

CONTRIBUTIONS TO THE KNOWLEDGE OF THE ROTALIIFORM FORAMINIFERA FROM THE MARINE MIDDLE MIOCENE DEPOSITS FROM ROMANIA

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Abstract: In the paper are described and figured 77 species belonging to the orders Robertinida and Rotaliida. The studied material comes from samples collected between the years 1960-2000 from different areas of Romania (western Oltenia, eastern border of the Pannonian Basin, northern and western borders of the Transylvania Basin). Most of the samples were collected from outcrops, but some of them come from drillings.

Key words: Rotaliiform foraminifera, Middle Miocene, Romania

INTRODUCTION

This paper continues the presentation of the normal marine Middle Miocene foraminifera from the Carpathian area (see Popescu, 2000; Popescu & Crihan, 2002; Popescu & Crihan, 2004 a, b; Popescu & Crihan, 2005 a, b). The specimens here described come from most of the zones with marginal marine or shelf deposits. The most important areas with deposits rich in foraminifera are situated at the interior of the Carpathian Arc (in the Transylvanian Basin and its connected basins and in Maramureş Basin), along the eastern margin of the Pannonian Basin, as well as at the exterior of the Carpathians, especially in the Getic Depression.

The paleontologic material comes from samples collected both from outcrops and from some boreholes drilled in the intermountain basins from the eastern border of the Pannonian Basin.

The appearance of the Middle Miocene faunas is connected to the great Langhian marine transgression which took place under the circumstances of the climatic maximum recorded all over the world, but also controlled by the regional tectonics. This transgression brought in the Central Paratethys east-mediterranean faunas with indo-pacific origin. The indo-pacific origin of the foraminifera from the eastern mediterranean area was already noticed by Cushman in 1937: "The relationships of the Mediterranean region to those of the present Indo-Pacific faunas, and to the Tertiary species of Austria, is very striking in this group, as in others of the foraminifera" (p. 13). The seaways that permitted the access of the mediterranean waters into the Paratethys are not entirely known, but a way via Slovenia and northern Croatia (Transtethyan Trench Corridor or Trans Dinaride Corridor) seems to be acceptable (Kovac et al., 2007).

The mediterranean character of the foraminifera from Paratethys is preserved until the Middle Miocene salinity crisis, inclusively. The faunas (foraminifera and radiolarians)

from the post-crisis deposits have similarities with the boreal faunas from Northern Germany (Dumitrică et al., 1975). This is the second most important moment of homogeneity of the endemic faunas from the Paratethys (after the Solenovian moment from the Oligocen, see Rusu, 1995), which will continue even more pregnantly during the Sarmatian and Meotian (Pannonian, respectively).

East of Carpathians, beginning from Moldavia and Dobrogea toward east, as well as in the area between Crimea and Caucasus, during the Early Badenian (Moravian) no marine deposits were accumulated. The first marine deposits that belong to the Middle Miocene start with the Tarkhanian, which Pishvanova (1978) considered to be the equivalent of the Lower Kossovian. Subsequently, Bobylev & Pishvanova (1979) admitted the existence of an important sedimentation gap, equivalent at least with the Moravian (= Langhian) from the Central Paratethys. From the data regarding the foraminifera content provided by Krasheninnikov (1959), the data regarding the mollusks of Zhizhchenko (in Zhizhchenko, B. P., Ed. 1959), and those regarding the foraminifera from the Kossovian deposits (from the Ukrainian Subcarpathians) and Tarkhanian deposits (Taman) mentioned by Pishvanova (1978) clearly results that the Tarkhanian deposits can be correlated with the Wielician and the Lowermost Kossovian (sensu Papp et al., 1978, not as defined by Pishvanova, 1968) from the Central Paratethys.

SYSTEMATIC DESCRIPTIONS

Order **ROBERTINIDA** MIKHALEVICH, 1980
Superfam. **Ceratobuliminacea** CUSHMAN, 1927

Fam. **Ceratobuliminidae** CUSHMAN, 1927
Subfam. **Ceratobulimininae** CUSHMAN, 1927

Genus *Ceratobulimina* TOULA, 1915

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Ceratobulimina contraria (REUSS), 1851
(Pl. 1, figs. 10-12)

Rotalina contraria Reuss, 1851. *Zeitschrift der Deutschen Geologischen Gesellschaft*, 3, p. 76, pl. 5, fig. 37 (fide Ellis & Messina, 1940 et seq.).

Ceratobulimina contraria (Reuss). Batjes, 1958, p. 160, pl. 10, fig. 4; Rögl, 1998, p. 89, pl. 29, figs. 9, 10.

Remarks: A few specimens were recorded at Lăpuşiu de Sus (west of Deva), Balta Sărată (Caransebeş) and Popeşti Quarry (North of Cluj-Napoca).

Genus *Ceratocancris* FINLAY, 1939

Ceratocancris haueri (d'Orbigny), 1846

Rotalina haueri d'Orbigny, 1846, p. 151, pl. 7, figs. 22-24.

Ceratocancris haueri (d'Orbigny). Rögl, 1969, p. 103, pl. 4, figs. 15, 16; Papp & Schmid, 1985, p. 58, pl. 48, figs. 1-6; Rögl, 1998, p. 89, pl. 29., figs. 14-16.

Range. Species common in Langhian deposits (= Lower Badenian).

Genus *Lamarckina* BERTHELIN, 1881

Lamarckina erinacea (KARRER), 1868

(Pl. 1, figs. 13,14)

Pulvinulina erinacea Karrer, 1868, p. 187, pl. 5, fig. 6.

Lamarckina erinacea (Karrer). Loeblich & Tappan, 1987, p. 441, pl. 475, figs. 7-9.

Test trochospiral, ventral side plane with a deep umbilicus, spiral side convex; surface smooth on ventral face, pustulate on dorsal side on which chambers are visible, 5-7 on the final whorl; peripheral margin bordered by a distinct hyaline carina; aperture interiomarginal.

Remarks: The type was described from Coştei; this species is rare but appears in many samples from Lower Badenian from Lăpuşiu de Sus (Valea Coşului section), Coştei (Valea Popii section), Caransebeş (Balta Sărată), Bega Basin (in many boreholes), and north-western and western Transylvania. A close species, probably a junior synonymus, is *Lamarckina ventricosa* (BRADY); see also description and illustrations for *L. ventricosa* given by Hottinger et al., 1993, p. 83, pl. 97, figs. 1-9.

Stratigraphic range: Upper Langhian -lower Serravallian (=Upper Moravian - Wielician). This species never occurs in Upper Badenian (Kossovian).

Fam. **Epistominidae** WEDEKIND, 1937

Subfam. **Epistomininae** WEDEKIND, 1937

Genus *Hoeglundina* BROTZEN, 1948

Hoeglundina partschiana (D'ORBIGNY), 1846

Rotalina partschiana d'Orbigny, 1846, p. 153, pl. 7, figs. 28-30; pl. 8, figs. 1-3

Hoeglundina elegans (d'Orbigny). Papp & Schmid (1985), p. 59, pl. 49, figs. 1-6.

Remarks: Marks (1951), Papp & Schmid (1985), Rogl (1998) and others consider *H. partschiana* as junior synonym of *H. elegans* (D'ORBIGNY), 1826.

Superfam. **Robertinacea** REUSS, 1850

Fam. **Robertinidae** REUSS, 1950

Subfam. **Alliatinae** MCGOWRAN, 1966

Genus *Alliatina* TROELSEN, 1954

Alliatina dentaperta n.sp.

(Pl. 1, figs. 4-9)

Test ovate, low trochospiral, compressed, assymetrical, chambers increasing rapidly in size as added; sutures distinct; surface smooth; apertural face elongate, slightly convex; ovate areal aperture, acuminated toward the umbilical side. Inner partition, folding around areal aperture, oblique, starting from above the areal aperture and attached to the inside of the apertural face just under previous areal opening, marked externally by a curved groove starting from the areal opening to the umbilicus; equatorial slit-like aperture with denticulate lip; on the umbilical side other secondary septal openings.

Remarks: Differs from *Alliatina excentrica* (di NAPOLI ALLIATA), 1952 in being more ovate, more compressed, and in having a "denticulate" aperture.

The holotype and paratypes come from Coştei, Valea Gemini section.

Age: Upper Langhian (Zone N9).

Authors collection.

Alliatina excentrica (di NAPOLI ALLIATA), 1952

(Pl. 1, figs. 1-3)

Cushmanella excentrica di Napoli Alliata, 1952, p. 105 (fide Loeblich & Tappan, 1987)

Alliatina excentrica (di Napoli Alliata). Loeblich & Tappan, 1987,

Occurrence. The illustrated material is coming from Valea Gemini section, Coştei (Hunedoara district). This is a very rare species.

Subfam. **Robertininae** REUSS, 1850

Genus *Robertinoides* HOEGLUND, 1947

Robertinoides austriacus (REUSS), 1850

(Pl. 2, figs. 2-7)

Robertina austriaca Reuss, 1850, p. 375, pl. 47, fig. 15.

Robertinoides austriacus (Reuss). Poignant, 1983, p. 24, pl. 3, figs. 4, 7-8.

Remarks: A close species is *Robertinoides brady* (CUSHMAN AND PARKER), 1936.

Range: Upper Langhian.

Robertinoides imperatrix (KARRER), 1868

(Pl. 1, fig. 15; pl. 2, fig. 1)

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Bulimina imperatrix Karrer, 1868, p. 176, pl. 4, fig. 11.

Robertina imperatrix (Karrer). Vasicek, 1951, pl. 2, fig. 15.

Stratigraphic range: Our specimens represent topotypic material. It comes from Valea Gemini, Coștei (Bega Basin, Timișoara district).

Order **ROTALIIDA** LANKESTER, 1885
Superfam. **Discorbacea** EHRENBERG, 1838
Fam. **Bagginidae** CUSHMAN, 1927
Subfam. **Baggininae** CUSHMAN, 1927
Genus *Baggina* CUSHMAN, 1927
Baggina regularis (d'ORBIGNY), 1846
(Pl. 2, figs. 8-11)

Globigerina regularis d'Orbigny, 1846, p. 162, pl. 9, figs. 1-3; Reuss, 1850, p. 373, pl. 47, figs. 7a-b.

Globigerina arenaria Karrer, 1867, p. 356, pl. 1, fig. 10.

non *Globigerina regularis* Papp et al., 1978, p. 270, pl. 3, figs. 5-8.

Baggina regularis (d'Orbigny). Popescu, 1982a, p. 25, pl. 1, figs. 1-6, pl. 2, figs. 1-3

Remarks: Papp & Schmid (1985) and Rögl (1985) described specimens of *Globigerinella obesa* (BOLLI), 1957 as *Globigerina regularis*. Descriptions and illustrations given by d'Orbigny (1846) and Reuss (1850) clearly represent specimens belonging to the genus *Baggina* (see also Popescu, 1982a). The "lectotype" described and figured by Papp & Schmid is not conspecific with the original description and illustration. The manner of selecting the lectotype is doubtful in spite of the fact that the mentioned authors had at their disposal the original d'Orbigny collection. The explanation of such a misunderstanding consists also in the fact that d'Orbigny vials contain specimens belonging to more different species or even genera and is necessary to search for a specimen looking like the original illustration and description. If, generally, this task is possible, sometimes the subjective factor is involved. The best example is this mode of choosing the "lectotype" for *Globigerina regularis* by Papp & Schmid, rejected here.

A closely resembling/related species is *Baggina gibba* CUSHMAN & TODD (1944, p. 104, pl. 16, fig. 8), suspected to be a junior synonym.

B. regularis has a large ontogenetic variability, consisting in the number of chambers on the last whorl. Young specimens have four chambers, while mature specimens have larger sizes, rounded peripheral margins and the last whorl is made of 6-7 chambers (see *Globigerina arenaria* KARRER, 1867, another suspected junior synonym). In the

same sample coexist all these ontogenetic stages.

Range: Miocen-Recent. In the Central Paratethys (Carpathian area) the species was recorded in Transylvania and on the eastern border of the Pannonian Basin but only from Langhian deposits (Lower and Middle Badenian).

Genus *Cancris* de MONTFORT, 1808
Cancris auriculus (FICHTEL & MOLL), 1798
(Pl. 2, figs. 12,13; pl. 3; figs. 1-4)
Nautilus auriculus Fichtel & Moll, 1798, p. 108, pl. 20, figs. a-c.
Rotalina brogniarti d'Orbigny, 1846, p. 158, pl. 8, figs. 22-24.

Cancris auriculus (Fichtel & Moll). Rögl & Hansen, 1984, p. 67, pl. 26, figs. 3-8, text-fig. 28; Hottinger et al., 1993, p. 106, pl. 136, figs. 6-14.

Occurrence: Lower and Middle Miocene (in Paratethys).

Genus *Valvulineria* CUSHMAN, 1921
Valvulineria complanata (d'ORBIGNY), 1846
(Pl. 3, figs. 5-8)

Rosalina complanata d'Orbigny, 1846, p. 176, pl. 10, figs. 16-18.

Valvulineria complanata (d'Orbigny). Marks, 1951, p. 64, pl. 6, fig. 13; Papp & Schmid, 1985, p. 66, pl. 59, figs. 7-11.

Range: Rare in the upper part of the Lower Badenian, common in Kossovian deposits (Upper Badenian).

Fam. **Eponididae** HOFKER, 1951
Subfam. **Eponidinae** HOFKER, 1951
Genus *Eponides* de MONTFORT, 1808
Eponides boueanus (d'ORBIGNY), 1846
(Pl. 3, fig. 9)

Rotalina boueana d'Orbigny, 1846, p. 152, pl. 7, figs. 25-27.

Eponides boueanus (d'Orb.). Papp & Schmid, 1985, p. 58, pl. 48, figs. 7-12.

Remarks: This species is common in the Upper Langhian deposits from Banat and Transylvania (Zone N9-10). The lectotype described and figured by Papp & Schmid (1985) is similar with the holotype of *Eponides repandus* (FICHTELL & MOLL), 1798 illustrated and re-described by Rögl and Hansen (1984, p. 31). The two species are suspected to be synonyms. Among specimens recorded from the Carpathian area there were specimens with secondary rounded openings on the apertural face like in *Poroeponides* CUSHMAN (see also Papp & Schmid, 1985, pl. 48, fig. 10). The authors of the present paper agree with the conclusions of Resig (1962) that *Poroeponides* and *Sestronophora* are ontogenetic stages of *Eponides* (see also Colom, 1964, p. 526, text-fig. 4 /1-10). The temporal succession of the first appearance

datum levels of the three "stages" pointed out the possibility to use them in biostratigraphy. In the Early Miocene were recorded only specimens belonging to *Eponides*, in the Middle Miocene to *Eponides* and "*Poroeponides*" and, finally, in Pliocene coexist *Eponides*, "*Poroeponides*" and "*Sestronophora*". This suggests a possible monophyletic lineage: *repandus* – *boueanus* – *arnoldti*. In this paper we consider the genera *Poroeponides* and *Sestronophora* as junior synonyms of the genus *Eponides*.

Genus *Neoeponides* REISS, 1960

Neoeponides schreibersi (d'ORBIGNY), 1846
(Pl. 3, fig. 10)

Rotalina schreibersi d'Orbigny, 1846, p. 154, pl. 8, figs. 4-6.

Neoeponides schreibersi (d'Orbigny). Rögl & Hansen, 1984, p. 34, pl. 6, figs. 4-6; Pap & Schmid, 1985, p. 59, pl. 49, figs. 7-12; Hottinger et al., 1990, p. 335-337, pl. 1, figs. 1-8; Rögl, 1998, p. 112, pl. 59, figs. 4-6.

Remarks: *Rotalina badensis* CZJZEK (1847, p. 154, pl. 12, figs. 1-3) has affinities with *N. schreibersi*, therefore might be a junior synonym.

Range: Langhian (in Paratethys).

Fam. **Mississippinidae** SAIDOVA, 1981

Subfam. **Mississippininae** SAIDOVA, 1981

Genus *Mississippina* HOWE, 1930

Mississippina neagui POPESCU, 1968

(Pl. 4, figs. 1-4)

Mississippina neagui Popescu, 1968, p. 109, text-figs. 1-3; Rögl, 1998, p. 112, pl. 58, figs. 11, 14, 15.

Text biconvex, trochoid in early stage, involute, planispiral in the adult; on both sides are visible only the chambers from the last whorl; wall calcareous, finely perforated; sutures radial, slightly convex on both sides, depressed on the ventral side, flush on the dorsal side; aperture interiomarginal at the base of the last chamber, extending from the umbilicus to the periphery; supplementary apertures filled with bands of clear shell material on both sides near periphery, parallel to it; other rows of secondary apertures occur on the spiral side at the last chambers near the spiral suture.

Range: Upper Langhian. Only few specimens were recorded from Lăpugiu de Sus (Valea Coşului section) and Coştei (Valea Gemini section).

Subfam. **Stomatorbininae** SAIDOVA, 1981

Genus *Stomatorbina* DOREEN, 1948

Stomatorbina concentrica (PARKER &

JONES), 1864

(Pl. 4, figs. 5, 6)

Pulvinulina concentrica Parker & Jones, 1864 (in Brady, Trans. Linn. Soc. London 24/3, p. 470, pl. 48, fig. 14, fide Brady, 1884; Brady, 1884, p. 686, pl. 105, fig. 1); Hodgkinson, 1992, p. 61, pl. 2, figs. 19-21.

Stomatorbina concentrica (Parker & Jones). Carter, 1958, p. 40, pl. 4, figs. 37-39, pl. 7, fig. 15; Andersen, 1961, p. 105, pl. 24, figs. 3 a-c.

Mississippina concentrica (Parker & Jones). Hornibrook, 1961, p. 114, pl. 17, figs. 369, 374; Schnitker, 1971, p. 210, pl. 10, fig. 16.

Remarks: This species was included in Doreen's genus *Stomatorbina*. Studying the relationship between *Stomatorbina* and *Mississippina*, Uchio (1952) and Hofker (1956) concluded that the two genera are synonymous. Additional remarks were made by Hornibrook (1961).

Range: Rare in the Upper Badenian from Banat; a very surprising rich sample was collected from Ciolt (Baia Mare Basin) from age equivalent deposits.

Fam. **Discorbidae** EHRENBERG, 1838

Genus *Lamellodiscorbis*, BERMUDEZ 1952

Remarks: The genus is considered synonymous with the genus *Trochulina* d'ORBIGNY, 1839 by Loeblich & Tappan (1987, p. 559). In our opinion the genus should be considered as valid since it has characters clearly distinct from *Trochulina* d'Orbigny, 1839.

Lamellodiscorbis cf. *L. dimidiata* (JONES & PARKER), 1862

(Pl. 4, fig. 7-10)

Test low trochospiral, planiconvex, with ventral side flattened; chamber arranged in two and a half whorls, 7-8 chambers on the last whorl; sutures curved, depressed; periphery rounded to subaccuminate; peripheral margin lobate, imperforated, wall calcareous, thin, optically radial, perforated; surface smooth; aperture interiomarginal, extraumbilical; secondary openings, an arched one at the posterior margin of the umbilical flap, and a slit-like sutural one at the anterior margin; umbilicus small, deep, sometimes covered by umbilical flaps.

Remarks: Our specimens differ from the type by the smaller number of chambers on the last whorl (6, 8 instead of 9, 10). Similar specimens were described as *Trochulina* sp.A by Hottinger et al., (1993, p. 109).

Range: In Paratethys area, Langhian. It was recorded in Lăpugiu de Sus, Delineşti and Valea Coşului sections (Bega basin).

Genus *Rotorbis* Sellier de CIVRIEUX, 1977

Rotorbis patella (REUSS), 1850

(Pl. 4, figs. 11-13)

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Rotalina patella Reuss, 1850, p. 371, pl. 46. fig. 22.

The holotype was described from Kostel (Moravia). In Romania the species was recorded in the Lower Badenian (Langhian) deposits from Lăpugiu de sus (Valea Coșului section).

Remarks: Loeblich & Tappan (1987) included the genus *Rotorbis* in the synonymy of the genus *Neoeponides* REISS, 1960. In our plates it can be clearly noticed that under the name *Neoeponides schreibersi* are figured specimens which do not fit the description and illustration of d'Orbigny, reillustrated by Papp & Schmid (1985) or by Reiss (1960) when he described his new genus. Our specimens are close to specimens referred by Brady (1884) to *Discorbina turbo* d'ORBIGNY, 1839 and by R. W. Jones (1994) to *Neoeponides auberii* (d'ORBIGNY), 1839.

Genus *Strebloides* BERMUDEZ & SEIGLIE,
1963

Strebloides sp.
(Pl. 5, fig. 9)

Remarks: The assignment of our specimens to the genus *Strebloides* is uncertain. We found only three specimens, here figured, in Valea Gemini section at Coștei.

Fam. **Rosalinidae** REISS, 1963
Genus *Rosalina* d'ORBIGNY, 1826
Rosalina bradyi (CUSHMAN), 1915
(Pl. 5, figs. 1-3)

Discorbis globularis (d'Orbigny) var. *bradyi*
Cushman, 1915, p. 12.

Rosalina bradyi (Cushman). Barker, 1960, p. 178,
pl. 86, fig. 8; Hottinger et al., 1993, p. 110, pl.
142, figs. 11, 12; pl. 143, figs. 1-6.

Range: Relatively rare species. In Romania it was recorded at Lăpugiu de Sus (Valea Coșului section) and at Gârbova de Sus (Valea Viilor section).

Fam. **Spheroidinidae** CUSHMAN, 1927
Genus *Spheroidina* d'ORBIGNY, 1826
Sphaeroidina bulloides d'ORBIGNY (1826)
(Pl. 5, figs. 4-5)

Sphaeroidina bulloides d'Orbigny, 1826, p. 267, no.
65 (fide Ellis & Messina);

Sphaeroidina austriaca d'Orbigny, 1846, p. 284, pl.
20, figs. 19-21.

Remarks: *S. austriaca* is a junior synonym of *S. bulloides* (see: Marks 1951; Papp & Schmid, 1985; Rögl, 1998). Differs of *S. variabilis* REUSS (1850) in its subspherical shape and fewer chambers visible at the surface of the test; The range of Reuss' species is restricted (in Paratethys) to the Upper Badenian (see Popescu, 1979).

Superfam. **Glabratellacea** LOEBLICH &
TAPPAN, 1964

Fam. **Glabratellidae** LOEBLICH & TAPPAN,
1964

Genus *Discorbinoidea* SAIDOVA, 1975

Discorbinoidea sp.
(Pl. 5, figs. 6-8)

The test is a low cone; chambers coiled trochospirally, six on the last whorl; sutures flush, radial on the ventral side, strongly curved on the dorsal side; periphery angular, with thin, very large, fimbriate carina; umbilicus deep, wall calcareous, perforated, smooth on the dorsal side, radiate rows of small pustules on ventral side; aperture umbilical, interiomarginal.

Remarks. Similar specimen was described and figured by Brady (1884) as *Discorbina patelliformis* and transferred by Jones (1994, p. 94, pl. 88, fig. 3) to the genus *Glabratella*.

Range. In Romania this species was recorded only from Lower Badenian deposits (Valea Gemini section, Coștei, Banat).

Genus *Glabratella* DORREEN, 1948
Glabratella (?) *neumannae* RAHAGHI, 1977
(Pl. 6, figs. 2,3)

Glabratella neumannae Rahaghi, 1977, p. 167, pl.
2, figs. 1-3.

Test free, trochospiral, plan-convex, 4-5 chambers on the final whorl; peripheral outline rounded, slightly lobulate equatorially; apertural face flat; dorsal side with reticulate pattern; sutures distinct on the dorsal side, flush on the ventral side; aperture restricted to the open umbilicus.

Remarks. This highly ornamented species was also illustrated in Rögl ((1998, pl. 60, figs. 5, 6) as *Glabratella ? neumannae*. Its generic position is uncertain: it is possible that the species belongs to the genus *Conorbella* HOFKER, 1951.

Range: Species described from the Falunes de Saubrigues, France. In Romania rare specimens were recorded from Upper Langhian (N9 Zone).

Glabratella (?) *saubriguensis* RAHAGHI, 1977
(Pl. 6, figs. 6, 8, 12)

Glabratella saubriguensis Rahaghi, 1977, p. 168, pl.
2, figs. 7, 8.

Range: This species was described from the Falunes de Saubrigues (Langhian), France. Our specimens come from Valea lui Ion section, Buitur, Hunedoara district).

Glabratella platyomphala (REUSS), 1867
(Pl. 6, figs. 4, 5, 7)

Discorbina platyomphala Reuss, 1867, p. 102, pl. 4,
fig. 13.

Glabratella platyomphala (Reuss). Łuczowska, 1967, p. 334, pl. 4, fig. 13; Popescu, 1979, p. 38, pl. 24, fig. 4.

Range: Species recorded only from Kossovian deposits.

Genus *Glabratellina* SEIGLIE and BERMUDEZ, 1965

Glabratellina sp. A
(Pl. 7, fig. 14-16)

Test small, high trochospiral, concavo-convex, 5-6 chambers on the final whorl; peripheral margin rounded, peripheral outline slightly lobulate to circular; umbilical face concave, spiral side slightly convex; sutures flush, slightly curved on the spiral side, radial, slightly depressed on umbilical face; wall smooth, densely perforated on spiral face; umbilical side ornamented with dense radial pustulate striae; aperture interiomarginal a low arch.

Range. Species rare, was recorded from Valea Gemini section (Lower Badenian).

Remarks. A similar specimen from the same section, but low trochospiral, almost lenticular was illustrated as *Glabratellina* sp. B (plate 7, fig. 17)

Genus *Schackoinella* WEINHANDL, 1958

Schackoinella imperatoria (d'ORBIGNY), 1846
(Pl. 5, fig. 10-12; pl. 6, fig. 1)

Rotalina imperatoria d'Orbigny, 1846, p. 176, pl. 10, figs. 16-18.

Schackoinella sarmatica Weinhandl, 1958, p. 141, text-fig. 1.

Schackoinella imperatoria (d'Orbigny). Papp & Schmid, 1985, p. 66, pl. 60, figs. 1-5; Rogl, 1998, p. 125, pl. 60, figs. 7-9.

Remarks. It is very possible that this genus includes more species known under the generic name of "*Glabratella*", e.g. the species *saubriguensis*, *neumannae*, *platyomphala* etc., having as a common characteristic the highly ornamented test.

Range. This species is mentioned only from Lower Sarmatian (Volhynian) deposits. An assemblage rich in this species was found in the Valea Fisici, at Bozioru (Buzău district).

Superfam. **Siphoninacea** CUSHMAN, 1927

Fam. **Siphoninidae** CUSHMAN, 1927

Siphonina reticulata (CŽJŽEK, 1847)
(Pl. 6, figs. 9-10)

Rosalina reticulata Cžjžek, 1847, p. 145, pl. 13, figs. 7-9.

Siphonina fimbriata Reuss, 1850, p. 372, pl. 47, fig. 6.

Range: Common in Miocene deposits from Paratethys. In Romania the species was recorded from Middle Miocene deposits.

Superfam. **Discorbinellacea** SIGAL, 1952

Fam. **Discorbinellidae** SIGAL, 1952

Subfam. **Discorbinellinae** SIGAL, 1952

Genus *Ruthtoddia* n.g.

Diagnosis: Test free, involute; dorsal side convex, apertural face flat or slightly concave; sutures limbate; peripheral margin circular, acute; wall optically granular; aperture interiomarginal, extraumbilical to equatorial, bordered by a phialine lip.

Type species: *Anomalina variolata* d'ORBIGNY, 1846.

Ruthtoddia variolata (d'ORBIGNY), 1846

(Pl. 6, fig. 11; pl. 7, figs. 1-3)

Anomalina variolata d'Orbigny, 1846, p. 176, pl. 9, figs. 27-29; Papp & Schmid, 1985, p. 65, pl. 57, figs. 1-3.

Test free, both sides involute, ventral side flattened to concave, dorsal side slightly convex, 5-6 chambers on the last whorl; sutures limbate, curved on the ventral side, depressed or flush on the dorsal side; periphery acute, carinate; peripheral margin slightly lobulate; wall calcareous, perforate except for keel; surface smooth on ventral side, pustulate to irregularly costate on the dorsal side; aperture an interiomarginal, extraumbilical to equatorial arch bordered by a prominent lip and with a triangular flap.

Remarks: *R. variolata* was mentioned and illustrated by Papp & Schmid (1985, p. 65, pl. 57, figs. 2, 3) as *Cibicides lobatulus*. Between the two species there is an obvious difference.

Family **Parrelloidae** HOFKER, 1956

Genus *Cibicoides* THALMANN, 1939

Cibicoides ungerianus (d'ORBIGNY), 1846
(Pl. 7, figs. 8, 9)

Rotalina ungeriana d'Orbigny, 1846, p. 157, pl. 8, figs. 16-18.

Cibicides ungerianus (d'Orb.). Papp & Schmid, 1985, p. 60, pl. 51, figs. 7-11.

Cibicoides ungerianus ungerianus (d;Orb.). Rogl, 1998, p. 91, pl. 61, figs. 15-17.

Cibicoides pachyderma (RZEHA), 1886

(Pl. 7, figs. 6, 7)

Truncatulina pachyderma Rzehak, 1886, p. 87, pl. 1, fig. 5.

Cibicoides pachyderma (Rzehak). Jones, R.W., 1994, p. 98, pl. 94, figs. 9a-c; Rögl, 1998, p. 90, pl. 62, figs. 7-9.

Test rounded, biconvex; 10-12 chambers in the final whorl; ventral side with slightly curved and depressed sutures in the last 6-8 chambers, the others flush, slightly depressed; sutures limbate on the dorsal side, hardly visible on the first whorls; periphery rounded at least at the last 2-3 chambers, then strongly keeled; wall perforated; aperture arched, equatorial, prolonged on the dorsal side.

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Remarks: Morkhoven et al. (1986, p. 69) figured the lectotype of the species which is a SEM photograph made by Rögl.

Range: In Paratethys the species occurs in the interval Lower Miocen-Middle Miocene.

Cibicoides austriacus (d'ORBIGNY, 1846)
(Pl. 7, figs. 4, 5)

Anomalina austriaca d'Orbigny, 1846, p. 172, pl. 10, figs. 4-9.

Cibicides austriacus (d'Orbigny). Marks, 1951, p. 72.

Planulina austriaca (d'Orbigny). Papp & Schmid, 1985, p. 65, pl. 58, figs. 2-6.

Cibicoides austriacus (d'Orb.). Rogl, 1998, p. 90, pl. 61, figs. 1-3.

Remarks: Rare in our material. It was recorded in samples collected at Coștei, Gemini Valley from deposits that can be attributed to the Upper Lagenids Zone (upper part) or to Agglutinated Foraminifers Zone.

Superfam. **Planorbulinacea** SCHWAGER, 1877

Fam. **Cibicididae** CUSHMAN, 1927

Subfam. **Cibicidinae** CUSHMAN, 1927

Genus *Lobatula* FLEMING, 1828

Lobatula lobatula (WALKER & JAKOB), 1798
(Pl. 7, figs. 10-13)

Nautilus lobatulus Walker & Jakob, 1798, p. 642, pl. 14, fig. 36.

Lobatula lobatula (Walker & Jakob). Hottinger et al., 1993, p. 117, pl. 154, figs. 5-11; Rögl, 1998, p. 111, pl. 63, figs. 23-25.

Remarks: Species with a sessile way of life and with a great intraspecific variability. Usually it appears in marginal environments or on the continental platforms at depth within the photic zone.

There are many similarities between some specimens here assigned to *Lobatula lobatula* which were separated as *Planorbulina variabilis* (d'ORBIGNY), 1826 (see Loeblich & Tappan, 1987, p. 588, pl. 645, figs. 5, 6) or as *Cibicidella variabilis* (d'Orbigny) (in Cimerman & Langer, 1991, p. 72, pl. 77, figs. 1-10). A junior synonymous could be *Truncatulina laciniosa* KARRER (1868, p. 183, pl. 5, figs. 1a-c)

Rare in the Upper Langhian.

Fam. **Planorbulinidae** SCHWAGER, 1877

Subfam. **Planorbulininae** SCHWAGER, 1877

Genus *Planorbulina* d'ORBIGNY, 1826

Planorbulina mediterraneensis d'ORBIGNY, 1826

(Pl. 8, figs. 1-5)

Planorbulina mediterraneensis d'Orbigny, 1826, p. 280, nr. 2 (fide Cimerman & Langer, 1991); Cushman, 1931, p. 129, pl. 24, figs. 5-8; Colom, 1974, p. 158, text-figs. 39, 40; Loeblich & Tappan, 1987, p. 588, pl. 645, figs. 1-4; pl. 646,

figs. 1, 2; Cimerman & Langer, 1991, p. 71, pl. 78, figs. 1-8.

Test attached on the dorsal side, discoidal, flat, with early chambers trochospirally enroled, then with annular disposition; wall bilamellar: inner lamella with granular structure, the outer lamella radial; on both sides the walls are perforated by very distinct circular pores; aperture peripheral, interiomarginal, a half-moon in the trochospiral stage, then two equatorial semicircular openings at the base of each chamber.

Remarks: The species is common in our material. The number and disposition of the chambers differs at the microspheric specimens from those of megalospheric specimens; usually, microspheric specimens have a higher number of chambers in the trochospiral stage (10-12) compared to 5-7 in microspheric specimens.

Range: The described material comes from marine Middle Miocene deposits from Transylvania and Banat.

Subfam. **Caribbeanellinae** SAIDOVA, 1981

Genus *Caribbeanella* BERMUDEZ, 1952

Caribbeanella ? sp.

(Pl. 8, fig. 6)

Test trochospiral, planoconvex; dorsal side evolute, ventral side involute, 5-6 chambers on the last whorl; sutures slightly depressed on ventral side, almost flush and radial, slightly curved on dorsal side; wall coarsely perforate, with smooth surface; aperture in the young stage, a low interiomarginal and equatorial arch at the base of the aperture face, bordered by a distinct and imperforate lip; in the last chamber, beside primary aperture a secondary, almost symmetrical, aperture occurs on the opposite side.

Remarks. The illustrated specimen is singular. It seems to be an initial part of *Planorbulina*. Our specimen comes from Coștei, Valea Gemini section.

Fam. **Cymbaloporidae** CUSHMAN, 1927

Subfam. **Cymbaloporinae** CUSHMAN, 1927

Genus *Cymbaloporetta* CUSHMAN, 1928

Cymbaloporetta bradyi (CUSHMAN), 1915
(Pl. 8, figs. 7-9)

Cymbalopora poeyi (d'Orbigny) var. *bradyi* Cushman, 1915, p. 25, pl. 10, fig. 2.

Cymbaloporetta bradyi (Cushman). Graham & Militante, 1959, p. 108, pl. 18, fig. 2; Todd, 1965, p. 37, pl. 19, figs. 1-4, pl. 20, fig. 4; Popescu, 1979, p. 43, pl. 23, figs. 4-7.

Test lamellar, conical in lateral view; peripheral outline circular, lobulated and rounded peripheral margin; chambers in early stage trochospiral, later alternating; wall coarsely and densely perforated on the dorsal

face, with fine pores on ventral side; sutures slightly depressed and curved on spiral side, and depressed on ventral one; primary aperture highly arched, umbilical, the others, secondary (2-8) arched, sutural, all of them provided with prominent rims.

Occurrence. In Romania the species was recorded from Kossovian (Upper Badenian), from Valea Morilor section (Colibași, Mehedinți district).

Genus *Planopulvinulina* SCHUBERT, 1921

Planopulvinulina granulosa (KARRER), 1884
(Pl. 3, figs. 11, 12)

Rosalina granulosa Karrer, 1864, p. 710, pl. 2, fig. 14.

Rotalia granulosa (Karrer). Karrer, 1868, p. 188.

Cymbalopora hungarica Vadasz, 1910, p. 29 (fide Korecz-Laky, 1968, p. 184, pl. 12, figs. 6, 7).

Cymbalopora granulosa (Karrer). Popescu, 1975, p. 97, pl. 93, figs. 14, 15.

Planopulvinulina granulosa (Karrer). Rögl, 1998, p. 117, pl. 58, figs. 7, 8.

Test large, low conical dorsal side, flattened ventral side; rounded to sub-pentagonal in outline, slightly lobulate; early chambers trochospiral, later annularly arranged; sutures obscured on dorsal side, covered by tubercles enlarged on earlier chambers, radial and depressed on ventral side; wall calcareous, finely perforated, lamellar, smooth on ventral side; multiple apertures as small, rounded openings, irregularly distributed along the radial sutures.

Remarks: Species rare in our material, typical for marginal areas, in calcareous, detrital facies. From age equivalent deposits from Hungary were described *Cymbalopora hungarica* Vadasz, *C. oblonga* Vadasz, *C. hungarica* var. *quadrata* Vadasz, *Cymbalopora vadaszi* Majzon and *C. tortonica* Franzenau & Majzon (v. Majzon, 1966, p. 831; Korecz-Laky, 1968, p. 112). All the above mentioned species are here considered as intraspecific variations of Karrer's species. The species *Hofkerina mediterranea* Colom (1964, fig. 6/1, 2) and *Hofkerina batalleri* Colom (1971, pl. 17, figs. 1-8) are also suspected as synonyms of Karrer's species.

Range: The holotype comes from Forchtenau (Austria). Rare specimens in Langhian deposits from Banat (Lăpugiu de Sus and Coștei), more frequent in Lower Langhian deposits (biostratigraphically belonging to the Lower Lagenid Zone, cf. Papp & Turnovsky, 1953) from NW Transilvania (at Popești, near Cluj-Napoca).

Fam. **Victoriellidae** CHAPMAN & CRESPIAN,
1930

Subfam. **Rupertininae** LOEBLICH &
TAPPAN, 1961

Biarritzina sp.

(Pl. 8, fig. 10)

Test attached; early chambers globular, trochospiral, then high trochospiral, with a tendency to become uniserial; sutures depressed; wall thick, with large, scattered pores; aperture terminal, circular or irregular, bordered by a high lip.

Remarks: Rare species in Early Serravallian deposits, in marginal facies, associated with planosteginas, gypsinas, borelis, colominellas, stylolinas, miliolids, and other foraminifera typical for the Wieliczka type assemblage. Our material is closely related to *B. proteiformis* (GOËS), as it was illustrated by Loeblich & Tappan (1987, pl. 655, figs. 1-5) or Hottinger et al. (1993, pl. 161).

Superfam. **Acervulinacea** SCHULTZE, 1854

Fam. **Acervulinidae** SCHULTZE, 1854

Genus *Discogypsina* SILVESTRI, 1937

Discogypsina sp.

(Pl. 9, figs. 1, 2)

Test large, flattened, slightly concave on both sides; distinct equatorial layer of chambers, but with irregular arrangement of successive chambers on both sides; sutures thickened, elevated; surface of the chambers coarsely perforated.

Differs from *Gypsina* by its equatorial layer of chambers and by the lack of the radial arrangement of the successive chambers.

Remarks. We have only one specimen, here illustrated, found in the Valea Gemini section. It was cut for seeing inner arrangement of the chambers. It seems to be a new species.

Genus *Gypsina* CARTER, 1877

Gypsina cf. *G. plana* (CARTER), 1877

(Pl. 9, figs. 3, 4)

Test large, attached, irregular, flattened, with flattened chambers, polygonal in apical view; wall calcareous, radial, hyaline, with elevated septae; aperture trematophore.

Remarks. Fragments of specimens of this genus are very frequent in the material collected from Lăpugiu de Sus (Valea Coșului section) and Coștei (Valea Gemini section). They were recognised only after the radial disposition of the chambers, typical for this genus.

Genus *Sphaerogypsina* GALLOWAY, 1933

Sphaerogypsina globulus (REUSS), 1848

(Pl. 9, figs. 5-9)

Ceripora globulus Reuss, 1848, p. 33, pl. 5, fig. 7.

Tinoporos fuchsi Karrer, 1877, p. 358, pl. 14b, fig. 59.

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Sphaerogypsina globula (Reuss). Vavra, 1978, p. 742, text-fig. 1 (nr. 1, 3, 4); Cimerman & Langer, 1991, p. 72, pl. 80, figs. 6-9;

Sphaerogypsina globulus (Reuss). Barker, 1960, pl. 101, fig. 42; Popescu, 1982b, p. 119, pl. 1, figs. 1-6; pl. 2, figs 1-6; pl. 3, figs 1, 2; Hottinger et al., 1993, p. 128, pl. 173, figs. 1-10; Rögl, 1998, p. 127, pl. 64, fig. 4.

Excentrogypsina fuchsi (Karrer). Popescu, 1975, p. 95, text-figs. 1, 2.

Remarks: Test reniform, almost sub-spherical: the aspect is given by the semi-sessile mode of life; the initial chamber in slightly eccentric position, surrounded by a series of chambers disposed around the embryonic apparatus, after which the chambers are radially arranged; wall perforated; multiple apertures, circular, at the base of the chamber; outer wall acts as a trematophore plate. It should be underlined that at the Upper Eocene specimens (assigned to *S. peruviana* BERRY, 1929, found in Valea Peșterii section, west of locality Hodiș, south of Mezeș Mountains, NW Transylvania; see Popescu, 1982b), have spherical shape, centered embryonic apparatus and smaller sizes.

Sphaerogypsina hemisphaerica POPESCU, 1982

Sphaerogypsina hemisphaerica Popescu, 1982b, p. 119, pl. 3, figs. 3-5)

Remarks: Test attached, hemisphaerical, recorded from Kossovian (Upper Badenian) deposits from Valea lui Ion section (Buitur, Hunedoara district) and Valea Morilor section (Colibași, Mehedinți district). This species is closely related to *Gypsina vesicularis* (PARKER & JONES) 1860 as it was figured by Loeblich & Tappan (1994, p.154, pl. 334, figs. 1-3)

Fam. **Homotrematidae** CUSHMAN, 1927

Genus *Homotrema* HICKSON, 1911

Homotrema sp.

(Pl. 9, figs. 10, 11)

Test large, attached, variable in shape, with one and, rarely, two or more conical projections; early chambers spiral, later ones in successive layers; wall calcareous, hyaline, radial; intercameral walls imperforate with septa elevated at the surface; the ceiling of the chambers perforated, acting as trematophore.

Remarks: Our specimens are closely related to *Homotrema rubra* (LAMARCK), 1816.

Occurrence. Rare in the Lower Badenian deposits from Lăpugiu de Sus (Hunedoara district).

Genus *Sporadotrema* HICKSON, 1911

Sporadotrema sp.

(Pl. 10, figs. 1, 4, 5)

Test attached, columnar in shape; early chambers subglobular, trochospirally arranged; later pear-shaped, in the column composed of stacks of chamberlet cycles growing upward; wall perforated by densely rounded pores seen from the chamber lumen; surface of the test decorated with polygonal network of raised, imperforate ridges, separating coarse rare pores but, usually, the surface of the test is covered by a thick calcareous laminae hiding the ornamentation; aperture, a rounded opening in the umbilical area.

The specimens assigned to this genus were recorded only from Lower Badenian deposits from Răchitova (Hațeg Basin, north of Densuș locality, Hunedoara district). Here we found only five fragments.

Superfam. **Asterigerinacea** d'ORBIGNY, 1839

Fam. **Asterigerinatidae** REISS, 1963

Genus *Biasterigerina* SEIGLIE & BERMUDEZ, 1965

Biasterigerina planorbis (d'ORBIGNY), 1846

(Pl. 10, figs. 2, 3)

Asterigerina planorbis d'Orbigny, 1846, p. 205, pl. 11, figs. 1-3.

Biasterigerina planorbis d'Orbigny. Loeblich & Tappan, 1987, p. 606, pl. 672, figs. 10-13.

Astrigerinata planorbis (d'Orb.). Rögl, 1998, p. 81, pl. 64, figs. 8-10.

Remarks: Species common in the Lower Badenian deposits in pelitic facies. Seiglie & Bermudez proposed *Asterigerina planorbis* d'Orbigny as type species of the genus *Biasterigerina*.

Fam. **Amphisteginidae** CUSHMAN, 1927

Genus *Amphistegina* d'ORBIGNY, 1826

Amphistegina mammilla (FICHTEL & MOLL), 1798

(Pl. 10, figs. 6, 7)

Nautilus mammilla Fichtel & Moll, 1798, p. 53, pl. 6, figs. a-d.

Amphistegina hauerina d'Orbigny, 1846, p. 207, pl. 12, figs. 3-5;

Amphistegina mammilla (Fichtel & Moll). Larsen, 1978, p. 224, pl. 1, figs. 8, 9; 11, 12; pl. 6, fig 3; pl. 7, fig. 4; Rögl & Hansen, 1984, p. 41, pl. 10, figs. 1-3; pl. 11, figs. 1, 2, text-fig. 13; Rögl, 1998, p. 80, pl. 64, figs. 17-19.

Remarks: In the marine Middle Miocene deposits from Romania, samples containing specimens belonging to the genus *Amphistegina* were recorded only from the Lower Badenian deposits, but never (excepting reworked specimens) from the Kossovian. Three morphotypes can be

distinguished: **type α** with lenticular test, short but distinct secondary lobes on the ventral side which form an umbonal rosette (*A. bohdanowiczi*); **type β** , with plan-convex test, generally larger than type α , with more chambers on the last whorl and elongated and more complex configuration of the secondary lobes on the ventral side; **type γ** , biumbonate, lenticular, nearly symmetrical in edge view, differing from type α by complicated ventral umbonal rosette and from type β by biumbonate shape and fewer chambers on the last whorl. Type β and type γ are illustrated here as *A. mammilla*.

In Vienna Basin d'Orbigny (1846) described *A. hauerina*, *A. mammilla* and *A. rugosa*. Papp & Schmid (1985) preserved the name *A. hauerina* in which include as synonym *A. mammilla*. *A. rugosa* represents actually a specimen of *A. hauerina* with corroded and broken outer wall. Rögl & Hansen (1984, p. 42) consider the types described in the Vienna Basin as junior synonyms of the species *Nautilus mammilla* FICHTEL & MOLL, 1798 (see also O'Here, 1974).

Range. In Romania occurs in Valea Coşului section (Lăpugiu de Sus), Valea Gemini section (Coştei), Caransebeş (Balta Sărată), Cariera Popeşti (near Cluj-Napoca), Valea Buha section, (Lopadea Veche, near Aiud), Curchia quarry, Bahna and Iloviţa (Bahna Basin, east Orşova).

Amphistegina bohdanowiczi BIEDA, 1936
(Pl. 10, figs. 8-10)

Amphistegina bohdanowiczi Bieda, 1936, p. 266, pl. 8, fig. 4 (fide Ellis & Messina); Rögl, 1998, p. 80, pl. 64, figs. 20-23.

Range: Lower Badenian. The best specimens were collected from Valea Gemini section (Coştei).

Superfam. **Nonionacea** SCHULTZE, 1854

Fam. **Nonionidae** SCHULTZE, 1854

Subfam. **Nonioninae** SCHULTZE, 1854

Genus *Nonion* de MONTFORT, 1808

Nonion commune (d'ORBIGNY),

(Pl. 10, figs. 11, 12)

Nonionina communis d'Orbigny, 1826, p. 128, no. 20 (fide Ellis & Messina); d'Orbigny, 1846, p. 106, pl. 5, figs. 7-8.

Nonion commune (d'Orbigny). Papp & Schmid, 1985, p. 45, pl. 34, figs. 1-5; Rögl, 1998, p. 113, pl. 66, figs. 1, 2.

Range: Common species in Miocene normal marine deposits from Transylvania and Subcarpathians.

Nonion bogdanowiczi VOLOSHINOVA, 1952
(pl. 11, figs. 1-3)

Nonion bogdanowiczi Voloshinova, 1952, p. 19, pl. 1, figs. 1, 2; Maissuradze, 1971, p. 65, pl. 10, figs. 1-13; Rögl, 1998, p. 113, pl. 66, fig. 6.

Range: Upper Volhynian-Basarabian. Frequent in South Dobrogea, Subcarpathians and Transylvania (in outcrops), and Romanian Plain (in boreholes) in Basarabian deposits.

Genus *Nonionella* CUSHMAN, 1926

Nonionella opima CUSHMAN, 1947

(Pl. 11, figs. 4-6)

Nonionella opima Cushman, 1947, (CCLFR – 23), p. 90, pl. 20, figs. 1-3; von Daniels (1970), p. 90, pl. 8, fig. 12.

Test trochospiral, somewhat compressed, oval in outline, dorsal side partially evolute, ventral side involute, asymmetrical in edge view, with umbilical side inflated (last chamber overhanging the umbilical area), 6-8 chambers on the last whorl; wall calcareous, granular; aperture interiomarginal, extending from the periphery to the umbilicus, with 3-5 high arches.

Remarks: This small species is related to *Rotalina turgida* WILLAMSON, 1858 (suspected senior synonym).

Range: Upper Langhian. Rare.

Subfam. **Astrononioninae** SAIDOVA, 1981
Genus *Astrononion* CUSHMAN & EDWARDS,
1937

Astrononion stelligerum (d'ORBIGNY), 1839
(Pl. 11, figs. 7, 8)

Nonionina stelligera d'Orbigny, 1839, p. 128 (fide Loeblich & Tappan, 1987, p. 619).

Astrononion italicum Marks (non Cushman & Edwards), 1951, p. 50, pl. 6, fig. 3.

Test free, plano-spirally enrolled, involute, 10-11 chambers on the last whorl; umbilical area slightly depressed; periphery rounded; chambers increasing gradually in size, each of them projecting backwards an umbilical flap; the secondary chambers covering the sutures leave behind slightly depressed, curved, elongated sutural cavities; wall calcareous, granular, finely perforated; aperture interiomarginal, equatorial, slit-like, at the base of the apertural face.

Remarks: The species is close to *Astrononion italicum* CUSHMAN & EDWARDS, 1937, p. 35, pl. 3, figs. 19, 20; Marks, 1951, p. 50, pl. 6, fig. 3 and *A. australe* CUSHMAN & EDWARDS, 1937. The closest species is *Nonionina perfossa* (CLODIUS), 1922 described from the Miocene from Mecklenburg, Germany.

Range: Upper Langhian.

Subfam. **Pulleninae** SCHWAGER, 1877

Genus *Pullenia* PARKER & JONES, 1862

Pullenia quinqueloba (REUSS), 1851

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(Pl. 11, figs. 9, 10)

Nonionina quinqueloba Reuss, 1851, p. 71, pl. 5, fig. 31

Pullenia quinqueloba (Reuss). Rogl, 1998, p. 121, pl. 66, figs. 10, 11.

Remarks. In the Romanian Carpathians the species was recorded from Lower and Middle Miocene.

Genus *Melonis* de MONTFORT, 1808
Melonis pompilioides (FICHTEL & MOLL),
1798

(Pl. 11, figs. 11, 12)

Nautilus pompilioides Fichtel & Moll, 1798, p. 31, pl. 2, figs. a-c.

Melonis pompilioides (Fichtel & Moll). Rogl, 1998, p. 111, pl. 66, figs. 14, 15.

Range: Eocene - Miocene. Common in the Lower and Middle Miocene from Carpathians area.

Superfam. **Chilostomellacea** BRADY, 1881

Fam. **Chilostomellidae** BRADY, 1881

Subfam. **Chilostomellinae** BRADY, 1881

Genus *Allomorphina* REUSS, 1849

Allomorphina trigona REUSS, 1850

(Pl. 11, figs. 13, 14)

Allomorphina trigona Reuss, 1850, p. 380, pl. 48, fig. 14.

Test trochospiral, subtriangular in shape, slightly flattened, peripheral margin rounded; three chambers on the last whorl; surface smooth; wall calcareous, granular, perforate; aperture an elongated slit at the base of the last chamber, bordered by a well developed hyaline lip.

Range: Rare in Langhian deposits. The holotype comes from Vienna Basin (Baden, Möllersdorf or Grinzig).

Genus *Chilostomella* REUSS, 1849

Chilostomella czizeki REUSS, 1850

(Pl. 11, fig. 15)

Chilostomella czizeki Reuss, 1850, p. 380, pl. 48, fig. 13.

Test ovoidal, elongated, planispiral, involute, two chambers visible, strongly embracing; surface smooth; wall calcareous, granular, finely perforate; aperture an elongated slit at the base of the last chamber, bordered by a thin lip.

Remarks: This species differs of *C. ovoidea* REUSS, 1850 in more elongated shape and parallel margins.

Range: Rare in Upper Langhian deposits from the Central Paratethys area.

Genus *Hidina* MIHAELA GHEORGHIAN, IVA,
MUSAT GHEORGHIAN, 1968

Hidina variabilae GHEORGHIAN, IVA,
GHEORGHIAN, 1968

(Pl. 12, figs. 1-4)

Hidina variabilae Gheorghian et al., 1968, p. 197, pl. 2, figs. 1-4, pl. 3, fig. 5 (nom. corr. by Loeblich & Tappan, 1987, p. 625 as *variabilis*);

Hidina transsylvaniaca Gheorghian et al., 1968, p. 197, pl. 3, figs. 1-4, 7;

Hidina bicamerata Gheorghian et al., 1968, p. 195, pl. 1, figs. 4-6. pl. 2, fig. 6;

Hidina sibiensis Musat Gheorghian, 1974, p. 28, pl. 3, figs. 1-12;

Remarks. Species with a large intraspecific variability. *Hidina klaszi* GHEORGHIAN, 1974, is similar with *H. variabilae*. *H. sibiensis* GHEORGHIAN, 1974 is closely related to *H. hidensis* POPESCU, 1975 (a junior synonym) and probably represent ontogenetic stages of *H. globata*.

Popescu (1975, p. 100, pl. 56, figs. 3, 4; pl. 57, figs. 1-3, pl. 93, fig. 4, the holotype and fig. 5) considers the species *H. variabilae* as a junior synonym of *Hidina globata* (GALLOWAY & HEMINWAY), described as *Chilostomella globata* GALLOWAY & HEMINWAY (1941, p. 409, pl. 28, fig. 2; see also Popescu, 1975, pl. 93, figs. 4 -holotype refigured- and 5). Between the two species there are closed relations.

Occurrence. The species seems to be restricted (in Paratethys) to the Lower Miocene (Burdigalian). Recorded in Romania from Transylvania and Subcarpathians from Chechiş Formation and, respectively, Cornu Formation.

Fam. **Quadriforminidae** SAIDOVA, 1981

Genus *Quadriformina* FINLAY, 1939

Quadriformina petrolei (ANDREAE), 1884
(pl. 12, fig. 6)

Pulvinulina petrolei Andreae, 1884, p. 217, pl. 8, fig. 15.

Quadriformina petrolei (Andreae). Rögl, 1998, p. 121, pl. 66, figs. 16-18.

Remarks. Some specimens, subtriangular in outline, were conferred here (see pl. 12, figs 5, 7) to the same species (*Q. cf. petrolei*).

Fam. **Anomalinidae** CUSHMAN, 1927

Genus *Anomalinoides* BROTZEN, 1942

Anomalinoides badenensis (d'ORBIGNY),
1846

(Pl. 12, figs. 8, 9)

Anomalina badenensis d'Orbigny, 1846, p. 171, pl. 10, figs. 1-3; Papp & Schmid, 1985, p. 65, pl. 57, figs. 4-8.

Anomalinoides badenensis (d'Orbigny). Rögl, 1998, p. 81, pl. 70, figs. 9-11.

Remarks. There are at least two taxa close to d'Orbigny's species: *Anomalina grosserugosa* (GÜMBEL), 1868 and *Anomalina globulosa* CHAMAN & PARR, 1937, possible synonyms.

Fam. **Heterolepidae** GONZÁLES-DONOSO, 1969Genus *Heterolepa* FRANZENAU, 1884*Heterolepa dutemplei* (d'ORBIGNY)

(Pl. 12, figs. 10-12)

Rotalina dutemplei d'Orbigny, 1846, p. 157, pl. 8, figs. 19-21.*Heterolepa dutemplei* (d'Orb.). Rogl, 1998, p. 107, pl. 71, figs. 1-3.**Range:** Common in Carpathian Area in the Lower and Middle Miocene, frequent in the Kossovian deposits.*Heterolepa praecincta* (KARRER), 1868

(Pl. 12, fig. 13)

Rotalina praecincta Karrer, 1868, p. 189, pl. 5, fig. 7.**Range:** Frequent species in Middle Badenian deposits from Transylvanian Depression, Subcarpathians and Getic depression.Genus *Hanzawaia* ASANO, 1944*Hanzawaia boueana* (d'ORBIGNY), 1846

(Pl. 12, figs. 14-16)

Truncatulina boueana d'Orbigny, 1846, p. 169, pl. 9, figs. 24-26.*Hanzawaia boueana* (d'Orb.). Rogl, 1998, p. 106, pl. 72, figs. 9-11; Loeblich & Tappan, 1994, p. 164, pl. 364, figs. 1-8.**Range** (in Paratethys): Marine Miocene.*Hanzawaia crassiseptata* (LUCZKOWSKA), 1955

(Pl. 12, figs. 17-19)

Cibicides boueanus var. *crassus* Luczkowska, 1955, p. 153, pl. 10, figs. 3a-c.*Cibicides crassiseptatus* nom. nov. Luczkowska, 1960, p. 320, pl. 29, figs. 1, 2.*Hanzawaia crassa* (Luczkowska). Popescu, 1979, p. 29, figs. 5a-c.*Hanzawaia crassiseptata* (Luczkowska). Rogl, 1998, p. 106, pl. 72, figs. 12, 13.Genus *Riminopsis* REVETS, 1996*Riminopsis boueanus* (d'ORBIGNY), 1846

(Pl. 13, figs. 1-3)

Nonionina Boueana d'Orbigny, 1846, p. 108, pl. 5, figs. 11, 12.*Hanzawaia boueana* (d'Orbigny). Papp & Schmid, 1985, p. 45, pl. 35, figs. 1-5.*Riminopsis boueanus* (d'Orbigny). Rögl, 1998, p. 124, pl. 70, figs. 1-3.**Remarks.** A very close species is *Anomalina colligera* CHAPMAN & PARR, 1937 (see *Anomalinoidea colligerus* (Chapman & Parr) in Jones, 1994, p. 98, pl. 94, figs. 2, 3). Another suspected synonym is *Rotalina cryptomphala* REUSS (1850, p. 371, pl. 47, figs. 2a-c) described from "Salzthone von Wieliczka".Fam. **Alabaminidae** HOFKER, 1951Genus *Alabamina* TOULMIN, 1941*Alabamina armellae* POPESCU, 1998

(Pl. 13, figs. 4, 5)

Alabamina armellae Popescu, 1998 (in Cicha et al., eds.), p. 76, pl. 68, fig. 3.**Remarks:** The species was described by Poignant (1984b, p. 423, pl. 1, figs. 1-3) as *Alabamina wolterstorffi* (non Franke, 1925, p. 186, pl. 6, fig. 66) from Soos, Austria from Langhian (Badenian) deposits.**Occurrence.** Rare species in the deposits from Valea Coşului section, Lăpuşiu de Sus.Genus *Svratkina* POKORNY, 1956*Svratkina perlata* (ANDREAE), 1884

(Pl. 13, figs. 6, 7)

Pulvinulina perlata Andreae, 1884, p. 216, pl. 8, fig. 12.*Svratkina perlata* (Andreae). Rogl, 1998, p. 130, pl. 68, figs. 8-10. Poignant, 1982, p. 21, text-figs. 1-7.**Remarks:** Very rare species; it occurs only in Valea Gemini section (Coştei, Timiş district) and Valea Coşului section (Lăpuşiu de Sus, Hunedoara district) in the Lower and Middle Badenian deposits.*Svratkina cichai* POPESCU, 1998

(Pl. 13, figs. 8-12)

Svratkina cichai Popescu, 1998 (in Cicha et al.), p. 76, pl. 68, figs. 11-14.**Remarks:** Poignant (1982, 1984b) made some valuable observations concerning the morphology and inner structure of the genera *Alabamina* and *Svratkina*. The author evidenced the elements shared by the two genera. Another related genus is *Asanonella* HUANG, 1965 (fide Loeblich & Tappan, 1987) which should be placed in the same family. As for the species *S. cichai*, it shows some characters similar to the genus *Alabamina* (e.g. continuous clava), but also to the genus *Asanonella* (perforations on the dorsal side).Fam. **Oridorsalidae** LOEBLICH & TAPPAN, 1984Genus *Oridorsalis* ANDERSEN, 1961*Oridorsalis nanum* (REUSS), 1850

(Pl. 14, figs. 1-3)

Rotalina nana Reuss, 1850, p. 371, pl. 46, fig. 23.*Oridorsalis umbonatus* (Reuss). Jones, 1994, p. 99, pl. 96, figs. 11a-c; Rogl, 1998, p. 114, pl. 69, figs. 8-10.**Test** small, biconvex, lenticular, trochospiral; periphery lobulated; 6-7 chambers in the last whorl; wall calcareous, granular, finely perforate; aperture interiomarginal; small secondary sutural openings on dorsal side near junction of spire with septal sutures and other sutural openings on ventral side at midpoint of radial sutures.

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Remarks: This species is closely related to *O. almasaensis* POPESCU (1975, p. 102), but differs in more chambers on the last whorl. Differs of *O. westi* ANDERSEN (1961, p. 107, pl. 22, figs. 3a-c) by the straight radial sutures and developed umbonal plug.

When the genus *Oridorsalis* was described, Andersen (1961, p. 107) noticed: "Gender: neuter."

Range: Upper Langhian, Coștei (Valea Gemini section) and Lăpușiu de Sus (Valea Coșului section).

Fam. **Gavelinellidae** HOFKER, 1956

Subfam. **Gavelinellinae** Hofker, 1956

Genus *Hansenisca* LOEBLICH & TAPPAN, 1987

Hansenisca soldanii (d'ORBIGNY), 1826
(Pl. 14, figs. 4-6)

Gyroidina soldanii d'Orbigny, 1926, p. 112, Nr. 5 (fide Ellis & Messina);

Hansenisca soldanii (d'Orbigny): Loeblich & Tappan, 1987, p. 639, pl. 719, figs. 5-9, 1994, p. 164, pl. 362, figs. 8-10; Revets, 1996a, p. 75, pl. 9, figs. 1-4.

Range: Lower and marine Middle Miocene (in Paratethys). Common in Kossovian deposits from Transylvania and Subcarpathians.

Superfam. **Rotaliacea** EHRENBERG, 1839

Fam. **Rotaliidae** EHRENBERG, 1839

Subfam. **Pararotaliinae** REISS, 1963

Genus *Pararotalia* LE CALVEZ, 1949

Pararotalia aculeata (d'ORBIGNY), 1846
(Pl. 14, figs. 7-9)

Rotalina aculeata d'Orbigny, 1846, p. 159, pl. 8, figs. 25-27.

Rotalia aculeata (d'Orb.). Papp & Schmid, 1985, p. 61, pl. 53, figs. 1-6.

Remarks: Species common in marginal calcareous facies of the Upper Langhian (Upper Moravian) from the Paratethys area. The type was described from Vienna Basin.

Pararotalia spinimargo (REUSS), 1850
(Pl. 14, figs. 10-13)

Rotalina spinimargo Reuss, 1850, p. 371, pl. 47, fig. 1a, b.

Remarks: The species is characterized, besides the aperture typical for the genus, by keeled, acuminate, stellate periphery, each chamber finished with well individualized spines. Chambers arrangement trochospiral, 6 – 6 ½ on the last whorl; dorsal side flattened, with surface covered by small spines, ventral side convex, with depressed umbilicus, with a calus in the center; wall calcareous, finely perforated; aperture interior marginal, bordered by a distinct lip extended slit-like on the apertural face. Typical for the Upper Langhian

in calcareous marginal facies. Similar specimens, but with a bigger number of chambers on the last whorl (7 – 8) and with better developed spines, with a hardly noticeable or no keel are suspected to represent the microspheric form.

Occurrence: Rare species. The type of the species was described from Lăpușiu de Sus; our specimens come from the same locality, from Valea Coșului section, and thus they represent topotypes.

Fam. **Elphidiidae** GALLOWAY, 1933

Subfam. **Elphidiinae** GALLOWAY, 1933

Genus *Elphidium* de MONTFORT, 1808

Elphidium hauerinum (d'ORBIGNY), 1846
(Pl. 15, figs. 1-9; pl. 16, fig. 8)

Polystomella hauerina d'Orbigny, 1846, p. 122, pl. 6, figs. 1, 2.

Polystomella antonina d'Orbigny, 1846, p. 128, pl. 6, figs. 17, 18.

Polystomella listeri d'Orbigny, 1846, p. 128, pl. 6, figs. 19-22.

Test free, planispiral, involute, with slightly rounded to acute periphery, 8-11 chambers on the last whorl; sutures deep, distinct, crossed by retral processes (tubes opened to the exterior as circular apertures); wall calcareous, granular, with fine pores unevenly distributed on the surface of the test; aperture multiple, as circular openings at the base of the septal face and large circular openings belonging to the previous chamber, formed by subsequent resorption.

Remarks: Papp & Schmid, 1985 consider the species *Polystomella listeri* and *P. antonina* synonyms to *P. haueriana*. For Cushman (1939), the species *P. antonina* and *P. listeri* are synonyms: the species *P. hauerina* is considered as valid. Similar specimens are mentioned by Cahuzac & Poignant (2000) as *E. excavatum* s.l. from the Langhian deposits of the Aquitaine Basin, SW France.

Range: Rare in the Langhian deposits from the eastern border of the Pannonian Depression.

Elphidium fichtelianum (d'ORBIGNY), 1846
(Pl. 15, figs. 10, 11)

Polystomella fichtelliana d'Orbigny, 1846, p. 125, pl. 6, figs. 7, 8.

Elphidium fichtellianum (d'Orbigny). Cushman, 1939, p. 42, pl. 11, fig. 12;

Elphidium fichtelianum d'Orbigny. Rogl, 1998, p. 95, pl. 76, figs. 14, 15.

Test involute, flattened, with both sides flat, 13-18 chambers on the last whorl; umbilical area flat, sometimes slightly depressed; periphery acute, keeled; sutures distinct, curved, slightly elevated; retral processes

distinct; surface pustulate and reticulate; aperture a few circular openings at the base of the apertural face.

Remarks: A close species is *Elphidium crespinae* CUSHMAN (1936, p. 78, pl. 14, fig. 1) described from Oligocene deposits from Australia.

Range: Rare species in the Langhian, present also in the Kossovian deposits.

Elphidium reussi MARKS, 1951

(Pl. 15, fig. 13)

Elphidium flexuosum (d'Orbigny) var. *reussi* Marks, 1951, p. 52, pl. 6, fig. 7.

Test free, involute, 11-12 chambers on the last, whorl; sutures depressed; equatorial margin acuminate, keeled, slightly lobulate; aperture multiple, circular openings at the base of the apertural face.

Remarks: Species rare in the Upper Langhian deposits; in Kossovian deposits there is a similar species – *E. notabilis* PISHVANOVA, 1958. The last species differs from *E. reussi* by lacking the nodes in the umbilical area, and by the presence of numerous openings on the apertural face. Cushman (1939) described a similar species as *E. ungeri* (REUSS), 1850, which comes from the Miocen from Austria, probably a senior synonym. Other possible synonym is *Cribrononin pseudoelphidiformis* GHEORGHIAN, IVA, GHEORGHIAN, 1968 (p. 483, pl. 1, figs. 7-9, pl. 2, figs. 10-12).

Range: Upper Langhian.

Elphidium notabilis PISHVANOVA, 1958

(Pl. 15, fig. 12; pl. 16, figs. 1-3)

Elphidium notabilis Pishvanova, 1958, p. 263, pl. 1, fig. 6; Pishvanova, 1972, p. 255, pl. 19, fig. 8.

Range: Upper Badenian. Rare in Valea lui Ion section, Buitur, Hunedoara district.

Elphidium rugosum (d'ORBIGNY), 1846

(Pl. 16, figs. 4-6)

Polystomella rugosa d'Orbigny, 1846, p. 123, pl. 6, figs. 3, 4.

Elphidium rugosum (d'Orbigny). Cushman, 1939, p. 42, pl. 11, figs 10, 11; Papp & Schmid, 1985, p. 49, pl. 39, figs. 1-4; Rogl, 1998, p.96, pl. 76, figs. 16, 17.

This species is closely related to *Elphidium flexuosum* (d'ORBIGNY), 1846, differing in the number of chambers on the last whorl: 18-20 to *E. flexuosum* and 15-16 to *E. rugosum*.

Range: Badenian.

Elphidium flexuosum (d'ORBIGNY), 1846

(Pl. 16, fig. 7)

Polystomella flexuosa d'Orbigny, 1846, p. 127, pl. 6, figs. 15, 16.

Range: Badenian, more frequent in the Upper Badenian.

Superfam. **Nummulitacea** de BLAINVILLE, 1827

Fam. **Nummulitidae** de BLAINVILLE, 1827

Genus *Planostegina* BANNER & HODGKINSON, 1991

Planostegina costata (d'ORBIGNY), 1846
(Pl. 16, figs. 9-12)

Heterostegina costata d'Orbigny, 1846, p. 212, pl. 12, figs. 15, 17 (non fig. 16); Papp & Schmid, 1985, p. 76, figs. 1-9;

Heterostegina costata costata d'Orbigny. Papp & Küpper, 1954, text-fig. 3/8-10;

Planostegina costata (d'Orbigny). Rogl, 1998, p. 117, pl. 78, figs. 7-9.

Remarks: In the Lower and Middle Badenian deposits from Coștei were recorded samples very rich in *Planostegina ex gr. costata*. Some remarks on the Badenian planosteginas from Romania were made by Papp & Küpper (1954) who studied a very rich material from Coștei and Lăpugiu. Based on the test ornamentation, they made some statistical observations. In their opinion, the percentual ratio between the ornamented and unornamented specimens (the smaller the ratio the younger the deposits) could offer indices on the stratigraphic position: the two authors reached the conclusion that the populations from Coștei are younger than those at Lăpugiu de Sus, considering the higher number of ornamented specimens at Lăpugiu. The populations from Coștei are biostratigraphically situated, by the mentioned authors, at the upper part of the Upper Lagenide Zone or even at the base of the Agglutinated Foraminifera Zone (therefore the base of Wielician), and the populations from Lăpugiu de Sus are situated in the lower part of the Upper Lagenide Zone. One of the very rich samples in large (15-25mm) heterosteginas (sample 124 BT, pers. col.) collected from Valea Gemini section (Coștei) had given the following statistical results: of 832 specimens, 117 are ornamented or weakly ornamented, and 715 have the test surface smooth. The ratio between the smooth specimens and the ornamented ones is 17/3, closely enough of the ratio obtained by Papp & Küpper (79-83% smooth specimens), the reversed ratio of that obtained for the stratigraphic interval corresponding to the Lower Lagenide Zone (at Călan, on the left side of the Strei River, at Lăpugiu de Sus, on the Viilor Valley or in the Popești Quarry, north of Cluj), where the ratio between the smooth specimens and the ornamented ones is 1/31. The assignment of the populations of planosteginas to the same species is

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motivated by by the continous passage from ornamented specimens to unornamented specimens. Without considering the relationships between them, two morphotypes can be distinguished: *laevitesta* form (*Planostegina costata laevitesta*, proposed by Papp & Kúpper, 1954), and *costata* form (*P. costata costata* (d'ORBIGNY), 1846). Micro- and megalospheric specimens were recorded, the number of the megalospheric specimens being clearly superior to the microspheric ones (ratio micro/mega is 1/50).

Range: In the Miocene deposits from Romania they were recorded only in the lower part of the marine Middle Miocene (Lower and Middle Badenian, never in the Upper

Badenian). Other important fossiliferous sites are in the northwest and west of the Transylvanian Depression (Popești Quarry and, respectively Gârbova de Sus, Lopadea Veche and Pietreni). At Gârbova and Pietroasa, within the Badenian limestones hardend levels of planosteginas lounmachelles were recorded. We also mention Valea Gemini (Coștei), where levels with detachable heterosteginas can be found, and Delinești, localities situated on the eastern border of the Pannonian Depression, west of Caransebeș.

REFERENCES

- Andersen, H.V., 1961. Genesis and paleontology of the Mississippi River mudlumps, Part II. Foraminifera of the mudlumps, lower Mississippi River delta. *Louisiana Department of Conservation, Geological Bulletin* **35**, 1-208, Louisiana.
- Barker, R.W., 1960. Taxonomic notes on the Species Figured by H.B. Brady in his Report on the Foraminifera Dredged by H.M.S. Challenger During the Years 1873 - 1876 (Accompanied by a Reproduction of Brady's Plates). *Soc. Economic Paleontologists and Mineralogists, Sp. Publ.* **9**, vii - xxiv, 2 - 238, Tulsa, Oklahoma.
- Batjes J.A., 1958. Foraminifera of the Oligocene of Belgium. *Konin Belge Inst. Nat. Verh.* **143**, 188 p., 13 pl., Brussel.
- Bieda, F., 1936. Miocen Brzozowej i Gromnika i jego fauna otwornicowa. *Polskiego Towarzystwa Geologicznego, Rocznik* **12**. Krakow.
- Bobylev, V. V., Pishvanova, L. S., 1979. Predtarkhanskiy pereryv v Azovo - Chernomorskom regione i vremya zalozheniya Chernomorskoy vpadiny (Pre-Tarkhan interval in the Azov-Black Sea region and the initial stage of the Black Sea depression). *Okeanologiya* **19-2**, 293-296, Moskwa.
- Brady, H. B., 1884. Report on the Foraminifera dredged by HMS Challenger, during the years 1873-1876 (in: *Report on the Scientific Results of the Voyage of the HMS Challenger, during the years 1873-1876, Zoology*, **9**, 814 p., 115 pl., London
- Brotzen, F., 1948. The Swedish Paleocene and its foraminiferal fauna. *Arsbok Sver.Geol. Unders.*, **42/2**, 1-140.
- Cahuzac, B., Poignant, A., 2000. Les foraminifères benthiques du Langhien du Bassin d'Aquitaine (SW de la France); données paléocéologiques et biogéographiques. *GEOBIOS*, **33**, 3: 271-300. Villeurbanne.
- Carter, D. J., 1958. Tertiary Foraminifera from the Aire district Victoria. *Geological Survey of Victoria, Bulletin.* **55**, 76 p., 10 pl., Melbourne.
- Carter, D. J., 1964. Tertiary foraminifera from Gypsland, Victoria and their stratigraphical significance. *Geological Survey Victoria, Memoires* **23**, 154 p., 17 pl., Melbourne.
- Cimerman, F., Langer, M. R., 1991. Mediterranean Foraminifera. *Ac. Scien. Art. Slovenica, Cl.IV, Hist. Nat.*, **30**, 119 p., 93 pl., Ljubljana.
- Clodius, G., 1922. Die Foraminiferen des obermiozanen Glimmertons in Norddeutschland mit besonderer Beruchsichtigung der Aufschlusse in Meklenberg. *Arh. d.Ver. d.Freunde d. Naturges.i. Meklenburg* **75**, 76-145.
- Colom, D. G., 1964. Estudios sobre la sedimentaton costiera Balear (Mallorca y Menorca). *Real Academia Ciencias y Artes de Barcelona, Memoires* **34/15**, 495-550, 24 text-fig., Barcelona.
- Colom D.G., 1971. Agglutinated Foraminifera from the Paleogene of North Sea, *Paleoecology, Biostratigraphy, Paleocenanography and Taxonomy of Agglutinated Foraminifera*, 139-244, Netherlands.
- Cushman, J. A., 1915. A monograph of the Foraminifera of the North Pacific Ocean. *U.S. Natural Museum, Smithsonian Institute, Bulletin* **71**, part 5 Rotaliidae, pp.. 1-87, pls. 1-31, text-fig. 1-62.
- Cushman, J. A., 1937. A monograph of the Subfamily Virgulininae of the foraminiferal Family Buliminidae. *Cushman Laboratory Foraminiferal Research, Special Publication* **9**, 228 p., 24 pls., Sharon, Mass.
- Cushman, J. A., 1939. A monograph of the Foraminiferal Family Nonionidae. *U. S. Geological Survey, Profesional Papers* **191**, 1-100, 20 pls., Washington.
- Cushman, J. A., 1942. The Foraminifera from the tropical Pacific collections of the "Albatros", 1899-1900. Part 3, Heterohelicidae and Buliminidae. Smithsonian Institution, *U.S. Natural Museum Bulletin* **161**, 67 p., 15 pls., Washington.
- Cushman, J. A., Edwards, P. G., 1937. *Astrononion*, a new genus of the foraminifera, and its species. *Cushman Laboratory Foraminiferal Research Contributions* **13/1**, 29-36.
- Czjzek, J., 1847. Beitrag zur Kenntniss der fossilen Foraminiferen des Wiener Beckens.

- Naturwissenschaft Abhandlungen* 2/1, 137-150, Wien.
- Daniels, C. H., von, 1970. Quantitative ökologische Analyse der zeitlichen und räumlichen Verteilung rezenter Foraminifera in Limski-Kanal bei Rovini (nördliche Adria). *Göttinger Arbeiten Geologie Paläontologie* 8, 106 p., 62 text-fig., 7 tab., 8 pl., Göttingen.
- Ellis, B. F. & Messina, A., 1940 et seq. Catalogue of Foraminifera. *American Museum of Natural History*, New York.
- Dumitrica P., Gheta. N., Popescu, Gh., 1975. New data of the biostratigraphy and correlation of the Middle Miocene in the Carpathian area. *Dări de Seamă ale Institutului de Geologie și Geofizică* 61/4, 65-84, București.
- Fichtel, L., Moll, J. P. C. v., 1798. Testacea microscopica aliaque minuta ex generibus Argonauta et Nautilus ad naturam delineata et descripta. XIII + 123 p., 24 pls., Wien.
- Franzenau, A., 1884. Heterolepa, egy új genus a foraminiferak rendjeben (Heterolepa, eine neue Gattung aus der Ordnung der Foraminiferen). *Termeszetráji Füzetek* 8/3, 181-184; 214-217, Budapest.
- Galloway, J. J., Heminway, C. E., 1941. The Tertiary foraminifera of Porto Rico. *New York Academy of Science, Scientific Survey of Porto Rico and the Virgin Islands* 3/4, 275-491, New York.
- Gheorghian, M., Iva, M., Gheorghian, M., 1968. Transylvanina and Hidina, foraminiferes nouveaux dans le Miocene de Transylvanie (Roumanie). *Revue de Micropaleontologie* 10/3, 193-199, Paris.
- Gheorghian, M., 1974. Consideratii asupra genului Hidina (Ordinul Foraminiferida Eichwald, 1830). *Dări de seama ale ședintelor* 60 (1972-1973), 3. Paleontologie, 23-31, București.
- Graham, J.J., Militante, P.J., 1959. Recent foraminifera from the Puerto-Galera area northern Mindoro, Philippines. *Stainforth Univ. Publ., Geol. sc.* 6/2, 132 p., 19 pls., Stainforth.
- Hodgkinson, R. L., 1992. W. K. Parker's collection of foraminifera in the British Museum (Natural History). *Bulletin British Museum of Natural History (Geology)* 48/2, 45-78, London.
- Hofker J., 1956. Tertiary foraminifera of costal Ecuador. Part 2, Addition notes on the Eocene Species. *Journal of Paleontology* 30/4, 891-958.
- Hornibrook, N. de B., 1961. Tertiary Foraminifera from Oamaru District (N. Z.), part I - Systematics and Distribution. *N. Z. Geological Survey, Paleontological Bulletin* 34/1, 192 p., 28 pl., Wellington.
- Hottinger, L., Reiss, Z., Halicz, E., 1990. Comments on *Neoeponides* (Foraminifera). *Revue de Paleontologie*, 9/2, 335-340, Geneve.
- Hottinger, I., Hacliz, E., Reiss, Z., 1993. Recent Foraminiferida from the Gulf of Aqaba, Red Sea. *Akademia Scientiarum et Artium Slovenica (SAZU), Classis IV: Historia Naturalis, opera* 33, VI+179 pp., 230 pls, Ljubljana.
- Jones, R.W., 1994. The Challenger Foraminifera. The Natural History Museum, Oxford University Press, 149 p., London.
- Karrer, F., 1864. Über das Auftreten der Foraminiferen in den Mergeln der marinen Uferbildungen (Leithakalk) des Wiener Beckens. *Sitzungsber. d. k. Akad. d. Wiss. math.-naturw. Kl.* 50/1, 692-721, pl. 1, 2, Wien.
- Karrer, F., 1867. Zur Foraminiferenfauna in Osterreich. III. Neue Foraminiferen aus der Familie der Miliolideen aus den Neogenen Ablagerungen von Holubica, Lapugy und Buitur. *Ibid.*, 55, 357-368, Wien.
- Karrer, F., 1868. Die Miocene Foraminiferenfauna von Kostež im Banat. *Sitz. d. K. Ak. d. Wiss. Wien, Math.-Naturw. Kl.* 58/1, 121-193, Wien.
- Korecz-Laky, I., 1968. A keleti-Mecsek miocén Foraminiferái (Miozäne Foraminiferen des östlichen Mecsek-Gebirges). *Földt. Int. Evk.* 52/1, 1-200, Budapest.
- Kováč, M., Andreyeva-Grigorovich, A., Bajraktarević, Z., Brzobohaty, R., Filipescu, S., Fodor, L., Harzhauser, M., Nagymarosy, A., Oszczypko, N., Pavelić, D., Rößl, F., Saftić, B., Sliva, U., Studencka, B., 2007. Badenian evolution of the Central Paratethys Sea: paleogeography, climate and eustatic sea-level changes. *Geologica Carpathica* 58/6, 579-606, Bratislava.
- Krashennikov, V. A., 1959. Charakteristika fauny foraminifery srednego miotzena (in Zhizhtschenko, B. P., Ed., Atlas srednemiotzenovoy fauny severnogo Kavkaza i Kryma). *Tr. VNIGAZ*, 15-103, 14 pl., Moskva.
- Larsen, A.R., 1978. Phylogenetic and paleobiogeographical trends in the foraminiferal genus *Amphistegina*. *Revista Espanola de Micropaleontologia* 10, 217-243, 7 pls., Madrid.
- Loeblich, R. A. & Tappan, H., 1988. Foraminiferal genera and their classification. Van Nostrand Reinhold Co., 970 p., New York.
- Loeblich, R. A. & Tappan, H., 1994. Foraminifera of the Sahul Shelf and Timor Sea. Cushman Foundation for Foraminiferal Research, Sp. Publ. 31, 661pp., 393 pls., 5 text figs.
- Luczkowska, E., 1955. O tortonskich otvornicach z warstw chodenickich i grabowieckich okolic Bochni. *Annales de la Societe Geologique de Pologne* 23 (1953), 77-156, pl. 4-10, Krakow.
- Majzon, L., 1966. Foraminifera vizsgálatok. Akad. Kiadó Budapest. 939 p., Budapest.
- Marks, P., 1951. A revision of the Smaller Foraminifera from the Miocene of the Vienna Basin. *Cushman Foundation for Foraminiferal Research, Contributions* 2/2, 33-73, pls.5-8, Bridgewater, Mass.
- Morkhoven, F. P. C. M. van, Breggren, W. A., Edwards, A. S., 1986. Cenozoic cosmopolitan deep-water benthic Foraminifera. *Bulletin C. R. E.-P. Elf-Aquitaine, Mem.* 11, 421 p., 126 pl., Pau.
- Napoli Alliata, E. di, 1952. Nuove specie di foraminiferi nel Pliocene e nel Pleistocene di Castel- l'Arcuato (Piacenza). *Rivista Italiana di Paleontologia e Stratigrafia* 58, 95-109.
- O'Here, L., 1974. A reconsideration of *Amphistegina lessoni* d'Orbigny, 1826, sensu Brady, 1884 (Foraminifera). *Scripta Geologica* 26, 1-53.

CONTRIBUTIONS TO THE KNOWLEDGE OF THE ROTALIIFORM FORAMINIFERA FROM THE MARINE MIDDLE MIOCENE DEPOSITS FROM ROMANIA

- Orbigny, A. d', 1846. Foraminifères fossiles du Bassin Tertiaire de Vienne (Autriche). i-xxxvi, 312 p., Gide & Co., Paris.
- Papp, A., 1963. Die biostratigraphische Gliederung des Neogens in Wiener Becken. *Mitteilungen Geologisches Gesellschaft Wien* **56**, 225-317, Vienna.
- Papp, A. Küpper, K., 1954. The genus *Heterostegina* in the Upper Tertiary of Europe. *Cushman Foundation for Foraminiferal Research, Contributions* **5/3**, 108-127, pl. 21-23, Bridgewater, Mass.
- Papp, A., Cicha, I., Senes, J., Eds., 1978. Chronostratigraphy und Neostatotypen. Miozan der Zentralen Paratethys, Bd. VI. M 4 Badenien. VEDA Verlag der Slov. Ak. der Wiss., 594 pg., Bratislava.
- Papp, A., Schmid, M.E., 1985. Die fossilen Foraminiferen des tertiären Beckens von Wien. Revision der Monographie von Alcide d'Orbigny (1846). *Abhandlungen der Geologisches Bundesanstalt* **37**, 311 p., 102 pls., 16 text-fig., Wien.
- Papp, A., Turnovski, K., 1953. Die Entwicklung der Uvigerinen im Vindobon (Helvet und Torton) des Wiener Beckens. *Jahrbuch der Geologie B.-A.* **91/1**, 117-142, Wien.
- Pishvanova, L. S., 1958. Novye dannye o mikrofaune verhneteronskikh i nizhnesarmatskikh otlozhenii Predkarpata. *Paleont. sb., Tr. VNIGRI vp. 9*, Moskwa.
- Pishvanova, L. S., 1968. On the zonation of the Miocene by means of planktonic foraminifera. *Giornale di Geologia, serie 2*, **35/3**, 233-244, Bologna.
- Pishvanova, L. S., 1972. Foraminifery verhneoligotzenovykh i miotzenovykh otlozhenii zapadnykh oblastei. *Ukr.SSR, Tr. Ukr.NIGRI* **27**, 205-283, 24 pls., Moskwa.
- Pishvanova, L. S., 1978. Vid *Globigerina tarchanensis* Subbotina et Chutzieva i ego znachenie dlya correlatsii srednemiotsenovykh otlozhenii yuga SSSR i sredizemnomorya (in: Stratigrafiya i paleontologiya mezokainozoiskikh otlozhenii yuga SSSR i Sredizemnomorya. *Sb. Nau. rabot, Vyp. 3*, 88 - 94, Moskwa.
- Poignant, A., 1983. Les genres peu frequents de foraminifères: exemple pris dans les "Faluns Bleus" Oligocenes du sud-ouest de l'Aquitaine. *C.R. 108 e Cong.Nat. des Soc.Savantes, Grenoble, Sect. des Sciences*, fasc. I, Sc. de la Terre, tom II, 19-31, Paris.
- Poignant, A., 1984a. Les representants des genres *Glabratella* et *Glabratellina* (Foraminiferida) dans l'Oligocene et le Miocene d'Aquitaine. 109-e Congr. nat. Soc. savantes, Dijon, Science, fasc. 1, 405-415, 3 pl., Dijon.
- Poignant, A., 1984b. Comparaisons entre les genres *Alabama* Toulmin, 1941 et *Svratkina* Pokorny, 1956 (Foraminiferida). Etude de leur structure interne. *Ibid.*, 417-425, 2 pl., Dijon.
- Popescu, Gh., 1975. Etudes des foraminiferes du Miocene inferieur et moyen du nord-ouest de la Transylvanie. *Institutul de Geologie și Geofizică, Memorii* **23**, 121 p., București.
- Popescu, Gh., 1979. Kossovian foraminifera in Romania. *Institute of Geology and Geophysics, Memoires* **29**, 5-64, 42 pl., București.
- Popescu, Gh., 1982a. Note on *Globigerina regularis* d'Orbigny. *Dări de Seamă ale Institutul de Geologie și Geofizică* **66** (1979), 23-26, București.
- Popescu, Gh., 1982b. Note on the foraminifer *Sphaerogypsina* Galloway. *Dări de Seamă ale Institutul de Geologie și Geofizică* **67**, 115-121, București.
- Popescu, Gh., 2000. Lower and Middle Miocene agglutinated foraminifera from the Carpathian area. *Acta Palaeontologica Romaniae*, **2**, 407-426, Cluj Napoca.
- Popescu, Gh., Crihan, I.M., 2002. Contributions to the knowledge of the marine Middle Miocene Miliolida from Romania. *Acta Paleontologica Romaniae*, **3**, 371-397, Iasi.
- Popescu, Gh., Crihan, I. M. 2004a. Contributions to the knowledge of the Miocene foraminifera from Romania: superfamily Nodosariacea (fam. Nodosariidae and Vaginulinidae). *Acta Palaeontologica Romaniae*, **4**, 385-402, Cluj Napoca.
- Popescu, Gh., Crihan, I. M. 2004b. Contributions to the knowledge of the calcareous unicameral foraminifera from the Middle Miocene of Romania. *Acta Palaeontologica Romaniae*, **4**, 403-421, Cluj Napoca.
- Popescu Gh., Crihan I.M., 2005a. Middle Miocene Foraminifera from Romania: Order Buliminida, part I *Acta Palaeontologica Romaniae* Vol. **5**, 379-396, București.
- Popescu Gh., Crihan I.M., 2005b. Middle Miocene Foraminifera from Romania: Order Buliminida, part II *Acta Palaeontologica Romaniae* Vol. **5**, 397-412, București.
- Popescu, Gh., Cicha, I., Rögl, F., 1998. Systematical notes (in: Cicha, I., Rögl, F., Rupp, Ch., Ctyroka Jirina, Ed. Oligocene - Miocene foraminifera of the Central Paratethys.) *Abhandlungen Senckenberg Naturforschung Gesellschaft*, **549**, 69-78, Frankfurt a. M.
- Rahaghi, A., 1977. Sur le genre *Cuvillierella* n. gen. et quelques nouvelles especes des faluns de Saubrigues (Landes, France). *Revue de Micropaleontologie* (1976) **19**, 166-171, Paris.
- Reiss, Z., 1960. Structure of so-called *Eponides* and some other rotaliiform foraminifera. *Geological Survey of Israel, Bulletin* **35**, 111 p.
- Resig, M. J., 1962. The morphological development of *Eponides repandus* (Fichtel & Moll), 1798. *Cushman Foundation Foraminiferal Research, Contributions* **13/2**, 55-57, pl. 14, Bridgewater, Ma.
- Reuss, A. E., 1850. Neues Foraminiferen aus den Schichten des osterreichischen Tertiärbeckens. *Denk.d. K. Ak. d. Wiss., Math.-Naturw. Cl. 1*, 365-390, Wien.
- Reuss, A. E., 1851. Über die fossilen Foraminiferen und Entomostraceen der Septarienthonen der Umgegend von Berlin. *Z. dtsh. geol. Ges.* **3**, 49-91, Berlin
- Reuss, A.E., 1867. Die fossile Fauna der Steinsalzablagerung von Wieliczka in Galizien. Sitzungsberichte der Kaiserlichen Akademie der

- Wissenschaften in Wien, Mathematisch-Naturwissenschaftliche Classe, 55, p. 17-182, Wien.
- Reverts, S.A., 1996a. The generic revision of the Anomaliniidae, Cancrisidae & Gavelinellidae. *Cushman Foundation Special Publication* **34**, 57-113, Cambridge, Mass.
- Reverts, S.A., 1996b. The generic concept of Hanzawaia Asano, 1944 and the new genus Riminopsis. *Journal of Foraminiferal Research* **26**, 3-8, Washington.
- Rögl, F., 1969. Die miozäne Foraminiferen-Fauna von Laa an der Thya in der Molassezone von Niederösterreich. *Mitteilungen Geologisches Gesellschaft in Wien* **61**, 63-123, 9 pl., Wien.
- Rögl, F., 1985. Late Oligocene and Miocene planktic foraminifera of the Central Paratethys (in: Bolli, H. M., Saunders, J. B., Perch-Nielsen, K., Eds., *Plankton Stratigraphy*), 315-328. Cambridge University Press, Cambridge.
- Rögl, F., 1998. Taxonomical index (In Cicha et al., Ed. *Oligocene-Miocene foraminifera of the Central Paratethys. Abhandlungen der Senckenbergischen Naturforschenden Gesellschaft* **549**, 78-136, Frankfurt am Main.
- Rögl, F. & Hansen, H. J., 1984. Foraminifera described by Fichtel & Moll in 1798. A revision of Testacea Microscopica. *Neue Denkschriften des Naturhistorischen Museum in Wien* **3**, 143 p., 30 pl. Wien.
- Rzehak, A., 1886. Die Foraminiferenfauna der Neogenformation der Umgebung von Mähren-Ostrau. *Naturf. Ver. Brunn, Verh.* **24** (1885), Brno.
- Said, R., 1949. Foraminifera of the northern Red Sea. *Cushman Laboratory for Foraminiferal Research, Special Publication* **26**, 1-44.
- Schnitker, D., 1971. Distribution of foraminifera on the North Carolina continental shelf. *Tul. St. in Geology, Paleontology* **8/4**, 169-215, New Orleans, La.
- Serova, M., 1955. Stratigrafiya i fauna foraminifer miotzenych otlozheniy Predcarpatiya. *Mater. Biostr. Zapad. Obl. Uk.SSR*, 261 - 458, 29 pls., Moskow.
- Todd, R., 1965. The Foraminifera from the tropical Pacific collections of the "Albatros", 1899-1900. Part 4, Rotaliform families and Planktonic families. *Smithsonian Institution, U.S. Natural Museum Bulletin* **161**, 139 p., 28 pls., Washington.
- Uchio, T., 1952. Foraminiferal assemblage from Hachijo Island, Tokyo Prefecture, with description of some new genera and species. *Japan Journal of Geology and Geography* **22**, 145-159.
- Vadasz, E., 1910. Bakonyi triasz Foraminiferak. *A Balaton Tud. tanulm. eredm. c. mü I, köt. 1, reszenek paleont. fug.*, 1-43, Budapesta.
- Vasicek, M., 1951. Soudany stav mikrobiostratigrafickeho vyzkumu miocennich sedimentu ve vnekarpatске neogenni panvi na Morave. *Sb. UUG* **18**, 149-195, pl. 19, 20, Praha.
- Van der Zwaan, G. J., 1982. Paleoecology of Late Miocene Mediterranean Foraminifera. *Utrecht Micropaleontological Bulletin* **25**, 201 p., 15 pl., 65 text-fig., 7 tab., Utrecht.
- Vavra, N., 1978. *Sphaerogypsina* Galloway, 1933 (Foraminifera) von Reuss (1848) als Bryozoe (*Ceriodora globulus*) und als Koralle (*Chaetetes pygmaeus*) beschrieben. *N. J. Geol. Palaont.* (1978) **12**, 741-746, Stuttgart.
- Voloshinova, N. A., 1958. O novoy sistematike Nonionid. Mikrofauna SSSR, Sbornic 9, Trudy VNIGRI **115**, 117-191. Leningrad.
- Weinhandl, R. 1958. *Schackoinella*, eine neue Foraminiferengattung. Verhandlungen der Geologischen Bundesanstalt (1958), p. 141-142, Wien.
- Zhizhchenko, B. P., 1959. Charakteristika fauny molliuskov srednego miotzena (in: Zhizhchenko, B. P., Ed., *Atlas srednemiotzenovoy fauny severnogo Kavkaza i Kryma*). Tr. VNIGAZ, 143-293, Moskwa.

PLATES

PLATE 1

- Figs. 1 - 3 *Alliatina excentrica* (di NAPOLI ALLIATA). Valea Gemini section, Coștei (official name, Coșteiu de Sus), Timiș district. Lower Badenian. Fig. 1, frontal-umbilical view; fig. 2, dorsal view; fig. 3, frontal view.
- Figs. 4 - 9 *Alliatina dentaperta* n.sp. Valea Gemini section, Coștei, Timiș district. Lower Badenian. Fig. 4, apertural/edge view; fig. 5, dorsal-apertural view; fig. 6, umbilical view; fig. 7, apertural-umbilical view; fig. 8, apertural detail of fig. 7; fig. 9, dorsal view.
- Figs. 10 - 12 *Ceratobulumina contraria* (REUSS). Valea Gemini section, Coștei, Timiș district. Lower Badenian. Ventral views.
- Figs. 13, 14 *Lamarckina erinacea* (KARRER). Valea Gemini section, Coștei, Timiș district. Topotypes. Lower Badenian. Fig. 13, umbilical view; fig. 14, dorsal view.
- Fig. 15 *Robertinoides imperatrix* (KARRER). Valea Gemini section, Coștei, Timiș district. Topotype. Lower Badenian. Lateral-frontal view.

Bar without specification, 100µm

PLATE 2

- Fig. 1 *Robertinoides imperatrix* (KARRER). Valea Gemini section, Coștei, Timiș district. Topotype. Lower Badenian. Lateral-frontal view.
- Figs. 2-7 *Robertinoides austiacus* (REUSS). Valea Gemini section, Coștei, Timiș district. Lower Badenian. Fig. 2, lateral view of a broken specimen; fig. 3, apertural detail of fig. 2; fig. 4, broken specimen, lateral view; fig. 5, detail on inner structure from the fig. 4; detail of wall structure from fig. 6; fig. 7 lateral view of a broken specimen.
- Figs. 8-11 *Baggina regularis* (d'ORBIGNY). Valea Gemini section, Coștei, Timiș district. Figs. 8-10, umbilical view; fig. 11, dorsal view. Lower Badenian.
- Figs. 12, 13 *Cancris auriculus* (FICHTEL & MOLL). Valea Gemini section, Coștei, Timiș district. Lower Badenian. Umbilical and dorsal views.

Bar without specification, 100 µm

PLATE 3

- Figs. 1-4 *Cancris auriculus* (FICHTEL & MOLL). Valea Gemini section, Coștei, Timiș district. Lower Badenian. Umbilical views.
- Figs. 5-8 *Valvulineria complanata* (d'ORBIGNY). Valea Gemini section, Coștei, Timiș district. Lower Badenian. Figs. 5, 8, umbilical views; fig. 6 dorsal-edge view; fig. 7, dorsal view.
- Fig. 9 *Eponides boueanus* (d'ORBIGNY). Valea Gemini section, Coștei, Timiș district. Lower Badenian. Optical photograph, umbilical view.
- Fig. 10 *Neoeponides schreibersi* (d'ORBIGNY). Popești Quarry, Cluj district, Lower Badenian. Umbilical view.
- Figs. 11, 12 *Planopulvinulina granulosa* (KARRER). Popești Quarry, Cluj district, Lower Badenian. Fig. 11, umbilical view, fragment; fig. 12, dorsal view.

Bar without specification, 100 µm

PLATE 4

- Figs. 1-4 *Mississippina neagui* POPESCU. Valea Gemini section, Coștei, Timiș district. Lower Badenian. Fig. 1, apertural detail of fig. 4; fig. 2, spiral view of a damaged specimen; fig. 3, umbilical view; fig. 4, edge view.
- Figs. 5, 6 *Stomatorbina concentrica* (PARKER & JONES). Valea Gemini section, Coștei, Timiș district. Lower Badenian. Fig. 5, umbilical view; Fig. 6, dorsal view.
- Figs. 7- 10 *Lamellodiscorbis* cf. *L. dimidiata* (JONES & PARKER) Valea Coșului section, Lăpușiu de Sus, Hunedoara district. Figs. 7-9, umbilical views; fig. 9, detail of fig. 8; fig. 10, dorsal view.
- Figs. 11-13 *Rotorbis patella* (REUSS). Valea Coșului section, Lăpușiu de Sus, Hunedoara district. Figs. 11, 12, umbilical views; fig. 13, dorsal view.

Bar without specification, 100 µm

PLATE 5

Figs. 1-3 *Rosalina bradyi* (CUSHMAN). Valea Gemini section, Coștei, Timiș district. Lower Badenian. Fig. 1, dorsal view; fig 2, edge view; fig. 3, umbilical view.

Figs. 4, 5 *Sphaeroidina bulloides* d'ORBIGNY. Valea Gemini section, Coștei, Timiș district. Lower Badenian. Umbilical views.

Figs. 6-8 *Discorbinooides* sp. Valea Gemini section, Coștei, Timiș district. Lower Badenian. Fig. 6, umbilical view; fig.7, edge view; fig.8, dorsal view.

Fig. 9 *Strebloides* sp Valea Gemini section, Coștei, Timiș district. Lower Badenian. Umbilical view.

Figs. 10-12 *Schakoinella imperatoria* (d'ORBIGNY). Valea Fisici section, Bozioru, Buzău district. Upper Volhynian. Figs. 10, lateral-umbilical view; fig. 11, dorsal view; fig. 12, edge view.

Bar without specification, 100 μm

PLATE 6

Fig. 1 *Schakoinella imperatoria* (d'ORBIGNY). Valea Fisici section, Bozioru, Buzău district. Upper Volhynian. Umbilical view.

Figs. 2, 3 *Glabratella* (?) *neumannae* RAHAGHI. Valea Gemini section, Coștei, Timiș district. Lower Badenian. Fig. 2, edge view; fig. 3, dorsal view.

Figs. 6, 8, 12 *Glabratella* (?) *saubriguensis* RAHAGHI. Valea lui Ion section, Buitur, Hunedoara district. Fig. 6, lateral-umbilical view; fig. 8, umbilical view; fig. 12, dorsal view.

Figs. 4, 5, 7 *Glabratella* (?) *platyomphala* (REUSS). Valea lui Ion section, Buitur, Hunedoara district. Uppermost Kossovian (an a equivalent of the eastern Paratethys stage Konkian ?). Fig. 4, dorsal view; fig 5, umbilical view; fig.7, umbilical detail of fig. 5.

Figs. 9-10 *Siphonina reticulata* CZJZEK. Valea Coșului section, Lăpugiu de Sus, Hunedoara district. Fig. 9, umbilical view; fig. 10, edge-apertural view.

Fig. 11 *RuthToddia variolata* (d'ORBIGNY). Valea Gemini section, Coștei, Timiș district. Lower Badenian. edge-umbilical view.

Bar without specification, 100 μm

PLATE 7

Figs. 1-3 *RuthToddia variolata* (d'ORBIGNY). Valea Gemini section, Coștei, Timiș district. Lower Badenian. Fig. 1, umbilical view; fig. 2, edge view; fig. 3, dorsal view.

Figs. 4, 5 *Cibicoides austriacus* (d'ORBIGNY). Valea Gemini section, Coștei, Timiș district. Lower Badenian. Fig. 4, umbilical view; fig. 5, dorsal view.

Figs. 6, 7 *Cibicoides pachiderma* (RZEHA). Valea Gemini section, Coștei, Timiș district. Lower Badenian. Fig. 6, umbilical-apertural view; fig. 7, dorsal view.

Figs. 8, 9 *Cibicoides ungerianus* (d'ORBIGNY). Valea Gemini section, Coștei, Timiș district. Lower Badenian. Fig. 8, umbilical view; fig. 9, dorsal view.

Figs. 10-13 *Lobatula lobatula* (WALKER & JAKOB). Fig. 11, umbilical view; figs. 12, 13, dorsal views.

Figs. 14-16 *Glabratellina* sp. A. Valea Gemini section, Coștei, Timiș district. Lower Badenian. Fig. 14, umbilical-lateral view; fig. 15, edge-lateral view of a pair; fig. 16, lateral view.

Fig. 17 *Glabratellina* sp. B. Valea Gemini section, Coștei, Timiș district. Lower Badenian. Umbilical view.

Bar without specification, 100 μm

PLATE 8

Figs. 1-5 *Planorbulina mediterraneensis* d'ORBIGNY. Valea Gemini section, Coștei, Timiș district. Lower Badenian. Fig. 1, free side; fig. 2, attached side; fig. 3, detail from fig. 2; fig. 4, optical section showing initial chambers.

Fig. 6 *Caribbeanella?* sp. Valea Gemini section, Coștei, Timiș district. Lower Badenian. Attached (?) side. Bar, 30 μm.

Figs. 7-9 *Cymbaloporetta bradyi* (CUSHMAN). Valea Gemini section, Coștei, Timiș district. Lower Badenian. Umbilical views; fig. 8, detail of the umbilicus of fig. 7.

Fig. 10 *Biarritzina* sp. Valea Gemini section, Coștei, Timiș district. Lower Badenian. Lateral view.

Bar without specification, 100 μm

CONTRIBUTIONS TO THE KNOWLEDGE OF THE ROTALIFORM FORAMINIFERA FROM THE
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PLATE 9

- Figs. 1, 2 *Discogypsina* sp. Valea Gemini section, Coştei, Timiș district. Lower Badenian. Optical photographs. Fig. 1, axial section; fig. 2, lateral view of the specimen from the figure 1.
- Figs. 3, 4 *Gypsina* cf. *G. plana*. Valea Gemini section, Coştei, Timiș district. Lower Badenian. Fig. 3, broken specimen: section and free surface; fig. 4, lateral view.
- Figs. 5-9 *Sphaerogypsina globulus* (REUSS). Popești Quarry, Cluj district. Lowermost Badenian. Fig. 5, lateral view; fig. 6, surface detail of fig. 1; fig. 7, transverse section through embrionar area, showing the obvious eccentric position of the initial chambers; fig. 8, detail of two successive chambers from the cross section of fig. 7; fig. 9, detail of embryonic area from fig. 7.
- Figs. 10, 11 *Homotrema* sp. Valea Gemini section, Coştei, Timiș district. Lower Badenian. Fig. 10, free side of a broken specimen; fig. 11, free side.

Bar without specification, 100 µm

PLATE 10

- Figs. 1, 4, 5 *Sporadotrema* sp. Optical photos. Valea Satului, Răchitova, Hunedoara district. Lower Badenian. Fig. 1, inner view showing the inner end of the pores perforations of the chamber wall and apertures seen from inside, as well as a transverse section of chamber wall showing the inner and outer end of the pores; fig. 4, basal view, showing the planispiral arrangement of the initial chambers; fig. 5, surface test detail
- Figs. 2, 3 *Biasterigerina planorbis* (d'ORBIGNY). Valea Gemini section, Coştei, Timiș district. Lower Badenian. Fig. 2, umbilical view; fig. 3, lateral view.
- Figs. 6, 7 *Amphistegina mammilla* (FICHTEL & MOLL). Valea Satului, Ilovița (Bahna Basin, east of Orșova). Optical photographs. Fig. 6, dorsal view; fig. 7, ventral view.
- Figs. 8-10 *Amphistegina bohdanowiczi* BIEDA. Valea Gemini section, Coştei, Timiș district. Lower Badenian. Fig. 8, ventral view; fig. 9, inner cast, ventral view, detail of the secondary chambers and of the aperture. The inner terminations of the pores can be observed, as short, cylindrical columns, on the surface of the cast; fig. 10, dorsal view, optical photograph.
- Figs. 11, 12 *Nonion communae* (d'ORBIGNY). Valea Gemini section, Coştei, Timiș district. Lower Badenian. Fig. 11, lateral view; fig. 12, frontal edge view.

Bar without specification, 100 µm

PLATE 11

- Figs. 1-3 *Nonion bogdanowiczi* VOLOSHINOVA. Isolated sample from locality Ohaba (Hunedoara district). Middle Sarmatian (Basarabian). Fig. 1, lateral view of a young specimen; fig. 2, detail of the central area; fig. 3, lateral view of a strongly lobated specimen.
- Figs. 4-6 *Nonionella opima* CUSHMAN Valea Gemini section, Coştei, Timiș district. Lower Badenian. Fig. 4, frontal-edge view; fig. 5, dorsal view; fig. 6, umbilical view.
- Figs. 7, 8 *Astrononion steligerum* (d'ORBIGNY). Valea Gemini section, Coştei, Timiș district. Lower Badenian. Lateral views.
- Figs. 9, 10 *Pullenia quinqueloba* (REUSS). Valea Gemini section, Coştei, Timiș district. Lower Badenian. Fig. 9, edge-lateral view; fig. 10, lateral view.
- Figs. 11, 12 *Melonis pompilioides* (FICHTEL & MOLL) Valea Gemini section, Coştei, Timiș district. Lower Badenian. Fig. 11, lateral view; fig. 12, edge view.
- Figs. 13, 14 *Allomorphina trigona* REUSS. Valea Gemini section, Coştei, Timiș district. Lower Badenian. Umbilical/apertural views.
- Fig. 15 *Chilostomella czjzeki* REUSS Valea Gemini section, Coştei, Timiș district. Lower Badenian. Lateral view.

Bar without specification, 100 µm

PLATE 12

- Figs. 1-4 *Hidina variabilae* GHEORGHIAN, IVA, GHEORGHIAN. Valea Steaza section, Steaza, Sibiu district, SW Transylvanian Depression. Burdigalian (Chechiș Form.). Fig. 1, frontal view; fig. 2, dorsal view; fig. 3, lateral eastwards view; fig. 4, lateral westwards view.
- Figs. 5, 7 *Quadrिमorphina* cf. *Q. petrolei* (ANDREAE). Valea Gemini section, Coştei, Timiș district. Lower Badenian. Umbilical views.
- Fig. 6 *Quadrिमorphina petrolei* (ANDREAE). Valea Gemini section, Coştei, Timiș district. Lower Badenian. Umbilical view.

- Figs. 8, 9 *Anomalinoides badenensis* (d'ORBIGNY). Valea Coşului section, Lăpuşiu de Sus, Hunedoara district. Lower Badenian. Fig. 8, edge view; fig. 9, dorsal view.
- Figs. 10-12 *Heterolepa dutemplei* (d'ORBIGNY). Valea Gemini section, Coştei, Timiş district. Lower Badenian. Fig. 10, umbilical view; fig. 11, dorsal-apertural view; fig. 12, dorsal view.
- Fig. 13 *Heterolepa praecincta* (KARRER). Valea Gemini section, Coştei, Timiş district. Lower Badenian. Edge view.
- Figs. 14-16 *Hanzawaia boueana* (d'ORBIGNY). Valea Gemini section, Coştei, Timiş district. Lower Badenian. Fig. 16, umbilical view; fig. 15, frontal-dorsal view; fig. 14, dorsal view.
- Figs. 17-19 *Hanzawaia crassiseptata* (ŁUCZKOWSKA). Valea Morilor section, Colibaşi, Mehedinţi district. Upper Badenian (Kossovian). Fig. 17, umbilical view; fig. 18, edge view; fig. 19, dorsal view.

Bar without specification, 100 µm

PLATE 13

- Figs. 1-3 *Riminopsis boueanus* (d'ORBIGNY). Valea Gemini section, Coştei, Timiş district. Lower Badenian. Fig. 1, umbilical view; fig. 2, frontal-umbilical view; fig. 3, dorsal view.
- Figs. 4, 5 *Alabama armellae* POPESCU. Valea Coşului section, Lăpuşiu de Sus, Hunedoara district. Lower Badenian. Fig. 4, umbilical view; fig. 5, edge view.
- Figs. 6, 7 *Svratkina perlata* (ANDREAE). Valea Coşului section, Lăpuşiu de Sus, Hunedoara district. Lower Badenian. Fig. 6, dorsal view; fig. 7, umbilical view.
- Figs. 8-12 *Svratkina cichai* POPESCU. Valea Coşului section, Lăpuşiu de Sus, Hunedoara district. Lower Badenian. Figs. 8, 11, dorsal view; fig. 9, umbilical view; fig. 10, edge view; fig. 12, detail of the last chamber from fig. 11.

Bar without specification, 100 µm

PLATE 14

- Figs. 1-3 *Oridorsalis nanum* (REUSS). Valea Coşului section, Lăpuşiu de Sus, Hunedoara district. Lower Badenian. Fig. 1, umbilical view; fig. 2, dorsal view; fig. 3, detail of fig. 2, showing a spiral aperture.
- Figs. 4-6 *Hansenisca soldanii* (d'ORBIGNY). Valea Coşului section, Lăpuşiu de Sus, Hunedoara district. Lower Badenian. Fig. 4, umbilical view; fig. 5, umbilical-edge view; fig. 6, dorsal view.
- Figs. 7-9 *Pararotalia aculeata* (d'ORBIGNY). Valea lui Ion section, Buitur, Hunedoara district. Umbilical views.
- Figs. 10-13 *Pararotalia spinimargo* (REUSS) Valea Coşului section, Lăpuşiu de Sus, Hunedoara district. Lower Badenian. Figs. 10, 12, umbilical views; fig. 11, frontal-umbilical view; fig. 13 dorsal view.

Bar without specification, 100 µm

PLATE 15

- Figs. 1-9 *Elphidium hauerinum* (d'ORBIGNY). Valea Gemini section, Coştei, Timiş district. Lower Badenian. Fig. 1, 5, 6, lateral views; fig. 2, apertural detail of fig. 1; fig. 3, 9, edge views; fig. 4, detail of the umbilical area of fig. 1; fig. 7, lateral-edge view; fig. 8, apertural detail of fig. 7.
- Figs. 10, 11 *Elphidium fichtelianum* (d'ORBIGNY). Valea Gemini section, Coştei, Timiş district. Lower Badenian. Lateral views.
- Fig. 12 *Elphidium notabilis* PISHVANOVA. Valea Morilor section, Colibaşi, Mehedinţi district. Lateral view.
- Fig. 13 *Elphidium reussi* MARKS. Valea lui Ion section. Uppermost Kossovian. Lateral view.

Bar without specification, 100 µm

PLATE 16

- Figs. 1-3 *Elphidium notabilis* PISHVANOVA. Valea Morilor section, Colibaşi, Mehedinţi district. Fig. 1, lateral view; Fig. 2, umbilical detail of the fig. 1; fig. 3, edge view.
- Figs. 4-6 *Elphidium rugosum* (d'ORBIGNY). Valea lui Ion section. Uppermost Kossovian.
- Fig. 7 *Elphidium flexuosum* (d'ORBIGNY) Valea lui Ion section. Uppermost Kossovian.
- Fig. 8 *Elphidium hauerinum* (d'ORBIGNY) Valea Gemini section, Coştei, Timiş district. Lower Badenian.
- Figs. 9-12 *Planostegina costata* (d'ORBIGNY) Valea Gemini section, Coştei, Timiş district. Lower Badenian. Lateral views; fig. 11, the same specimen: lateral outside view and inner chambers view of a megalosphaeric specimen.

Bar without specification, 100 µm































