Late Jurassic-Early Cretaceous foraminifera from Štramberg-type limestones, Polish Outer Carpathians

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Abstract. Foraminifera studies were carried out on the Štramberg-type limestones which occur as pebbles to small boulders (exotics) within the uppermost Jurassic-Palaeogene flysch deposits of the Polish Outer Carpathians. The studies were focused on foraminifera from (1) reef and peri-reef facies, and (2) lagoonal algal-foraminiferal facies. The paper deals with 34 species (including 8 in open nomenclature) representing 30 genera, 22 families, 14 superfamilies, 11 suborders, and 7 orders. A more precise age determination has been obtained for 30 exotics, representing a Tithonian (mostly) to Valanginian age. Foraminiferal assemblages from at least two exotics suggest a Valanginian age as indicated by the co-occurrence of the species: *Meandrospira favrei* (CHAROLLAIS, BRÖNNIMANN & ZANINETTI), *Montsalevia salevensis* (CHAROLLAIS, BRÖNNIMANN & ZANINETTI), *Patellina turriculata* DIENI & MASSARI, *Neotrocholina valdensis* REICHEL, *Hechtina praeantiqua* BARTENSTEIN & BRAND, *Istriloculina elliptica* (IOVCHEVA) and *I. emiliae* NEAGU. Previous studies based on ammonites and calpionellids indicated the Tithonian to the Early Berriasian age of the Štramberg Limestone in Moravia (the Czech Republic), and their equivalents in Poland. However, Valanginian shallow-water limestones occur as pebbles in some deposits of the Outer Carpathians in the Czech Republic. Further evidence for Valanginian shallow-water marine carbonate sedimentation (algal facies) in the Polish part of the Tethyan margin comes from recent studies of the substrate drilled in the Carpathian Foredeep.

Key words: Foraminifera, Upper Jurassic, Lower Cretaceous, Štramberg-type limestones, Outer Carpathians, Poland.

INTRODUCTION

During the Late Jurassic and earliest Cretaceous, sedimentation in the Polish segment of the northern Tethyan margin developed on a carbonate platform affected by block tectonics. In the Outer Carpathians these deposits occur within the uppermost Jurassic-Palaeogene flysch deposits as so-called *exotics* - pebbles, cobbles and boulders, rarely klippen (e.g., Inwałd near Wadowice, Kruhel near Przemyśl).

Like the Štramberg Limestone from type localities in Moravia (Czech Republic), Štramberg-type limestones are often developed in reefal facies. In fact, these limestones represent more diverse facies of a carbonate platform. The Tithonian-early Berriasian age of the Štramberg Limestone in Moravia, and its equivalent in Poland, is evidenced by ammonites and calpionellids (e.g., Morycowa, 1988; Houša, 1990; Eliáš and Vašíček, 1995; Ciborowski and Kołodziej, 2001). However some biostratigraphical studies indicate that Valanginian shallow-water limestones occur as pebbles in the Outer Carpathians (Soták and Mišík 1993; Ivanova and Kołodziej, 2004). Further evidence of Valanginian shallow-water sedimentation on the northern shelf of the Polish and Czech segment of the Tethyan northern platform comes from boreholes in the middle part of the Polish Carpathian Foredeep (Foreland) (e.g., Gutowski et al., 2007; Matyja, 2009).

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To date foraminifera from the Štramberg-type limestones of the Polish Outer Carpathians have not been the subject of detailed analysis. Previous studies were mainly performed during microfacies analyses, rarely in terms of biostratigraphy, and dealt with limited samples (Geroch and Morycowa, 1966; Kołodziej, 1997; Decrouez and Morycowa, 1997; Kołodziej and Decrouez, 1997; Olszewska and Wiczeorek, 2001; Król and Decrouez, 2002; Ivanova and Kołodziej, 2004). Recently Olszewska (2005) described the foraminifera from the Tithonian-Valanginian Cieszyn Limestones, which are a deep-water equivalent of the Štramberg carbonates.

In the present paper the boring foraminifera *Troglotella incrustans* WERNLI & FOOKES, 1992, nubecularids, and microproblematica, e.g. *Crescentiella* (= "*Tubiphytes*") *morronensis* (CRESCENTI, 1969) (see Senowbari-Daryan et al., 2008) interpreted by some authors as foraminifera, are not described. The representatives of the genera *Trocholina* and *Neotrocholina* (subfamily Involutininae) will be the subject of another paper.

GEOLOGICAL CONTEXT

Sedimentation of the Štramberg Limestone from Moravia and the Štramberg-type limestones from the Polish

Outer Carpathians developed on a carbonate platform along the northern Tethyan margin affected by the Late Jurassic/Early Cretaceous block tectonics (e.g., Brno Platform, Pavlov Platform; Eliáš and Eliášová, 1984, 1986; Vašíček et al., 1994; Golonka et al., 2000).

These limestones, traditionally assumed as reefal, are in fact represented by diversified facies of a carbonate platform. For instance, Książkiewicz (1971) recognized that the Inwałd limestones (the local name for the Štramberg-type limestones from the Inwałd klippe near Wadowice) represent deposits of shoals with reef bordering bahamite deposits. Among the Andrychów Klippes occur also other Jurassic carbonates: Callovian crinoidal limestones, and Oxfordian cherty limestones with *Saccocoma* (Książkiewicz, 1935; Nowak, 1976; Olszewska and Wieczorek, 2001).

Hoffmann & Kołodziej (2004, 2008) have distinguished six main facies represented in exotics of Štramberg-type limestones: (1) coral-microbial boundstones, (2) sponge-microbial boundstones, (3) poorly sorted bioclastic grainstones to rudstones being fragments of coral-debris pile reefs or talus of coral-microbial boundstones, (4) foraminiferal-algal packstones to grainstones, (5) bioclastic wackestones/packstones, and (6) peloidal wackestones. Some of the facies, e.g. marls, might not be preserved as exotics due to their lower fossilization potential.

Establishing spatial and temporal relationships between different facies on the basis of exotics is difficult or impossible. Hoffmann and Kołodziej (2008) presented a generalized interpretation of the sedimentary environment of the studied limestones. This model assumes that on the margin of carbonate platforms high-energy debris reefs were developed. Within the inner part of the platform, coral-microbial patch reefs were formed, however it was foraminiferal-algal facies and peloidal-bioclastic wackestones/packstones that were mainly deposited there. Microbial or sponge-microbial boundstones are much less common than coral facies and their age is unknown. They can be a deeper water equivalent of shallow-water reefs. They can also represent Oxfordian sponge megafacies known from the Cracow Upland, and from boreholes in the Carpathian Foredeep. However, according to Barski and Matyja (2008) and Matyja (2009) this megafacies was formed in the area of the present Carpathian Foredeep as late as the Early Tithonian. Within narrow basins between the North European Plate and carbonate platforms deep-water sedimentation including allodapic limestones (e.g., Cieszyn Limestone) took place (Malik, 1986; Słomka, 1986; Matyszkiewicz and Słomka, 2004; Olszewska, 2005).

The source areas of exotics, not outcropping now, represent the basement of flysch deposits: periodically emerged and eroded marginal parts (known from wells in the Carpathian Foredeep) of the flysch basins or intrabasinal ridges (so-called *cordilleras*; Książkiewicz, 1965).

The present paper deals with foraminifera from limestones representing two facies (based on the interpretation of exotics usually dozen or so centimeters in diameter) where foraminifera are common, namely (1) coral-microbial boundstones, and (2) algal-foraminiferal grainstones. Both facies were recently the subject of detailed studies with respect to benthic algae (Bucur et al., 2005). Unequivocal attribution to one of these two main facies is sometimes problematic, but most studied limestones represent the second facies.

Coral-microbial boundstones are composed of diversified corals, microbialites, and microencrusts (including the encrusting microporellid *Crescentella morronensis* (Crescenti) and nubecularid foraminifera). Corals are numerous and diversified (e.g., Morycowa, 1964, 1968, 1974; Kołodziej, 2003), commonly bored by the foraminifer *Troglotella incrustans* (see Kołodziej, 1997). The latter is commonly associated with microporellid *Lithocodium aggregatum* Elliott, interpreted recently as the foraminifer (Schmid and Leinfelder, 1996) or calcimicrobs (Cherchi and Schroeder, 2006). Locally, microencrusts and syndimentary cement played an important role in the formation of the reef framework (Hoffmann et al., 2008). Such a framework seems to be characteristic for margins of isolated platforms in the Tethyan domain (Schlagintweit and Gawlick, 2008). Common growth cavities are filled with bioclastic grainstones. Coral-microbial boundstones contain the benthic algae *Thaumatoporella parvovesiculifera* (RAINERI), *Nipponophycus ramosus* YABE & TOYAMA, *Neoteutloporella socialis* (PRATURLON), and other fragments of Dasycladales, rare solenoporaceans including *Marinella lugeoni* PFENDER (Bucur et al., 2005).

The algal-foraminiferal facies consists of bioclastic grainstones and packstones. Grain particles are often superficially micritised. The faunal community is dominated by dasycladacean algae (19 species), rivulariacean-like cyanobacteria (Bucur et al., 2005), and benthic foraminifera. Bioclasts are commonly encrusted by *Lithocodium-Bacinella*.

MATERIAL

The studied foraminifera were collected from pebbles, cobbles and small boulders of the Štramberg-type limestones from several localities of the Silesian, Sub-Silesian and Skole units (Fig. 1). The localities and stratigraphic position of exotic-bearing flysch deposits with relation to the Outer Carpathian nappes are given below. More than 360 thin sections from nearly 200 exotics were studied. Exotics and thin sections are deposited in the Geological Museum of the Institute of Geological Sciences, Jagiellonian University, Kraków (collection UJ 140 P). The second number (e.g., 78 in 140 P/78) refers to the number of exotic pebble/boulder.

Silesian nappe

1 - Zamarski - 6 km north from Cieszyn; Lower Cieszyn Beds (Kimmeridgian-middle Upper Tithonian).

2 - stream in **Leńcze** village, 5 km north of Kalwaria Zebrzydowska; Lower Istebna Beds (Late Senonian).

3 - Gródek nad Dunajcem (Gródek upon Dunajec), Rożnów Lake, 15 km north of Nowy Sącz; Ciężkowice Beds (Eocene).

Sub-Silesian nappe

4 - Krzywa stream in **Lusina** village (previously localized as Krzywica village - Kołodziej, 2003), 7 km west of Skawina; Verovice Beds (Barremian).

5 - Jastrzębia stream in Jastrzębia village, 1.5 km east of Lanckorona; Grodziszczce Beds (Early Aptian).

6 - Rędzina stream in **Woźniki** village, 6 km N of Wadowice; black shales within Gaize Beds (Late Aptian-Albian).

Skole nappe

7 - Lubeńka stream in **Lubenia** village, 12 km south-east of Rzeszów, Babica Clays (Upper Paleocene).

Fig. 1. Geological map of the Polish Carpathians (based on Malata et al., 1996) with position of localities with analysed exotics.

BIOSTRATIGRAPHIC RESULTS

Thirty-four foraminiferal species (including 8 in open nomenclature) representing 30 genera, 22 families, 14 superfamilies, 11 suborders, and 7 orders were recognized in the studied limestones. In consequence of the detailed taxonomical and biostratigraphical micropaleontological investigation the age of the studied exotic blocks fits within the late Tithonian to early Valanginian interval. Although foraminifera from nearly 200 exotics were studied, a more precise age determination was obtained for only for 30 of them.

According to the generalized stratigraphic range of the foraminifera species given in Chapter 6 the following age of the exotics were determined:

- 2 exotics - not older than Tithonian
- 13 exotics - not older than late Tithonian
- 6 exotics - not older than Berriasian
- 7 exotics - not older than late Berriasian
- 2 exotics - not older than Valanginian

Among exotics whose age was estimated as not older than Tithonian or Berriasian 27 exotics contain foraminifera with stratigraphic range exceeding the Berriasian (sometimes there are exotics containing only one determined species).

Although the species mentioned below were not found together in one exotic their first appearances mark the age of the exotics, where they were established. Accordingly the present study, the lower boundary of some exotics is determined as Upper Tithonian based on the presence of the species: *Nautiloculina brönnimanni* ARNAUD-VANNEAU & PEYBERNÉS, *Coscinophragma cribratum* (REUSS), *Charentia cuvillieri* NEUMANN, and *Protopeneroplis ultragranulata* (GORBACHIK). The Berriasian age is documented by presence of the species: *Melathrokerion valserinensis* BRÖNNIMANN & CONRAD, *Mayncina* cf.

bulgarica LAUG, PEYBERNÉS & REY, *Dobrogeolina ovidi* NEAGU, *Hechtina praeantiqua* BARTENSTEIN & BRAND, *Moesiloculina danubiana* NEAGU, *Istriloculina elliptica* (IOVCHEVA), *I. emiliae* NEAGU, as well as an appearance of a very rich association of representatives of the genera *Trocholina* and *Neotrocholina* (Arnaud-Vanneau et al., 1988; Mancinelli and Coccia, 1999). Supporting evidence for a Valanginian age of some exotic blocks is found in the presence of the association: *Meandrospira favrei* (CHAROLLAIS, BRÖNNIMANN & ZANINETTI), *Montsalevia salevensis* (CHAROLLAIS, BRÖNNIMANN & ZANINETTI), *Patellina turriculata* DIENI & MASSARI, *Neotrocholina valdensis* REICHEL, *Hechtina praeantiqua* BARTENSTEIN & BRAND, *Istriloculina elliptica* (IOVCHEVA) and *I. emiliae* NEAGU. Despite some of these species possessing a wider range as an association they clearly show Valanginian age.

A Tithonian, mainly late Tithonian, age is assumed for the Štramberg Limestone (Moravia) and Štramberg-type limestones (Poland), however both ammonites and calpionellids provide evidence for an early Berriasian age as well (e.g., Morycowa, 1968; Houša, 1990; Eliáš and Vašíček, 1995; Ciborowski and Kołodziej, 2001). Evidence for a Valanginian age for coral-bearing limestones provided by previous studies of foraminifera (Ivanova and Kołodziej, 2004), and herein. However, all available data indicate that although shallow-water sedimentation persisted through the Valanginian, the main coral reef development occurred in the Late Tithonian and less extensively in the Early Berriasian. The Berriasian stage is represented by exotics that can be attributed mainly to lagoonal, algal-foraminiferal facies.

It should be emphasized that shallow-water limestones of Valanginian age were recognized in the Outer Carpathians in the Czech Republic. They occur as pebbles within conglomerates in the Ždanice unit and Magura

Group, and represent the Berriasian to Valanginian *Clupeina*-limestones (with detritus of reefal organisms), and the Berriasian to Valanginian *Bacinella* biolithites and peri-reefal rudstones (Soták and Mišík, 1993). Further evidence for Valanginian shallow-water marine carbonate sedimentation in the Polish part of the Tethyan margin comes from recent studies of the substrate drilled in the Carpathian Foredeep (see next chapter).

SUBSURFACE EQUIVALENTS OF THE ŠTRAMBERK-TYPE LIMESTONES IN POLAND OUTSIDE OF THE CARPATHIANS

Lower Cretaceous deposits were known in the Polish Carpathian Foredeep (e.g., Moryc, 1997). However, until the end of the 1990s, Tithonian-lowermost Cretaceous facies equivalents of Štramberk-type limestones were not recognized in this area. New wells drilled in the middle part of the Carpathian Foredeep have provided new data and allowed a revision of the biostratigraphy. On the basis of calpionellids, calcareous and organic dinocysts, as well as foraminifera deposits previously not known or determined as Oxfordian-Kimmeridgian were established as Tithonian-Valanginian (Olszewska, 1999, 2001; Maksym et al., 2001; Zdanowski et al., 2001; Urbaniec and Świetlik, 2003; Bobrek et al., 2005; Gutowski et al., 2007; Barski and Matyja, 2008; Matyja, 2009; Urbaniec et al., *in review*; see also Świdrowska et al., 2007). In spite of some differences in biostratigraphy and lithostratigraphy presented by Polish research groups, the presence of Tithonian-Valanginian shallow water carbonates in the Carpathian Foreland is now firmly established. They are represented by diverse facies of carbonate platform including reefs.

Coral-bearing limestones from the northern part of the Carpathian Foreland may represent the Upper Oxfordian-Lower Kimmeridgian (Morycowa and Moryc, 1976; Gutowski et al., 2007), although according to Barski and Matyja (2008) and Matyja (2009) they represent the Tithonian as indicated by organic dinocysts. An age of late early Tithonian or early late Tithonian of coral reefs in the southern part of the middle part of the Carpathian Foreland (drillings in Pilzno area) was given by calpionellids (Matyja, 2009) and foraminifera (Urbaniec and Świetlik, 2003; Urbaniec et al., *in review*). The reefal limestones from the southern region are a lateral equivalent to coral reefs known from Štramberk Limestone (Matyja, 2009). However, the lack of more detailed data on these reefs makes impossible a direct comparison with the Štramberk Limestone with respect to lithology and coral assemblages (unique coral fauna in the Štramberk Limestone and exotics). Both the corals and lithology of coral-bearing limestones from the northern part of the Carpathian Foreland (Morycowa and Moryc, 1976; Morycowa, 1985) differ from those known from the Štramberk Limestone and exotics.

Valanginian shallow water deposits, mainly limestones, represent an inner and outer lagoon (including ooidal-bioclastic limestones of high energy shoals). Bioclastic detritus contains coral fragments (Urbaniec and Świetlik, 2003; Bobrek et al., 2005; Urbaniec et al., *in review*).

The nearest outcrops where shallow water facies, an age equivalent of the Štramberk-type limestones, occur *in situ* is in the Nižniów (Nyzhniv) region in the Western Ukraine (Gutowski et al., 2005b). The upper Tithonian-lower

Berriasian Nižniów Formation is regarded by Gutowski et al. (2005a) as the stratigraphic equivalent of the Late Kimmeridgian-Lower Berriasian Babczyn Formation („Portlandian” according to Niemczycka, 1976a, b) recognized in boreholes in the Lublin Upland, SE Poland. These are developed mostly as bioclastic limestones; extensive reef development is not known.

SYSTEMATIC PART

The taxonomic determination of the foraminifera is based on the latest changes in the foraminiferal classifications: Loeblich and Tappan, 1987; Loeblich and Tappan, 1992 and Kaminski, 2004 and takes into account the following: Charollais et al., 1966; Hottinger, 1967; Neagu, 1968, 1970 a, b, 1979, 1984, 1985, 1986, 1999; Septfontaine, 1974, 1977, 1980, 1988; Darsac, 1983; Loeblich and Tappan, 1985; Bucur, 1988, 1993, 1997; Bucur et al., 1995, 2004; Schlagintweit et al., 2005 and others.

Class Foraminifera D'ORBIGNY, 1826

Order Lituolida LANKESTER, 1885

Suborder Lituolina LANKESTER, 1885

Superfamily Lituolacea DE BLAINVILLE, 1827

Family Lituolidae DE BLAINVILLE, 1827

Subfamily Ammomarginulinae PODOBINA, 1978

Genus *Ammobaculites* CUSHMAN, 1910

Ammobaculites subcretaceus CUSHMAN &

ALEXANDER, 1930. Pl. 1, Figs. 14, 15

*1930 *Ammobaculites subcretacea* CUSHMAN &

ALEXANDER, p. 6, Pl. 2, Figs. 9, 10.

1990 *Ammobaculites subcretaceus* CUSHMAN &

ALEXANDER, Weidich p. 92, Pl. 2, Figs. 13-16

(Synonymy).

1991 *Ammobaculites subcretaceus* CUSHMAN &

ALEXANDER, Schmalzriedt p. 100, Pl. 5, Fig. 6

(Synonymy).

Material: Woźniki (140P/31); Zamarski (140P/36); Lusina (140P/52).

Description: The test is of medium size, elongate with well developed small initial coil made up of seven chambers followed by an enrolled stage composed of maximum four chambers, rounded in section; smooth to gently lobate periphery; the wall is finely agglutinated, aperture terminal.

Distribution: Hauterivian - Cenomanian of the Northern Calcareous Alps (Weidich, 1990); Oxfordian to Lower Kimmeridgian of the western Swabian Alb, Southwestern Germany (Schmalzriedt, 1991).

Known range: Oxfordian (Schmalzriedt, 1991) - Cenomanian (Weidich, 1990).

Suborder Spiroplectamminina MIKHALEVICH, 1992

Superfamily Spiroplectamminacea CUSHMAN, 1927

Family Textulariopsidae LOEBLICH & TAPPAN, 1982

Genus *Haghimashella* NEAGU & NEAGU, 1995

Haghimashella arcuata (HAEUSLER, 1890) Pl. 1, Fig. 17

*1890 *Bigenerina arcuata* HAEUSLER p. 73, Pl. 12,

Figs. 5-7 (non: Pl. 11, Fig. 39).

1988 *Bigenerina arcuata* HAEUSLER, Riegraf p. 472, Pl. 5,

Figs. 14, 15 (Synonymy)

1989a *Bigenerina arcuata* HAEUSLER, Riegraf and Luterbacher p. 1026, Pl. 2, Figs. 12-14.

1991 *Bigenerina arcuata* HAEUSLER, Schmalzriedt p. 107, Pl. 3, Fig. 10; Pl. 7, Figs. 4-9 (Synonymy).

1995 *Haghimashella arcuata* (HAEUSLER), Neagu and Neagu p. 216, Pl. 2, Figs. 1-11.

2007 *Haghimashella arcuata* (HAEUSLER), Krajewski and Olszewska p. 295, Fig. 4 D.

Material: Gródek nad Dunajcem (140 P/109).

Description: *Haghimashella arcuata* possess elongate test with early biserial stage, later becoming uniserial where four globular chambers are visible; the wall is agglutinated, compact and non-canalliculated.

Remarks: See Neagu and Neagu (1995) for detailed description and arguments for the creation of the genus.

Distribution: Oxfordian of the Swiss Jura (Haeusler, 1890); Middle Callovian-Lower Oxfordian of Southwestern Germany (Riegraf, 1988); Callovian-Valanginian of Northern Atlantic Ocean (Riegraf and Luterbacher, 1989a); Oxfordian to Lower Kimmeridgian of the western Swabian Alb, Southwestern Germany (Schmalzriedt, 1991); Kimmeridgian-Lower Tithonian of Eastern Carpathians, Romania (Neagu and Neagu, 1995); Upper Oxfordian-Lower Berriasian of the Southern part of the Crimea Mts., Southern Ukraine (Krajewski and Olszewska, 2007).

Known range: Middle Callovian (Riegraf, 1988) - Valanginian (Riegraf and Luterbacher, 1989a).

Genus *Plectinella* MARIE, 1956

Plectinella sp. Pl. 1, Fig. 18

Material: Gródek nad Dunajcem (140 P/100)

Description: The observed sections possess a biserial arrangement of the test, slightly twisted; the chambers are relatively high; the wall is solid, agglutinated, and noncanalliculate.

Suborder Verneulinina MIKHALEVICH & KAMINSKI, 2004

Superfamily Verneulinacea CUSHMAN, 1911

Family Prolixoplectidae LOEBLICH & TAPPAN, 1985

Genus *Protomarssonella* DESAI & BANNER, 1987

Protomarssonella kummi (ZEDLER, 1961). Pl. 1, Figs. 11, 12

*1961 *Marssonella kummi*, ZEDLER p. 31, Pl. 7, Fig. 1.

1989b *Protomarssonella kummi* (ZEDLER), Riegraf and Luterbacher p. 1096, Pl. 3, Figs. 6-7.

1992 *Protomarssonella kummi* (ZEDLER), Jones and Wonders p. 563, Pl. 1, Fig. 20.

2005 *Protomarssonella kummi* (ZEDLER), Olszewska p. 34, Pl. 5, Fig. 5.

Material: Lusina (140 P/67); Gródek nad Dunajcem (140 P/91).

Description: *Protomarssonella kummi* is characterized by its conical, circular in transverse section test; the early stage is trochospiral followed by a biserial stage of rapidly increasing diameter; the terminal face is flattened to concave; the wall is agglutinated.

Remarks: See discussion for the synonymy in Riegraf and Luterbacher (1989b).

Distribution: Lower Hauterivian of Northwest Germany (Zedler, 1961); Valanginian-Albian of the Northern Atlantic Ocean (Riegraf and Luterbacher, 1989b); Valanginian-Hauterivian of the Barrow Group, Northwest shelf, Australia (Jones and Wonders, 1992); ?Upper Tithonian-Hauterivian of the Cieszyn Limestones Beds, Polish Outer Carpathians (Olszewska, 2005).

Known range: ?Upper Tithonian (Olszewska, 2005) - Albian (Riegraf and Luterbacher, 1989b).

Family Verneulinidae CUSHMAN, 1911

Subfamily Verneulinoidinae SULEYMANOV, 1973

Genus *Gaudryinopsis* PODOBINA, 1975

Gaudryinopsis sp. Pl. 1, Figs 9, 10

Material: Zamarski (140 P/36); Lusina (140 P/39)

Description: The observed sections possess an elongate test with a short early triserial stage, later biserial and with nearly parallel sides; the chambers are slightly appressed and sutures are depressed (visible in Pl. 1, Fig. 10); the wall is finely agglutinated, simple; aperture is not visible.

Genus *Verneulinoides* LOEBLICH & TAPPAN, 1949

Verneulinoides neocomiensis (MJATLIUK, 1939). Pl. 1, Figs. 1-5

*1939 *Verneulinoides neocomiensis*, MJATLIUK p. 50,

Pl. 1, Figs. 12, 13.

1974 *Verneulinoides neocomiensis* (MJATLIUK),

Kuznetsova, Pl. 1, Figs. 6 a-c.

1983 *Verneulina* cf. *polonica* CUSHMAN &

GLAZEWSKI, Darsac p. 210, Pl. 5, Fig. 21.

1989b *Verneulinoides neocomiensis* (MJATLIUK), Riegraf and Luterbacher p. 1093, Pl. 2, Figs. 10-12 (Synonymy).

1992 *Verneulinoides neocomiensis* (MJATLIUK),

Kaminski et al., p. 256, Pl. 7, Fig. 13.

1992 *Verneulinoides neocomiensis* (MJATLIUK), Jones and Wonders p. 563, Pl. 1, Fig. 21.

2007 *Verneulinoides polonicus* (CUSHMAN &

GLAZEWSKI), Krajewski and Olszewska p. 297, Fig. 8 B.

Material: Woźniki (140 P/31), Lusina (140P/39), Gródek nad Dunajcem (140 P/99),

Gródek nad Dunajcem (140 P/158).

Description: *Verneulinoides neocomiensis* is typified by its large, massive and triserial test with globular chambers, increasing rapidly in dimensions; the periphery is rounded; the sutures are oblique and the wall is agglutinated.

Distribution: Upper Jurassic and Lower Cretaceous of the region of the Middle Volga River and the Great Syrt (Mjatliuk, 1939); Uppermost Tithonian-Lower Cretaceous (?) of the Eastern Indian Ocean (Kuznetsova, 1974); Upper Berriasian-Lower Aptian of Ain, Savoie, France (Darsac, 1983); Berriasian-Aptian of the Northern Atlantic and Indian Ocean (Riegraf and Luterbacher, 1989b); Tithonian-Valanginian of Site 765, Northwestern Australia (Kaminski et al., 1992); Tithonian-Lower Aptian of the Barrow Group, Northwest shelf, Australia (Jones and Wonders, 1992); Tithonian-Early Valanginian of the southern part of the Crimea Mts., Southern Ukraine (Krajewski and Olszewska, 2007).

Known range: Uppermost Tithonian (Kuznetsova, 1974) - Aptian (Riegraf and Luterbacher, 1989b; Jones and Wonders, 1992).

Verneulinoides sp. Pl. 1, Fig. 1

Material: Gródek nad Dunajcem (140 P/99).

Description: The observed section shows a large and massive test similar to *V. neocomiensis* but differs by its distinct triserial arrangement in the initial part, the flattened chambers and the rapid increase of the test width; the wall is agglutinated, exceptionally thick, solid, and coarse grained.

Suborder Nezzazatina KAMINSKI, 2004

Superfamily Nezzazatacea HAMAOU & SAINT-MARC, 1970

Family Nautiloculinidae LOEBLICH & TAPPAN, 1985

Genus *Nautiloculina* MOHLER, 1938

Nautiloculina bronnimanni ARNAUD-VANNEAU &

PEYBERNÉS, 1978. Pl. 2, Figs. 2-4

1978 *Nautiloculina bronnimanni* ARNAUD-VANNEAU & PEYBERNÉS, p. 70, Pl. 1, Figs. 6-8; Pl. 2, Figs. 4-11 (Synonymy).

1983 *Nautiloculina bronnimanni* ARNAUD-VANNEAU & PEYBERNÉS, Darsac p. 208, Pl. 6, Figs. 26-27.

1989 *Nautiloculina bronnimanni* ARNAUD-VANNEAU & PEYBERNÉS, Arnaud-Vanneau and Masse p. 264, Pl. 1, Fig. 9.

2003 *Nautiloculina bronnimanni* ARNAUD-VANNEAU & PEYBERNÉS, Dragastan and Richter p. 93, Pl. 1, Fig. 2; Pl. 9, Figs. 10, 11, 16.

2004 *Nautiloculina broennimanni* ARNAUD-VANNEAU & PEYBERNÉS, Bucur et al., Pl. 3, Fig. 22.

2004 *Nautiloculina bronnimanni* ARNAUD-VANNEAU & PEYBERNÉS, Ivanova and Koleva-Rekalova, Pl. 1, Fig. 5.

2004 *Nautiloculina bronnimanni* ARNAUD-VANNEAU & PEYBERNÉS, Ivanova and Kołodziej, Fig. 1 D.

2005 *Nautiloculina cretacea* PEYBERNÉS, Olszewska, p. 35, Pl. 4, Fig. 3.

2007 *Nautiloculina bronnimanni* ARNAUD-VANNEAU & PEYBERNÉS, Krajewski and Olszewska p. 297, Fig. 4 H.

Material: Jastrzębia (140 P/191); Lubenia (140P/11); Lusina (140P/52); Leńcze (140P/73), Gródek nad Dunajcem (140 P/158).

Description: Arnaud-Vanneau and Peybernés (1978) introduced the new species *N. bronnimanni* that is distinguished from *N. cretacea* by its smaller size, depressed sutures, and quadrangular chambers, which display a characteristic shape in the last whorl, and an acute periphery in axial section.

Distribution: Berriasian-Upper Albian of the French and Spanish Pyrenees (Arnaud-Vanneau and Peybernés, 1978); Berriasian-Lower Valanginian of Ain, Savoie, France (Darsac, 1983); Berriasian-Aptian of the Neuchatel area, Switzerland (Arnaud-Vanneau and Masse, 1989); Upper Berriasian-Lower Valanginian of the Mathana Peninsula, Asprovouni Mts., Greece (Dragastan and Richter, 2003); Valanginian-Hauterivian of the Berdiga Limestone, Kale-Gümüşhane region, NE Turkey (Bucur et al., 2004); Berriasian-Valanginian of Southwestern Bulgaria (Ivanova and Koleva-Rekalova, 2004); Upper Berriasian-Valanginian of Stramberk-type limestones, Polish Carpathians (Ivanova and Kołodziej, 2004); Berriasian-Hauterivian of the Southern part of the Crimea Mts., Southern Ukraine (Krajewski and Olszewska, 2007).

Known range: Upper Tithonian (Bucur et al., 1996) - Upper Albian (Arnaud-Vanneau and Peybernés, 1978).

Family Mayncinidae LOEBLICH & TAPPAN, 1985

Genus *Carasuella* NEAGU, 2000

Carasuella sp. Pl. 2, Fig. 5

Material: Gródek nad Dunajcem (140 P/91)

Description: The section shows the robust outline of the test, with a slightly lobate acute to rounded periphery, only the last 6 chambers are clearly visible; the section is similar to the species *C. lenticularis*, described from the Lower Valanginian of South Dobrogea by Neagu (1999).

Genus *Freixialina* RAMALHO, 1969

Freixialina planispiralis RAMALHO, 1969. Pl. 2, Fig. 1.

1969 *Freixialina planispiralis*, RAMALHO p. 37, Pl. 1-2.

1999 *Freixialina planispira* RAMALHO, Neagu p. 289, Fig. 2 c-d; Pl. 4, Figs. 1-15, 39-44; Pl. 5, Figs. 55-64; Pl. 9, Figs. 20-23.

2004 *Freixialina planispiralis* RAMALHO, Bucur et al., Pl. 4, Figs. 10-12, 14.

2006 *Freixialina planispiralis* RAMALHO, Kobayashi and Vuks, Fig. 4, 5-10.

2008 *Freixialina planispiralis* RAMALHO, Omaña and González Arreola, p. 803, Pl. 9 g.

Material: Woźniki (140P/31)

Description: *Freixialina planispiralis* is characterized by its discoidal to lenticular shape test; evolute coiling, with up to 17 narrow chambers increasing rapidly in height, with weakly visible sutures in the last whorl; the wall is finely agglutinated, rather thin, and compact.

Distribution: Upper Jurassic of Portugal (Ramalho, 1969); Uppermost Berriasian-Lowermost Hauterivian of South Dobrogea (Neagu, 1999); Hauterivian-Barremian of the Berdiga Limestone, Kale-Gümüşhane region, NE Turkey (Bucur et al., 2004); undivided Tithonian-Berriasian of Torinosu-type limestones, Kanto Mts., Japan (Kobayashi and Vuks, 2006); Kimmeridgian of Santiago Coatepec, SE Puebla, Mexico (Omaña and González Arreola, 2008).

Known range: Kimmeridgian (Omaña and González Arreola, 2008) - Barremian (Bucur et al., 2004).

Genus *Mayncina* NEUMANN, 1965

Mayncina cf. *bulgarica* LAUG, PEYBERNÉS & REY, 1980. Pl. 2, Fig. 11.

*1980 *Mayncina bulgarica* LAUG, PEYBERNÉS & REY p. 68, Figs. 3, 1-16.

1984 *Mayncina bulgarica* LAUG, PEYBERNÉS & REY, Canerot, Pl. 2, Fig. 3.

1984 *Mayncina bulgarica* LAUG, PEYBERNÉS & REY, Peybernés et al., Pl. 1, Fig. 8.

1988 *Mayncina bulgarica* LAUG, PEYBERNÉS & REY, Bucur, Pl. 1, Fig. 14.

2002 *Mayncina bulgarica* LAUG, PEYBERNÉS & REY, Voznesenskii et al., Pl. 2, Fig. 25.

2006 *Mayncina bulgarica* LAUG, PEYBERNÉS & REY, Husinec and Sokać, Fig. 7, P-R.

2007 *Mayncina bulgarica* LAUG, PEYBERNÉS & REY, Krajewski and Olszewska, p. 297, Fig. 4 J, K.

Material: Lusina 140 P/39; Gródek nad Dunajcem (140 P/118).

Description: *Mayncina bulgarica* is distinguished by its discoidal to lenticular shape test, with numerous broad and low chambers; coiling is planispiral and the operculinoid spire increases slowly in height, chambers arched toward the apertural face, the sutures slightly depressed; the wall is finely agglutinated and simple in structure.

Distribution: Lower Aptian of Bulgaria (Laug et al., 1980); Uppermost Berriasian-Lower Hauterivian of the Eastern Iberides, Spain (Canerot, 1984); Barremian of the Daia Mountains, Oranie, Algeria (Peybernés et al., 1984); Uppermost Berriasian of the Resita-Moldova Noua zone, Southern Carpathians, Romania (Bucur, 1988); Aptian of the southeastern part of the Lesser Caucasus (Voznesenskii et al., 2002); Upper Hauterivian-Lower Barremian of Mljet Island, Southern Croatia (Husinec and Sokać, 2006).

Known range: Upper Berriasian (Canerot, 1984; Bucur, 1988) - Aptian (Laug et al., 1980; Voznesenskii et al., 2002).

Order Loftusiida KAMINSKI & MIKHALEVICH, 2004

Suborder Biokovinina MIKHALEVICH & KAMINSKI, 2004

Superfamily Coscinophragmatacea THALMANN, 1951

Family Coscinophragmatidae THALMANN, 1951

Genus *Coscinophragma* THALMANN, 1951

Coscinophragma cribrosum (REUSS, 1854), Pl. 3, Figs. 1-4

*1846 *Lichenopora cribrosa* REUSS p. 46, Pl. 14, Fig. 10; Pl. 24, Figs. 3-5.

1988 *Coscinophragma cribrosum* REUSS, Bucur, Pl. 1, Fig. 3.

1996 *Coscinophragma* aff. *cribrosum* REUSS, Bucur et al., Pl. 1, Figs. 1, 5; Pl. 6, Figs. 1-3, 5.

2005 *Coscinophragma?* aff. *cribrosus* (REUSS), Schlagintweit et al., p. 27, Fig. 8 a-b (Synonymy)

Material: Lusina (140P/39); Gródek nad Dunajcem (140 P/115, 140 P/176).

Description: The species has an initial coiled part, attached to the substrate, followed by a detached uniserial stage.

Remarks: For detailed description and analysis of generic position see Bucur et al. (1996) and Schlagintweit et al. (2005).

Distribution: Cretaceous of the Bohemian Massif (Reuss, 1846); Valanginian of the Resita-Moldova Noua zone, Southern Carpathians, Romania (Bucur, 1988); Upper Tithonian of the Madonie Mts., Italy (Bucur et al., 1996); Uppermost Tithonian-Lowermost Berriasian of the Plassen carbonate platform, Salzkammergut area (Schlagintweit et al., 2005).

Known range: Upper Tithonian (Bucur et al., 1996) - Lower Aptian (Arnaud-Vanneau et al., 1987).

Superfamily Biokovincea GUŠIĆ, 1977

Family Charentiidae LOEBLICH & TAPPAN, 1985

Genus *Charentia* NEUMANN, 1965

Charentia cuvillieri NEUMANN, 1965. Pl. 3, Figs. 5-10

*1965 *Charentia cuvillieri* NEUMANN, p. 63, Pl. 2, Figs. 6-12.

1968 *Melatrokerion spiralis* Gorbachik p. 6, Pl. 1, Figs. 1-6.

1968 *Tonasia evoluta* GORBACHIK, p. 8, Pl. 2, Figs. 1-5.

1983 *Charentia* cf. *cuvillieri* NEUMANN, Darsac p. 209, Pl. 6, Fig. 24.

1985 *Charentia cuvillieri* NEUMANN, Loeblich and Tappan, p. 98, Pl. 3, Figs. 1-13.

1989 *Charentia cuvillieri* NEUMANN, Arnaud-Vanneau and Masse p. 262, Pl. 1, Fig. 8 (Synonymy).

1993 *Melathrokerion spiralis* GORBACHIK, Dulub and Zhabina, Pl. 5, Fig. 1.

1993 *Charentia evoluta* (GORBACHIK), Dulub and Zhabina, Pl. 1, Fig. 2.

1999 *Charentia cuvillieri* NEUMANN, Ivanova, Pl. 2, Fig. 11.

1999 *Charentia evoluta* (GORBACHIK), Neagu, p. 292, Pl. 3, Figs. 24-29; Pl. 9, Figs. 25, 26.

1999 *Charentia cuvillieri* NEUMANN, Schlagintweit and Ebli, p. 398, Pl. 5, Figs. 1-3 (Synonymy).

2001 *Charentia evoluta* GORBACHIK, Olszewska and Wiczorek, Pl. 3, Figs. 1, 2.

2002 *Melathrokerion spiralis* GORBACHIK, Voznesenskii et al., Pl. 1, Fig. 4.

2003 *Charentia cuvillieri* NEUMANN, Dragastan and Richter, p. 91, Pl. 9, Fig. 9.

2004 *Charentia cuvillieri* NEUMANN, Bucur et al., p. 210, Pl. 3, Fig. 22.

2004 *Charentia cuvillieri* NEUMANN, Ivanova and Koleva-Rekalova, Pl. 2, Figs. 1-3.

2004 *Charentia cuvillieri* NEUMANN, Ivanova and Kolodziej, Fig. 1 A.

2005 *Charentia evoluta* GORBACHIK, Olszewska, p. 35, Pl. 4, Figs. 7, 8.

2006 *Melathrokerion spiralis* GORBACHIK, Arkad'ev et al., Pl. 4, Figs. 8-10.

2006 *Charentia evoluta* GORBACHIK, Arkad'ev et al., Pl. 4, Fig. 15.

2006 *Charentia evoluta* GORBACHIK, Kobayashi and Vuks, Figs. 4 (27-32).

2006 *Melathrokerion spiralis* GORBACHIK, Kobayashi and Vuks, Fig. 4 (35-45).

2007 *Charentia evoluta* GORBACHIK, Krajewski and Olszewska, p. 299, Figs. 5 G, H.

2007 *Melathrokerion spiralis* GORBACHIK, Krajewski and Olszewska, p. 299, Fig. 5 I.

2008 *Charentia cuvillieri* NEUMANN, Ivanova et al., Fig. 7 G, H.

Material: Leńcze (140 P/45, 140 P/83); Gródek nad Dunajcem (140 P/84, 140 P/99, 140 P/105); Lusina, UJ 140P/39.

Description: *Charentia cuvillieri* is characterized by its planispiral enrollment in the early stage test with a clearly tendency to uncoil in the last stage where two chambers are present; periphery is subacute to round.

Remarks: Loeblich and Tappan (1985) described in details the nature of the wall; for synonyms at species and genera level see Loeblich and Tappan (1985), Neagu (1999) and Bucur et al. (2004).

Distribution: Cenomanian of Charente Maritime, France (Neumann, 1965); Berriasian and Valanginian of the Crimea (Gorbachik, 1968); Berriasian-Lower Valanginian of Ain, Savoie, France (Darsac, 1983); Cenomanian of the Charente Maritime, France (Loeblich and Tappan, 1985); Middle Berriasian-Cenomanian of the Neuchâtel area, Switzerland (Arnaud-Vanneau and Masse, 1989); undivided Tithonian and Berriasian of the South-Eastern Crimea (Dulub and Zhabina, 1993); Berriasian-Valanginian of West Balkan Mts., Bulgaria (Ivanova, 1999); Uppermost Berriasian-Lower Hauterivian of South Dobrogea, Romania (Neagu, 1999); Upper Tithonian-Lower Valanginian of the Trisselwand section, Northern Calcareous Alps (Schlagintweit and Ebli, 1999); Upper Tithonian of Andrychow Klippe, Outer Western Carpathians, Poland (Olszewska and Wiczorek, 2001); Upper Tithonian of Southeastern part of the Lesser Caucasus (Voznesenskii et al., 2002); Lower Valanginian of the Mathana Peninsula, Asprovouni Mts., Greece (Dragastan and Richter, 2003); Valanginian-Barremian of the Berdiga Limestone, Kale-Gümüşhane region, NE Turkey (Bucur et al., 2004); Berriasian-Valanginian of Southwestern Bulgaria (Ivanova and Koleva-Rekalova, 2004); Upper Berriasian-Valanginian of the Stramberk-type limestones (Ivanova and Kolodziej, 2004); Berriasian-Valanginian of Cieszyn Beds, Polish Outer Carpathians (Olszewska, 2005); Upper Tithonian of the Eastern Crimea (Arkad'ev et al., 2006); undivided Tithonian-Berriasian of Torinosu-type limestones, Kanto Mts., Japan (Kobayashi and Vuks, 2006); Berriasian-Valanginian of Southwestern Bulgaria (Ivanova et al., 2008).

Known range: Upper Tithonian (Bucur et al., 1996) - Cenomanian (Neumann, 1965; Loeblich and Tappan, 1985).

Genus *Melathrokerion* BRÖNNIMANN & CONRAD, 1967

Melathrokerion valserinensis BRÖNNIMANN & CONRAD, 1967. Pl. 2, Figs. 12-15

1967 *Melathrokerion valserinensis* BRÖNNIMANN & CONRAD, p. 137, Pl. 1-3, 11, and figures in the text.

1983 *Melathrokerion* cf. *valserinensis* BRÖNNIMANN & CONRAD, Darsac, p. 212, Pl. 7, Figs. 2, 3.

1989 *Melathrokerion valserinensis* BRÖNNIMANN & CONRAD, Arnaud-Vanneau and Masse, p. 262, Pl. 1, Fig. 6.

1995 *Melathrokerion* sp. cf. *M. valserinensis* BRÖNNIMANN & CONRAD, Arnaud-Vanneau and Sliter, p. 550, Pl. 1, Figs. 3, 4.

Material: Gródek nad Dunajcem (140 P/78, 140 P/100); Woźniki (140 P/23; 140 P/177).

Description: This species is distinguished by its nautiloid, planispirally coiled and involute test, with a slight tendency to be streptospiral in the early stage; few chambers per whorl as in *Charentia* and a broadly rounded periphery; the wall is agglutinated, microgranular, thick, simple in the early stage, later becoming pseudoalveolar with very narrow cylindrical canaliculi piercing the wall but not becoming true alveoles (note pseudoalveolar structure in Pl. 2, Figs. 12, 13, and 15).

Distribution: Upper Barremian-Lowermost Aptian of the French Jura (Brönnimann & Conrad, 1967); Middle-Upper Berriasian of Ain, Savoie, France (Darsac, 1983); Barremian of Neuchatel area, Switzerland (Arnaud-Vanneau and Masse, 1989); Probable Hauterivian of the Mid-Pacific Mts. (Arnaud-Vanneau and Sliter, 1995).

Known range: Berriasian (Darsac, 1983) - Lowermost Aptian (Brönnimann and Conrad, 1967).

Suborder Ataxophragmiina FURSENKO, 1958

Superfamily Ataxophragmiacea SCHWAGER, 1877

Family Ataxophragmiidae SCHWAGER, 1877

Subfamily Ataxophragmiinae SCHWAGER, 1877

Genus *Arenobulimina* CUSHMAN, 1927

Arenobulimina sp. Pl. 1, Fig. 16

Material: Woźniki (UJ 140P/31).

Description: The observed specimen possesses a trochospiral test, with the early part trochospirally enrolled; chambers in the last part of the test are globulus with depressed sutures; the wall is finely agglutinated and the section is similar to *A. corniculum* Arnaud-Vanneau (1980) figured by Darsac (1983; Pl. 5, Figs. 32, 33) and later by Neagu (1997; Pl. 2, Figs. 56-58; Pl. 4, Figs. 20-26).

Family Montsaleviidae (ZANINETTI, SALVINIBONNARD, CHAROLLAIS & DECROUEZ, 1987)

Genus *Montsalevia* (ZANINETTI, SALVINI-BONNARD, CHAROLLAIS & DECROUEZ, 1987)

Montsalevia salevensis (CHAROLLAIS, BRÖNNIMANN & ZANINETTI, 1966). Pl. 2, Fig. 10

1966 *Pseudotextulariella salevensis* CHAROLLAIS, BRÖNNIMANN & ZANINETTI, p. 28, Pl. 1, Figs. 1-5; Pl. 2, Figs. 2, 6; text-fig. 1.

1983 *Pseudotextulariella salevensis* CHAROLLAIS, BRÖNNIMANN & ZANINETTI, Darsac p. 214, Pl. 5, Figs. 9-13 (Synonymy).

1995 *Montsalevia salevensis* CHAROLLAIS, BRÖNNIMANN & ZANINETTI, Bucur et al., Pl. 4, Figs. 11-15.

1999 *Montsalevia salevensis* CHAROLLAIS, BRÖNNIMANN & ZANINETTI, Ivanova, Pl. 1, Fig. 11 (non: Fig. 12).

2002 *Pseudotextulariella salevensis* CHAROLLAIS, BRÖNNIMANN & ZANINETTI, Voznesenskii et al., Pl. 1, Fig. 28.

2004 *Montsalevia salevensis* CHAROLLAIS, BRÖNNIMANN & ZANINETTI, Bucur et al., Pl. 3, Figs. 1-5.

2004 *Montsalevia salevensis* CHAROLLAIS, BRÖNNIMANN & ZANINETTI, Ivanova and Koleva-Rekalova, Pl. 2, Figs. 4-6.

2004 *Montsalevia salevensis* CHAROLLAIS, BRÖNNIMANN & ZANINETTI, Ivanova and Kolodziej, Fig. 1 K.

2005 *Montsalevia salevensis* CHAROLLAIS, BRÖNNIMANN & ZANINETTI, Bucur and Săsăran, Pl. 4, Figs. 3-8.

2006 *Montsalevia salevensis* CHAROLLAIS, BRÖNNIMANN & ZANINETTI, Husinec and Sokać, Fig. 7 D, F-H.

2007 *Montsalevia salevensis* CHAROLLAIS, BRÖNNIMANN & ZANINETTI, Bruni et al., Pl. 3, Figs. 1, 2 non 2007 *Montsalevia salevensis* CHAROLLAIS, BRÖNNIMANN & ZANINETTI, Krajewski and Olszewska, Fig. 5 K.

Material: Jastrzębia (140 P/191); Lusina (140P/41)

Description: *Montsalevia salevensis* is characterized by a reduced conical test with trochospiral initial portion, followed by a biserial portion composed of 5 to 8 sets of chambers that are wider than high, periphery subangular to rounded; the wall is calcareous, microgranular, simple, and imperforate.

Distribution: Upper Valanginian of the Haute-Savoie, France (Charollais et al., 1966); Valanginian of Ain, Savoie, France (Darsac, 1983); Valanginian of the Jerma River canyon, Eastern Serbia (Bucur et al., 1995); Valanginian of the West Balkan Mts., Bulgaria (Ivanova, 1999); Valanginian of the southeastern part of the Lesser Caucasus (Voznesenskii et al., 2002); Berriasian-Hauterivian of the Berdiga Limestones, Kale-Gümüşhane region, NE Turkey (Bucur et al., 2004); Valanginian of Southwestern Bulgaria (Ivanova and Koleva-Rekalova, 2004); Upper Berriasian-Valanginian of Stramberk-type limestones, Polish Carpathians (Ivanova and Kolodziej, 2004); Lower Valanginian of the Apuseni Mountains, Romania (Bucur and Săsăran, 2005); Valanginian of Mljet Island, Southern Croatia (Husinec and Sokać, 2006); undivided Berriasian-Valanginian of Fara San Martino, Maiella, Italy (Bruni et al., 2007).

Known range: Upper Berriasian (Bucur et al., 2004; Ivanova and Kolodziej, 2004) - Hauterivian (Bucur, 1988).

Suborder Orbitolinina KAMINSKI, 2004

Superfamily Pfenderinacea SMOUT & SUGDEN, 1962

Family Pfenderinidae SMOUT & SUGDEN, 1962

Subfamily Pseudopfenderininae SEPTFONTAINE, 1988

Genus *Siphovalvulina* SEPTFONTAINE, 1988

Siphovalvulina variabilis SEPTFONTAINE, 1988. Pl. 1, Fig. 19.

1980 *Siphovalvulina* sp., SEPTFONTAINE, Pl. 2, Fig. 10; Pl. 3, Figs. 17, 18.

1983 *Belorussiella* sp., Darsac p. 211, Pl. 7, Figs. 18, 19.

*1988 *Siphovalvulina variabilis*, SEPTFONTAINE, p. 245, Fig. 5.

2004 *Siphovalvulina variabilis* SEPTFONTAINE, Ivanova and Koleva-Rekalova, Pl. 3, Fig. 8.

2005 *Siphovalvulina variabilis* SEPTFONTAINE, Schlagintweit et al. p. 42, Pl. 26 a-c (Synonymy).

2005 *Belorussiella* cf. *taurica* GORBATCHIK, Olszewska p. 34, Pl. 4, Fig. 15.

2005b *Siphovalvulina variabilis* SEPTFONTAINE, Gutowski et al., Fig. 10, A.

2006 *Siphovalvulina* sp., Kobayshi and Vuks, Pl. 6 (1, 3, 4, 5).

2007 *Siphovalvulina variabilis* SEPTFONTAINE, Krajewski and Olszewska, p. 301, Fig. 6 A.

2008 *Siphovalvulina variabilis* SEPTFONTAINE, Ivanova et al., Fig. 6, R.

Material: Woźniki (140P/31); Lusina (140P/39).

Description: The species is characterized by the trochospirally-coiled test with three subglobular chambers per whorl, which are increasing in size in growth direction,

and a twisted siphonal canal connecting successive apertures.

Remarks: This common form has been variously placed in *Belorussiella*, *Trochammina*, or *Gaudryina*, but these genera do not possess a central siphon; for details see Septfontaine (1980, 1988) and Loeblich and Tappan (1987).

Distribution: Domerian of Morocco; Bathonian of France and Callovian of the Swiss Prealps (Septfontaine, 1980); Upper Berriasian of Ain, Savoie, France (Darsac, 1983); Hettangian to Lower (?Upper) Cretaceous of the Swiss Prealps (Septfontaine, 1988); Upper Kimmeridgian-Valanginian of Southwestern Bulgaria (Ivanova and Koleva-Rekalova, 2004); Uppermost Kimmeridgian-Upper Tithonian of the Plassen carbonate platform, Northern the Calcareous Alps (Schlagintweit et al., 2005); Upper Tithonian-Middle Berriasian of Cieszyn Beds, Polish Outer Carpathians (Olszewska, 2005); Upper Tithonian-Lower Berriasian of the Nizniow area, Western Ukraine (Gutowski et al., 2005b); Middle Jurassic-Tithonian of the Southern part of the Crimea Mts., Southern Ukraine (Krajewski and Olszewska, 2007); Upper Kimmeridgian-Lower Berriasian of Southwestern Bulgaria (Ivanova et al., 2008).

Known range: Hettangian-Upper Barremian to ?Upper Cretaceous (Septfontaine, 1988).

Subfamily PFENDERININAE SMOUT & SUGDEN, 1962

Genus *Dobrogeolina* NEAGU, 1979

Dobrogeolina ovidi NEAGU, 1979. Pl. 2, Figs. 16-19

*1979 *Dobrogeolina ovidi*, NEAGU, p. 494, Pl. 1, Figs. 1-7; Pl. 4, Figs. 17-18.

1983 *Dobrogeolina ovidi* ? NEAGU, Darsac, p. 211, Pl. 7, Figs. 13-15.

2004 *Dobrogeolina ovidi* NEAGU, Ivanova and Koleva-Rekalova, Pl. 3, Figs. 9, 11.

2007 *Dobrogeolina ovidi* NEAGU, Krajewski and Olszewska, p. 301, Fig. 6 B.

2008 *Dobrogeolina* sp., Ivanova et al., Fig. 7, J.

Material: Woźniki (140P/31); Lusina (140P/39); Gródek nad Dunajcem (140P/100, 140P/110).

Description: *Dobrogeolina ovidi* is characterized by its trochospirally enrolled test, with a nearly flat to moderately conical spire. The trochospire has six to twelve chambers in the final whorl; the wall is thin, consisting of nonlamellar, microgranular calcite.

Distribution: Upper Berriasian of the southern part of Dobrogea, Romania (Neagu, 1979); Berriasian-Lower Valanginian of Ain, Savoie, France (Darsac, 1983); Berriasian-Valanginian of Southwestern Bulgaria (Ivanova and Koleva-Rekalova, 2004); Berriasian-Valanginian of the Southern part of the Crimea Mts., Southern Ukraine (Krajewski and Olszewska, 2007); Berriasian-Valanginian of Southwestern Bulgaria (Ivanova et al., 2008).

Known range: Berriasian (Darsac, 1983; Ivanova and Koleva-Rekalova, 2004) - Valanginian (Darsac, 1983; Ivanova et al., 2008).

Family Hauraniidae SEPTFONTAINE, 1988

Subfamily Amijellinae SEPTFONTAINE, 1988

Genus *Pseudocyclammina* YABE & HANZAWA, 1926

Pseudocyclammina lituus (YOKOYAMA, 1890). Pl. 4, Figs. 1-10

*1890 *Cyclammina lituus*, YOKOYAMA, p. 26, Pl. 5, Fig. 7.

1983 *Pseudocyclammina lituus* YOKOYAMA, Darsac, p. 213, Pl. 8, Figs. 6-8.

1995 *Pseudocyclammina lituus* YOKOYAMA, Bucur et al., Pl. 1, Figs. 3, 4.

1999 *Pseudocyclammina lituus* YOKOYAMA, Ivanova, Pl. 1, Fig. 6.

2001 *Pseudocyclammina lituus* YOKOYAMA, Olszewska and Wiczeorek, Pl. 4, Figs. 5.

2002 *Pseudocyclammina lituus* YOKOYAMA, Voznesenskii et al., Pl. 1, Fig. 20.

2003 *Pseudocyclammina lituus* (YOKOYAMA) YABE & HANZAWA, Dragastan and Richter p. 92, Pl. 9, Figs. 1-2; Pl. 12, Fig. 1.

2004 *Pseudocyclammina lituus* YOKOYAMA, Bucur et al., Pl. 4, Figs. 1, 2, 5.

2004 *Pseudocyclammina lituus* YOKOYAMA, Ivanova and Koleva-Rekalova, Pl. 1, Fig. 10.

2004 *Pseudocyclammina lituus* YOKOYAMA, Ivanova and Kolodziej, Fig. 1 B.

2005 *Pseudocyclammina lituus* YOKOYAMA, Olszewska p. 35, Pl. 4, Fig. 10.

2005 *Pseudocyclammina lituus* (YOKOYAMA), Schlagintweit et al. p. 38, Pl. 22 a-d (Synonymy).

2006 *Pseudocyclammina lituus* YOKOYAMA, Arkad'ev et al., Pl. 4, Fig. 14.

2006 *Pseudocyclammina lituus* YOKOYAMA, Kobayashi and Vuks, Pl. 5, Figs. 7-14.

2007 *Pseudocyclammina lituus* YOKOYAMA, Krajewski and Olszewska p. 301, Fig. 6, F.

2008 *Pseudocyclammina lituus* YOKOYAMA, Ivanova et al., Fig. 7 A.

Material: Leńcze (140 P/45, 140 P/83); Lusina (140P/52); Woźniki (140 P/177); Gródek nad Dunajcem (140 P/99; 140 P/105, 140 P/180); Zamarski (140P/36); Jastrzębia (140 P/191); Gródek nad Dunajcem (140 P/158)

Description: The test is planispirally-enrolled, subspherical to flattened, involute at least in the early stage, later uncoiling, and sutures strongly oblique in the coiled stage; the wall is coarsely agglutinated, with coarse subepidermal network; the exoskeleton may have a few irregular pillars in a narrow zone in the median plane of the test, the endoskeleton consisting of thick and massive septa, perforated by large openings.

Distribution: Berriasian-Lower Valanginian of Ain, Savoie, France (Darsac, 1983); Valanginian of the Jerma River canyon, Eastern Serbia (Bucur et al., 1995); Upper Kimmeridgian-Berriasian of the West Balkan Mts., Bulgaria (Ivanova, 1999); Oxfordian-Berriasian of Cieszyn Beds, Polish Outer Carpathians (Olszewska, 2005); Upper Tithonian Plassen carbonate platform, Northern Calcareous Alps (Schlagintweit et al., 2005); Upper Tithonian of the eastern Crimea (Arkad'ev et al., 2006); undivided Tithonian-Berriasian of Torinosu-type limestones, Kanto Mts., Japan (Kobayashi and Vuks, 2006); Oxfordian-Berriasian of the southern part of the Crimea Mts., Southern Ukraine (Krajewski and Olszewska, 2007); Upper Kimmeridgian - Valanginian of Southwestern Bulgaria (Ivanova et al., 2008).

Known range: Oxfordian (Hughes, 2004; Velić, 2007) - Hauterivian (Canérot, 1984).

Order Textulariida DELAGE & HEROUARD, 1896

Suborder Textulariina DELAGE & HEROUARD, 1896

Superfamily Chrysalidinacea NEAGU, 1968

Family Paravalvulinidae BANNER, SIMMONS & WHITTAKER, 1991

Subfamily Paravalvulininae BANNER, SIMMONS & WHITTAKER, 1991

Genus *Redmondoides* BANNER, SIMMONS & WHITTAKER, 1991

Redmondoides lugeoni (SEPTFONTAINE, 1977), Pl. 1, Figs. 6-8
 1977 *Valvulina lugeoni*, SEPTFONTAINE, p. 612, Pl. 2, Fig. 2-5; text Fig. 6.
 1987 *Valvulina* aff. *lugeoni* SEPTFONTAINE, Sotak, Pl. 4, Figs. 4-5.
 2004 *Valvulina lugeoni* SEPTFONTAINE, Ivanova and Kołodziej, Fig. 1 E.
 2005 *Redmondoides* cf. *lugeoni* SEPTFONTAINE, Schlagintweit et al. p. 40, Pl. 25 a-d (Synonymy).
 2006 *Valvulina* spp., Kobayashi and Vuks, Fig. 6 (12).
 2008 *Valvulina lugeoni* SEPTFONTAINE, Ivanova et al., Fig. 6 H.
Material: Woźniki (140 P/31); Gródek nad Dunajcem (140 P/78).
Description: The species is characterised by its trochospiral and triserial test with valvular tooth plate simple or perforate by supplementary apertures (pores); primary aperture is a basal slit.
Distribution: Dogger-Lower Malm? (Septfontaine, 1977); Lower-Middle Berriasian of the Stramberk carbonate platform, Outer Western Carpathians, Slovakia (Sotak, 1987); Upper Berriasian-Valanginian of Stramberk-type limestones, Polish Carpathians (Ivanova and Kołodziej, 2004); Uppermost Kimmeridgian-Tithonian Plassen carbonate platform, Northern Calcareous Alps (Schlagintweit et al., 2005); Upper Kimmeridgian-Lower Berriasian of Southwestern Bulgaria (Ivanova et al., 2008).
Known range: Lias? Bajocian (Septfontaine, 1977) - Valanginian (Ivanova and Kołodziej, 2004).
 Order Spirillinida GORBACHIK & MANTSUROVA, 1980
 Suborder Involutinina HOHENEGGER & PILLER, 1977
 Family Ventrolaminidae WEYNSCHENK, 1950
 Genus *Protopenneroplis* WEYNSCHENK, 1950
Protopenneroplis striata WEYNSCHENK, 1950. Pl. 5, Fig. 7
 1950 *Protopenneroplis striata* WEYNSCHENK, p. 13, Fig. 2.
 1987 *Protopenneroplis striata* WEYNSCHENK, Sotak, Pl. 3, Fig. 10, 11-12.
 1997 *Protopenneroplis striata* WEYNSCHENK, Bucur, p. 65, Pl. 1, Figs. 1-12 (Synonymy)
 2001 *Protopenneroplis striata* WEYNSCHENK, Olszewska and Wieczorek, Pl. 4, Fig. 7.
 2004 *Protopenneroplis striata* WEYNSCHENK, Bucur et al., Pl. 1, Figs. 3, 4.
 2005 *Protopenneroplis striata* WEYNSCHENK, Schlagintweit et al. p. 36, Pl. 20: a-c (Synonymy)
 ?2005 *Protopenneroplis striata* WEYNSCHENK, Olszewska, Pl. 5, Fig. 13.
 2005 *Protopenneroplis striata* WEYNSCHENK, Bucur and Săsăran, Pl. 2, Figs. 2, 10.
 2006 *Protopenneroplis striata* WEYNSCHENK, Arkad'ev et al., Pl. 4, Fig. 2.
 2007 *Protopenneroplis striata* WEYNSCHENK, Krajewski and Olszewska, p. 303, Fig. 8 D, E.
 2008 *Protopenneroplis striata* WEYNSCHENK, Ivanova et al., Fig. 6 J, K.

Material: Zamarski (UJ 140P/36).

Description: *Protopenneroplis striata* has a lenticular shape test, consisting of rapidly enlarging, planispirally to low trochospirally coiled, numerous chambers arranged in two whorls; coiling is involute; the wall consists of two layers (inner and outer layers are microgranular and hyaline calcareous, respectively); septa separating the chambers are

made up of both microgranular and hyaline carbonate; aperture is areal.

Distribution: Middle/Upper Dogger and Malm of Sonwend Mountain, Tyrol, Austria (Weynschenk, 1950); Outer Western Carpathians, Slovakia (Sotak, 1987); Oxfordian to Tithonian, Romania (Bucur, 1997); Upper Tithonian of the Andrychow Klippes, Outer Western Carpathians, Poland (Olszewska and Wieczorek, 2001); Oxfordian of the Berdiga Limestone, Kale-Gümüşhane region, NE Turkey (Bucur et al., 2004); Kimmeridgian-Lower Tithonian Plassen carbonate platform, Northern Calcareous Alps (Schlagintweit et al., 2005); Upper Oxfordian-Lower Tithonian of the Apuseni Mountains, Romania (Bucur and Săsăran, 2005); Lower Tithonian of the eastern Crimea (Arkad'ev et al., 2006); Middle-Late Jurassic (up to Tithonian) of the southern part of the Crimea Mts., Southern Ukraine (Krajewski and Olszewska, 2007); Oxfordian-Lower Tithonian of Southwestern Bulgaria (Ivanova et al., 2008).

Discussion: Bucur et al. (1993) determined the range of the species as reaching Upper Tithonian-Berriasian. Later, Bucur et al. (2004) mentioned, that the presence of the species in sediments belonging to Berriasian age is uncertain.

Known range: Aalenian (Septfontaine, 1974) - Upper Tithonian (Schlagintweit and Ebli, 1999; Bucur et al., 2004).
Protopenneroplis ultragranulata (GORBACHIK, 1971), Pl. 5, Figs. 1-6.

*1971 *Hoeglundina* (?) *ultragranulata*, GORBACHIK, Pl. 5, Fig. 2 a-c.

1987 *Protopenneroplis trochangulata* SEPTFONTAINE, Sotak, p. 653, Pl. 2, Figs. 1-9; Pl. 3, Figs. 1-9 (Synonymy).

1993 *Protopenneroplis ultragranulata* (GORBACHIK), Bucur, p. 214, Pl. 2, Figs. 1, 2, 5, 8, 11, 12 (Synonymy).

1997 *Protopenneroplis ultragranulata* (GORBACHIK), Bucur, p. 67, Pl. 1, Figs. 13-16; Pl. 2, Figs. 1-14; Pl. 3, Figs. 1-3 (Synonymy).

2004 *Protopenneroplis trochangulata* SEPTFONTAINE, Ivanova and Kołodziej, Fig. 1 C.

2005 *Protopenneroplis ultragranulata* GORBACHIK, Schlagintweit et al., p. 37, Pl. 21 a-d (Synonymy).

2005 *Protopenneroplis ultragranulata* GORBACHIK, Olszewska p. 37, Pl. 5, Figs. 15, 16.

2005 *Protopenneroplis ultragranulata* (GORBACHIK), Bucur and Săsăran, Pl. 4, Figs. 10, 11.

2006 *Protopenneroplis ultragranulata* GORBACHIK, Arkad'ev et al., Pl. 4, Figs. 18, 19 a, b, c.

2007 *Protopenneroplis ultragranulata* GORBACHIK, Bruni et al., Pl. 3, Figs. 5, 6.

2007 *Protopenneroplis ultragranulata* (GORBACHIK), Velić, Pl. 11, Figs. 1-5.

2007 *Protopenneroplis ultragranulata* (GORBACHIK), Krajewski and Olszewska, p. 303, Fig. 7 C.

2008 *Protopenneroplis trochangulata* SEPTFONTAINE, Ivanova et al., Fig. 7 E, F.

Material: Woźniki 140 P/23, 140P/31; Lubenia (140 P/11); Lusina (140P/52); Gródek nad Dunajcem (140 P/79, 140 P/90, 140 P/97, 140 P/99).

Description: *Protopenneroplis ultragranulata* (Gorbachik) differs from *P. striata* Weynschenk by its trochospiral test with angular periphery, larger dimensions and a pustulated ornamentation on the spiral face.

Remarks: Septfontaine (1974) provided a detailed description of this species (sub *Protopenneroplis trochangulata*); for a complete description and synonymy

see also Soták (1987), Bucur (1993, 1997), and Schlagintweit et al. (2005).

Distribution: Upper Tithonian-Berriasian of the Crimea, Russia (Gorbachik, 1971); Lower-Middle Berriasian of the Stramberk platform, Outer Western Carpathians, Slovakia (Soták, 1987); Upper Tithonian-Barremian of Romania (Bucur, 1993, 1997); Upper Berriasian-Valanginian of the Stramberk-type limestones (Ivanova and Kolodziej, 2004); Upper Tithonian of the Plassen carbonate platform, Northern Calcareous Alps (Schlagintweit et al., 2005); Middle part of Upper Tithonian-Valanginian of the Cieszyn Beds, Polish Outer Carpathians (Olszewska, 2005); Upper Tithonian-Valanginian of the Apuseni Mts., Romania (Bucur and Săsăran, 2005); Upper Tithonian of the eastern Crimea (Arkad'ev et al., 2006); undivided Berriasian-Valanginian of Fara San Martino, Maiella, Italy (Bruni et al., 2007); Upper Tithonian-Berriasian of the Karst Dinarides, SE Europe (Velić, 2007); Upper Tithonian-Valanginian of the southern part of the Crimea Mts., Southern Ukraine (Krajewski and Olszewska, 2007); Berriasian-Valanginian of Southwestern Bulgaria (Ivanova et al., 2008).

Discussion: According Heinz and Isenschmid (1988) in the "Nappe des Prealpes medians", Switzerland the species *Pr. trochangulata* (*Pr. ultragranulata*) appear in resediments of Albeuve strata, i.e. just before the appearance of the first Calpionellids. This coeval arise of the both species is important evidence for the first appearance of the species *Pr. ultragranulata* in the late Tithonian.

Known range: Upper Tithonian (Gorbachik, 1971; Bucur, 1997 e.c.) - Valanginian/Barremian (Bucur, 1997).

Suborder Spirillinina HOHENEGGER & PILLER, 1975

Family Spirillinidae REUSS & FRITSCH, 1861

Genus *Spirillina* EHRENBERG, 1843

Spirillina sp. Pl. 2, Fig. 21

Material: Woźniki (140 P/23).

Description: The section is round and possesses a proloculus followed by a nonseptate, planispirally enrolled tubular second chamber; the aperture is not visible; the illustrated specimen is similar to *S. italica* Dieni and Massari, 1966 figured by Bucur, 1988 (Pl. 2, Figs. 29, 30).

Family Patellinidae RHUMBLER, 1906

Subfamily Patellininae RHUMBLER, 1906

Genus *Patellina* WILLIAMSON, 1858

Patellina turriculata DIENI & MASSARI, 1966. Pl. 5, Figs. 8-11.

*1966 *Patellina turriculata*, DIENI & MASSARI, p. 222, Pl. 8, Figs. 15, 16.

1988 *Patellina turriculata* DIENI & MASSARI, Bucur, 382.

1991 *Patellina* sp., Altiner, Pl. 10, Figs. 31-33.

1991 *Patellina turriculata* DIENI & MASSARI, Altiner, Pl. 13, Fig. 24.

1999 *Patellina turriculata* DIENI & MASSARI, Ivanova, Pl. 1, Fig. 13.

2004 *Patellina turriculata* DIENI & MASSARI, Ivanova and Kolodziej, Fig. 1 F-H.

2008 *Patellina turriculata* DIENI & MASSARI, Ivanova et al., Fig. 7 M.

Material: Lusina (140P/39); Woźniki (140P/31).

Description: *Patellina turriculata* is characterised by its low conical, planoconvex test formed by a proloculus followed by an undivided coiled tubular chamber arranged

in one to three whorls; the test has a flattened umbilical side and carinate periphery.

Distribution: Upper Valanginian of northeastern Sardinia, Italy (Dieni and Massari, 1966); Upper Berriasian-Lower Hauterivian of the Resita-Moldova Noua zone, Southern Carpathians, Romania (Bucur, 1988); Valanginian-Barremian of northwestern Anatolia, Turkey (Altiner, 1991); Upper Valanginian-Lower Hauterivian of the West Balkan Mts., Bulgaria (Ivanova, 1999); Valanginian of the Stramberk-type limestones (Ivanova and Kolodziej, 2004); Valanginian of southwestern Bulgaria (Ivanova et al., 2008).

Known range: Upper Berriasian (Bucur, 1988) - Barremian (Altiner, 1991).

Order Miliolida LANKESTER, 1885

Suborder Miliolina DELAGE & HEROUARD, 1896

Superfamily Cornuspiracea SCHULTZE, 1854

Family Cornuspiridae SCHULTZE, 1854

Subfamily Meandrospirinae SAIDOVA, 1981

Genus *Meandrospira* LOEBLICH & TAPPAN, 1946

Meandrospira favrei (CHAROLLAIS, BRÖNNIMANN & ZANINETTI, 1966). Pl. 2, Figs. 8, 9

*1966 *Citaella? Favrei*, CHAROLLAIS, BRÖNNIMANN & ZANINETTI, p. 37, Pl. 2, Figs. 3, 4; Pl. 3, Figs. 1-5; Pl. 5, Figs. 1, 2; Text-Figs. 4-6.

1999 *Meandrospira favrei* CHARROLAIS, BROENNIMANN & ZANINETTI, Ivanova, Pl. 1, Figs. 9, 10.

1999 *Meandrospira favrei* CHARROLAIS, BROENNIMANN & ZANINETTI, Schlagintweit and Ebli, p. 398, Pl. 4, Figs. 8, 11 (Synonymy).

2004 *Meandrospira favrei* CHARROLAIS, BROENNIMANN & ZANINETTI, Bucur et al., Pl. 2, Figs. 18-23.

2004 *Meandrospira favrei* CHARROLAIS, BROENNIMANN & ZANINETTI, Ivanova and Kolodziej, Fig. 1 L, M.

non 2007 *Meandrospira favrei* CHARROLAIS, BROENNIMANN & ZANINETTI, Krajewski and Olszewska, Fig. 7 B.

2008 *Meandrospira favrei* CHARROLAIS, BROENNIMANN & ZANINETTI, Ivanova et al., Fig. 7, N, O.

Material: Woźniki (140P/31); Lusina (140P/39).

Description: The test of the species *M. favrei* is very small; the proloculus is followed by a spirally enrolled tubular undivided second chamber, bending back and forth in involute zigzag bends that enroll planispirally at the umbilicus; the wall is thin, calcareous, porcelaneous.

Distribution: Upper Valanginian-Upper Hauterivian of Haute-Savoie, France (Charrolais et al., 1966); Upper Valanginian- Lower Hauterivian of the West Balkan Mts., Bulgaria (Ivanova, 1999); Valanginian of the Trisselwand section, Northern Calcareous Alps (Schlagintweit and Ebli, 1999); Valanginian-Hauterivian of the Berdiga Limestones, Kale-Gümüşhane region, NE Turkey (Bucur et al., 2004); Valanginian of the Stramberk-type limestones (Ivanova and Kolodziej, 2004); Valanginian of southwestern Bulgaria (Ivanova et al., 2008).

Known range: Valanginian (Schlagintweit and Ebli, 1999; Bucur et al., 2004; Ivanova and Kolodziej, 2004; Ivanova et al., 2008) - Lower Aptian (Neagu, 1970a).

Superfamily Nubeculariacea JONES, 1875

Family Nubeculariidae JONES, 1875

Subfamily Nubeculinellinae AVNIMELECH & REISS, 1954

Genus *Hechtina* BARTENSTEIN & BRAND, 1949

Hechtina praeantiqua BARTENSTEIN & BRAND, 1949. Plate 2, Fig. 7.

*1949 *Hechtina praeantiqua*, BARTENSTEIN & BRAND p. 669, Fig. 1 a-c; 2 a-c.

1949 *Hechtina antiqua* (REUSS), Bartenstein & Brand p. 670, Fig. 10 a-b.

1970b *Hechtina antiqua* (REUSS), Neagu p. 420, Pl. 1-3, Figs. 1-41, Text-Figs. 1-3.

1983 *Hechtina praeantiqua* BARTENSTEIN & BRAND, Darsac p. 216, Pl. 6, Figs. 15-17.

1991 *Hechtina praeantiqua* BARTENSTEIN & BRAND, Altiner, Pl. 10, Figs. 9-13.

1999 *Hechtina praeantiqua* BARTENSTEIN & BRAND, Ivanova, Pl. 1, Fig. 14.

2005 *Hechtina praeantiqua* BARTENSTEIN & BRAND, Olszewska p. 37, Pl. 6, Fig. 3.

Material: Lusina (140 P/39); Gródek nad Dunajcem (140 P/100, 140 P/120), Gródek nad Dunajcem (140 P/158).

Description: This species possesses a free, subglobular to somewhat flattened test with a proloculus followed by an irregularly enrolled early stage; later the chambers become more regular and possess a streptospirally coiled arrangement, and finally planispiral, about three to six chambers per whorl; the wall is calcareous, imperforate.

Distribution: Valanginian of Germany and England (Bartenstein and Brand, 1949); Valanginian to Barremian, Germany; Lowermost Aptian, Romania (Neagu, 1970b); Upper Berriasian of Ain, Savoie, France (Darsac, 1983); Berriasian-Valanginian of northwestern Anatolia, Turkey (Altiner, 1991); Berriasian of the West Balkan Mts., Bulgaria (Ivanova, 1999); Berriasian-Valanginian of the Cieszyn Beds, Polish Outer Carpathians (Olszewska, 2005).

Known range: Berriasian (Darsac, 1983; Altiner, 1991; Ivanova, 1999) - Lower Aptian (Neagu, 1970b).

Family Ophthalmitidae WIESNER, 1920

Genus *Ophthalmitium* KUBLER & ZWINGLI, 1870

Ophthalmitium sp. Pl. 2, Fig. 20

Material: Lusina (140 P/85).

Description: The section found in the studied material is poorly preserved, oval in outline, flattened and possesses a globular proloculus followed by a narrow tubular flexostyle of up to one-half whorl in length; the wall is calcareous; the aperture at the end of a clearly visible neck.

Superfamily Miliolacea EHRENBERG, 1839

Family Hauerinidae SCHWAGER, 1876

Subfamily Hauerininae SCHWAGER, 1876

Genus *Istriloculina* NEAGU, 1984

Istriloculina elliptica (IOVCHEVA, 1962). Pl. 2, Figs. 22, 23

*1962 *Pyrgo elliptica*, IOVCHEVA p. 52, Pl. 2, Figs. 7-11.

1968 *Pyrgo elliptica* IOVCHEVA, Neagu p. 567, Pl. 1, Figs. 18-25.

1983 *Pseudotriloculina* sp., Darsac p. 217, Pl. 6, Figs. 5-7.

1986 *Istriloculina elliptica* (IOVCHEVA), Neagu p. 344, Pl. 5, Figs. 25-34; Figs. 6 a-m.

1993 *Istriloculina elliptica* (IOVCHEVA), Bucur et al., Pl. 6, Fig. 12.

1995 *Istriloculina* sp. cf. *I. elliptica* (IOVCHEVA), Arnaud-Vanneau and Sliter p. 556, Pl. 5, Figs. 13, 15, 17, 18.

2006 *Istriloculina*? sp., Kobayashi and Vuks, Pl. 5, 29-31.

Material: Gródek nad Dunajcem (140 P/84) and Woźniki (140P/31).

Description: *Istriloculina elliptica* possesses an elliptic up to high elliptic-elongate thin test with two chambers in the last

whorl, and without floors; the sutures are slightly depressed; the wall is very thin, calcareous, imperforate, porcelaneous.

Distribution: Aptian of the Ruse region, Bulgaria (Iovcheva, 1962); Barremian of the southern part of Dobrogea, Romania (Neagu, 1968, 1986); Middle-Upper Berriasian of Ain, Savoie, France (Darsac, 1983); Barremian of the Pădurea Craiului Mts., Romania (Bucur et al., 1993); Hauterivian-Lower Aptian of the western Mid-Pacific Mts. (Arnaud-Vanneau and Sliter, 1995).

Known range: Middle/Upper Berriasian (Darsac, 1983) - Aptian (Iovcheva, 1962; Arnaud-Vanneau and Sliter, 1995).

Istriloculina emiliae NEAGU, 1984. Pl. 2, Figs. 24-26

*1984 *Istriloculina emiliae*, NEAGU p. 88, Pl. 2, Figs. 22-25.

1985 *Istriloculina emiliae* NEAGU, Neagu p. 219, Pl. 5, Figs. 25-34; Fig. 6 a-m.

1989 *Istriloculina fabaria*, Matsieva & Temirbekova p. 117, Pl. 1, Figs. l, m, n, o.

1989 *Istriloculina rectoangularia*, Matsieva & Temirbekova p. 117, Pl. 1, Figs. p, r.

1989 *Istriloculina terekensis*, Matsieva & Temirbekova p. 118, Pl. 1, Figs. s, t, u.

2005 *Istriloculina fabaria* MATSIEVA & TEMIRBEKOVA, Olszewska p. 37, Pl. 6, Fig. 7.

2005 *Istriloculina terekensis* MATSIEVA & TEMIRBEKOVA, Olszewska p. 37, Pl. 6, Fig. 8.

2005b *Istriloculina emiliae* NEAGU, Gutowski et al., Fig. 10, K.

2008 *Istriloculina emiliae* NEAGU, Ivanova et al., Fig. 7, K.

Material: Lusina 140P/39; Gródek nad Dunajcem (140 P/100, 140 P/82, 140 P/99), Gródek nad Dunajcem (140 P/158).

Description: *Istriloculina emiliae* is characterised by its globular, ovate to subglobular test, with three chambers on each whorl, obviously Y-shaped; the chambers without floors; the sutures are depressed; the wall is thin, calcareous, imperforate and porcelaneous; aperture indistinct.

Distribution: Upper Berriasian-Valanginian southern part of Dobrogea, Romania (Neagu, 1984, 1985); Tithonian of the northeastern Caucasus (Matsieva and Temirbekova, 1989); Barremian of Pădurea Craiului Mts., Romania (Bucur, Cociuba and Cociuba, 1993); Tithonian-Berriasian of the Cieszyn Beds, Polish Outer Carpathians (Olszewska, 2005); Upper Berriasian-Valanginian of the Nizniow area, Western Ukraine (Gutowski et al., 2005b); Berriasian-Valanginian of southwestern Bulgaria (Ivanova et al., 2008).

Known range: Tithonian (Matsieva and Temirbekova, 1989; Olszewska, 2005) -Barremian (Bucur et al., 1993).

Genus *Moesiloculina* NEAGU, 1984

Moesiloculina danubiana (NEAGU, 1968). Pl. 2, Figs. 27, 28

1968 *Quinqueloculina danubiana* Neagu p. 567, Pl. 2, Figs. 8-21.

1968 *Quinqueloculina scythica*, Neagu p. 567, Pl. 3, Figs. 1-12.

1968 *Quinqueloculina histri* Neagu p. 567, Pl. 3, Figs. 13-23.

1986 *Moesiloculina danubiana* (NEAGU), Neagu p. 321, Pl. 4, Figs. 1-19; Pl. 9, Figs. 1-19; Text-Figs. 5 a-d.

1986 *Moesiloculina scythica* (NEAGU), Neagu p. 323, Pl. 5, Figs. 1-19; Pl. 10, Figs. 39-43; Text-Fig. 4 f.

1986 *Moesiloculina histri* (NEAGU), Neagu p. 324, Pl. 4, Figs. 20-36; Text-Fig. 3 g-h.

1986 *Moesiloculina deformata* Neagu p. 331, Pl. 6, Figs. 20-30.

- 1987 *Quinqueloculina aff. danubiana* NEAGU, Arnaud-Vanneau et al., Figs. A 25, 14, 19.
- 1993 *Moesiloculina danubiana* NEAGU, Bucur et al., Pl. 6, Fig. 13.
- 2005b *Moesiloculina danubiana* NEAGU, Gutowski et al., Fig. 10, J.
- Material:** Woźniki (UJ 140P/31); Lusina (140P/39, 140P/41); Leńcze (140 P/83)
- Description:** *Moesiloculina danubiana* is characterized by its elongate, quinqueloculiniform test with triangular flattened chambers and concave lateral walls; very slightly depressed sutures.
- Distribution:** Barremian of Southern Dobrogea, Romania (Neagu, 1968); Upper Berriasian-Lower Aptian of the southern part of Dobrogea, Romania (Neagu, 1986); Berriasian-Lower Aptian of the Vocontian basin, Swiss Jura, France (Arnaud-Vanneau et al., 1987); Barremian of the Pădurea Craiului Mts., Romania (Bucur et al., 1993); Upper Berriasian-Aptian of the Nizniow area, Western Ukraine (Gutowski et al., 2005b).
- Known range:** Berriasian (Arnaud-Vanneau et al., 1987) - Lower Aptian (Neagu, 1986).
- Genus *Quinqueloculina* D'ORBIGNY, 1826
- Quinqueloculina egmontensis* LLOYD, 1962. Pl. 2, Figs. 29-36
- *1962 *Quinqueloculina egmontensis*, Lloyd p. 376, Pl. 2, Fig. 7a-c.
- 1964 *Quinqueloculina podlubiensis* Terestschuk (in Dulub & Terestschuk) p. 107, Figs. 1, 1 a-g, 2.
- 1964 *Quinqueloculina verbizhiensis* Dulub (in Dulub & Terestschuk) p. 108, Fig. 1, 3 a-g, 4.
- 1966 *Quinqueloculina jurassica* Bielecka and Styk p. 362, Pl. 1, Fig. 2 a-c.
- 1968 *Quinqueloculina minima* TAPPAN, Neagu p. 566, Pl. 1, Figs. 1-7.
- 1968 *Quinqueloculina robusta* Neagu p. 566, Pl. 1, Figs. 8-17; Pl. 7, Figs. 1-3.
- 1971 *Quinqueloculina mitchurini* Dain (in Dain and Kuznetsova) p. 114, Pl. 1, Figs. 9, 10.
- 1983 *Quinqueloculina robusta?* NEAGU, Darsac p. 216, Pl. 6, Fig. 1.
- 1985 *Rumanoloculina robusta* (NEAGU), Neagu p. 213, Pl. 5, Figs. 21-24.
- 1986 *Rumanoloculina robusta* (NEAGU), Neagu p. 315, Pl. 7, Figs. 23-25; Pl. 8, Figs. 30-38; Text-Fig. 2.
- 1989 *Quinqueloculina stellata* Matsieva and Temirbekova, p. 115, Pl. 1, Figs. d, e, zh.
- 1989 *Quinqueloculina verbizhiensis* DULUB, Matsieva and Temirbekova p. 115, Pl. 1, Figs. z, i, k.
- 1991 *Quinqueloculina robusta* NEAGU, Altiner, Pl. 10, Figs. 1-4.
- 1993 *Quinqueloculina podlubiensis* TERESTSCHUK, Dulub & Zhabina, Pl. 2, Fig. 3.
- 1993 *Quinqueloculina aff. verbizhiensis* DULUB, Dulub and Zhabina, Pl. 2, Fig. 6.
- 1993 *Quinqueloculina verbizhiensis* DULUB, Dulub and Zhabina, Pl. 2, Fig. 7.
- 1995 *Rumanoloculina robusta* (NEAGU), Bucur et al., Pl. 3, Figs. 6-9.
- 1999 *Rumanoloculina robusta* (NEAGU), Ivanova, Pl. 2, Figs. 9, 10.
- 2002 *Quinqueloculina* sp., Voznesenskii et al., Pl. 2, Fig. 18.
- 2005 *Decussoloculina barbui* NEAGU, Olszewska p. 37, Pl. 6, Figs. 4, 5.
- 2005b *Quinqueloculina verbizhiensis* DULUB, Gutovski et al., Pl. 10, C.
- 2005b *Quinqueloculina podlubiensis* TERESTSCHUK, Gutovski et al., Pl. 10, D.
- 2007 *Decussoloculina barbui* NEAGU, Krajewski and Olszewska p. 303, Fig. 7, D.
- 2007 *Quinqueloculina semisphaeroidalis* DANITSCH, Krajewski and Olszewska p. 303, Fig. 7, H.
- 2007 *Rumanoloculina mitchurini* DAIN, Krajewski and Olszewska p. 304, Fig. 7, E.
- 2007 *Rumanoloculina verbizhiensis* (DULUB), Krajewski and Olszewska p. 305, Fig. 7, I, J.
- 2008 *Quinqueloculina robusta* NEAGU, Ivanova et al., Fig. 7, C, D.
- Material:** Woźniki (140P/31); Jastrzębia (140 P/191); Lusina (140P/39, 140P/41); Gródek nad Dunajcem (140P/97, 140 P/99, 140 P/105, 140 P/118); Gródek nad Dunajcem (140 P/158).
- Description:** The species *Q. egmontensis* is characterised by its ovate, globular test with rounded periphery; the chambers with floors and quite thick added in quinqueloculine arrangement; the wall is calcareous, imperforate, and porcelaneous; the aperture is indistinct.
- Distribution:** Kimmeridgian of Dorset, England (Lloyd, 1962); Kimmeridgian-Tithonian of the southwestern margin of the Russian platform and Carpathian Foredeep (Dulub and Terestschuk, 1964); Uppermost Oxfordian - Kimmeridgian of the Peri-Baltic Syncline, Poland (1966); Barremian of the southern part of Dobrogea, Romania (Neagu, 1968); Tithonian of the Russian platform (Dain and Kuznetsova, 1971); Middle-Upper Berriasian of Ain, Savoie, France (Darsac, 1983); Upper Berriasian-Lower Aptian of the southern part of Dobrogea, Romania (Neagu, 1984, 1985, 1986); Middle Berriasian-Lower Valanginian of the Vocontian basin, Swiss Jura, France (Arnaud-Vanneau et al., 1987); Tithonian of northeastern Caucasus (Matsieva and Temirbekova, 1989); Upper Tithonian to Valanginian of northwestern Anatolia, Turkey (Altiner, 1991); Berriasian of southeastern Crimea (Dulub and Zhabina, 1993); Berriasian-Valanginian of the Jerma River canyon, Eastern Serbia (Bucur et al., 1995); Berriasian of the West Balkan Mts., Bulgaria (Ivanova, 1999); Barremian-Aptian of southeastern part of the Lesser Caucasus (Voznesenskii et al., 2002); Middle Tithonian-Valanginian of the Cieszyn Beds, Polish Outer Carpathians (Olszewska, 2005); Kimmeridgian-Berriasian of the Nizniow area, Western Ukraine (Gutowski et al., 2005b); Kimmeridgian-Lower Valanginian of the southern part of the Crimea Mts., Southern Ukraine (Krajewski and Olszewska, 2007); Upper Tithonian-Valanginian of southwestern Bulgaria (Ivanova et al., 2008).
- Discussion:** The genus *Quinqueloculina* includes many species which are morphologically highly variable. During the study of carbonate sediments we ascertain that many of the species introduced as new for the Upper Jurassic-Lower Cretaceous interval (Dulub and Terestschuk, 1964; Bielecka and Styk, 1966; Dain and Kuznetsova, 1971; Neagu, 1968, 1984, 1985, 1986; Matsieva and Temirbekova, 1989) are synonyms and requires revision.
- Known range:** Uppermost Oxfordian (Bielecka and Styk, 1966) - Albian (Neagu, 1984, 1985, 1986).

Quinqueloculina multicostata NEAGU, 1968. Pl. 2, Figs. 33, 37
 *1968 *Quinqueloculina multicostata*, Neagu p. 566, Pl. 4, Figs. 1-7.
 1985 *Rumanoluculina multicostata primitiva* n. ssp., Neagu p. 214, Pl. 5, Figs. 9-14.
Material: Woźniki, UJ 140P/31.
Description: This species is characterized by its quinqueloculinid chamber arrangement, whit depressed sutures between them and fine, numerous ribs which give specific ornamentation of the test surface.
Distribution: Barremian of the southern part of Dobrogea, Romania (Neagu, 1968); Upper Berriasian-Lower Aptian of the southern part of Dobrogea, Romania (Neagu, 1984, 1985, 1986); undivided Berriasian-Valanginian of Fara San Martino, Maiella, Italy (Bruni et al., 2007).
Known range: Upper Berriasian-Lower Aptian (Neagu, 1984, 1985, 1986).
 Order Lagenida LANKESTER, 1885
 Superfamily Nodosariacea EHRENBERG, 1838
 Family Vaginulinidae REUSS, 1860
 Subfamily Lenticulininae CHAPMAN, PARR & COLLINS, 1934
 Genus *Lenticulina* LAMARCK, 1804
Lenticulina sp. Pl. 2, Fig. 6
Material: Lusina (140P/39); Gródek nad Dunajcem (140P/32).
Description: The observed section possesses an enrolled and compressed test, the early portion is coiled, and later uncoiled; chambers are low and elongate; the wall is calcareous. This section is referred to *L. ex. gr. muensteri* (Roemer, 1839) which is interpreted as relict Jurassic group (see Jones and Wonders, 1992, Pl. 2, Figs. 10, 11).
 Order Rotaliida LANKESTER, 1885
 Superfamily Discorbacea EHRENBERG, 1838
 Family Discorbidae EHRENBERG, 1838
 Genus *Mohlerina* BUCUR, SENOWBARI-DARYAN & ABATE, 1996
Mohlerina basiliensis (MOHLER, 1938). Pl. 5, Figs. 12-18
 *1938 *Conicospirillina basiliensis*, Mohler p. 27, Pl. 4, Fig. 5.
 1956 *Conicospirillina* cf. *basiliensis* MOHLER, Weynschenk, Pl. 1, Figs. 9-10.
 1983 *Conicospirillina basiliensis* MOHLER, Darsac p. 217, Pl. 6, Figs. 21-22.
 1993 *Archaeosepta basiliensis* nov. comb., Tasli p. 60, Pl. 3, Fig. 6, 7 (Synonymy).
 1996 *Mohlerina basiliensis* MOHLER nov. comb., Bucur et al. p. 70, Pl. 3, Figs. 3-6; Pl. 4, Figs. 2, 3, 5-9 (Synonymy).
 2001 *Mohlerina basiliensis* MOHLER, Olszewska and Wiczorek, Pl. 4, Fig. 6.
 2004 *Mohlerina basiliensis* MOHLER, Bucur et al., Pl. 1, Fig. 2.
 2005 *Mohlerina basiliensis* MOHLER, Olszewska p. 38, Pl. 6, Fig. 1.
 2005 *Mohlerina basiliensis* MOHLER, Bucur and Săsăran, Pl. 2, Fig. 12.
 2005 *Mohlerina basiliensis* MOHLER, Schlagintweit et al. p. 33, Pl. 16: a-c (Synonymy).
 2007 *Mohlerina basiliensis* MOHLER, Krajewski and Olszewska p. 305, Fig. 8, A.
 2008 *Mohlerina basiliensis* MOHLER, Ivanova et al., Fig. 6, N, Q.

Material: Gródek nad Dunajcem (140 P/81, 140 P/84, 140 P/99, 140 P/115); UJ 140P/36 Zamarski, 140 P/115; to chyba Lusina 140 P/39, Gródek nad Dunajcem (140 P/158).

Remarks: The detailed description of the species and arguments for the creation of the new combination *Mohlerina* are given by: Tasli, 1993; Bucur et al., 1996; Schlagintweit et al., 2005.

Distribution: Upper Jurassic of Switzerland (Mohler, 1938); Middle/Upper Dogger and lowermost Malm of Sonwend Mountain, Tyrol, Austria (Weynschenk, 1956); Middle/Upper Berriasian of Ain, Savoie, France (Darsac, 1983); Upper Kimmeridgian or Tithonian of the Kale-Gümüşhane region, Eastern Pontids, Turkey (Tasli, 1993); Upper Tithonian of the Madonie Mts., Italy (Bucur et al., 1996); Oxfordian-Valanginian of the Cieszyn Beds, Polish Outer Carpathians (Olszewska, 2005); Upper Oxfordian-Valanginian of the Apuseni Mountains, Romania (Bucur and Săsăran, 2005); Upper Kimmeridgian-Lower Berriasian Plassen carbonate platform, Northern Calcareous Alps (Schlagintweit et al., 2005); Middle Oxfordian - Lower Valanginian of the southern part of the Crimea Mts., Southern Ukraine (Krajewski and Olszewska, 2007); Upper Kimmeridgian - Lower Berriasian of southwestern Bulgaria (Ivanova et al., 2008).

Known range: Middle Dogger (Weynschenk, 1956) - Valanginian (Schlagintweit and Ebli, 1999; Olszewska, 2005; Bucur and Săsăran, 2005).

CONCLUSION

Our study of exotic pebbles to small boulders of the Štramberk-type limestones from the Polish Outer Carpathians revealed 34 species of foraminifera (including 8 in open nomenclature) representing 30 genera, 22 families, 14 superfamilies, 11 suborders, and 7 orders. The studied limestones can be attributed to reef and peri-reef facies, and lagoonal algal-foraminiferal facies (the latter facies contain more stratigraphically important species). Age determination was possible only for 30 exotics. Fifteen of them are not older than Tithonian, 13 - not older than Berriasian, and at least 2 of them are Valanginian. The age based on foraminifera is only partly in agreement with the previous studies of calpionellids and ammonites which indicated a Tithonian-Early Berriasian age. However, Valanginian shallow-water limestones have already been known as pebbles in some deposits of the Outer Carpathians in the Czech Republic. Further evidence for Valanginian shallow-water marine carbonate sedimentation (algal facies) comes from recent studies of the substrate drilled in the Carpathian Foredeep. Thus, shallow-water marine sedimentation, mainly as lagoonal facies, persisted on the northern segment of the Tethyan margin into the Valanginian.

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Plate 1.

Fig. 1. *Verneuilinoides* sp. (Gródek nad Dunajcem, UJ 140 P/99, x 35).

Figs. 2-5. *Verneuilinoides neocomiensis* (MJATLIUK) (2-3. Lusina, UJ 140P/39; 4-5 . Woźniki, UJ 140P/31).

Figs. 6-8. *Redmondoides lugeoni* (SEPTFONTAINE) (6. Gródek nad Dunajcem, UJ 140 P/78; 7. Woźniki, UJ 140P/31; 8. Gródek nad Dunajcem, UJ 140 P/158).

Figs. 9, 10. *Gaudryinopsis* sp. (8. Lusina, UJ 140 P/39; 9. Zamarski, UJ 140 P/36).

Figs. 11, 12. *Protomarssonella kummi* (ZEDLER) (10. Lusina, UJ 140 P/67; 11. Gródek nad Dunajcem UJ 140P/91).

Fig. 13. Valvulinidae indet. (Leńcze, UJ 140 P/73).

Figs. 14, 15. *Ammobaculites subcretaceus* CUSHMAN & ALEXANDER (14. Zamarski, UJ 140 P/36, x 35; 15. Lusina, UJ 140P/52, x 35)

Fig. 16. *Arenobulimina* sp. (Woźniki, UJ 140P/31).

Fig. 17. *Haghimashella arcuata* (HAEUSLER) (Gródek nad Dunajcem, UJ 140 P/109).

Fig. 18. *Plectinella* sp. (Gródek nad Dunajcem, UJ 140 P/109).

Fig. 19. *Siphovalvulina variabilis* SEPTFONTAINE (Woźniki, UJ 140P/31).

All figures x 90, except otherwise stated.

PLATE I

Plate 2.

Fig. 1. *Freixialina planispiralis* RAMALHO, 1969 (Woźniki, UJ 140P/31).

Figs. 2-4. *Nautiloculina brönnimanni* ARNAUD-VANNEAU & PEYBERNES (2. Lusina, UJ 140P/52; 3. Leńcze, 140 P/73; 4. Jastrzębia, UJ 140 P/191).

Fig. 5. *Carasuella* sp. (Gródek nad Dunajcem, UJ 140 P/91).

Fig. 6. *Lenticulina* sp. (Lusina 140P/39, x 35).

Fig. 7. *Hechtina praeantiqua* BARTENSTEIN & BRAND Gródek nad Dunajcem, 140P/32.

Figs. 8, 9. *Meandrospira favrei* (CHAROLLAIS, BRÖNNIMANN & ZANINETTI) (Lusina, UJ 140P/39).

Fig. 10. *Montsalevia salevensis* (CHAROLLAIS, BRÖNNIMANN & ZANINETTI) (Jastrzębia, UJ 140 P/191).

Fig. 11. *Mayncina* cf. *bulgarica* LAUG, PEYBERNES & REY (Gródek nad Dunajcem, UJ 140 P/118).

Figs. 12-15. *Melathrokerion valserinensis* BRÖNNIMANN & CONRAD (12. Gródek nad Dunajcem, UJ 140 P/78; 13. Woźniki, UJ 140 P/23; 14. Woźniki, UJ 140 P/177. 15. Gródek nad Dunajcem, UJ 140 P/100).

Figs. 16-19. *Dobrogeolina ovidi* NEAGU (16. Gródek nad Dunajcem, UJ 140 P/110; 17–19. Gródek nad Dunajcem, UJ 140 P/100)

Fig. 20. *Ophthalmidium* sp., Lusina, UJ 140 P/85).

Fig. 21. *Spirillina* sp. (Woźniki, UJ 140 P/23).

Figs. 22, 23. *Istriloculina eliptica* (IOVCHEVA) (22. Gródek nad Dunajcem, UJ 140 P/84; 23. Woźniki, UJ 140P/31).

Figs. 24-26. *Istriloculina emiliae* NEAGU (24. Gródek nad Dunajcem, UJ 140 P/99); 25. Gródek nad Dunajcem, UJ 140 P/82; 26. Gródek nad Dunajcem, UJ 140 P/100).

Figs. 27, 28. *Moesiloculina danubiana* NEAGU (27. Lusina, UJ 140P/39; 28. Woźniki, UJ 140P/31).

Figs. 29-32, 34-36. *Quinqueloculina egmontensis* LLOYD (29. Gródek nad Dunajcem, UJ 140 P/99; 30. Gródek nad Dunajcem, UJ 140 P/118; 31. Jastrzębia, UJ 140 P/191; 32. Gródek nad Dunajcem, UJ 140 P/158; 34. Woźniki, UJ 140P/34; 35 Gródek nad Dunajcem, UJ 140 P/99; 36. Gródek nad Dunajcem, UJ 140 P/97).

Figs. 33, 37. *Quinqueloculina multicostata* NEAGU (Woźniki, UJ 140P/31).

All figures x 90, except otherwise stated.

PLATE II

Plate 3.

Figs. 1-4. *Coscinophragma cribrosum* (REUSS) (1. Gródek nad Dunajcem, UJ 140 P/176; 2. Gródek nad Dunajcem, UJ 140 P/176; 3-4. Gródek nad Dunajcem, UJ 140 P/115).

All figures x 35.

Figs. 5-10. *Charentia cuvillieri* NEUMANN (5. Gródek nad Dunajcem, UJ 140 P/99; 6, 8, 10. Leńcze, UJ 140 P/45; 7, 9. Leńcze, UJ 140 P/83).

All figures x 90.

PLATE III

Plate 4.

Figs. 1-10. *Pseudocyclammina lituus* (YOKOYAMA) (1. Gródek nad Dunajcem, UJ 140 P/99; 2. Leńcze, UJ 140 P/45; 3-4, 6. Gródek nad Dunajcem, UJ 140 P/180; 5. Gródek nad Dunajcem, UJ 140 P/158; 7. Leńcze, UJ 140 P/83; 8-9. Gródek nad Dunajcem, UJ 140 P/99; 10. Woźniki, UJ 140 P/177).

All figures x 35.

PLATE IV

Plate 5.

Figs. 1-6. *Protopeneroplis ultragranulata* (GORBACHIK) (1. Gródek nad Dunajcem, UJ 140 P/99; 2. Woźniki, UJ 140P/31; 3. Gródek nad Dunajcem, UJ 140 P/90; 4. Gródek nad Dunajcem, UJ 140 P/97; 5. Gródek nad Dunajcem, UJ 140 P/79; 6. Lubenia, UJ 140 P/11).

Figs. 7, 8. *Protopeneroplis striata* WEYNSCHENK (Zamarski, UJ 140 P/36).

Figs. 9-11. *Patellina turriculata* DIENI & MASSARI (Lusina, UJ 140P/39).

Figs. 12-18. *Mohlerina basiliensis* (MOHLER) (12. Gródek nad Dunajcem, UJ 140 P/84; 13. Gródek nad Dunajcem, UJ 140 P/115; 14. Gródek nad Dunajcem, UJ 140 P/158; 15. Gródek nad Dunajcem, UJ 140 P/81; 16. Gródek nad Dunajcem, UJ 140 P/99; 17. Gródek nad Dunajcem, UJ 140 P/115; 18. Zamarski, UJ 140P/36).

Figs. 1-11 x 90, Figs. 12-18 x 35.

PLATE V