NEW RADIX SPECIES IDENTIFIED IN THE NEOGENE DEPOSITS OF THE DACIC BASIN

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Abstract. The first appearance of the Radix genus took place in the Middle Pontian (Porterferian). Then follow two intervals of strong specific diversification. One of these is situated in the Middle Pontian, when five new species occurred. The other one took place in the Lower Dacian (Getian), when four new taxa appeared. From the five species identified in the Porteraferian, the taxa Radix aff. lytostomopsis (Brusina), R. aff. jaksici (Brusina) as were as 3 new species have a restricted distribution only to the lower part of the Middle Pontian. They are species characterizing this stratigraphic interval. In the Lower Dacian 4 new species occur in the Upper Romanian the presence of the Radix genus could be seen as a paleontological rarity. In the deposits belonging to the above mentioned interval only one species of this genus could be remarked. In the uppermost Romanian the genus Radix disappeared.

Keywords: Middle Pontian, Upper Pontian, Porteraferian, Bosphorian, Dacian, Romanian, bivalves, new species.

INTRODUCTION

In dating the Upper Neogene deposits, beside the bivalve faunas, the gastropod faunas had a greater importance. Like the Viviparus, Melanopsis, Bulimus and Theodoxus genus, the Radix genera has a remarkable biostatigraphic significance.

In the Dacic Basin, the Radix species have their first occurrence in the Middle Pontian (Porteraferian), the last occurrence being observed in the Upper Romanian deposits (Pelorovian).

From the ten Radix species identified, five of them are located in the Middle Pontian (Porteraferian) deposits, one species is lodged in the Upper Pontian (Bosphorian) deposits, four in the Lower Dacian (Getian), one in the Upper Dacian (Parsovian) and one is lodged in the Upper Romanian (Pelorovian) formations (fig. 1).

The stratigraphic distribution of the Radix species in the Middle Pontian – Upper Romanian interval deposits shows us the separation of two moments in which this genus occurs more often and has a greater diversity, namely in the Middle Pontian and Lower Dacian.

Of all the five Radix species present in the Porteraferian, Radix aff. jaksici (Brusina), Radix papaianopoli sp. nov., and Radix altus sp. nov. are exclusively located in the Middle Pontian.

Radix socialis sp. nov. appeared in the Middle Pontian, but it is found again with little specimens in the Upper Pontian (Bosphorian).

The Lower Dacian represents a new moment for Radix evolution in the Dacic Basin.

In the Lower Dacian (Getian), we found four species: Radix amaricus, R. berestiensis and Radix bodesanensis are a kind of index species for this interval of time in the Dacic Basin (mainly in the western part between the Olt Valley and the Jiu Valley).

Radix marinescui sp. nov. occurred in the Getian but also it is found in Parnsovan sediments. It is the only Radix species found so far in Upper Dacian.

The last occurrence of this genus in the Dacic Basin is during the Upper Romanian (Pelorovian), particularly in Podar Ortocrop (right-side of Jiu Valley). Here, Radix podarorenna sp. nov. is associated with numerous species of Viviparus, Melanopsis, Bulimus, Stenothyrella, Emmenicia, Amphimelania and Theodoxus.

Classa Gastropoda
Order Basomatophora
Family Lymnaeidae
Genus Radix MONTFORT, 1810

Radix aff. lytostomopsis (BRUSINA)
PI. I., Figs. 1-3

Synonymy of the species Radix lytostomopsis (BRUSINA)
1902 Lymnaea lytostomopsis; BRUSINA, pl. i., figs. 34-35
1976 Radix lytostomopsis; STEVANOVIC, pl. VI., figs. 13-14

Description. Small shell, relatively fragile, formed of four whors separated by quite deep sutures. Spire very low. Last whor, globulous and very well developed, is about four times higher than the spire. On the outer surface only numerous growth striae can be observed. Aperture rounded or a little oval, with a thin and continuous peristome.

Comparisons. Our specimen differs from the typical specimens of Radix lytostomopsis (BRUSINA) by the greater width and convexity of the last whor as well as by the quite great difference of width between the last two anfractures. Radix aff. jaksici (Brusina) is quite different from Radix aff. lytostomopsis (BRUSINA) by the much

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shorter spire and the aspect of the last anfract, which is the least higher and more globulous.

Remarks. Radix jakisci (BRUSINA) occurs in the Portaferian deposits in the Pannonian Basin. Our specimens come from the Middle Pontian (Portaferian) in the Dacic Basin.

_Radix papaianopolis_ sp.nov.
Pl. I, Figs. 5-8

_Holotype:_ Pl. I, Fig.5, Collection of the Geological Institute of Romania, no 19.551

_Derivatio nominis:_ in memory of paleontologist Ioan Papaianopol

_Locus typicus:_ Prigoria Valley, village of Prigoria,
Gorj Country

_Stratum typicum:_ sandy clays with Limnocardium (Tauricardium) petersi (M. HORNES), L. (Euxinicardium) nobile SABBIA, Plagiocacna carinata (DESHAYES), Parvidacna planicostata STEVANOVIC, Pontalmyras (Pontalmyra) dacica PAPAIANPOL, Viviparus moskoni LUBENESCU, Melanopsis (Melanopsis) decollata STOLICZKA, of Middle Pontian (Portaferian) age.

_Description._ - Shell small-sized, locally of larger, sizes, elongated, formed of 4-5 whors separated by relatively deep sutures. Short spire, with the first anfract almost plane. The last whor is quite wide and usually slightly convex. Last anfract is very well developed, high, strongly convex, even with a tend to become globulous. Its height is about four times higher than the spire height. On the outer surface there are only numerous growth striae. Large aperture, oval, with holostom peristom. External lip (labrum) is thin. Internal lip (labium) is usually slightly thickened, thrown over the umbilical zone.

_Intraspecific variability._ Some of the shells are more supple (Pl.I, Fig.8), others show a tendency to become globulous due to the higher convexity of the last anfract (Pl.I, Fig.6). Some specimens have a narrower aperture (Pl.I, Figs.5,8), whereas in others it is wider (Pl.I, Fig.6). The last anfract of the spire can be almost plane (Pl.I, Fig.7) or slightly convex (Pl.I, Fig.5).

_Dimensions (in mm)_

_Total height of the shell: between 4.6 and 6.4 mm
_Total width of the shell: between 3.2 and 4.5 mm

_Comparisons._ _Radix papaianopolis_ sp. nov. is different from _Radix of lytochomopris_ (Brusina). Its shell is smaller, more fragile, shorter spire, and high of the last anfract is less high, superficial sutures.

It is different from _Radix altus_ sp. nov., due to higher spira, more convexity of the last anfract and less height of the last whor.

Remarks. _Radix papaianopolis_ sp. nov. has been found only in the Portaferian deposits from the Dacic Basin.

_Radix altus_ sp. nov.
Pl. II, fig. 1

_Holotype:_ Pl.II, Fig.1, Collection of the Geological Institute of Romania, no. 19.545

_Derivatio nominis:_ from lat altus

_Locus typicus:_ Topolog Valley, Barsesti village, Arges Country

_Stratum typicum:_ sandy clays with Plagiocacna carinata (DESHAYES), Daciarcium vetustum PAPAIAINPOL, Prosodeaconyma rostrata (SINZOW), Zagrabica natica BRUSINA, Z. maceki BRUSINA, Viviparus aff. icertus MACAROVICI of Middle Pontian (Portaferian) age.

_Description._ Small shell, mainly globulous, with 4 whors separated by deep sutures. Short spire. The first anfracts are almost planispiral, the last of them is slightly convex. Its height is 5 times higher than spire height. Outer surface of shell is smooth. Large aperture, holostom- type peristome. Outer lip is thin, inner lip is fairly thick.

_Dimensions (in mm)_

_Total height of the shell: 9.5 mm
_Total width of the shell: 8.3 mm

_Comparisons._ _Radix altus_ sp. nov. is different from _Radix papaianopolis_ sp. nov., being more globulous, shorter and with narrower spire. The last anfract is broader and more rounded. It is different from _Radix socialis_ sp. nov., due to shorter, less convex spira, and the size of the last whor.

Remarks. _Radix altus_ sp. nov. has been only found in Middle Pontian deposits from the Dacic Basin.

_Radix socialis_
Pl. II, Figs. 2-3

_Holotype:_ Pl.II, Fig.2, Collection of the Geological Institute of Romania, no. 19.546

_Derivatio nominis:_ from lat socialis

_Locus typicus:_ Calugarului Valley, Butuci village, Prahova Country

_Stratum typicum:_ sands with Phyllocardium planum planum (DESHAYES), Limnocardium (Tauricardium) olivaceum (IONESCU-ARGETOAI), L. (T.) petersi (M.HORNES), Chartococna gigantea (WENZ), Luxuricacna luxuriosa (WENZ), Viviparus achatinoides (DESHAYES), Bulimus (Tylopoma) orientalis PAPAIAINPOL et MACALET of Upper Pontian (Bosphorian) age.

_Description._ Small shell, fragile, with 4-5 whors separated by deep sutures. Short spire. The first anfract of spira are almost planispiral, the last two are more convex. The last is very height, convex, more or less globulous (its high is 4 times the spira height). On the outer surface of the shell there are many and fine front striae. The aperture is large and the peristome is holostom- type. Outer lip is thin, inner lip is thickened and overlapping omblincus zone.

_Dimensions (in mm)_

_Total height of the shell: between 4.6 and 6.4 mm
_Total width of the shell: between 3.2 and 4.5 mm

Remarks. _Radix socialis_ sp. nov. appeared in the Middle Pontian and its “geological life” continues in the Upper Pontian (Bosphorian) deposits from Dacic Basin.

_Radix aradicus_ sp. nov.
Pl. II, Fig. 4

_Holotype:_ Pl. II, Fig.4, Collection of the Geological Institute of Romania, no.19.547

_Derivatio nominis:_ after the Amaradia Valley (Gorj district, western part of the Dacic Basin)

_Stratum typicum:_ In this region there is an almost constant mollusk community located in the Lower Dacian (= Getian). It consists of: Pachydracna (Pachydracna) socialis PAPAIAINPOL, P. (P.) mirabilis (TEISSEYRE), Zamphiradica orientalis SABBIA, Pontalmyras (Pontalmyra) amaricada PAPAIAINPOL, Stylocacna heberti (Cobleseca), Viviparus argesiensis SABBIA, Bulimus (Tylopoma) speciosus (COBALESCECU).

_Description._ Small and long shell, with four whors, separated by fine sutures. The shell is very short. The
first is slightly flattened, and the last is slightly convex. The base is stronger, higher, convex but not globulous. It is 7-8 times higher than the spire. On the lateral surface there are numerous, fine growth striae. Aperture is elongated, narrower and sharp in its upper portion. Outer lip is thin. Inner lip is more massive.

**Dimensions**
- Total height of the shell: 10 mm
- Diameter of last whorl: 6 mm
- Last whorl height: 9 mm

**Comparisons.** This species is different from other Dacian species by its very short spire. A slimmer feature is visible in *Radix berbestiensis* also, but this has a smaller shell and much more globulous shape. It seems to be similar to *Radix marinescui* sp. nov., but it has shorter spira and larger diameter of the last whorl.

**Remarks.** *Radix amaraducus* sp. nov. has been found in the Lower Dacian (= Getian) from the Dacic Basin.

**Radix berbestiensis** sp. nov.

**Holotype:** PI. II, Fig. 5, Collection of the Geological Institute of Romania, no.19.548

**Derivatio nominis:** after Berbesti village (Valcea county, Olenia)

**Locus typicus:** Bogdan's Valley, northern part of the Berbesti village, Valcea county

**Stratum typicum:** sands and argillaceous sands with: *Pachydacna (Pachydacna) onusta PAPAIONOPOL*, *P. (P) socialis PAPAIONOPOL*, *Limonocardium (Teuricardium) oleniense (IONESCUC-ARGOEAOA)*, *Prosodacna (Prosodacna) longisulcugillettae FONTANES*, Unio (Rumanunio) rumanus TOURNOUER, *Viviparus argesiiensis SABBIA*, *Melanopsis (Melanopsis) decollata STOLIDICA*, of Upper Dacian (Getian) age.

**Description.** Small shell, high, slender with fusiform habitus. There are 5-6 whors separated by deep sutures. The spire is high. The first are almost flattened, the last is convex. The last whorl is strong, high, more or less convex, but many specimens have a visible convexity. The last whorl is 5-6 times higher than the spire. On the lateral surface there are numerous growth striae. Aperture is large, high and narrow. Outer lip is thin. Inner lip is thick.

**Dimensions (in mm)**
- Total height of the shell: between 12.2 and 18.2 mm
- Diameter of last whorl: between 6.1 and 10.5 mm
- Total width of the shell: between 10 and 14.2 mm

**Intraspecific variability:** In the case of this species, I found some morphotypes more or less well delimited. Some shells have the last whors more elongated and les convex (PI. II, Fig. 7), others have the same portion of the shell shorter and more inflated (PI. II, Fig. 6; PI. III, Fig. 1).

There are also some specimens more slender and elofided (PI. II, Fig. 7). Aperture can be sonnded (PI. II, Fig. 6; PI. III, Fig. 2) or narrower and larger (PI. II, Fig. 7).

**Remarks.** *Radix bogdaniensis* sp. nov. has been found in Lower Dacian (= Getian) from the Dacic Basin.

**Radix bogdaniensis** sp. nov.

**Holotype:** PI. II, Fig. 5, Collection of the Geological Institute of Romania, no.19.549

**Derivatio nominis:** after Bogdan's Valley (Valcea county, )

**Locus typicus:** Bogdan's Valley, northern part of the Berbesti village, Valcea county

**Stratum typicum:** sands and argillaceous sands with: *Pachydacna (Pachydacna) onusta PAPAIONOPOL*, *P. (P) socialis PAPAIONOPOL*, *Limonocardium (Teuricardium) oleniense (IONESCUC-ARGOEAOA)*, *Prosodacna (Prosodacna) longisulcugillettae FONTANES*, Unio (Rumanunio) rumanus TOURNOUER, *Vivipar us argesiiensis SABBIA*, *Melanopsis (Melanopsis) decollata STOLIDICA*, of Upper Dacian (Getian) age.

**Description.** Small shell, high, slender with fusiform habitus. There are 5-6 whors separated by deep sutures. The spire is high. The first are almost flattened, the last is convex. The last whorl is strong, high, more or less convex, but many specimens have a visible convexity. The last whorl is 5-6 times higher than the spire. On the lateral surface there are numerous growth striae. Aperture is large, high and narrow. Outer lip is thin. Inner lip is thick.

**Dimensions (in mm)**
- Total height of the shell: between 5 and 11 mm
- Total width of the shell: between 3.4 and 7.5 mm

**Comparisons.** *Radix marinescui* sp. nov. is different from *Radix amaraducus* sp. nov. by having a higher spire, the convexity of the last whorl more visible and the aperture-diameter larger than in *Radix amaraducus*.
NEW RADIX SPECIES IDENTIFIED IN THE NEogene DEPOSITS OF THE DACiC BASiN

Remarks. Most of the specimens have been found in the Lower Dacian, but also I found few specimens in Upper Dacian (in the eastern extremity of the Dacic Basin) where coexisted many other species.

Radix podarensi sp. nov.
Pl. III, Fig. 6

Holotype: Pl. III, Fig.6. Collection of the Geological Institute of Romania, no.19.544

Derivatio nominis: after Podari village, Gorj county

Locuta typicus: Podari village, in the right side of Jiu river, Gorj county

Stratum typicum: sands wich: Buhlum (Buhlum) podarensis PANA, Viviparus bifurcatus (BIELZ), V. strictatus NEUMAYR, Melanopsis (Melanopsis) romana TOURNOUER, M. (Lyraeae) slavonica NEUMAYR, Emmercia candida NEUMAYR, Theodoxus quadrifasciatus (BIELZ), Th. botanii PORMBARU.

Description. Shell small and fragile, with 4 whorls separated by deep suture. The spire is very short, with the first whorls flattened. The last of them is mainly convex.

The last whorl of the shell is convex, high and thin. Its height is 5-6 times higher than the high spire.

Aperture is large in diameter, rounded. Outer lip is thin. Inner lip is thick and overlapped.

Dimensions (in mm)
Total height of the shell: 4.2 mm
Diameter of last whorl: 3.5 mm

Comparisons. It is different from Radix marinesci sp. nov. (from the Dacian) by the small size, a kind of fragility of the shell, short spire and convexity of the last whorl. Its aperture is shorter than Radix marinesci sp. nov.

Remarks. It seems to appear in Romanian sediments.

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PLATES

Plate I

Figs. 1-3 Radix aff. lytostomopsis (BRUSINA), (fig. 1 x 3; fig. 2x2; fig. 3 x 4.5), figs. 1,2, Prigoria Valley, Prigoria village, Gorj Country; fig. 3, Ialomita Valley, Príboiu village, Dambovita Country, Middle Pontian (Portaferrian)

Fig. 4 Radix aff. jaksici (BRUSINA), Gogoreasca Valley, Boteni village, Arges Country, Middle Pontian (Portaferrian)

Figs. 5-8 Radix papaianopoli sp. nov. holotype (figs. 5, 7, 8 x 5, fig. 6 x 3), figs. 5,7,8 Prigoria Valley, Prigoria village, Gorj Country; fig. 6, Topolog Valley, Barsesti village, Arges Country, Middle Pontian (Portaferrian)

Plate II

Fig. 1 Radix altus sp. nov., holotype (x 5), Topolog Valley, Barsesti village, Arges Country, Middle Pontian (Portaferrian)

Fig. 2 Radix socialis sp. nov., (x 8), Traistarului Valley, Marlogea village, Prahova Country, Middle Pontian (Portaferrian)

Fig. 3 Radix socialis sp. nov. holotype, (x 8), Calugarului Valley, Butuci village, Prahova Country, Upper Pontian (Bosphorian)

Fig. 4 Radix amaradicus sp. nov., holotype, (x 5), Amaradia Valley, Seciuri village, Gorj Country, Lower Dacian (Getian)

Fig. 5 Radix berbestiensis sp. nov., holotype, (x 5), Bogdan’s Valley, Berbesti village, Valcea Country, Lower Dacian (Getian)

Figs. 6-7 Radix bogdanensis sp. nov., (fig. 6 x 3; fig. 7 x 5), fig. 6 holotype, Mare Valley, Bengesti village, Gorj Country; fig. 7., Bogdan’s Valley, Bengesti village, Valcea Country, Lower Dacian (Getian)

Plate III

Figs. 1-2 Radix bodganhensis sp. nov., (fig. 1 x 5; fig. 2 x 3), fig. 1, Bogdan’s Valley, Berbesti village, Valcea Country; fig. 2, Valea Mara Valley, Berbesti village, Gorj Country, Lower Dacian (Getian)

Figs. 3-4 Radix marinesci sp. nov., (x 5), fig. 3, holotype, Mutilor Valley, right tributary of the Cerna Valley, Valcea Country; fig. 4, Amaradia Valley, Seciuri village, Gorj Country, Lower Dacian (Getian)

Fig. 5 Radix marinesci sp. nov., (x 5), Budureasca Valley, Calugareni village, Prahova Country, Upper Dacian (Parsrovian)

Fig. 6 Radix podarenssi sp. nov., holotype, (x 5), Podari village, Jiu Valley, Dolj Country, Upper Romanian (Pelendavian)