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Early Pliensbachian foraminifera from Szentgál, Bakony Mountains (Hungary)

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(with 4 figures and Plates 1–4)

Abstract

Well-preserved and rich foraminifera fauna were set free by concentrated acetic acid from hard "Ammonitico Rosso" limestone of Bakony Mts. The studied section is well defined by ammonites, indicating the Early Pliensbachian age. Family Nodosariidae is the most abundant and the most diversified. *Lenticulina gottingensis* (BORNEMANN), *Involutina liassica* (JONES), *Trocholina granosa* FRENTZEN and *Ammodiscoides? clypeiformis* (FRENTZEN) are the dominant species. Most species are cosmopolitan in character and have wide stratigraphical distribution. Detailed systematic description of 46 benthic species, involving 5 new species are given.

Key words: Lower Jurassic, Foraminifera, Bakony Mts, Hungary, new species

Introduction

During the prestudy of Lower Jurassic foraminifers from Bakony Mts one of the best preserved and rich fauna was found on the Tűzköves Hill of Szentgál. The studied section is one of the classical Lower Jurassic localities. GÉCZY (1974) investigated it in detail and gave its stratigraphical subdivision. On the basis of ammonite fauna he established that these layers correspond to the lower part of the Carixian (Lower Pliensbachian) Jamesoni Zone and the basal Ibex Zone.

At this time the foraminifera of the Hungarian Lower Jurassic had received very little or no attention. The main reason was that the non-washable formations, as the indurated marls and limestones are predominant, from which it was impossible to free the microfossils by standard processing methods. The use of the concentrated acetic acid solution allowed the study of free microfauna from hard Ammonitico Rosso type rocks, too.

The aim of this paper is to give a detailed study of a rich foraminiferal fauna from a stratigraphically well determined layer.

Material and methods

The studied samples were collected from Layer 11 of the T–I section on the top of the Tűzköves Hill, Szentgál, Southern Bakony Mts (Fig. 1). On the basis of previous studies these layers seemed to be the most fossiliferous. The Lower Jurassic rocks of the Tűzköves Hill are well-known long ago. The lithological features were investigated by NOSZKY (1953), KONDA (1970) and MÉSZÁROS (1980). The most detailed lithological and stratigraphical subdivisions of the T–I section were given by GÉCZY (1974) (Fig. 2). Lower Pliensbachian layers are less than 2 m thick, thin-bedded, brownish-red limestones. The macrofauna contains ammonites, nautiloids and is relatively rich in brachiopods and bivalves. The specimens are often coated with ferromanganese crust. On the basis of ammonites the studied layer corresponds to Jamesoni Zone and the basal Ibex Zone (GÉCZY, 1974). The microfauna were represented by mainly foraminifers, less ostracods, echinoid spines and sponge spicules, moreover some embryonic bivalves, gastropods and brachiopods were found.

The sample of Layer 11 in T–I section weighed about a kilogram. The hard limestone was dissolved in concentrated acetic acid. A total of 687 specimens were extracted, distributed among 47 species including 5 new ones. Synonym lists, stratigraphical ranges and paleogeographical distributions of species are based only on

publications which contain descriptions and/or figures of given forms. Abundance was studied both as percentage of the total foraminifera assemblage and as the number of their specimens in the sample.

Described foraminifers are housed in the micropalaeontological collection of the Department of Palaeontology, Eötvös University, Budapest.

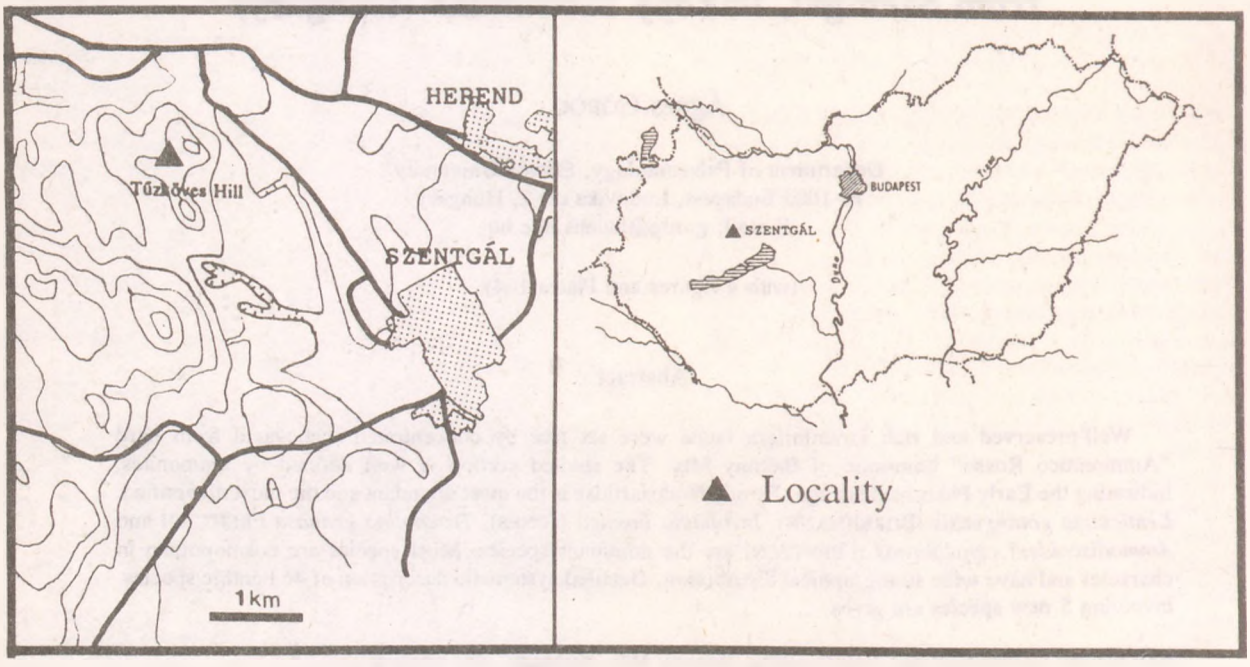

Fig. 1. Sketch map of the locality of studied section on the Tűzköves Hill, Bakony Mountains.

Lower Pliensbachian foraminifera fauna of Szentgál, Bakony Mts

The studied layer of of the T–I section, on the Tűzköves Hill, of Szentgál were rich in benthic foraminifera. The identified 20 genera (47 species) belong into 5 suborders: Textulariina, Involutinina, Miliolina, Lagenina and Rotaliina. The abundance and species number of characteristic taxa can be seen on Fig. 3.

Species of Lagenina, Involutinina and Textulariina are the most abundant (in this order), while the two other suborder are subordinate. More than 64% of the studied specimens belong to suborder Lagenina, moreover in it 11 genera and 38 species were identified, so this is the most diversified group. Within Lagenina the family Nodosariidae is the dominant and the family Ichthyolariidae play the second role, as the family Lagenidae and Polymorphinidea do not comprise 1% of the total assemblage. More than 50% of the studied specimens belong to family Nodosariidae. Genus Nodosaria is the most diversified genus, involving 11 genera and represents 16% of the total fauna. The most frequent species is *Nodosaria regularis* TERQUEM, 1862 (4.5%). Genus *Lenticulina* is represented by four species, but nearly 20 % of the studied specimens belong to these forms. The most frequent species of the assemblage is *Lenticulina gottingensis* (BORNEMANN, 1854) (13% of the total fauna).

Genus *Ichthyolaria* is relatively frequent, especially the characteristic Lower Jurassic forms namely *Ichthyolaria tenera* (BORNEMANN, 1854) and *Ichthyolaria testudinaria* (FRANKE, 1936) are abundant. Suborder Involutinina stands on second place in abundance (nearly 20%), but it is represented by two species only. *Involutina liassica* (JONES, 1853) is the second, *Trocholina granosa* FRENTZEN, 1941 is the third in frequence of specimens. Within subordo Textulariina *Ammodiscoides? clypeiformis* (FRENTZEN, 1941) (6%) and *Ammodiscus siliceus* (TERQUEM, 1862) (4.5%) are relatively abundant. Subordo Rotaliina is represented by a few specimens of *Reinholdella margarita* (TERQUEM, 1866b) and *Epistomina*? sp.. Only a broken *Ophthalmidium* specimen indicates the presence of Subordo Miliolina. Relatively in large number apperared the specimens of *"Placentula" pictonica* (BERTHELIN, 1879) (3,5%), which is taxonomically incertain.

Greater part of the species have wide stratigraphical distribution (Fig. 4). Most of them range from Hettangian to Pliensbachian. On the basis of literature there are no characteristic changes in foraminifera fauna at the Sinemurian–Pliensbachian boundary.

Detailed stratigraphical range and geographical distribution of each species are given in the systematic part.

Conclusion

Several papers on Lower Pliensbachian foraminifera fauna were published in the last 100 years (ISSLER 1908; FRANKE 1936; BARTENSTEIN & BRAND 1937; FRENTZEN 1941; BARNARD, 1950; PIETRZENUK 1961; RABITZ 1963; BARBIERI 1964; PJATKOVA & PERMJAKOVA 1978; EXTON and GRADSTEIN 1984; RIEGRAF et al. 1984; NOCCHI 1992). Inspite of this fact, because of the absence of detailed quantitative data from other age-equivalent localities the comparison with other foraminifera faunas is very difficult.

Generally speaking, that the most studied species have wide geographical distribution. The most characteristic Lower Jurassic species are cosmopolitan, e.g. *Involutina liassica* (JONES, 1853), *Ichthyolaria sulcata* (BORNEMANN, 1854), *Ichthyolaria tenera* (BORNEMANN, 1854), *Ichthyolaria testudinaria* (FRANKE, 1936), *Nodosaria dispar* FRANKE, 1936, *Nodosaria regularis* TERQUEM, 1862, *Berthelinella paradoxa* (BERTHELIN, 1879), *Lenticulina* gottingensis (BORNEMANN, 1854), *Marginulina prima* D'ORBIGNY, 1849. These species could be found in the sample of Tűzköves Hill.

The assemblage of Szentgál is attributed a late Sinemurian to early Pliensbachian age since they are in good agreement with other faunas of this age.

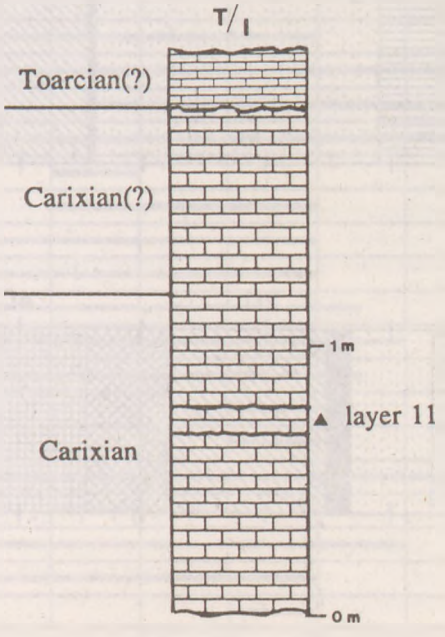

Fig. 2. Detailed section of T–I locality on the Tűzköves Hill (after GÉCZY, 1974).

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Systematic descriptions

After LOEBLICH & TAPPAN (1988).

Phylum Protista
Subphylum Sarcodina SCHMARDA, 1871
Classis Rhizopodea VON SIEBOLD, 1845
Subclassis Lobosia CARPENTER, 1861
Ordo Foraminiferida EICHWALD, 1830
Subordo Textulariina DELAGE & HÉROUARD, 1894
Superfamily Ammodiscacea REUSS, 1862
Family Ammodiscidae REUSS, 1862
Subfamily Ammovolumininae CHERNYKH, 1967
Genus *Ammodiscoides* CUSHMAN, 1909

Ammodiscoides? *clypeiformis* (FRENTZEN, 1941)
Pl. 1, Figs 1, 2.

1941 *Ammodiscoides clypeiformis* nov. spec.; FRENTZEN, p. 302, pl. 1, fig. 6.

1984 *Trocholina umbo* FRENTZEN, 1941; RIEGRAF et al., p. 689, pl. 7, figs 181–182.

Material. 42 specimens.

Description. Test very low cone, the about 5 times wider than high; periphery rounded; proloculus spherical, in the apex of spira; the second tubular chamber trochospirally coiled of 5 to 6 whorls, which can be seen only on the dorsal side; ventral side depressed; sutures indistinct; aperture is on the open end of the tube; wall finely agglutinated.

Remarks. Specimens of Szentgál show a very good resemblance to specimens of FRENTZEN.

Dimensions. Diameter: 0.13–0.32mm; thickness: 0.05–0.06mm.

Distribution. Germany (Karlsruhe): Upper Sinemurian; Morocco (DSDP): Sinemurian–Pliensbachian.

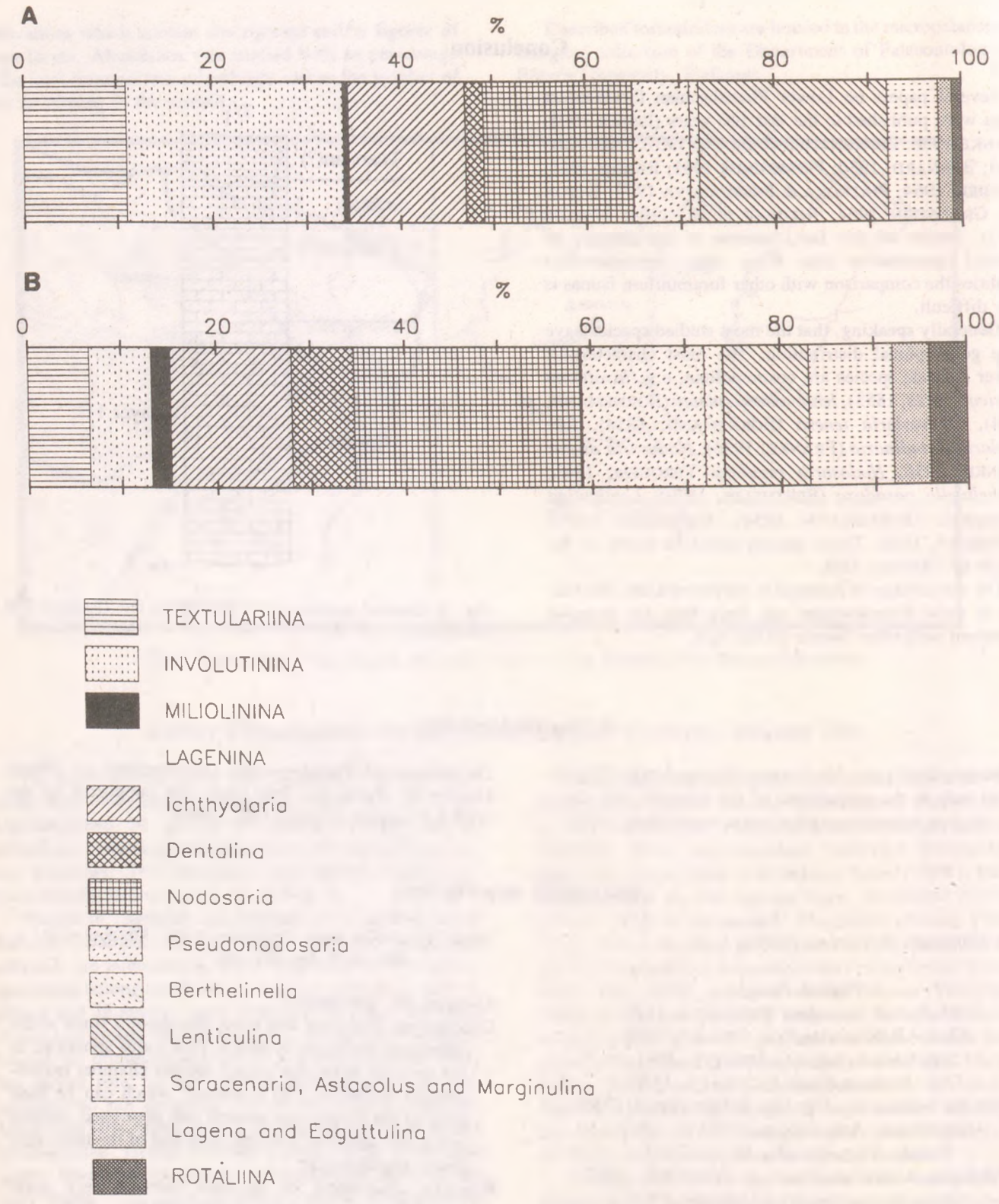

Fig. 3. **A.** Abundances of the characteristic taxa. Abundance is given in % of the total foraminiferal assemblage. **B.** Distribution of species number by characteristic taxa.

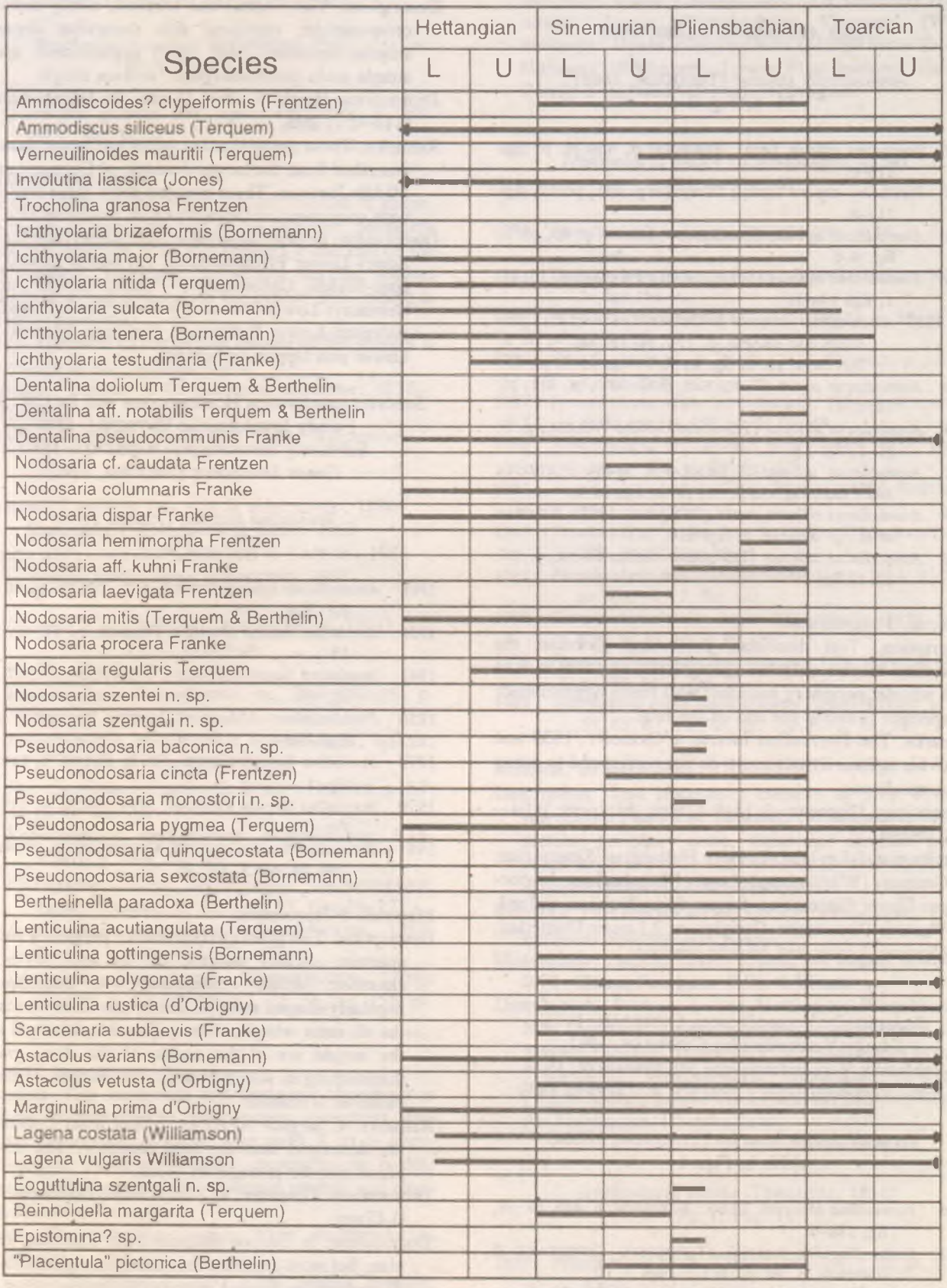

Fig. 4. Stratigraphic distribution of studied species

Genus *Ammodiscus* REUSS, 1862

Ammodiscus siliceus (TERQUEM, 1862)
Pl. 1, Fig. 3

1862 *Involutina silicea Terq.;* TERQUEM p. 450 pl. 6, figs 11a–b.
1863 *Involutina aspera* TERQ.; TERQUEM p. 221, pl. 10, figs 21a–b.
1908 *Ammodiscus infimus* STRICKLAND; ISSLER, p. 40, pl. 1, fig. 4–6.
1936 *Ammodiscus infimus* (STRICKLAND); FRANKE; p. 15, pl. 1, figs 14a–b.
pars 1937 *Ammodiscus incertus* (D'ORBIGNY, 1839); BARTENSTEIN and BRAND, p. 130, pl. 2B, fig. 4; pl. 3, figs 5a–c; pl. 4, fig. 4; pl. 5, figs 5a–b; pl. 8,
1950 *Ammodiscus asper* (TERQUEM); BARNARD, p. 351, pl. 1a, i, ii.
1968 *Ammodiscus siliceus* (TERQUEM, 1862); WELZEL, p. 5, pl. 1, fig. 11.
1978 *Ammodiscus infimus* (STRICKLAND, 1846); PJATKOVA and PERMJAKOVA, p. 16, pl. 2, figs 6a–c.
1984 *Ammodiscus siliceus asper* (TERQUEM, 1863); RIEGRAF et al., p. 679, pl. 4, figs 114, 117.
1988 *Ammodiscus siliceus* (TERQUEM, 1862); KOPIK, p. 26, pl. 1, fig. 1.

Material. 31 specimens.
Description. Test discoidal; proloculus globular; the second tubular chamber planispirally enrolled in 4 to 8 whorls; periphery rounded; wall finely agglutinated; aperture round at the end of the tube.
Remarks. The *Operculina incerta* D'ORBIGNY, 1839 and *Orbis infimus* STRICKLAND do not correspond to genus *Ammodiscus.*
Dimensions. Diameter: 0.14–0.42mm; thickness: 0.04–-0.08mm.
Distribution. S England (Dorset): Hettangian–Sinemurian; Germany (Württenberg): Lower Pliensbachian; Morocco: Upper Sinemurian–Lower Pliensbachian; Poland, Western Pomerania: Carixian or ? Lower Domerian; Ukraine: Lower and Middle Jurassic.

Superfamily Verneuilinacea CUSHMAN, 1911
Family Verneuilinidae CUSHMAN, 1911
Subfamily Verneuilinoidinae SULEYMANOV, 1973
Genus *Verneuilinoides* LOEBLICH & TAPPAN, 1949

Verneuilinoides mauritii (TERQUEM, 1866a)
Pl. 1, Fig. 4

1866 *Verneuilina Mauritii,* TERQ.; TERQUEM, p. 448, pl. 18, fig. 18a–b.
1981 *Verneuilinoides mauritii* (TERQUEM); COPESTAKE & JOHNSON, p. 90, pl. 6.1.1, Figs 5, 10.
1995 *Verneuilinoides mauritii* (TERQUEM, 1866); GÖRÖG, p. 31, pl. 2, fig. 3. cum. syn.

Material. 2 specimens.
Description. Test conical and triserial; nearly circular in cross-section; umbilical side somewhat depressed; sutures depressed; wall finely agglutinated; aperture simple arch, interiomarginal; surface rough.
Dimensions. Height: 0.18–0.23 mm; the largest diameter: 0.13–0.17 mm.
Remarks. These specimens are wider and lower than those described from the Lower Jurassic of Germany and the Middle Jurassic. These specims show large similarities with specimens of COPESTAKE & JOHNSON (1981).
Distribution. Britain: uppermost Sinemurian (Raricostatum Zone)–Lower Pliensbachian; E France: Lower Bajocian–Middle Oxfordian; S France: Lower Jurassic; Germany: Lower Jurassic; Poland (Extra-Carpathian): Aalenian–Lower Bathonian; Hungary (Mecsek Mts): Lower and Upper Bathonian.

Subordo Involutinina HOHENEGGER and PILLER, 1977
Family Involutinidae BÜTSCHLI, 1880
Subfamily Involutininae BÜTSCHLI, 1880
Genus *Involutina* TERQUEM, 1862

Involutina liassica (JONES, 1853)
Pl. 1. Fig. 5

1908 *Ammodiscus infimus* STRICKLAND; ISSLER, p. 40, pl. 1, fig. 7–8.
1936 *Involutina liasina* (JONES); FRANKE, p. 17, pl. 1, fig. 13.
1941 *Involutina liassica* (JONES); FRENTZEN, p. 307, pl. 1, fig. 14.
1950 *Problematina* cf. *liassica* (JONES); BARNARD, p. 378, figs 10a–c.
1970 *Involutina liassica* (JONES, 1853); FUCHS, p. 116, pl. 9, fig. 1.
1970 *Involutina turgida* KRISTAN, 1957; FUCHS, p. 116, pl. 9, fig. 6.
1981 *Involutina liassica* (JONES); COPESTAKE & JOHNSON, p. 100, pl. 6.1.5, fig. 9.

Material. 84 specimens.
Description. Test planispirally coiled; periphery rounded; aperture circular situated on the end of the final chamber; surface ornamented with numeruous irregularly-shaped short pillars or verrucae, which cover the all inner whorls; these pillars are arranged so that the largest are at the centre of the disc, gradually diminishing in size outwards; the surface of the final chamber is smooth.
Remarks. *I. turgida* KRISTAN differs from *I. liassica* in the destroyed smooth, final chamber. The ornamentation may be stronger or weak.
Dimensions. Diameter: 0.23–1.15mm; thickness: 0.09–-0.45mm.
Distribution. In Europe ranging from Rhaetian to Toarcian, but most common between Hettangian and Lower Pliensbachian. Lower Austria (Hernstein): Lowermost Jurassic; S England: Uppermost Pliensbachian; S Germany (Württenberg): Hettangian–Sinemurian.

Genus *Trocholina* PAALZOW, 1922

Trocholina granosa FRENTZEN, 1941
Pl. 1, Figs 6, 7

1941 *Trocholina granosa* nov. spec.; FRENTZEN, p. 304, pl. 1, fig. 11.

Material. 52 specimens.
Description. Test trochospirally coiled; conical in shape, the height is nearly the half of the diameter; periphery subacute; aperture oval and situated at the end of the last chamber, marginal. Spiral side smooth, sutures indistinct; a ring situated on the ventral side, which is filled by verrucae.
Remarks. The most characteristic feature of this species is the ring with the pustules inside.
Dimensions. Height: 0.16–0.36mm; diameter: 0.18–0.51mm.
Distribution. Germany, Karlsruhe: Upper Sinemurian.

Subordo Lagenina DELAGE & HÉROUARD, 1896
Superfamily Robuloidacea REISS, 1963
Family Ichthyolariidae LOEBLICH & TAPPAN, 1986
Genus *Ichthyolaria* WEDEKIND, 1937

Ichthyolaria brizaeformis (BORNEMANN, 1854)
Pl. 1, Figs 8–9

1854 *Frondicularia brizaeformis* m.; BORNEMANN, p. 36, pl. 3, figs 17a–d, 18a–c, 20a–b.
1908 *Frondicularia brizaeformis* BORNEMANN; ISSLER, p. 57, pl. 3, figs 122–124.
1936 *Frondicularia brizaeformis* BORN.; FRANKE, p. 67, pl. 6, fig. 24.
1950 *Frondicularia brizaeformis* BORNEMANN; BARNARD, p. 369, fig. 7h.
1963 *Plectofrondicularia brizaeformis* (BORNEMANN, 1854); RABITZ, p. 215, pl. 17, figs 26–27.
1970 *Frondicularia brizaeformis* BORNEMANN, 1854; FUCHS, p. 89, pl. 5, fig. 15.
1985 *Ichtyolaria brizaeformis* (BORNEMANN, 1854); RUGET, p. 52, 59, 63, 67, 72, 76, fig. 15b; pl. 2, fig. 15;

Material. 7 specimens.
Description. Test lanceolate and flattened; rhomboid in outline; rhomboidal in cross-section; periphery subacute; proloculus globular; the next 3 to 6 chevron-shaped chambers rapidly increasing in width; sutures slightly depressed; aperture central and elongated; surface smooth.
Remarks. The test-shape varies from rhomboidal to broad-oval.
Dimensions. Height: 0.35–0.52 ; the largest breadth: 0.36–0.45mm; thickness: 0.09–0.13mm.
Distribution. Lower Austria (Hernstein): Lowermost Jurassic; France: Lower Hettangian–Pliensbachian; S Germany: Upper Pliensbachian; NW Germany (Hannover): Lower Pliensbachian; Germany (Württemberg): Upper Pliensbachian (Margaritatus Zone); Germany (Göttingen): Lower Pliensbachian (Davoei Zone); S England (Dorset): Hettangian.

Ichthyolaria major (BORNEMANN, 1854)
Pl. 1, Fig. 10

1854 *Frondicularia major* m.; BORNEMANN, p. 36, pl. 3, figs 21a–c.
1854 *Frondicularia intumescens* m.; BORNEMANN, p. 36, pl. 3, figs 19a–c.
1908 *Frondicularia carinata* BURBACH; ISSLER, p. 59, pl. fig. 127, 128.
1936 *Frondicularia major* BORN., 1854; FRANKE, p. 68, pl. 7, figs 2a–b.
1937 *Frondicularia major* BORNEMANN, 1854; BARTENSTEIN & BRAND, p. 155, pl. 5, fig. 68.
1959 *Frondicularia brizaeformis* BORNEMANN, 1854; DREXLER, p. 496, pl. 20, fig. 17.
1963 *Frondicularia major* elliptica BURBACH 1886; RABITZ, p. 208, pl. 17, fig. 19.
1963 *Frondicularia major lata* BURBACH 1886; RABITZ, p. 209, pl. 17, fig. 20.
1963 *Frondicularia major major* BORNEMANN 1854; RABITZ, p. 209, pl. 17, fig. 18.
1968 *Frondicularia major major* BORNEMANN, 1854; WELZEL, p. 37, pl. 2, fig. 20.
1984 *Frondicularia major* BORNEMANN, 1854; RIEGRAF et al., p. 684, pl. 1, fig. 21.
1985 *Ichthyolaria major* (BORNEMANN, 1854); RUGET, pl. 52, 59, 63, 67, 72, 76, fig. 15c; pl. 2, fig. 19

Material. 10 specimens.
Description. Test lanceolate, consists of 5 to 8 chevron-shaped chambers; flattened, rhomboidal in cross-section; periphery acute, sometimes carinate; proloculus large and spherical; sutures slightly depressed; aperture slit-like; surface smooth.
Remarks. This species differs from *F. nitida* TERQUEM its gradually widened test-shape.
Dimensions. Height:0.22–0.63mm; the largest diameter: 0.21–42mm; thickness: 0.06–0.13mm.
Distribution. France: Lower Hettangian–Pliensbachian; NW Germany: Lower Pliensbachian–Toarcian; Germany (Göttingen, Hannover): Pliensbachian; Germany (Thüringen, Württenberg): Hettangian; Germany (Württenberg): Lower Pliensbachian; Morocco (DSDP): Sinemurian–Pliensbachian.

Ichthyolaria nitida (TERQUEM, 1858)
Pl. 1, Fig. 11

1858 Frondicularia nitida, TERQ.; TERQUEM, p. 32, pl. 1, fig 9 a–c.
pars 1908 Frondicularia nitida TERQUEM; ISSLER, p. 56, pl. 2, fig. 104–106, non 107–108.

1936 Frondicularia nitida TERQ.; FRANKE, p. 68, pl. 7, fig. 1, 3.
1937 Frondicularia nitida TERQUEM, 1858; BARTENSTEIN & BRAND, p. 155, pl. 2B, fig. 19; pl. 4, fig. 55; pl. 5, fig. 35.
1968 Frondicularia major nitida TERQUEM, 1858; WELZEL, p. 38, pl. 2, fig. 21.
1970 Frondicularia nitida TERQUEM, 1858; FUCHS, p. 89, pl. 5, fig. 10.
1985 Ichthyolaria nitida (TERQUEM, 1858); RUGET, p. 72, 76, 77, pl. 30, figs 1–3.

Material. 4 specimens.

Description. Test lanceolate, elongated; nearly parallel-sided; strongly flattened; periphery acute; 8 to 11 shevron-shaped chambers; sutures distinct, depressed; aperture slit-like and terminal; surface smooth.

Remarks. Most characteristic feauture of this species is the parallel-sided test-shape. Specimens of ISSLER (1908, pl. 2, figs 107–108) correspond to genus *Lingulina*.

Dimensions. Height: 0.39–0.50mm; the largest diameter: 0.18–0.28mm; thickness: 0.08–0.11mm.

Distribution. Lower Austria (Hernstein):Lowermost Jurassic; S France: Lower Jurassic; Central France (Etaules): Lower Pliensbachian; NW Germany: Hettangian–Upper Pliensbachian; Germany (Thüringen, Württenberg): Hettangian; Germany (Thüringen, Bayern, Württenberg): Lower Pliensbachian.

Ichthyolaria sulcata (BORNEMANN, 1854)
Pl. 2, Figs 1–2

1854 *Frondicularia sulcata* m.; BORNEMANN, p. 37, pl. 3, fig. 22a–c.
1908 *Frondicularia sulcata* BORNEMANN; ISSLER, p. 61, pl. 3, figs 140–142.
1936 *Frondicularia sulcata* BORN.; FRANKE, p. 71, pl. 7, fig. 8.
1937 *Frondicularia sulcata* BORNEMANN, 1854; BARTENSTEIN & BRAND, p. 158, pl. 1A, fig. 12; pl. 2A, figs 19a–b; pl. 2B, fig. 20; pl. 4, fig. 50.
1950 *Frondicularia sulcata* BORNEMANN; BARNARD, p. 369, fig. 7a, e, f.
1961 *Frondicularia sulcata* BORNEMANN 1854; PIETRZENIUK, p. 81, pl. 6, figs 5, 6.
1963 *Frondicularia bicostata sulcata* BORNEMANN, 1854; RABITZ, p. 213, pl. 17, fig. 22.
1968 *Frondicularia terquemi sulcata* BORNEMANN, 1854; WELZEL, p. 39, pl. 2, fig. 27.
1970 *Frondicularia sulcata* BORNEMANN, 1854; FUCHS, p. 90, pl. 5, fig. 3.
1981 *Ichthyolaria terquemi muelensis* RUGET & SIGAL; COPESTAKE & JOHNSON, p. 94, pl. 6.1.2., figs 12–13.
1985 *Ichtyolaria sulcata* (BORNEMANN); RUGET, 52, 59, 63, 67, 72, 77, 81, 86, 90–97, 118, 123–125, 128–129, 140, 142–143, 146, pl. 3, figs 2–4, 6–11, pl. 4, figs 4, 10–11; pl. 14, figs 1–8, 10–11; pl. 15, figs 7, 10–11; pl. 16, figs 1–13; pl. 17, figs 1–12; pl. 18, figs 1–7, 10, pl. 27, fig. 11; pl. 28, figs 1–3, 5–12, 16–17, 19.; pl. 29, figs 2, 9, 13; pl. 39, fig. 5; pl. 47, figs 1–3, 5–6, 8–9, 12–15.
1985 *Ichtyolaria muelensis* RUGET et SIGAL, 1970; RUGET, p. 52, 59, 63, 67, 72, 77, 93, 94, 95, 97, 118, 123–126, 128–129, 140, 142–143, 146, pl. 18, figs 8–9; pl. 27, flg. 10; pl. 28, figs 13–14, 18, 20–21; pl. 29, fig. 4; pl. 47, figs 4, 7, 10–11.
1993 *Ichthyolaria sulcata* (BORNEMANN); HOHENEGGER, p. 250, pl. 1, fig. 1–5.

Material. 4 specimens.

Description. Test robust, lanceolate and elongated; strongly flattened; periphery acute or keeled except in the apertural region; proloculus rounded; the 4 to 8 chevron-shaped chambers slowly increasing in size; sutures indistinct and flush; aperture oval and terminal; surface ornamented with numerous strong and longitudial ribs, but on the macrospherical form the last chamber is smooth.

Remarks. Test-shape is similar with *I. terquemi* (D'ORBIGNY, 1850), differ in its surface ornamentation, because *I. terquemi* is smooth. Macrospheric forms have more higher ribs, thus ribs of microspheric forms are coarser.

RUGET (1985) and HOHENEGGER (1993) dealt with the morphological changes and stratigraphical ranges of this genus and species in detail.

Dimensions. Height: 0.34–0.65 mm; the largest diameter 0.21–0.32 mm; thickness: .10–0.13 mm.

Distribution. Lower Austria (Hernstein):Hettangian–Sinemurian; S England (Dorset): Lower Sinemurian and Upper Sinemurian (Raricostatum Zone)–Upper Toarcian; France: Lower Hettangian–lowermost Toarcian; NW Germany: Hettangian–Upper Pliensbachian; Germany (Apfelstädt, Stollenhalde am Grossen Seeberg): Upper Sinemurian); Germany (Halberstadt): Hettangian; Germany (Dobbertin) Upper Pliensbachian; Germany (Göttingen): Hettangian–Lower Pliensbachian (Davoei Zone); Germany (Wüttemberg): Lower Sinemurian–Pliensbachian.

Ichthyolaria tenera (BORNEMANN, 1854)
Pl. 2, Figs 3–5

1854 *Lingulina tenera* m.; BORNEMANN, p. 36, pl. 3, figs 24a–c.
1858 *Lingulina hexagona* TERQ.; TERQUEM, p. 594, pl. 1, figs 13a–c.
1858 *Lingulina tenera*, TERQ. (BORN. sp.); TERQUEM, p. 595, pl. 1, figs 14a–c.
1875 *Frondicularia pupa*, TERQ. et BERTH.; TERQUEM & BERTHELIN, p. 36, figs 1c, d.
1950 *Lingulina tenera* BORNEMANN; BARNARD, p. 365, figs 6a, c, f, g.
1936 *Lingulina tenera* BORN.; FRANKE, p. 64, pl. 6, fig. 18.
1937 *Frondicularia tenera tenera* (BORNEMANN, 1854); BARTENSTEIN & BRAND, p. 156, pl. 1A, fig. 11, 19; pl. 2A, figs 10a–c; pl. 2B, figs 18a–b; pl. 3, figs 25–26, pl. 5, figs 67a–b.

1941 *Lingulina tenera tenera* (BORNEMANN); FRENTZEN, p. 333, pl. 3, figs 18, 19.
1961 *Lingulina tenera tenera* BORNEMANN 1854; PIETRZENUK, p. 77, pl. 8, figs 1, 2.
1961 *Lingulina tenera carinata* NORVANG 1957; PIETRZENUK, p. 78, pl. 8, figs 7–9.
1963 *Lingulina tenera tenera* BORNEMANN 1854; RABITZ, p. 218, pl. 17, fig. 30.
1964 *Lingulina tenera* BORNEMANN; BARBIERI, p. 775, pl. 60, figs 8a–b.
1964 *Lingulina tenera prismatica* BARTENSTEIN & BRAND; BARBIERI, p. 775, pl. 60, figs 9a–b.
1968 *Lingulina tenera* BORNEMANN, 1854; WELZEL, p. 36, pl. 19, fig. 19, text-fig. 4.
1970 *Lingulina tenera tenera* BORNEMANN; FUCHS, p. 108, pl. 8, figs 1, 12, 15. 444
1984 *Lingulina tenera carinata* NORVANG, 1957; RIEGRAF et al., p. 688, pl. 7, fig. 180.
1985 *Lingulina tenuistriata* (NOERVANG, 1957); RUGET, p. 53, 54, 58, 59, 63, 67, 73, 143, pl. 5, figs 4–5.
1985 *Lingulina tenera* BORNEMANN, 1854; RUGET, p. 53, 54, 59, 63, 67, 73, 77, 85, 86, 143, 144, pl. 6, figs 1–3; pl. 19, fig. 5; pl. 31, figs 10–11, 13, 15; pl. 39, figs 2, 6.

Material. 30 specimens.
Description. Test elongate and compressed; hexagonal in cross-section; proloculus small and sharpened; later 5 to 10, chevron-shaped chamber slowly increasing in size; sutures distinct and more or less depressed; aperture oval and terminal; surface ornamented with 6 longitudinal, strong costae or broad and sharp rims.
Remarks. WELZEL (1968) dealt with the different subspecies of species L. tenera. The development of the surface ornamentataion strongly varies.
Dimensions. Height: 0.16–0.50mm; the largest diameter 0.14–0.36mm; thickness: 0.04–0.10mm.
Distribution. Lower Austria (Hernstein):Lowermost Jurassic; England: Upper Sinemurian–Lower Pliensbachian; France (Nancy): Upper Pliensbachian (Margaritataus Zone); France (after Ruget, 1985): Upper Sinemurian–Lower Toarcian; Germany (after Franke, 1936): Hettangian–Upper Pliensbachian; Germany (Göttingen, Eisenach): Lower Hettangian–Lower Pliensbachian; Germany (Völpke, Apfelstädt, Stollenhalde am Grossen Seeberg, Eisenach): Upper Sinemurian); Germany (Dobbertin) Upper Pliensbachian. Morocco (DSDP): Sinemurian–Pliensbachian; Portugal (Coimbra): Lower Pliensbachian–lower part of the Upper Pliensbachian; Sicily: Pliensbachian–Lower Toarcian.

Widespread in Europe from Hettangian to lowermost Toarcian: Denmark, Sweden Germany, Portugal, Poland Italy, France (COPESTAKE at al. 1981.);

Ichthyolaria testudinaria (FRANKE, 1936)
Pl. 2, Fig. 6–7

1936 *Lingulina testudinaria* n. sp.; FRANKE, p. 63, pl. 6, fig. 19.
1970 *Lingulina testudinaria* FRANKE, 1936; FUCHS, p. 109, pl. 8, fig. 19.
1981 *Lingulina testudinaria* FRANKE, 1936; COPESTAKE & JOHNSON, p. 96, pl. 6.1.3., figs 1–3.
non 1985 *Lingulina testudinaria* FRANKE, 1937; RUGET, p. 73, 77, 81, 84, 85, 86, 143, 144, pl. 40, figs 1–4.
non 1985 *Lingulina testudinaria* FRENTZEN; RUGET, p. , pl. 40, figs 5–6.

Material. 23 specimens.
Description. Test subtriangular, consists of 6 to 10 low chambers; strongly flattened and subrhomboidal in cross-section; periphery keeled; the first 4 to 5 chambers rapidly increasing in size, later ones nearly uniform in wide; sutures bordering with ribs; aperture is slit-shaped; surface ornamented with two longitudinal central ribs, which bordering a median sulcus.
Remarks. Most distinctive character of this species are the surface ornamentation, wich give a "trilobite-like" appearence. Specimens of RUGET (1985) have totally different surface ornamentation.
Dimensions. Height: 0.18–0.37mm; the largest diameter: 0.13–0.26mm; thickness: 0.09–0.13mm.
Distribution. Lower Austria (Hernstein):Lowermost Jurassic; England: Upper Sinemurian (Raricostatum Zone)–Lower Toarcian (Tenuicostatum Zone): Germany (Göttingen): Lower Pliensbachian.

Superfamily Nodosariacea EHRENBERG, 1838
Family Nodosariidae EHRENBERG, 1838
Subfamily Nodosariinae EHRENBERG, 1838
Genus *Dentalina* RISSO, 1826

Dentalina doliolum TERQUEM & BERTHELIN, 1875
Pl. 2, Fig. 8

1875 *Dentalina doliolum*, TERQ. et BERTH.; TERQUEM & BERTHELIN, p. 32, pl. 2, fig. 23.

Material. 3 specimens.
Description. Test short, consists of 2 chambers; the chambers nearly uniform in size; sutures indistinct flush; aperture small and round; surface ornamented with 12 to 14 longitudinal ribs, except the nearly flat area around the aperture.
Remarks. Specimens of Szentgál are very close to the original decription of TERQUEM & BERTHELIN (1875).
Dimensions. Height: 0.23–0.41mm; the largest diameter: 0.20–0.36mm.
Distribution. France (Nancy): Upper Pliensbachian (Margaritatus Zone).

Dentalina aff. *notabilis* TERQUEM & BERTHELIN, 1875
Pl. 2, Fig. 9

1875 *Dentalina notabilis*, TERQ. et BERTH.; TERQUEM & BERTHELIN, p. 31, pl. 2, fig. 19.

Material. 1 specimen.

Description. Test large, elongated egg-shaped; consists of 4 chambers; the first chamber strongly sharpened; sutures indistinct; aperture round and relative large and situated on the tapered end of the last chamber; surface ornamented 14 strong,longitudinal ribs.

Remarks. The test-shape of specimen from Szentgál is very similar to those of TERQUEM & BERTHELIN (1875), but the surface ornamentation seems stronger than of holotype.

Dimensions. Height: 0.73mm; the largest diameter: 0.29mm.

Distribution. France (Nancy): Upper Pliensbachian (Margaritatus Zone).

Dentalina pseudocommunis FRANKE, 1936
Pl. 2, Fig. 10

1908 *Dentalina communis* D'ORBIGNY; ISSLER, p. 62, pl.3, figs 143-145.
1936 *Dentalina pseudocommunis* n. sp.; FRANKE, p. 30, pl. 2, fig. 20a-b.
1961 *Dentalina pseudocommunis* FRANKE 1936; PIETRZENUK, p. 63, pl. 2, fig. 4.
1964 *Dentalina communis* D'ORBIGNY; BARBIERI, p. 752, pl. 57, figs 6a-b.
1970 *Dentalina communis* (ORBIGNY, 1826); FUCHS, p. 80, pl. 3, figs 12, 15.
1970 *Dentalina pseudocommunis* FRANKE, 1936; FUCHS, p. 84, pl. 4, figs 16-17.
1985 *Dentalina pseudocommunis* FRANKE, 1937; RUGET, p. 51, 59, 62, 67, 70, 71, 77, 85, 86, 88; pl. 2, fig. 10; pl. 13, fig. 5.
1995 *Dentalina pseudocommunis* FRANKE, 1936; GÖRÖG, p. 44, pl. 4, fig. 1. cum. syn

Material. 2 specimens.

Description: Test uniserial, elongated; circular to slightly oval in cross section; proloculus ovate; 6 to 7 chambers gradually increasing in size, giving slender, gently flaried outline; the height of chambers are usually larger than the wide; end of the last chamber narrowed; suture slightly oblique, usually indistinct at first, later depressed; aperture radial and terminal; surface smooth.

Dimensions. Height: 0.71-0.82 mm; the largest diameter: 0.29-0.37 mm.

Distribution. Lower Austria (Hernstein):Lowermost Jurassic; England: Hettangian-Kimmeridgian; France: Hettangian-Toarcian; NW Germany: Lower Jurassic-lower part of the Upper Jurassic; S Germany: Lower Jurassic; Upper Bajocian, Lower Oxfordian; Germany (Völpke, Apfelstädt, Stollenhalde am Grossen Seeberg): Upper Sinemurian); Germany (Dobbertin): Upper Pliensbacian; Hungary (Mecsek Mts): Bathonian; Poland: Lower Jurassic; Central Poland: Kimmeridgian; Switzerland: Oxfordian; Ukraine: Aalenian-Bajocian, Callovian.

Genus *Nodosaria* LAMARCK, 1812

Nodosaria cf. *caudata* FRENTZEN, 1941
Pl. 2, Fig. 11

1941 *Nodosaria caudata* nov. spec.; FRENTZEN, p. 317, pl. 2, fig. 22.

Material. 1 brokened specimen.

Description. Test elongated, slim; the 3 remained chambers are elongated; sutures slightly depressed; aperture is bordered with a rim and situated on the end of the long extension of the last elongated, egg-shaped chamber; surface smooth.

Remarks. The most characteristic features of this species is the shape of the aperture.

Dimensions. Height of the chambers: about 0.2mm; the largest diameter 0.125mm.

Distribution. Germany, Karlsruhe: Upper Sinemurian.

Nodosaria columnaris FRANKE, 1936
Pl. 2, Fig. 12

1908 *Nodosaria raphanistrum* LINNÉ; ISSLER, p. 53, pl. 2, figs 84, 85.
1936 *Nodosaria columnaris* n. sp.; FRANKE, p. 48, pl. 4, fig. 19a-b.
1937 *Nodosaria columnaris* FRANKE, 1936; BARTENSTEIN & BRAND, p. 146, pl. 3, fig. 24.
1950 *Nodosaria columnaris* FRANKE, 1936; BARNARD, p. 356, fig. 4e.
1961 *Nodosaria columnaris* FRANKE 1936; PIETRZENUK, p. 60, pl. 1, fig. 6.
1981 *Nodosaria byfieldensis* BARNARD, 1950b; COPESTAKE & JOHNSON, p. 97, pl. 6.1.2, fig. 6.1.3.
1985 *Nodosaria columnaris* FRANKE, 1936; RUGET, p. 61, 67, 69, 77, pl. 12, fig. 5; pl. 25, figs 10, 13, 19-20.

Material. 4 specimen.

Description. Test elongated, nearly parallel-sided, with 6 to 7 drum-shaped chambers; sutures nearly flush; aperture round and central; surface ornamented with 8 longitudinal, continuous ribs.

Remarks. Specimens from Szentgál very well correspond to type specimen of Franke.

Dimensions. Height: 0.73-0.96 mm; the largest diameter 0.20-0.24 mm.

Distribution. Britain: Lower and mid-Toarcian; France: Upper Sinemurian-Pliensbachian; Germany (Württenberg): Hettangian-mid-Toarcian; Germany (Göttingen): Lower Pliensbachian; Germany (Völpke, Apfelstädt, Stollenhalde am Grossen Seeberg): Upper Sinemurian); Portugal (Coimbra): Lower Pliensbachian (Davoei Zone).

Nodosaria dispar FRANKE, 1936
Pl. 2, Fig. 13

1908 *Nodosaria raphanistrum* LINNÉ: ISSLER, p. 53, pl. 2, figs 87–89.
1936 *Nodosaria dispar* n. sp.; FRANKE, p. 47, pl. 4, fig. 18.
1961 *Nodosaria dispar* FRANKE 1936; PIETRZENUK, p. 60, pl. 1, figs 2, 3.
1964 *Nodosaria dispar* FRANKE; BARBIERI, p. 748, pl. 56, fig. 16.
1970 *Nodosaria dispar* FRANKE, 1936; FUCHS, p. 76; pl. 2, fig. 8.

Material. 1 specimen.
Description. Test elongated, consists of 3 nearly globular chambers; first chamber apiculate; sutures depressed; aperture radial and elevated; surface covered by 8 to 10 costae.
Remarks. Specimen of Szentgál correspond to FRANKE, (1936, pl. 4, fig. 18c) and FUCHS (1970).
Dimensions. Height: 0.46mm; the largest diameter: 0.21mm.
Distribution. Lower Austria (Hernstein): Lowermost Jurassic; Germany (Württenberg): Hettangian–Upper Pliensbachian; Germany (Völpke, Apfelstädt, Stollenhalde am Grossen Seeberg): Upper Sinemurian; Germany (Dobbertin): Upper Pliensbacian; Sicily: Sinemurian–Lower Pliensbachian.

Nodosaria hemimorpha FRENTZEN, 1941
Pl. 2, Figs 14–15

1941 *Nodosaria hemimorpha* nov. spec.; FRENTZEN, p. 318, pl. 2, figs 29, 30, 31.

Material. 17 specimens (10 rectangular and 7 quinquangular).
Description. Test elongated; the initial chamber piramidal and large; the next 4 to 8 chambers neraly uniform in size; sutures indistinct, sometimes slightly depressed; aperture radiate and situated on the extention of the last chamber; surface ornamented 4 to 5 straight costae.
Remarks. The test-shape of this species is very variable, it may be rectangular or quinquangular in cross-section. Sometimes the later chambers are smaller in diameter than the previous ones.
Dimensions. Height: 0.48–0.78mm; the largest diameter: 0.16–0.23mm.
Distribution. Germany (Karlsruhe): Upper Pliensbachian.

Nodosaria aff. *kuhni* FRANKE, 1936
Pl. 2, Fig. 16

1936 *Nodosaria kuhni* n. sp.; FRANKE, p. 46, pl. 4, fig. 13.

Material. 6 chambers.
Description. Chambers ovoid in shape; sutures strongly deepened; aperture small and round; surface ornamented with 8 longitudinal, upwards widened ribs, diminishing towards the aperture.
Remarks. These chambers are probably the last chambers of *N. kuhni*.
Dimensions. The largest diameter 0.25–0.29mm.
Distribution. Germany (Hannover): Upper Pliensbachian; Germany (Bayern): Lower Pliensbachian.

Nodosaria laevigata FRENTZEN, 1941
Pl. 2, Fig. 17

1941 *Nodosaria laevigata* nov. spec.; FRENTZEN, p. 319, pl. 2, figs 26–27.

Material. 4 specimens.
Description. Test elongated, pupa-shaped; the first chamber small and spherical; the next 5 to 7 chambers slowly increasing in wide, forming nearly parallel side of the test; chambers are somewhat wider than high; sutures indistinct, horizontal; aperture is on a small extension of the final chamber; wall smooth.
Remarks. The most characteristic features of this species are the pupa-shaped test and the indistinct sutures.
Dimensions. Height: 0.41–0.44mm; the largest diameter: 0. 17–0.19mm.
Distribution. Germany, Karlsruhe: Upper Sinemurian.

Nodosaria mitis (TERQUEM & BERTHELIN, 1875)
Pl. 2, Fig. 18

pars 1875 *Dentalina mitis*, TERQ. et BERTH. (n. sp); TERQUEM & BERTHELIN, p. 28, pl. 2, fig. 9 b, non 9a, c, d.
1908 *Nodosaria raphanistrum* LINNÉ; ISSLER, p. 53, pl. 2, fig. 86.
1936 *Nodosaria mitis* (TERQ. & BERTH.); FRANKE, p. 45, pl. 4, figs 10a–b.
1937 *Nodosaria mitis* (TERQUEM & BERTHELIN, 1875); BARTENSTEIN & BRAND, p. 145, pl. 2A, fig. 9; pl. 2B, fig. 13; pl. 3, fig. 18; pl. 4, fig. 36; pl. 5, fig. 24.
1961 *Nodosaria mitis* (TERQUEM & BERTHELIN, 1875); PIETRZENUK, p. 59, pl. 1, figs 7–8.

Material. 2 specimens.
Description. Test elongated, consists of 6 chambers; first chambers small and sharpened; the next 2 to 3 chambers rapidly increasing in size, later chambers nearly similar in size; sutures distinct depressed; aperture round and somewhat elevated; surface ornamented with 6 strong longitudinal costae.
Remarks. FRANKE (1936) described and figured specimens with 8 costae.
Dimensions. Height: 0.71–76mm; the largest diameter 0.24–0.26 mm.

Distribution. France (Nancy): Upper Pliensbachian (Margaritataus Zone); Germany (Hannover, Bayern): Upper Pliensbachian; Germany (Bayern): Lower Pliensbachian; Germany (Württenberg): Hettangian–Sinemurian; Germany (Völpke, Apfelstädt, Stollenhalde am Grossen Seeberg): Upper Sinemurian; Germany (Dobbertin): Upper Pliensbacian.

Nodosaria procera FRANKE, 1936
Pl. 2, Fig. 19

1936 *Nodosaria procera* n. sp.; FRANKE, pl. 51, pl. 5, fig. 3.
1937 *Nodosaria procera* FRANKE, 1936; BARTENSTEIN & BRAND, p. 146, pl. 3, figs 17a–c.
1985 *Nodosaria procera* FRANKE, 1936; RUGET, p. 61, 67, pl. 12, figs 12–13.

Material. 2 specimens
Description. Test uniserial, elongated; round in cross-section; proloculus large and spherical; 3 to 4 chambers, which are wider than high; sutures depressed and distinct; aperture small and round; surface ornamented by 10 to 12 longitudinal costae.
Remarks. Usually there are more costae on the younger chambers.
Dimensions. Height of chambers: 0.16–0.18mm; diameter of chambers: 0.18–0.20mm.
Distribution. Central France: Upper Sinemurian; Germany (Bayern): Lower Pliensbachian; NW Germany: Hettangian–Lower Pliensbachian.

Nodosaria regularis TERQUEM, 1862
Pl. 2, Fig. 10

1862 *Nodosaria regularis*, TERQ.; TERQUEM, p. 436, pl. 5, fig. 12.
1862 *Nodosaria nitida*, var., TERQ.; TERQUEM, p. 436, pl. 5, fig. 11.
1875 *Nodosaria simplex*, TERQ. et BERTH. (n. sp.); TERQUEM & BERTHELIN, p. 19, figs 18a–b.
1936 *Nodosaria regularis* TERQ.; FRANKE, p. 41, pl. 3, figs 19a–b.
1937 *Nodosaria regularis* TERQUEM, 1862; BARTENSTEIN and BRAND, p. 144, pl. 11A, figs 6a–b; pl. 15A, fig. 10.
1941 *Nodosaria regularis* TERQUEM; FRENTZEN, p. 323, pl. 2, figs 12–15.
1964 *Nodosaria regularis* TERQUEM; BARBIERI, p. 750, pl. 56, fig. 11.
?1968 *Nodosaria regularis regularis* TERQUEM, 1862; WELZEL, p. 10, pl. 1, fig. 16.
1970 *Nodosaria regularis* TERQUEM, 1862; FUCHS, p. 78, pl. 2, fig. 15.
1981 *Nodosaria regularis* subsp. A; COPESTAKE & JOHNSON, p. 98, pl. 6.1.4, fig. 3.
1984 *Nodosaria regularis* TERQUEM, 1862; RIEGRAF et al., p. 682, pl. 5, fig. 129.

Material. 31 chambers.
Description. Chambers globular, connected by short constricted neck; aperture produced on a neck; surface smooth.
Remarks. Specimen figured by WELZEL (1968) have pyriform chambers.
Dimensions. Diameter: 0.28–0.33mm.
Distribution. Lower Austria (Hernstein): lowermost Jurassic; Britain: Toarcian–Bathonian; France: Upper Pliensbachian (Margaritatus Zone); Germany (Karlsruhe): Upper Pliensbacian–uppermost Middle Jurassic; S Germany (Bayern, Württemberg): Upper–Toarcian; Morocco (DSDP): Pliensbachian ?; Sicily: Sinemurian.

Nodosaria szentei n. sp.
Pl. 3, Figs 1–3

Derivatio nominis: After István SZENTE, my kindly colleaque.
Locus typicus: 11 layers of T–I section on Tűzköves Hill, Szentgál, Bakony Mts, Hungary.
Stratum typicum: Lower Pliensbachian, Jamesoni–Ibex Zone.
Holotype: Plate 3, Figure 1.
Paratypes: Plate 3, Figure 2, 3.
Material. 5 specimens.
Diagnosis. Test is cucumber-shaped, sutures indistinct; aperture round at the tapered end of the last chamber, costae bifurcated at the latest chambers.
Description. Test elongated, more or less curved and robust; round in cross-section; 4 to 7 chambers are wider than high; sutures indistinct and flush; aperture round at the tapered end of the last chamber; surface ornamented with 10–12 longitudinal costae, which often bifurcated at the younger chambers.
Remarks. The most characteristic features of this species are the cucumber-shaped test, and the surface ornamentation. This species most resembles to *N. szentgali* n. sp., but the latter differs from *N. szentei* in its more slender and straight test-shape, large number of costae and the less tapered final chamber.
Dimensions. Height: 0.68–1.32mm; the largest diameter: 0.26–0.36 mm.

Nodosaria szentgali n. sp.
Pl. 3, Fig. 4

Derivatio nominis: After Szentgál, the type locality.
Locus typicus: 11 layers of T–I section on Tűzköves Hill, Szentgál, Bakony Mts, Hungary.
Stratum typicum: Lower Pliensbachian, Jamesoni-Ibex Zone.
Holotype: Plate 3, Figure 4.
Material. 10 specimens.
Diagnosis. Test is elongated and slim; sutures indistinct and flush; aperture round and terminal, covered by 11 to 14 longitudinal costae.

Description. Test elongated, slim and consists of 3 to 8 nearly uniform chambers; sutures indistinct and flush; aperture round and terminal; surface ornamented by 11 to 14 sharp longitudinal costae.

Remarks. The most distinctive features of this species are the slim test-shape and the indistinct and flush sutures. This species most resembles to *Nodosaria bambergensis* FRANKE, 1936, but differs from it in uniform chambers and flush sutures.

Dimensions. Height: 0.46–0.65mm; the largest diameter 0.20–0.23mm.

Genus *Pseudonodosaria* BOOMGAART, 1949

Pseudonodosaria baconica n. sp.
Pl. 3, Fig. 5

Derivatio nominis: After type locality, Bakony Mts.

Locus typicus: 11 layers of T–I section on Tűzköves Hill, Szentgál, Bakony Mts, Hungary.

Stratum typicum: Lower Pliensbachian, Jamesoni–Ibex Zone.

Holotype: Plate 3, Figure 5.

Material. 2 specimens.

Diagnosis. Test is spindle-shaped; sutures indistinct and flush; aperture round and terminal, the periphery of the last chamber is ornamented with dense and short grooves.

Description. Test spindle-shaped; periphery subacute; 3 to 4 chambers rapidly increasing in size; sutures indistinct and flush; aperture round and terminal; surface smooth except the periphery of the last chamber, which is ornamented with dense and short grooves.

Remarks. The most distinctive features of this species are the indistinct and flush sutures and the short grooves on the periphery. This species most resembles to *P. pygmea* (TERQUEM, 1866b), but differs from it in surface ornamentation.

Dimensions. Height: 0.32–0.35mm; the largest diameter 0.23–0.25mm.

Pseudonodosaria cincta (FRENTZEN, 1941)
Pl. 3, Fig. 6

1941 *Pseudoglandulina cincta* nov. spec.; FRENTZEN, p. 326, pl. 3, fig. 4.

Material. 24 specimens.

Description. Test large, elongated, rectilinear and consists of 5 to 8 chambers; the initial chamber small and rounded; the first 3 to 4 chambers are very broad and rapidly increasing in size, than the enlarging more slowly and less; the final chamber is onion-shaped; sutures straight and slightly depressed; along the sutures there are ring-like thickening; aperture radiate terminal; surface smooth.

Remarks. This species is most resembles to *Nodosaria annulifera* FRENTZEN, 1941, but differs from it in its lower chambers, which very quickly enlarging in wide.

Dimensions. Height: 0.31–0.56mm; the largest diameter: 0.22–0.28mm.

Distribution. Germany (Karlsruhe): Upper Sinemurian–uppermost Pliensbachian;

Pseudonodosaria monostorii n. sp.
Pl. 3, Fig. 7

Derivatio nominis: After Miklós MONOSTORI, my kindly colleaque.

Locus typicus: 11 layers of T–I section on Tűzköves Hill, Szentgál, Bakony Mts, Hungary.

Stratum typicum: Lower Pliensbachian, Jamesoni–Ibex Zone.

Holotype: Plate 3, Figure 7.

Material. 2 specimens.

Diagnosis. Test is egg-shaped; lower part of the chambersa ornamented with numerous short ribs; sutures distinct and depressed.

Description. Test elongated egg-shaped and consists of 5 chambers gradually increasing in size; sutures distinct and depressed; aperture round and terminal; lower part of the chamber ornamented with 8 to 12 short ribs.

Remarks. The most characteristic feature of this species is the surface ornamentation.

Dimensions. Height: 0.26–0.28mm; the largest diameter 0.14–0.16mm.

Pseudonodosaria pygmea (TERQUEM, 1866b)
Pl. 3, Fig. 8

1866b *Glandulina pygmea*, TERQ.; TERQUEM, p. 478, pl. 19, fig. 6.

1875 *Glandulina pygmea*, TERQ.; TERQUEM & BERTHELIN, p. 22, pl. 1, figs 23a–b.

1984 *Pseudonodosaria vulgata* (BORNEMANN, 1854); RIEGRAF et al., pl. 1, fig. 35.

Material. 4 specimens.

Description. Test elongated egg-shaped; proloculus rounded; 3 to 5 chambers gradually increasing in size; sutures indistinct and flush; aperture radiate; surface smooth.

Remarks. This species differs from *Pseudonodosaria vulgata* (BORNEMANN) in its flush and indistinct sutures.

Dimensions. Height: 0.41–0.62mm; the largest diameter: 0.27–0.35mm.

Distribution. S France: Sinemurian–Pliensbachian; Germany (Bayern): Pliensbachian; Germany (Württemberg): Hettangian, Toarcian; Morocco: Sinemurian–Pliensbachian.

Pseudonodosaria quinquecostata (BORNEMANN, 1854)
Pl. 3, Fig. 9

1854 *Glandulina quinquecostata* m.; BORNEMANN, p. 32, pl. 2, figs 6a, b.
1936 *Glandulina quinquecostata* BORN.; FRANKE, p. 58, pl. 5, fig. 25a–b, 26a–b.

Material. 4 specimens.
Description. Test egg-shaped consists of 3 to 4 chambers; quinquangular in cross-section; proloculus sharpened; aperture terminal, radiate and produced on a short neck; surface ornamented with 5 strong, rounded and longitudinal ribs.
Remarks. This species differs from *P. sexcostata* BORNEMANN in less, but broad and rounded ribs.
Dimensions. Height: 0.41–0.46; the largest diameter: 0.22–0.24mm. Distribution. Germany (Göttingen): Lower Pliensbachian (Davoei Zone); Germany (Bayern): Upper Pliensbachian.

Pseudonodosaria sexcostata (BORNEMANN, 1854)
Pl. 3, Fig. 10

1854 *Glandulina sexcostata* m.; BORNEMANN, p. 32, pl. 2, figs 7a–b.
1936 *Glandulina sexcostata* BORN.; FRANKE, p. 58, pl. 6, figs 1a–b, 2a–b.
1963 *Rectoglandulina sexcostata* (BORNEMANN 1854); RABITZ, p. 207, pl. 17, fig. 29.
1984 *Pseudonodosaria sexcostata* (BORNEMANN, 1854); RIEGRAF et al., p. 686, pl. 1, fig. 32.

Material. 5 specimens.
Description. Test spindle-shaped, consists of 3 chambers; first chamber apiculate; sutures indistinct, sometimes slightly depressed; aperture round and elevated; surface ornamented with 6 thin, sharp and longitudinal ribs.
Remarks. The most characteristic features of this species are the spindle-like test-shape and the six longitudinal ribs.
Dimensions. Height: 0.31–0.42mm; the largest diameter: 0.22–0.25mm.
Distribution. Germany (Göttingen): Lower Pliensbachian (Davoei Zone); Germany (Bayern): Upper Pliensbachian; Germany (Hannover): Lower Pliensbachian; Morocco: Sinemurian–Pliensbachian.

Subfamily Plectofrondicularinae CUSHMAN, 1927.
Genus *Berthelinella* LOEBLICH & TAPPAN, 1957

Berthelinella paradoxa (BERTHELIN, 1879)
Pl. 3, Fig. 11

1908 *Frondicularia paradoxa* BERTHELIN; ISSLER, p. 57, pl. 3, figs 119–121.
1936 *Flabellina paradoxa* (BERTH.); FRANKE, p. 91, pl. 9, figs, 10–11.
1937 *Flabellina paradoxa* (BERTHELIN, 1879); BARTENSTEIN & BRAND, p. 168. pl. 4, figs 63a–e.
1961 *Berthelinella paradoxa* (BERTHELIN 1879); PIETRZENUK, p. 83, pl. 4, figs 14–15.
1970 *Berthelinella paradoxa* (BERTHELIN, 1879); FUCHS, p. 110, pl. 8, fig. 7.
1984 *Frondicularia paradoxa* BERTHELIN, 1879; RIEGRAF, pl. 684, pl. 6, figs 150–151.
1985 *Berthelinella paradoxa* (BERTHELIN, 1879); RUGET, p. 64, 67, 68, 144, pl. 21, figs 6, 8, 10; pl. 36, fig. 13.

Material. 6 specimens.
Description. Test elliptical, consists of 6 to 10 chambers; compressed and slightly deepened along the longitudinal axis; periphery subacute or acute; proloculus oval and followed by 2 or 3 pairs of biserially arranged chambers; later chambers uniserial and chevron-shaped; sutures slightly raised above the surface; aperture slit-like and terminal; surface smooth.
Remarks. The sutures can be more or less elevated.
Dimensions. Height: 0.43–0.55mm; the largest diameter: 0.31–0.40mm; thickness: 0.06–0.08 mm.
Distribution. Lower Austria (Hernstein): lowermost Jurassic; France (Nancy): Upper Sinemurian; NW Germany: Lower Pliensbachian; Germany (Württemberg): Hettangian–Lower Pliensbacian; Germany (Völpke): Upper Sinemurian; Germany (Dobbertin): Upper Pliensbachian; Portugal (Coimbra): Lower Pliensbachian (Jamesoni Zone); Morocco (DSDP): Sinemurian–Pliensbachian.

Subfamily Lenticulininae
CHAPMAN, PARR & COLLINS, 1934
Genus *Lenticulina* LAMARCK, 1804

Lenticulina acutiangulata (TERQUEM, 1863)
Pl. 3, Fig. 12

1863 *Robulina acutiangulata*, TERQ.; TERQUEM, p. 220, pl. 10, fig. 20, a, b. 1936. *Cristellaria (Lenticulina) acutiangulata* (TERQ.); FRANKE, p. 117, pl. 11, fig. 25.
1937 *Cristellaria (Lenticulina) acutiangulata* (TERQUEM, 1864); BARTENSTEIN & BRAND, p. 175, pl. 5, figs 52a–d.
1961 *Lenticulina (Lenticulina) acutiangulata* (TERQUEM 1864); PIETRZENUK, p. 63, pl. 5, figs 1a–b.
1968 *Lenticulina muensteri acutiangulata* (TERQUEM, 1863); Welzel, p. 43, pl. 2, fig. 29.
1975 *Lenticulina acutiangulata* (TERQUEM, 1864); JENDRYKA-FUGLEWICZ, p. 135, pl. 2, figs 4–6.

Material. 4 specimens.
Description. Test lenticular in shape; periphery keeled; 7 to 8 chambers on the last whorl; sutures distinct, flush and gently arcuate; aperture radiate, terminal and peripheral; surface smooth.

Remarks. JENDRYKA-FUGLEWICZ (1975) dealt with this species in detail. This species differs from *L. gottingensis* BORNEMANN only in its keeled periphery.

Dimensions. Diameter: 0.41–0.48mm.

Distribution. S France: Lower Pliensbachian (Davoei Zone); NW Germany: Pliensbachian; S Germany: Pliensbachian–Toarcian; Poland: Pliensbachian–Toarcian.

Lenticulina gottingensis (BORNEMANN, 1854)
Pl. 3, Fig. 13–14

1854 *Robulina Gottingensis* m.; BORNEMANN, p. 43, pl. 4, figs 40a, b; 41a–b.
1908 *Cristellaria rotulata* LAMARCK; ISSLER, p. 87, pl. 7, figs 311–315.
1936 *Cristellaria (Lenticulina) gottingensis* (BORNEMANN, 1854); FRANKE, p. 116, pl. 11, fig. 22a–b.
1937 *Cristellaria (Lenticulina) münsteri* (ROEMER); BARTENSTEIN & BRAND, p. 174, pl. 3, fig. 30, pl. 4, fig. 69.
1963 *Lenticulina gottingensis gottingensis* (BORNEMANN 1854); RABITZ, p. 202, pl. 16, fig. 4.
1975 *Lenticulina gottingensis* (BORNEMANN, 1854); JENDRYKA-FUGLEWICZ, p. 129, pl. 1; pl. 2, fig. 3; pl. 3, figs 1–4.
1984 *Lenticulina gottingensis* (BORNEMANN, 1854); RIEGRAF et al., p. 684, pl. 6, fig. 159.

Material. 94 specimens.

Description. Test planispiral, nearly round in outline, slightly biconvex; periphery acute; 7 to 9 chambers are on the final whorl; sutures distinct, flush, gently arcuate; aperture radiate, terminal and peripheral; surface smooth.

Remarks. JENDRYKA-FUGLEWICZ (1975) dealt with the variability of this species in detail.

Dimensions. Diameter: 0.23–0.73mm; thickness: 0.24–0.36mm. .

Distribution. Germany (Hannover, Göttingen): Pliensbachian; Germany (Bayern): Upper Pliensbachian; Germany (Württemberg): Lower Pliensbachian, Upper Toarcian; Poland: Pliensbachian; Morocco (DSDP): Sinemurian–Pliensbachian.

Lenticulina polygonata (FRANKE, 1936)
Pl. 3, Fig. 15

1908 *Cristellaria rotulata* LAMARCK; ISSLER, p. 87, pl. 7, figs 316.
1936 *Cristellaria (Lenticulina) polygonata* n. sp.; FRANKE, p. 118, pl. 12, figs 1a–b; 2a–b.
1964 *Lenticulina polygonata* (FRANKE); BARBIERI, p. 758, pl. 57, fig. 13.
1968 *Lenticulina muensteri polygonata* (FRANKE, 1936); WELZEL, p. 42, pl. 2, fig. 38.
1975 *Lenticulina polygonata* (FRANKE, 1936); JENDRYKA-FUGLEWICZ, p. 136, pl. 2, figs 7–8.
1984 *Lenticulina polygonata* (FRANKE, 1936); RIEGRAF et al., p. 685, pl. 1, fig. 23.
pars 1985 *Lenticulina polygonata* (FRANKE, 1937) mg *Lenticulina;* RUGET, p. 64, 73, 77, 83, pl. 32, fig. 1, non 2.

Material. 16 specimens.

Description. Test planispirally coiled, biconvex; polygonal in outline; periphery acute; 7 to 10 chambers on the final whorl; sutures slightly deflected posteriorly and somewhat elevated; aperture radiate, terminal and peripheral; surface smooth.

Remarks. This species differs from *L. gottingensis* (BORNEMANN) in its polygonal outline and elevated, nearly straight sutures.

Dimensions. Diameter: 0.43–0.71mm; thickness: 0.16–0.24mm.

Distribution. Germany (Hannover, Thüringen): Pliensbachian; Germany (Bayern): Upper Toarcian; S Germany: Upper Pliensbachian; Morocco (DSDP): Sinemurian–Pliensbachian; Poland: Pliensbachian–Toarcian; Portugal (Coimbra): Lower Pliensbachian; Sicily: Upper Pliensbachian–Lower Bajocian.

Lenticulina rustica (D'ORBIGNY, 1849)
Pl. 3, Fig. 16

1849 *Cristellaria rustica, d'Orb.;* D'ORBIGNY, p. 242, Nr. 268.
1854 *Robulina nautiloides* m.; BORNEMANN, p. 43, pl. 4, figs 42a–b.
1858 *Cristellaria rustica* D'ORB.; TERQUEM, p. 623, pl. 3, fig. 19a, b.
1936 *Cristellaria (Lenticulina) rustica* (D'ORBIGNY, 1850); FRANKE, p. 115, pl. 11, figs 23a–b.
1963 *Lenticulina (Robulina) rustica* (D'ORBIGNY, 1849); RABITZ, p. 203, pl. 16, fig. 7.
1968 *Lenticulina muensteri rustica* (D'ORBIGNY, 1850); WELZEL, p. 42, pl. 2, fig. 31.

Material. 3 specimens.

Description. Test planispiral, flattened; periphery subacute; 8 to 10 chambers on the final whorl; inner part of the last 2 or 3 chambers do not reach the umbilicus; sutures distinct, slightly arcaute and deepened at the younger part of the test; umbilicus depressed; aperture radiate and peripheral; surface smooth.

Remarks. The most distinctive features of this species are the deepened umbilicus and the nearly parallel-sided test-shape.

Dimensions. The largest diameter: 0.42–0.48mm; thickness: 0.24–0.26mm.

Distribution. S France: Lower Jurassic; N Germany (Hannover): Upper Sinemurian–Upper Pliensbachian; Germany (Württemberg): Pliensbachian–Toarcian; Germany (Bayern): Upper Pliensbachian.

Genus *Saracenaria* DEFRANCE, 1824

Saracenaria sublaevis (FRANKE, 1936)
Pl. 4, Fig. 1

1936 *Cristellaria (Saracenaria) sublaevis* n. sp.; FRANKE, p. 98, pl. 9, figs 30–31.
1937 *Cristellaria (Saracenaria) sublaevis* FRANKE, 1936; BARTENSTEIN & BRAND, p. 170, pl. 5, figs 59a–b.
1961 *Saracenaria sublaevis* (FRANKE, 1936); PIETRZENUK, p. 69, pl. 5, figs 7a–b.
1968 *Saracenaria sublaevis sublaevis* (FRANKE, 1936); WELZEL, p. 49, pl. 2, fig. 51.
1978 *Saracenaria sublaevis* (FRANKE, 1936); PJATKOVA & PERMJAKOVA, p. 89, pl. 30, figs 4a–b.
1981 *Saracenaria sublaevis sublaevis* (FRANKE); COPESTAKE & JOHNSON, p. 98, pl. 6.1.4, fig. 6.
1985 *Lenticulina sublaevis* (FRANKE, 1936) mg *Saracenaria;* RUGET, p. 75, 76, 77, 86, pl. 36, fig. 11.

Material. 2 specimens.
Description. The coiled initial part consists of 4–5 chambers, which followed by an uncoiled portion of 3–4 chambers; nearly triangular in cross-section; periphery subangular; ventral surface slightly convex; aperture is situated on a protruding part of the last chamber; surface smooth.
Remarks. Specimens from Szentgál differ from specimens of FRANKE (1936) in more inflated last chamber.
Dimensions. Height: 0.37–0.41mm; the largest diameter: 0.21–23mm.
Distribution. Britain: Hettangian–Lower Toarcian; N Germany (Hannover): Hettangian; Germany (Dobbertin, Bayern, Württemberg): Upper Pliensbachian; S Germany: Upper Toarcian; Portugal (Murtade): Upper Pliensbachian–Toarcian; Ukraine: Oxfordian.

Subfamily Marginulininae WEDEKIND, 1937
Genus *Astacolus* DE MONTFORT, 1808

Astacolus varians (BORNEMANN, 1854)
Pl. 4, Figs 2–3

1854 *Cristellaria varians* m.; BORNEMANN, p. 41, pl. 4, fig. 32–34a–c.
1854 *Cristellaria granulata* m.; BORNEMANN, p. 41, pl. 4, fig. 36a, b.
1908 *Cristellaria varians* BORNEMANN; ISSLER, p. 86, pl. 6, fig. 306–310; pl. 7, figs 308, 310.
1963 *Lenticulina (Astacolus) varians* (BORNEMANN 1854); RABITZ, p. 203, pl. 16, figs 1–3, 6.
1968 *Lenticulina varians varians* (BORNEMANN, 1854); WELZEL, p. 43, pl. 2, figs 32–33.
1981 *Astacolus varians* (BORNEMANN, 1854); RIEGRAF et al., p. 683, pl. 6, fig. 169.
1995 *Astacolus varians* (BORNEMANN, 1854); GÖRÖG, p. 58, pl. 8, fig. 4. cum. syn.

Material. 25 specimens.
Description. Test planispiral, oval in outline, somewhat biconvex; periphery acute, sometimes keeled on the spiral part of the test; initial portion planispirally coiled, the final 1 or 2 chambers elongated and uncoiled; 7 to 10 chambers are on the last whorl; sutures distinct, flush, arcuate on the spiral portion, nearly straight on the uncoiled portion; aperture radiate, terminal and peripheral; surface smooth.
Dimensions. The largest diameter: 0.58–1.12 mm; thickness: 0.12–0.16 mm.
Remarks. According to WELZEL (1968, pl. 2, fig. 33) and JENDRYKA-FUGLEWICZ (1975) sutures sometimes elevated and thickened, like on Plate 4, fig. 3.
Distribution. England: Middle Callovian–Lower Oxfordian; NW Germany: upper part of the Lower Jurassic–Oxfordian; Germany (Göttingen): Upper Hettangian–Lower Pliensbachian (Davoei Zone); Germany (Völpke, Apfelstädt, Stollenhalde am Grossen Seeberg): Upper Sinemurian); Germany (Völpke, Halberstadt): Hettangian; Germany (Dobbertin): Upper Pliensbachian; Hungary (Mecsek Mts): Lower and lower part of the Middle Bathonian; Morocco (DSDP): Sinemurian–Pliensbacian; Poland: Lower Jurassic, Malm; Russia: Upper Bajocian; Ukraine: Upper Bajocian–Lower Bathonian, Lower Callovian.

Astacolus vetusta (D'ORBIGNY, 1849)
Pl. 4, Fig. 4

1849 *Cristellaria vetusta* D'ORB., 1849; D'ORBIGNY, p. 242, No. 267.
1858 *Cristellaria vetusta* TERQUEM; TERQUEM, p. 622, pl. 3, figs 17a–d.
1970 *Lenticulina (Vaginulinposis) vetusta* (ORBIGNY, 1850); FUCHS, p. 101, pl. 5, fig. 16.
1985 *Lenticulina vetusta* (D'ORBIGNY, 1849) mg *Marginulinopsis;* RUGET, p. 65, 67, 74, 77, 143; pl. 20, figs 8, 10, pl. 34, figs 2, 3, 5, 10, 12, 13.
1995 *Astacolus vetusta* (D'ORBIGNY, 1849); GÖRÖG, p. 59. pl. 8, fig. 5.

Material. 2 specimens.
Description. Test elongated; early portion coiled later uncoiled and rectilinear; periphery rounded; oval in cross-section; 4 to 6 coiled chambers rapidly increasing in size as added, the 5 uniserial ones nearly uniform in size; sutures distinct, oblique and arcaute; sutures slightly depressed on the coiled portion and depressed on the younger portion of the test; aperture radiate, at the dorsal angle; surface smooth.
Dimensions. Height: 0.51–0.62 mm; breadth of uncoiled portion: 0.17–0.19 mm; thickness: 0.11–0.13 mm.
Distribution. Lower Austria (Hernstein): lowermost Jurassic; France: Lower Sinemurian–Lower Pliensbachian; NW Germany: Lower Jurassic–Middle Jurassic; S Germany: Lower Jurassic–lower part of the Upper Jurassic; Hungary (Mecsek Mts): Bathonian; Central Poland: Kimmeridgian; S Poland: Bathonian;

Portugal (Coimbra): Lower Pliensbachian (Davoei Zone).

Genus *Marginulina* D'ORBIGNY, 1826

Marginulina prima D'ORBIGNY, 1849
Pl. 4, Figs 5–6

1849 *Marginulina prima,* D'ORB; D'ORBIGNY, p. 242, No. 262.
1858 *Marginulina prima,* D'ORB. var. *gibbosa* TERQ.; TERQUEM, p. 612, pl. 3, figs 5a–d.
1858 *Marginulina alata,* TERQ.; TERQUEM, p. 615, pl. 3, figs 9a–b.
1858 *Marginulina ornata,* TERQ.; TERQUEM, p. 616, pl. 3, figs 10a–c.
1863 *Marginulina burgundiae,* TERQ.; TERQUEM, p. 196, pl. 9, figs 3a–d.
1875 *Marginulina gibberula,* TERQ. et BERTH.; TERQUEM & BERTHELIN, p. 55, pl. 4, fig. 21a–b.
1908 *Marginulina burgundiae* TERQUEM; ISSLER, p. 67, pl. 4, figs 171–174.
1936 *Marginulina prima* D'ORB.; FRANKE, p. 76, pl. 8, fig. 1–7. 1936. *Marginulina burgundie* TERQ.; FRANKE, p. 78, pl. 8, fig. 8.
1936 *Dentalina insignis* n. sp.; FRANKE, p. 36, pl. 3, fig. 11a–b.
1937 *Marginulina prima* D'ORBIGNY; BARTENSTEIN & BRAND, p. 161, pl. pl. 2B, fig. 26; pl. 3, figs 39–40; pl. 4, figs 60a–b; pl. 5, figs 46a–b.
1937 *Marginulina burgundiae* TERQUEM; BARTENSTEIN & BRAND, p. 161, pl. 4, fig. 58.
1950 *Marginulina prima* D'ORBIGNY; BARNARD, p. 372, figs 5a–b, g.
1961 *Marginulina prima* D'ORBIGNY 1849; PIETRZENUK, p. 73, pl. 7, figs 1–9.
1964 *Marginulina prima* D'ORBIGNY; BARBIERI, p. 767, pl. 59, fig. 6.
1968 *Marginulina prima prima* D'ORBIGNY, 1850; WELZEL, p. 32, pl. 2, figs 10–12.
1970 *Marginulina prima* D'ORBIGNY, 1850; FUCHS, p. 101, pl. 6, fig. 10; pl. 8, fig. 9.
1981 *Marginulina prima* D'ORBIGNY, 1850; RIEGRAF, p. 685, pl. 6, figs 162–163.
1985 *Marginulina burgundiae* TERQUEM, 1863; RUGET, p. 58, 66, 67, 75, 77, pl. 21, fig. 3; pl. 37, figs 7, 15; pl. 38, figs 9, 20.
1985 *Marginulina prima* D'ORBIGNY, 1849; RUGET, p. 58, 66, 67, 75, 77, 84, 86, 143, 144, 146, pl. 21, figs 4–5; pl. 31, figs 16, 18; pl. 37, figs 5–6, 8, 10, 12–14, 16–18; pl. 38, figs 4, 10, 12–17, 19, 21, 23; pl.39, fig. 12.

Material. 8 specimens.

Description. Test elongated, usually slightly curved and consists of 5 to 8 chambers; round in cross-section; proloculus rounded, or sometimes somewhat sharpened; sutures flush or slightly depressed; aperture round, nearly central to peripheral and produced on a short neck; surface ornamented with 6 to 12 longitudinal costae.

Remarks. WELZEL (1968) dealt with trimorphizm of this species in detailed. Variability size of the proloculus, number of costae, deepening of sutures and the position of the aperture. Specimens from Szentgál have nearly flush sutures.

Dimensions. Height: 0.40–0.81mm; the largest diameter 0.20–0.35mm.

Distribution. Lower Austria (Hernstein): lowermost Jurassic; S England (Dorset): Lower Sinemurian; W Europe (according to RUGET, 1985): Upper Sinemurian–lowermost Toarcian; Central France: Upper Sinemurian–Upper Pliensbachian; S France: Lower Pliensbachian (Davoei Zone); S Germany: Upper Pliensbachian; Germany (Württemberg): Hettangian; N Germany: Upper Pliensbachian; NW Germany: Hettangian–Pliensbacian; Portugal (Coimbra): Lower Pliensbachian–Upper Pliensbachian (Margaritatus Zone); Morocco (DSDP): Sinemurian–Pliensbachian; Sicily: Lower Toarcian.

Family Lagenidae REUSS, 1862
Genus *Lagena* WALKER & JAKOB, 1798

Lagena costata (WILLIAMSON, 1858)
Pl. 4, Fig. 7

1858 *Entosolenia costata* (n. sp.); WILLIAMSON, p. 9, pl. 1, fig. 18.
1978 *Lagena costata* (WILLIAMSON, 1858); PJATKOVA & PERMJAKOVA, p. 45, pl. 13, fig. 11.

Material. 4 specimens.

Description. Test consists of a ovoid chamber; round in cross-section; aperture small, round and terminal; surface covered by 11 to 12 longitudinal ribs.

Remarks. The most distinctive features of this species is the surface ornamentation.

Dimensions. Height: 0.40–0.42mm; the largest diameter: 0.32–34mm.

Distribution. Lower Jurassic–Recent. SSSR: Lower Jurassic.

Lagena vulgaris WILLIAMSON, 1858
Pl. 4, Fig. 8

1858 *Lagena vulgaris typica* (n. ssp.); WILLIAMSON, p. 4, pl. 1, fig. 5, 5a.
1875 *Lagena vulgaris* WILLIAMSON; TERQUEM et BERTHELIN, p. 13, figs 6a–b.
1995 *Lagena vulgaris* WILLIAMSON, 1858; GÖRÖG, p. 67, pl. 9, fig. 10. cum. syn.

Material. 3 specimens.

Description. Test consists of a nearly globular chamber; round to oval in cross-section; aperture small round and protruding on short conical neck; surface smooth.

Dimensions. Diameter: 0.28–0.33mm.

Distribution. England: S France: Lower Jurassic–Middle Jurassic; Germany: upper part of the Lower Jurassic; Hungary (Mecsek Mts): Bathonian; S Poland: Bathonian.

Family Polymorphinidea D'ORBIGNY, 1839
Subfamily Polymorphininae D'ORBIGNY, 1839
Genus *Eoguttulina* CUSHMAN & OZAWA, 1930

Eoguttulina szentgali n. sp.
Pl. 4, Figs 8–9

Derivatio nominis: After Szentgál, the type locality.
Locus typicus: 11 layers of T–I section on Tűzköves Hill, Szentgál, Bakony Mts, Hungary.
Stratum typicum: Lower Pliensbachian, Jamesoni–Ibex Zone.
Holotype: Plate 4, Figure 9.
Paratype: Plate 4, Figure 10.
Material. 5 specimens.
Diagnosis. Test rhomboid in side-view and subtriangular in cross-section; aperture radial.
Description. Test rhomboid in side-view and subtriangular in cross-section; tapered at both ends; subtriangular in cross-section; periphery rounded; 3 or 4 chambers are visible; sutures indistinct, more or less depressed; aperture radial; surface smooth.
Remarks. This species differs from the other Jurassic species of genus *Eoguttulina* in very broad and squat test-shape.
Dimensions. Height: 0.37–0.41 mm; breadth: 0.32–0.34 mm; thickness: 0.19–0.23mm.

Subordo Rotaliina DELAGE & HÉROUARD, 1896
Superfamily Ceratobuliminacea CUSHMAN, 1927
Family Epistominidae WEDEKIND, 1937
Subfamily Reinholdellinae SEIGLIE & BERMÚDEZ, 1965
Genus *Reinholdella* BROTZEN, 1948

Reinholdella margarita (TERQUEM, 1866b)
Pl. 4, Figs 11–12

1866b *Rotalina margarita* TERQ.; TERQUEM, p. 522, pl. 22, figs 20–22.
1981 *Reinholdella margarita* (TERQUEM); COPESTAKE & JOHNSON, p. 102, pl. 6.1.5, fig. 13.

Material. 2 specimens.
Description. Test trochospiral, biconvex; periphery acute; Spiral side: 7 or 8 chambers on the final whorl; elevated spiral and septal sutures. Umbilical side: 5 to 6 chamber visible; sutures depressed; open and crater-like umbilicus; aperture interiomarginal. Surface smooth.
Remarks. The *R. macfadyeni* (TEN DAM) emend. HOFKER differs from this species in its less convex test-shape, less elevated sutures and closed umbilicus.
Dimensions. The largest diameter: 0.27–0.34mm; thickness: 0.12–0.16mm.
Distribution. Britain: Lower Sinemurian (Semicostatum Zone)–Upper Sinemurian (early Obtusum Zone); S France: lowermost Jurassic.

Family Epistominidae WEDEKIND, 1937
Genus *Epistomina* WEDEKIND, 1937

Epistomina? sp.
Pl. 4, Figs 13–14

Material. 4 specimens.
Description. Test low trochospiral, planoconvex; periphery rounded and sligtly lobulate; chambers gradually increasing in size; arrenged in 2 whorls on the spiral side; umbilicus flush; sutures slightly curved and somewhat depressed; aperture oval and peripheral, situated on the umbilical side; surface smooth.
Dimensions. The largest diameter: 0.25–0.41mm; thickness: 0.07–0.12 mm.

Foraminifera incertae sedis

"Placentula" pictonica (BERTHELIN, 1879)
Pl. 4, Figs 15–16

1981 *"Placentula" pictonica* (BERTHELIN); COPESTAKE & JOHNSON, p. 100, pl. 6.1.5, figs 2, 3.

Material. 24 specimens.
Description. Test low conical, trochospirally coiled, 4 to 6 chambers per whorl; periphery sharp. Dorsal side: sharp spiral line run along the chambers, giving a distinct step-like appearence in side view, there is a small apical depression; sutures indistinct. Ventral side: umbilicus flush or slightly convex, with numerous curved growth lines radiate from the umbilicus to the ventral side.
Remarks. Specimens of Szentgál show a very good resemblance to specimens of Copestake and Johnson (1981).
Dimensions. Height: 0.19–0.24mm; diameter: 0.23–0.31mm.
Distribution. Britain: Upper Sinemurian (Raricostatum Zone)–Upper Pliensbacian (Spinatum Zone).

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Plate 1

Fig. 1. *Ammodiscoides*? *clypeiformis* (FRENTZEN, 1941), spiral side. 200×
Fig. 2. *Ammodiscoides*? *clypeiformis* (FRENTZEN, 1941), umbilical side. 160×
Fig. 3. *Ammodiscus siliceus* (TERQUEM, 1862), side view. 80×
Fig. 4. *Verneuilinoides mauritii* (TERQUEM, 1866a), oblique umbilical view. 240×
Fig. 5. *Involutina liassica* (JONES, 1853), oblique side view. 160×
Fig. 6. *Trocholina granosa* FRENTZEN, 1941, umbilical side. 100×
Fig. 7. *Trocholina granosa* FRENTZEN, 1941, spiral side. 120×
Fig. 8. *Ichthyolaria brizaeformis* (BORNEMANN, 1854), side view. 110×
Fig. 9. *Ichthyolaria brizaeformis* (BORNEMANN, 1854), side view. 90×
Fig. 10. *Ichthyolaria major* (BORNEMANN, 1854), side view. 100×
Fig. 11. *Ichthyolaria nitida* (TERQUEM, 1858), side view. 100×

Plate 2

Fig. 1. *Ichthyolaria sulcata* (BORNEMANN, 1854), side view of a microspherical specimen. 90×
Fig. 2. *Ichthyolaria sulcata* (BORNEMANN, 1854), side view of a macrospherical specimen. 140×
Fig. 3. *Ichthyolaria tenera* (BORNEMANN, 1854), side view of a "tenera" type specimen 70×
Fig. 4. *Ichthyolaria tenera* (BORNEMANN, 1854), side view of a "pupa" type specimen. 100×
Fig. 5. *Ichthyolaria tenera* (BORNEMANN, 1854), side view of a "carinata" type specimen. 110×
Fig. 6. *Ichthyolaria testudinaria* (FRANKE, 1936), side view. 100×
Fig. 7. *Ichthyolaria testudinaria* (FRANKE, 1936), apertural view. 120×
Fig. 8. *Dentalina doliolum* TERQUEM & BERTHELIN, 1875, side view. 80×
Fig. 9. *Dentalina* aff. *notabilis* TERQUEM & BERTHELIN, 1875, side view. 70×
Fig. 10. *Dentalina pseudocommunis* FRANKE, 1936, side view. 70×
Fig. 11. *Nodosaria* cf. *caudata* FRENTZEN, 1941, sligthly oblique side view. 70×
Fig. 12. *Nodosaria columnaris* FRANKE, 1936, side view. 80×
Fig. 13. *Nodosaria dispar* FRANKE, 1936, side view. 110×
Fig. 14. *Nodosaria hemimorpha* FRENTZEN, 1941, slightly oblique view of a rectangular specimen. 75×
Fig. 15. *Nodosaria hemimorpha* FRENTZEN, 1941, side view of a quinquangular specimen. 90×
Fig. 16. *Nodosaria* aff. *kuhni* FRANKE, 1936, side view. 100×
Fig. 17. *Nodosaria laevigata* FRENTZEN, 1941, side view. 80×
Fig. 18. *Nodosaria mitis* (TERQUEM & BERTHELIN, 1875), side view. 40×
Fig. 19. *Nodosaria procera* FRANKE, 1936, slightly oblique view. 80×
Fig. 20. *Nodosaria regularis* TERQUEM, 1862, side view. 100×

Plate 3

Fig. 1. *Nodosaria szentei* n. sp., side view of the holotype. 75×
Fig. 2. *Nodosaria szentei* n. sp., side view of paratype. 110×
Fig. 3. *Nodosaria szentei* n. sp., side view of paratype. 50×
Fig. 4. *Nodosaria szentgali* n. sp., side view of the holotype 50×
Fig. 5. *Pseudonodosaria baconica* n. sp., side view of the holotype 140×
Fig. 6. *Pseudonodosaria cincta* (FRENTZEN, 1941), side view. 130×
Fig. 7. *Pseudonodosaria monostorii* n. sp., side view of the holotype 160×
Fig. 8. *Pseudonodosaria pygmea* (TERQUEM, 1866b), side view. 80×
Fig. 9. *Pseudonodosaria quinquecostata* (BORNEMANN, 1854), side view. 70×
Fig. 10. *Pseudonodosaria sexcostata* (BORNEMANN, 1854), side view. 100×
Fig. 11. *Berthelinella paradoxa* (BERTHELIN, 1879), side view. 85×
Fig. 12. *Lenticulina acutiangulata* (TERQUEM, 1863), side view. 75×
Fig. 13. *Lenticulina gottingensis* (BORNEMANN, 1854), slightly oblique view. 100×
Fig. 14. *Lenticulina gottingensis* (BORNEMANN, 1854), apertural view. 120×
Fig. 15. *Lenticulina polygonata* (FRANKE, 1936), slightly oblique view. 100×
Fig. 16. *Lenticulina rustica* (D'ORBIGNY, 1849), slightly oblique view. 130×

Plate 4

Fig. 1. *Saracenaria sublaevis* (FRANKE, 1936), slightly oblique view. 120×
Fig. 2. *Astacolus varians* (BORNEMANN, 1854), slightly oblique view. 115×
Fig. 3. *Astacolus varians* (BORNEMANN, 1854), side view. 100×
Fig. 4. *Astacolus vetusta* (D'ORBIGNY, 1849), side view. 80×
Fig. 5. *Marginulina prima* D'ORBIGNY, 1849, side view of "gibberula" type specimen. 80×
Fig. 6. *Marginulina prima* D'ORBIGNY, 1849, slightly oblique view. 90×
Fig. 7. *Lagena costata* (WILLIAMSON, 1858), side view. 65×
Fig. 8. *Lagena vulgaris* WILLIAMSON, 1858, side view. 60×
Fig. 9. *Eoguttulina szentgali* n. sp., side view of holotype. 120×
Fig. 10. *Eoguttulina szentgali* n. sp., apertural view of paratype. 150×
Fig. 11. *Reinholdella margarita* (TERQUEM, 1866b), slightly oblique view of the spiral side. 120×
Fig. 12. *Reinholdella margarita* (TERQUEM, 1866b), slightly oblique view of the umbilical side. 110×
Fig. 13. *Epistomina*? sp., spiral side. 150×
Fig. 14. *Epistomina*? sp., ventral side. 130×
Fig. 15. *"Placentula" pictonica* (BERTHELIN, 1879), spiral side. 160×
Fig. 16. *"Placentula" pictonica* (BERTHELIN, 1879), umbilical side. 170×