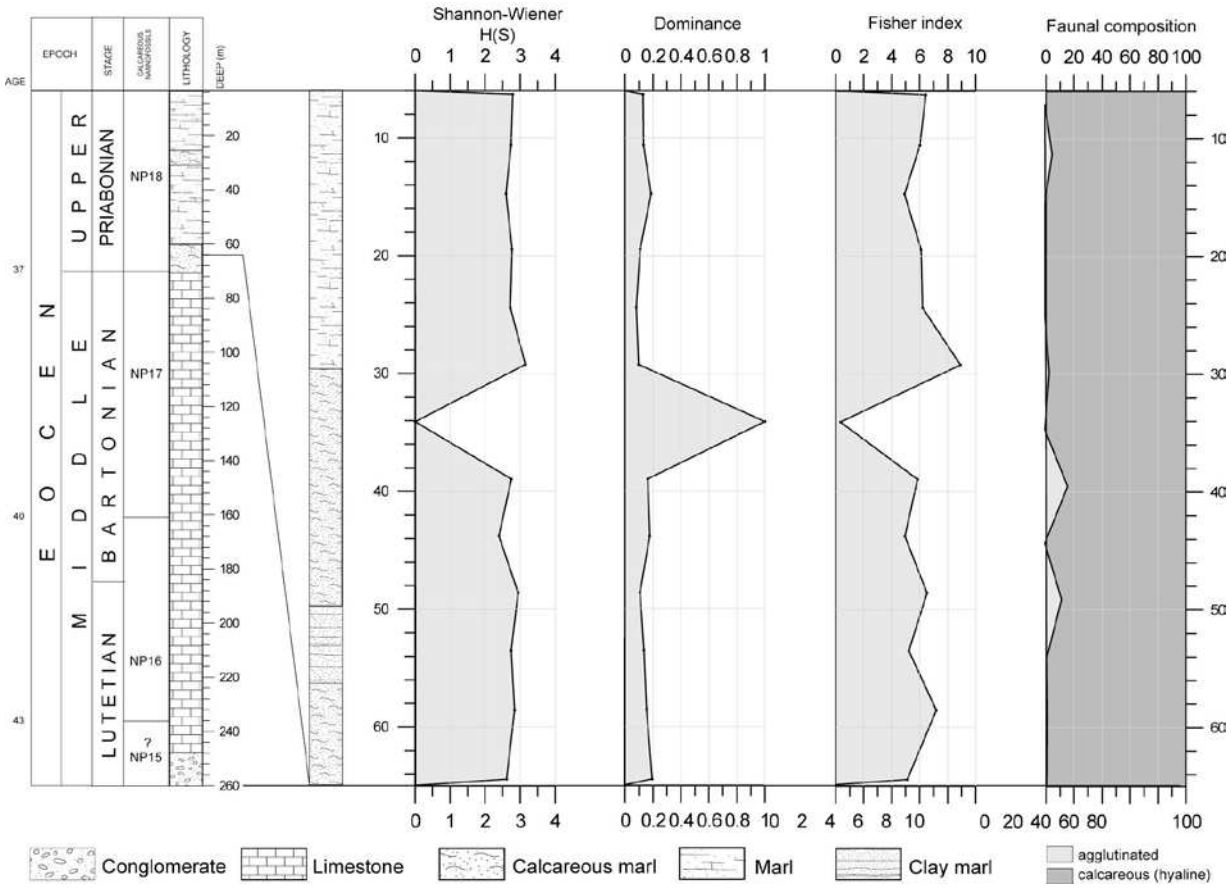

Fig. 6 – Shannon-Wiener, Dominance, Fisher-index and faunal composition of Padrag 5 borehole.

Somlóvásárhely 1 borehole

Sv 1 borehole is located in the north-western part of *SW Bakony – Zala Paleogene Subbasin* (Fig. 3). A total of 306.8 m thick Eocene succession was drilled in this core, represented by continous sequences between NP14 and NP 19 nannoplankton zones. The oldest Eocene sediments are terrestrial clay, variegated clay and clay marl. The sequence grades into shallow-marine carbonate (Szőc Limestone Formation). At 720 m the limestone grades into grey, greenish grey marl of the Padrag Formation. 223 samples contain 10,234 specimens of 64 species. The Shannon-Wiener H(S) diversity index of the benthic foraminiferal association shows strong fluctuation along the whole section (Fig. 7). Index values vary between 0 and 2 in the lower part of the section (between 837.8 m and 712 m). Diversity increases slightly (H(S) = 2.5–3; Fisher (α)= 2–5) in the middle part of the section (between 580 m and 712 m, upper interval decreases suddenly (H(S) = 0.5–2, while Fisher (α) index increases at the top of the section. Calcareous tests are dominant (60–100%) in percentage, particularly the porcellaneous (60–100 % between 837.6 m and 828.0 m) and agglutinated tests (between 700.0 m to 800.0 m) are significant. The assemblage is chiefly composed of *Cibicides* sp., *Uvigerina eocaena, Dentalina elegans, Lenticulina arcuatostriata* and *Heterolepa dutemplei* (see Table 2).

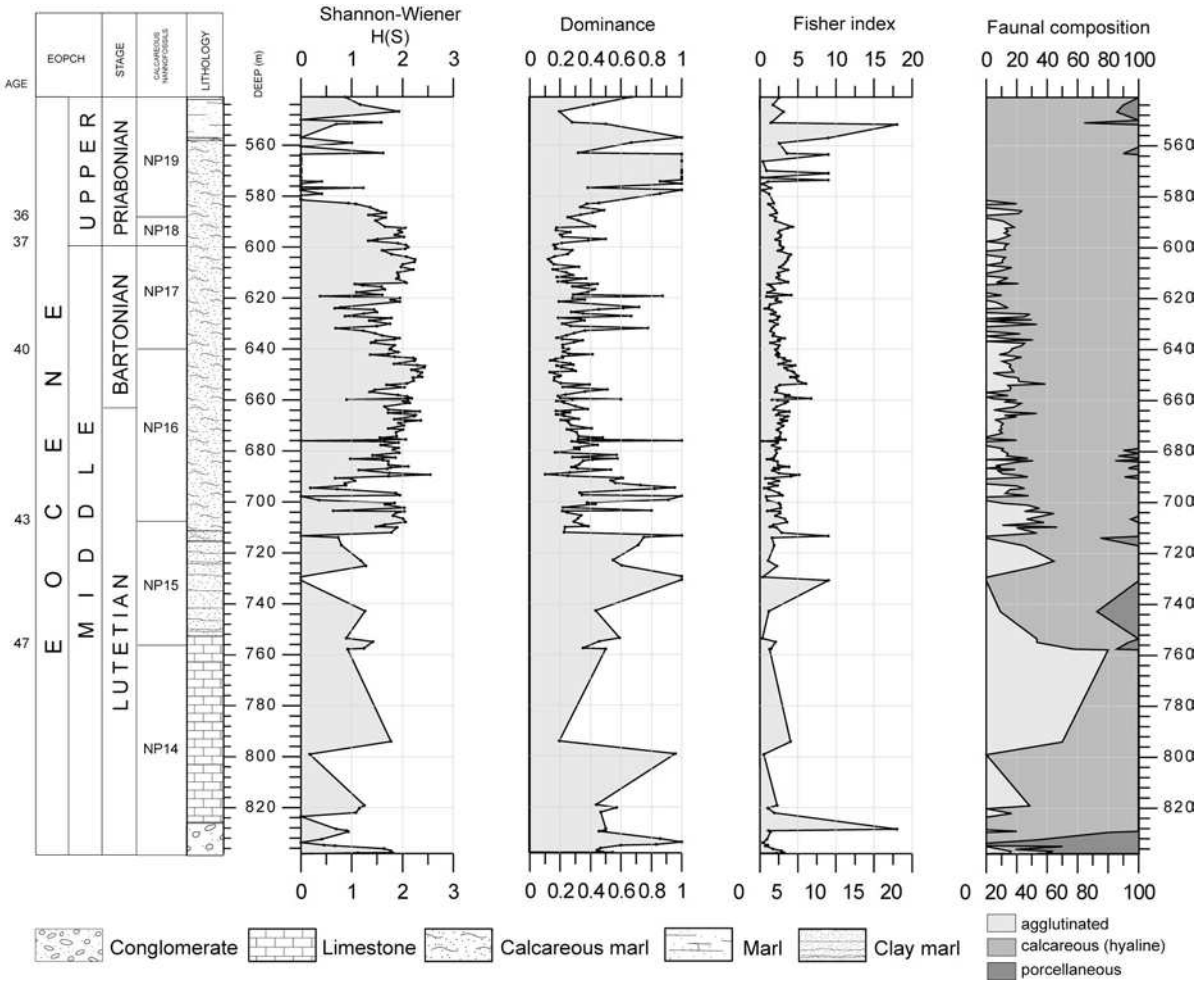

Fig. 7. Shannon-Wiener, Dominance, Fisher index and faunal composition of Somlóvásárhely 1 borehole.

NE Bakony–Vértes Paleogene Subbasin

Bakonycsernye 18 borehole

Bkcs 18 borehole was drilled in south-eastern part of *NE Bakony–Vértes Paleogene Subbasin* (Fig. 8). This core penetrated 93 m continous Middle Eocene grey, greenish grey marl of Padrag Formation. Twenty-one samples yielded 2332 specimens of 81 species. Diversity index of the association increases slightly (H(S) = 1.5–3; Fisher (α) = 1–10) up to 352 m from the bottom (Fig. 9). Diversity is low (H(S) = 0.5–1.5; Fisher (α)=2–3) in the middle part of the section and increases (H(S) = 1.5–3; Fisher (α) = 4–6) in the upper interval. Calcareous tests are dominant, particularly agglutinated tests are significant in the upper interval. The dominant benthic foraminifera are *Lenticulina arcuatostriata, Heterolepa dutemplei, Bulimina truncana* and *Heterolepa simplex* (see Table 2).

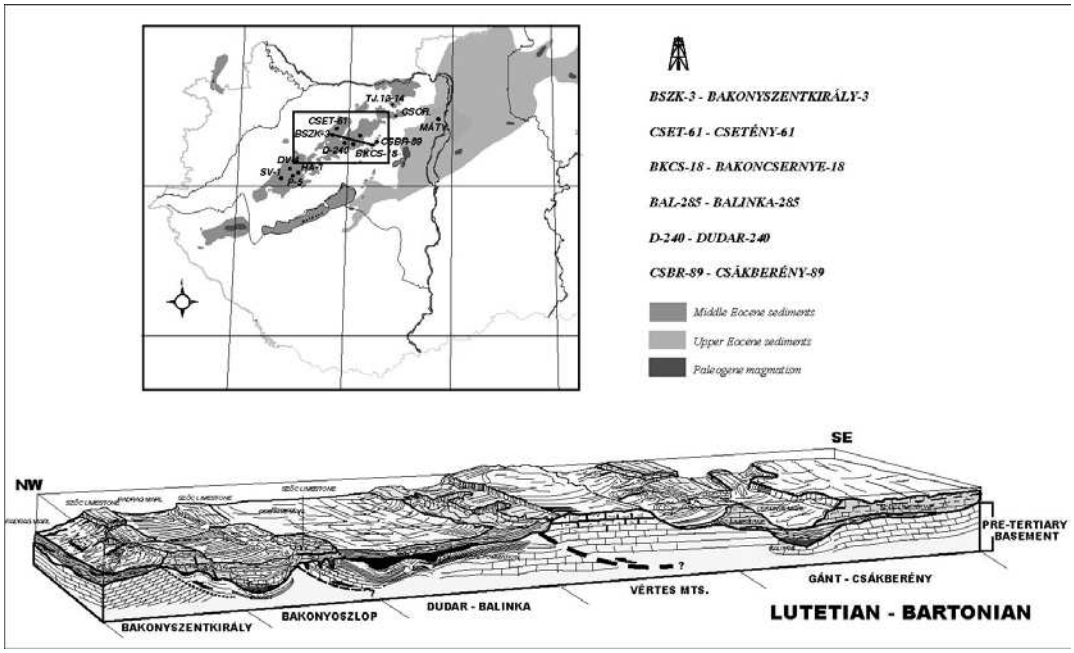

Fig. 8. Position and hypothetical configuration of the *NE Bakony–Vértes Paleogene Subbasin* in the Hungarian Paleogene Basin

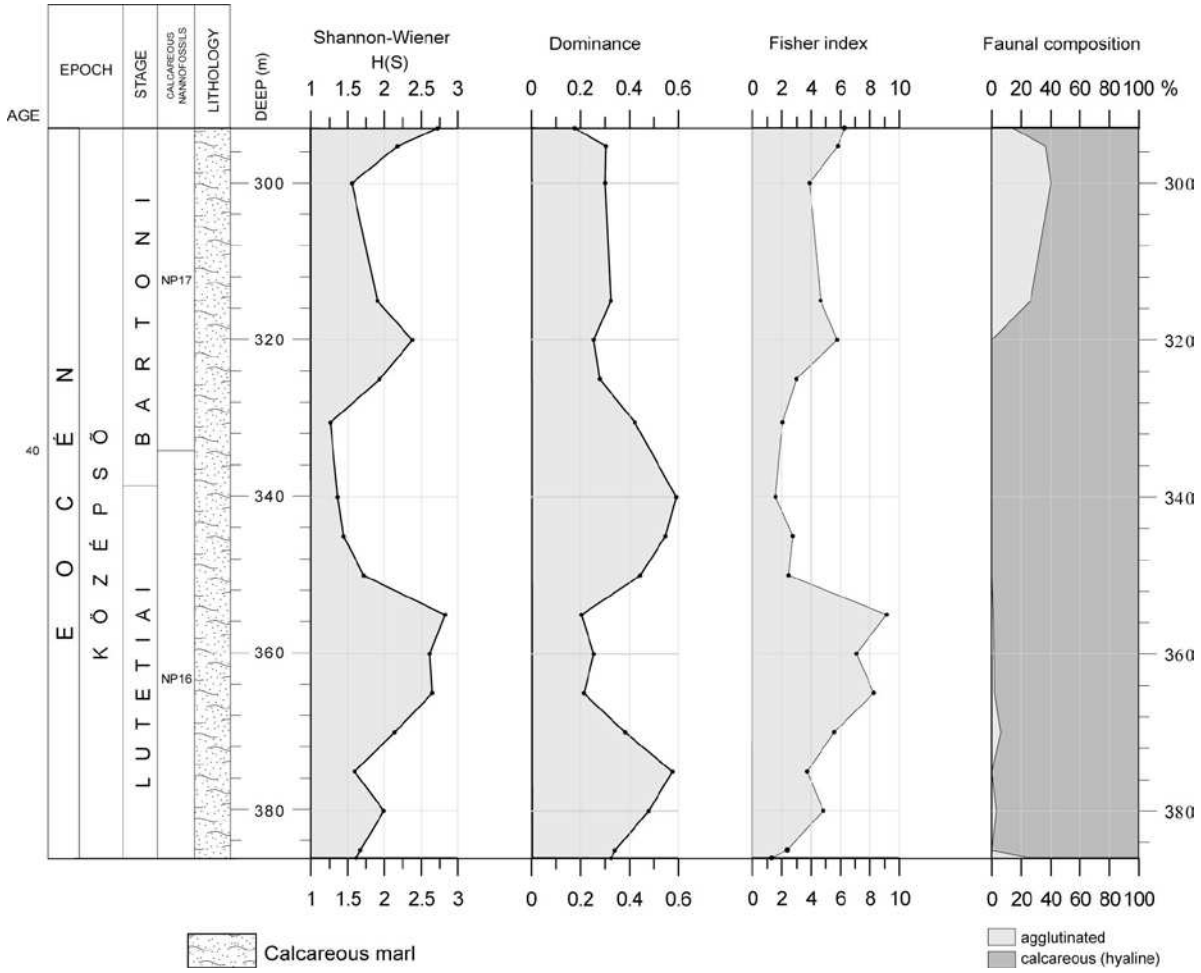

Fig. 9. Shannon-Wiener, Dominance, Fisher index and faunal composition of Bakonycsernye 18 borehole.

Bakonyszentkirály 3 borehole

Bszk 3 borehole contains 180 m thick Middle and Upper Eocene sediments of grey marl of *Padrag Formation*. 35 samples yielded 7324 specimens of 43 benthic foraminiferal species. Diversity is low (Fig. 10), (H(S) varies between 1 and 3; Fisher (α) = 2–14) and shows a decrease in the upper interval of the section. Calcareous test are significant (40–100%, however the porcellaneous and agglutinated test are also present in whole section (up to 60%). Dominant benthic foraminifera are *Lenticulina arcuatostriata, Heterolepa dutemplei, Bulimina truncana* and *Quinqueloculina* sp. (see Table 2).

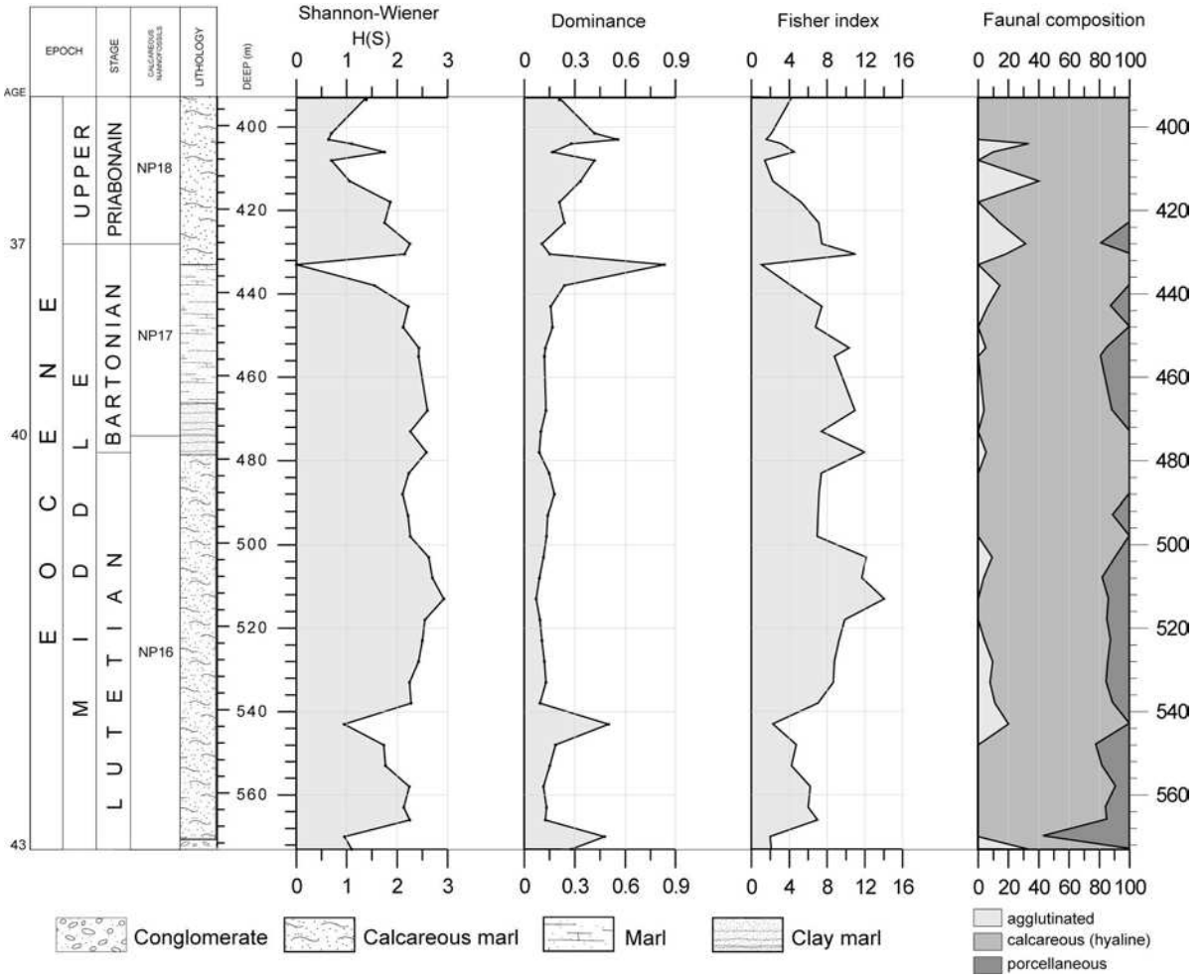

Fig. 10. Shannon-Wiener, Dominance, Fisher index and faunal composition of Bakonyszentkirály 3 borehole.

Balinka 285 borehole

Ba 285 borehole is located in the south-eastern part of the *NE Bakony–Vértes Paleogene Subbasin* (Fig. 8). This core penetrated a 100 m thick Eocene succession and 31 samples contain 3462 specimens of 56 benthic foraminiferal species. H(S) diversity index of the benthic foraminiferal association increases slightly (H(S) = 2.5–3; Fisher (α) = 2–16) from the bottom to top of the investigated section (Fig. 11). In the lower part of the section (between 564.0 m to 580.0 m) porcellaneous tests dominate (60–80%), while agglutinated tests are present in 0–20 %. Calcareous foraminifera tests become dominant from 564.0 m to top of the section. The benthic foraminiferal fauna are distributed differently through the succession, the dominant species are: *Heterolepa*

dutemplei, Bulimina truncana, Quinqueloculina carinata, Cibicidoides sp., and *Nodosaria* sp. (see Table 2).

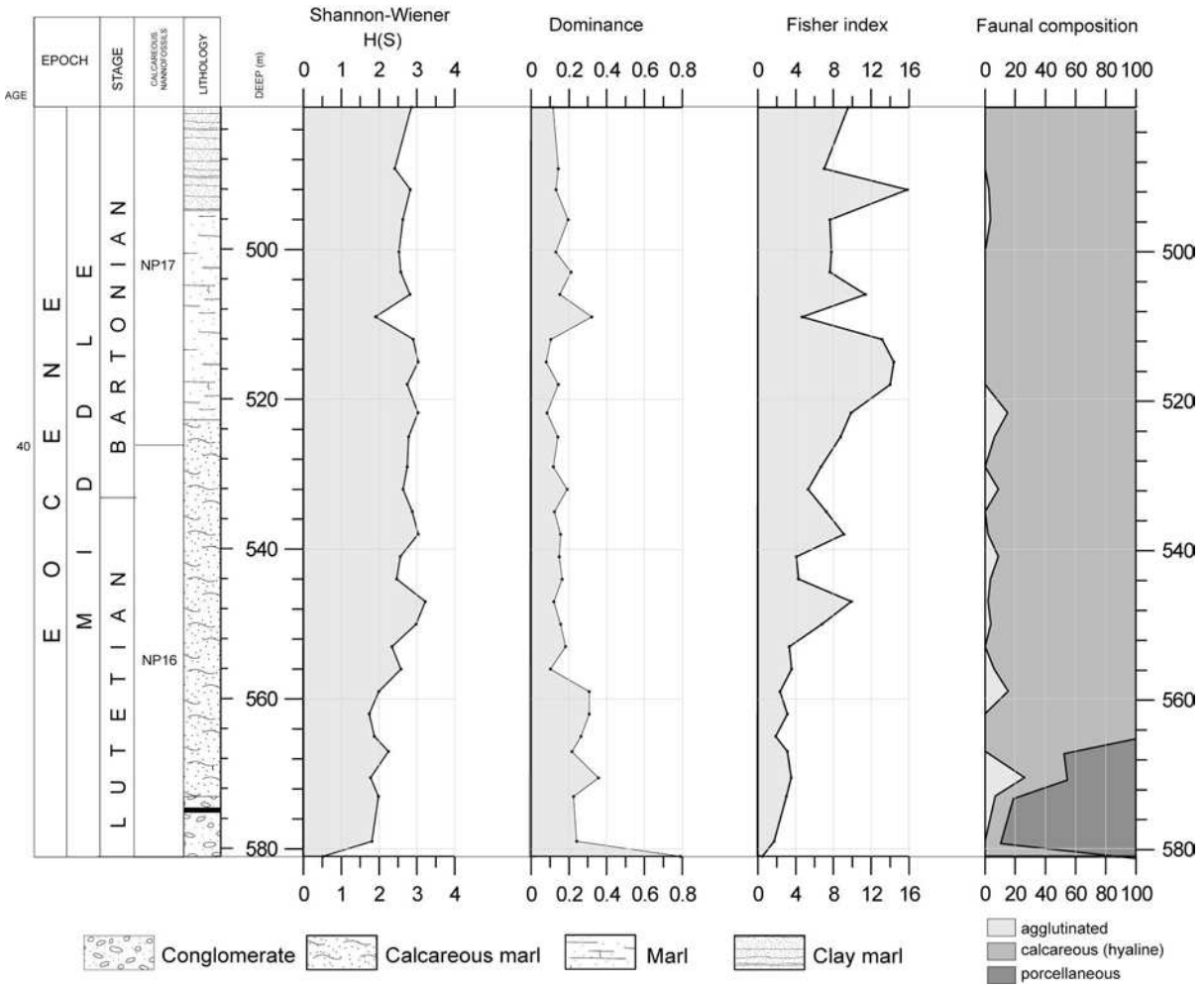

Fig. 11. Shannon-Wiener, Dominance, Fisher index and faunal composition of Balinka 285 borehole.

Csetény 61 borehole

Cset 61 borehole penetrated 543 m, in which a 245 m thick Eocene succession was recovered. The oldest Eocene sediments (Fig. 12) at depth of 515.4 m are Upper Lutetian (NP16) gray clay, variegated clay and clay marl layers, frequently intercalated by thin coal seams (*Dorog Formation*). Above 476.0 m this basal terrestrial sequence interfingers with calcareous marls and lumachelle of the Csernye Formation. At 470.0 m calcareous marls grade into grey, greenish grey marls of the Padrag Formation which is characterised by mass occurrence of coccoliths. Between 425.6 m and 420.6 m thin-bedded, laminated, fine-grained marls have been observed. Higher up (between 420.0 m and 401.0 m, stratification becomes more pronounced and carbonate content increases. The upper part of the section is lithologically uniform, but the carbonate content of marl layers is variable. The interval between 402.5 m and 356.0 m consists of thick-bedded marl, frequently intercalated with tuffaceous layers. Seventy samples yielded 3404 specimens of 102 benthic foraminiferal species. The Shannon-Wiener H(S) diversity index of the benthic foraminiferal association varies between 1 and 3 (Fig. 7). In the lower part of the section (between 432 m and 470 m) diversity exhibits higher values (between 2 and 3). In the middle part of the section (around 432 m) a drop in diversity is observed, and H(S) values show strong fluctuations between 1 and 2. Agglutinated and porcellaneous tests dominate in bottom part, but decrease their dominance progressively upwards. Calcareous tests are dominated from the 468.0 m. The dominant foraminiferal assemblage is composed of *Lenticulina platyptera,*

Cibicidoides eocaenus, Lenticulina arcuatostriata, Eponides polygonus and *Bulimina truncana* (see Table 2).

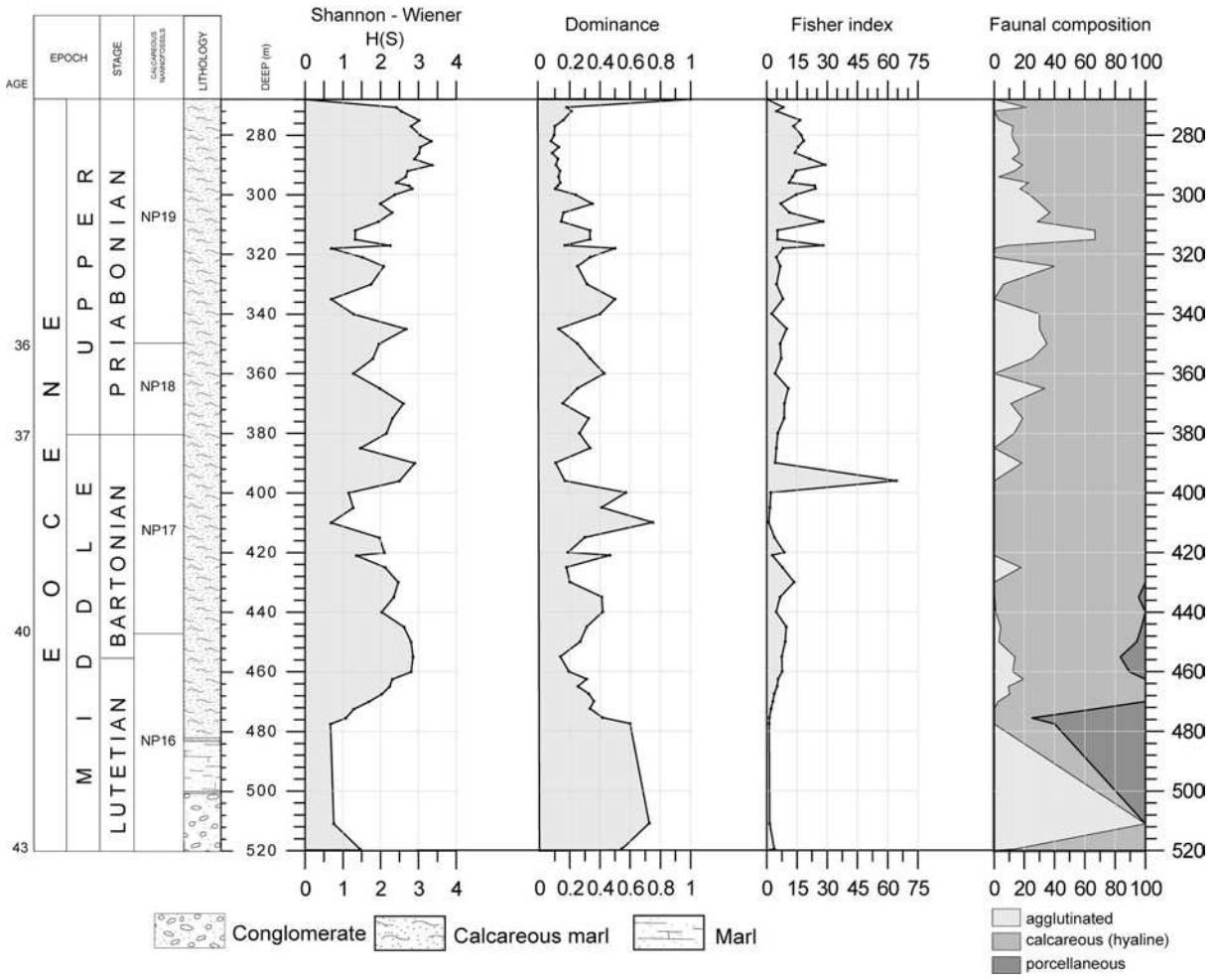

Fig. 12. Shannon-Wiener, Dominance, Fisher index and faunal composition of Csetény 61 borehole.

Dudar 240 borehole

D 240 borehole yield 168.5 m thick Middle and Upper Eocene (NP16–NP19 nannoplankton zones) sequences. The bottom interval is terrestrial clay, variegated clay and clay marl. The sequence grades into the shallow marine, marly limestone and limestone (*Szőc Limestone Formation*). This carbonate succession passes into grey, grey marls upward. Thirty-seven samples yielded 2773 specimens of 64 benthic foraminiferal species. H(S) index of the benthic foraminiferal association varies between 1.5 and 2.5, while the Fisher (α) varies between 2 and 8 (Fig. 13). The diversity indexes show strong fluctuation along the section. Calcareous tests are dominant in all samples. The dominant benthic foraminifera are *Lenticulina arcuatostriata, Heterolepa dutemplei, Bulimina truncana, Pararotalia inermis* and *Stilostomella* sp. (see Table 2).

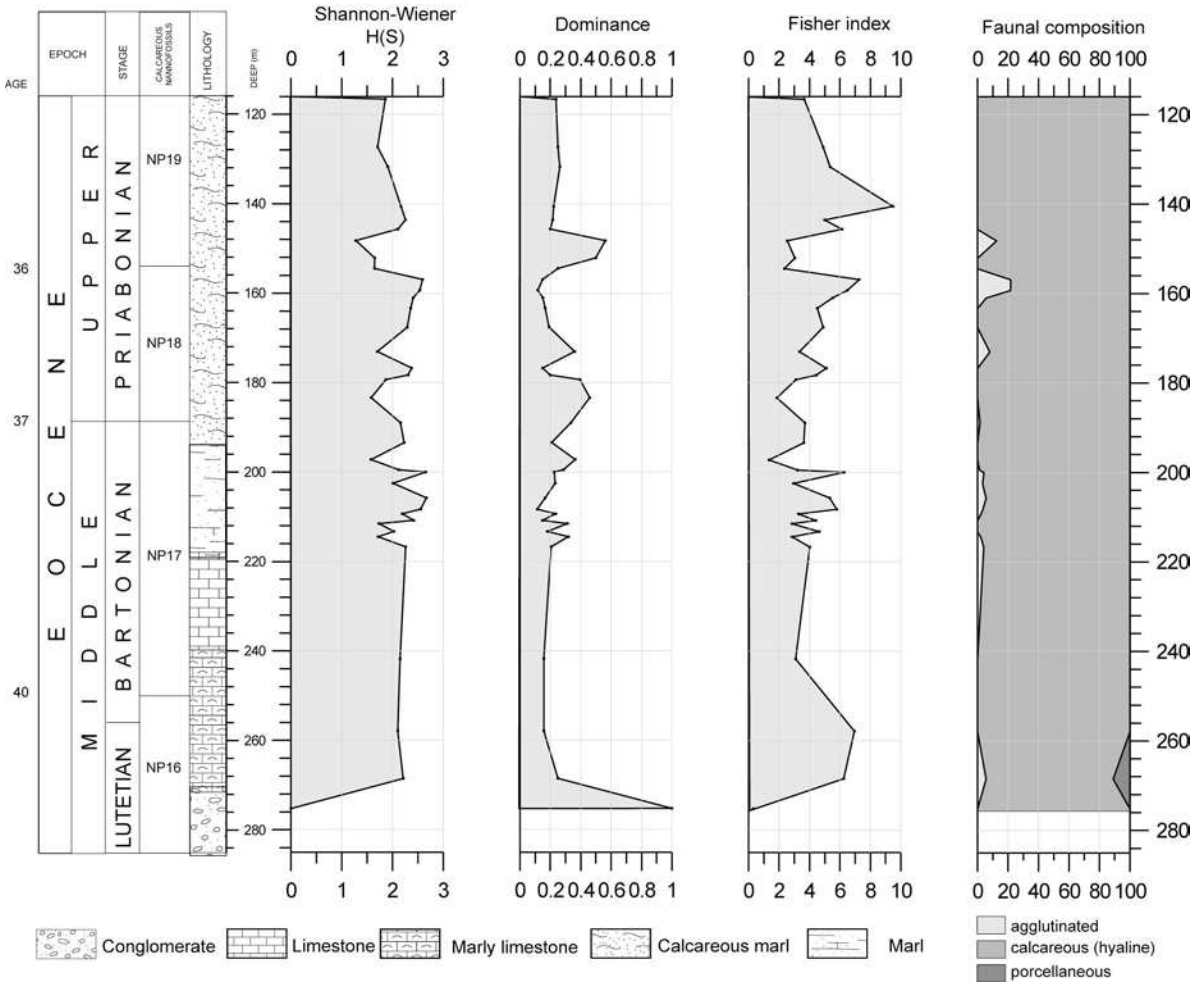

Fig. 13. Shannon-Wiener, Dominance, Fisher index and faunal composition of Dudar 240 borehole.

Csákberény 89 borehole

Csbr 89 borehole penetrated a 197.3 thick Lutetian (NP16 nannoplankton zone) succession. This consists of grey clay, clay marl, calcareous marl and marl. Seventy-six samples contain 4767 specimens of 98 benthic foraminiferal species. Diversity indexes show strong fluctuation in whole section (H(S) = 1–2.5; Fisher (α) = 1–6). They show slightly decreasing (Fig. 14) from bottom to the middle interval, later increase up to relatively high values (H(S) = 1.5–3; Fisher (α) = 6–10). Porcellaneous tests dominant (80–100%) up to 240.0 m, from that level calcareous tests become dominant. The benthic foraminiferal fauna is distributed differently through the succession. The dominant assemblage is composed of *Quinqueloculina carinata, Eponides haidingeri, Eponides umbonatus* and *Triloculina porvaensis* (see Table 2).

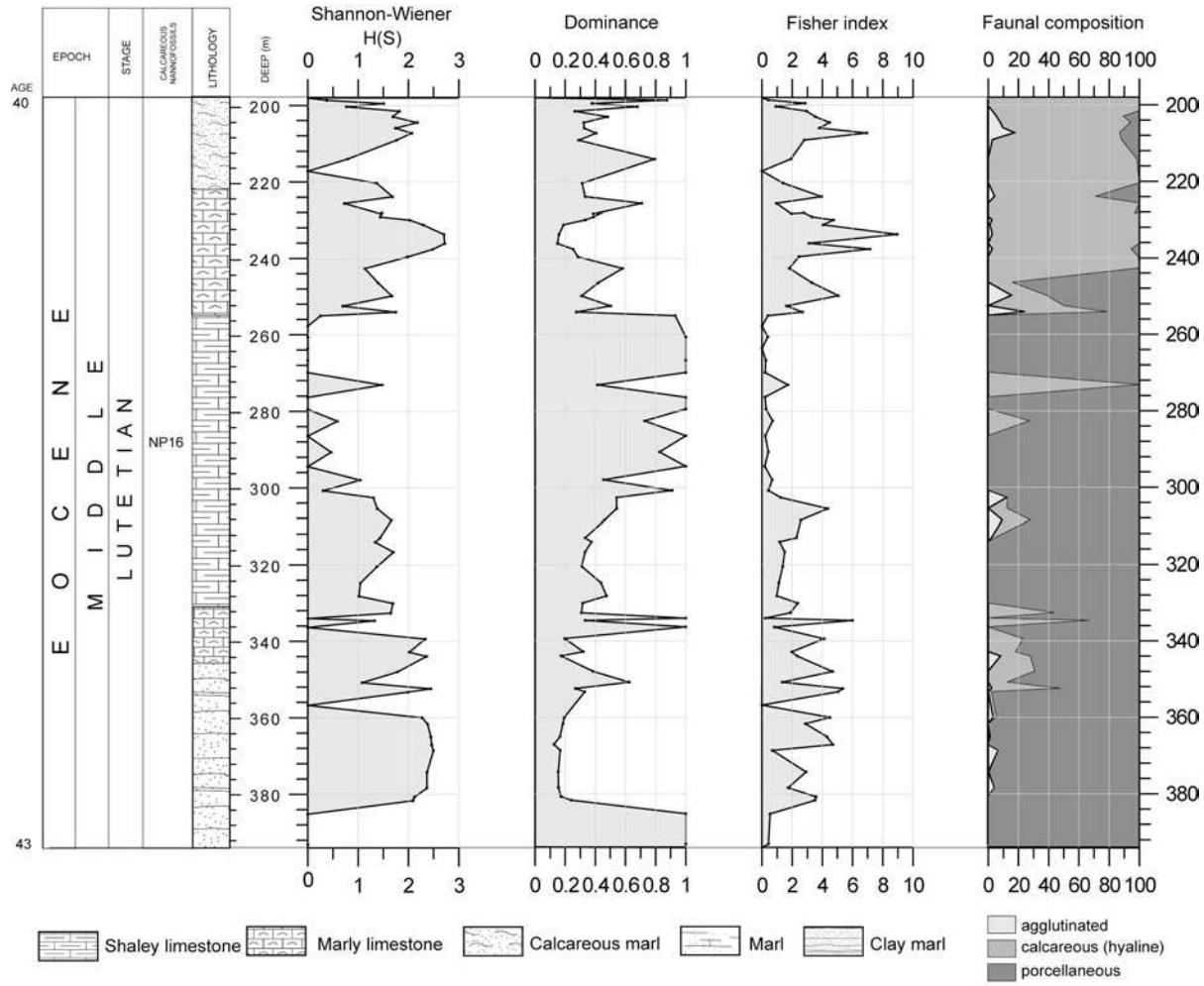

Fig. 14. Shannon-Wiener, Dominance, Fisher index and faunal composition of Csákberény 89 borehole.

Gerecse Paleogene Subbasin

Csordakút outcrop

Csordakút is located in the southern part of the Gerecse Mountains (Fig. 15). The 35 m thick Middle Eocene sequence of the open-cast mine of Csordakút Basin is the following: very fine-grained, grey, reddish brown variegated clay covered by brown marl with Triassic dolomite boulders in the lower part of the bed. This sequence grades into grey, brownish-grey, well-stratified *Nummulites* marl and limestone. It is biomicrite with packstone (rudstone), wackestone (floatstone) and wackestone/packstone texture. This marl and limestone passes into light-coloured, unstratified, nodular "*Alveolina*" limestone. It is biomicrite with mudstone, wackestone and packstone texture. This formation is overlain by *Ostrea* lumachelle. It is poorly consolidated greenish grey argillaceous marl with rich mollusca fauna. Twenty-one samples yielded 5183 specimens of 41 benthic foraminiferal species. Diversity indexes show slightly increasing (Fig. 16) from bottom to upper interval of the section (H(S) = 0.5–2; Fisher (α) = 1–4). Calcareous tests are dominant, particularly the porcellaneous and agglutinated tests are also significant in particular levels. The dominant benthic foraminifera are *Nonion scaphum, Pararotalia curry, Pyrgo simplex* and *Eponides polyganus* (see Table 2).

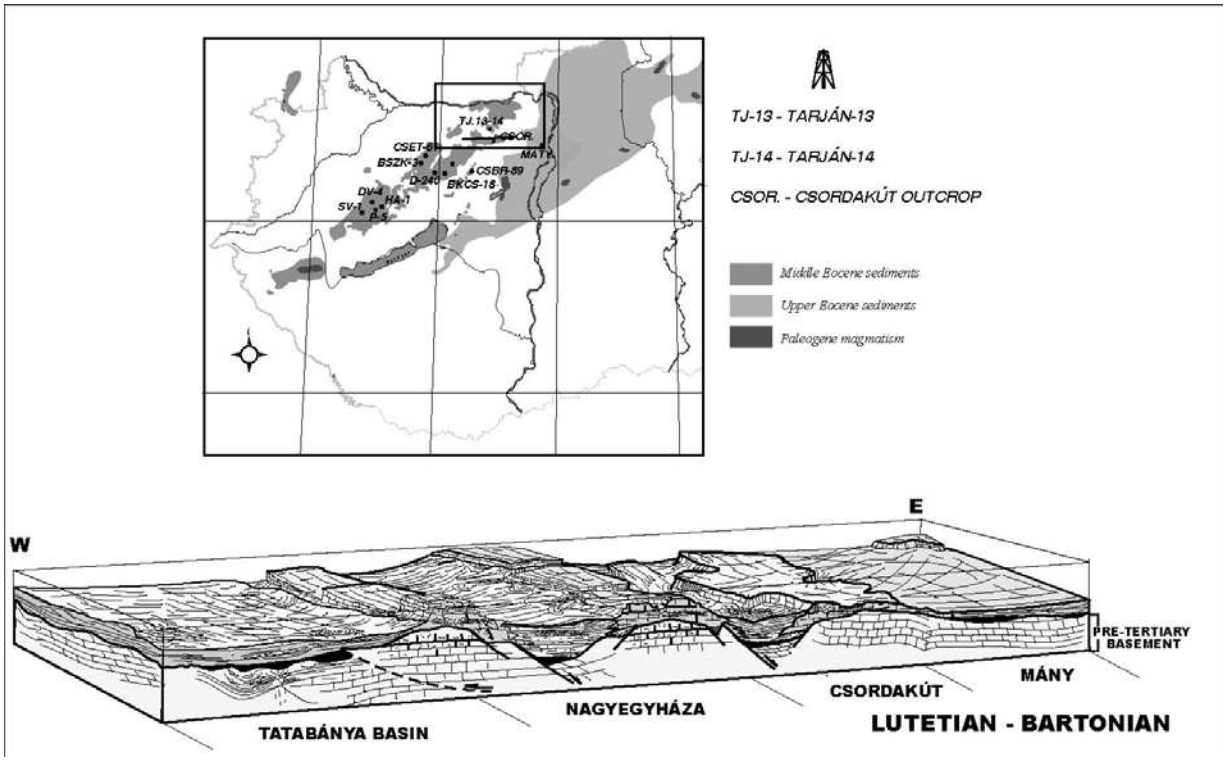

Fig. 15. Position and hypothetical configuration of *Gerecse Paleogene Subbasin* in the Hungarian Paleogene Basin.

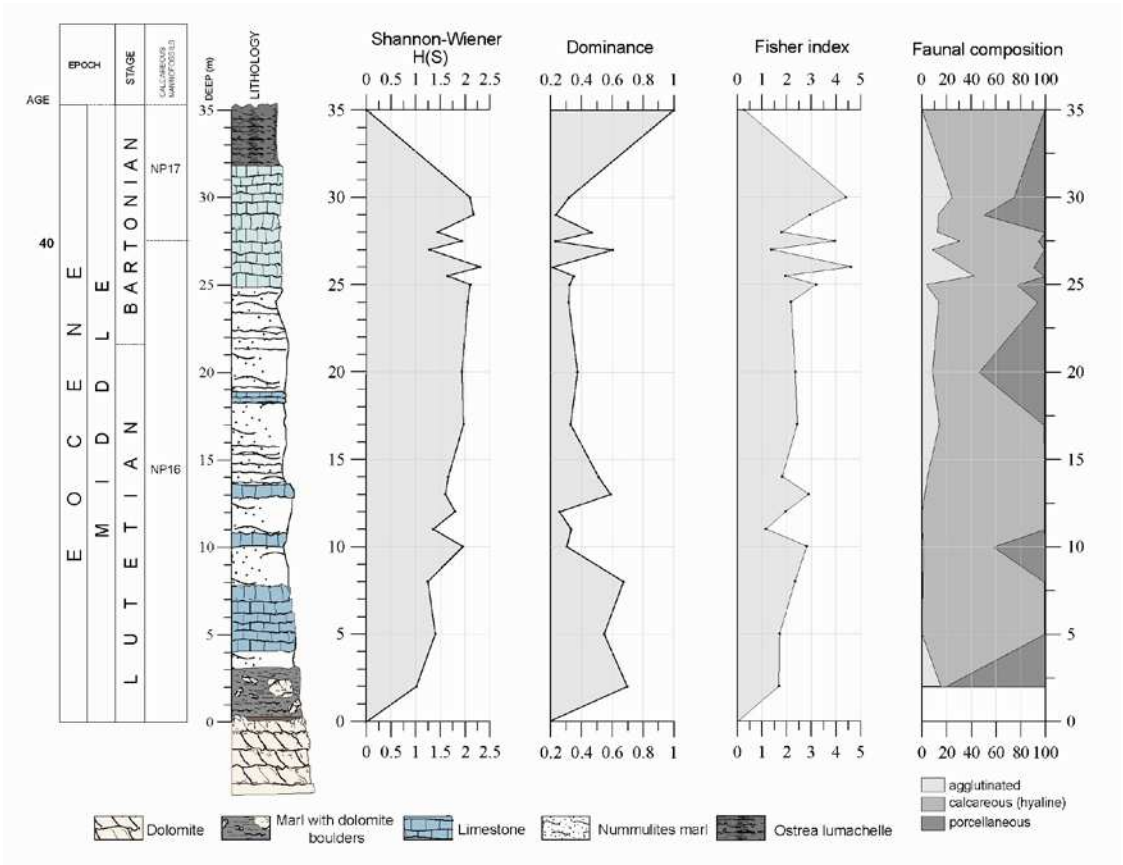

Fig. 16. Shannon-Wiener, Dominance, Fisher index and faunal composition of Csordakút section.

Tarján 13 and Tarján 14 boreholes

Tj 13 and Tj 14 boreholes are located in the middle part of the *Gerecse Paleogene Subbasin,* close to each other (Table 1). Both boreholes represent the Middle Eocene (NP16–NP17 nannoplankton zones) sequences, and the investigated samples contain 2630 specimens of 43 individual benthic foraminiferal species (see Table 2). Diversity indices are low (H(S) = 1.5–2; Fisher (α) = 1–5) and show decreasing trend in Tj 13 borehole (Fig. 17), and relatively high fluctuation in Tj 14 borehole (Fig. 18). Calcareous and porcellaneous tests are dominant in both sections. The benthic foraminiferal fauna is distributed differently through the succession. Dominant assemblages are composed of *Quinqueloculina carinata, Heterolepa dutemplei, Cibicides pygmeus, Cibicides lobatulus* and *Bulimina parisensis* (see Table 2).

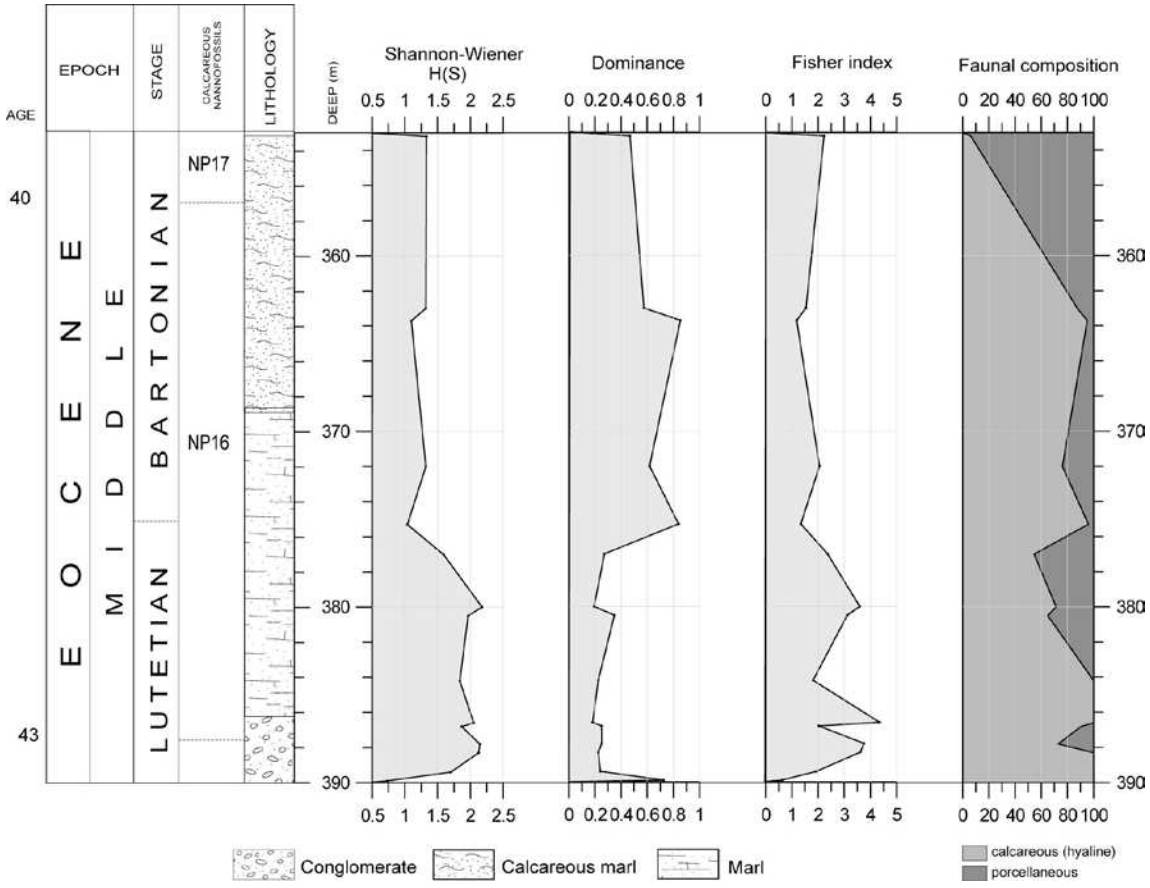

Fig. 17. Shannon-Wiener (H(S)), Dominance, Fisher-index and faunal composition of the Tarján 13 borehole

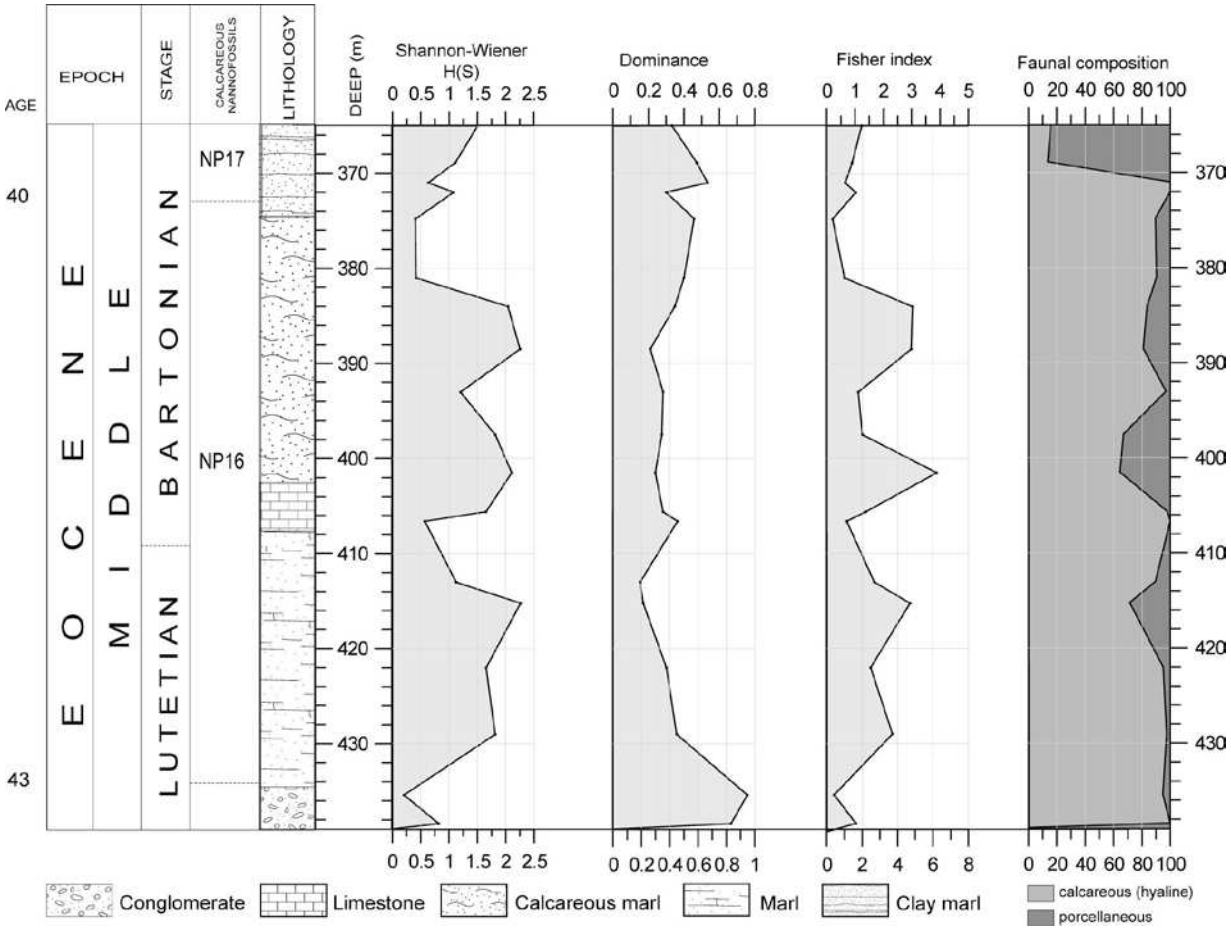

Fig. 18. Shannon-Wiener (H(S)), Dominance, Fisher index and faunal composition of Tarján 14 borehole.

North Hungarian Paleogene Subbasin

Mátyás-hegy outcrop

The section is situated in Budapest, District 3, at the fork of the Virág Benedek and Mátyáshegyi streets opposite the entrance of Pálvölgy Cave (Fig. 19). The quarry is part of the Buda Natural Protection Area. A nearly complete continuous Priabonian sequence is exposed in this quarry: paleoenvironments range from transgressive conglomerate (*Kosd Formation*) through neritic limestone (*Szépvölgy Limestone*) and bryozoan marl to shallow bathyal globigerina marl (*Buda Marl Formation*). The sequence is subdivided into three units: hard compact limestone (0–10 m) containing large quantity of orthophragminids, in the lower 5 m in rock-forming quantity. This formation is overlain by marly limestone. This is covered by yellow, light-brown *Buda Marl Formation.* Twelve samples contain 1675 specimens of 100 benthic foraminiferal species. The Shannon-Wiener H(S) diversity index of the benthic foraminiferal association increases slightly (Fig. 20) from the bottom upwards (H(S) = 1–3.5; Fisher (α) = 1–22). Calcareous tests dominate, while agglutinated test are also significant in the upper interval. The dominant benthic foraminifera are *Cibicides oligocenicus, Heterolepa dutemplei,* and *Clavulinoides szaboi* (see Table 2).

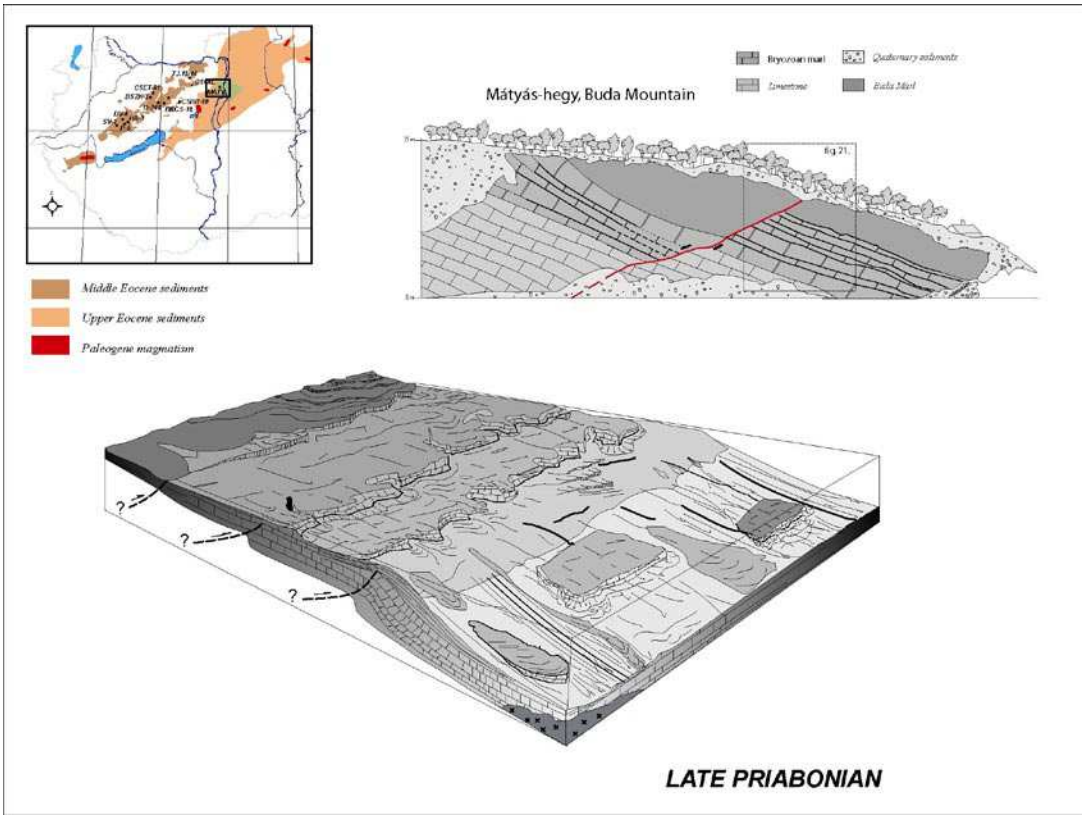

Fig. 19. Position and hypothetical configuration of the *North Hungarian Paleogene Subbasin* in the Hungarian Paleogene Basin.

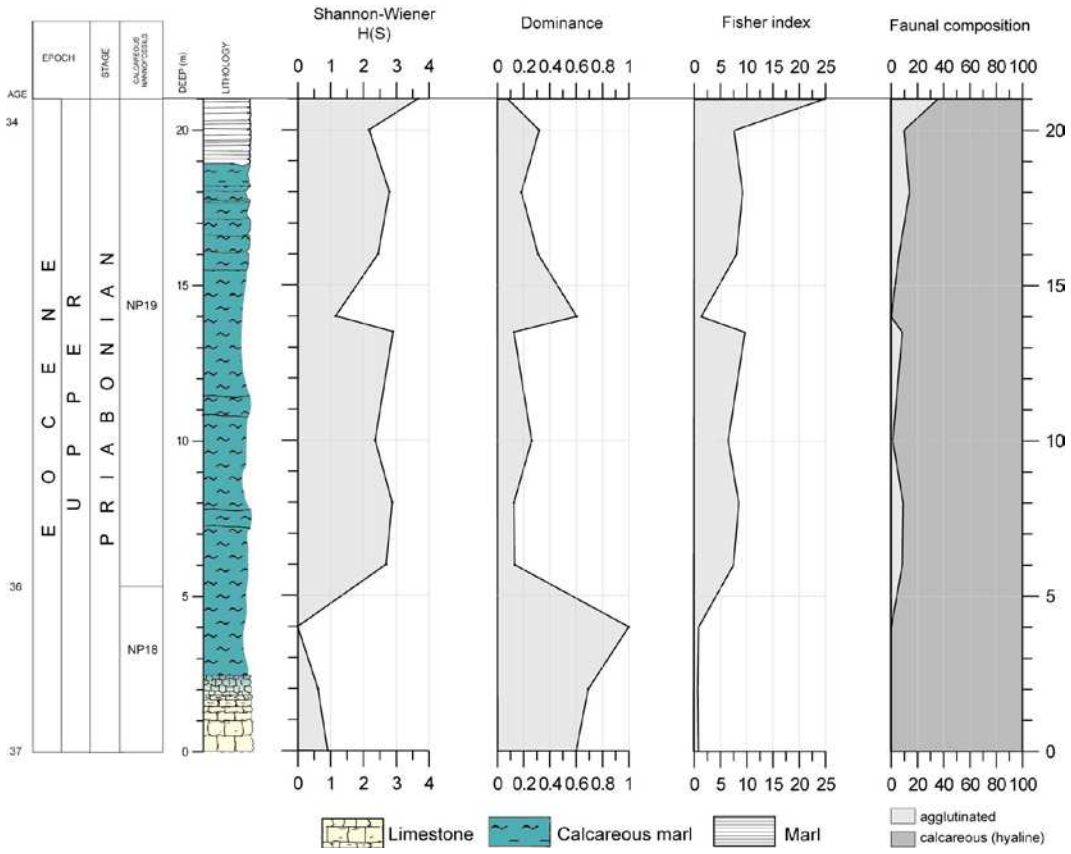

Fig. 20. H(S), Dominance, Fisher index and faunal composition of Mátyás hegy section.

Paleoecology

Benthic foraminiferal assemblages

In total, 232 benthic foraminiferal species were picked from 665 samples. The assemblages are moderately diverse, H(S) varies between 1 and 3.5, principally ($H(S_{min})$ = 0.17 at 799.0 m in Sv 1 borehole and $H(S_{max})$=3.66 at top of Mátyás-hegy section), with 40 to 130 species, and 10 to 30 genera present in most sections. Commonly, the H(S) index varies between 1.5 and 2 and these values show strong fluctuations in all sections. Generally, foraminifera assemblages in different sections contain a few dominant species, except in such samples where extreme paleoenvironmental conditions might be assumed (typical in brackish or hypersaline conditions). The Fisher (α) index varies between 1 and 4, principally ($F(\alpha_{max})$ = 64.34 at 396.0 m in Cset 61 borehole and ($F(\alpha_{min})$ = 0.18 at 294.45 m in Csbr 89 borehole). The most frequent Fisher (α) index values (<5) during NP16 nannoplankton zone are typical for brackish or hypersaline, marginal marine environments. The Fisher (α) index varies between 5 and 15 from NP17 nannoplankton zone to NP19 nannoplankton zone which are typical for the inner and outer shelves and for bathyal (values between 1 and 23 (see Murray, 1991) region. Composition of benthic foraminiferal assemblages confirms shallow water conditions during the NP16 nannoplankton zone and the normal marine environment in the younger parts of the sections. Benthic foraminiferal faunas are chiefly dominated by hyaline, calcareous species, making up about between 60 to 100 % of the total fauna. The most common calcareous taxa include *Cibicides* spp., *Heterolepa* spp., *Lenticulina* spp., *Dentalina* spp., *Uvigerina* spp. The most common porcellaneous taxa are *Quinqueloculina* spp. and the most common agglutinated taxa are *Clavulinoides* spp., and *Textularia* spp. All these common taxa show strong fluctuations in relative abundance.

Water temperature and salinity

Diversity and composition of benthic foraminiferal assemblages is strongly controlled by water temperature and salinity of water mass (Sen Gupta, 1999). Especially, in shallow and deeper region on shelves, where changes in temperature and salinity might pass off rapidly. Several observations of recent benthic foraminferal faunas illustrate the temperature and salinity oscillations in shallow water region connect to seasonal changes (i. e. GOODAY, 1988, 1993; KITAZATO et al., 2000, while in abyssal region this procedure could be a long-term change. The dominant *Miliolina* spp. and *Cibicides* spp. and the low-diversity (H(S) = 0.5–1.5; Fisher (α) = 2–4) indicate warm-temperate (18–23°) temperature and oscillated salinity in the *SW Bakony – Zala Paleogene Subbasin* up to NP16 nannoplankton zone. Significant temperature decreasing was recognized during early NP16 nannoplankton zone, where temperate and cold water foraminiferal species (*Lenticulina spp., Heterolepa* spp.) (after Murray, 1991) became dominant up to end of the NP18 nannoplankton zone. In *NE Bakony–Vértes Paleogene Subbasin* were warm water foraminiferal species dominated during the NP16 nannoplankton zone. Moreover presumably strongly oscillatong salinity in warm sea-water. A significant cooling event was recognized by appearance of cold water foraminiferal species during NP17–NP18 nannoplankton zones. In *Gerecse Paleogene Subbasin* presumably warm and strong salinity fluctuation as indicated by by low diversity (HS) = 0,5–1.5; Fisher (α) = 2–3) during NP16–NP17 nannoplankton zones. Like in *SW and NE Bakony Paleogene Subbasins* there was a similar trend represented in *North Hungarian Paleogene Subbasin* during NP18–NP19 nannoplankton zones: warm-temperate water temperature without significant environmental stress; later benthic foraminiferal assembleges indicate temperate and cold bottom water.

Acknowledgements

This study is part of a joint paleoecological and paleoceanographical analysis of the HPB during the Eocene time that was my doctoral project at Eötvös University, Budapest. My special thanks go to my supervisor, Miklós KÁZMÉR, for his enduring support, advice and encouragement throughout the project. I thank Katalin KOLLÁNYI (Geological Institute of Hungary) for providing access to their benthic foraminiferal collections. Special thanks are due to Mária HORVÁTH (Eötvös University) for reviewing an earlier version of my PhD manuscript, which included this systematic part. The draft manuscript has benefited from the constructive criticism and English correction of József PÁLFY (Hungarian Natural History Museum). The printing of this manuscript has been supported by a publishing grant from the Hungarian Academy of Sciences.

Systematic paleontology

Benthic foraminifera taxonomy follows chiefly the systematic classification of LOEBLICH and TAPPAN (1988). Geographical and geological (age ranges) distribution is not given in taxonomy descriptions, instead the occurences of taxa in the HPB are shown on Table 2. Holotypes and all illustrated material are deposited in the Department of Geology and Paleontology of Hungarian Natural History Museum, Budapest.

Phylum Protozoa GOLDFUSS, 1818
Class Rhizopodea VON SIEBOLD, 1845
Order Foraminifera EHRENBERG, 1930
Suborder Textulariina DELAGE and HÉROUARD, 1896
Superfamily Astrorhizacea BRADY, 1881
Family Astrorhizidae BRADY, 1881
Subfamily Astrorhizinae BRADY, 1881

Genus *Astrorhiza* SANDAHL, 1858

Type species: *Astrorhiza limicola* SANDAHL, 1858

Astrorhiza bakonycsernyensis n. sp.
Plate 1, Figure 1

Derivatio nominis: In reference to its occurence in a borehole near Bakonycsernye, Hungary.
Holotype: Figured specimen on Plate 1, Figure 1. (Inventory number: M 2008.116.1)
Dimension of holotype: diameter 0.89 mm.
Description: Test unilocular, spherical or oval in outline, very short radial arms visible on a single chamber; small oval or round apertures on arms without any sign of tooth; wall simple, imperforate, finely to coarsely agglutinated grains.
Type locality: Bakonycsernye 18 (Bkcs 18) borehole.
Type strata: In Bkcs 18 borehole, at 365.0 m. Padrag Marl Formation (Middle Eocene, Bartonian).
Remarks*:* Generally, the specimens which belong to genus *Astrorhiza* are always compressed in various planes.

Family Bathysiphonidae AVNIMELECH, 1952

Genus *Bathysiphon* SARS, 1872

Type species: *Bathysiphon filiformis* Sars, 1872

Bathysiphon eocenicus CUSHMAN and HANNA, 1927
Plate 1, Figures 2–3

1927 *Bathysiphon eocenica* n. sp. – CUSHMAN and HANNA, p. 210, pl. 13, figs. 2–3.
1936 *Bathysiphon eocenica* CUSHMAN and HANNA – CUSHMAN and MCMASTERS, p. 508, pl. 74, fig. 1.
1942 *Bathysiphon eocenica* CUSHMAN and HANNA – CUSHMAN and SIEGFUS, p. 400, pl. 15, fig. 1.
1944 *Bathysiphon eocenica* CUSHMAN and HANNA – CUSHMAN and SIMONSON, p. 193, pl. 30, fig. 1.
1947 *Bathysiphon eocenica* CUSHMAN and HANNA – CUSHMAN et al., p. 97, pl. 12, figs. 1–2.
1947 *Bathysiphon eocenica* CUSHMAN and HANNA – CUSHMAN and STONE, p. 2, pl. 1, fig. 1.
1949 *Bathysiphon eocenica* CUSHMAN and HANNA – BERMÚDEZ, p. 47, pl. 1, figs. 1–2.
1949 *Bathysiphon eocenica* CUSHMAN and HANNA – CUSHMAN and STONE, p. 75, pl. 13, fig. 3.
1951 *Bathysiphon eocenica* CUSHMAN and HANNA – CUSHMAN and STAINFORTH, p. 142, pl. 25, fig. 4.
1952 *Bathysiphon eocenicus* CUSHMAN and HANNA – TODD and KNIKER, p. 4, pl. 1, figs. 3–4.

1957 *Bathysiphon eocenica* CUSHMAN and HANNA – SMITH, p. 148, pl. 17, fig. 1.
1972 *Bathysiphon eocenica* CUSHMAN and HANNA – MCDOUGALL, p. 33, pl. 1, fig. 1.
1975 *Bathysiphon eocenicus* CUSHMAN and HANNA – BRAGA et al., p. 102, fig. 5.
1982 *Bathysiphon eocenicus* CUSHMAN and HANNA – SZTRÁKOS, pl. 1, fig. 2.
1985 *Bathysiphon eocenicus* CUSHMAN and HANNA – GRÜNIG, p. 253, pl. 1, figs. 4–6.
1987 *Bathysiphon* sp. – SZTRÁKOS, pl. 1, figs. 2–3.
2005 *Bathysiphon eocenicus* CUSHMAN and HANNA – ANAN, p. 18, pl. 1, fig. 1.
2005 *Bathysiphon eocenica* CUSHMAN and HANNA – NARAYAN et al., p. 118, pl. 1, fig. 5.

Description: Test tubular, elongate, cylindrical, strongly compressed in apertural view; wall simple, finely agglutinated with amorphous material; oval aperture without any sign of tooth; length unidentified, breadth 0.4–0.6 mm.

Bathysiphon saidi (ANAN, 1994)
Plate 1, Figure 4

1927 *Rhabdammina eocenica* n. sp. – CUSHMAN and HANNA, p. 208, pl. 13, fig. 1.
1952 *Rhabdammina eocenica* CUSHMAN and HANNA – TODD and KNIKER, p. 4, pl. 1, figs. 1–2.
1982 *Rhabdammina eocenica* CUSHMAN and HANNA – SZTRÁKOS, pl. 1, fig. 1.
1994 *Rhabdammina saidi* n. sp. – ANAN, p. 218, fig. 8. 1.
1997 *Bathysiphon abbassi* n. sp. – HUSSEIN, p. 109, fig. 3. 2.
2005 *Bathysiphon saidi* (ANAN) – ANAN, p. 19, pl. 1, fig. 2.

Description: Test tubular, straight and cylindrical, mildly compressed in apertural view; wall simple, coarsely agglutinated; oval aperture without any sign of tooth; length unidentified, breadth 0.3 – 0.5 mm.
Remarks: CUSHMAN and HANNA (1927) described the new, straight and elongate species *Rhabdammina eocenica* from Coalinga, California, although shape of the genus *Rhabdammina* was defined as triradiate or quadriradiate. They described the *Bathysiphon eocenica* as an other new species from the same section. ANAN (2005) established the new species *Rhabdammina saidi*, which was placed in 2005 in the genus *Bathysiphon.* The species *Bathysiphon saidi* has straight, elongate test and its wall agglutinated by coarse fragmented grains as CUSHMAN and HANNA (1927) described for *Rhabdammina eocenica.* Thus, the genus name *Rhabdammina* is invalid for the elongate and straight test so it should be placed into the genus *Bathysiphon.* Unfortunately, the species name *eocenica* is also invalid, because the species *Bathysiphon eocenica* is a valid species name so having referred to International Code of Zoological Nomenclature (Article 57.3) the species *Rhabdammina eocenica* and the species *Bathysiphon eocenica* become secondary homonyms. Thus, the first valid synonim (*Bathysiphon saidi* in 2005) was used for this species. *Bathysiphon saidi* differs only from *B. eocenicus* in having rough agglutinated surface with coarse fragmented grains.

Family Rhabdamminidae BRADY, 1884
Subfamily Rhabdammininae BRADY, 1884

Genus *Rhabdammina* SARS, 1869

Type species: *Rhabdammina abyssorum* SARS, 1869

Rhabdammina abyssorum SARS, 1868
Plate 1, Figure 5

1868 *Rhabdammina abyssorum* n. sp. – SARS, p. 248.
1869 *Rhabdammina abyssorum* SARS – SARS in CARPENTER, p. 60.
1881 *Rhabdammina abyssorum* SARS – CARPENTER, p. 562, pl. 321c–d.
1884 *Rhabdammina abyssorum* SARS – BRADY, p. 266, pl. 21, figs. 1–3; 10–13.
1889 *Rhabdammina abyssorum* SARS – NEUMAYR, p. 173, pl. 17, fig. a.
1893 *Rhabdammina abyssorum* SARS – EGGER, p. 255, pl. 4, fig. 31.
1894 *Rhabdammina abyssorum* SARS – GOES, p. 19, pl. 4, figs. 67–68.
1896 *Rhabdammina abyssorum* SARS – GRZYBOWSKI, p. 275, pl. 8, figs. 1–4.
1901 *Rhabdammina abyssorum* SARS – SCHUBERT, p. 17, pl. 1, figs. 5–9.

1902 *Rhabdammina abyssorum* SARS – CHAPMAN, p. 125, pl. 6, fig. H.
1918 *Rhabdammina abyssorum* SARS – CUSHMAN, p. 15, pl. 6, fig. 1; pl. 7, fig.1.
1921 *Rhabdammina abyssorum* SARS – CUSHMAN, p. 36, pl. 1, fig. 2.
1925 *Rhabdammina abyssorum* SARS – CUSHMAN, pl. 1, fig. 2.
1927 *Rhabdammina abyssorum* SARS – CUSHMAN, p. 7, pl. 1, fig. 4.
1928 *Rhabdammina abyssorum* SARS – CUSHMAN, p. 64, pl. 2, figs. 7–8.
1930 *Rhabdammina abyssorum* SARS – HOFKER, p. 107, pl. 42, figs. 5–11; pl. 43, figs. 3–4, 6.
1933 *Rhabdammina abyssorum* SARS – CUSHMAN, p. 69, pl. 1, fig. 9.
1933 *Rhabdammina abyssorum* SARS – GALLOWAY, p. 69, pl. 5, fig. 5.
1969 *Rhabdammina abyssorum* SARS – VILKS, p.43, pl. 1, fig. 2.
1979 *Rhabdammina eocenica* CUSHMAN and HANNA – SZTRÁKOS, pl. 1, figs. 1–2.
1985 *Rhabdammina eocenica* CUSHMAN and HANNA – GRÜNIG, p. 253, pl. 1, figs. 1–2.

Description: Test triradiate, mildly compressed in apertural view; aperture terminal, mildly compressed; wall simple, coarsely agglutinated.

Superfamily Hormosinacea HAECKEL, 1894
Family Hormosinidae HAECKEL, 1894
Subfamily Reophacinae CUSHMAN, 1910

Genus *Reophax* De Montfort emend. Brönnimann and Whittaker, 1980

Type species: *Reophax arctica* BRADY, 1881

Reophax harrisi nomen novum
Plate 1, Figure 6

1951 *Reophax sabulosus* n. sp. – HARRIS and JOBE, p. 5, pl. 1, fig. 3.

Description: Test elongate, monoserial, four chambers, circular in apertural view; chambers increasing gradually in size, earlier chambers subspherical, final chamber inflated; sutures barely visible, mildly depressed; terminal aperure, circular, slightly produced; wall simple, coarsely agglutinated; length of test 1.53 mm, maximum breadth 0.5 mm.
Remarks: BRADY established the new species *Reophax sabulosa* in 1882 and HARRIS and JOBE (1951) described the new species *Reophax sabulosus* from the Paleocene Midway Formation from Hempstead County, Arkansas, USA. Thus, the *Reophax sabulosus* is invalid name, because it is junior homonym of *Reophax sabulosa* referred to International Code of Zoological Nomenclature (Article 60.1).
Etymology: Named after R. W. HARRIS who described the new species *Reophax sabulosus*.
Holotype: Original holotype deposited in the collections of Oklahoma, Norman, Oklahoma; no. PeM 10,002A.
Type locality: Exposure in a roadside ditch on the east side of State Highway 29 in Hempstead County, Arkansas, USA.
Type strata: Midway Formation, Paleocene.

Superfamily Lituolacea DE BLAINVILLE, 1827
Family Haplophragmoididae MAINC, 1952

Genus *Haplophragmoides* CUSHMAN emend. HÖGLUND, 1947

Type species: *Haplophragmoides canariense* D'ORBIGNY, 1889

Haplophragmoides sp.
Plate 1, Figure 8

Description: Test lenticular, planispiral, involute, circular and slightly lobulate in outline, biconvex in cross-section; chambers increasing in size; suteres barely visible; wall thick, finely agglutinated; aperture deeply inpressed fissure on interiomarginal side.

Family Lituolidae DE BLAINVILLE, 1827

Genus *Ammomarginulina* WIESNER, 1931

Type species: *Ammomarginulina enis* WIESNER, 1931.

Ammomarginulina sp.
Plate 1, Figure 7

Description: Test trochospiral in earlier three – four chambers, becoming monoserial in final chambers; length approximately two and one – half times width breadth; test elongate, mildly compressed in cross-section; trochospiral chambers increasing rapidly in size, monoserial chambers equal in size; sutures barely visible; aperture terminal, compressed from aperual view; wall simple, coarsely agglutinated.

Superfamily Spiroplectamminacea CUSHMAN, 1927
Family Spiroplectamminidae CUSHMAN, 1927
Subfamily Spiroplectammininae CUSHMAN, 1927

Genus *Bolivinopsis* JAKOVLEV emend. KISELMAN, 1964

Type species: *Bolivinopsis capitata* JAKOVLEV, 1891

Bolivinopsis foliacea (GRZYBOWSKI, 1898)
Plate 1, Figure 9

1898 *Spiroplecta foliacea* n. sp. – GRZYBOWSKI, p. 294, pl. 12, figs. 14–15.
1952 *Spiroplectammina elgansoensis* n. sp. – TODD and KNIKER, p. 7, pl. 1, fig. 17.
1975 *Bolivinopsis foliacea* (GRZYBOWSKI) – PROTO DECIMA and DE BIASE, p. 91, pl. 3, fig. 10.

Description: Test strongly elongate, strongly compressed in cross-section; test planispiral in early four – five chambers, becoming biserial in adult portion; length approximately six – seven times witdh; initial chambers slowly increasing in size as added; sutures fairly distinct, slightly depressed, straight; wall finely agglutinated; aperture a narrow slit between the last two chambers.

Genus *Spiroplectammina* CUSHMAN emend. NØRVANG, 1966

Type species: *Spiroplectammina biformis* (PARKER and JONES, 1865)

Spiroplectammina carinata (D'ORBIGNY, 1846)
Plate 1, Figures 10–11

1846 *Textularia carinata* n. sp. – D'ORBIGNY, p. 247, pl. 14, figs. 32–34.
1936 *Spiroplectammina carinata* n. sp. – SUBBOTINA, p. 6, pl. 1, figs. 8–11.
1951 *Spiroplectammina carinata* (D'ORBIGNY) – MARKS, p. 35, pl. 6, figs. 2 a–b.
1961 *Spiroplectammina carinata* (D'ORBIGNY) – KAASSCHIETER, p. 140, pl. 1, fig. 12.
1969 *Textularia carinata* (D'ORBIGNY) – RÖGL, p. 67, pl. 1, figs. 2a–b.
1985 *Spiroplectammina carinata* (D'ORBIGNY) – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 6, fig. 11; pl. 84, fig. 3; pl. 104, figs. 4–5, 7, 15.

Description: Test planispiral in earlier three – four chambers, becoming biserial in adult part; seven to eight pairs of chambers in biserial part, increasing rapidly in size; mildly lobulate in outline; biconvex

and compressed in cross-section; length approximately two times width; periphery serrated; wall finely agglutinated; sutures curved, composed of coarser material than chambers; aperture interiomarginal fissure.

Spiroplectammina subhaeringensis (GRZYBOWSKI, 1896)
Plate 1, Figure 12

1896 *Textularia subhaeringensis* n. sp. – GRZYBOWSKI, p. 285, pl. 9, figs. 13, 16.
1926 *Textularia excolata* n. sp. – CUSHMAN, p. 585, pl. 15, figs. 9a–b.
1929 *Textularia excolata* CUSHMAN – WHITE, p. 30, pl. 4, fig. 1.
1946 *Spiroplectammina excolata* (CUSHMAN) – CUSHMAN, p. 27, pl. 5, figs. 9–10.
1962 *Spiroplectammina excolata* (CUSHMAN) – HILLEBRANDT, p. 29, pl. 1, figs. 12–13.
1966 *Spiroplectammina subhaeringensis* (GRZYBOWSKI) – HUSS, p. 39, pl. 6, figs. 15–17.
1966 *Spiroplectammina excolata* (CUSHMAN) – HOFKER, p. 306, pl. 66, figs. 7–8.
1970 *Spiroplectammina excolata* (CUSHMAN) – KIESEL, p. 194, pl. 3, fig. 24; pl. 16, fig. 1.
1974 *Spiroplectammina subhaeringensis* (GRZYBOWSKI) – SZCZECHURA and POŻARYSKA, p. 31, pl. 3, figs. 16–17.
1975 *Vulvulina haeringensis* (GÜMBEL) – PROTO PROTO DECIMA and DE BIASE, p. 91, pl. 1 fig. 23.

Description: Test planispiral in earlier three to four chambers, becoming biserial in adult part; four to five pairs of chambers in biserial part, increasing very rapidly in size; final chambers extremely inflated, overlapping earlier chambers; periphery subacute, slightly serrate; length approximately equal to width; sutures mildly compressed; wall finely agglutinated; aperture interiomarginal fissure.

Subfamily Vulvulininae SAIDOVA, 1981

Genus *Vulvulina* D'ORBIGNY emend. CICHA and ZAPLETALOVA, 1965

Type species: *Vulvulina capreolus* (DEFRANCE, 1826)

Vulvulina advena CUSHMAN, 1926
Plate 1, Figure 13

1926 *Vulvulina advena* n. sp. – CUSHMAN, p. 32, pl. 4, fig. 9.
1928 *Vulvulina advena* CUSHMAN – COLE, p. 206, pl. 1, fig. 24; pl. 3, fig. 17.
1935 *Vulvulina advena* CUSHMAN – CUSHMAN, p. 9, pl. 2, figs. 1a–b.
1949 *Vulvulina advena* CUSHMAN – CUVILLIER and SZAKÁLL, p. 18, pl. 6. fig. 3.
1956 *Vulvulina haeringensis* (GÜMBEL) – HAGN, p. 115, pl. 9, figs. 7–8.
1975 *Vulvulina haeringensis* (GÜMBEL) – PROTO DECIMA and DE BIASE, p. 91, pl. 1, fig. 4.
1982 *Vulvulina haeringensis* (GÜMBEL) – SZTRÁKOS, pl. 2, fig. 7.
1985 *Vulvulina haeringensis* (GÜMBEL) – GRÜNIG, p. 256, pl. 2, fig. 10.
1987 *Vulvulina haeringensis* (GÜMBEL) – SZTRÁKOS, pl. 2. fig. 12.
2006 *Vulvulina haeringensis* (GÜMBEL) – CIMERMAN et al., p. 16, pl. 1, fig. 6.
2006 *Vulvulina advena* CUSHMAN – ORTIZ and THOMAS, p. 109, pl. 2, figs. 10–12. (non 9a–b).

Description: Test planispiral in juvenile stage, becoming biserial in adult part, last two or three chambers monoserial; triangular in outline; periphery subacute; biconvex, strongly compressed in cross-section; length approximately two times width; sutures limbate, slightly depressed; wall finely agglutinated; aperture interiomarginal fissure.

Vulvulina jarvisi CUSHMAN, 1932
Plate 1, Figure 14

1932 *Vulvulina jarvisi* n. sp. – CUSHMAN, p. 84, pl. 10, fig. 20.
1945 *Vulvulina jarvisi* CUSHMAN – CUSHMAN and STAINFORTH, p. 16, pl. 1, fig. 27.
1953 *Vulvulina jarvisi* CUSHMAN – BECKMANN, p. 340, pl. 17, figs. 3–5.
1982 *Vulvulina jarvisi* CUSHMAN – AGIP, pl. 3, fig. 2.
1985 *Vulvulina haeringensis* (GÜMBEL) – GRÜNIG, p. 256, pl. 2, fig. 12.
1998 *Vulvulina jarvisi* CUSHMAN – ROBERTSON, p. 16, pl. 1, fig. 3.

Description: Test planispiral in juvenile stage, becoming biserial in adult part, last two or three chambers monoserial, increasing rapidly in size, final chambers overlapping earlier chambers; oval in outline; periphery acute; biconvex, compressed in cross-section; length approximately two times width; sutures limbate, slightly depressed; wall finely agglutinated; aperture interiomarginal fissure.

Family Prolixoplectidae LOEBLICH and TAPPAN, 1985

Genus *Plectina* MARSSON, 1878

Type species: *Plectina ruthenica* (REUSS, 1851)

Plectina dalmatina (SCHUBERT, 1911)
Plate 1, Figure 15

1911 *Gaudryina dalmatina* n. sp. – SCHUBERT in LIEBUS, p. 939, pl. 3, fig. 5.
1950 *Plectina dalmatina* (SCHUBERT) – CITA, p. 86, pl. 6, fig. 10.
1972 *Plectina dalmatina* (SCHUBERT) – KUHN, p, pl. 3, figs. 22–25.
1975 *Plectina dalmatina* (SCHUBERT) – PROTO DECIMA and BIASE, p. 92, pl. 1, figs. 21–22. (non fig. 30.).
1987 *Plectina dalmatina* (SCHUBERT) – SZTRÁKOS, pl. 3. fig. 7.

Description: Test planispiral in juvenile stage, becoming biserial in adult part; chambers inflatted, increasing rapidly in size; rounded subtriangular in outline; circular, oval in cross-section; wall finely agglutinated; aperture terminal.

Plectina eocenica CUSHMAN, 1936
Plate 1, Figure 16

1936 *Plectina eocenica* n. sp. – CUSHMAN, p. 43, pl. 3 figs. 1–3.
1975 *Plectina dalmatina* (SCHUBERT) – PROTO DECIMA and BIASE, p. 92, pl. 1, fig. 30.

Description: Test elongate, slender, triserial in juvenile portion, becoming biserial in adult portion; length approximately three times width; chambers inflated, distinct in adult portion, slightly overlapping; sutures barely visible, slightly depressed; wall coarsely agglutinated; aperture marginal.

Family Verneuilinidae CUSHMAN, 1911
Subfamily Verneuilininae CUSHMAN, 1911

Genus *Verneuilina* D'ORBIGNY, 1839

Type species: *Verneuilina tricarinata* D'ORBIGNY, 1840

Verneuilina sp
Plate 1, Figure 17

Description: Test triserial; triangular in outline; triangular in cross-section; sutures barely visible; wall coarsely agglutinated; aperture terminal.

Superfamily Textulariacea EHRENBERG, 1838
Family Eggerellidae CUSHMAN, 1937
Subfamily Dorothiinae BALAKHMATOVA, 1972

Genus *Dorothia* PLUMMER emend. DESAI and BANNER, 1987

Type species: *Dorothia bulletta* (CARSEY, 1926)

Dorothia textilaroides (HANTKEN, 1875)
Plate 1, Figure 18

1875 *Gaudryina textilaroides* n. sp. – HANTKEN, p. 12, pl. 1, fig. 6.
1987 *Dorothia textilaroides* (HANTKEN) – SZTRÁKOS, pl. 2., fig. 22.

Description: Test trochospiral in juvenile stage, becoming biserial in adult part; chambers inflatted, increasing rapidly in size; elongate in outline; circular, rounded in cross-section; sutures mildly depressed; wall coarsely agglutinated; aperture interiomarginal slit.

Subfamily Eggerellinae CUSHMAN, 1937

Genus *Martinottiella* CUSHMAN, 1933

Type species: *Martinottiella communis* (D'ORBIGNY, 1826)

Martinottiella rhumbleri (CUSHMAN, 1936)
Plate 1, Figure 19

1936 *Listerella rhumbleri* n. sp. – CUSHMAN, p. 38, pl. 6, fig. 4.
1979 *Martinottiella rhumbleri* (CUSHMAN) – SZTRÁKOS, pl. 6. fig. 4.

Description: Test elongate, slender, trochospiral in initial chambers, becoming monoserial in adult portion; chambers inflated, increasing in size regularly; circular in cross-section; wall coarsely agglutinated; aperture terminal, rounded.

Family Textulariidae EHRENBERG, 1838
Subfamily Textulariinae EHRENBERG, 1838

Genus *Textularia* DEFRANCE emend. NØRVANG, 1966

Type species: *Textularia sagittula* DEFRANCE, 1824

Textularia crookshanki HAQUE, 1956
Plate 1, Figure 20

1956 *Textularia crookshanki* n. sp. – HAQUE, p. 24, pl. 2, fig. 8.
1982 *Textularia crookshanki* HAQUE – SZTRÁKOS, pl. 2., figs. 5–6.

Description: Test biserial, slightly flaring towards apertural end; chambers two times as long as with, rapidly increasing in size; horn-like in outline; biconvex, mildly compressed, parallelogram-like in cross-section; periphery acute; sutures barely visible, mildly depressed, gently curved towards apertural end; wall finely agglutinated; aperture interiomarginal wide slit.
Remarks: Our specimens differ from the holotype of *Textularia crookshanki* in having more compressed test and stronger acute on periphery area.

Textularia deperdita D'ORBIGNY, 1846
Plate 2, Figures 1–2

1846 *Textularia deperdita* n. sp. – D'ORBIGNY, p. 244, pl. 14, figs. 23–25.
1985 *Textularia deperdita* D'ORBIGNY – PAPP and SCHMID, p. 84, pl. 78, figs. 7–9.

Description: Test biserial, slightly flaring towards apertural end; chambers two times as long as broad, rapidly increasing in size; conical in outline; biconvex, inflated in cross-section; periphery subacute; sutures distinct, straight; wall finely agglutinated; aperture interiomarginal wide slit.

Textularia halkyardi LALICKER, 1935
Plate 2, Figure 3

1875 *Textularia elongata* n. sp. – HANTKEN, p. 57, pl. 15, fig. 3.
1935 *Textularia halkyardi* n. sp. – LALICKER, p. 45, pl. 2, figs. 5a–c.
1962 *Bolivina elongata* (HANTKEN) – MAJZON, pl. 43, fig. 3.
1982 *Textularia elongata* HANTKEN – SZTRÁKOS, p. 20, pl. 2, fig. 10.
1987 *Textularia elongata* HANTKEN – SZTRÁKOS, pl. 1, fig. 16.
1993 *Textularia elongata* HANTKEN – MATHELIN and SZTRÁKOS, p. 40, pl. 24, fig. 12.
2002 *Textularia elongata* HANTKEN – HORVÁTH, p. 35, pl. 2, fig. 8.

Description: Test elongate, biserial, slightly flaring towards apertural end; chambers strongly inflated, rapidly increasing in size; conical in outline; biconvex, inflated, broadly oval in cross-section; periphery smooth; sutures barely visible, curved; wall finely agglutinated; aperture interiomarginal wide slit.
Remarks: HANTKEN established the species *Textularia elongata* in 1875. He described this species from the world-famous Upper Eocene and Lower Oligocene Buda Marl Formation from Budapest, Hungary. The species name *Textularia elongata* was described as new name at five times before 1875 (*Textularia elongata* HAGENOW, 1842; *Textularia elongata* CORNUEL, 1848; *Textularia elongata* JONES, 1850; *Textularia elongata* D'ORBIGNY, 1852 and *Textularia elongata* EHRENBERG, 1873) thus, this name is invalid after 1842. In my view, the first valid synonim of *Textularia elongata* (HANTKEN, 1875) is *Textularia halkyardi* LALICKER, 1932 who described it as a new species from the Upper Eocene of Biarritz, France.

Textularia globosa (HANTKEN, 1875)
Plate 2, Figures 4–5

1875 *Textilaria globosa* n. sp. – HANTKEN, p. 58, pl. 15. figs. 5a–b.

Description: Test squattish, biserial; oval in outline; circular in cross-section; chambers mildly inflated; increasing in size; periphery mildly undulate; sutures distinct, strongly curved; wall finely agglutinated; aperture interiomarginal wide slit.

Textularia cf. *partschii* CZJZEK, 1848
Plate 2, Figures 6–7

1848 *Textularia partschii* n. sp. – CZJZEK, p.148, pl. 13, figs. 22–24.
1893 *Textularia partschii* CZJZEK – EGGER, p. 267, pl. 6, figs. 22–23.

Description: Test biserial, rapidly flaring towards apertural end; chambers inflated, rapidly increasing in size; triangular in outline; biconvex, circular in cross-section; periphery subacute; sutures barely visible, mildly depressed, strongly curved towards apertural end; wall finely agglutinated; aperture interiomarginal slit.
Remarks: Originally, *Textularia partschii* CZJZEK was described from the Badenian of Vienna Basin, Austria. The figured specimen is a bit wider and larger than the holotype. It differs from typical *Textularia partschii* in having larger, less elongate final chambers.

Textularia lancelota (KARRER, 1868)
Plate 2, Figure 8

1868 *Plecanium lanceolatum* n. sp. – KARRER, p. 129, pl. 1, fig. 2.
1979 *Textularia lanceolata* (KARRER) – SZTRÁKOS, pl. 4. figs. 1a–b.
1982 *Textularia lanceolata* (KARRER) – SZTRÁKOS, pl. 3. fig. 1.
1985 *Textularia lanceolata* (KARRER) – KORECZNÉ LAKY and NAGYNÉ GELLAI, pl. 91, fig. 2.

Description: Test strongly elongate, biserial; circular in cross-section; periphery subacute; sutures barely visible; wall finely agglutinated; aperture interiomarginal slit.

Textularia pala CZJZEK, 1848
Plate 2, Figure 9

1848 *Textularia pala* n. sp. – CZJZEK, p. 148, pl. 13, figs. 25–27.
1979 *Textularia pala* CZJZEK – SZTRÁKOS, pl. 4., fig. 3.
1985 *Textularia pala* CZJZEK – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 6, fig. 14.

Description: Test squattish, biserial; oval in outline; biserial, strongly compressed in cross-section; chambers two times as long as broad, rapidly increasing in size; periphery mildly undulate; sutures distinct, strongly curved; wall finely agglutinated; aperture interiomarginal wide slit.

Textularia sp. 1.
Plate 2, Figures 10–11

Description: Test biserial, rapidly flaring towards apertural end; chambers inflated, rapidly increasing in size; triangular in outline; biconvex, oval in cross-section; sutures barely visible; wall finely agglutinated; aperture interiomarginal slit.

Textularia sp. 2.
Plate 2, Figure 12

Description: Test strongly elongate, biserial; final chambers elongate; circular in cross-section; periphery acute; sutures barely visible; wall finely agglutinated; aperture interiomarginal slit.

Textularia sp. 3.
Plate 2, Figures 13–14

Description: Test biserial, rapidly flaring towards apertural end; chambers inflated, rapidly increasing in size; triangular in outline; biconvex, mildly compressed in cross-section; periphery corrugated; sutures barely visible; wall finely agglutinated; aperture interiomarginal fissure.

Family Pseudogaudryinidae LOEBLICH and TAPPAN, 1985
Subfamily Pseudogaudryininae LOEBLICH and TAPPAN, 1985

Genus *Clavulinoides* CUSHMAN emend. BANNER and DESAI, 1985

Type species: *Clavulinoides trilatera* (CUSHMAN, 1926)

Clavulinoides alpina CUSHMAN, 1936
Plate 2, Figures 15–16

1936 *Clavulinoides alpina* n. sp. – CUSHMAN, p. 22, pl. 3, fig. 16.
1937 *Clavulinoides alpina* CUSHMAN – CUSHMAN, p. 127, pl. 18, figs. 13–15.
1975 *Tritaxia alpina* (CUSHMAN) – PROTO DECIMA and BIASE, p. 91, pl. 1, fig. 12.
1987 *Tritaxia alpina* (CUSHMAN) – SZTRÁKOS, pl. 2, fig. 19.
2005 *Tritaxia alpina* (CUSHMAN) – ANAN, p. 21, pl. 1, fig. 8.

Description: Test squattish, initially triserial, becoming monoserial; chambers rapidly flaring towards apertural end; length approximately two times as long as broad; triangular in cross-section; chambers slightly inflated; sutures invisible; wall finely agglutinated; aperture terminal.

Clavulinoides lakiensis elongata HAQUE, 1956
Plate 2, Figure 17

1956 *Clavulinoides lakiensis* HAQUE var. e*longata* n. ssp. – HAQUE, p. 45, pl. 21, figs. 13a–b.
1987 *Tritaxia dimidiata* (CUSHMAN and BERMÚDEZ) – SZTRÁKOS, pl. 2, fig. 21.

Description: Test elongate, initially triserial, becoming monoserial; chambers rapidly flaring towards apertural end; length approximately four times as long as broad; triangular in cross-section; chambers slightly inflated; sutures barely visible, slightly depressed; wall finely agglutinated; aperture terminal, rounded, extended.

Clavulinoides procerus n. sp.
Plate 2, Figure 20

Derivatio nominis: Named after long, elongate test.
Holotype: The specimen on Plate 2, Figure 20. (Inventory number: M 2008.117.1)
Dimension of holotype: length 0.95 mm, width 0.33 mm.
Description: Test elongate, initially triserial, becoming monoserial in adult portion; length approximately three times as long as broad; triserial portion extreamly acute and sharp; mildly curved in outline; triangular in cross-section; periphery serrated; chambers increasing gradually in size; sutures barely visible, slightly depressed; wall coarsely agglutinated; aperture terminal, rounded, extended.
Type locality: Bkcs 18 borehole, Transdanubian Central Range, Bakony Mountains.
Type strata: In the B18 borehole, at 295.3 m. Padrag Marl Formation (Middle Eocene, Bartonian)
Remarks: *Clavulinoides procerus* differs from *Clavulinoides lakiensis elongata* HAQUE in having slender test, smaller and slender triserial portion and wider monoserial portion.

Clavulinoides szaboi (HANTKEN, 1868)
Plate 2, Figures 18–19

1868 *Rhabdogonium Szabói* n. sp. – HANTKEN, p. 90, pl. 1, fig. 18.
1875 *Clavulina szabói* HANTKEN – HANTKEN, p. 13, pl. 1, figs. 9a–d.
1903 *Clavulina szabói* HANTKEN – WOJCIK, p. 498, pl. 6, fig. 20.
1932 *Clavulina szabói* HANTKEN – PROTESCU, p. 88, pl. 1, figs. 1–2.
1937 *Clavulinoides szabói* (HANTKEN) – CUSHMAN, p. 133, pl. 18, figs. 33a–b, 34.
1937 *Clavulinoides szabói* (HANTKEN) – CUSHMAN, p. 134, pl. 18, figs. 35a–b, 36.
1946 *Clavulina szabói* HANTKEN – KAPTARENKO and CSERNUSZOVA, p. 229, pl. 2, fig. 10.
1946 *Clavulinoides szabói* (HANTKEN) – VAN BELLEN, p. 86, pl. 13, fig. 16.
1949 *Clavulinoides szabói* (HANTKEN) – CUVILLIER and SZAKALL, p. 24, pl. 10, fig. 4.
1950 *Clavulinoides szabói* (HANTKEN) – CITA, p. 85, pl. 6, fig. 8.
1953 *Clavulinoides szabói* (HANTKEN) – HAGN, p. 39, fig. 2.
1956 *Clavulinoides szabói* (HANTKEN) – HAGN, p. 116, pl. 10, fig. 1.
1956 *Clavulina szabói* HANTKEN – KAPTARENKO and CSERNUSZOVA, pl. 7, fig. 9.
1972 *Clavulinoides szabói* (HANTKEN) – MAJZON, p. 114, pl. 1, figs. 3–9, 11–16, 18–19, 21–23; pl. 2, figs. 1–8, 14–20.
1973 *Clavulinoides szabói* (HANTKEN) – NAGYNÉ GELLAI, p. 445, pl. 2, fig. 1.
1975 *Tritaxia szabói* (HANTKEN) – BRAGA and GRÜNIG, p. 103, pl. 4, figs. 1–2.
1979 *Tritaxia szabói* (HANTKEN) – SZTRÁKOS, pl. 5, fig. 8.
1985 *Tritaxia szabói* (HANTKEN) – GRÜNIG, p. 257, pl. 2, figs. 22–23.
1985 *Tritaxia szabói* (HANTKEN) – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 7, figs. 9–10; pl. 22, figs. 1–2, 4.
1988 *Clavulina szabói* HANTKEN – GELLAI – NAGY, pl. 4, figs. 1–7.
1998 *Tritaxia szabói* (HANTKEN) – CICHA et al., p. 132, pl. 7, figs 12–13.
1999 *Tritaxia szabói* (HANTKEN) – OZSVART, p. 83, pl. 1, fig. 2.
2002 *Tritaxia szabói* (HANTKEN) – HORVÁTH, p. 35, pl. 2, fig. 10.

Description: Test initially triserial, becoming monoserial in adult portion; length approximately two and one-half times as long as broad; triserial portion acute; triangular in cross-section; chambers increasing gradually in size; sutures barely visible, slightly depressed; wall coarsely agglutinated; aperture terminal, rounded.

Family Valvulamminidae LOEBLICH and TAPPAN, 1986

Genus *Clavulina* D'ORBIGNY, 1826

Type species: *Clavulina parisiensis* D'ORBIGNY, 1826

Clavulina terterensis KHALILOV, 1958
Plate 2, Figure 21

1958 *Clavulina terterensis* n. sp. – KHALILOV, p. 9, pl. 2, figs. 1–2.

Description: Test elongate, initially triserial, becoming monoserial in adult portion; monoserial part three-four time longer as triserial part; four monoserial chambers; length approximately three-four times as long as broad; triserial chambers inflated, increasing gradually in size; monoserial chambers inflated, equal in size; final chamber stronger inflated; circular in cross-section; sutures distinct, strongly depressed; wall finely agglutinated; aperture terminal.
Remarks: This form was originaly described from Caucasus, northeastern Azerbaidzhan. It occurs only in the Sv 1 borehole in Hungary.

Genus *Cylindroclavulina* BERMÚDEZ and KEY, 1952

Type species: *Cylindroclavulina bradyi* (CUSHMAN, 1911)

Cylindroclavulina colomi HAGN, 1956
Plate 2, Figures 22–23

1956 *Cylindroclavulina colomi* n. sp. – HAGN, p. 122, pl. 11, fig. 14.
1987 *Cylindroclavulina colomi* HAGN – SZTRÁKOS, pl. 3. fig. 8.

Description: Test initially spherical, planispiral (?), becoming monoserial in final chambers; length two times as long as width; initially chambers increasing rapidly in size, monoserial chambers equal in size; final chambers width greater than height; final chamber slightly pointed; sutures distinct, depressed; wall finely agglutinated; wide terminal aperture.

Cylindroclavulina rudislosta (HANTKEN, 1875)
Plate 2, Figure 24

1875 *Clavulina cylindrica* n. sp. – HANTKEN, p. 14, pl. 1, fig. 8.
1987 *Cylindroclavulina rudislosta* HANTKEN – SZTRÁKOS, pl. 3, fig. 9.

Description: Test squattish, initially spherical, planispiral (?), becoming monoserial in final chambers; length two times as long as width; chambers increasing rapidly in size; sutures invisible; wall finely agglutinated; aperture terminal on short neck.

Subfamily Tritaxilininae LOEBLICH and TAPPAN, 1986

Genus *Tritaxilina* CUSHMAN emend. MARIE 1941

Type species: *Tritaxilina caperata* (BRADY, 1881)

Tritaxilina pupa (GÜMBEL, 1868)
Plate 2, Figures 25–27

1868 *Gaudryna pupa* n. sp. – GÜMBEL, p. 602, pl. 18, figs. 8–15.
1937 *Tritaxilina pupa* (GÜMBEL) – CUSHMAN, p. 156, pl. 3, fig. 5.
1975 *Tritaxilina pupa* (GÜMBEL)– PROTO DECIMA and DE BIASE, p. 93, pl. 1, figs. 24–27.
1982 *Tritaxilina hantkeni* CUSHMAN – SZTRÁKOS, pl. 4. figs. 13a–b.
1987 *Tritaxilina pupa* (GÜMBEL) – SZTRÁKOS, pl. 3. figs. 11–12.

Description: Test squattish, initially triserial, becoming biserial in adult portion; test rapidly flaring towards apertural end; triangular in outline; circular in cross-section; sutures mildly depressed; wall rather coarsely agglutinated; aperture interiomarginal slit.

Tritaxilina sp.
Plate 3, Figure 1

Description: Test squattish, initially triserial, becoming biserial in adult portion; test rapidly flaring towards apertural end; triangular in outline; circular in cross-section; sutures distinct, strongly depressed; wall rather coarsely agglutinated; aperture interiomarginal slit.

Suborder Miliolina DELAGE and HÉROUARD, 1896
Superfamily Cornuspiracea SCHULTZE, 1854
Family Cornuspiridae SCHULTZE, 1854
Subfamily Cornuspirinae SCHULTZE, 1854

Genus *Cornuspira* SCHULTZE, 1854

Type species: *Cornuspira foliacea* (PHILIPPI, 1844)

Cornuspira involvens (REUSS, 1850)
Plate 3, Figures 2–3

1850 *Operculina involvens* n. sp. – REUSS, p. 370, pl. 46, fig. 20.
1864 *Cornuspira archimedis* (REUSS) – STACHE, p. 180, pl. 22, figs. 1a–b.
1875 *Cornuspira involvens* (REUSS) – HANTKEN, p. 16, pl. 2, fig. 2.
1884 *Cornuspira involvens* (REUSS) – BRADY, p. 200, pl. 60, figs. 1–3.
1926 *Cornuspira involvens* (REUSS) – CHAPMAN, p. 27, pl. 3, figs. 1–2.
1982 *Cornuspira involvens* (REUSS) – AGIP, pl. 7, figs. 10–10p.
1994 *Cornuspira involvens* (REUSS) – JONES, p. 26, pl. 11, figs. 1–3.

Description: Test planispiral, evolute, seven whorls visible; chambers unidentified; circular in outline; strongly compressed in cross-section; periphery smooth; wall calcareous, porcellaneous; aperture oval opening at end of final chamber; without visible tooth.

Superfamily Miliolacea EHRENBERG, 1839
Family Spiroloculinidae WIESNER. 1920

Genus *Adelosina* D'ORBIGNY, 1826

Type species: *Adelosina laevigata* D'ORBIGNY, 1826

Adelosina sp.
Plate 3, Figure 4

Description: Test circular in outline, axial periphery subacute, quinqueloculine coiling, oval or triangular in cross-section; chambers indistinct, curved, elongated and overlapped by the subsequent chambers; wall calcareous, porcellaneous, smooth; aperture an elongate opening at end of final camber with tiny pores.

Genus *Spiroloculina* D'ORBIGNY, 1826

Type species: *Spiroloculina depressa* D'ORBIGNY, 1826

Spiroloculina obscura (CUSHMAN and TODD, 1944)

Plate 3, Figure 5

1852 *Spiroloculina gratteloupi* n. sp. – D'ORBIGNY, p. 298, p. 161, pl. 1, fig. 3.
1882 *Spiroloculina grateloupi* n. sp. – TERQUEM, p. 155, pl. 16, fig. 6.
1905 *Spiroloculina grateloupi* TERQUEM – FORNASINI, p. 4, pl. 1, fig. 3.
1944 *Spiroloculina obscura* nomen nodum – CUSHMAN and TODD, p. 20, pl. 3, figs. 24–25.

Description: Test planispiral; oval in outline; slightly compressed in cross-section; length approximately two times width; chambers barely visible in initially portion, in final whorl tubular, increasing rapidly in size, overlapping earlier chambers; periphery smooth; sutures barely visible, mildly depressed; wall calcareous, smooth, porcellaneous; aperture terminal, circular on short neck.

Spiroloculina bicarinata TERQUEM, 1882
Plate 3, Figures 6–7

1882 *Spiroloculina bicarinata* n. sp. – TERQUEM, p. 155, pl. 16, fig. 5.
1944 *Spiroloculina bicarinata* TERQUEM – CUSHMAN and TODD, p. 8, pl. 2, fig. 12.

Description: Test planispiral, evolute; oval in outline; long, tubular chambers, increasing rapidly in size; periphery smooth, chanelled; sutures distinct, slightly swollen; wall calcareous, smooth, porcellaneous; aperture terminal, circular on short neck.

Spiroloculina jarvisi CUSHMAN and TODD, 1944
Plate 3, Figures 8–9

1944 *Spiroloculina jarvisi* n. sp. – CUSHMAN and TODD, p. 14, pl. 3. fig. 9.
1951 *Spiroloculina jarvisi* CUSHMAN and TODD – CUSHMAN and STAINFORTH, p. 145, pl. 25, fig. 36.
1956 *Spiroloculina jarvisi* CUSHMAN and TODD – HOFKER, p. 91. Text-figs. 8e–f.

Description: Test planispiral, evolute; length approximately equal with width; circular in outline; mildly compressed in cross-section; tubular chambers, increasing rapidly in size; sutures distinct, slightly swollen; wall calcareous, smooth, porcellaneous; aperture terminal, circular on short neck.

Family Hauerinidae SCHWAGER, 1876
Subfamily Hauerininae SCHWAGER, 1876

Genus *Quinqueloculina* D'ORBIGNY, 1826

Type species: *Quinqueloculina seminula* (LINNE, 1758)

Quinqueloculina buchiana D'ORBIGNY, 1846
Plate 3, Figure 10

1846 *Quinqueloculina buchiana* n. sp. – D'ORBIGNY, p. 289, pl. 18. figs. 10–12.
1974 *Quinqueloculina buchiana* D'ORBIGNY – ŁUCZKOWSKA, p. 46, pl. 4, figs. 1–4.
1985 *Quinqueloculina buchiana* D'ORBIGNY – PAPP and SCHMID, p. 99, pl. 93, figs. 1–7.
1985 *Quinqueloculina buchiana* D'ORBIGNY – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 86, figs. 3a–b.

Description: Test nearly twice as long as broad, periphery subacute; trapezoidal in outline, triangular in cross-section with sharp edge; chambers increasing gradually in size, each chamber comprising one and half coil and overlapped by subsequent chambers; sutures distinct, mildly compressed; wall calcareous, smooth, porcellaneous; aperture terminal, circular.
Remarks: *Q. buchiana* differs from all other species of *Quinqueloculina* in having a sharp periphery of test.

Quinqueloculina juleana D'ORBIGNY, 1846
Plate 3, Figure 11

1846 *Quinqueloculina juleana* n. sp. – D'ORBIGNY, p. 298, pl. 20, figs. 1–3.
1955 *Quinqueloculina juleana* D'ORBIGNY – BHATIA, p. 672, pl. 66, fig. 9.
1958 *Quinqueloculina juleana* D'ORBIGNY – BATJES, p. 103, pl. 1, fig. 16.
1961 *Quinqueloculina juleana* D'ORBIGNY – KAASSCHIETER, p. 149, pl. 2, figs. 14–15.
1985 *Quinqueloculina juleana* D'ORBIGNY – PAPP and SCHMID, p. 104, pl. 100, figs. 1–4.
1985 *Quinqueloculina juleana* D'ORBIGNY – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 9, fig. 2.

Description: Test elongate in outline, oval in cross-section; wall calcareous, smooth, porcellaneous; aperture terminal, circular with single small tooth.

Quinqueloculina seminula (LINNÉ, 1758)
Plate 3, Figure 12

1758 *Serpula seminulum* n. sp. – LINNÉ, p. 786, pl. a, figs. 1a–c (fide: ELLIS and MESSINA).
1949 *Quinqueloculina seminula* (LINNÉ) – CUVILLIER and SZAKALL, p. 37. pl. 17. fig. 4.
1955 *Quinqueloculina seminula* (LINNÉ) – BHATIA, p. 674, pl. 67, fig. 8.
1956 *Quinqueloculina seminula* (LINNÉ) – GULLENTOPS, p. 9, pl. 1, fig. 1.
1958 *Quinqueloculina seminula* (LINNÉ) – BATJES, p. 102, pl. 1, fig. 15.
1961 *Quinqueloculina seminula* (LINNÉ) – KAASSCHIETER, p. 147, pl. 2, figs. 5–6.
1963 *Quinqueloculina seminula* (LINNÉ) – KÜMMERLE, p. 27, pl. 1, fig. 6.
1970 *Quinqueloculina seminula* (LINNÉ) – LE CALVEZ, p. 40, pl. 46, figs. 6–7.

Description: Test large, oval or circular in outline, oval in cross-section; chambers increasing gradually in size, each chamber comprising one and half coil and overlapped by subsequent chambers; wall calcareous, smooth, porcellaneous; sutures barely visible; terminal aperture with two sharp teeth.

Quinqueloculina sp. 1.
Plate 3, Figure 13

Description: Test large, milioline, oval in lateral view, triangular in cross-section; periphery subacute; chambers increasing gradually in size, each chamber comprising one and half coil and overlapped by subsequent chambers; wall calcareous, smooth, porcellaneous; sutures barely visible; terminal aperture on short neck.

Quinqueloculina sp. 2.
Plate 3, Figure 14

Description: Test large, milioline, oval in lateral view, strongly compressed in cross-section; each chamber comprising one and half coil and overlapped by subsequent chambers; wall calcareous, smooth, porcellaneous; sutures barely visible; terminal aperture.

Subfamily Miliolinellinae VELLA, 1957

Genus *Pyrgo* DEFRANCE, 1824

Type species: *Pyrgo laevis* DEFRANCE, 1824

Pyrgo bulloides (D'ORBIGNY, 1826)
Plate 3, Figure 15

1826 *Biloculina bulloides* n. sp. – D'ORBIGNY, p. 13, pl. 1, fig. 1.
1961 *Pyrgo bulloides* (D'ORBIGNY) – KAASSCHIETER, p. 167, pl. 5, fig. 18.
1970 *Pyrgo bulloides* (D'ORBIGNY) – LE CALVEZ, p. 54, pl. 6, fig. 5.

Description: Test large, biloculine; oval in outline, subcircular in cross-section; two chambers visible in final whorl; wall calcareous, smooth, porcellaneous; aperture terminal with tooth.
Remarks: *Pyrgo bulloides* (D'ORBIGNY) is very common in Paleogene sediments of the HPB, especially in shallow water environments.

Subfamily Sigmoilinitinae ŁUCZKOWSKA, 1974

Genus *Articulina* D'ORBIGNY, 1825

Type species: *Articulina nitida* D'ORBIGNY, 1825

Articulina curta LE CALVEZ, 1947
Plate 3, Figure 16

1947 *Articulina curta* n. sp. – LE CALVEZ, p. 39, pl. 4, fig. 87.
1970 *Articulina curta* LE CALVEZ – LE CALVEZ, p. 67, pl. 10, fig. 8.

Description: Test squattish, elongated in outline, oval in cross-section; initial chambers rather triloculine, later monoserial; sutures distinct, mildly depressed; wall calcareous, porcellaneous with numerous fine, longitudinal ribs; aperture circular, terminal with thickened lip.

Articulina laevigata TERQUEM, 1882
Plate 3, Figure 17

1882 *Articulina laevigata* n. sp. – TERQUEM, p. 151, pl. 15, figs. 27–31.
1947 *Articulina laevigata* TERQUEM – KAASSCHIETER, p. 158, pl. 4, figs. 15–17.

Description: Test elongated, oval in cross-section; initial chambers rather triloculine or quinqueloculine, later monoserial; sutures distinct, mildly depressed; wall calcareous, porcellaneous with numerous fine, longitudinal ribs; aperture circular, terminal with thickened lip.
Remarks: *A. laevigata* TERQUEM is distinguished from all other species of *Articulina* by long, monoserial final chambers.

Articulina nitida D'ORBIGNY, 1826
Plate 3, Figure 18

1826 *Articulina nitida* n. sp. – D'ORBIGNY, p. 300, fig. 22.
1961 *Articulina nitida* D'ORBIGNY – KAASSCHIETER, p. 157, pl. 4, fig. 11.
1970 *Articulina nitida* D'ORBIGNY – LE CALVEZ, p. 69, pl. 4, fig. 6.

Description: Test squattish, oval in outline, subcircular in cross-section; initial chambers triloculine, later monoserial; sutures distinct, barely sutures; wall calcareous, porcellaneous with numerous fine, longitudinal ribs; aperture circular, terminal with thickened lip.

Family Miliolidae EHRENBERG, 1839
Subfamily Miliolinae EHRENBERG, 1839

Genus *Miliola* LAMARCK, 1804

Type species: *Miliola trigonula* (LAMARCK, 1804)

Miliola prisca (D'ORBIGNY, 1826)
Plate 3, Figures 19–20

1826 *Quinqueloculina prisca* n. sp. – D'ORBIGNY, p. 136, pl. 6, fig. 5.

1970 *Miliola prisca* (D'ORBIGNY) – LE CALVEZ, p. 45, pl. 6, figs. 1–2; pl. 46, figs. 4–5.

Description: Test large, milioline, oval in lateral view; large-size chambers increasing gradually in size, each chamber comprising one and half coil and overlapped by subsequent chambers; wall calcareous, smooth, porcellaneous; sutures barely visible; terminal aperture with many pores.
Remarks: The only difference between *Quinquloculina* and *Miliola* is the aperture. *Quinqueloculina* have large, open aperture with or without any tooth. *Miliola* have closed aperture with many pores.

Miliola strigillata (D'ORBIGNY, 1850)
Plate 3, Figures 21–22

1850 *Triloculina strigillata* n. sp. – D'ORBIGNY, p. 409, pl. 1, figs. 7a–b.
1882 *Triloculina strigillata* D'ORBIGNY – TERQUEM, p. 169, pl. 17, fig. 25.
1905 *Miliola strigillata* (D'ORBIGNY) – FORNASINI, p. 60, pl. 1, fig. 7.

Description: Test large, milioline, subcircular in lateral view; oval in cross-section, large-size chambers increasing gradually in size, each chamber comprising one and half coil and overlapped by subsequent chambers; wall calcareous, porcellaneous with numerous fine, longitudinal ribs on periphery; sutures barely visible; terminal aperture with many pores.
Remarks: *Miliola strigillata* (D'ORBIGNY) is distingushed from *Miliola prisca* (D'ORBIGNY) by its numerous fine, longitudinal ribs on periphery.

Genus *Massilina* SCHLUMBERGER, 1893

Type species: *Massilina secans* (D'ORBIGNY, 1826)

Massilina sp. 1.
Plate 3, Figure 23

Description: Test large, milioline, oval in lateral view; triangular in cross-section; periphery acute, slightly carinate; chambers increasing gradually in size, each chamber comprising one and half coil and overlapped by subsequent chambers; wall calcareous, porcellaneous with minute pores; sutures distinct; terminal, circular aperture.

Family Peneroplidae SCHULTZE, 1854

Genus *Spirolina* LAMARCK, 1804

Type species: *Spirolina cylindrica* (LAMARCK, 1804)

Spirolina mariei LE CALVEZ, 1952
Plate 3, Figures 24–25

1952 *Spirolina mariei* n. sp. – LE CALVEZ, p. 25, pl. 2, figs. 17–18.
1970 *Spirolina mariei* LE CALVEZ – LE CALVEZ, p. 76, pl. 15, fig. 2.

Description: Test squattish, planispiral in initial five-six chambers, becoming monoserial in adult part (two or three chambers, circular in cross-section; length approximately two times of wdth; initial chambers slowly increasing in size; wall calcareous, perforate with numerous fine, longitudinal ribs; sutures distinct, strongly depressed; terminal aperture.

Spirolina pedum D'ORBIGNY, 1826
Plate 3, Figure 26

1826 *Spirolina pedum* n. sp. – D'ORBIGNY, p. 121, pl. 1, figs. 20–24.
1952 *Spirolina pedum* D'ORBIGNY – LE CALVEZ, p. 23, pl. 2, fig. 15.
1970 *Spirolina pedum* D'ORBIGNY – LE CALVEZ, p. 76, pl. 15, fig. 4.

Description: Test strongly elongate, planispiral in initial five-six chambers, becoming monoserial in adult part (six to nine chambers, circular in cross-section; length approximately six-seven times width; initial chambers slowly increasing in size; wall calcareous, perforate with numerous fine, longitudinal ribs; sutures distinct, strongly depressed; terminal aperture.
Remarks: *Spirolina pedum* D'ORBIGNY is distinguished from *Spirolina mariei* LE CALVEZ by its long monoserial part (six to nine chambers) of test.

Spirolina sp.
Plate 3, Figure 27

Description: Test elongate, planispiral in initial five-six chambers, becoming monoserial in adult part, circular in cross-section; length approximately three times width; initial chambers slowly increasing in size; wall calcareous, perforate with numerous fine, longitudinal ribs; sutures distinct, strongly depressed; terminal aperture.

Suborder Lagenina DELAGE and HÉROUARD, 1896
Superfamily Nodosariacea EHRENBERG, 1838
Family Nodosariidae EHRENBERG, 1838
Subfamily Nodosariinae EHRENBERG, 1838

Genus *Chrysalogonium* SCHUBERT, 1907

Type species: *Chrysalogonium polystoma* (SCHWAGER, 1866)

Chrysalogonium tympaniplectiformis (SCHWAGER, 1866)
Plate 4, Figure 1–2

1866 *Nodosaria tympaniplectiformis* n. sp. – SCHWAGER, p. 215, pl. 5, fig. 34.

Description: Test elongate, monoserial, straight to slightly curved, circular in cross-section; four chambers increasing gradually in size, first chamber ovoidal, inflated, later chambers becoming more elongate, final chamber tubular; wall calcareous, smooth, finely perforate; sutures distinct; terminal aperture.

Chrysalogonium sp.
Plate 4, Figure 3

Description: Test elongate, monoserial, straight, circular in cross-section; first chamber elongate, tubular, later chambers missing; wall calcareous, smooth, finely perforate; suture distinct; terminal aperture.

Genus *Dentalina* RISSO, 1826

Type species: *Dentalina cuvieri* (D'ORBIGNY, 1826)

Dentalina aboleta SCHWAGER, 1865
Plate 4, Figure 6

1865 *Dentalina aboleta* n. sp. – SCHWAGER, p. 105, pl. 3, figs. 5, 8.

Description: Test squattish, monoserial, straight, subcircular in cross-section; ovoidal chambers increasing gradually in size; wall calcareous, hyaline, finely perforate; aperture terminal, radiate.

Remarks: *Dentalina aboleta* SCHWAGER has been reported from the Upper Jurassic of Northern Calcareous Alps.

Dentalina sp. cf. *D. acuta* D'ORBIGNY, 1846
Plate 4, Figure 4

1846 *Dentalina acuta* n. sp. – D'ORBIGNY, p. 56, pl. 2, figs. 40–43.
1949 *Dentalina acuta* D'ORBIGNY – CUVILLIER and SZAKÁLL, p. 75, pl. 28, figs. 3–4.
1985 *Dentalina acuta* D'ORBIGNY – PAPP and SCHMID, p. 35, pl. 18, figs. 1–6.

Description: Test elongate, monoserial, straight, circular in cross-section; chambers increasing gradually in size; wall calcareous, hyaline, finely perforate with numerous fine, longitudinal ribs; aperture terminal, radiate.

Dentalina antennula D'ORBIGNY, 1846
Plate 4, Figure 12

1846 *Dentalina antennula* n. sp. – D'ORBIGNY, p. 53, pl. 2, figs. 29–30.
1851 *Dentalina philippii* n. sp. – REUSS, p. 60, pl. 3, fig. 5.
1985 *Dentalina antennula* D'ORBIGNY – PAPP and SCHMID, p. 33, pl. 15, figs. 7–9.
2004 *Dentalina antennula* D'ORBIGNY – EILAND and GUDMUNDSSON, p. 198, pl. 1, fig. P; pl. 2, fig. C.

Description: Test elongate, monoserial, straight, circular in cross-section; first and last chambers slightly inflated; wall calcareous, hyaline, finely perforate with numerous fine, longitudinal ribs; sutures barely visible; aperture terminal, radiate.

Dentalina approximata (REUSS, 1866)
Plate 4, Figure 5

1866 *Nodosaria (Dentalina) approximata* n. sp. – REUSS, p. 134, pl. 2, fig. 22.
1875 *Dentalina approximata* REUSS – HANTKEN, p. 26, pl. 3, fig. 5.
1975 *Dentalina approximata* REUSS – SAMUEL, p. 122, pl. 69. figs. 5–6.

Description: Test elongate, monoserial, slightly curved, circular in cross-section; squattish chambers increasing gradually in size; wall calcareous, smooth, hyaline, finely perforate; aperture terminal, radiate.

Dentalina cornicula (D'ORBIGNY, 1826)
Plate 4, Figures 7–8

1826 *Nodosaria (Dentalina) cornicula* n. sp. – D'ORBIGNY, p. 255, pl. 9, fig. 56.
1949 *Dentalina cornicula* (D'ORBIGNY) – CUVILLIER and SZAKÁLL, p. 75, pl. 28, fig. 1.

Description: Test elongate, monoserial, straight, circular in cross-section; chambers increasing gradually in size, final chamber acute; wall calcareous, hyaline with numerous strong, longitudinal ribs; aperture terminal, radiate.

Dentalina debilis HANTKEN, 1868
Plate 4, Figure 9

1868 *Dentalina debilis* n. sp. – HANTKEN, pl. 2, fig. 27.
1875 *Dentalina debilis* HANTKEN – HANTKEN, p. 28, pl. 13, fig. 10.

Description: Test elongate, monoserial, straight to slightly curved, circular in cross-section; chambers increasing gradually in size; wall calcareous, hyaline, finely perforate; sutures distinct; aperture terminal, radiate.

Dentalina elegans D'ORBIGNY, 1846
Plate 4, Figure 10

1846 *Dentalina elegans* n. sp. – D'ORBIGNY, p. 45, pl. 1, figs. 52–56.
1985 *Dentalina elegans* D'ORBIGNY – PAPP and SCHMID, p. 28, pl. 10, figs. 1–5.

Description: Test elongate, monoserial, straight to slightly curved, circular in cross-section; chambers decreasing gradually in size; wall calcareous, hyaline, finely perforate; sutures distinct; aperture terminal, radiate.

Dentalina fissicostata GÜMBEL, 1868
Plate 4, Figure 11

1868 *Dentalina fissicostata* n. sp. – GÜMBEL, p. 48, pl. 1, fig. 46.
1966 *Dentalina fissicostata* GÜMBEL – HOFKER, p. 217, pl. 41, fig. 21.

Description: Test elongate, monoserial, straight, circular in cross-section; large-size, inflated chambers increasing gradually in size; wall calcareous, hyaline, finely perforate with numerous strong, longitudinal ribs; sutures strongly depressed; aperture terminal, radiate.

Dentalina inornata D'ORBIGNY, 1846
Plate 4, Figure 13

1846 *Dentalina inornata* n. sp. – D'ORBIGNY, p. 44, pl. 1, figs. 50–51.
1961 *Dentalina inornata* D'ORBIGNY – KAASSCHIETER, p. 176, pl. 7, figs. 18–19.
1977 *Dentalina inornata* D'ORBIGNY – POŻARYSKA, p. 23, pl. 2, fig. 25.

Description: Test elongate, monoserial, slightly curved, circular in cross-section; chambers increasing gradually in size; wall calcareous, hyaline, finely perforate; sutures distinct; aperture terminal, radiate.

Dentalina multilineata BORNEMANN, 1855
Plate 4, Figure 14

1855 *Dentalina multilineata* n. sp. – BORNEMANN, p. 325, pl. 13, fig. 12.
1932 *Dentalina multilineata* BORNEMANN – NUTTALL, pl. 3, fig. 5.
1987 *Dentalina multilineata* BORNEMANN – SZTRÁKOS, pl. 4. fig. 14.

Description: Test elongate, monoserial, slightly curved, circular in cross-section; chambers increasing gradually in size; wall calcareous, hyaline, finely perforate with numerous fine, longitudinal ribs; sutures distinct; aperture terminal, radiate.

Dentalina karreri (HANTKEN, 1868)
Plate 4, Figure 15

1868 *Nodosaria karreri* n. sp. – HANTKEN, p.85, pl. 1. fig. 8.

Description: Test elongate, monoserial, straight, circular in cross-section; chambers increasing gradually in size, final chamber inflated; wall calcareous, hyaline, finely perforate; sutures distinct; aperture terminal, radiate.

Dentalina havanensis CUSHMAN and BERMÚDEZ, 1937
Plate 4, Figure 16

1937 *Dentalina havanensis* n. sp. – CUSHMAN and BERMÚDEZ, p. 11, pl. 1, figs. 39–40.

Description: Test elongate, monoserial, slightly curved, circular in cross-section; chambers increasing gradually in size; wall calcareous, hyaline, finely perforate; sutures invisible; aperture terminal, radiate.

Dentalina roemeri NEUGEBOREN, 1856
Plate 4, Figure 17

1856 *Dentalina roemeri* n. sp. – NEUGEBOREN, p. 82, pl. 2, figs. 13–17.
1949 *Dentalina roemeri* NEUGEBOREN – CUVILLIER and SZAKÁLL, p. 79, pl. 28. fig. 31.

Description: Test elongate, monoserial, slightly curved, circular in cross-section; chambers increasing gradually in size; wall calcareous, hyaline, finely perforate; sutures slightly depressed; aperture terminal, radiate.

Dentalina subtilis NEUGEBOREN, 1856
Plate 4, Figure 18

1856 *Dentalina subtilis* n. sp. – NEUGEBOREN, p. 9, pl. 3, fig. 4.
1875 *Dentalina subtilis* NEUGEBOREN – HANTKEN, p. 28, pl. 3, fig. 13.

Description: Test elongate, monoserial, slightly curved, circular in cross-section; chambers increasing gradually in size; wall calcareous, hyaline, finely perforate; sutures barely visible; aperture terminal, radiate.

Genus *Nodosaria* LAMARCK, 1812

Type species: *Nodosaria radicula* (LINNÉ, 1758)

Nodosaria acuminata HANTKEN, 1875
Plate 4, Figures 25–26

1875 *Nodosaria acuminata* n. sp. – HANTKEN, p. 28, pl. 2, fig. 9, pl. 13, fig. 5.
1975 *Nodosaria acuminata* HANTKEN – SAMUEL, p. 119, pl. 70, fig. 3.
1985 *Nodosaria acuminata* HANTKEN – KORECZNÉ LAKY and NAGYNÉGELLAI, pl. 10, fig. 14.

Description: Test elongate, monoserial, straight, circular in cross-section; chambers increasing gradually in size, final chamber acute; wall calcareous, hyaline, finely perforate with numerous strong, longitudinal ribs; aperture terminal, central, circular.

Nodosaria affinis REUSS, 1845
Plate 4, Figure 19

1845 *Nodosaria affinis* n. sp. – REUSS, p. 26, pl. 13, fig. 16.
1968 *Nodosaria affinis* REUSS – HOFKER, p. 179, pl. 34, figs. 88–89.

Description: Test elongate, monoserial, straight, circular in cross-section; first chamber inflated; wall calcareous, hyaline, finely perforate with numerous strong, longitudinal ribs; aperture terminal, central, circular.

Nodosaria badenensis (D'ORBIGNY, 1846)
Plate 4, Figure 20

1846 *Nodosaria spinicosta* n. sp. – D'ORBIGNY, p. 37, pl. 1, figs. 32–33.
1985 *Nodosaria badenensis* (D'ORBIGNY) – PAPP and SCHMID, p. 26, pl. 7, figs. 1–3.
1985 *Nodosaria badenensis* (D'ORBIGNY) – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 99, fig. 11.

Description: Test elongate, monoserial, straight, circular in cross-section; chambers increasing gradually in size, final chamber inflated; wall calcareous, hyaline, finely perforate with numerous strong, longitudinal ribs; aperture terminal, central, circular.
Remarks: *Nodosaria badenensis* (D'ORBIGNY) has been reported from the Miocene of Vienna Basin, from the Lower Miocene of France and Hungary.

Nodosaria crassa HANTKEN, 1868
Plate 4, Figure 21

1868 *Nodosaria crassa* n. sp. – HANTKEN, p. 52, pl. 1, fig. 15.

1875 *Nodosaria crassa* HANTKEN – HANTKEN, p. 23, pl. 13, fig. 4.
1985 *Nodosaria crassa* HANTKEN – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 35, fig. 3.

Description: Test squattish, monoserial, straight, circular in cross-section; two or three chambers, wall calcareous, hyaline, finely perforate with numerous strong, longitudinal ribs; aperture terminal, central, circular.

Nodosaria elegans (HANTKEN, 1875)
Plate 4, Figure 22

1875 *Dentalina elegans* D'ORBIGNY – HANTKEN, p. 25, pl. 3, fig. 7.

Description: Test elongate, monoserial, slightly curved, circular in cross-section; chambers increasing gradually in size, wall calcareous, smooth, hyaline, finely perforate; aperture terminal, central, circular.

Nodosaria exilis NEUGEBOREN, 1852
Plate 4, Figure 23

1852 *Nodosaria exilis* n. sp. – NEUGEBOREN, p. 51, pl. 1, figs. 25–26.
1975 *Nodosaria exilis* NEUGEBOREN – SAMUEL, p. 120, pl. 69, figs. 12a–b, 13–14.
1985 *Nodosaria exilis* NEUGEBOREN – KORECZNÉ-LAKY – NAGYNÉ-GELLAI, pl. 9, fig. 14.

Description: Test elongate, monoserial, straight, circular in cross-section; first chamber inflated, spherical; wall calcareous, hyaline, finely perforate; aperture terminal, central, circular.

Nodosaria intermedia (HANTKEN, 1875)
Plate 4, Figure 24

1875 *Dentalina intermedia* n. sp. – HANTKEN, p. 25, pl. 3, figs. 4, 8.

Description: Test elongate, monoserial, slightly curved, circular in cross-section; chambers increasing gradually in size, final three chambers slightly inflated; wall calcareous, hyaline, smooth, finely perforate; aperture terminal, central, circular.

Nodosaria longiscata D'ORBIGNY, 1846
Plate 4, Figure 27

1846 *Nodosaria longiscata* n. sp. – D'ORBIGNY, p. 32, pl. 1, figs. 10–12.
1952 *Nodosaria longiscata* D'ORBIGNY – TODD and KNIKER, p. 16, pl. 3, figs. 9–10.
1985 *Nodosaria longiscata* D'ORBIGNY – PAPP and SCHMID, p. 23, pl. 3, figs. 1–5.
1985 *Nodosaria longiscata* D'ORBIGNY – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 99, fig. 1.

Description: Test elongate, monoserial, straight, circular in cross-section; first chamber inflated, chambers increasing gradually in size; wall calcareous, hyaline, finely perforate with numerous strong, longitudinal ribs; invisible sutures; aperture terminal, central, circular.

Nodosaria pyrula D'ORBIGNY, 1826
Plate 4, Figure 28.

1826 *Nodosaria pyrula* n. sp. – D'ORBIGNY, p. 253, pl. 9, fig. 37.
1846 *Nodosaria mariae* n. sp. – D'ORBIGNY, p. 33, pl. 1, figs. 15–16.
1985 *Nodosaria pyrula* D'ORBIGNY – PAPP and SCHMID, p. 24, pl. 4, figs. 2–3.
1985 *Nodosaria pyrula* D'ORBIGNY – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 9, figs. 12–13; pl. 35, fig. 5; pl. 99, fig. 21.

Description: Test elongate, monoserial, straight, circular in cross-section; chambers increasing gradually in size, final chamber inflated; wall calcareous, smooth, hyaline, finely perforate; strongly depressed sutures; aperture terminal on long neck with thickened lip.

Nodosaria radicula (LINNÉ, 1758)
Plate 4, Figure 29

1758 *Nautilus radicula* n. sp. – LINNÉ, p. 711, pl. 1, figs. 5a–c (fide ELLIS and MESSINA).
1982 *Nodosaria radicula* LINNÉ – SZTRÁKOS, pl. 5. fig. 19.
1985 *Nodosaria radicula* LINNÉ – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 14, figs. 3–4; pl. 103, fig. 3.

Description: Test squattish, monoserial, straight, circular in cross-section; chambers increasing gradually in size, final chamber inflated; wall calcareous, smooth, hyaline; aperture terminal, central, circular.

Genus *Pseudonodosaria* BOOMGAART, 1949

Type species: *Pseudonodosaria discreta* (REUSS, 1850)

Pseudonodosaria discreta (REUSS, 1850)
Plate 4, Figure 30

1850 *Glandulina discreta* n. sp. – REUSS, p. 372, pl. 47. fig. 9.
1987 *Pseudonodosaria discreta* (REUSS) – SZTRÁKOS, pl. 5. fig. 28.

Description: Test squattish, monoserial, straight, circular in cross-section; chambers increasing gradually in size, final chamber inflated; wall calcareous, hyaline, finely perforate smooth; aperture terminal, circular.

Subfamily Lingulininae LOEBLICH and TAPPAN, 1961

Genus *Gonatosphaera* GUPPY, 1894

Type species: *Gonatosphera prolata* Guppy, 1894

Gonatosphaera inflata BERMÚDEZ, 1949
Plate 4, Figures 31–32

1949 *Gonatosphaera inflata* n. sp. – BERMÚDEZ, p. 232, pl. 14, figs. 50–51.
1979 *Gonatosphaera inflata* BERMÚDEZ – SZTRÁKOS, pl. 16, fig. 3.

Description: Test squattish, monoserial, straight, circular in cross-section; chambers inflated and increasing gradually in size, final chamber strongly inflated; wall calcareous, hyaline, finely perforate smooth; aperture terminal, central, circular.

Genus *Frondicularia* DEFRANCE emend. NORLING, 1972

Type species: *Frondicularia complanata* (DEFRANCE, 1824)

Frondicularia budensis (HANTKEN, 1875)
Plate 5, Figure 2

1875 *Flabellina budensis* n. sp. – HANTKEN, p. 37, pl. 4, fig. 17.
1949 *Frondicularia budensis* (HANTKEN) – CUVILLIER and SZAKÁLL, p. 84, pl. 30. fig. 14.
1953 *Frondicularia budensis* (HANTKEN) – SUBBOTINA, p. 199, pl. 7, figs. 6–7.
1979 *Palmula budensis* (HANTKEN) – SZTRÁKOS, pl. 33, figs. 9–10.
1985 *Frondicularia budensis* (HANTKEN) – GRÜNIG, p. 261, pl. 4, fig. 21.
1985 *Frondicularia budensis* (HANTKEN) – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 11, fig. 24; pl. 25, figs. 1–2.
1992 *Palmula budensis* (HANTKEN) – DARAKCHIEVA and JURANOV, p. 12, pl. 1, figs. 9–10.
1993 *Palmula budensis* (HANTKEN) – SZTRÀKOS, p. 76, pl. 9, fig. 10.
2006 *Palmula budensis* (HANTKEN) – CIMERMAN et al., p. 24, pl. 5, fig. 7.

Description: Test monoserial, lanceolate in outline, strongly compressed in cross-section; length approximately two times width breadth; chambers increasing gradually in size, wall calcareous, finely perforate with numerous V-shaped elevated sutures; terminal aperture.

Frondicularia semicosta KARRER, 1877
Plate 5, Figure 1

1877 *Frondicularia semicosta* n. sp. – KARRER, p. 380, pl. 16b, fig. 26.
1954 *Plectofrondicularia semicosta* (KARRER) – COLOM, p. 260. pl. 29. figs. 24–25.
1982 *Plectofrondicularia semicosta* (KARRER) – AGIP, pl. 24, fig. 6.

Description: Test monoserial, lanceolate in outline, strongly compressed in cross-section; length approximately three and a half times larger than width; chambers increasing gradually in size, wall calcareous, finely perforate with numerous fine, longitudinal ribs, aperture terminal.

Frondicularia tenuissima HANTKEN, 1875
Plate 5, Figures 3–4

1875 *Frondicularia tenuissima* n. sp. – HANTKEN, p. 43, pl. 13, fig. 11.
1927 *Frondicularia tenuissima* HANTKEN – CUSHMAN, p. 111, pl. 22, fig. 11.
1949 *Frondicularia tenuissima* HANTKEN – CUVILLIER and SZAKÁLL, p. 85, pl. 30, fig. 15.
1951 *Frondicularia tenuissima* HANTKEN – FRIESE, p. 27, pl. 11, fig. 22.
1952 *Flabellinella tenuissima* (HANTKEN) – HAGN, p. 156, pl. 4, fig. 20.
1979 *Frondicularia tenuissima* HANTKEN – SZTRÁKOS, pl. 12, fig. 1.
1982 *Plectofrondicularia tenuissima* (HANTKEN) – AGIP, pl. 24, fig. 8.
1985 *Frondicularia tenuissima* HANTKEN – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 11, fig. 25; pl. 25, figs. 3–4.
1987 *Flabellinella tenuissima* (HANTKEN) – REISER, p. 72, pl. 5, figs. 29–30.
1993 *Frondovaginulina tenuissima* (HANTKEN) – MATHLEIN and SZTRÁKOS, p. 76, pl. 9, fig. 8.
2006 *Palmula tenuissima* (HANTKEN) – CIMERMAN et al., p. 24, pl. 5, figs. 8–9.

Description: Test monoserial, lanceolate in outline, strongly compressed in cross-section; length approximately three times larger than width; wall calcareous, finely perforate with numerous fine, longitudinal ribs; terminal aperture.

Family Vaginulinidae REUSS, 1860
Subfamily Lenticulininae CHAPMAN, PARR and COLLINS, 1934

Genus *Lenticulina* LAMARCK, 1804

Type species: *Lenticulina rotula* (LAMARCK, 1804)

Lenticulina arcuatostriata (HANTKEN, 1868)
Plate 5, Figures 5–6

1868 *Cristellaria (Robulina) arcuato striata* n. sp. – HANTKEN, p. 93, pl. 2, fig. 30.
1875 *Robulina arcuatostriata* (HANTKEN) – HANTKEN, p. 48, pl. 7, fig. 2.
1949 *Robulus arcuatostriatus* (HANTKEN) – CUVILLIER and SZAKÁLL, p. 51, pl. 23. fig. 9.
1950 *Robulus arcuatostriatus* (HANTKEN) – RUIZ DE GAONA and COLOM, p. 402, pl. 6, figs. 1–9.
1956 *Robulus arcuatostriatus* (HANTKEN) – HAGN, p. 127, pl. 11, fig. 4.
1982 *Lenticulina arcuatostriata* (HANTKEN) – SZTRÁKOS, pl. 9, fig. 2.
1985 *Lenticulina arcuatostriata* (HANTKEN) – GRÜNIG, p. 261, pl. 4, fig. 19.
1985 *Lenticulina arcuatostriata* (HANTKEN) – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 12, fig. 1.
2006 *Lenticulina arcuatostriata* (HANTKEN) – CIMERMAN et al., p. 22, pl. 4, fig. 13.

Description: Test planispiral, involute, circular in outline, biconvex in cross-section; chambers increasing moderately in size; sutures distinct, slightly curved, wall calcareous, smooth, finely perforate; aperture terminal, radiate.

Lenticulina excisa (BORNEMANN, 1855)

Plate 5, Figure 7

1855 *Cristellaria excisa* n. sp. – BORNEMANN, p. 328, pl. 13, figs. 19–20.
1979 *Lenticulina excisa* (BORNEMANN) – SZTRÁKOS, pl. 12, fig. 11.

Description: Test planispiral, involute, oval in outline, biconvex in cross-section; periphery acute; chambers increasing moderately in size; sutures distinct, slightly curved; wall calcareous, smooth, finely perforate; aperture terminal, radiate.

Lenticulina falcifer (STACHE, 1865)
Plate 5, Figure 8

1865 *Cristellaria (Cristellaria) falcifer* n. sp. – STACHE, p. 240, pl. 23, figs. 19a–b.
1979 *Lenticulina falcifer* (STACHE) – SZTRÁKOS, pl. 12, fig. 12.

Description: Test planispiral, involute, circular in outline, biconvex in cross-section; chambers increasing moderately in size; sutures indistinct; wall calcareous, smooth, finely perforate; aperture terminal, radiate.

Lenticulina granulata (HANTKEN, 1875).
Plate 5, Figure 9

1875 *Robulina granulata* n. sp. – HANTKEN, p. 49, pl. 14, fig. 15.
1987 *Lenticulina granulata* (HANTKEN) –SZTRÁKOS, pl. 4, fig. 35.

Description: Test planispiral, involute, circular in outline, biconvex in cross-section; periphery acute; chambers increasing moderately in size; sutures indistinct, wall calcareous with many irregularly arranged nodes, finely perforate; aperture terminal, radiate.

Lenticulina gutticostata (GÜMBEL, 1868)
Plate 5, Figure 10

1868 *Robulina gutticostata* n. sp. – GÜMBEL, p. 643, pl. 1, figs. 74a–b.
1875 *Robulina gutticostatus* (GÜMBEL) – HANTKEN, p. 48, pl. 6, fig. 10.
1985 *Lenticulina cassis* (FICHTEL and MOLL) – GRÜNIG, p. 261, pl. 4, fig. 20.

Description: Test planispiral, involute, circular in outline, biconvex in cross-section; chambers increasing moderately in size; sutures distinct with small oval to circular beads; wall calcareous, smooth, finely perforate; aperture terminal, radiate.

Lenticulina platyptera (REUSS, 1870)
Plate 5, Figure 11

1870 *Cristellaria (Robulina) platyptera* n. sp. – REUSS, p. 482, pl. 19, figs. 7–8.
1987 *Lenticulina platyptera* (REUSS) – SZTRÁKOS, pl. 4, fig. 37.

Description: Test planispiral, involute, circular in outline, biconvex in cross-section; periphery acute; chambers increasing moderately in size; sutures distinct, straight to slightly curved; wall calcareous, smooth, finely perforate; aperture terminal, radiate.

Lenticulina sp.
Plate 5, Figure 12

Description: Test planispiral, involute, dropshape in outline, biconvex in cross-section; chambers increasing moderately in size; sutures indistinct; wall calcareous, smooth, finely perforate; aperture terminal, radiate.

Genus *Marginulinopsis* SILVESTRI, 1904

Type species: *Marginulinopsis densicostata* THALMANN, 1937

Marginulinopsis porvaensis (HANTKEN, 1875)
Plate 5, Figure 13

1875 *Cristellaria porvaensis* n. sp. – HANTKEN, p. 42, pl. 14, fig. 1.
1950 *Marginulina porvaensis* (HATKEN) – RUIZ DE GAONA and COLOM, p. 387, pl. 11, figs. 1–14.
1987 *Marginulinopsis porvaensis* (HANTKEN) – SZTRÁKOS, pl. 5. fig. 20.
1993 *Astacolus porvaensis* (HANTKEN) – MATHELIN and SZTRÀKOS, p. 76, pl. 26, fig. 13.
2006 *Marginulinopsis porvaensis* (HANTKEN) – CIMERMAN et al., p. 24, pl. 5, figs. 2–3.

Description: Test planispiral, involute in earlier three – four chambers, becoming monoserial later (five to seven chambers, oval in cross-section; length approximately four times width breadth; chambers increasing gradually in size; sutures distinct, straight, slightly elevated; wall calcareous, smooth, finely perforated; aperture terminal, circular on short neck.

Marginulinopsis sp.
Plate 5, Figure 14

Description: Test planispiral, involute in earlier three – four chambers, becoming monoserial later, oval in cross-section; length approximately four times width breadth; chambers increasing gradually in size; sutures distinct, straight, slightly elevated; wall calcareous, smooth, finely perforated with numerous fine, longitudinal ribs on earlier chambers; aperture terminal, circular on short neck.

Genus *Saracenaria* DEFRANCE, 1824

Type species: *Saracenaria italica* DEFRANCE, 1824

Saracenaria hantkeni CUSHMAN, 1933
Plate 5, Figures 15–16

1933 *Saracenaria arcuata* D'ORBIGNY var. hantkeni – CUSHMAN, p. 4, pl. 1, figs. 11–12.
1953 *Saracenaria hantkeni* CUSHMAN – BECKMANN, p. 353, pl. 19, fig. 18.
1956 *Saracenaria hantkeni* CUSHMAN – HAGN, p. 138, pl. 13, fig. 4.
1977 *Saracenaria arcuata* (D'ORBIGNY) – POŻARYSKA, p. 25, pl. 2, figs. 22a–b.
1987 *Saracenaria hantkeni* CUSHMAN – SZTRÁKOS, pl. 6. fig. 3.
1993 *Saracenaria hantkeni* CUSHMAN – MATHELIN and SZTRÁKOS, p. 76, pl. 9, fig. 6.
2006 *Saracenaria hantkeni* CUSHMAN – CIMERMAN et al., p. 24, pl. 5, fig. 6.

Description: Test planispiral in earlier chambers, involute, becoming monoserial in final two or three chambers; dropshape in outline, rounded triangular in cross-section; chambers increasing gradually in size, final chambers strongly inflated; wall calcareous, smooth, finely perforated; sutures invisible; aperture terminal, radiate.

Subfamily Marginulininae WEDEKIND, 1937

Genus *Marginulina* D'ORBIGNY, 1826

Type species: *Marginulina raphanus* LINNÉ, 1758

Marginulina behmi (REUSS, 1866)
Plate 5, Figure 17

1866 *Cristellaria behmi* n. sp. – REUSS, p. 138, pl. 2, fig. 37.
1868 *Cristellaria behmi* REUSS – GÜMBEL, p. 55, pl. 1, fig. 61.
1875 *Marginulina behmi* (REUSS) – HANTKEN, p. 48, pl. 5, figs. 1–2.

1947 *Marginulina behmi* (REUSS) – SAMOILOVA, p. 82, pl. 3, fig. 9.
1949 *Marginulina behmi* (REUSS) – CUVILLIER and SZAKÁLL, p. 70, pl. 27. fig. 7.
1953 *Marginulina behmi* (REUSS) – SUBBOTINA, p. 65, pl. 4, figs. 4–5.
1956 *Marginulina behmi* (REUSS) – HAGN, p. 131, pl. 11, fig. 11.
1950 *Marginulina behmi* (REUSS) – RUIZ DE GAONA and COLOM, p. 384, pl. 11, figs. 18–26.
1956 *Marginulina behmi* (REUSS) – HAGN, p. 131, pl. 11, fig. 11.
1965 *Marginulina behmi* (REUSS) – KRAYEVA, p. 4, pl. 21, figs. 1–2.
1969 *Marginulina behmi* (REUSS) – KRAYEVA and ZARNECKIJ, p. 60, pl. 21, figs. 5–6.
1975 *Marginulina behmi* (REUSS) – BRAGA et al., p. 105, pl. 4, fig. 13.
1975 *Marginulina behmi* (REUSS) – SAMUEL, p. 126, pl. 70, fig. 11.
1977 *Marginulina behmi* (REUSS) – POŻARYSKA, p. 24, pl. 2, figs. 27a–b; pl. 3, figs. 1–9; pl. 8, figs. 1a–c.
1982 *Marginulina behmi* (REUSS) – AGIP, pl. 11, figs. 10–10p.
1985 *Marginulina behmi* (REUSS) – GRÜNIG, p. 262, pl. 5, figs. 17–19.
1985 *Marginulina behmi* (REUSS) – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 13, fig. 1.
1992 *Marginulina behmi* (REUSS) – DARAKCHIEVA and JURANOV, p. 13, pl. 2, figs. 4–5.
1993 *Marginulina behmi* (REUSS) – MATHELIN and SZTRÁKOS, p. 43, pl. 26, figs. 14–16.
2006 *Marginulinopsis behmi* (REUSS) – CIMERMAN et al., p. 24, pl. 5, fig. 1.

Description: Test elongate, planispiral, involute in earlier chambers, becoming monoserial later (four or five chambers, oval in cross-section; chambers increasing gradually in size; sutures distinct, slightly depressed; wall calcareous, smooth, finely perforated with numerous strong, longitudinal ribs; aperture terminal, circular with thickened lip on short neck.

Marginulina fragaria texasensis (CUSHMAN and APPLIN, 1926)
Plate 5, Figure 18

1926 *Cristellaria fragaria* (GÜMBEL) var. *texasensis* n. subsp. – CUSHMAN and APPLIN, p. 171, pl. 8, figs. 5–7.
1932 *Lenticulina fragaria* (GÜMBEL) var. *texasensis* CUSHMAN and APPLIN – HOWE and WALLACE, p. 32, pl. 5, figs. 3–5.
1933 *Marginulina fragaria* (GÜMBEL) var. *texasensis* CUSHMAN and APPLIN – ELLISOR, pl. 2, fig. 4.
1935 *Marginulina fragaria* (GÜMBEL) var. *texasensis* CUSHMAN and APPLIN – CUSHMAN, p. 19, pl. 7, figs. 8a–b, 10a–b (non figs. 9a–b).

Description: Test elongate, planispiral, involute in earlier chambers, becoming monoserial later (four or five chambers, oval in cross-section; chambers increasing gradually in size, final chamber smaller than previous; sutures distinct, slightly depressed; wall calcareous, smooth, finely perforated with numerous horizontal beads; aperture terminal, circular with thickened lip on short neck.

Marginulina hantkeni BANDY, 1949
Plate 5, Figures 19–20

1875 *Marginulina subbullata* n. sp. – HANTKEN, p. 46, pl. 4, figs. 9–10; pl. 5, fig. 9.
1949 *Marginulina hantkeni* nomen novum – BANDY, p. 46, pl. 6, fig. 9.
1975 *Marginulina hantkeni* BANDY – POPESCU, p. 56, pl. 20, fig. 4; pl. 21, fig. 8.
1982 *Marginulina subbullata* HANTKEN – AGIP, pl. 13, fig. 1.
1982 *Marginulina hantkeni* BANDY – SZTRÁKOS, pl. 11, fig. 6.
1987 *Marginulina hantkeni* BANDY – SZTRÁKOS, pl. 5. fig. 14.

Description: Test squattish, planispiral in earlier chambers, becoming monoserial in final two or three chambers; oval in outline, circular in cross-section; chambers increasing gradually in size, final chambers strongly inflated; wall calcareous, smooth, finely perforated; sutures distinct, strongly depressed; aperture terminal, radiate on short neck.

Marginulina pediformis BORNEMANN, 1855
Plate 5, Figure 21

1855 *Marginulina pediformis* n. sp. – BORNEMANN, p. 326, pl. 13, fig. 13.
1949 *Marginulina pediformis* BORNEMANN – CUVILLIER and SZAKÁLL, p. 70, pl. 27. fig. 5.
1987 *Marginulina pediformis* BORNEMANN – SZTRÁKOS, pL. 5, fig. 13.

Description: Test elongate, slightly curved, planispiral in earlier chambers, becoming monoserial in final three or four chambers; chambers mildly inflated and increasing gradually in size; sutures distinct, strongly depressed; wall calcareous, smooth, finely perforated

Marginulina propinqua HANTKEN, 1883
Plate 5, Figure 22

1883 *Marginulina propinqua* n. sp – HANTKEN, p. 26, pl. 2, figs. 4a–b.
1987 *Marginulina propinqua* HANTKEN – SZTRÁKOS, pl. 5, fig. 16.

Description: Test squattish, planispiral, involute in earlier chambers, becoming monoserial later, oval in cross-section; chambers increasing gradually in size; sutures barely visible; wall calcareous, smooth, finely perforated with numerous fine, longitudinal ribs on planispiral chambers; aperture terminal, circular on short neck.

Marginulina tumida REUSS, 1851
Plate 5, Figure 23

1851 *Marginulina tumida* n. sp. – REUSS, p. 64, pl. 3, figs. 14a–b.
1979 *Marginulina tumida* REUSS – SZTRÁKOS, pl. 14, fig. 3.

Description: Test mildly elongate, planispiral, involute in earlier chambers, becoming monoserial later, oval in cross-section; chambers increasing gradually in size; sutures barely visible; wall calcareous, smooth, finely perforated; aperture terminal, radiate.

Marginulina sp. 1.
Plate 5, Figure 24

Description: Test squattish, planispiral, involute in earlier chambers, becoming monoserial later, oval to circular in cross-section; chambers increasing gradually in size; sutures barely visible; wall calcareous, smooth, finely perforated with numerous strong longitudinal ribs; aperture terminal, radiate.

Genus *Vaginulinopsis* SILVESTRI, 1904

Type species: *Vaginulinopsis inversa carinata* SILVESTRI, 1904

Vaginulinopsis hagni n. sp.
Plate 5, Figures 25–27

1956 *Vaginulinopsis cumulicostata* (GÜMBEL) – HAGN, p. 135, pl. 13, fig. 3.
1975 *Vaginulinopsis cumulicostata* (GÜMBEL) – BRAGA et al, p. 105, pl. 4, fig. 8.
1985 *Vaginulinopsis cumulicostata* (GÜMBEL) – GRÜNIG, p. 263, pl. 6, fig. 6.
1987 *Vaginulinopsis cumulicostata* (GÜMBEL) – SZTRÁKOS, pl. 6. fig. 12.
1993 *Vaginulinopsis cumulicostatus* (GÜMBEL) – MATHELIN and SZTRÀKOS, p. 76, pl. 10, fig. 12.
2006 *Vaginulinopsis cumulicostata* (GÜMBEL) – CIMERMAN et al., p. 26, pl. 5, figs. 13–14.

Derivatio nominis: In honour of HAGN, H. for his outstanding work on Tetriary benthic foraminifera
Holotype: The specimen on Plate 5, Figure 26. (Inventory number: M 2008.118.1)
Dimension of holotype: length 0.7 mm, width 0.34 mm.
Description: Test elongate, planispiral, evolute in earlier chambers, becoming monoserial later (four or five chambers); oval in cross-section; chambers increasing gradually in size; sutures distinct, slightly depressed; wall calcareous, smooth, finely perforated with three or four horizontal ribs; aperture terminal, circular on short neck
Remarks: GÜMBEL (1868) described the species *Cristellaria cumulicostata* GÜMBEL, 1868 from Upper Eocene of Northern Calcareous Alps. An absolutely different specimen was assigned by HAGN (1956) to *Vaginulinopsis cumulicostata* (GÜMBEL) as the synonim of *Cristellaria cumulicostata*

GÜMBEL, 1868 from Tertiary of Monte Brione, Italy. This form is not related to *Vaginulinopsis cumulicostata* (GÜMBEL) which has a broad planispiral portion and long monoserial part with numerous horizontal beads on sutures. Many authors used the name *Vaginulinopsis cumulicostata* (GÜMBEL) refer to HAGN (1956) none the less the *Vaginulinopsis hagni* n. sp. has significantly different shape and different ribs.
Type locality: In borehole Devecser 4.
Type strata: In borehole Devecser 4 borehole, at 81.0 m. Padrag Marl Formation (Middle Eocene, Bartonian)

Vaginulinopsis hantkeni (HANTKEN, 1875)
Plate 5 Figure 28

1875 *Cristellaria ornata* n. sp. – HANTKEN, p. 77, pl. 13, fig. 19.

Description: Test squattish, planispiral, involute in earlier chambers, becoming monoserial later; corcular to oval in cross-section; chambers increasing gradually in size; sutures barely visible; wall calcareous, smooth, finely perforated; aperture terminal, circular on short neck.

Vaginulinopsis fragaria (GÜMBEL, 1868)
Plate 6, Figure 1

1868 *Marginulina fragaria* n. sp. – GÜMBEL, p. 57, pl. 1, figs. 58a–c.
1875 *Cristellaria fragaria* (GÜMBEL) – HANTKEN, p. 53, pl. 6, figs. 1–3.
1947 *Lenticulina fragaria* (GÜMBEL) – SUBBOTINA, p. 85, pl. 8, figs. 6–7.
1953 *Marginulina fragaria* GÜMBEL – SUBBOTINA, p. 162, pl. 4, figs. 1–3.
1949 *Marginulina fragaria* (GÜMBEL) – CUVILLIER and SZAKÁLL, p. 69, pl. 26. figs. 15, 17–18.
1950 *Marginulina fragaria* (GÜMBEL) – RUIZ DE GAONA and COLOM, p. 386, pl. 11, figs. 15– 17.
1956 *Marginulinopsis fragaria* (GÜMBEL) – HAGN, p. 134, pl. 12, figs. 3, 8, 10.
1958 *Marginulina fragaria* (GÜMBEL) – NYIRŐ, p. 34, fig. 8.
1975 *Marginulina fragaria* (GÜMBEL) – PROTO DECIMA and DE BIASE, p. 93, pl. 1, fig. 35.
1982 *Marginulinopsis fragaria* (GÜMBEL) – AGIP, pl. 12, figs. 6–6p.
1982 *Marginulinopsis fragaria* (GÜMBEL) – SZTRÁKOS, pl. 12, fig. 5.
1985 *Marginulinopsis fragaria* (GÜMBEL) – GRÜNIG, p. 161, pl. 5, figs. 24–28.
1991 *Marginulinopsis fragaria* (GÜMBEL) – BARBIN and KELLER-GRÜNIG, p. 240, pl. 2, figs. 6–12.
1992 *Marginulina fragaria* (GÜMBEL) – DARAKCHIEVA and JURANOV, p. 13, pl. 2, fig. 10.
1993 *Percultazonaria fragaria* (GÜMBEL) – MATHELIN and SZTRÁKOS, p. 76, pl. 9, figs. 1–2.
2006 *Percultazonaria fragaria* (GÜMBEL) – CIMERMAN et al., p. 24, pl. 5, figs. 4–5.

Description: Test elongate, planispiral, involute in earlier chambers, becoming monoserial later (six or seven chambers); oval in cross-section; chambers increasing gradually in size; sutures distinct, slightly depressed; wall calcareous, smooth, finely perforated with numerous fine longitudinal beads; aperture terminal, circular on short neck.

Vaginulinopsis minimus (HANTKEN, 1875)
Plate 5, Figure 29

1875 *Cristellaria minima* n. sp. – HANTKEN, p. 77, pl. 13, fig. 21.
1962 *Marginulina (Marginulinopsis) minima* (HANTKEN) – MAJZON, pl. 41, fig. 21.
1973 *Marginulina minima* (HANTKEN) – NAGYNÉ GELLAI, p. 453, pl. 3, fig. 12.
1979 *Astacolus minima* (HANTKEN) – SZTRÁKOS, pl. 10, figs. 6a–b.
1982 *Astacolus minima* (HANTKEN) – SZTRÁKOS, pl. 6, figs. 10a–b.
1987 *Astacolus minimus* (HANTKEN) – REISER, p. 66, pl. 4, figs. 3, 8.
2003 *Saracenaria minima* (HANTKEN) – HORVÁTH, p. 16, pl. 5, fig. 10. (HANTKEN's draw)
.

Description: Test squattish, planispiral, involute in earlier chambers, becoming monoserial later; mildly compressed in cross-section; chambers increasing gradually in size; sutures barely visible; wall calcareous, smooth, finely perforated; aperture terminal, radiate.

Vaginulinopsis pseudodecorata HAGN, 1956
Plate 6, Figure 2

1956 *Vaginulinopsis pseudodecorata* n. sp. – HAGN, p. 83, pl. 6, fig. 5.
1979 *Vaginulinopsis pseudodecorata* HAGN – SZTRÁKOS, pl. 15, fig. 10.

Description: Test elongate, planispiral, involute in earlier chambers, becoming monoserial later; oval in cross-section; chambers increasing gradually in size; sutures distinct; wall calcareous, smooth, finely perforated with numerous horizontal beads; aperture terminal, circular.

Vaginulinopsis sp.
Plate 6, Figure 3

Description: Test squattish, planispiral, involute in earlier chambers, becoming monoserial later; oval in cross-section; chambers increasing gradually in size; sutures barely visible; wall calcareous, smooth, finely perforated with curved rib on earlier chambers; aperture terminal, radiate.

Subfamily Vaginulininae REUSS, 1860

Genus *Planularia* DEFRANCE, 1826

Type species: *Planularia auris* (DEFRANCE), 1824

Planularia sp. 1
Plate 6, Figures 4–5

Description:Test small, planispiral, evolute, strongly compressed in cross-section; chambers increasing gradually in size; sutures barely visible; wall calcareous, smooth, finely perforated; aperture terminal, radiate.

Planularia sp. 2
Plate 6, Figure 6

Description: Test large, planispiral, evolute in earlier chambers, becoming monoserial in final two or three chambers; strongly compressed in cross-section; periphery with keel; chambers increasing gradually in size, final chamber acute; wall calcareous, smooth, finely perforated; sutures barely visible; aperture terminal, radiate.

Genus *Vaginulina* D'ORBIGNY, 1826

Type species: *Vaginulina legumen* (LINNÉ, 1758)

Vaginulina legumen (LINNÉ, 1758)
Plate 6, Figures 7–8

1758 *Nautilus legumen* n. sp. – LINNÉ, p. 711, pl. 1, figs. 7g–i (fide ELLIS and MESSINA).
1949 *Vaginulina legumen* (LINNÉ) – CUVILLIER and SZAKÁLL, p. 82, pl. 29. figs. 28–29.
1982 *Vaginulina legumen* (LINNÉ) – AGIP, pl. 15, figs. 7–7p.
1985 *Vaginulina legumen* (LINNÉ) – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 118, figs. 3–4.

Description: Test elongate, planispiral, involute in earlier chambers, becoming monoserial later (six to eight chambers); oval, strongly compressed in cross-section; length approximately three-four times as long as broad; chambers increasing gradually in size in planispiral portion, later moderately increasing in size; sutures distinct; wall calcareous, smooth, finely perforated with numerous strong horizontal ribs on central portion of each chamber; aperture terminal, radiate.

Vaginulina sp. cf. *V.* ex gr. *mexicana* NUTTALL, 1932

Plate 6, Figure 9

Description: Test elongate, planispiral, involute in earlier chambers, becoming monoserial later (four to six chambers); oval, strongly compressed in cross-section; periphery with keel; length approximately two-three times as long as broad; chambers increasing gradually in size; sutures distinct; wall calcareous, smooth, finely perforated with numerous strong horizontal ribs; aperture terminal, radiate.

Family Lagenidae REUSS, 1862

Genus *Lagena* WALKER and BOYS 1784 emend. SILVESTRI, 1902

Type species: *Lagena sulcata* WALKER and JACOB, 1798

Lagena globosa (WALKER and BOYS, 1784)

Plate 6, Figure 10

1784 *Serpula (Lagena) laevis globosa* n. sp. – WALKER and BOYS, p. 2, pl. 1, fig. 8. (fide: ELLIS and MESSINA).
1884 *Oolina globosa* (MONTAGU) – BRADY, p. 452, pl. 56, figs. 1–3.
1970 *Oolina globosa* (WALKER and BOYS) – LE CALVEZ, p. 101, pl. 17, fig. 1.
1979 *Oolina globosa* (MONTAGU) – SZTRÁKOS, pl. 18, fig. 6.
1987 *Oolina globosa* (MONTAGU) – REISER, p. 77, pl. 6, fig. 23.

Description: Test small, squattish, unilocular, circular in outline, circular in cross-section; wall calcareous, hyaline, smooth, finely perforated; aperture terminal, circular on short neck.

Lagena hexagona (WILLIAMSON, 1848)

Plate 6, Figure 11

1848 *Entosolenia squamosa* var. *hexagona* – WILLIAMSON, p. 20, pl. 2, fig. 23.
1884 *Lagena hexagona* (WILLIAMSON) – BRADY, p. 472, pl. 58, figs. 32–33.
1932 *Lagena hexagona* (WILLIAMSON) – HOWE and WALLACE, p. 6, fig. 14.
1935 *Lagena hexagona* (WILLIAMSON) – CUSHMAN, p. 23, pl. 9, fig. 10.
1945 *Lagena hexagona* (WILLIAMSON) – CUSHMAN and TODD, p. 33, pl. 5, fig. 14.
1956 *Lagena hexagona* (WILLIAMSON) – HAGN, p. 141, pl. 10, fig. 22.
1960 *Oolina hexagona* (WILLIAMSON) – BARKER, p. 120, pl. 58, figs. 32–33.
1961 *Oolina hexagona* (WILLIAMSON) – ANDERSEN, p. 98, pl. 20, figs. 19a–b.
1962 *Lagena hexagona* (WILLIAMSON) – KIESEL, p. 41, pl. 6, fig. 18.
1970 *Oolina hexagona* (WILLIAMSON) – LE CALVEZ, p. 101, pl. 16, figs. 2–3.
1975 *Lagena hexagona* (WILLIAMSON) – SAMUEL, p. 124, pl. 65, figs. 4 a–d.
1982 *Lagena hexagona* (WILLIAMSON) – SZTRÁKOS, pl. 8, fig. 15.
1985 *Oolina hexagona* (WILLIAMSON) – KOHL, p. 57, pl. 16, figs. 16a–c.
1985 *Lagena hexagona* (WILLIAMSON) – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 29, figs. 3–4; pl. 122, figs. 1–4.
1987 *Oolina hexagona* (WILLIAMSON) – SZTRÁKOS, pl. 16, fig. 6.
1987 *Lagena hexagona* (WILLIAMSON) – WENGER, p. 260, pl. 5, fig. 9.
1992 *Lagena hexagona* (WILLIAMSON) – DARAKCHIEVA and JURANOV, p. 15, pl. 2, fig. 6.
1998 *Oolina hexagona* (WILLIAMSON) – ROBERTSON, p. 100, pl. 37, figs. 2a–b.

Description: Test small, squattish, unilocular, circular in outline, circular in cross-section; wall calcareous, hyaline, smooth, finely perforated with hexagonal, slightly elevated frames; aperture terminal.

Lagena laevis (WALKER and BOYS, 1784)

Plate 6, Figure 12

1784 *Serpula laevis ovalis* n. sp. – WALKER and BOYS, p. 2, pl. 1, fig. 9. (fide: ELLIS and MESSINA).
1858 *Lagena laevis* (MONTAGU) – WILLIAMSON, p. 12, pl. 1, figs. 1–2.
1962 *Lagena laevis* (MONTAGU) – KIESEL, p. 42, pl. 6, fig. 14.
1970 *Lagena laevis* (MONTAGU) – LE CALVEZ, p. 81, pl. 16, fig. 4.
1982 *Lagena laevis* (MONTAGU) – SZTRÁKOS, pl. 8, figs. 14a–b.

1985 *Lagena laevis* (MONTAGU) – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 91, fig. 17; pl. 93, fig. 2.

Description: Test elongate, unilocular, oval in outline, circular in cross-section; wall calcareous, hyaline, smooth, finely perforated; aperture terminal, circular on short neck.

Lagena sulcata (WALKER and JACOB, 1784)
Plate 6, Figure 14

1784 *Serpula (Lagena) striata sulcata rotunda* n. sp. – WALKER and BOYS, p. 2, pl. 1, fig. 6. (fide: ELLIS and MESSINA).
1798 *Serpula (Lagena) sulcata* n. sp. – WALKER and JACOB in KANMACHER, p. 634, pl. 14, fig. 5.
1839 *Oolina isabella* n. sp. – D'ORBIGNY, p. 21, pl. 5, fig. 1.
1961 *Lagena isabella* (D'ORBIGNY) – KAASSCHIETER, p. 178, pl. 7, fig. 25.
1975 *Lagena isabella* (D'ORBIGNY) – SAMUEL, p. 125, pl. 66, fig. 6.
1985 *Lagena sulcata* (WALKER and JACOB) – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 11, fig. 11; pl. 91, fig. 18; pl. 121, figs. 1–4.
1992 *Lagena* ex gr. *striata* (D'ORBIGNY) – DARAKCHIEVA and JURANOV, p. 15, pl. 2, fig. 9.

Description: Test small, squattish, unilocular, circular in outline, circular in cross-section; wall calcareous, hyaline, smooth, finely perforated with numerous longitudinal ribs; aperture terminal, circular on short neck.

Lagena tenuis ornata REUSS, 1863
Plate 6, Figure 13

1863 *Ovulina tenuis* (BORNEMANN) var. *ornata* n. ssp. – REUSS, 35, pl. 3, figs. 33–39.
1958 *Lagena tenuis* (BORNEMANN) – BATJES, p. 119, pl. 3, fig. 23.
1975 *Lagena tenuis ornata* – SAMUEL, p. 125, pl. 66, figs. 3a–b.
1985 *Lagena tenuis ornata* – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 31, figs. 1–5.

Description: Test small, squattish, unilocular, drop-shaped in outline, circular in cross-section; wall calcareous, hyaline, smooth, finely perforated; aperture terminal, circular on short neck.

Family Polymorphinidae D'ORBIGNY, 1839
Subfamily Polymorphininae D'ORBIGNY, 1839

Genus *Globulina* D'ORBIGNY, 1839

Type species: *Globulina gibba* (D'ORBIGNY, 1839)

Globulina guttula REUSS, 1851
Plate 6, 15

1851 *Globulina guttula* n. sp. – REUSS, p. 82, pl. 6, fig. 46.
1979 *Globulina guttula* REUSS – SZTRÁKOS, pl. 17, fig. 4.

Description: Test slightly elongate, drop-shaped in outline, circular in cross-section; invisible chambers, earlier chambers overlapped by final chamber; length approximately two times maximum width; sutures invisible; wall calcareous, hyaline, smooth, finely perforated; aperture terminal, radiate.

Globulina minuta (ROEMER, 1838)
Plate 6, Figure 16

1838 *Polymorphina minuta* n. sp. – ROEMER, p. 386, pl. 3, figs. 35a–b. (fide ELLIS and MESSINA).
1987 *Globulina minuta* (ROEMER) – SZTRÁKOS, pl. 6. fig. 19.

Description: Test squattish, oval in outline, circular in cross-section; invisible chambers, earlier chambers overlapped by final chamber; length approximately two times maximum width; sutures invisible; wall calcareous, hyaline, smooth, finely perforated; aperture terminal, radiate.

Subfamily Ramulininae BRADY, 1884

Genus *Ramulina* JONES, 1875

Type species: *Ramulina laevis* JONES, 1875

Ramulina sp.
Plate 6, Figure 17

Description: Test represented by a single fragment, unilocular, six to eight irregularly arranged branches; wall calcareous, hyaline, smooth, finely perforated.

Family Ellipsolagenidae SILVESTRI, 1923
Subfamily Ellipsolageninae SILVESTRI, 1923

Genus *Fissurina* REUSS, 1850

Type species: *Fissurina laevigata* REUSS, 1850

Fissurina orbignyana SEGUENZA, 1862
Plate 6, Figure 18

1862 *Fissurina orbignyana* n. sp. – SEGUENZA, p. 66, pl. 2, figs. 25–26.
1961 *Fissurina orbignyana* SEGUENZA – KAASSCHIETER, p. 180, pl. 7, fig. 29.

Description: Test small, unilocular, oval, mildly compressed in cross-section; periphery with pair of keels, surrounding test and extending to apertual end; wall calcareous, hyaline, smooth, finely perforated; aperture terminal fissure on short neck.

Fissurina sp. cf. *F. orbignyana praeclara* (CUSHMAN and RENZ, 1946)
Plate 6, Figure 19

1946 *Entosolenia orbignyana* var. p*raeclara* n. subsp. – CUSHMAN and RENZ, p. 38, pl. 6, fig. 18.

Description: Test small, unilocular, oval, mildly compressed in cross-section; periphery with triple keels, surrounding test and extending to apertual end and with single wide keel surrounding test at aequatorial plane and extending to apertural end; wall calcareous, hyaline, smooth, finely perforated with numerous longitudinal ribs; aperture terminal, circular on long, straight neck.

Fissurina tricincta (GÜMBEL, 1868)
Plate 6, Figures 20–22

1868 *Lagena tricincta* n. sp. – GÜMBEL, p. 606, pl. 1, figs. 8a–b.
1883 *Lagena scarenaensis* n. sp. – HANTKEN, p. 24, pl. 1, fig. 9.
1987 *Lagena tricincta* GÜMBEL – SZTRÁKOS, pl. 6, fig. 25.

Description: Test large, unilocular, circular in cross-section; periphery with pair of interior keels, surrounding test and extending to apertural end, with single keel surrounding test at aequatorial plane and extending to apertural end; wall calcareous, hyaline, smooth, finely perforated with numerous circular to oval, densely arranged nodes; aperture terminal, circular on long, straight neck.

Fissurina sp.

Plate 6, Figure 23

Description: Test small, unilocular, mildly compressed in cross-section; periphery with pair of interior keels, surrounding test and extending to apertural end, with single keel surrounding test at aequatorial planw and extending to apertural end; wall calcareous, hyaline, smooth, finely perforated with circular to oval, sparsely arranged nodes; aperture terminal, circular on long, straight neck.

Family Glandulinidae REUSS, 1860
Subfamily Glandulininae REUSS, 1860

Genus *Glandulina* D'ORBIGNY, 1839

Type species: *Glandulina laevigata* D'ORBIGNY, 1826

Glandulina aequalis REUSS, 1863
Plate 6, Figure 24

1863 *Glandulina aequalis* n. sp. – REUSS, p. 61, pl. 2, fig. 5.
1969 *Glandulina aequalis* REUSS – BATJES, p.123, pl. 4, figs. 5–6.
non 1975 *Glandulina aequalis* REUSS – SAMUEL, p. 128, pl. 71, fig. 7.
1987 *Pseudonodosaria aequalis* (REUSS) – SZTRÁKOS, pl. 5.,fig. 27.

Description: Test squattish, oval in outline, circular in cross-section, monoserial; length approximately two times maximum width; chambers increasing gradually in size; sutures distinct; aperture terminal, radiate.

Glandulina hantkeni (FRANZENAU, 1894)
Plate 6, Figure 27

1894 *Glandulina cuspidata* n. sp. – FRANZENAU, p. 11, pl. 5, fig. 5.
1987 *Pseudonodosaria hantkeni* (FRANZENAU) – SZTRÁKOS, pl. 6. fig. 2.

Description: Test slightly elongate, monoserial, circular in cross-section; length approximately two times maximum width; chambers increasing gradually in size; strongly inflated final chamber; sutures barely visible; wall calcareous, hyaline, smooth, finely perforated; aperture terminal, radiate.

Glandulina inflata COSTA, 1856
Plate 6, Figures 28

1856 *Glandulina inflata* n. sp. – COSTA, p. 126, pl. 11, fig. 21.

Description: Test elongate, monoserial, oval in outline, circular in cross-section; length approximately two times maximum width; mildly inflated chambers; sutures barely visible; wall calcareous, hyaline, smooth, finely perforated; aperture terminal, radiate.

Glandulina obtusissima REUSS, 1863
Plate 6, Figures 25–26

1863 *Glandulina obtusissima* n. sp. – REUSS, p. 66, pl. 8, figs. 92–93.
1949 *Pseudoglandulina obtusissima* REUSS – CUVILLIER and SZAKÁLL, p. 80, pl. 29. fig. 3.

Description: Test squattish, monoserial, circular in cross-section; length approximately two times of maximum width; strongly inflated chambers; sutures distinct; wall calcareous, hyaline, smooth, finely perforated; aperture terminal, radiate.

Glandulina sp.
Plate 6, Figure 29

Description: Test elongate, monoserial, circular in cross-section; length approximately two or three times of maximum width; chambers increasing gradually in size; sutures distinct, strongly depressed; wall calcareous, hyaline, smooth, finely perforated; aperture terminal.

Suborder Rotaliina DELAGE and HÉROUARD, 1879
Superfamily Bolivinacea GLAESSNER, 1937
Family Bolivinidae GLAESSNER, 1937

Genus *Bolivina* D'ORBIGNY, 1839

Type species: *Bolivina plicata* D'ORBIGNY, 1839

Bolivina cookei CUSHMAN, 1922
Plate 7, Figure 1

1922 *Bolivina cookei* n. sp. – CUSHMAN, p. 126, pl. 29, fig. 1.
1961 *Bolivina cookei* CUSHMAN – KAASSCHIETER, p. 195, pl. 8, figs. 25–26.
1962 *Bolivina cookei* CUSHMAN – KIESEL, p. 62, pl. 9, fig. 10.
1985 *Bolivina cookei* CUSHMAN – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 49, figs. 1–4.

Description: Test elongate, biserial, lanceolate in outline, oval, strongly compressed in cross-section; length approximately three to four times of maximum width; chambers increasing gradually in size; sutures invisible; wall calcareous, hyaline, smooth, finely perforated with numerous longitudinal ribs; aperture terminal fissure.

Bolivina elongata HANTKEN, 1875
Plate 7, Figures 2–3

1875 *Bolivina elongata* n. sp. – HANTKEN, p. 55, pl. 7, fig. 14.
1979 *Bolivina elongata* HANTKEN – SZTRÁKOS, pl. 18, fig. 22.
1982 *Bolivina elongata* HANTKEN – SZTRÁKOS, pl. 28, fig. 3.

Description: Test elongate, biserial, lanceolate in outline, oval, strongly compressed in cross-section; length approximately two to three times of maximum width; chambers increasing gradually in size; wall calcareous, hyaline, smooth, finely perforated; sutures distinct, slightly depressed; aperture terminal fissure.

Bolivina nobilis HANTKEN, 1875
Plate 7, Figure 4

1875 *Bolivina nobilis* n. sp. – HANTKEN, p. 56, pl. 15, figs. 4a–b.
1937 *Bolivina nobilis* HANTKEN – CUSHMAN, p. 51, pl. 7, figs. 1–4.
1947 *Bolivina nobilis* HANTKEN – SUBBOTINA, p. 96, pl. 9, fig. 3.
1953 *Bolivina nobilis* HANTKEN – SUBBOTINA, p. 225, pl. 10, fig. 10.
1967 *Bolivina nobilis* HANTKEN – HOFMANN, p. 173, pl. 1, fig. 12.
1975 *Bolivina nobilis* HANTKEN – BRAGA et al., p. 106, pl. 5, figs. 1–2.
1975 *Bolivina nobilis* HANTKEN – SAMUEL, p. 134, pl. 74, figs. 4–6.
1979 *Bolivina nobilis* HANTKEN – SZTRÁKOS, pl. 19, fig. 2.
1982 *Bolivina nobilis* HANTKEN – SZTRÁKOS, pl. 27, fig. 9.
1983 *Bolivina nobilis* HANTKEN – KRHOVSKY, p. 77, pl. 1, fig. 8.
1985 *Bolivina nobilis* HANTKEN – GRÜNIG, p. 265, pl. 5, figs. 12–14.
1987 *Bolivina nobilis* HANTKEN – REISER, p. 90, pl. 9, figs. 10., 16.
1992 *Bolivina nobilis* HANTKEN – DARAKCHIEVA and JURANOV, p. 21, pl. 4, figs. 1–2.
1993 *Bolivina nobilis* HANTKEN – MATHELIN and SZTRÀKOS, p. 78, pl. 32, fig. 9.
2006 *Bolivina nobilis* HANTKEN – CIMERMAN et al, p. 26, pl. 6, figs. 8–9.
2006 *Bolivina nobilis* HANTKEN – ORTIZ and THOMAS, p. 113, pl. 4, figs. 7–8.

Description: Test elongate, biserial, lanceolate in outline, oval, mildly compressed in cross-section; length approximately three to four times of maximum width; chambers increasing gradually in size; wall calcareous, hyaline, smooth, finely perforated with numerous longitudinal ribs; aperture terminal fissure.

Bolivina semistriata HANTKEN, 1868
Plate 7, Figure 5

1868 *Bolivina semistriata* n. sp. – HANTKEN, p. 95, pl. 2, fig. 34,.
1875 *Bolivina semistriata* HANTKEN – HANTKEN, p. 55, pl. 7, fig. 13.
1979 *Bolivina semistriata* HANTKEN – SZTRÁKOS, pl. 19, fig. 3.
1985 *Bolivina semistriata* HANTKEN – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 15, fig. 2; 47, figs. 1–4.
1987 *Bolivina semistriata* HANTKEN – SZTRÁKOS, pl. 7, fig. 3.
1993 *Bolivina semistriata* HANTKEN – MATHELIN and SZTRÁKOS, p. 78, pl. 32, fig. 10.
2006 *Bolivina semistriata* HANTKEN – CIMERMAN et al, p. 28, pl. 6, fig. 10.

Description: Test elongate, slightly curved, biserial, lanceolate in outline, oval, mildly compressed in cross-section; length approximately three to four times of maximum width; chambers increasing gradually in size; wall calcareous, hyaline, smooth, finely perforated with numerous longitudinal ribs; aperture terminal fissure.

Bolivina sp.
Plate 7, Figure 6

Description: Test elongate, biserial, triangular in outline, oval in cross-section; length approximately two times of maximum width; chambers increasing gradually in size, strongly inflated final chamber; sutures distinct, strongly depressed; wall calcareous, hyaline, smooth, finely perforated; aperture terminal fissure.

Superfamily Cassidulinacea D'ORBIGNY, 1839
Family Cassidulinidae D'ORBIGNY, 1839
Subfamily Cassidulininae D'ORBIGNY, 1839

Genus *Globocassidulina* VOLOSHINOVA, 1960

Type species: *Globocassidulina globosa* (HANTKEN, 1875)

Globocassidulina globosa (HANTKEN, 1875)
Plate 7, Figure 7–8

1875 *Cassidulina globosa* n. sp. – HANTKEN, p. 54, pl. 16. figs. 2a–b.
1935 *Cassidulina globosa* HANTKEN – CUSHMAN, p. 49, pl. 26, fig. 12.
1956 *Cassidulina globosa* HANTKEN – HAGN, p. 167, pl. 14, figs. 9–10.
1975 *Globocassidulina globosa* (HANTKEN) – BRAGA et al., p. 108, pl. 6, fig. 4.
1979 *Globocassidulina globosa* (HANTKEN) – SZTRÁKOS, pl. 27, fig. 13.
1985 *Globocassidulina globosa* (HANTKEN) – GRÜNIG, p. 273, pl, 10. fig. 3.
1987 *Globocassidulina globosa* (HANTKEN) – SZTRÁKOS, pl. 11, fig. 22.
2006 *Globocassidulina globosa* (HANTKEN) – CIMERMAN et al, p. 28, pl. 6, figs. 12–13.

Description: Test squattish, planispiral, evolute, chambers increasing gradually in size; sutures invisible; wall calcareous, hyaline, smooth, finely perforated; aperture terminal.

Superfamily Buliminacea JONES, 1857
Family Buliminidae JONES, 1875
Subfamily Bulimininae KAASSCHIETER, 1961

Genus *Bulimina* D'ORBIGNY, 1826

Type species: *Bulimina marginata* D'ORBIGNY, 1826

Bulimina affinis D'ORBIGNY, 1839
Plate 7, Figure 9

1839 *Bulimina affinis* n. sp. – D'ORBIGNY, p. 2, figs. 25–26.
1926 *Bulimina affinis* D'ORBIGNY – CHAPMAN, p. 37, pl. 5, figs. 15–16.

Description: Test squattish, triserial, rapidly flaring towards apertural end, triangular in outline, oval in cross-section; chambers increasing gradually in size; length approximately two times of maximum width; sutures distinct, mildly depressed; wall calcareous, hyaline, smooth, finely perforated; aperture terminal.

Bulimina truncana GÜMBEL, 1868
Plate 7, Figures 10–11

1868 *Bulimina truncana* n. sp. – GÜMBEL, p. 644, pl. 2, fig. 77.
1875 *Bulimina truncana* GÜMBEL – HANTKEN, p. 61, pl. 7, fig. 5.
1975 *Bulimina truncana* GÜMBEL – BRAGA et al., p. 106, pl. 4, figs. 15–16.
1985 *Bulimina truncana* GÜMBEL – GRÜNIG, p. 267, pl. 7, figs. 26–27.
1985 *Bulimina truncana* GÜMBEL – KORECZNÉ-LAKY – NAGYNÉ-GELLAI, pl. 14, fig. 23; pl. 56, fig. 4.
1987 *Bulimina truncana* GÜMBEL – SZTRÁKOS, pl. 19. fig. 17.
2006 *Bulimina truncana* GÜMBEL – CIMERMAN et al., p. 30, pl. 7, fig. 8.

Description: Test elongate, triserial, dropshape in outline, circular in cross-section; chambers increasing gradually in size; length approximately two-three times maximum width; sutures invisible; wall calcareous, hyaline, smooth, finely perforated with numerous strong longitudinal ribs, extending to apertual end; aperture terminal.

Bulimina sp.
Plate 7, Figure 12

Description: Test squattish, triserial, rapidly flaring towards apertural end, dropshape in outline, circular in cross-section; chambers increasing gradually in size; length approximately two-three times maximum width; sutures invisible; wall calcareous, hyaline, smooth, finely perforated; aperture terminal.

Family Uvigerinidae HAECKEL, 1894
Subfamily Uvigerininae HAECKEL, 1894

Genus *Uvigerina* D'ORBIGNY, 1826

Type species: *Uvigerina pigmea* D'ORBIGNY, 1826

Uvigerina chirana CUSHMAN and STONE, 1947
Plate 7, Figure 13

1947 *Uvigerina chirana* n. sp. – CUSHMAN and STONE, p. 17, pl. 2, fig. 25.
1951 *Uvigerina chirana* CUSHMAN and STONE – CUSHMAN and STAINFORTH, p. 155, pl. 26, fig. 60.
1956 *Uvigerina chirana* CUSHMAN and STONE – HAGN, p. 150, pl. 13, figs. 14–15.
1956 *Neouvigerina chirana* (CUSHMAN and STONE) – HOFKER, p. 929, Text-fig. 56.
1975 *Uvigerina chirana* CUSHMAN and STONE – BRAGA and GRÜNIG, p. 106, pl. 5, fig. 10.
1977 *Uvigerina chirana* CUSHMAN and STONE – PROTO DECIMA and DE BIASE, p. 95, pl. 2, fig. 10.
1985 *Uvigerina chirana* CUSHMAN and STONE – GRÜNIG, p. 267, pl. 7, figs. 3–5.
1987 *Uvigerina chirana* CUSHMAN and STONE – SZTRÁKOS, pl. 18, figs. 6–7.

Description: Test small, triserial, rapidly flaring towards apertural end, lobulate in outline, circular, lobulate in cross-section; chambers increasing gradually in size; length approximately two times maximum width; sutures strongly depressed, curved; wall calcareous, hyaline, smooth, finely perforated with numerous densely arranged nodes; aperture terminal on short neck with lip.

Uvigerina cocoaensis CUSHMAN, 1925
Plate 7, Figure 14

1925a *Uvigerina cocoaensis* n. sp. – CUSHMAN, p. 68, pl. 10, fig. 12.
1926 *Uvigerina cocoaensis* CUSHMAN – CUSHMAN and APPLIN, p. 174, pl. 8, fig. 15.
1933 *Uvigerina cocoaensis* CUSHMAN – ELLISOR, pl. 3, fig. 13.
1935 *Uvigerina cocoaensis* CUSHMAN – CUSHMAN, p. 39, pl. 15, figs. 11–13.
1982 *Uvigerina cocoaensis* CUSHMAN – SZTRÁKOS, pl. 25, figs. 3–4, pl. 29, fig. 4.

Description: Test large, triserial, lobulate in outline, circular, lobulate in cross-section; chambers increasing rapidly in size; length approximately two times maximum width; sutures mildly depressed, curved; wall calcareous, hyaline, smooth, finely perforated with numerous fine longitudinal ribs extending to central portion of test; aperture terminal on short neck with lip.

Uvigerina cocoaensis jacksonensis CUSHMAN, 1925
Plate 7, Figure 15

1925 *Uvigerina jacksonensis* n. sp. – CUSHMAN, p. 67, pl. 10, fig. 13.
1983 *Uvigerina cocoaensis jacksonensis* CUSHMAN – SZTRÁKOS, p. 134, pl. 2, figs. 20–21; pl. 3, figs. 2, 8–12, 14–16, 20–24.

Description: Test squattish, triserial, rapidly flaring towards apertural end, lobulate in outline, circular, lobulate in cross-section; chambers increasing gradually in size; length approximately two times maximum width; sutures mildly depressed, curved; wall calcareous, hyaline, smooth, finely perforated with numerous fine longitudinal ribs extending to apertual end; aperture terminal on short neck with lip.

Uvigerina eocaena GÜMBEL, 1868
Plate 7, Figure 16

1868 *Uvigerina eocaena* n. sp. – GÜMBEL, p. 645, pl. 2, fig. 78.
1975 *Uvigerina eocaena* GÜMBEL – BRAGA et al., p. 107, pl. 5, fig. 17.
1983 *Uvigerina eocaena* GÜMBEL – SZTRÁKOS, p. 134, pl. 2, figs. 7–15 (cum syn).
1985 *Uvigerina eocaena* GÜMBEL – GRÜNIG, p. 267, pl. 7, figs. 8–10.
1993 *Uvigerina eocaena* GÜMBEL – MATHELIN and SZTRÁKOS, p. 79, pl. 34, figs. 9–10.
2006 *Uvigerina eocaena* GÜMBEL – CIMERMAN et al, p. 30, pl. 7, fig. 12.

Description: Test elongate, triserial, rapidly flaring towards apertural end, lobulate in outline, circular, lobulate in cross-section; chambers increasing gradually in size, inflated, overlapping earlier chambers; length approximately three times maximum width; sutures distinct, mildly depressed, curved; wall calcareous, hyaline, smooth, finely perforated with several longitudinal ribs extending to apertural end; aperture terminal.

Uvigerina gallowayi CUSHMAN, 1929
Plate 7, Figure 17–18

1929 *Uvigerina gallowayi* n. sp. – CUSHMAN, p. 67, pl. 10., fig. 13.
1979 *Uvigerina gallowayi* CUSHMAN – SZTRÁKOS, pl. 34, fig. 2.
1983 *Uvigerina gallowayi* CUSHMAN – SZTRÁKOS, p. 134, pl.3, figs. 5–7, 13, 25 (cum syn).
1985 *Uvigerina gallowayi* CUSHMAN – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 16, figs. 5–8.
2005 *Uvigerina gallowayi* CUSHMAN – NARAYAN et al., p. 138, pl. 5, fig. 24.

Description: Test elongate, triserial, lobulate in outline, circular, lobulate in cross-section; chambers increasing gradually in size, length approximately three times maximum width; sutures distinct, mildly

depressed, curved; wall calcareous, hyaline, smooth, finely perforated with several longitudinal ribs extending to apertual end; aperture terminal on short neck.

Uvigerina hantkeni CUSHMAN and EDWARDS, 1937
Plate 7, Figure 19

1875 *Uvigerina pygmea* n. sp – HANTKEN, p. 52, pl. 7, fig. 4.
1937 *Uvigerina hantkeni* nomen nodum – CUSHMAN and EDWARDS, p. 60, pl. 8, figs. 15–16.
1975 *Uvigerina hantkeni* CUSHMAN and EDWARDS – PAPP, p. 282, pl. 1, figs. 9–10.
1979 *Uvigerina hantkeni* CUSHMAN and EDWARDS – SZTRÁKOS, pl. 24, fig. 3.
1985 *Uvigerina hantkeni* CUSHMAN and EDWARDS – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 16, figs. 1–4.
1986 *Uvigerina hantkeni* CUSHMAN and EDWARDS – CICHA et al., p. 136, pl. 4, fig. 1–2, 6.
1987 *Uvigerina hantkeni* CUSHMAN and EDWARDS – REISER, p. 81, pl. 7, figs. 18, 22.

Description: Test squattish, triserial, rapidly flaring towards apertural end, oval in outline, circular in cross-section; chambers increasing gradually in size; length approximately two times maximum width; sutures slightly depressed, curved; wall calcareous, hyaline, smooth, finely perforated with several longitudinal beads composing ribs; aperture terminal on short neck.

Uvigerina hourcqi GRAHAM, DE KLASZ and RÉRAT, 1965
Plate 7, Figures 21–22

1965 *Uvigerina hourcqi* n. sp. – GRAHAM, DE KLASZ and RÉRAT, p. 75, pl. 1, figs. 9–10.
1983 *Uvigerina hourcqi* GRAHAM, DE KLASZ and RÉRAT – SZTRÁKOS, p. 134, pl. 2, figs. 1–6

Description: Test elongate, triserial, rapidly flaring towards apertural end, lobulate in outline, circular, lobulate in cross-section; chambers increasing gradually in size, overlapping earlier chambers; length approximately two to three times of maximum width; sutures mildly depressed, curved; wall calcareous, hyaline, smooth, finely perforated with several longitudinal, sharp ribs extending to apertual end; aperture terminal on short neck with thickened lip.

Uvigerina multistriata HANTKEN, 1871
Plate 7, Figure 20

1871 *Uvigerina multistriata* n. sp. – HANTKEN, p. 129, pl. 2, fig. 14.
1983 *Uvigerina multistriata* HANTKEN – SZTRÁKOS, p. 136, pl. 1, figs. 7–13.

Description: Test elongate, triserial, lobulate in outline, circular, lobulate in cross-section; chambers increasing gradually in size, inflated, overlapping earlier chambers; length approximately three times maximum width; sutures mildly depressed, curved; wall calcareous, hyaline, smooth, finely perforated with numerous longitudinal ribs extending to apertural end; aperture terminal.

Uvigerina pigmea D'ORBIGNY, 1826
Plate 7, Figure 23

1826 *Uvigerina pigmea* n. sp. – D'ORBIGNY, p. 269, pl. 12, figs. 8–9.
1846 *Uvigerina pygmaea* D'ORBIGNY – D'ORBIGNY, p. 190, pl. 11, figs. 25–26.
1875 *Uvigerina pygmea* D'ORBIGNY – HANTKEN, p. 62, pl. 7, fig. 4.
1926 *Uvigerina pygmea* D'ORBIGNY – CHAPMAN, p. 70, pl. 14, fig. 7.
1929 *Uvigerina pygmea* D'ORBIGNY – GALLOWAY and MORREY, p. 39, pl. 6, fig. 5.
1932 *Uvigerina pigmaea* D'ORBIGNY – NUTTALL, p. 21, pl. 5, fig. 6.
1953 *Uvigerina pygmea* D'ORBIGNY – SUBBOTINA, p. 239, pl. 12, figs. 1–6.
1953 *Uvigerina pygmea* D'ORBIGNY – PAPP and TURNOVSKY, p. 131, pl. 5, fig. 4.
1958 *Uvigerina pygmea* D'ORBIGNY – NYÍRŐ, p. 35, pl. 1, figs. 9a–d.
1975 *Uvigerina pygmea* D'ORBIGNY – SAMUEL, p. 137, pl. 76, figs. 1–2.
1982 *Uvigerina pygmea* D'ORBIGNY – AGIP, pl. 34, fig. 3.
1984 *Uvigerina pigmaea* D'ORBIGNY – BOERSMA, p. 128, pl. 1, figs. 1–6; pl. 2, figs. 1–5.
1985 *Uvigerina pygmea* D'ORBIGNY – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 147, figs. 1–4.
1985 *Uvigerina pygmoides* D'ORBIGNY – PAPP and SCHMID, p. 74, pl. 65, figs. 1–5.
1987 *Uvigerina pygmea* D'ORBIGNY – LOEBLICH and TAPPAN, p. 151, pl. 573, figs. 21–23.
1992 *Uvigerina pygmea* D'ORBIGNY – DARAKCHIEVA and JURANOV, p. 25, pl. 4, fig. 7.

1993 *Uvigerina pigmaea* D'ORBIGNY – KATZ and MILLER, pl. 4, fig. 3.
2006 *Uvigerina pigmea* D'ORBIGNY – ORTIZ and THOMAS, p. 136, pl. 11, figs. 9–11.

Description: Test squattish, triserial, rapidly flaring towards apertural end, lobulate in outline, circular, lobulate in cross-section; chambers increasing gradually in size, overlapping earlier chambers; length approximately three times maximum width; sutures mildly depressed, curved; wall calcareous, hyaline, smooth, finely perforated; aperture terminal on short neck.

Uvigerina rippensis COLE, 1927
Plate 7, Figure 24

1927 *Uvigerina rippensis* n. sp. – COLE, p. 11, pl. 2, fig. 27.
1982 *Uvigerina rippensis* COLE – SZTRÁKOS, pl. 25, pl. 30, fig. 2.
1983 *Uvigerina rippensis* COLE – SZTRÁKOS, p. 136, pl. 1, figs. 5. 14–23.
1983 *Uvigerina rippensis* COLE – TJALSMA and LOHMANN, p. 38, pl. 14, figs. 6–7.
1984 *Uvigerina rippensis* COLE – BOERSMA, p. 137, pl. 1, figs. 1–4; pl. 3, figs. 1–6.
1987 *Uvigerina rippensis* COLE – SZTRÁKOS, pl. 18. fig. 14.
1998 *Uvigerina rippensis* COLE – BIGNOT, p. 436, pl. 2, figs. 7–8.
2006 *Uvigerina rippensis* COLE – ORTIZ and THOMAS, p. 136, pl. 11, figs. 12–14

Description: Test squattish, triserial, continually flaring towards apertural end, lobulate in outline, circular, lobulate in cross-section; chambers increasing gradually in size, overlapping earlier chambers; length approximately two times maximum width; sutures mildly depressed, curved; wall calcareous, hyaline, smooth, finely perforated with numerous longitudinal short ribs on earlier chambers and densely arranged oval to circular nodes on final chambers; aperture terminal.

Uvigerina tenuistriata REUSS, 1870
Plate 7, Figure 25

1870 *Uvigerina tenuistriata* n. sp. – REUSS, p. 485, pl. 22, figs. 34–37.
1926 *Uvigerina tenuistriata* REUSS – CHAPMAN, p. 70, pl. 14, fig. 9.

Description: Test squattish, triserial, rapidly flaring towards apertural end, lobulate in outline, circular, lobulate in cross-section; chambers increasing gradually in size, inflated, overlapping earlier chambers; length approximately two times maximum width; sutures distinct, strongly depressed, curved; wall calcareous, hyaline, smooth, finely perforated with several longitudinal, sharp ribs, extending to apertural end; aperture terminal.

Family Reussellidae CUSHMAN, 1933

Genus *Reussella* GALLOWAY, 1933

Type species: *Reussella spinulosa* (REUSS, 1850)

Reussella elongata (TERQUEM, 1882)
Plate 7, Figures 27–28

1882 *Verneuilina elongata* n. sp. – TERQUEM, p. 106, pl. 11, fig. 326.
1950 *Reussella elongata* (TERQUEM) – LE CALVEZ, p. 46, pl. 3, figs. 45–46.
1961 *Reussella elongata* (TERQUEM) – KAASSCHIETER, p. 191, pl. 9, figs. 7–9.
1970 *Reussella elongata* (TERQUEM) – LE CALVEZ, p. 119, pl. 22, fig. 4.

Description: Test large, elongate, triserial, rapidly flaring towards apertural end, pyramidal in outline, triangular in cross-section; periphery acute; chambers increasing gradually in size; sutures invisible; wall calcareous, hyaline, smooth, finely perforated; aperture terminal.

Reussella terquemi CUSHMAN, 1945
Plate 7, Figure 26

1882 *Verneuilina spinulosa* REUSS – TERQUEM, p. 28, pl. 5, figs. 15–16.
1945 *Reussella terquemi* n. sp. – CUSHMAN, p. 28, pl. 5, figs. 15–16.
1961 *Reussella terquemi* (CUSHMAN) – KAASSCHIETER, p. 192, pl. 9, fig. 11.
1970 *Reussella terquemi* (CUSHMAN) – LE CALVEZ, p. 121, pl. 24, fig. 7.

Description: Test large, wide, triserial, rapidly flaring towards apertural end, pyramidal in outline, triangular in cross-section; periphery acute with wide edges; chambers short, increasing gradually in size; sutures invisible; wall calcareous, hyaline, smooth, finely perforated; aperture terminal, circular.

Reussella sp.
Plate 7, Figures 29–30

Description: Test squattish, triserial, rapidly flaring towards apertural end, pyramidal in outline, triangular in cross-section; periphery acute; chambers increasing gradually in size; sutures barely visible; wall calcareous, hyaline, smooth, finely perforated; aperture terminal.

Superfamily Fursenkoinacea LOEBLICH and TAPPAN, 1961
Family Fursenkoinidae LOEBLICH and TAPPAN, 1961

Genus *Fursenkoina* LOEBLICH and TAPPAN, 1961

Type species: *Fursenkoina squammosa* (D'ORBIGNY, 1826)

Fursenkoina hungarica (HANTKEN, 1868)
Plate 8, Figures 1–2

1868 *Virgulina hungarica* n. sp. – HANTKEN, p. 92, pl. III, fig. 26.

Description: Test spindle-shaped, twisted biserial, slightly flaring towards apertural end; lanceolate, lobulate in outline, compressed in cross-section; length approximately four times maximum width; five pairs chambers, increasing rapidly in size; sutures distinct, mildly depressed; wall calcareous, hyaline, smooth, finely perforated; aperture terminal fissure between final two chambers.

Fursenkoina schreibersiana (CZJZEK, 1848)
Plate 8, Figure 3

1848 *Virgulina schreibersiana* n. sp. – CZJZEK, p. 147, pl. 13., figs. 18–21.
1875 *Virgulina schreibersiana* (CZJZEK) – HANTKEN, p. 53, pl. 7, fig. 15.
1982 *Fursenkoina schreibersiana* (CZJZEK) – PETTERS, p. 77, pl. 5, fig. 26.
1999 *Fursenkoina schreibersiana* (CZJZEK) – HAYWARD et al., p. 131, pl. 257, figs. 1–12.
2005 *Fursenkoina schreibersiana* (CZJZEK) – NARAYAN et al., p. 129, pl. 3, figs. 33–34.

Description: Test spindle-shaped, biserial, rapidly flaring towards apertural end; lobulate in outline, oval, mildly compressed in cross-section; length approximately two to three times of maximum width; chambers increasing rapidly in size; sutures distinct, mildly depressed; wall calcareous, hyaline, smooth, finely perforated; aperture terminal fissure between in final two chambers.

Superfamily Pleurostomellacea REUSS, 1860
Family Pleurostomellidae REUSS, 1860
Subfamily Pleurostomellinae REUSS, 1860

Genus *Ellipsoglandulina* SILVESTRI, 1900

Type species: *Ellipsoglandulina laevigata* SILVESTRI, 1900

Ellipsoglandulina multicostata (GALLOWAY and MORREY, 1929)
Plate 8, Figure 4

1929 *Daucina multicostata* n. sp. – GALLOWAY and MORREY, p. 42, pl. 6, fig. 13.
1932 *Ellipsoglandulina multicostata* (GALLOWAY and MORREY) – NUTTALL, p. 24, pl. 4, fig. 4.
1945 *Ellipsoglandulina multicostata* (GALLOWAY and MORREY) – CUSHMAN and STAINFORTH, p. 58, pl. 10, figs. 6–7.
1949 *Ellipsoglandulina multicostata* (GALLOWAY and MORREY) – BERMÚDEZ, p. 228, pl. 14, figs. 46–47.
1952 *Ellipsoglandulina multicostata* (GALLOWAY and MORREY) – TODD and KNIKER, p. 23, pl. 4, fig. 11.
1953 *Ellipsoglandulina multicostata* (GALLOWAY and MORREY) – BECKMANN, p. 380, pl. 23, fig. 13.
1975 *Ellipsoglandulina multicostata* (GALLOWAY and MORREY) – PROTO DECIMA and DE BIASE, p. 96, pl. 2, fig. 16.
1985 *Ellipsoglandulina multicostata* (GALLOWAY and MORREY) – GRÜNIG, p. 272, pl. 9, figs. 18–19.
1998 *Ellipsoglandulina multicostata* (GALLOWAY and MORREY) – ROBERTSON, p. 168, pl. 63, figs. 2a–b.

Description: Test elongate, monoserial, circular in cross-section; length approximately two-three times maximum width; chambers increasing gradually in size, strongly inflated later chambers; sutures distinct, mildly depressed; wall calcareous, hyaline, smooth, finely perforated with numerous fine longitudinal ribs; aperture terminal elongate fissure.

Genus *Nodosarella* RZEHAK, 1895

Type species: *Nodosarella tuberosa* (GÜMBEL, 1868)

Nodosarella lorifera (HALKYARD, 1919)
Plate 8, Figure 5

1919 *Nodosaria (Dentalina) lorifera* n. sp. – HALKYARD, p. 70, pl. 4, figs. 2–3.
1987 *Nodosarella lorifera* (HALKYARD) – SZTRÁKOS, pl. 11, fig. 18.

Description: Test elongate, slightly curved monoserial, circular in cross-section; length approximately six times maximum width; seven chambers increasing gradually in size; sutures distinct, mildly depressed; wall calcareous, hyaline, smooth, finely perforated; aperture terminal, elongate fissure.

Nodosarella tuberosa (GÜMBEL, 1868)
Plate 8, Figures 6–7

1868 *Lingulina tuberosa* n. sp. – GÜMBEL, p. 629, pl. 1, fig. 52.
1956 *Nodosarella tuberosa* (GÜMBEL) – HAGN, p. 157, pl. 14, fig. 4.
1975 *Nodosarella tuberosa* (GÜMBEL) – PROTO DECIMA and DE BIASE, p. 96, pl. 3, fig. 9.
1987 *Nodosarella tuberosa* (GÜMBEL) – SZTRÁKOS, pl. 11, fig. 19.

Description: Test elongate, monoserial, circular in cross-section; length approximately four times maximum width; four chambers increasing gradually in size; wall calcareous, hyaline, smooth, finely perforated; aperture terminal elongate fissure.

Nodosarella sp.
Plate 8, Figure 8

Description: Test squattish, monoserial, lobulate in outline, circular in cross-section; length approximately three times maximum width; chambers increasing gradually in size, strongly inflated later chambers; wall calcareous, hyaline, smooth; aperture terminal elongate fissure.

Genus *Pleurostomella* REUSS, 1860

Type species: *Pleurostomella subnodosa* (REUSS, 1846)

Pleurostomella acuta HANTKEN, 1875
Plate 8, Figures 9–11

1875 *Pleurostomella acuta* n. sp. – HANTKEN, p. 37, pl. 13, fig. 18.
1953 *Pleurostomella* cf. *acuta* HANTKEN – BECKMANN, p. 372, pl. 22, fig. 1.
1956 *Pleurostomella acuta* HANTKEN – HAGN, p. 156, pl. 14, fig. 6.
1970 *Pleurostomella acuta* HANTKEN – PROTO DECIMA and DE BIASE, p. 96, pl. 3, fig. 7.
1979 *Pleurostomella acuta* HANTKEN – SZTRÁKOS, pl. 27, fig. 5.
1982 *Pleurostomella acuta* HANTKEN – SZTRÁKOS, pl. 21, fig. 1.
1987 *Pleurostomella acuta* HANTKEN – SZTRÁKOS, pl. 11, fig. 11.

Description: Test squattish, loosely biserial, oval in outline, circular in cross-section; length approximately two times maximum width; chambers increasing gradually in size, final pair of chambers extremely inflated; sutures barely visible, slightly depressed, strongly curved; wall calcareous, hyaline, smooth, finely perforated; aperture large oval opening of final chamber.

Pleurostomella alternans SCHWAGER, 1866
Plate 8, Figure 12

1866 *Pleurostomella alternans* n. sp. – SCHWAGER, p. 238, pl. 6, figs. 79–80.
1926 *Pleurostomella alternans* SCHWAGER – CHAPMAN, p. 41, pl. 9, fig. 9.
1953 *Pleurostomella alternans* SCHWAGER – BECKMANN, p. 373, pl. 22, fig. 3.
1987 *Pleurostomella alternans* HANTKEN – SZTRÁKOS, pl. 11, figs. 15–16.

Description: Test elongate, loosely biserial, lobulate in outline, circular in cross-section; length approximately three to four times of maximum width; four chambers increasing gradually in size; sutures barely visible, slightly depressed; wall calcareous, hyaline, smooth, finely perforated; aperture large oval opening of final chamber.

Pleurostomella eocaena GÜMBEL, 1868
Plate 8, Figure 13

1868 *Pleurostomella eocaena* n. sp. – GÜMBEL, p. 52, pl. 1, figs. 53a–b.
1875 *Pleurostomella eocaena* GÜMBEL – HANTKEN, p. 37, pl. 13, fig. 17.
1975 *Pleurostomella eocaena* GÜMBEL – PROTO DECIMA and DE BIASE, p. 96, pl. 3, figs. 6a–b.

Description: Test mildly elongate, loosely biserial, lobulate in outline, circular in cross-section; length approximately three to four times of maximum width; four chambers increasing gradually in size; sutures barely visible, slightly depressed; wall calcareous, hyaline, smooth, finely perforated; aperture oval opening of final chamber.
Remarks: The difference between *Pleurostomella alternans* SCHWAGER and *Pleurostomella eocaena* GÜMBEL is the aperture. *Pleurostomella alternans* SCHWAGER has large, oval aperture contrary to *Pleurostomella eocaena* GÜMBEL which has much smaller aperture.

Pleurostomella incrassata HANTKEN, 1884
Plate 8, Figures 15–16

1884 *Pleurostomella incrassata* n. sp. – HANTKEN, p. 146, pl. 1, figs. 4, 7.
1956 *Pleurostomella incrassata* HANTKEN – HAGN, p. 156, pl. 14, figs. 2, 5.
1975 *Pleurostomella incrassata* HANTKEN – PROTO DECIMA and DE BIASE , p. 96, pl. 3, fig. 5.
1987 *Pleurostomella incrassata* HANTKEN – SZTRÁKOS, pl. 11, fig. 14.

Description: Test squattish, loosely biserial, lobulate in outline, circular in cross-section; length approximately two to three times of maximum width; four chambers increasing gradually in size, third chamber extremely inflated and large, globular, inflated final chamber; sutures distinct, strongly depressed; wall calcareous, hyaline, smooth, finely perforated; aperture small oval opening of final chamber.

Pleurostomella sp.
Plate 8, Figure 14

Description: Test squattish, inflated, loosely biserial, lobulate in outline, circular in cross-section; length approximately two times maximum width; three chambers increasing gradually in size, second chamber extreamly inflated; sutures distinct, mildly depressed; wall calcareous, hyaline, smooth, finely perforated; aperture small oval opening of final chamber

Superfamily Stilostomellacea FINLAY, 1947
Family Stilostomellidae FINLAY, 1947
Subfamily Stilostomellacea FINLAY, 1947

Genus *Orthomorphina* STAINFORTH, 1952

Type species: *Orthomorphina havanensis* (CUSHAMN and BERMÚDEZ, 1937)

Orthomorphina rohri (CUSHMAN and STAINFORTH, 1945)
Plate 8, Figure 17

1945 *Nodogenerina rohri* n. sp. – CUSHMAN and STAINFORTH, p. 39, pl. 5, fig. 26.
1953 *Orthomorphina rohri* (CUSHMAN and STAINFORTH) – BECKMANN, p. 365, pl. 21, fig. 8.
1982 *Orthomorphina rohri* (CUSHMAN and STAINFORTH) – SZTRÁKOS, pl. 12, figs. 9–10.
1985 *Orthomorphina rohri* (CUSHMAN and STAINFORTH) – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 9, figs. 7–8.

Description: Test elongate, monoserial, circular in cross-section; length approximately four to five times of maximum width; chambers increasing gradually in size; sutures distinct, strongly depressed; wall calcareous, hyaline, smooth, finely perforated with numerous fine, longitudinal ribs extending to suture of final inflated chamber; aperture terminal, circular with lip.

Genus *Stilostomella* GUPPY, 1894

Type species: *Stilostomella rugosa* GUPPY, 1894

Stilostomella abyssorum (BRADY, 1881)
Plate 8, Figures 18–19

1881 *Nodosaria abyssorum* n. sp. – BRADY, p. 63, pl. 63, figs. 8–9.
1934 *Ellipsonodosaria nuttalli* n. sp. – CUSHMAN and JARVIS, p. 72, pl. 10, fig. 6.
1953 *Stilostomella abyssorum* (BRADY) – BECKMANN, p. 369, pl. 21, fig. 33.
1987 *Stilostomella* cf. *abyssorum* (BRADY) – SZTRÁKOS, pl. 7, figs. 6–7.

Description: Test elongate, monoserial, beads-like in outline, circular in cross-section; length approximately five to six times of maximum width; chambers increasing moderately in size; sutures broad, hoop-like, strongly depressed; wall calcareous, hyaline, smooth, finely perforated; aperture terminal, circular on short neck with thickened lip.

Stilostomella adolphina (D'ORBIGNY, 1846)
Plate 8, Figures 20–22

1846 *Dentalina adolphina* n. sp. – D'ORBIGNY, p. 51, pl. 2, figs. 18–20.
1868 *Dentalina adolphina* D'ORBIGNY – GÜMBEL, p. 45, pl. 1, fig. 32.
1953 *Siphonodosaria adolphina* (D'ORBIGNY) – SUBBOTINA, p. 180, pl. 6, figs. 1–2.
1969 *Nodosaria adolphina* (D'ORGIGNY) – KRAYEVA and ZERNECKIJ, p. 41, pl. 14, fig. 6.
1969 *Stilostomella adolphina* (D'ORBIGNY) – RÖGL, p. 80, pl. 3, fig. 12.
1975 *Nodosaria adolphina* (D'ORGIGNY) – SAMUEL, p. 119, pl. 70, figs. 2a–b.
1979 *Stilostomella adolphina* (D'ORBIGNY) – SZTRÁKOS, pl. 19, fig. 8.
1983 *Stilostomella adolphina* (D'ORBIGNY) – KRHOVSKY, p. 78, pl. 2, fig. 2.
1985 *Stilostomella adolphina* (D'ORBIGNY) – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 10, fig. 8., pl. 24. 4–5; pl. 118, figs. 1–2.
1985 *Stilostomella adolphina* (D'ORBIGNY) – PAPP and SCHMID, p. 31, pl. 14, figs. 8–11.
1987 *Stilostomella adolphina* (D'ORBIGNY) – WENGER, p. 287, pl. 10, figs. 21–22.

1992 *Siphonodosaria adolphina* (D'ORBIGNY) – DARAKCHIEVA and JURANOV, p. 30, pl. 5, fig. 4.

Description: Test elongate, monoserial, beads-like in outline, circular in cross-section; length approximately five - six times maximum width; chambers increasing gradually in size; sutures distinct strongly depressed; wall calcareous, hyaline, smooth, finely perforated with numerous random arranged circular to oval nodes; aperture terminal, circular on short neck with thickened lip.

Stillostomella consobrina (D'ORBIGNY, 1846)
Plate 8, Figure 23

1846 *Dentalina consobrina* n. sp. – D'ORBIGNY, p. 46, pl. 2, figs. 1–3.
1953 *Stilostomella consobrina* (D'ORBIGNY) – BECKMANN, p. 370, pl. 21, figs. 24–25.
1979 *Stilostomella consobrina* (D'ORBIGNY) – SZTRÁKOS, pl. 19, fig. 9.
1982 *Stilostomella consobrina* (D'ORBIGNY) – SZTRÁKOS, pl. 16, fig. 5.
1985 *Stilostomella consobrina* (D'ORBIGNY) – PAPP and SCHMID, p. 29, pl. 11, figs. 1–5.
1987 *Stilostomella consobrina* (D'ORBIGNY) – SZTRÁKOS, pl. 7, fig. 11.

Description: Test elongate, monoserial, tubular in outline, circular in cross-section; length approximately five to six times of maximum width; chambers increasing moderately in size, first chamber strongly inflated with short tubular spine; sutures barely visible, slightly depressed; wall calcareous, hyaline, smooth, finely perforated; aperture terminal, circular.

Stilostomella curvatura (CUSHMAN, 1939)
Plate 8, Figure 24

1939 *Dentalina curvatura* n. sp. – CUSHMAN, p. 105, pl. 28, fig. 5.
1953 *Stilostomella curvatura* (CUSHMAN) – BECKMANN, p. 370, pl. 21, figs. 26–27.
1987 *Stilostomella curvatura* (CUSHMAN) – SZTRÁKOS, pl. 17, fig. 12.

Description: Test elongate, slightly curved, monoserial, beads-like in outline, circular in cross-section; length approximately five to six times of maximum width; chambers increasing gradually in size; sutures distinct, strongly depressed; wall calcareous, hyaline; smooth, finely perforated with numerous random arranged circular to oval nodes; aperture terminal, circular on short neck with thickened lip.

Stilostomella elegans (D'ORBIGNY, 1846)
Plate 8, Figures 25–26

1846 *Dentalina elegans* n. sp. – D'ORBIGNY, p. 45, pl. 1, figs. 52–56.
1979 *Stilostomella elegans* (D'ORBIGNY) – SZTRÁKOS, pl. 19, fig. 12.
1985 *Stilostomella elegans* (D'ORBIGNY) – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 11, fig. 6; pl. 104, figs. 2, 13.
1987 *Stilostomella elegans* (D'ORBIGNY) – SZTRÁKOS, pl. 7, fig. 12.

Description: Test elongate, slightly curved, monoserial, beads-like in outline, circular in cross-section; length approximately five to six times of maximum width; chambers increasing gradually in size, final four to five chambers spindle-shaped; sutures distinct, broad, strongly depressed; wall calcareous, hyaline; smooth, finely perforated; aperture terminal, circular on short neck with strongly thickened lip.

Stilostomella emaciata (REUSS, 1851)
Plate 8, Figure 27

1851 *Dentalina emaciata* n. sp. – REUSS, p. 63, pl. 3, fig. 9.
1979 *Stilostomella emaciata* (REUSS) – SZTRÁKOS, pl. 19. fig. 14.

Description: Test elongate, curved, monoserial, tubular in outline, circular in cross-section; length approximately five to six times of maximum width; chambers increasing moderately in size, first chamber globular, inflated with short tubular spine; sutures distinct, slightly depressed; wall calcareous, hyaline; smooth, finely perforated; aperture terminal, circular.

Stilostomella hoernesi (HANTKEN, 1868)
Plate 8, Figure 28

1868 *Dentalina hörnesi* n. sp. – HANTKEN, p. 89, pl. 1. fig. 2.
1979 *Stilostomella hoernesi* (HANTKEN) – SZTRÁKOS, pl. 19. fig. 15.
1982 *Stilostomella hoernesi* (HANTKEN) – SZTRÁKOS, pl. 16, fig. 4.
1985 *Stilostomella hoernesi* (HANTKEN) – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 10, figs. 5–6.

Description: Test elongate, monoserial, beads-like in outline, circular in cross-section; length approximately five to six times of maximum width; chambers increasing gradually in size; sutures distinct strongly depressed; wall calcareous, hyaline; smooth, finely perforated with numerous longitudinal ribs; aperture terminal, circular.

Stilostomella pauperata (D'ORBIGNY, 1846)
Plate 8, Figure 29

1846 *Dentalina pauperata* n. sp. – D'ORBIGNY, p. 46, pl. 1, figs. 57–58.
1979 *Stilostomella pauperata* (D'ORBIGNY) – SZTRÁKOS, pl. 19, fig. 13.
1985 *Stilostomella pauperata* (D'ORBIGNY) – KORECZNÉ-LAKY and NAGYNÉ-GELLAI, pl. 10, fig. 12; pl. 99, fig. 3; pl. 102, fig. 13; pl. 104, fig. 11.

Description: Test elongate, slightly curved, monoserial, beads-like in outline, circular in cross-section; length approximately five to six times of maximum width; chambers increasing gradually in size; sutures distinct strongly depressed; wall calcareous, hyaline; smooth, finely perforated with numerous irregularly arranged nodes; aperture terminal, circular.

Stilostomella sp.
Plate 8, Figure 30

Description: Test elongate, monoserial, beads-like in outline, circular in cross-section; length approximately four – five times maximum width; chambers increasing gradually in size; sutures distinct strongly depressed; wall calcareous, hyaline; smooth, finely perforated; aperture terminal, circular.

Superfamily Discorbacea EHRENBERG, 1838
Family Bagginidae CUSHMAN, 1927
Subfamily Baggininae CUSHMAN, 1927

Genus *Cancris* DE MONTFORT, 1808

Type species: *Cancris auriculatus* DE MONTFORT, 1808

Cancris sp.
Plate 9, Figures 1–2

Description: Test trochospiral, circular in outline, spiral side evolute, umbilical side involute, biconvex in cross-section; periphery acute; chambers increasing gradually in size, five to six chambers in final whorl; sutures slightly depressed, radial; wall calcareous, hyaline; smooth, perforated; aperture umbilical.

Genus *Valvulineria* CUSHMAN, 1926

Type species: *Valvulineria californica* CUSHMAN, 1926

Valvulineria sp.
Plate 9, Figure 3

Description: Test trochospiral, spiral side evolute, umbilical side involute, plano-convex in cross-section; periphery mildly undulate; chambers increasing gradually in size, five chambers in final whorl; sutures strongly depressed, radial, mildly curved; wall calcareous, hyaline; smooth, perforated; aperture umbilical.

Family Eponididae HOFKER, 1951
Subfamily Eponidinae HOFKER, 1951

Genus *Eponides* DE MONTFORT, 1808

Type species: *Eponides repandus* FICHTEL and MOLL, 1798

Eponides budensis (HANTKEN, 1875)
Plate 9, Figures 4–5

1875 *Truncatulina budensis* n. sp. – HANTKEN, p. 65, pl. 8, fig. 6.

Description: Test trochospiral, spiral side evolute, umbilical side involute, biconvex in cross-section; periphery rounded; chambers increasing gradually in size, six to seven chambers in final whorl; sutures slightly depressed, radial, mildly curved; wall calcareous, hyaline; smooth, coarsely perforated; aperture umbilical.

Eponides haidingeri (D'ORBIGNY, 1846)
Plate 9, Figures 6–7

1846 *Rotalina haidingeri* n. sp. – D'ORBIGNY, p. 154, pl. 8, figs. 7–9.
1875 *Pulvinulina haidingeri* (D'ORBIGNY) – HANTKEN, p. 67, pl. 15, figs. 10a–b.

Description: Test trochospiral, spiral side evolute, umbilical side involute, plano-convex in cross-section; periphery rounded; chambers increasing gradually in size, five to six chambers in final whorl; sutures strongly depressed, radial, mildly curved; wall calcareous, hyaline; smooth, coarsely perforated; aperture umbilical.

Eponides umbonatus (REUSS, 1851)
Plate 9, Figures 8–9

1851 *Rotalina umbonata* n. sp. – REUSS, p. 75, pl. 5, figs. 35a–c.
1875 *Pulvinulina umbonata* (REUSS) – HANTKEN, p. 67, pl. 9, figs. 8a–c.
1926 *Pulvinulina umbonata* (REUSS) – CHAPMAN, p. 84, pl. 17, fig. 3.
1928 *Eponides umbonata* (REUSS) – COLE, p. 15, pl. 2, fig. 6.
1929 *Rotalia umbonata* (REUSS) – GALLOWAY and MORREY, p. 26, pl. 4, figs. 1a–c.
1929 *Eponides umbonata* (REUSS) – CUSHMAN, p. 98, pl. 14, figs. 8a–c.
1949 *Eponides umbonatus* (REUSS) – BERMÚDEZ, p. 249, pl. 17, figs. 22–24.
1961 *Eponides umbonatus* (REUSS) – KAASSCHIETER, p. 211, pl. 13, fig. 1.
1962 *Eponides umbonatus* (REUSS) – KIESEL, p. 71, pl. 10, fig. 10.
1975 *Oridorsalis umbonatus* (REUSS) – PROTO DECIMA and DE BIASE, p. 97, pl. 2, figs. 14a–c.
1979 *Eponides umbonatus* (REUSS) – SZTRÁKOS, pl. 25, fig. 12.
1982 *Oridorsalis umbonatus* (REUSS) – AGIP, pl. 40, fig. 10.
1987 *Oridorsalis umbonatus* (REUSS) – WENGER, p. 311, pl. 17, figs. 6–8.
1993 *Oridorsalis umbonatus* (REUSS) – DARAKCHIEVA and JURANOV, p. 68, pl. 3, figs. 7, 9.
1997 *Oridorsalis umbonatus* (REUSS) – BORNMALM, pl. 24, figs. j–l.
2001 *Oridorsalis umbonatus* (REUSS) – MÜHLSTRASSER, pl. 3, figs. 4–5.

Description: Test trochospiral, spiral side evolute, umbilical side involute, biconvex in cross-section; periphery with thin keel; chambers increasing gradually in size, five to six chambers in final whorl; sutures strongly depressed, radial, mildly curved; wall calcareous, hyaline; smooth, coarsely perforated; aperture umbilical.

Eponides sp.
Plate 9, Figure 10

Description: Test trochospiral, spiral side evolute, umbilical side involute, biconvex in cross-section; periphery rounded; chambers increasing gradually in size, five to six chambers in final whorl; sutures slightly depressed, radial, mildly curved; wall calcareous, hyaline; smooth, coarsely perforated; aperture umbilical.

Family Discorbidae EHRENBERG, 1838

Genus *Discorbis* LAMARCK, 1804

Type species: *Discorbis vesicularis* LAMARCK, 1804

Discorbis elegans HANTKEN, 1875
Plate 9, Figure 11

1875 *Discorbina elegans* n. sp. – HANTKEN, p. 66, pl. 9, fig. 3, pl. 15, fig. 7.

Description: Test trochospiral, spiral side evolute, umbilical side involute, plano-convex in cross-section; periphery rounded; chambers increasing gradually in size, five to six chambers in final whorl; sutures slightly elevated, radial; wall calcareous, hyaline; smooth, coarsely perforated; aperture umbilical.

Discorbis perplexa LE CALVEZ, 1949
Plate 9, Figures 12–13

1949 *Discorbis perplexa* LE CALVEZ – LE CALVEZ, p. 21, pl. 2, figs. 18–20.
1970 *Discorbis perplexa* LE CALVEZ – LE CALVEZ, p. 137, figs. 46–48.

Description: Test trochospiral, spiral side evolute, umbilical side involute, biconvex in cross-section; periphery with broad keel; chambers increasing gradually in size, five – six chambers in final whorl; sutures strongly depressed, radial; wall calcareous, hyaline; smooth, coarsely perforated; aperture umbilical.

Superfamily Discorbinellacea SIGAL, 1952
Family Parrelloididae HOFKER, 1956

Genus *Cibicidoides* THALMANN, 1939

Type species: *Cibicidoides mundula* (BRADY, PARKER and JONES, 1888)

Cibicidoides eocaenus (GÜMBEL, 1868)
Plate 9, Figures 14–16

1868 *Rotalia eocaena* n. sp. – GÜMBEL, p. 650, pl. 2, figs. 87 a–b.
1986 *Cibicidoides eocaenus* (GÜMBEL) – VAN MORKHOVEN et al., p. 256, pl. 86A, figs. 1–4; pl. 86B, figs. 1–2; pl. 86C, 1–3 (cum syn).
2006 *Cibicidoides eocaenus* (GÜMBEL) – ORTIZ and THOMAS, p. 115, pl. 5, fig. 2.

Description: Test trochospiral, spiral side evolute, umbilical side involute, biconvex in cross-section; periphery rounded; chambers increasing gradually in size, seven to eigth chambers in final whorl; sutures barely visible, radial; wall calcareous, hyaline; smooth, coarsely perforated; aperture umbilical.

Cibicidoides perlucidus (NUTTALL, 1932)

Plate 9, Figures 17–18

1932 *Cibicides perlucida* n. sp. – NUTTALL, p. 33, pl. 8, figs. 10–12.
1986 *Cibicidoides perlucidus* (NUTTALL) – VAN MORKHOVEN et al., p. 260, pl. 86D, figs. 1–2.

Description: Test trochospiral, spiral side evolute, umbilical side involute, biconvex in cross-section; periphery acute; large central umbilicus; chambers increasing gradually in size, eigth - nine chambers in final whorl; sutures thick, slightly depressed, gently curved, radial; wall calcareous, hyaline; smooth, coarsely perforated; aperture umbilical.

Superfamily Planorbulinacea SCHWAGER, 1877
Family Planulinidae BERMÚDEZ, 1952

Genus *Planulina* D'ORBIGNY, 1826

Type species: *Planulina ariminensis* (D'ORBIGNY, 1826)

Planulina austriaca (D'ORBIGNY, 1826)
Plate 9, Figures 19–20

1826 *Anomalina austriaca* n. sp. – D'ORBIGNY, p. 172, pl. 10, figs. 4–9.
1985 *Planulina austriaca* (D'ORBIGNY) – PAPP and SCHMID, p. 65, pl. 58, figs. 1–8; pl. 59, figs. 1–6.

Description: Test trochospiral, evolute, biconvex, mildly compressed in apertural view; periphery with rounded keel; chambers increasing gradually in size, eigth to nine chambers in final whorl; sutures strongly depressed, curved; wall calcareous, hyaline; smooth, perforated; aperture interiomarginal.

Planulina compressa (HANTKEN, 1875)
Plate 9, Figure 21

1875 *Truncatulina compressa* n. sp. – HANTKEN, p. 62, pl. 8, figs. 8a–b.
1987 *Truncatulina costata* HANTKEN – SZTRÁKOS, pl. 20, fig. 2.

Description: Test trochospiral, evolute, biconvex, strongly compressed in apertural view; periphery with rounded keel; chambers increasing gradually in size, six to eigth chambers in final whorl; sutures barely visible, curved; wall calcareous, hyaline; smooth, perforated; aperture interiomarginal.

Planulina costata (HANTKEN, 1875)
Plate 9, Figures 22–23

1875 *Truncatulina costata* n. sp. – HANTKEN, p. 63, pl. 9, fig. 2.
1987 *Planulina costata* HANTKEN – SZTRÁKOS, pl. 10, fig. 5.

Description: Test trochospiral, evolute, biconvex, mildly compressed in apertural view; periphery with rounded keel; chambers increasing gradually in size, eigth to nine chambers in final whorl; sutures strongly depressed, curved; wall calcareous, hyaline; smooth, coarsely perforated; aperture interiomarginal

Family Cibicididae CUSHMAN, 1927
Subfamily Cibicidinae CUSHMAN, 1927

Genus *Cibicides* DE MONTFORT, 1808

Type species: *Cibicides reflugens* DE MONTFORT, 1808

Cibicides ammophilus (GÜMBEL, 1868)

Plate 9, Figure 24

1868 *Rotalia ammophila* n. sp. – GÜMBEL, p. 652, pl. 2, figs. 90a–b.
1982 *Cibicides ammophilus* (GÜMBEL) – SZTRÁKOS, pl, 20. fig. 6.

Description: Test trochospiral, squattish, involute, plano-convex in cross-section; chambers increasing gradually in size, ten to eleven chambers in final whorl; deep umbilicus; sutures depressed, strongly curved; wall calcareous, hyaline; smooth, perforated; aperture interiomarginal.

Cibicides boueanus (D´ORBIGNY, 1846)
Plate 9, Figures 25–27

1846 *Truncatulina boueana* n. sp. – D´ORBIGNY, p. 169, pl. 9, figs. 24–26.
1951 *Cibicides boueanus* (D´ORBIGNY) – MARKS, p. 72, pl. 8, figs. 9a–b.
1985 *Cibicides boueanus* (D´ORBIGNY) – PAPP and SCHMID, p. 64, pl. 56, figs. 6–9.

Description: Test trochospiral, involute, plano-convex in cross-section; periphery with rounded keel; chambers increasing gradually in size, eigth to nine chambers in final whorl; deep umbilicus; sutures slightly depressed on umbilical side, strongly elevated on spiral side, strongly curved; wall calcareous, hyaline; smooth, perforated; aperture interiomarginal.

Cibicides carinatus (TERQUEM, 1882)
Plate 9, Figures 28–29

1882 *Truncatulina carinatus* n. sp. – TERQUEM, p. 94, pl. 10, figs. 1–2.
1949 *Cibicides carinatus* (TERQUEM) – LE CALVEZ, p. 45, pl. 4, figs. 72–74.
1968 *Cibicides carinatus* (TERQUEM) – POŻARYSKA and SZCZECHURA, p. 75, pl. 11, fig. 1.
1970 *Cibicides carinatus* (TERQUEM) – LE CALVEZ, p. 180, figs. 66–68.
1970 *Cibicides carinatus* (TERQUEM) – MYATLYUK, p. 152, pl. 63, fig. 1.
1974 *Cibicides carinatus* (TERQUEM) – SZCZECHURA and POŻARYSKA, p. 86, pl. 28, figs. 6–7.
1975 *Cibicides carinatus* (TERQUEM) – SAMUEL, p. 148, pl. 86, figs. 6a–b.
1987 *Cibicides carinatus* (TERQUEM) – SZTRÁKOS, pl. 20, figs. 8–9.

Description: Test trochospiral, spiral side evolute, umbilical side involute, plano-convex in cross-section; periphery with rounded, relatively broad keel; chambers increasing gradually in size, eigth to nine chambers in final whorl; sutures strongly depressed, curved; wall calcareous, hyaline; smooth, perforated; aperture interiomarginal.

Cibicides mauricensis HOWE and ROBERTS, 1939
Plate 10, Figure 1

1939 *Cibicides mauricensis* n. sp. – HOWE and ROBERTS in HOWE, p. 87, pl. 13, figs. 4–5.

Description: Test trochospiral, spiral side evolute, umbilical side involute, plano-convex in cross-section; periphery rounded; chambers increasing gradually in size, six to seven chambers in final whorl; deep umbilicus; sutures slightly depressed; wall calcareous, hyaline, smooth, perforated; aperture interiomarginal.

Cibicides oligocenicus SAMOILOVA, 1947
Plate 10, Figure 2

1947 *Cibicides dutemplei* var. *oligocenica* (SAMOILOVA) n. ssp. – SAMOILOVA, p. 96, figs. 34–36.
1977 *Cibicides oligocenicus* (SAMOILOVA) – POŻARYSKA, p. 39, pl. 6. figs. 1–6; pl. 7, figs. 3a–c; pl. 13, figs. 8–9.

Description: Test trochospiral, spiral side evolute, umbilical side involute, plano-convex in cross-section; periphery rounded; chambers increasing gradually in size, eigth to nine chambers in final whorl; sutures strongly depressed, curved; wall calcareous, hyaline; smooth, perforated; aperture interiomarginal.

Cibicides proprius BROTZEN, 1948
Plate 10, Figure 3

1948 *Cibicidoides proprius* n. sp. – BROTZEN, p. 78, pl. 12, figs. 3–4.
1961 *Cibicides proprius* BROTZEN – KAASSCHIETER, p. 222, pl. 13, figs. 9–10; pl. 14, fig. 7.

Description: Test trochospiral, squattish, umbilical side involute, plano-convex in cross-section; periphery rounded; chambers increasing gradually in size, eigth to nine chambers in final whorl; sutures slightly depressed, curved; wall calcareous, hyaline; smooth, coarsely perforated; aperture interiomarginal.

Cibicides pseudolobatulus PERELIS and REISS, 1975
Plate 10, Figure 4

1975 *Cibicides pseudolobatulus* PERELIS and REISS – PERELIS and REISS, p. 77, pl. 4, figs. 1–7.
1993 *Cibicides pseudolobatulus* PERELIS and REISS – HOTTINGER, HALICZ and REISS, p. 116, pl. 152, figs. 7–11.

Description: Test trochospiral, umbilical side involute, spiral side evoulte, plano-convex in cross-section; periphery rounded; chambers increasing gradually in size, six chambers in final whorl; deep umbilicus; sutures depressed, radial; wall calcareous, hyaline; smooth, coarsely perforated; aperture interiomarginal.

Cibicides pseudoungerianus (CUSHMAN, 1922)
Plate 10, Figure 5

1884 *Truncatulina ungeriana* (not D'ORBIGNY) – BRADY, p. 664, pl. 94, fig. 9.
1899 *Truncatulina ungeriana* (not D'ORBIGNY) – FLINT, p. 333, pl. 77, fig. 2.
1918 *Truncatulina ungeriana* (not D'ORBIGNY) – CUSHMAN, p. 69, pl. 24., fig. 1.
1922 *Truncatulina pseudoungeriana* n. sp. – CUSHMAN, p. 97, pl. 20, fig. 9.
1931 *Cibicides pseudoungeriana* (CUSHMAN) – CUSHMAN, p. 123, pl. 22, figs. 3–7.
1951 *Cibicides ungerianus* (D'ORBIGNY) – MARKS, p. 73, pl. 8, figs. 2a–b.
1953 *Cibicides pseudoungerianus* (CUSHMAN) – BECKMANN, p. 403, pl. 28, figs. 3–4.
1959 *Cibicides pseudoungerianus* (CUSHMAN) – DIECI, p. 100, pl. 8, fig. 1.
1960 *Cibicides pseudoungerianus* (CUSHMAN) – BARKER, p. 194, pl. 94, figs. 9a–c.
1960 *Cibicides pseudoungerianus* (CUSHMAN) – CHRISTODOULOU, p. 94, pl. 14, fig. 7a–b.
1970 *Cibicides pseudoungerianus* (CUSHMAN) – VERDENIUS, pl. 6, fig. 3.
1971 *Cibicides pseudoungerianus* (CUSHMAN) – VERHOEVE, p. 63, pl. 3, fig. 5a–c.
1976 *Cibicides* cf. p*seudoungerianus* (CUSHMAN) – PFLUM and FRERICHS, pl. 2, fig. 9, pl. 3, figs. 1–2.
1978 *Cibicides pseudoungerianus* (CUSHMAN) – BROLSMA, pl. 3, figs. 7a–c.
1979 *Cibicides ungerianus* (D'ORBIGNY) – HAGEMAN, p. 92, pl. 4, figs. 2a–c, non fig. 3a–b.
1980 *Cibicidoides floridanus* (CUSHMAN) – BREMER et al., p. 24, pl. 3, figs. 12–14.
1982 *Cibicidoides pseudoungerianus* (CUSHMAN) – AGIP, pl. 52, fig. 1.
1991 *Cibicidoides pseudoungerianus* (CUSHMAN) – CIMERMAN and LANGER, p. 69, pl. 74, figs. 2–3.
1991 *Cibicides pseudoungerianus* (CUSHMAN) – VERHALLEN, p. 129, pl. 16, figs. 1–4.
2000 *Cibicides pseudoungerianus* (CUSHMAN) – DEN DULK, pl. 6, figs. 3a–c.
2000 *Cibicides pseudoungerianus* (CUSHMAN) – KOUWENHOVEN, pl. 1, figs. 3a–c.
2001 *Cibicides pseudoungerianus* (CUSHMAN) – MÜHLSTRASSER, p. 73, pl. 4, figs. 9–11.
2006 *Cibicides pseudoungerianus* (CUSHMAN) – SCHWEIZER, p. 125, pl. 7, figs. a–p.

Description: Test trochospiral, squattish, spiral side evolute, umbilical side involute, plano-convex in cross-section; periphery undulate; chambers increasing gradually in size, eigth to nine chambers in final whorl; sutures slightly depressed, curved; wall calcareous, hyaline, smooth, coarsely perforated; aperture interiomarginal, extending onto spiral side.

Cibicides sublobatulus (GÜMBEL, 1868)
Plate 10, Figures 6–7

1868 *Truncatulina sublobatula* n. sp. – GÜMBEL, p. 659, pl. 2, figs. 103a–c.
1988 *Cibicides sublobatulus* (GÜMBEL) – HORVÁTH-KOLLÁNYI, p. 81, pl. 22, figs. 1–3.

Description: Test trochospiral, umbilical side involute, plano-convex to biconvex in cross-section; periphery rounded; chambers increasing gradually in size, eigth to nine chambers in final whorl;

sutures slightly depressed, curved; wall calcareous, hyaline; smooth, coarsely perforated; aperture interiomarginal.

Cibicides sulzensis (HERRMANN, 1917)
Plate 10, Figure 8

1917 *Discorbina sulzensis* n. sp. – HERRMANN, p. 290, pl. 3, fig. 26.
1958 *Cibicides sulzensis* (HERRMANN) – BATJES, p. 143, pl. 9, fig. 5.
1961 *Cibicides sulzensis* (HERRMANN) – KAASSCHIETER, p. 223, pl. 13, fig. 11.

Description: Test trochospiral, umbilical side involute, plano-convex in cross-section; periphery rounded; chambers increasing gradually in size, eigth to nine chambers in final whorl; deep umbilicus; sutures barely visible; wall calcareous, hyaline; smooth, perforated; aperture interiomarginal.

Cibicides ungerianus (D'ORBIGNY, 1846)
Plate 10, Figure 9

1846 *Rotalina ungeriana* n. sp. – D'ORBIGNY, p. 157, pl. 8, figs. 16–18.
1951 *Cibicides ungerianus* D'ORBIGNY – MARKS, p. 73, pl. 8, figs. 2a–b.
1960 *Cibicides ungerianus* D'ORBIGNY – CICHA and ZAPLETOVA, p. 13, pl. 6, figs. 4–6.
1985 *Cibicides ungerianus* D'ORBIGNY – PAPP and SCHMID, p. 60, pl. 51, figs. 7–11.

Description: Test trochospiral, squattish, umbilical side involute, spiral side evolute, plano-convex in cross-section; periphery rounded; chambers increasing gradually in size, eigth to nine chambers in final whorl; sutures slightly depressed, curved; thick spiral line on spiral side; wall calcareous, hyaline; smooth, coarsely perforated; aperture interiomarginal.

Cibicides westi HOWE, 1939
Plate 10, Figures 10–12

1939 *Cibicides westi* n. sp. – HOWE, p. 88, pl. 13, figs. 20–22.
1949 *Cibicides westi* HOWE – BANDY, p. 112, pl. 20, fig. 7.
1961 *Cibicides westi* HOWE – KAASSCHIETER, p. 218, pl. 13, fig. 7.

Description: Test trochospiral, involute, plano-convex in cross-section; periphery rounded; chambers increasing gradually in size, eigth to nine chambers in final whorl; large-sized, triangular final chamber in lateral view; sutures slightly elevated, radial; relatively deep umbilicus; wall calcareous, hyaline; smooth, coarsely perforated; aperture interiomarginal, extending to spiral side.

Cibicides sp.
Plate 10, Figure 13

Description: Test trochospiral, involute, plano-convex in cross-section; periphery rounded; chambers increasing gradually in size, eigth to nine chambers in final whorl; sutures slightly depressed, radial; wall calcareous, hyaline; smooth, coarsely perforated; aperture interiomarginal, extending to spiral side.

Subfamily Stichocibicidinae SAIDOVA, 1981

Genus *Dyocibicides* CUSHMAN and VALENTINE, 1930

Type species: *Dyocibicides biserialis* CUSHMAN and VALENTINE, 1930

Dyocibicides uniserialis THALMANN, 1933
Plate 10, Figures 14–15

1884 *Truncatulina variabilis* D'ORBIGNY – BRADY, pl. 93, fig. 7.

1933 *Dyocibicides uniserialis* n. sp. – THALMANN, p. 254, pl. 93, fig. 7.

Description: Test elongate, trochospiral, involute in earlier chambers, becoming irregularly monoserial later (three or four monoserial chambers, compressed in cross-section; chambers increasing gradually in size, younger chambers much bigger than earlier; periphery rounded; sutures distinct, strongly depressed; wall calcareous, smooth, finely perforated; aperture terminal.

Superfamily Asterigerinacea D'ORBIGNY, 1839
Family Asterigerinidae D'ORBIGNY, 1839

Genus *Asterigerina* D'ORBIGNY, 1839

Type species: *Asterigerina carinata* D'ORBIGNY, 1839.

Asterigerina sp.
Plate 10, Figure 16

Description: Test trochospiral, umbilical side involute, spiral side evolute, plano-convex in cross-section; periphery rounded; chambers increasing gradually in size, eigth to nine chambers in final whorl; secondary chambers forming a star or rosette pattern around umbilical region; sutures slightly depressed, curved; wall calcareous, hyaline; smooth, finely perforated; aperture interiomarginal, extending to umbilical region.

Family Epistomariidae HOFKER, 1954
Subfamily Epistomariinae HOFKER, 1954

Genus *Nuttallides* FINLAY, 1939

Type species: *Nuttallides truempyi* (NUTTALL, 1930)

Nuttallides sp.
Plate 10, Figures 17–18

Description: Test trochospiral, triangular in lateral view, spiral side involute, umbilical side involute, plano-convex in cross-section; periphery rounded with thin keel; chambers increasing gradually in size, four to five chambers in final whorl wall calcareous, hyaline; smooth, finely perforated; aperture interiomarginal, extending to umbilical region.

Superfamily Nonionacea SCHULTZE, 1854
Family Nonionidae SCHULTZE, 1854
Subfamily Nonioninae SCHULTZE, 1854

Genus *Nonion* DE MONTFORT, 1808

Type species: *Nonion faba* (FICHTEL and MOLL, 1798)

Nonion granosum (D'ORBIGNY, 1846)
Plate 10, Figure 19

1846 *Nonionia perforata* n. sp. – D'ORBIGNY, p. 110, pl. 5, figs. 17–18.
1965 *Nonion granosus* (D'ORBIGNY) – SOUAYA, p. 326. pl. 3. fig. 5.
1985 *Elphidium granosum* (D'ORBIGNY) – PAPP and SCHMID, p. 46, pl. 36, figs. 6–8.

Description: Test planispiral, nautiloid-like, involute, compressed in cross-section; chambers increasing gradually in size, eigth to nine chambers in final whorl; strongly depressed sutures; wall

calcareous, hyaline; smooth with irregularly arranged tiny nodes, finely perforated; aperture interiomarginal.

Nonion soldani (D'ORBIGNY, 1846)
Plate 10, Figure 20

1846 *Nonionia soldani* n. sp. – D'ORBIGNY, p. 109, pl. 5, figs. 15–16.
1939 *Nonion soldani* (D'ORBIGNY) – CUSHMAN, p. 13, pl. 3, figs. 10–11.

Description: Test planispiral, nautiloid-like, involute, slightly inflated in cross-section; chambers increasing gradually in size, eigth to nine chambers in final whorl; sutures barely visible; wall calcareous, hyaline; smooth, finely perforated; aperture interiomarginal.

Genus *Nonionella* CUSHMAN, 1926

Type species: *Nonionella miocenica* (CUSHMAN, 1926)

Nonionella sp.
Plate 10, Figure 21

Description: Test planispiral, involute, compressed in cross-section; chambers increasing gradually in size, eigth to nine chambers in final whorl; strongly depressed sutures; wall calcareous, hyaline; smooth, finely perforated; aperture interiomarginal.

Subfamily Pulleniinae SCHWAGER, 1877

Genus *Melonis* DE MONTFORT, 1808

Type species: *Melonis etruscus* DE MONTFORT, 1808

Melonis sp. 1
Plate 10, Figures 22–23

Description: Test globular, inflated, planispiral, circular in lateral view, oval in cross-section; chambers increasing gradually in size, strongly inflated; wall calcareous, hyaline; smooth, finely perforated; aperture interiomarginal.

Genus *Pullenia* PARKER and JONES, 1862

Type species: *Pullenia sphaeroides* (D'ORBIGNY, 1826)

Pullenia jarvisi CUSHMAN, 1936
Plate 10, Figures 24–25

1936 *Pullenia jarvisi* n. sp. – CUSHMAN, p. 77, pl. 13, fig. 6.
1962 *Pullenia jarvisi* CUSHMAN – HILLEBRANDT, p. 94, pl. 7, figs. 1–3.
1975 *Pullenia jarvisi* CUSHMAN – PROTO DECIMA and DE BIASE, p. 97, pl. 2, figs. 8a–b.
1994 *Pullenia jarvisi* CUSHMAN – BOLLI et al., p. 128, pl. 10, fig. 9.
1997 *Pullenia jarvisi* CUSHMAN – WIDMARK, p. 56, pl. 25, figs. E–F.
2001 *Pullenia jarvisi* CUSHMAN – ALEGRET and THOMAS, p. 298, pl. 10, fig. 6.
2006 *Pullenia jarvisi* CUSHMAN – ORTIZ and THOMAS, p. 128, pl. 10, fig. 9.

Description: Test globular, inflated, planispiral, circular in lateral view, oval in cross-section; chambers increasing gradually in size, strongly inflated; sutures distinct, slightly depressed; wall calcareous, hyaline; smooth, finely perforated; aperture interiomarginal.

Pullenia quinqueloba (REUSS), 1851
Plate 10, Figure 26

1851 *Nonionia quinqueloba* n. sp. – REUSS, p. 71, pl. 5, fig. 31.
1926 *Pullenia quinqueloba* (REUSS) – PLUMMER, p. 136, pl. 8, fig. 12.
1927 *Pullenia quinqueloba* (REUSS) – COLE, p. 32, pl. 5, fig. 15.
1929 *Pullenia quinqueloba* (REUSS) – GALLOWAY and MORREY, p. 44, pl. 6, fig. 17.
1941 *Pullenia quinqueloba* (REUSS) – TOULMIN, p. 607, pl. 81, fig. 24.
1943 *Pullenia quinqueloba* (REUSS) – CUSHMAN and TODD, p. 10, pl. 2, fig. 5; pl. 3, fig. 8.
1947 *Nonionia quinqueloba* n. sp. – SUBBOTINA, p. 105, pl. 4, fig. 4.
1949 *Pullenia quinqueloba* (REUSS) – BERMÚDEZ, p. 246, pl. 21, figs. 32–33.
1951 *Pullenia quinqueloba* (REUSS) – MARKS, p. 69. pl. 7. figs. 19 a–b.
1951 *Pullenia quinqueloba* (REUSS) – CUSHMAN, p. 59, pl. 17, fig. 6.
1953 *Pullenia quinqueloba* (REUSS) – BECKMANN, p. 389, pl. 24, figs. 12–13.
1961 *Pullenia quinqueloba* (REUSS) – HORNIBROOK, p. 90, pl. 11, figs. 207–208.
1961 *Pullenia quinqueloba* (REUSS) – KAASSCHIETER, p. 202, pl. 202, pl. 11, figs. 1–2.
1962 *Pullenia quinqueloba* (REUSS) – KIESEL, p. 67, pl. 10, fig. 1.
1967 *Pullenia quinqueloba* (REUSS) – ROMEO, p. 58, pl. 3, figs. 6a–b.
1974 *Pullenia quinqueloba* (REUSS) – MURRAY and WRIGHT, p. 120, pl. 18, figs. 13–14.
1974 *Pullenia quinqueloba* (REUSS) – SZCZECHURA and POŻARYSKA, p. 96, pl. 9, fig. 5.
1975 *Pullenia quinqueloba* (REUSS) – SAMUEL, p. 145, pl. 78, figs. 6–7.
1983 *Pullenia quinqueloba* (REUSS) – BASOV and KRASHENINNIKOV, p. 766, pl. 14, figs. 10–11.
1983 *Pullenia quinqueloba* (REUSS) – TJALSMA and LOHMANN, p. 36, pl. 16, fig. 2.
1987 *Pullenia quinqueloba* (REUSS) – WENGER, p. 299, pl. 13, figs. 16, 20.
1993 *Pullenia quinqueloba* (REUSS) – DARAKCHIEVA and JURANOV, p. 65, pl. 2, figs. 1, 4.
1993 *Pullenia quinqueloba* (REUSS) – MATHELIN and SZTRÁKOS, p. 82, pl. 19, fig. 17.
2002 *Pullenia quinqueloba* (REUSS) – KUHNT et al., p. 152, pl. 12, figs. 18–20.
2005 *Pullenia quinqueloba* (REUSS) – NARAYAN et al., p. 133, pl. 4, figs. 31–32.
2006 *Pullenia quinqueloba* (REUSS) – CIMERMAN et al., p. 38, pl. 10, fig. 10.
2006 *Pullenia quinqueloba* (REUSS) – ORTIZ and THOMAS, p. 129, pl. 10, fig. 10.

Description: Test globular, inflated, planispiral, circular in lateral view, oval in cross-section; chambers increasing gradually in size, strongly inflated; four distinct sutures, slightly depressed; wall calcareous, hyaline; smooth, finely perforated; aperture interiomarginal.

Family Almaenidae MYATLYUK, 1959
Subfamily Almaeninae MYATLYUK, 1959

Genus *Almaena* SAMOILOVA, 1940

Type species: *Almaena taurica* SAMOILOVA, 1941

Almaena sp.
Plate 10, Figure 27

Description: Test circular in lateral view, compressed in cross-section, evolute; periphery rounded; chambers increasing gradually in size, eigth – nine chambers in final whorl; wall calcareous, hyaline; smooth, coarsely perforated; aperture terminal, on outer edge of individual chambers.

Genus *Queraltina* MARIE, 1950

Type species: *Queraltina epistominoides* Marie, 1950

Queraltina epistominoides MARIE, 1950
Plate 10, Figures 28–30

1950 *Queraltina epistominoides* n. sp. – MARIE, p. 74, figs. 1–3, 8–9.
1983 *Queraltina epistominoides* MARIE – SETIAWAN, p. 133, pl. 15, figs. 2–3.
1991 *Queraltina epistominoides* MARIE – BARBIN and KELLER-GRÜNIG, p. 241, pl. 2, fig. 16.
1993 *Queraltina epistominoides* MARIE – SZTRÁKOS and MATHELIN, p. 56, pl. 39, fig. 20.
2006 *Queraltina epistominoides* MARIE – CIMERMAN et al., p. 38, pl. 10, figs. 11–12.

Description: Test trochospiral, biconvex in cross-section, involute; periphery with relatively thick parallel keels; chambers increasing gradually in size, eigth to nine chambers in final whorl, strongly inflated; wall calcareous, hyaline; smooth, coarsely perforated; aperture terminal, on outer edge of individual chambers.

Superfamily Chilostomellacea BRADY, 1881
Family Chilostomellidae BRADY, 1881
Subfamily Chilostomellinae BRADY, 1881

Genus *Chilostomella* REUSS, 1849

Type species: *Chilostomella ovoidea* REUSS, 1850

Chilostomella tenuis BORNEMANN, 1855
Plate 11, Figures 1–2

1855 *Chilostomella tenuis* n. sp. – BORNEMANN, p. 343, pl. 17, fig. 2.
1987 *Chilostomella tenuis* BORNEMANN – SZTRÁKOS, pl. 11. fig. 26.

Description: Test oval, elongate, planispiral, ovate in outline, ovate in cross-section; two chambers in final whorl; invisible suture; wall calcareous, hyaline; smooth, finely perforated; aperture an interiomarginal large slit.

Chilostomella sp.
Plate 11, Figure 3

Description: Test oval, elongate, planispiral, ovate in outline, ovate in cross-section; two chambers in final whorl; invisible suture; wall calcareous, hyaline; smooth, finely perforated; aperture an interiomarginal small slit.

Family Heterolepidae GONZÁLES – DONOSO, 1969

Genus *Anomalinoides* BROTZEN, 1942

Type species: *Anomalinoides plummerae* Brotzen, 1942

Anomalinoides affinis (HANTKEN, 1875)
Plate 11, Figures 4–5

1875 *Pulvinulina affinis* n. sp. – HANTKEN, p. 68, pl. 10, fig. 6.
1934 *Anomalina affinis* (HANTKEN) – CUSHMAN and APPLIN, p. 64, pl. 9, fig. 2.
1935 *Anomalina affinis* (HANTKEN) – CUSHMAN, p. 51, pl. 21, figs. 11–12.
1947 *Anomalina affinis* (HANTKEN) – SUBBOTINA, p. 134, pl. 6, figs. 20–25.
1974 *Anomalinoides affinis* (HANTKEN) – SZCZECHURA and POŻARYSKA, p. 109, pl. 26, figs. 4–5; pl. 27, figs. 6–7.
1979 *Anomalina affinis* (HANTKEN) – SZTRÁKOS, pl. 29, fig. 7 .
1982 *Anomalina affinis* (HANTKEN) – SZTRÁKOS, pl. 22, fig. 14.
1993 *Anomalinoides affinis* (HANTKEN) – DARAKCHIEVA and JURANOV, p. 71, pl. 3, figs. 4–5.
1993 *Anomalinoides affinis* (HANTKEN) – MATHELIN and SZTRÁKOS, p. 82, pl. 20. fig. 8.

2006 *Anomalinoides affinis* (HANTKEN) – CIMERMAN et al., p. 38, pl. 10, fig. 16.

Description: Test trochospiral, circular in outline, oval, involute, biconvex in cross-section; deep umbilicus; chambers increasing gradually in size; wall calcareous, hyaline; smooth, finely perforated; aperture interiomarginal.

Anomalinoides alazanensis (NUTTALL, 1932)
Plate 11, Figure 6

1932 *Anomalina alazanensis* n. sp. – NUTTALL, p. 31, pl. 8, figs. 5–7.
1966 *Anomalinoides alazanensis* (NUTTALL) – BERGGREN and AUBERT, p. 62, pl. 7, fig. 4.
1983 *Anomalina alazanensis* (NUTTALL) – SETIAWAN, p. 132, pl. 14, fig. 2.
1986 *Cibicides alazanensis* (NUTTALL) – VAN MORKHOVEN et al., p. 201, pl. 68, figs. 1–2.
1994 *Anomalinoides alazanensis* (NUTTALL) – BOLLI et al., p. 373, pl. 59, figs 5–9; pl. 79, fig. 20.
2006 *Anomalinoides alazanensis* (NUTTALL) – ORTIZ and THOMAS, p. 111, pl. 3, figs. 3a–c.

Description: Test low trochospiral, almost planispiral, circular in outline, involute, biconvex in cross-section; chambers increasing gradually in size; strongly depressed sutures; wall calcareous, hyaline; smooth, finely perforated; aperture interiomarginal.

Anomalinoides grosserugosus (GÜMBEL, 1868)
Plate 11, Figures 7–8

1868 *Truncatulina grosserugosa* n. sp. – GÜMBEL, p. 82, pl. 2, fig. 104.
1961 *Anomalina grosserugosa* (GÜMBEL) – KAASSCHIETER, p. 217, pl. 12, fig. 14.
1970 *Anomalina grosserugosa* (GÜMBEL) – LE CALVEZ, p. 198, pl. 40, fig. 2.
1983 *Anomalina grosserugosa* (GÜMBEL) – SETIAWAN, p. 132, pl. 14, fig. 1.

Description: Test low trochospiral, almost planispiral, circular in outline, involute, biconvex in cross-section; chambers increasing gradually in size, strongly inflated; strongly depressed sutures; wall calcareous, hyaline; smooth, coarsely perforated; aperture interiomarginal.

Anomalinoides cf. *A. chileana* (TODD and KNIKER, 1952)
Plate 11, Figures 9–10

1952 *Anomalina chileana* n. sp. – TODD and KNIKER, p. 27, pl. 4, fig. 34.

Description: Test low trochospiral, almost planispiral, circular in outline, involute, biconvex in cross-section; chambers increasing gradually in size, ten to eleven chambers in final whorl; deep umbilicus; strongly depressed sutures, curved backward; wall calcareous, hyaline; smooth, finely perforated; aperture interiomarginal.

Genus *Heterolepa* FRANZENAU, 1884

Type species: *Heterolepa dutemplei* (D'ORBIGNY, 1846)

Heterolepa dutemplei (D'ORBIGNY, 1846)
Plate 11, Figures 11–13

1846 *Rotalina dutemplei* n. sp. – D'ORBIGNY, p. 157, pl. 8, figs. 19–21.
1875 *Truncatulina dutemplei* (D'ORBIGNY) – HANTKEN, p. 71, pl. 8, fig. 5.
1846 *Rotalina dutemplei* D'ORBIGNY – D'ORBIGNY, p. 157, pl. 8, figs. 19–21.
1855 *Rotalia bruckneri* n. sp. – REUSS, p. 273, pl. 12, fig. 7.
1857 *Rotalina dutemplei* D'ORBIGNY – EGGER, p. 274, pl. 7, fig. 8.
1868 *Rotalia praecincta* n. sp. – KARRER, p. 189, pl. 5, fig. 7.
1884 *Truncatulina praecincta* (KARRER) – BRADY, p. 667, pl. 95, figs. 1–3.
1884 *Heterolepa costata* n. sp. – FRANZENAU, p. 216, pl. 5, figs. 2a–c.
1958 *Cibicides dutemplei* (D'ORBIGNY) – BATJES, p, pl. 9, figs. 9–11.
1960 *Cibicides dutemplei* (D'ORBIGNY) – CHRISTODOULOU, p. 92, pl. 13, figs. 8a–c.
1961 *Cibicides dutemplei* (D'ORBIGNY) – KAASSCHIETER, p. 218, pl. 12, fig. 15.

1962 *Cibicides dutemplei* (D'ORBIGNY) – KIESEL, p. 73, pl. 11, fig. 1.
1964 *Heterolepa dutemplei* (D'ORBIGNY) – LOEBLICH and TAPPAN, p. C758, pl. 623, figs. 3a–c.
1966 *Cibicides dutemplei* (D'ORBIGNY) – BUTT, p. 68, pl. 4, figs. 9a–c.
1971 *Heterolepa dutemplei* (D'ORBIGNY) – POPESCU and IVA, p. 14, pl. 12, fig. 2.
1971 *Heterolepa dutemplei* (D'ORBIGNY) – VERHOEVE, p. 109, pl. 5, figs. 18a–c; pl. 10, fig. 7.
1975 *Heterolepa dutemplei* (D'ORBIGNY) – BRAGA et al., p. 109, pl. 6, figs. 1–3.
1979 *Cibicides dutemplei* (D'ORBIGNY) – HAGEMAN, p. 91, pl. 3, figs. 5a–b.
1982 *Cibicides dutemplei* (D'ORBIGNY) – VAN DER ZWAAN, p. 145, pl. 5, figs. 1a–c and 2a–c.
1983 *Cibicides dutemplei* (D'ORBIGNY) – SETIAWAN, p. 126, pl. 11, figs. 4a–c.
1984 *Cibicides dutemplei* (D'ORBIGNY) – JONKERS, pl. 4, figs. 2, 3a–b.
1985 *Heterolepa dutemplei* (D'ORBIGNY) – GRÜNIG, p. 275, pl. 11, figs. 4–6.
1986 *Cibicidoides dutemplei* (D'ORBIGNY) – VAN MORKHOVEN et al., p. 112, pl. 35, figs. 1–2.
1993 *Heterolepa dutemplei* (D'ORBIGNY) – DARAKCHIEVA and JURANOV, p. 69, pl. 2, figs. 7–8.
2000 *Cibicides dutemplei* (D'ORBIGNY) – DEN DULK, pl. 7, figs. 2a–b.
2000 *Cibicides dutemplei* (D'ORBIGNY) – KOUWENHOVEN, pl. 2, figs. 2a–c.

Description: Test trochospiral, spiral side evolute, umbilical side involute, biconvex in cross-section; large central umbilicus; chambers increasing gradually in size, eigth to nine chambers in final whorl; sutures barely visible, slightly depressed, curved; wall calcareous, hyaline; smooth, coarsely perforated; aperture interiomarginal, extending to umbilical area.

Heterolepa simplex FRANZENAU, 1884
Plate 11, Figures 14–15

1884 *Heterolepa simplex* n. sp. – FRANZENAU, p. 215, pl. 5, figs. 1a–c.

Description: Test trochospiral, spiral side evolute, umbilical side involute, biconvex in cross-section; periphery rounded; chambers increasing gradually in size, eigth - nine chambers in final whorl; sutures barely visible, slightly depressed; wall calcareous, hyaline; smooth, coarsely perforated; aperture interiomarginal.

Family Gavelinellidae HOFKER, 1956
Subfamily Gyroidinoidinae SAIDOVA, 1981

Genus *Gyroidinoides* BROTZEN, 1942

Type species: *Gyroidinoides nitida* (REUSS, 1845)

Gyroidinoides dissimilis (CUSHMAN and RENZ, 1947)
Plate 11, Figures 16

1947 *Gyroidina dissimilis* n. sp. – CUSHMAN and RENZ, p. 32, pl. 3, fig. 4.
1982 *Gyroidinoides dissimilis* (CUSHMAN and RENZ) – SZTRÁKOS, pl. 22, fig. 15.
1987 *Gyroidinoides dissimilis* (CUSHMAN and RENZ) – SZTRÁKOS, pl. 12, fig. 17.

Description: Test trochospiral, spiral side evolute, umbilical side involute, triangular, plano-convex in cross-section; chambers increasing gradually in size; sutures barely visible; wall calcareous, hyaline; smooth, coarsely perforated; aperture interiomarginal, extending to umbilical area.

Gyroidinoides soldanii (D'ORBIGNY, 1826)
Plate 11, Figures 19–21

1826 *Rotalina soldanii* n. sp. – (D'ORBIGNY), p. 278, pl. 8, figs. 10–12.
1846 *Gyroidina soldanii* (D'ORBIGNY) – D'ORBIGNY, p. 155, pl. 8, figs. 10–12.
1953 *Gyroidina soldanii* (D'ORBIGNY) – MYATLYUK, p. 61, pl. 5, figs. 3–5.
1958 *Gyroidina soldanii* (D'ORBIGNY) – BATJES, p. 147, pl. 7, figs. 12–13.
1975 *Gyroidinoides soldanii* (D'ORBIGNY) – BRAGA et al., p. 109, pl. 6, figs. 10–11.
1975 *Gyroidina soldanii* (D'ORBIGNY) – SAMUEL, p. 151, pl. 81, figs. 3–4.

1983 *Gyroidinoides soldanii* (D'ORBIGNY) – SETIAWAN, p. 131, pl. 13, fig. 4.
1985 *Gyroidinoides soldanii* (D'ORBIGNY) – GRÜNIG, p. 275, pl. 10, figs. 12–14.
1987 *Gyroidinoides* ex. gr. *soldanii* (D'ORBIGNY) – SZTRÁKOS, pl. 13, fig. 4.
1991 *Gyroidinoides soldanii* (D'ORBIGNY) – CIMERMAN and LANGER, p. 75, pl. 85, figs. 5–6.

Description: Test trochospiral, spiral side evolute, umbilical side involute, plano-convex in cross-section; large central umbilicus; chambers increasing gradually in size, eigth - nine chambers in final whorl; sutures depressed around umbilicus and forming a rosette pattern around umbilical region; wall calcareous, hyaline; smooth, finely perforated; aperture interiomarginal, extending to umbilical area.

Gyroidinoides sp.
Plate 11, Figure 17

Description: Test trochospiral, spiral side evolute, umbilical side involute, plano-convex to biconvex in cross-section; chambers increasing gradually in size; sutures depressed around umbilicus and forming a rosette pattern around umbilical region; wall calcareous, hyaline; smooth, finely perforated; aperture interiomarginal, extending to umbilical area.

Family Gavelinellinae HOFKER, 1957

Genus *Gavelinella* BROTZEN, 1942

Type species: *Gavelinella pertusa* (MARSSON, 1878)

Gavelinella micra (BERMÚDEZ, 1949)
Plate 11, Figures 22–23

1949 *Cibicides micrus* n. sp. – BERMÚDEZ, p. 302, pl. 24, figs. 34–36.
1975 *Gavelinella micra* (BERMÚDEZ) – BRAGA et al., p. 109, pl. 6, fig. 15.
1982 *Cibicides micrus* (BERMÚDEZ) – AGIP, pl. 51, figs. 9d–v.
1985 *Gavelinella micra* (BERMÚDEZ) – GRÜNIG, p. 275, pl. 10, figs. 23–25.

Description: Test trochospiral in earlier three to four chambers, becoming planispiral in final chambers, test circular in outline, oval in cross-section; periphery rounded with thin keel; large umbilical knob; thick radial, elevated sutures; wall calcareous, hyaline; smooth, coarsely perforated; aperture interiomarginal.

Genus *Hanzawaia* ASANO, 1944

Type species: *Hanzawia nipponica* ASANO, 1944

Hanzawaia ammophila (GÜMBEL, 1868)
Plate 11, Figures 25–26

1868 *Rotalia ammophila* n. sp. – GÜMBEL, p. 652, pl. 2, figs. 90a–b.
1930 *Cibicides cushmani* n. sp. – NUTTALL, p. 291, pl. 25, figs. 3, 5–6.
1948 *Cibicides cushmani* NUTTALL – CUSHMAN and RENZ, p. 41, pl. 8, figs. 22–23.
1949 *Cibicides cushmani* NUTTALL – BERMÚDEZ, p. 297, pl. 26, figs. 4–6.
1949 *Cibicides cushmani* NUTTALL – CUSHMAN and STONE, p. 83, pl. 14, fig. 26.
1980 *Hanzawaia ammophila* (GÜMBEL) – SAPERSON and JANAL, p. 401, pl. 5, figs. 1–3.
1983 *Hanzawaia cushmani* (NUTTALL) – TJALSMA and LOHMANN, p. 32, pl. 17, figs, 1a–c.
1983 *Hanzawaia cushmani* (NUTTALL) – MILLER, p. 437, pl. 1, fig. 12.
1986 *Hanzawaia ammophila* (GÜMBEL) – VAN MORKHOVEN et al., p. 170, pl. 56, figs. 1–3.
1987 *Hanzawaia ammophila* (GÜMBEL) – MILLER and KATZ, p. 134, pl. 6, figs. 3a–b.
1992 *Hanzawaia cushmani* (NUTTALL) – MACKENSEN and BERGGREN, p. 620, pl. 3, figs. 1–4.
1994 *Cibicidina cushmani* (NUTTALL) – BOLLI et al., p. 370, pl. 57, figs 15–16.
2006 *Hanzawaia ammophila* (GÜMBEL) – ORTIZ and THOMAS, p. 120, pl. 7, figs. 5–6.

Description: Test trochospiral, circular in outline, oval, plano-convex in cross-section, involute umbilical side, evolute spiral side; periphery rounded with thick keel; thick radial, elevated sutures; wall calcareous, hyaline; smooth, coarsely perforated; aperture interiomarginal.

Hanzawaia producta (TERQUEM, 1882)
Plate 11, Figure 18

1882 *Truncatulina producta* n. sp. – TERQUEM, p. 92, pl. 9, figs. 20–21.
1961 *Hanzawaia producta* (TERQUEM) – KAASSCHIETER, p. 266, pl. 13, fig. 13.
1970 *Hanzawaia producta* (TERQUEM) – KIESEL, p. 3, pl. 21, fig. 2.
1970 *Hanzawaia producta* (TERQUEM) – LE CALVEZ, p. 201, pl. 44, figs. 3, 9.
1970 *Hanzawaia producta* (TERQUEM) – NYÍRŐ, p. 201, pl. 44, figs. 3, 9.
1988 *Hanzawaia producta* (TERQUEM) – HORVÁTH-KOLLÁNYI, p. 93, pl. 29, figs. 3–5.

Description: Test trochospiral, circular in outline, plano-convex in cross-section, involute umbilical side, evolute spiral side; periphery rounded with keel; relatively large umbilicus, slightly compressed sutures; wall calcareous, hyaline; smooth, coarsely perforated; aperture interiomarginal.

Superfamily Orbitoidacea SCHWAGER, 1876
Family Linderinidae LOEBLICH and TAPPAN, 1984

Genus *Eoannularia* COLE and BERMÚDEZ, 1944

Type species: *Eoannularia eocenica* COLE and BERMÚDEZ, 1944

Eoannularia eocenica COLE and BERMÚDEZ, 1944
Plate 11, Figure 24

1944 *Eoannularia eocenica* n. sp. – COLE and BERMÚDEZ, p. 342, pl. 24, figs. 12–14.
1969 *Eoannularia eocenica* COLE and BERMÚDEZ – ZILAHY, p. 158, pl. 7, figs. 10–13.
1976 *Eoannularia eocenica* COLE and BERMÚDEZ – SIREL, p. 80, pl. 1, figs. 1–3, pl. 2, 1–2, 4–5, 8–9.
1988 *Eoannularia eocenica* COLE and BERMÚDEZ – HORVÁTH-KOLLÁNYI, p. 83, pl. 23, figs. 1–2.
2006 *Eoannularia eocenica* COLE and BERMÚDEZ – CIMERMAN et al., p. 40, pl. 12, fig. 3.

Description: Test small, circular in outline, strongly compressed in cross-section; large umbilicus; wall formed by calcareous meshwork.

Superfamily Rotaliacea EHRENBERG, 1839
Family Rotaliidae EHRENBERG, 1839
Subfamily Pararotaliinae REISS, 1963

Genus *Pararotalia* LE CALVEZ, 1949

Type species: *Pararotalia inermis* (TERQUEM, 1882)

Pararotalia inermis (TERQUEM, 1882)
Plate 11, Figures 27–28

1882 *Rotalina inermis* n. sp. –TERQUEM, p. 38, pl. 6, fig. 1.
1970 *Pararotalia inermis* (TERQUEM) – LE CALVEZ, p. 163, pl. 34, figs. 6–7

Description: Test trochospiral, evolute, circular in outline, biconvex in cross-section; periphery undulate with broad keel; deep, distinct umbilicus surrounded by numerous large-sized nodes; sutures strongly depressed; wall calcareous, hyaline; smooth, finely perforated; aperture interiomarginal, extending to umbilical area.

Genus *Rotalia* LAMARCK, 1804

Type species: *Rotalia trochidiformis* (LAMARCK, 1804)

Rotalia sp. cf. *R. calcar* (D'ORBIGNY, 1826)
Plate 11, Figure 29

1826 C*alcarina calcar* n. sp. – D'ORBIGNY, p. 276, pl. 5, figs. 22–24.

Description: Test trochospiral, circular in outline, involute on umbilical side, evolute on spiral side, biconvex on cross-section; periphery acute, star-shaped; chambers increasing gradually in size; sutures distinct, depressed; wall calcareous, hyaline; smooth, finely perforated; aperture interiomarginal, extending to umbilical area.

Rotalia sp.
Plate 11, Figure 30

Description: Test trochospiral, circular in outline, involute on umbilical side, evolute on spiral side, convex-plane in cross-section; umbilicus filled up by coarse grains; chambers increasing gradually in size, seven to eigth chambers in final whorl; sutures distinct, depressed; wall calcareous, hyaline; smooth, coarsely perforated; aperture interiomarginal, extending to umbilical area.

Subfamily Ammoniinae SAIDOVA, 1981

Genus *Ammonia* BRÜNNICH, 1772

Type species: *Ammonia beccari* (LINNÉ, 1758)

Ammonia sp.
Plate 11, Figure 31

Description: Test trochospiral, circular in outline, biconvex in cross-section; periphery acute, star-shaped; chambers increasing gradually in size; sutures distinct, depressed; wall calcareous, hyaline; smooth, finely perforated; aperture interiomarginal, extending to umbilical area.

Family Elphidiidae Galloway, 1933
Subfamily Elphidiinae GALLOWAY, 1933

Genus *Elphidium* DE MONTFORT, 1808

Type species: *Elphidium macellum* (FICHTEL and MOLL, 1798)

Elphidium sp. cf. *E. laeve* (D'ORBIGNY, 1826)
Plate 11, Figures 32–33

1826 *Nonionina laevis* n. sp. – D'ORBIGNY, p. 294, fig. 46.
1970 *Elphidium laeve* (D'ORBIGNY) – LE CALVEZ, p. 168, pl. 25, fig. 1.

Description: Test planispiral, involute, circular in outline, oval, slightly compressed in cross-section; periphery rounded with thin keel; deep circular umbilicus; chambers increasing gradually in size; sutures strongly depressed; wall calcareous, hyaline; smooth, coarsely perforated; aperture interiomarginal, extending to umbilical area.

Table 1. Geographical coordinates, total thickness of Eocene sequences, number of samples and defined age of the investigated boreholes and outcrops

Boreholes and outcrops	Code	Latitude	Longitude	Total thickness of Eocene sequences (m)	Number of samples	Age (Nannoplankton Zone)
Csetény 61	Cst-61	47°18'48.48"	18°00'55.72"	249	48	NP16-NP19
Bakonycsernye 18	Bkcs-18	47°18'12.33"	18°04'58.64"	90	18	NP16-NP17
Padrag 5	Pa-5	47°03'27.57"	17°32'52.76"	256	13	NP15?-NP18
Somlóvásárhely 1	Sv-1	47°05'00.70"	17°23'24.39"	294	207	NP14-NP19
Devecser 4	Dv-4	47°07'09.31"	17°28'40.59"	236	83	NP15?-NP17
Bakonyszentkirály 3	Bszk-3	47°21'53.54"	17°56'05.85"	178	40	NP16-NP18
Balinka 285	Ba-285	47°21'36.99"	18°10'50.57"	98	31	NP16-NP17
Csákberény 89	Csbr-89	47°20'03.88"	18°20'31.18"	197	76	NP16
Dudar 240	D-240	47°18'41.75"	17°58'34.08"	169	37	NP16-NP19
Halimba 1	Hgy-1	47°03'20.76"	17°32'31.74"	54	34	NP15?-NP16
Tarján 13	Tj-13	47°36'13.49"	18°32'52.52"	43	15	NP16-NP17
Tarján 14	Tj-14	47°35'56.43"	18°33'22.25"	86	19	NP16-NP17
Csordakút	CSk.	47°35'05.36"	18°32'31.97"	35	22	NP16-NP17
Mátyás-hegy	Mh.	47°32'01.33"	19°01'04.57"	21	12	NP18-NP19

Table 2. Presence/absence of foraminifer species in Eocene profiles of the Hungarian Paleogene Basin.

Boreholes	**Dv-4**	**Hgy-1**		**Pa-5**	**Sv-1**						**Ba-285**		**Bkcs-18**		**D-240**				**Cst-61**				**Bszk-3**			**Cshr-89**		**Csk**	**Tj-13**		**Tj-14**		**Mh**	
Species (Nannoplankton zones)	**NP 17**	**?NP 15**	**NP 16**	**NP18**	**NP 14**	**NP 15**	**NP 16**	**NP 17**	**NP 18**	**NP 19**	**NP 16**	**NP 17**	**NP 16**	**NP 17**	**NP 16**	**NP 17**	**NP 18**	**NP 19**	**NP 16**	**NP 17**	**NP 18**	**NP 19**	**NP 16**	**NP 17**	**NP 18**	**NP 16**	**NP 16**	**NP 17**	**NP 16**	**?NP 17**	**NP 16**	**?NP17**	**NP 18**	**NP 19**
Acervulina sp.																												+						
Adelosina sp.																										+								
Almaena sp.													+																					
Ammomarginulina sp.													+																					
Ammonia sp.											+																							
Anomalinoides affinis			+					+					+			+	+					+												
Anomalinoides alazanensis			+										+	+																				
Anomalinoides cf. chileana													+																					
Anomalinoides grosserugosa			+										+																					
Articulina curta																										+								
Articulina laevigata																										+								
Articulina nitida																										+								
Asterigerina sp.										+																+	+							
Astrorhiza bakonycsernyensis n. sp													+																					
Bathysiphon eocenicus	+												+						+	+	+	+									+			+
Bathysiphon saidi	+												+																					+
Bolivina cookei														+																+					
Bolivina elongata			+					+	+		+	+	+	+		+	+		+	+			+	+										+
Bolivina nobilis			+					+	+	+	+	+	+	+		+	+						+	+										
Bolivina semistriata											+	+	+			+																		
Bolivina sp.			+	+					+										+	+		+				+			+					
Bolivinopsis foliacea	+																																	
Bulimina affinis																						+												
Bulimina parisensis																						+						+						
Bulimina sp.				+				+			+	+								+	+	+								+				+
Bulimina truncana	+							+				+	+	+		+	+			+														
Cancris sp.																									+									+
Chilostomella tenuis																																		+
Chilostomella sp.	+																																	+
Chrysalogonium tympaniplectiformis	+																					+												
Chrysalogonium sp.														+																				
Cibicides ammophilus	+																																	

Boreholes	Dv-4	Hgy-1		Pa-5	Sv-1						Ba-285		Bkcs-18		D-240				Cst-61				Bszk-3			Csbr-89		Csk	Tj-13		Tj-14		Mh	
Species (Nannoplankton zones)	NP 17	?NP 15	NP 16	NP18	NP 14	NP 15	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 16	NP 17	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 18	NP 16	NP 16	NP 17	NP 16	?NP 17	NP 16	?NP17	NP 18	NP 19
Cibicides boueanus	+																																	
Cibicides carinatus	+														+	+		+	+			+	+	+									+
Cibicides lobatulus		+	+	+							+	+														+			+		+			+
Cibicides mauricensis																										+								
Cibicides oligocenicus																																		+
Cibicides proprius																																		+
Cibicides pseudolobatulus																										+								
Cibicides pseudoungerianus	+																																	+
Cibicides pygmeus																											+					+		
Cibicides sp.	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+	+	+	+	+	+	+	+	+	+	+							+	+
Cibicides sublobatulus	+	+	+	+						+			+		+	+	+	+	+	+	+		+			+			+		+	+		
Cibicides sulzensis													+																					
Cibicides ungerianus	+	+	+	+							+	+	+													+								+
Cibicides westi		+	+													+	+	+					+	+	+	+								
Cibicidoides eocaenus	+										+	+			+	+	+	+	+	+		+												+
Cibicidoides perlucidus																			+	+														
Clavulina parisensis	+									+	+				+	+						+	+			+	+	+	+					
Clavulina terterensis								+	+																									
Clavulinoides alpina														+																				
Clavulinoides lakiensis elongata																+																		
Clavulinoides procerus n. sp.														+																				
Clavulinoides szabói	+		+	+	+	+	+	+			+	+	+	+		+			+	+	+	+			+	+	+	+				+		+
Cornuspira involvens													+																					+
Cylindroclavulina colomi	+			+																														
Cylindroclavulina rudislosta	+		+								+		+						+															+
Dentalina aboleta			+	+							+	+		+								+	+	+										
Dentalina approxiamata	+		+								+		+						+			+												
Dentalina cf. acuta			+									+	+	+				+	+	+		+												
Dentalina cornicula																						+												
Dentalina debilis																+		+																
Dentalina elegans	+		+	+	+	+	+	+	+		+	+	+						+	+	+	+	+	+	+									+
Dentalina fissicostata	+												+																					
Dentalina havanensis	+																																	
Dentalina inornata	+		+	+							+	+							+	+		+												+
Dentalina karreri	+																																	
Dentalina multilineata	+																																	

Boreholes	Dv-4	Hgy-1		Pa-5	Sv-1						Ba-285		Bkcs-18		D-240				Cst-61				Bszk-3			Csbr-89		Csk	Tj-13		Tj-14		Mh	
Species (Nannoplankton zones)	NP 17	?NP 15	NP 16	NP18	NP 14	NP 15	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 16	NP 17	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 18	NP 16	NP 16	NP 17	NP 16	?NP 17	NP 16	?NP17	NP 18	NP 19
Dentalina roemeri				+																		+												
Dentalina sp.	+		+	+	+	+	+	+	+		+	+	+	+					+	+	+	+	+	+	+	+								+
Dentalina subtilis	+												+			+	+	+				+												
Discorbis elegans		+	+	+																														
Discorbis parisiensis																											+	+						
Discorbis perplexa										+	+				+	+							+			+			+		+	+		+
Discorinopsis sp.																											+	+						
Dorothia textilaroides	+								+													+		+	+									
Dyocibicides uniserialis																																		+
Ellipsoglandulina multicostata	+																																	
Elphidium cf. *laeve*																													+		+			
Eoannularia eocenica	+														+																			
Eponides budensis			+	+							+	+			+	+	+									+					+			
Eponides haidingeri	+	+	+																+							+								
Eponides polyganus	+		+								+	+	+	+	+	+	+		+	+	+	+				+	+	+	+		+	+		+
Eponides sp.																																	+	+
Eponides umbonatus	+		+	+									+	+												+			+					
Fissurina cf. praeclara	+																																	
Fissurina orbignyana	+																																	
Fissurina sp.	+																																	+
Fissurina tricincta	+																																	
Frondicularia budensis	+																																	
Frondicularia semicosta																						+												
Frondicularia tenuissima																						+												
Fursenkoina hungarica																+							+	+										+
Fursenkoina schreibersiana											+	+														+								
Gavelinella micra												+										+	+	+										
Glandulina aequalis																									+									
Glandulina hantkeni																									+									
Glandulina inflata																										+								
Glandulina obtusissima																										+								
Glandulina sp.																						+												
Globocassidulina globosa	+																																	
Globulina gibba			+	+				+						+		+						+	+	+		+		+	+		+			+
Globulina guttula	+																																	
Globulina minuta																																		+

Boreholes	Dv-4	Hgy-1		Pa-5	Sv-1						Ba-285		Bkcs-18		D-240				Cst-61				Bszk-3			Csbr-89		Csk	Tj-13		Tj-14		Mh	
Species (Nannoplankton zones)	NP 17	?NP 15	NP 16	NP18	NP 14	NP 15	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 16	NP 17	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 18	NP 16	NP 16	NP 17	NP 16	?NP 17	NP 16	?NP17	NP 18	NP 19
Gonatosphaera inflata	+																																	
Guttulina irregularis	+				+										+								+			+	+	+	+		+			+
Gyroidinoides dissimilis																																		+
Gyroidinoides soldanii			+	+	+	+	+	+			+	+		+			+	+	+	+	+	+		+	+	+								+
Gyroidinoides koestleri																						+												
Gyroidionides sp.																						+												+
Hanzawaia ammophila																					+	+												
Hanzawaia producta									+																									+
Haplophragmoides sp.																	+																	
Heterolepa dutemplei		+	+	+			+	+	+		+	+	+	+	+	+	+	+	+	+			+	+	+	+			+		+			
Heterolepa simplex		+	+	+									+	+																				
Lagena clava	+																																	
Lagena globosa			+										+																					
Lagena hexagona																	+																	
Lagena laevis	+																																	
Lagena sulcata	+												+				+																	
Lagena tenuis ornata																		+																
Lenticulina arcuatostriata	+	+	+	+		+	+	+	+		+	+	+	+		+	+	+	+	+	+	+	+	+	+	+			+		+			
Lenticulina excisa	+																																	
Lenticulina falcifer	+																		+	+	+													
Lenticulina granulata																					+	+												
Lenticulina gutticostata	+																																	
Lenticulina platyptera	+												+	+					+	+	+	+												
Lenticulina sp.	+	+	+	+	+		+	+		+	+	+	+				+	+								+								+
Marginulina behmi	+		+	+				+	+		+		+						+		+	+	+	+	+									
Marginulina fragaria texasensis	+						+	+	+							+	+	+					+	+										
Marginulina hantkeni	+																																	
Marginulina pediformis	+																																	+
Marginulina propinqua				+										+																				
Marginulina sp								+	+																									
Marginulina tumida				+							+	+						+																
Marginulinopsis porvaensis													+	+																				
Marginulinopsis sp.													+																					
Martinottiella rhumbleri																		+																
Massilina sp.																		+																
Melonis sp. 1																		+													+			

Boreholes	Dv-4	Hgy-1		Pa-5	Sv-1						Ba-285		Bkcs-18		D-240				Cst-61				Bszk-3			Csbr-89		Csk	Tj-13		Tj-14		Mh	
Species (Nannoplankton zones)	NP 17	?NP 15	NP 16	NP18	NP 14	NP 15	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 16	NP 17	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 18	NP 16	NP 16	NP 17	NP 16	?NP 17	NP 16	?NP17	NP 18	NP 19
Miliola prisca																										+								
Miliola strigillata																										+								
Nodosarella lorifera	+																					+												+
Nodosarella sp.																						+												+
Nodosarella tuberosa	+			+																		+												
Nodosaria affinis	+																+																	
Nodosaria badenensis													+																					
Nodosaria crassa	+																																	
Nodosaria elegans			+	+							+	+		+																				
Nodosaria exilis																						+												
Nodosaria intermedia	+	+	+	+							+	+		+																				
Nodosaria longiscata	+																	+	+	+	+	+												
Nodosaria pyrula	+																																	
Nodosaria radicula	+																																	
Nodosaria sp.	+	+	+	+					+		+	+		+		+	+	+	+	+	+	+				+		+				+		+
Nonion affinae																											+							+
Nonion boueanum																											+							
Nonion granosum			+	+																														
Nonion scaphum	+	+	+	+	+						+	+				+	+	+	+				+	+		+	+	+	+		+	+		+
Nonion soldani																														+		+		
Nonionella sp.																																		+
Nonionella wemmelensis																													+					+
Nuttalides sp.																+										+								
Orthomorphina rohri																																		+
Pararotalia curry																											+	+						
Pararotalia inermis					+					+					+	+							+	+					+					
Planularia sp. 1														+																				
Planularia sp. 2	+																		+			+												+
Planulina austriaca				+										+																				
Planulina compressa				+										+																				
Planulina costata	+				+	+	+	+			+	+	+	+			+					+				+			+					
Planulina sp.							+	+																										
Plectina eocenica	+					+	+	+						+																				
Pleurostomella acuta	+																																	+
Pleurostomella alternans	+			+																		+												+
Pleurostomella eocaena	+																																	

Boreholes	Dv-4	Hgy-1		Pa-5	Sv-1						Ba-285		Bkcs-18		D-240				Cst-61				Bszk-3			Csbr-89		Csk	Tj-13		Tj-14		Mh	
Species (Nannoplankton zones)	NP 17	?NP 15	NP 16	NP18	NP 14	NP 15	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 16	NP 17	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 18	NP 16	NP 16	NP 17	NP 16	?NP 17	NP 16	?NP17	NP 18	NP 19
Pleurostomella incrassata	+																																	
Pleurostomella sp.																						+												
Pseudonodosaria discreta														+																				
Pullenia jarvisi	+																																	
Pullenia quinqueloba	+																																	+
Pyrgo bulloides										+					+											+			+		+			
Pyrgo simplex																										+	+	+						
Pyrulina sp.																											+	+						
Queraltina epistominoides																										+								
Quinqueloculina bicarinata											+															+		+						
Quinqueloculina buchiana																										+								
Quinqueloculina carinata										+	+															+	+		+	+	+	+		
Quinqueloculina affig. carinata																											+	+						
Quinqueloculina cf. contorta																											+	+						
Quinqueloculina juleana											+														+	+			+	+	+			
Quinqueloculina seminula															+											+								
Quinqueloculina ungeriana																												+						
Quinqueloculina sp. 1		+			+			+	+	+	+												+	+	+		+	+	+	+	+	+		
Quinqueloculina sp. 2																										+								
Ramulina sp.													+																					+
Reophax harrisi	+															+			+			+												+
Reussella elongata																						+				+								
Reussella sp.	+			+												+															+			
Reussella terquemi																																		+
Rhabdammina abyssorum																						+												
Rotalia cf. *R. calcar*															+											+					+			
Rotalia trochidiformis	+									+																	+	+						
Rotalia sp.	+									+													+			+					+			
Saracenaria hantkeni	+												+	+								+												+
Sphaerogypsina globula	+				+					+																	+							+
Spirolina mariei																										+								
Spirolina pedum																										+								
Spirolina sp.																										+		+						
Spiroloculina bicarinata																							+							+				
Spiroloculina jarvisi																										+								
Spiroloculina obscura																										+				+		+	+	

Boreholes	Dv-4	Hgy-1		Pa-5	Sv-1						Ba-285		Bkcs-18		D-240				Cst-61				Bszk-3			Csbr-89		Csk	Tj-13		Tj-14		Mh	
Species (Nannoplankton zones)	NP 17	?NP 15	NP 16	NP18	NP 14	NP 15	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 16	NP 17	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 18	NP 16	NP 16	NP 17	NP 16	?NP 17	NP 16	?NP17	NP 18	NP 19
Spiroplectammina carinata	+						+	+	+	+						+	+	+				+	+	+	+									+
Spiroplectammina subhaeringensis	+																																	+
Stilostomella abyssorrum	+																					+												+
Stilostomella adolphina	+																					+												
Stilostomella consobrina			+	+																						+								+
Stilostomella curvatura	+																																	
Stilostomella elegans	+		+	+							+	+	+					+	+	+	+	+												
Stilostomella emaciata	+																	+																+
Stilostomella hoernesi	+																																	
Stilostomella pauperata																																		+
Stilostomella sp.	+										+	+	+		+	+	+	+	+	+	+	+												+
Textularia cf. partschii			+																															
Textularia crookshanki													+			+																		+
Textularia deperdita													+									+				+								+
Textularia globosa	+																																	
Textularia halkyardi																																		+
Textularia lancelota			+																							+								+
Textularia pala														+																				
Textularia sp. 1.	+				+	+	+	+	+							+								+	+	+								+
Textularia sp. 2.																																		+
Textularia sp. 3	+																		+	+														
Triloculina gibba										+																+	+	+						
Triloculina porvaensis																										+		+	+	+	+	+		+
Triloculina sp.					+					+	+											+				+	+		+					+
Triloculina trigonula																												+						
Tritaxilina pupa	+																		+	+	+	+												+
Tritaxilina sp.	+		+																			+												
Uvigerina chirana	+						+	+	+							+	+																	
Uvigerina cocoaensis										+																								
Uvigerina cocoaensis jackonis																										+								+
Uvigerina eocaena	+			+	+	+	+	+			+	+		+		+	+	+		+		+		+	+	+	+							+
Uvigerina gallowayi	+			+																						+								
Uvigerina gracilis				+							+		+	+												+								
Uvigerina hantkeni																										+			+					+
Uvigerina hourcqi											+	+								+	+	+												
Uvigerina multistriata	+							+	+				+	+		+	+			+		+		+	+		+			+				+

Boreholes	Dv-4	Hgy-1		Pa-5	Sv-1						Ba-285		Bkcs-18		D-240				Cst-61				Bszk-3			Cshr-89		Csk	Tj-13		Tj-14		Mh	
Species (Nannoplankton zones)	NP 17	?NP 15	NP 16	NP18	NP 14	NP 15	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 16	NP 17	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 18	NP 19	NP 16	NP 17	NP 18	NP 16	NP 16	NP 17	NP 16	?NP 17	NP 16	?NP17	NP 18	NP 19
Uvigerina pigmea																										+								
Uvigerina rippensis																										+								
Uvigerina tenustriata																										+								
Vaginulina legumen				+																														
Vaginulina sp. cf. *V. ex gr. mexicana*	+																																	
Vaginulinopsis fragaria	+																					+												
Vaginulinopsis hagni n. sp.	+																																	
Vaginulinopsis hantkeni	+																																	
Vaginulinopsis minimus	+																																	
Vaginulinopsis pseudodecorata	+		+								+	+	+				+		+	+	+	+			+	+			+		+	+		+
Vaginulinopsis sp.	+																				+	+				+								
Valvulineria sp.	+																																	
Verneuilina sp.									+				+																					
Vulvulina advena	+																					+												
Vulvulina jarvisi			+														+		+		+	+		+	+									

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Plate 1

1. *Astrorhiza bakonycsernyensis* n.sp. (Inv. num.: M 2008.116.1) scale=1.1 mm
2–3. *Bathysiphon eocenicus* CUSHMAN and HANNA, 1927 scale=2 mm
4. *Bathysiphon saidi* (ANAN, 1994) scale=1.4 mm
5. *Rhabdammina abyssorum* SARS, 1869 scale=1.3 mm
6. *Reophax harrisi* nomen novum scale=2 mm
7. *Ammomarginulina* sp. scale=1.9 mm
8. *Haplophragmoides* sp. scale=1.23 mm
9. *Bolivinopsis foliacea* (GRZYBOWSKI, 1898) scale=1.9 mm
10–11. *Spiroplectammina carinata* (D'ORBIGNY, 1846) scale=0.43 mm
12. *Spiroplectammina subhaeringensis* (GRZYBOWSKI, 1896) scale=0.38 mm
13. *Vulvulina advena* CUSHMAN, 1926 scale=1.6 mm
14. *Vulvulina jarvisi* CUSHMAN, 1932 scale=1.5 mm
15. *Plectina dalmatina* (SCHUBERT, 1911) scale=0.75 mm
16. *Plectina eocenica* CUSHMAN, 1936 scale=1.63 mm
17. *Verneuilina sp.* scale=0.95 mm
18. *Dorothia textilaroides* (HANTKEN, 1875) scale=0.95 mm
19. *Martinottiella rhumberi* CUSHMAN, 1936 scale=0.55 mm
20. *Textularia crookshanki* (HAQUE, 1956) scale=1.8 mm

Plate 1

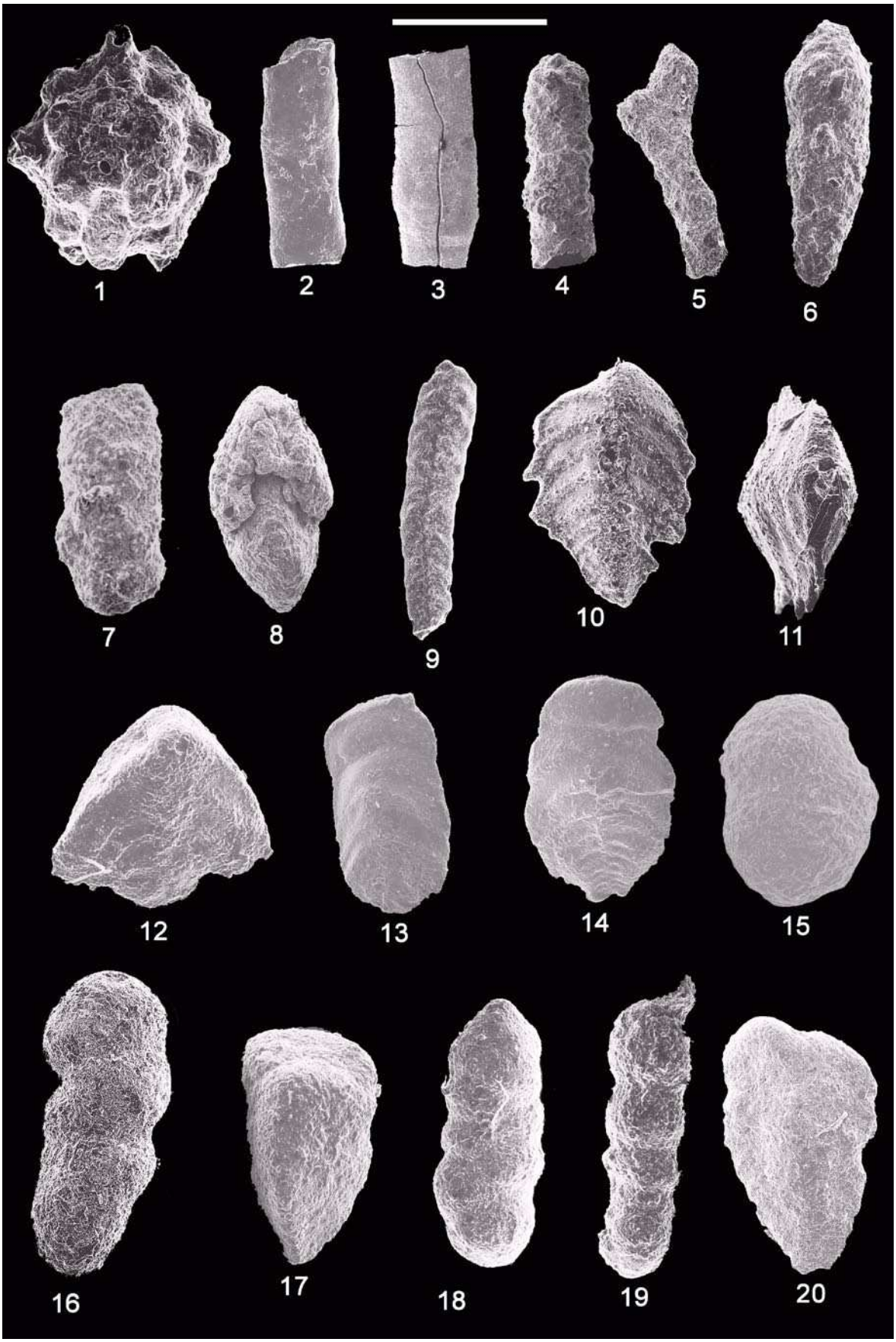

Plate 2

1–2. *Textularia deperdita* D'ORBIGNY, 1826 scale=0.25 mm

3. *Textularia halkyardi* LALICKER, 1935 scale=0.95 mm

4–5. *Textularia globosa* (HANTKEN, 1875) scale=1 mm

6–7. *Textularia* cf. *partschii* CZJZEK, 1848 scale=0.85 mm

8. *Textularia lancelota* (KARRER, 1861) scale=1.55 mm

9. *Textularia pala* CZJZEK, 1848 scale=0.45 mm

10–11. *Textularia* sp. 1 scale=1 mm

12. *Textularia* sp. 2 scale=1 mm

13–14. *Textularia* sp. 3 scale=0.25 mm

15–16. *Clavulinoides alpina* (CUSHMAN, 1936) scale=1.53 mm

17. *Clavulinoides lakiensis elongata* HAQUE, 1949 scale=1.6 mm

18–19. *Clavulinoides szabói* (HANTKEN, 1868) scale=1.55 mm

20. *Clavulinoides procerus* n. sp. (Inv. num.: M 2008.117.1) scale=0.6 mm

21. *Clavulina terterensis* KHALILOV, 1958 scale=1.3 mm

22–23. *Cylindroclavulina colomi* HAGN, 1956 scale=1 mm

24. *Cylindroclavulina rudislosta* (HANTKEN, 1875) scale=1.6 mm

25–27. *Tritaxilina pupa* (GÜMBEL, 1868) scale=1.85 mm

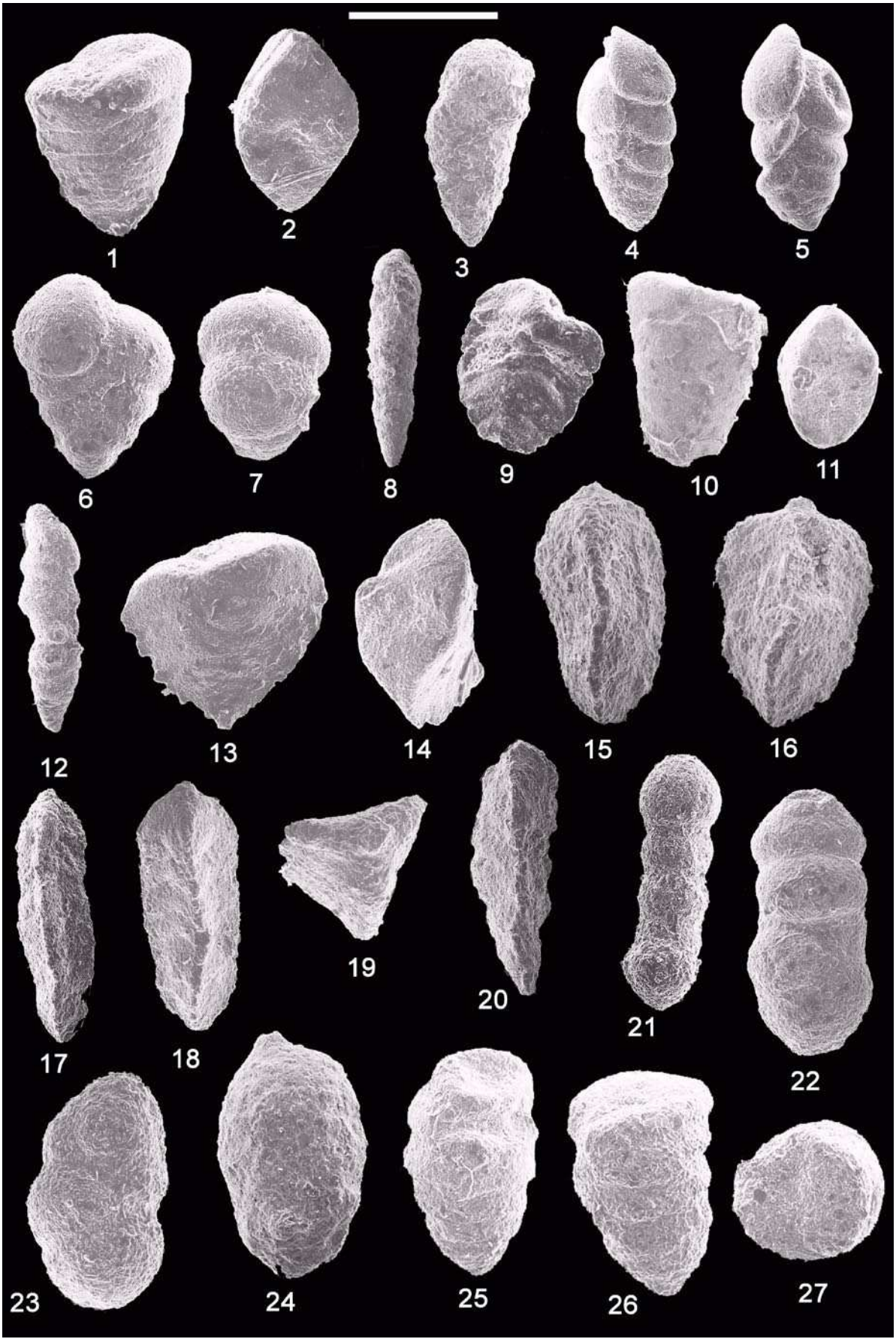

Plate 3

1. *Tritaxilina* sp. scale=1.85 mm

2–3. *Cornuspira involens* (REUSS, 1864) scale=0.65 mm

4. *Adelosina* sp. scale=0.68 mm

5. *Spiroloculina obscura* (CUSHMAN and TODD, 1882) scale=0.34 mm

6–7. *Spiroloculina bicarinata* TERQUEM, 1882 scale=0.8 mm

8–9. *Spiroloculina jarvisi* CUSHMAN and TODD, 1944 scale=0.75 mm

10. *Quinqueloculina buchiana* D'ORBIGNY, 1846 scale=0.9 mm

11. *Quinqueloculina juleana* D'ORBIGNY, 1846 scale=0.45 mm

12. *Quinqueloculina seminula* (LINNÉ, 1758) scale=0.8 mm

13. *Quinqueloculina* sp. 1. scale=0.95 mm

14. *Quinqueloculina* sp. 2. scale=1 mm

15. *Pyrgo bulloides* (D'ORBIGNY, 1826) scale=0.34 mm

16. *Articulina curta* LE CALVEZ, 1947 scale=0.45 mm

17. *Articulina laevigata* TERQUEM, 1882 scale=0.32 mm

18. *Articulina nitida* D'ORBIGNY, 1826 scale=0.18 mm

19–20. *Miliola prisca* (D'ORBIGNY, 1826) scale=0.85 mm

21–22. *Miliola strigillata* (D'ORBIGNY, 1850) scale=0.96 mm

23. *Massilina* sp. 1. scale=0.78 mm

24–25. *Spirolina mariei* LE CALVEZ, 1952 scale=0.42 mm

26. *Spirolina pedum* D'ORBIGNY, 1826 scale=1 mm

27. *Spirolina* sp. scale=0.45 mm

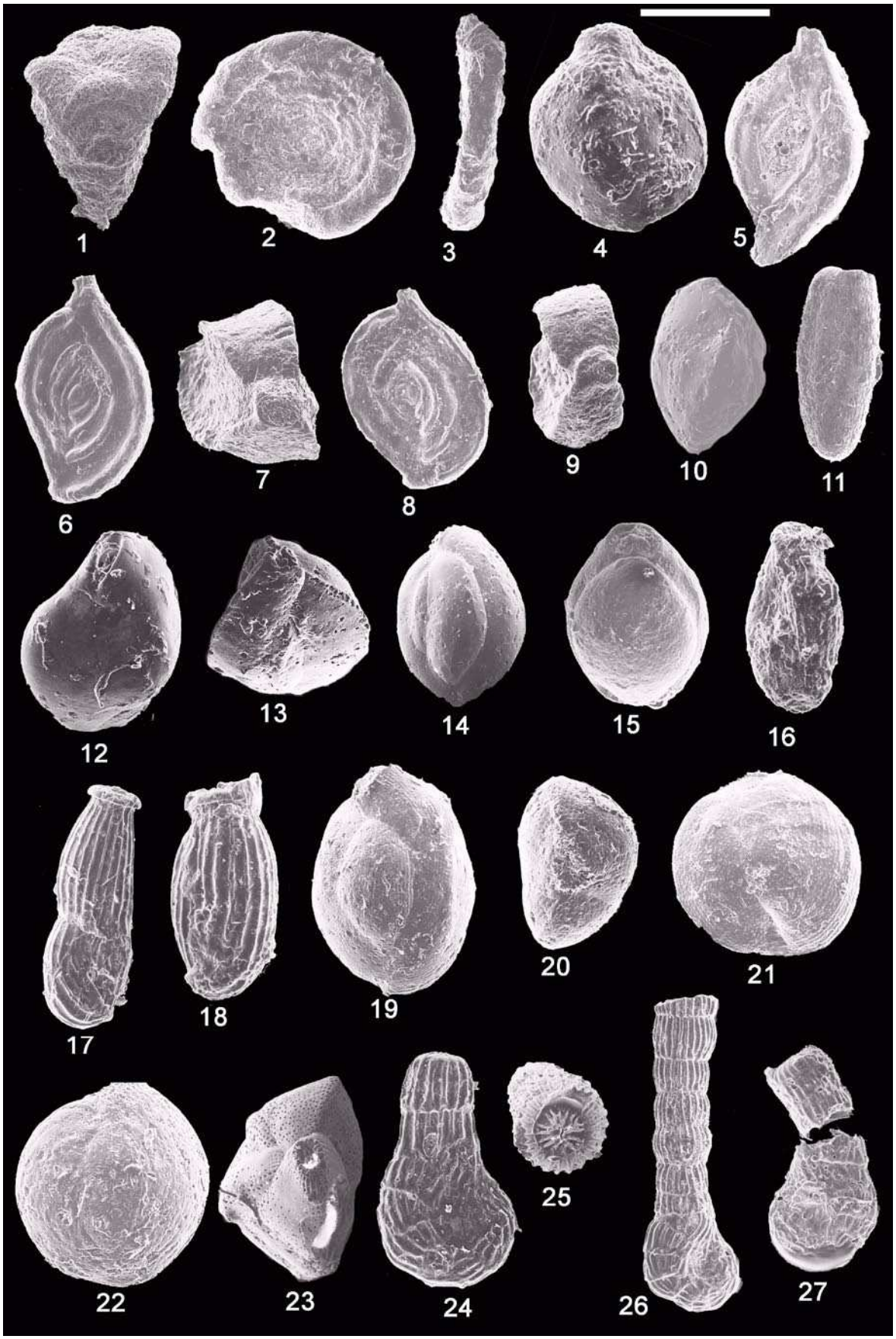

Plate 4

1–2. *Chrysalogonium tympaniplectiformis* (SCHWAGER, 1866) scale=0.85 mm

3. *Chrysalogonium* sp. scale=0.45 mm

4. *Dentalina* cf. *acuta* D'ORBIGNY, 1846 scale=1 mm

5. *Dentalina approximata* REUSS, 1846 scale=1.3 mm

6. *Dentalina aboleta* SCHWAGER, 1865 scale=0.95 mm

7–8. *Dentalina cornicula* (D'ORBIGNY, 1826) scale=1 mm

9. *Dentalina debilis* HANTKEN, 1868 scale=1.1 mm

10. *Dentalina elegans* D'ORBIGNY, 1846 scale=1 mm

11. *Dentalina fissicostata* GÜMBEL, 1868 scale=0.95 mm

12. *Dentalina antennula* D'ORBIGNY, 1846 scale=1.2 mm

13. *Dentalina inornata* D'ORBIGNY, 1846 scale=1 mm

14. *Dentalina multilineata* BORNEMANN, 1855 scale=1 mm

15. *Dentalina karreri* (HANTKEN, 1868) scale=0.85 mm

16. *Dentalina havanensis* NEUGEBOREN, 1856 scale=1.2 mm

17. *Dentalina roemeri* NEUGEBOREN, 1856 scale=1 mm

18. *Dentalina subtilis* NEUGEBOREN, 1856 scale=1 mm

19. *Nodosaria affinis* REUSS, 1845 scale=1.1 mm

20. *Nodosaria badenensis* (D'ORBIGNY, 1846) scale=1.3 mm

21. *Nodosaria crassa* HANTKEN, 1868 scale=1 mm

22. *Dentalina budensis* HANTKEN, 1875 scale=1.1 mm

23. *Nodosaria elegans* (HANTKEN, 1875) scale=0.65 mm

24. *Nodosaria exilis* NEUGEBOREN, 1852 scale=1.1 mm

25–26. *Nodosaria acuminata* HANTKEN, 1875 scale=0.85 mm

27. *Nodosaria longiscata* D'ORBIGNY, 1846 scale=0.32 mm

28. *Nodosaria pyrula* (D'ORBIGNY, 1826) scale=0.75 mm

29. *Nodosaria radicula* LINNÉ, 1758 scale=1 mm

30. *Pseudonodosaria discreta* (REUSS, 1850) scale=1 mm

31–32. *Gonatosphaera inflata* BERMÚDEZ, 1949 scale=1.2 mm

Plate 4

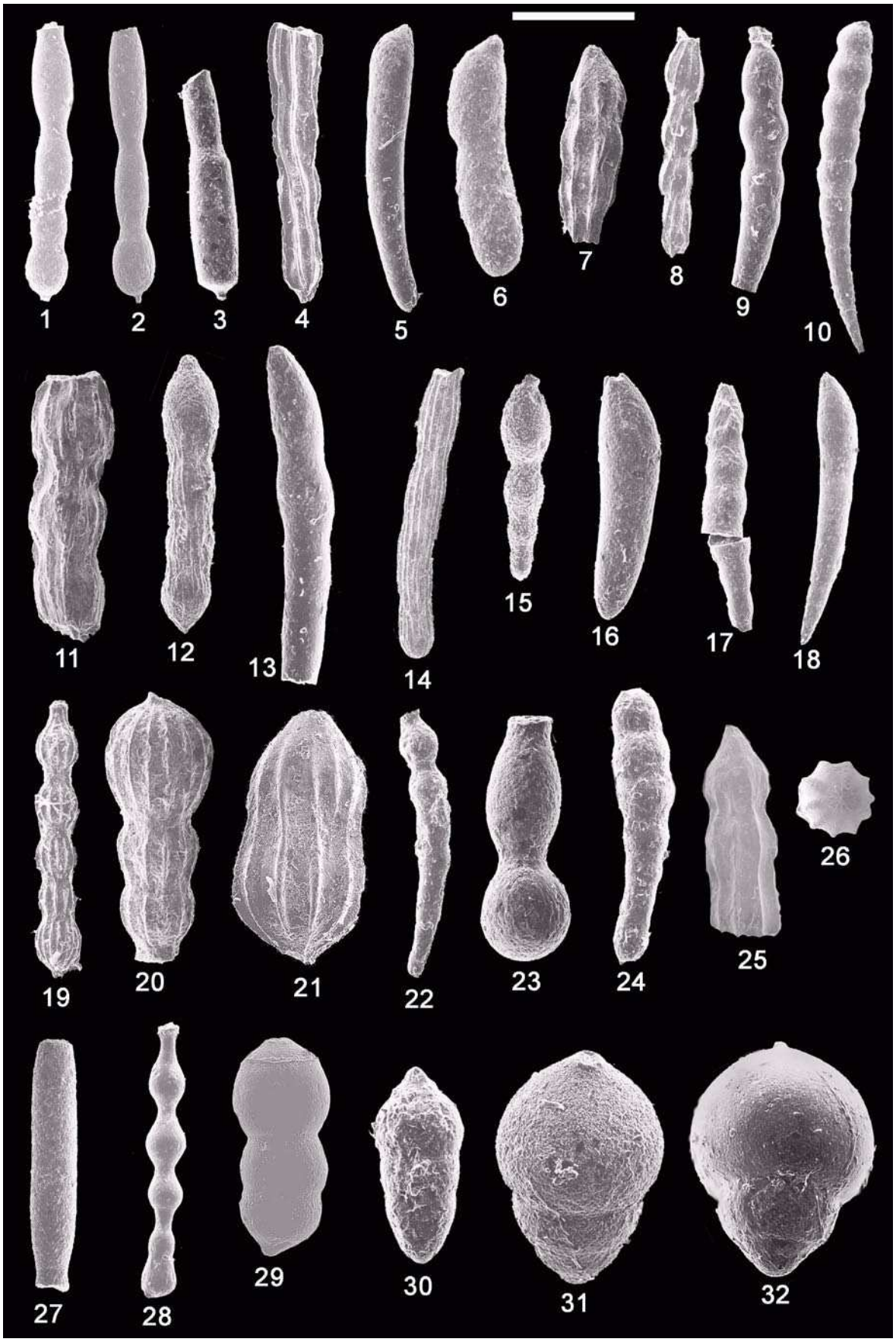

Plate 5

1. *Frondicularia semicosta* KARRER, 1878 scale=1.2 mm
2. *Frondicularia budensis* (HANTKEN, 1875) scale=1.1 mm
3–4. *Frondicularia tenuissima* HANTKEN, 1875 scale=1.2 mm
5–6. *Lenticulina arcuatostriata* (HANTKEN, 1875) scale=1.3 mm
7. *Lenticulina excisa* (BORNEMANN, 1855) scale=1.85 mm
8. *Lenticulina falcifer* (STACHE, 1865) scale=0.76 mm
9. *Lenticulina granulata* (HANTKEN, 1875) scale=1.55 mm
10. *Lenticulina gutticostata* (GÜMBEL, 1870) scale=1.7 mm
11. *Lenticulina platyptera* (REUSS, 1870) scale=1.15 mm
12. *Lenticulina* sp. scale=1.1 mm
13. *Marginulinopsis porvaensis* (HANTKEN, 1875) scale=1.3 mm
14. *Marginulinopsis* sp. scale=1.3 mm
15–16. *Saracenaria hantkeni* CUSHMAN, 1933 scale=1.3 mm
17. *Marginulina behmi* (REUSS, 1866) scale=0.95 mm
18. *Marginulina fragaria texasensis* (CUSHMAN and APPLIN, 1926) scale=1.3 mm
19–20. *Marginulina hantkeni* BANDY, 1949 scale=1 mm
21. *Marginulina pediformis* BORNEMANN, 1855 scale=1.1 mm
22. *Marginulina propinqua* HANTKEN, 1883 scale=1.3 mm
23. *Marginulina tumida* REUSS, 1851 scale=1.2 mm
24. *Marginulina* sp. 1. scale=0.95 mm
25. *Vaginulinopsis hagni* n. sp., holotype (Inv. num.: M 2008.118.1) scale=0.55 mm
26. *Vaginulinopsis hagni* n. sp. (Inv. num.: M 2008.118.2) scale=0.85 mm
27. *Vaginulinopsis hagni* n. sp. (Inv. num.: M 2008.118.3) scale=0.8 mm
28. *Vaginulinopsis hantkeni* (HANTKEN, 1875) scale=1 mm
29. *Vaginulinopsis minimus* (HANTKEN, 1875) scale=1.1 mm

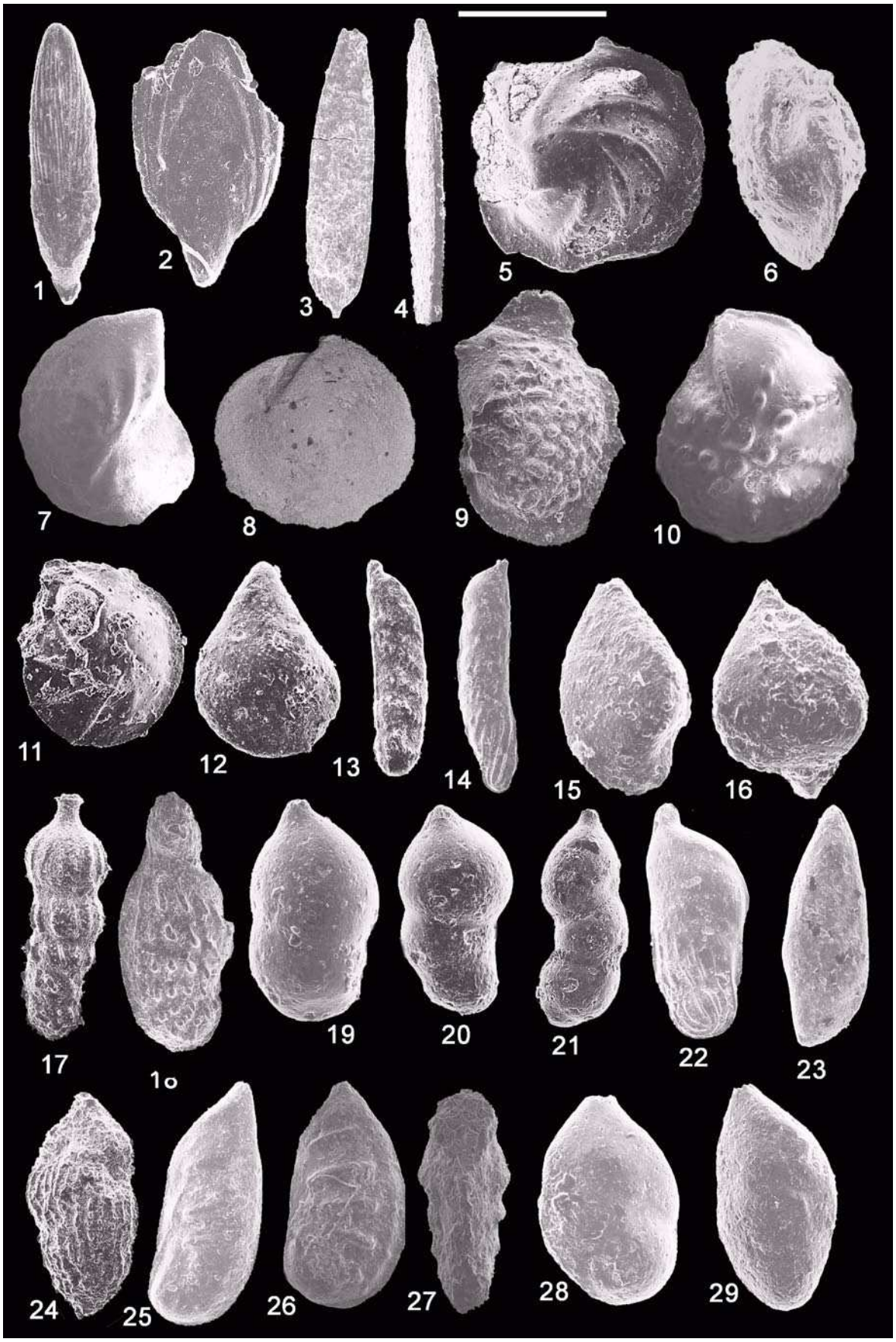

Plate 6

1. *Vaginulinopsis fragaria* (GÜMBEL, 1868) scale=1.2 mm
2. *Vaginulinopsis pseudodecorata* HAGN, 1956 scale=1.3 mm
3. *Vaginulinopsis* sp. scale=1.8 mm

4–5. *Planularia* sp. 1 scale=0.45 mm

6. *Planularia* sp. 2 scale=1.3 mm

7–8. *Vaginulina legumen* (LINNÉ, 1758) scale=1.2 mm

9. *Vaginulina* sp. cf. *V.* ex gr. *mexicana* NUTTALL, 1932 scale=1.3 mm
10. *Lagena globosa* (WALKER and BOYS, 1784) scale=0.85 mm
11. *Lagena hexagona* (WILLIAMSON, 1848) scale=0.15 mm
12. *Lagena laevis* (MONTAGU, 1803) scale=0.85 mm
13. *Lagena tenuis ornata* REUSS, 1863 scale=0.35 mm
14. *Lagena sulcata* (WALKER and JACOB, 1798) scale=0.25 mm
15. *Globulina guttula* REUSS, 1851 scale=0.86 mm
16. *Globulina minuta* (ROEMER, 1838) scale=0.54 mm
17. *Ramulina* sp. scale=0.32 mm
18. *Fissurina orbignyana* SEGUENZA, 1862 scale=0.95 mm
19. *Fissurina* sp. cf. *F. orbignyana praeclara* (CUSHMAN and RENZ, 1946) scale=1 mm

20–22. *Fissurina tricincta* (GÜMBEL, 1870) scale=0.85 mm

23. *Fissurina* sp. scale=0.85 mm
24. *Glandulina aequalis* REUSS, 1863 scale=0.35 mm

25–26. *Glandulina obtussisima* REUSS, 1863 scale=1.2 mm

27. *Glandulina hantkeni* (FRANZENAU, 1894) scale=0.85 mm
28. *Glandulina inflata* COSTA, 1853 scale=1 mm
29. *Glandulina* sp. scale=1.3 mm

Plate 6

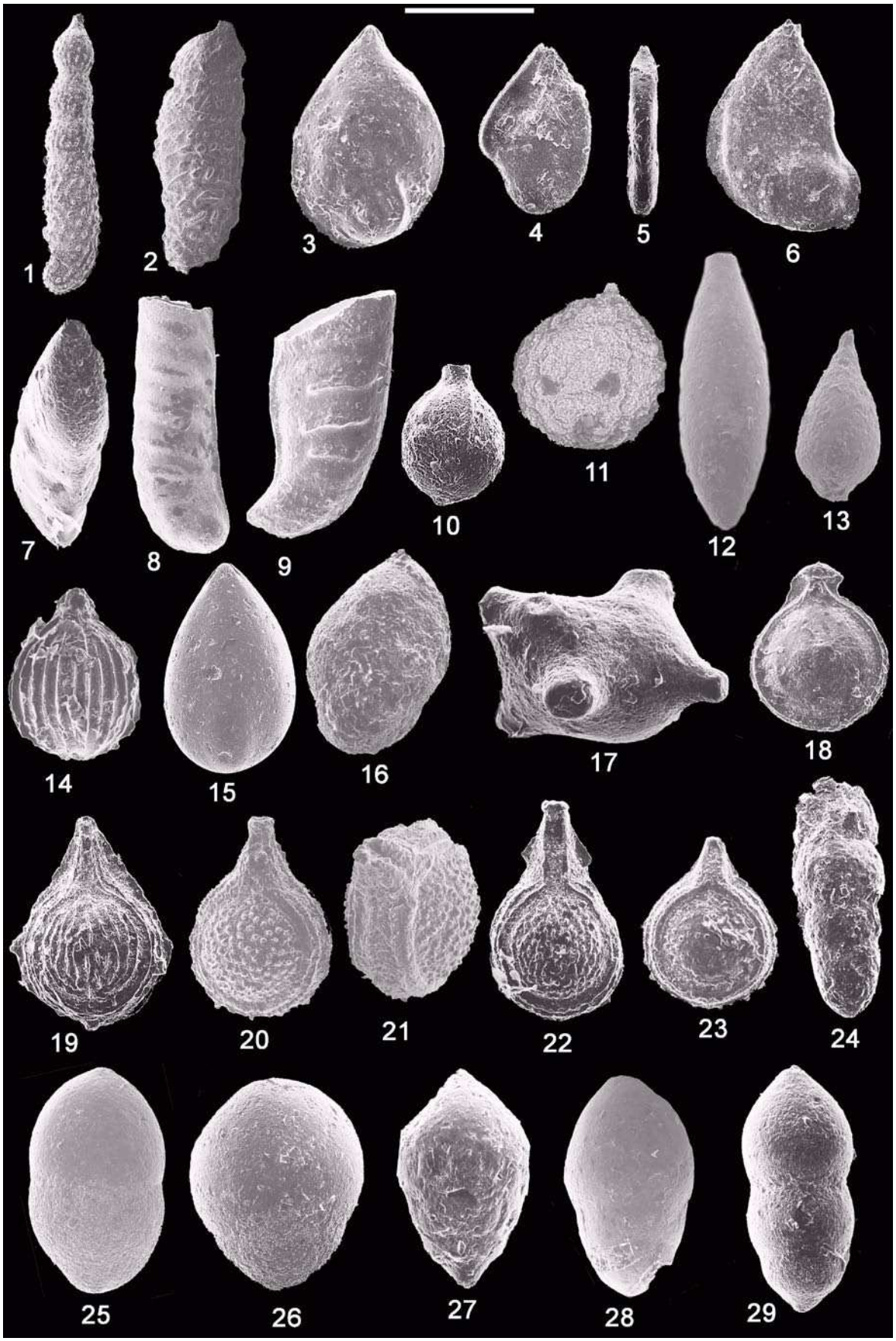

Plate 7

1. *Bolivina cookei* CUSHMAN, 1922 scale=0.15 mm
2–3. *Bolivina elongata* HANTKEN, 1875 scale=0.1 mm
4. *Bolivina nobilis* HANTKEN, 1875 scale=0.23 mm
5. *Bolivina semistriata* HANTKEN, 1868 scale=0.32 mm
6. *Bolivina* sp. scale=0.56 mm
7–8. *Globocassidulina globosa* (HANTKEN, 1875) scale=0.75 mm
9. *Bulimina affinis* D'ORBIGNY, 1839 scale=0.43 mm
10–11. *Bulimina truncana* GÜMBEL, 1868 scale=0.5 mm
12. *Bulimina* sp. scale=0.6 mm
13. *Uvigerina chirana* CUSHMAN and STONE, 1947 scale=0.86 mm
14. *Uvigerina cocoaensis* CUSHMAN, 1925 scale=0.3 mm
15. *Uvigerina cocoaensis jacksonensis* CUSHMAN, 1925 scale=0.3 mm
16. *Uvigerina eocaena* GÜMBEL, 1868 scale=0.4 mm
17–18. *Uvigerina gallowayi* CUSHMAN, 1929 scale=0.5 mm
19. *Uvigerina hantkeni* CUSHMAN and EDWARDS, 1937 scale=0.15 mm
20. *Uvigerina multistriata* HANTKEN, 1871 scale=0.2 mm
21–22. *Uvigerina hourcqi* GRAHAM, DE KLASZ and RÉRAT, 1965 scale=0.4 mm
23. *Uvigerina pigmea* D'ORBIGNY, 1826 scale=0.15 mm
24. *Uvigerina rippensis* COLE, 1927 scale=0.35 mm
25. *Uvigerina tenuistriata* REUSS, 1870 scale=0.25 mm
26. *Reussella terquemi* CUSHMAN, 1945 scale=1 mm
27. *Reussella elongata* (TERQUEM, 1882) scale=0.65 mm
28. *Reussella elongata* (TERQUEM, 1882) scale=0.01 mm
29–30. *Reussella* sp. scale=0.6 mm

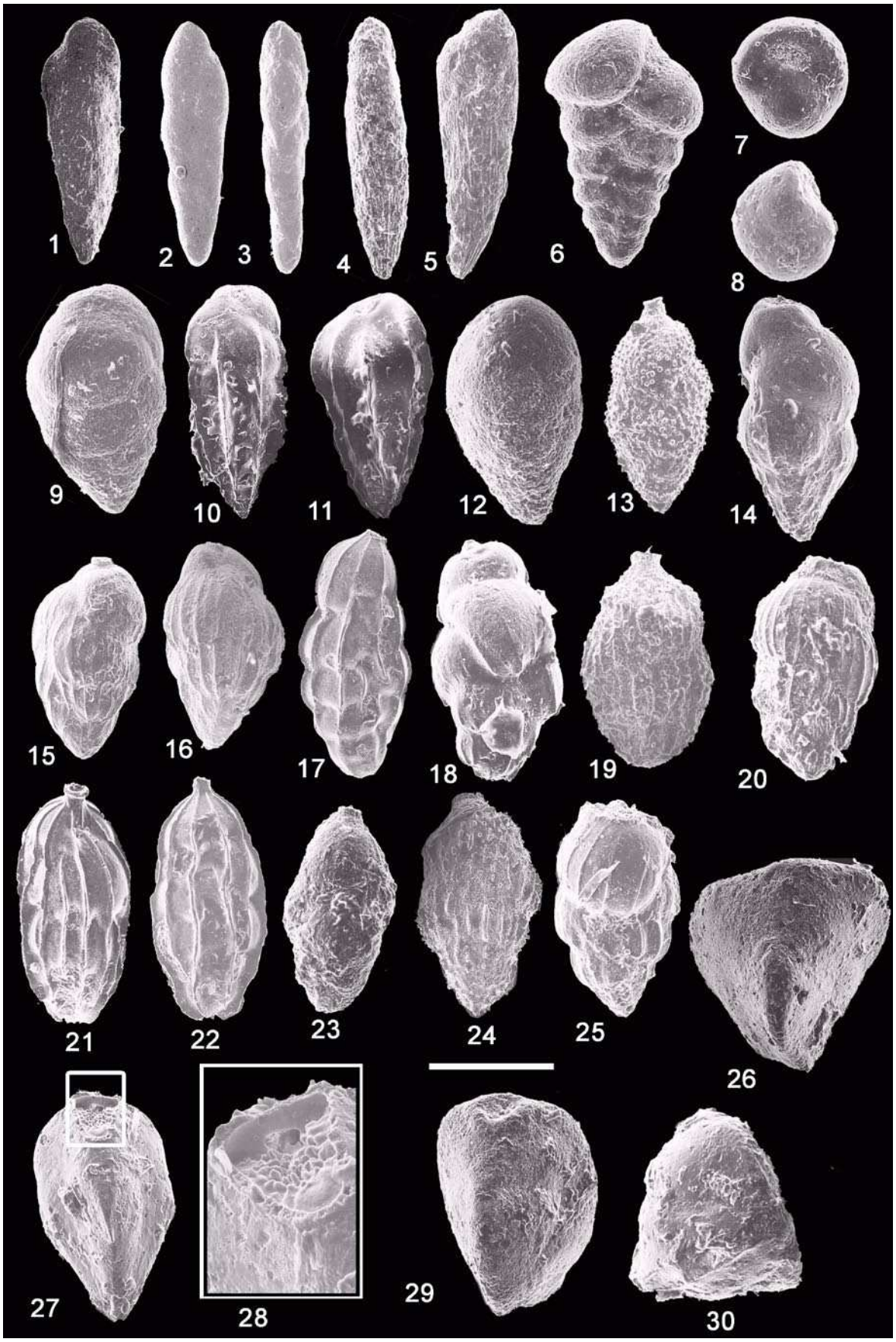

Plate 8

1–2. *Fursenkoina hungarica* (HANTKEN, 1868) scale=0.1 mm

3. *Fursenkoina schreibersiana* (CZJZEK, 1848) scale=0.15 mm

4. *Ellipsoglandulina multicostata* (GALLOWAY and MORREY, 1929) scale=0.85 mm

5. *Nodosarella lorifera* (HALKYARD, 1919) scale=1.2 mm

6. *Nodosarella tuberosa* (GÜMBEL, 1868) scale=1.2 mm

7. *Nodosarella tuberosa* (GÜMBEL, 1868) scale=0.025 mm

8. *Nodosarella* sp. scale=1 mm

9–11. *Pleurostomella acuta* HANTKEN, 1875 scale=1.2 mm

12. *Pleurostomella alternans* SCHWAGER, 1866 scale=1.3 mm

13. *Pleurostomella eocaena* GÜMBEL, 1868 scale=1.3 mm

14. *Pleurostomella* sp. scale=1.4 mm

15–16. *Pleurostomella incrassata* HANTKEN, 1884 scale=1.4 mm

17. *Orthomorphina rohri* (CUSHMAN and STAINFORTH, 1945) scale=0.8 mm

18. *Stilostomella abyssorum* (BRADY, 1881) scale=1.2 mm

19. *Stilostomella abyssorum* (BRADY, 1881) scale=0.9 mm

20. *Stilostomella adolphina* (D'ORBIGNY, 1846) scale=1.2 mm

21. *Stilostomella adolphina* (D'ORBIGNY, 1846) scale=0.03 mm

22. *Stilostomella adolphina* (D'ORBIGNY, 1846) scale=1.1 mm

23. *Stillostomella consobrina* (D'ORBIGNY, 1846) scale=1.2 mm

24. *Stilostomella curvatura* (CUSHMAN, 1939) scale=1.6 mm

25. *Stilostomella elegans* (D'ORBIGNY, 1846) scale=1.7 mm

26. *Stilostomella elegans* (D'ORBIGNY, 1846) scale=0.05 mm

27. *Stilostomella emaciata* (REUSS, 1851) scale=1.2 mm

28. *Stilostomella hoernesi* (HANTKEN, 1868) scale=1 mm

29. *Stilostomella pauperata* (D'ORBIGNY, 1846) scale=1.3 mm

30. *Stilostomella* sp. scale=1.2 mm

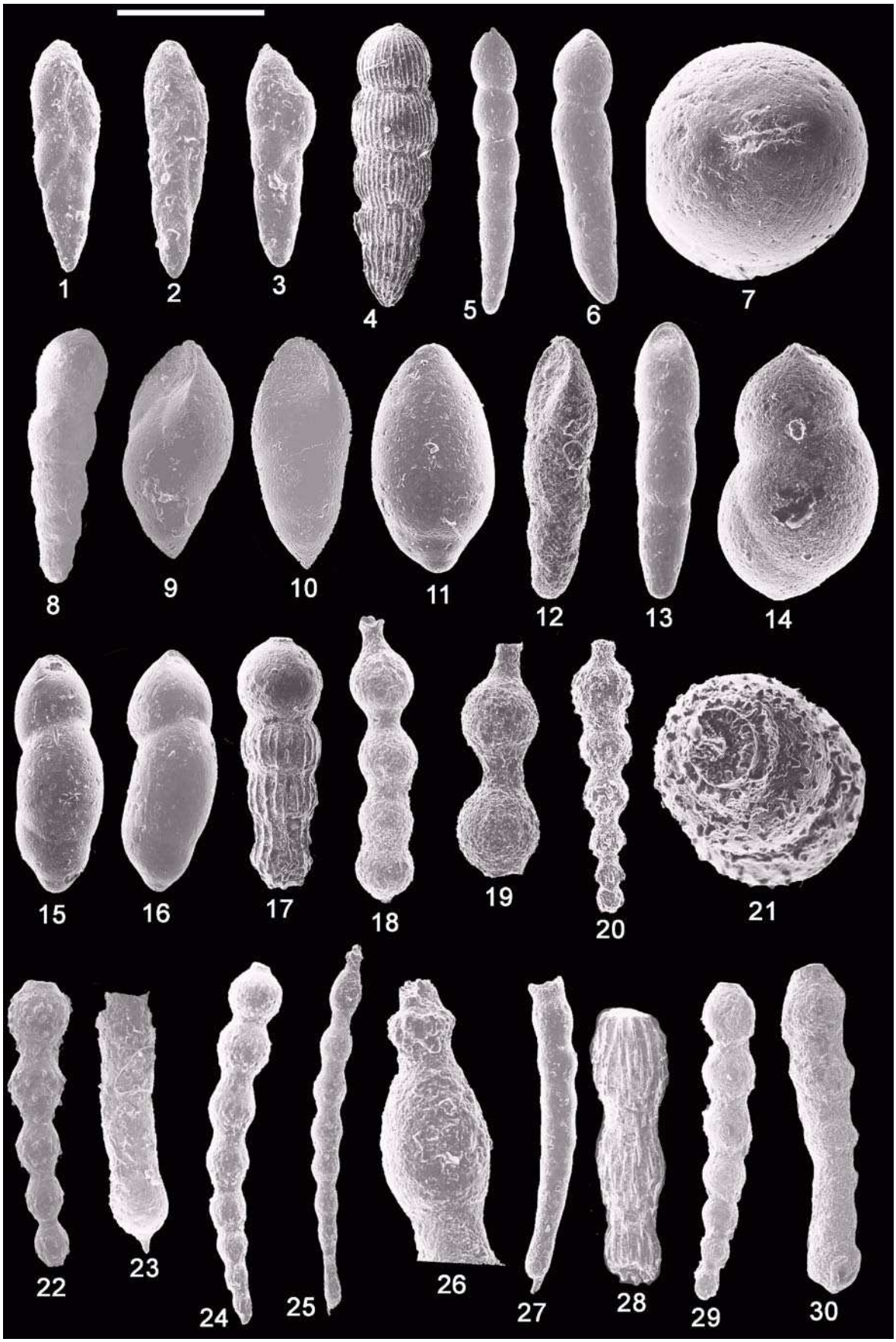

Plate 9

1–2. *Cancris* sp. scale=0.95 mm

3. *Valvulineria* sp. scale=1 mm

4–5. *Eponides budensis* (HANTKEN, 1875) scale=1.1 mm

6–7. *Eponides haidingeri* (D'ORBIGNY, 1846) scale=1 mm

8–9. *Eponides umbonatus* (REUSS, 1851) scale=1.1 mm

10. *Eponides* sp. scale=0.6 mm

11. *Discorbis elegans* HANTKEN, 1875 scale=0.95 mm

12–13. *Discorbis perplexa* LE CALVEZ, 1949 scale=0.85 mm

14–16. *Cibicidoides eocaenus* (GÜMBEL, 1868) scale=1 mm

17–18. *Cibicidoides perlucidus* (NUTTALL, 1932) scale=1.1 mm

19–20. *Planulina austriaca* (D'ORBIGNY, 1826) scale=1.1 mm

21. *Planulina compressa* (HANTKEN, 1875) scale=1 mm

22–23. *Planulina costata* (HANTKEN, 1875) scale=0.35 mm

24. *Cibicides ammophilus* (GÜMBEL, 1870) scale=1 mm

25–27. *Cibicides boueanus* (D´ORBIGNY, 1846) scale=1.1 mm

28–29. *Cibicides carinatus* (TERQUEM, 1882) scale=0.95 mm

Plate 9

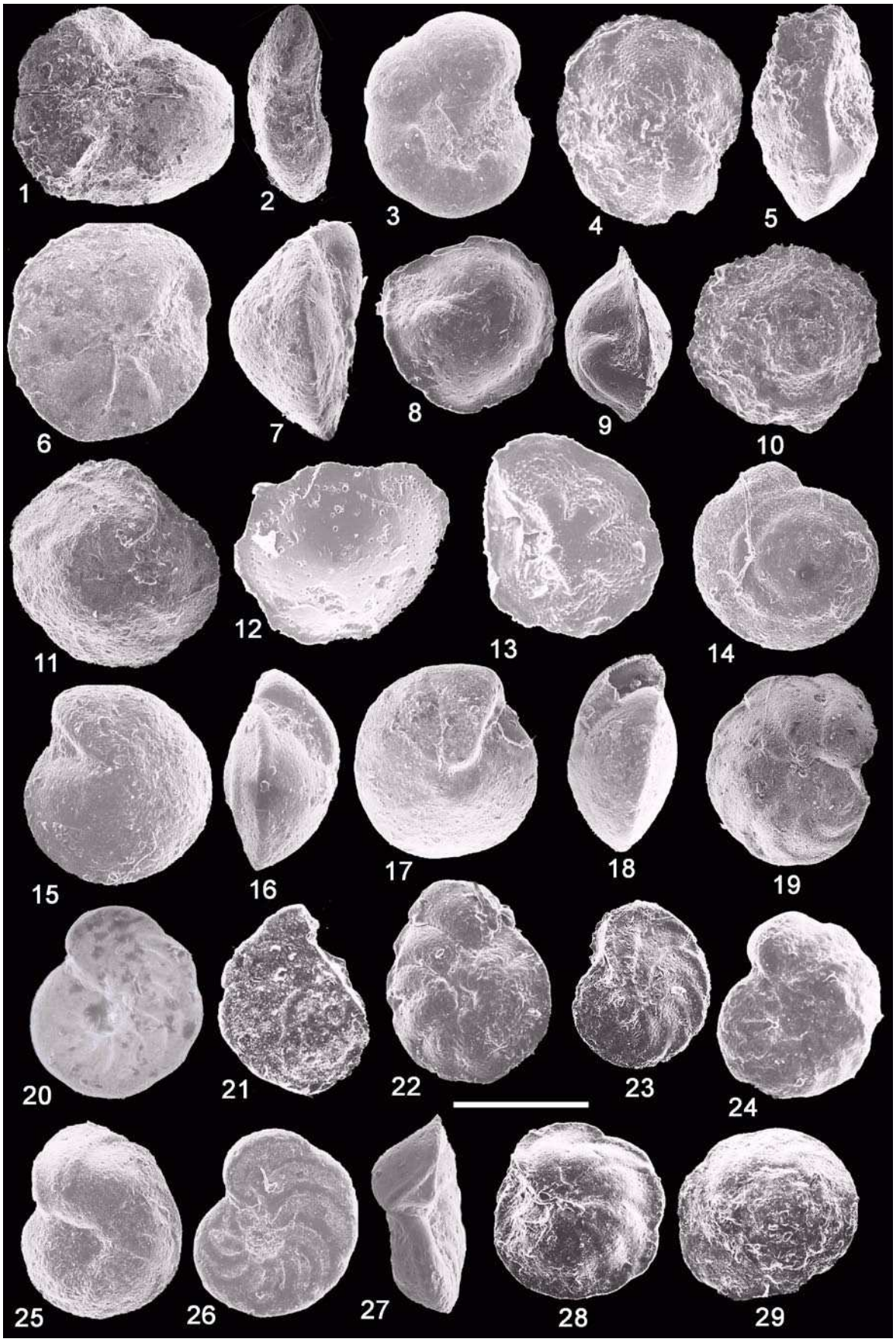

Plate 10

1. *Cibicides mauricensis* HOWE and ROBERTS, 1939 scale=0.95 mm
2. *Cibicides oligocenicus* SAMOILOVA, 1947 scale=0.8 mm
3. *Cibicides proprius* BROTZEN, 1948 scale1= mm
4. *Cibicides pseudolobatulus* PERELIS and REISS, 1975 scale=1 mm
5. *Cibicides pseudoungerianus* (CUSHMAN, 1922) scale=1.1 mm

6–7. *Cibicides sublobatulus* (GÜMBEL, 1868) scale=0.95 mm

8. *Cibicides sulzensis* (HERRMANN, 1917) scale=0.86 mm
9. *Cibicides ungerianus* D'ORBIGNY, 1846 scale=0.8 mm

10–12. *Cibicides westi* HOWE, 1939 scale=1.1 mm

13. *Cibicides* sp. scale=1 mm

14–15. *Dyocibicides uniserialis* Thalmann, 1933 scale=1.1 mm

16. *Asterigerina* sp. scale=0.95 mm

17–18. *Nuttallides* sp. scale=0.85 mm

19. *Nonion granosum* (D'ORBIGNY, 1846) scale=1 mm
20. *Nonion soldani* (D'ORBIGNY, 1846) scale=1.1 mm
21. *Nonionella* sp. scale=0.8 mm

22–23. *Melonis* sp. 1 scale=0.12 mm

24–25. *Pullenia jarvisi* CUSHMAN, 1936 scale=0.14 mm

26. *Pullenia quinqueloba* (REUSS, 1851) scale=0.23 mm
27. *Almaena* sp. scale=0.95 mm

28–30. *Queraltina epistominoides* MARIE, 1950 scale=1.1 mm

Plate 10

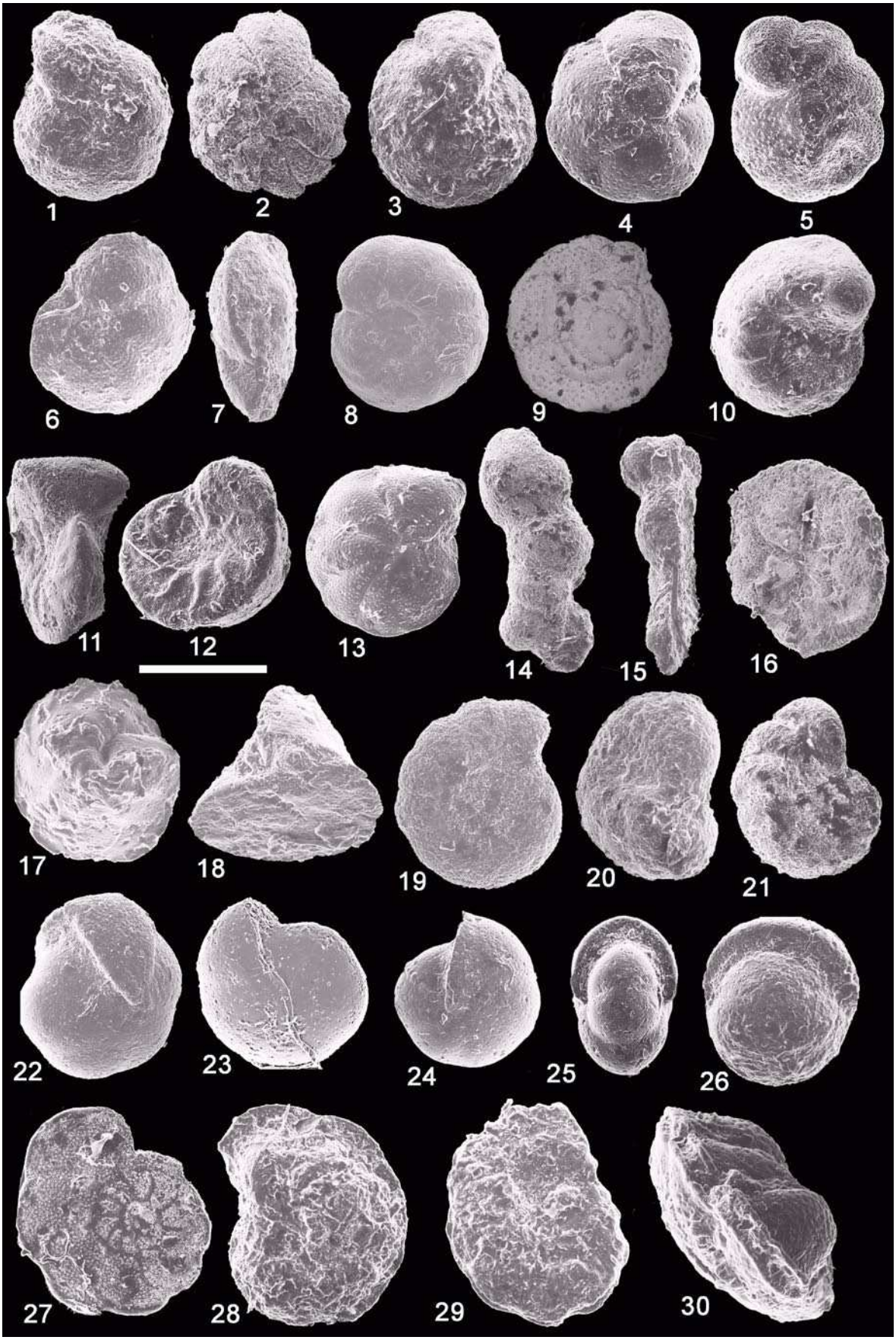

Plate 11

1–2. *Chilostomella tenuis* BORNEMANN, 1855 scale=0.45 mm

3. *Chilostomella* sp. scale=0.51 mm

4–5. *Anomalinoides affinis* (HANTKEN, 1875) scale=0.85 mm

6. *Anomalinoides alazanensis* (NUTTALL, 1932) scale=0.83 mm

7–8. *Anomalinoides grosserugosus* (GÜMBEL, 1868) scale=0.86 mm

9–10. *Anomalinoides* cf. *chileana* (TODD and KNIKER, 1952) scale=0.78 mm

11–13. *Heterolepa dutemplei* (D'ORBIGNY, 1846) scale=1.1 mm

14–15. *Heterolepa simplex* FRANZENAU, 1884 scale=1.2 mm

16. *Gyroidinoides dissimilis* (CUSHMAN and RENZ, 1947) scale=1 mm

17. *Gyroidinoides* sp. scale=1.1 mm

18. *Hanzawaia producta* (TERQUEM, 1882) scale=1.2 mm

19–21. *Gyroidinoides soldanii* (D'ORBIGNY, 1826) scale=1.1 mm

22–23. *Gavelinella micra* (BERMÚDEZ, 1949) scale=1 mm

24. *Eoannularia eocenica* COLE and BERMÚDEZ, 1944 scale=0.85 mm

25–26. *Hanzawaia ammophila* (GÜMBEL, 1868) scale=1.1 mm

27–28. *Pararotalia inermis* (TERQUEM, 1882) scale=1.1 mm

29. *Rotalia* sp. cf. *R. calcar* (D'ORBIGNY, 1826) scale=1.1 mm

30. *Rotalia* sp. scale=0.8 mm

31. *Ammonia* sp. scale=0.46 mm

32–33. *Elphidium* sp. cf. *E. laeve* (D'ORBIGNY, 1826) scale=0.015 mm