

The Pliocene and Early Pleistocene Lipotyphla (Insectivora, Mammalia) from Romania

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Abstract. 14 species of shrews and at least three of moles, five of water-moles, and one of hedgehogs are described from ten Pliocene and one Early Pleistocene localities of Romania. The systematic position of the above-mentioned taxa, their measurements, illustrations, and history of Lipotyphla in Romania are given.

Key-words: fossil mammals, Lipotyphla, Soricidae, Talpidae, Erinaceidae, Pliocene, Early Pleistocene, Romania.

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I. INTRODUCTION

With few exceptions (e.g. RĂDULESCU and SAMSON 1989, RĂDULESCU et al. 1989, RĂDULESCU et al. 1992, TERZEA 1970, 1980) the fossil Lipotyphla of Romania have not been studied in detail. Only two papers of RZEBIK-KOWALSKA (2000a and 2000b) gave an extensive picture of the Early and the early Middle Pleistocene fauna of shrews, moles, and hedgehogs from the Betfia Karstic Complex situated near Oradea. The present work deals with the Pliocene and the Early Pleistocene insectivores of Romania. The fossil materials described here originated from 10 localities situated in the Dacic Basin (Jiu and Olt Valleys) and one locality (Valea Crişului) from the Intracarpathian Basin (Braşov Depression). Localities: Dranic-0, Dranic-1, and Dranic-X are dated to the middle of the zone MN15, Dranic-2 is a little younger (the second half of MN15), Dranic-3 represents the end of MN15 or MN15/MN16 boundary, Podari and Valea Crişului the zone MN16. All localities (with the exception of Valea Crişului) lie in the Jiu Valley. Slatina-1, Slatina-2, and Cherleştii-Moşteni are dated to the zone MN17 and Izvoru-2 represents sediments of the Early Pleistocene. The last four localities are situated in the Olt Valley. A detailed description of particular localities can be found in works by RĂDULESCU and SAMSON 1987, RĂDULESCU et al. 1993, RĂDULESCU et al. 1995, RĂDULESCU and SAMSON 2001.

Besides the descriptions of particular taxa and their systematic position the paper also contains a review of the data on fossil Lipotyphla of Romania.

In Table VI name codes for particular localities are as follows: Dr-0 - Dranic-0, Dr-1 - Dranic-1, Dr-X - Dranic-X, Dr-2 - Dranic-2, Dr-3 - Dranic-3, VC - Valea Crişului, Pd - Podari, Sl-1 - Slatina-1, Sl-2 - Slatina-2, CM - Cherleştii Moşteni, Iz-2 - Izvoru-2.

In the tooth measurements L means maximal length, W - maximal width, H – maximal height, all in occlusal view. The explanation of other dimensions are given in the Tables or in the text (see – Measurements). Measurements marked by stars (in the text and in the tables) mean that measured teeth are slightly damaged and they are less exact.

The studied materials are housed in the collections of the Institute of Speology “Emil RACOVITZA” in Bucharest. The author is particularly grateful to Prof. Costin RĂDULESCU, for giving her the Lipotyphla materials to study. She is indebted to Mr. Marek KAPTURKIEWICZ for the illustrations.

II. SYSTEMATIC PART

Family Soricidae FISCHER VON WALDHEIM, 1817

Subfamily Allosoricinae FEJFAR, 1966

Genus *Allosorex* FEJFAR, 1966

Allosorex stenodus FEJFAR, 1966

M a t e r i a l. Dranic-0. Two I¹ (one with damaged apex and lower part of talon) and one fragment of mandible with M₂ and talonid of M₁. MNI = 1.

D e s c r i p t i o n. The detailed description of the genus and species is given in FEJFAR 1966.

M e a s u r e m e n t s. I¹. No. 1 – H of talon (bucc.) = 1.68 mm; no. 2 – L (bucc.) = 2.14 mm, L of talon (bucc.) = 1.04 mm, H of talon (bucc.) = 1.51 mm; M₁ – W = 0.97 mm; M₂ – L = 1.83 mm, W = 0.83 mm; H of mandible below M₂ = 1.85 mm.

S y s t e m a t i c p o s i t i o n a n d d i s t r i b u t i o n. The size and morphology of the above-listed teeth agree with the teeth of *A. stenodus* described from Ivanovce in Slovakia (FEJFAR 1966). Their “Carnivora”-like appearance distinguishes *A. stenodus* from other Soricidae species and shows that it was the most specialized among shrews to a diet consisting of meat.

So far, this very rare shrew has been found only twice, in Ivanovce and Dranic-0 (RĂDULESCU et al. 1995, 1997), in localities of the same age (Early Pliocene MN15). In 1971 GUERIN and MEIN listed *?Allosorex* sp. from an older (MN14) French locality Hauterive.

Paenelimnoecus BAUDELLOT, 1972

Paenelimnoecus pannonicus (KORMOS, 1934)

M a t e r i a l. Dranic-2. One M₂; Podari – three fragments of mandible without processes (one without teeth, one with M₁ and one with the fragment of M₁). MNI = 2.

D e s c r i p t i o n. A detailed description of *P. pannonicus* was given in REUMER (1984) and its complicated nomenclatorial history was explained in REUMER (1984, 1992).

M e a s u r e m e n t s. Dranic-2. M₂ – L = 1.03 mm, W = 0.60 mm; Podari. No. 1 – H of mandible below M₂ = 0.99 mm, no. 2 – H of mandible below M₂ = 0.94 mm, No. 3 – M₁ – L = 1.13 mm. W = 0.72 mm.

S y s t e m a t i c p o s i t i o n a n d d i s t r i b u t i o n. According to a new approach of shrew classification (REUMER 1992, 1998) the genus *Paenelimnoecus* has again been included in the subfamily Allosoricinae. This opinion is not shared by STORCH (1995, STORCH et al. 1998) who referred it to Soricinae *incertae sedis*. The classification of REUMER is tentatively used in this publication.

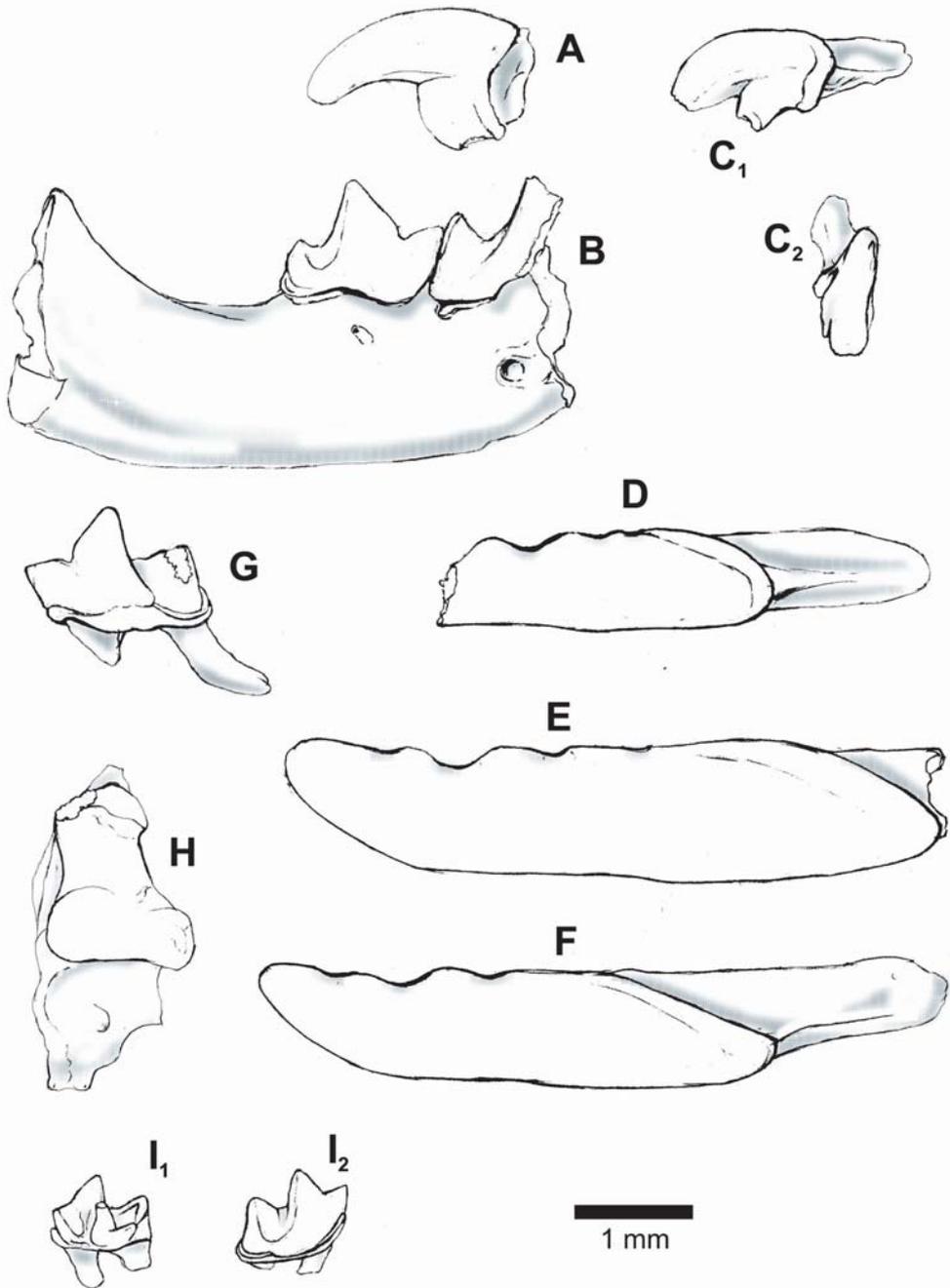


Fig. 1. *Allosorex stenodus*. Dranic-0. A – I¹ sin., spec. No. 2; B – fragment of mandible with M1 (broken) – M2 dext., spec. No. 1 (both buccal view). *Sorex (Drepanosorex) cf. praearaneus*. Dranic-0. C₁ – I¹ sin. (buccal view), spec. No. 1; C₂ – the same specimen (anterior view); Dranic-1. D – I₁ (broken) sin. (buccal view), spec. No. 1. *Blarinoides mariae*. Węże 1 (Poland). E – I₁ sin. (buccal view). ?*Blarinoides* n. sp. Dranic-1. F – I₁ sin. (buccal view), spec. No. 1. *Mafia cf. csar-notensis*. Dranic-2. G – M₁ sin. (buccal view), spec. No. 1; Podari. H – condylid process (posterior view), spec. No. 1. Soricidae gen. et sp. indet. Izworu-2. I₁ – M₁ dext. (lingual view), spec. No. 1; I₂ – the same specimen (buccal view)

P. pannonicus was described as *Pachyura pannonica* by KORMOS (1934) from the Late Pliocene locality Beremend (probably Beremend 4) in Hungary. Later on it was found in many European Early and Late Pliocene localities, from Spain to Poland and Romania. In Romania it has been listed, so far, from Podari as *Petenyiella gracilis* (RĂDULESCU et al. 1993, 1995). The records of this species under the name of *Petenyiella gracilis* from the Early Pleistocene of Betfia IX (TERZEA 1988) and Betfia XIII (TERZEA and JURCSÁK 1976) were not confirmed by later studies (RZEBIK-KOWALSKA 2000a). They belonged to a small *Sorex* species.

Subfamily Soricinae FISCHER VON WALDHEIM, 1917

Tribe Soricini FISCHER VON WALDHEIM, 1817

Genus *Sorex* LINNAEUS, 1758

Sorex cf. *minutus* LINNAEUS, 1766

M a t e r i a l. Dranic-0. Two fragments of mandibles, one toothless with damaged coronoid and condyloid processes and one with M₃. MNI = 1.

D e s c r i p t i o n. The coronoid process is narrow, the apex bends only slightly towards the anterior. The external temporal fossa is developed as a longitudinal groove and ends below the upper sigmoid notch, which is open. The condyloid process is damaged in its upper part (upper facet), the lower facet is slightly concave. The internal temporal fossa is high, continuing to the tip of the coronoid. The mandibular foramen is large and situated below the posterior corner of the internal temporal fossa. The last lower molar, M₃, is not reduced.

M e a s u r e m e n t s. H of ascending ramus = 3.05 mm, W of coronoid process = 0.53 mm, M₃ – L = 0.98 mm, W = 0.52 mm.

S y s t e m a t i c p o s i t i o n a n d d i s t r i b u t i o n. All measurements cited above fall within the range of variation of *Sorex minutus* used for comparison, both fossil and recent originating from Romania and Poland. However, some morphological characters (the almost straight coronoid process and largely open upper sigmoid notch) differ Dranic-0 specimen from other *S. minutus*, which have the coronoid process bent to the anterior and the upper sigmoid notch narrow. In these characters the specimen from Dranic-0 is similar to Recent *S. gracillimus* THOMAS, 1907 (living in the Far East), which is, however, a little larger.

Today *S. minutus* lives in Europe and Asia to Japan. Its oldest remains come from the Early Pliocene of Europe (MN14 – Poland, MN15 – Germany, Hungary, Slovakia, Romania, RZEBIK-KOWALSKA 1998, DAHLMANN 2001). So far, in Asia it has been mentioned once, from the Early Pleistocene locality of China (Liaoning Province, STORCH et al. 1998).

In the Pliocene of Romania, besides that of Dranic-0, where it was already listed as *S. minutus* (RĂDULESCU et al. 1995) and *S. cf. minutus* (RĂDULESCU et al. 1997) this species was also cited as *S. cf. minutus* from the Late Pliocene (MN16) of Podari (RĂDULESCU et al. 1995). Its presence there has not been confirmed in the present work. In the Early Pleistocene it was present at Betfia XIII, X, XI, IX, VII/1, V, and VII/3 (RZEBIK-KOWALSKA 2000a), in the Middle Pleistocene at Gura Dobrogei Cave 1 (SAMSON and RĂDULESCU 1972, as *S. cf. minutus*), at Sindominic 1 (RĂDULESCU and SAMSON 1985), at Betfia VII/4 (RZEBIK-KOWALSKA 2000a) and in the Late Pleistocene of La Adam Cave (DUMITRESCU et al. 1963), Bursucilor Cave (TERZEA 1974), Sindominic 2 (RĂDULESCU and SAMSON 1985), Hotilor Cave (TERZEA 1986), Cioarei Cave (TERZEA 1987), Scocul Scorotei Cave 4 (RĂDULESCU et al. 1991), and Cave 13 of Lupsa Valley (BURGHELE et al. 1994)

Sorex (Drepanosorex) cf. praeearaneus KORMOS, 1934

M a t e r i a l. Dranic-0. One first upper incisor, I¹, with damaged tips of the apex and of the talon. Dranic-1. One first lower incisor, I₁, with broken apex and worn cusps.

D e s c r i p t i o n. I^1 is relatively large, fissident, and slightly bulbous with well developed, sharply pointed and slightly bulbous talon and broad and undulated buccal cingulum. It seems not to be stained, although its cusps (apex and talon) are worn. It may be also secondary decolorized. I_1 is large, with two large somewhat bulbous and one (the most proximal) small cusps. Its buccal cingulum is wide but not protruding, the lingual one is wider and protruding.

M e a s u r e m e n t s. Dranic-0. $I^1 - L$ (bucc.) = 1.87* mm, L of talon (bucc.) = 1.15 mm, H of talon (bucc.) = 1.05* mm. Dranic-1. $I_1 - W$ (bucc.) = 1.12 mm.

S y s t e m a t i c p o s i t i o n. Only Beremendiini, Neomyini and some Soricini have fissident I^1 and the morphology of the Dranic-0 tooth indicates that it belongs to the Soricini and the genus *Sorex*. The large dimensions and slightly inflated talon of I^1 as well as the rounded (not pointed) proximal part of the crown and bulbous cusps of I_1 , suggest their appurtenance to the genus *Sorex* (*Drepanosorex*), and especially to *S.(D.) praeearaneus*. However, I^1 differs from the last species in a flatter upper side, which is strongly convex in *S. (D.) praeearaneus*. Also, I_1 seems to be slightly more massive [W of *S. (D.) praeearaneus* from Polish localities = 0.90 mm - 1.10 mm (n=28), RZEBIK-KOWALSKA 1991] and its cingula, especially lingual one, are better marked, wide and protruding, whereas in *S. (D.) praeearaneus* they are rather weak. Besides, the earliest remains of *S. (D.) praeearaneus* are known only from the Late Pliocene. It was found in localities of Hungary, The Netherlands, and Poland dated to MN17. The only mention (without any description or measurements) of *S. (D.) praeearaneus* from MN15 is that of FEJFAR (1966) from Ivanovce in Slovakia. Other species of *S. (Drepanosorex)* are larger than Dranic-0 and Dranic-1 specimens, their teeth are more inflated, and they appeared later (the Late Pliocene/Early Pleistocene boundary and the Early Pleistocene) than *S. (D.) praeearaneus*. More abundant materials are needed to confirm the presence of the last species in the Early Pliocene of Romania. So far, *S. (D.) praeearaneus* has been found there at Betfia XIII, Xi XI, localities dated to the Early Pleistocene. It survived to the Late Pleistocene in Ukraine (MEZHZERIN 1972).

Genus *Deinsdorfia* HELLER, 1963

Deinsdorfia cf. *hibbardi* (SULIMSKI, 1962)

M a t e r i a l. Dranic-0. One fragment of toothless mandible with posterior alveolus of M_1 and alveoli of M_2 and M_3 . Podari. A buccal fragment of P^4 and a fragment of the first the lower incisor, I_1 , with the two most proximal cusps, without root, MNI = 1.

D e s c r i p t i o n. The fragmentary P^4 is characterized by the large parastyle and long metastyle. The first lower incisor, I_1 , has distinct, slightly bulbous cusps and well marked cingulum along the dorso-buccal margin. The mental foramen on the medium-sized mandible is situated below the posterior half of M_1 .

M e a s u r e m e n t s. Dranic-0. H of the mandible below M_2 = 1.35 mm; Podari. $P^4 - L$ (bucc.) = 1.64 mm, $I_1 - W$ (bucc.) = 0.98 mm.

S y s t e m a t i c p o s i t i o n a n d d i s t r i b u t i o n. Although the material is very poor and damaged, its medium size, well-developed parastyle and metastyle on P^4 , distinct and bulbous cusps and distinct cingulum in I_1 , as well as the position of the mental foramen, allow us to identify these specimens as belonging to the genus *Deinsdorfia* and tentatively to *D. cf. hibbardi*. From *D. janossyi* REUMER, 1984 *D. hibbardi* (and specimens from Dranic-0 and Podari) differ in bulbous and from *D. kerkhoffi* REUMER, 1995 (DOUKAS et al. 1995) in larger and bulbous cusps on I_1 . From *D. kordosi* REUMER, 1984 and *D. reumeri* RZEBIK-KOWALSKA, 1990 our specimens differ also in smaller size, less bulbous cusps and the presence of cingulum in I_1 , and from *D. insperata* RZEBIK-KOWALSKA, 1990 in the presence of cingulum in I_1 . It is impossible to compare Romanian specimens with *D. fallax* (HELLER, 1936) because I_1 of the last species is so far unknown.

D. hibbardi first appeared in Europe in the Early Pliocene (MN15) and disappeared in the Early Pleistocene (the only Early Pleistocene locality is Deutsch-Altensburg 21 in Austria, RZEBIK-KOWALSKA 1998). During this period it was present in several European countries, such as

Spain, France, Italy, Switzerland, Germany, Poland, Slovakia, Hungary, and Austria (RZEBIK-KOWALSKA 1998, DAHLMANN 2001). So far it has not been listed from Romania.

Deinsdorfia cf. *kordosi* REUMER, 1984

M a t e r i a l. Dranic-3. Fragment of mandible with small proximal fragment of I_1 and $A_1 - M_1$, without processes.

D e s c r i p t i o n. Only a small fragment of I_1 is preserved but it is clear that it has no cingulum. A_1 is long and slightly inflated. P_4 is large, two-cusped and fairly bulbous. Its postero-lingual basin is short and shallow, but another deeper depression is present in the postero-buccal side of the tooth. M_1 is large and extremely bulbous, with a low and open trigonid valley and its paraconid situated far forward. Its talonid is very short and the entoconid crest not very high. The hypolophid is present. The cingula of all teeth are wide but flat.

M e a s u r e m e n t s. $A_1 - L$ (bucc.) = 1.06 mm, $P_4 - W$ = 0.96 mm, $M_1 - L$ = 1.69 mm, W = 1.05 mm.

S y s t e m a t i c p o s i t i o n a n d d i s t r i b u t i o n. Exoedaenodont teeth, I_1 with bulbous cusps, M_1 with low and open trigonid valley, the paraconid situated far forward and very short talonid allow the Dranic-3 specimen to be identified as belonging to the genus *Deinsdorfia*. The large size and the lack of cingulum in I_1 suggest that it should belong to a large species of *Deinsdorfia*, *D. kordosi* REUMER, 1984 or *D. reumeri* RZEBIK-KOWALSKA, 1990. It differs, however, from *D. reumeri* in its larger size (e.g. in *D. reumeri* from Podlesice, Poland L of M_1 = 1.46 mm - 1.58 mm, n = 17 and W = 0.92 mm - 1.02 mm, n = 15, RZEBIK-KOWALSKA 1990a), in a larger, but less bulbous P_4 (because of the postero-buccal depression), and a more inflated M_1 . From *D. kordosi* the Romanian specimen differs in the position of I_1 , (the tooth does not buccally reach the paraconid of M_1 , only the end of P_4) and in the morphology of P_4 (presence of the postero-buccal depression). As its size is closer to the size of *D. kordosi* [e.g. in *D. kordosi* from Csarnota 2 (REUMER 1984) L of M_1 = 1.53 mm - 1.81 mm, W = 0.82 mm - 1.02 mm] than to *D. reumeri*, and as their geological age is the same (MN15, MN16) (*D. reumeri* MN14), the specimen from Romania was tentatively classified as *D. cf. kordosi*.

D. kordosi was described from the Hungarian locality Csarnota 2, dated to the Early Pliocene, MN15. It was also cited by POPOV (1994) from Muselievo in Bulgaria and by DAHLMANN (2001) from Wölfersheim in Germany (both MN15) and as *D. cf. kordosi* from Weże 1 (MN15) and Rębielice Królewskie 1A (MN16) in Poland (RZEBIK-KOWALSKA 1998).

The mandible from Dranic-3 was already listed in the work of RĂDULESCU et al. (1993, 1997) as *D. cf. kordosi*. The presence of *D. cf. kordosi* in Dranic-2 (mentioned in the same papers of RĂDULESCU et al. 1993, 1997) has not been confirmed.

More material (especially upper dentition and processes of the mandible) is needed to explain the specific position of the Dranic-3 specimen. It is not improbable that it belongs to a new species of *Deinsdorfia*.

Deinsdorfia sp.

M a t e r i a l. Dranic-2. Fragment of I_1 without apex and the most distal cusp.

D e s c r i p t i o n. I_1 is characterized by distinct and bulbous cusps and distinct buccal and lingual cingula.

M e a s u r e m e n t s. $I_1 - W$ (bucc.) = 1.09 mm.

S y s t e m a t i c p o s i t i o n. The lower incisor, I_1 , from Dranic-2 was listed by RĂDULESCU et al. in 1993 as belonging to *D. cf. kordosi*. However, this large tooth of *Deinsdorfia* is characterized by a clearly marked cingulum, which is absent in I_1 of the two largest species of *Deinsdorfia*, *D. reumeri* and *D. kordosi*. All remaining species of *Deinsdorfia* (*D. hibbardi*, *D. kerkhoffi*, *D. janossyi*) with I_1 having cingulum, are much smaller than the tooth from Dranic-2. The

I₁ of *D. fallax* (HELLER, 1936) is lacking, but concluding from other dimensions the species was also smaller. Without more material the specific position of *Deinsdorfia* from Dranic-2 cannot be fixed.

Tribe Beremendiini REUMER, 1984

Genus *Beremendia* KORMOS, 1930

Beremendia fissidens (PETÉNYI, 1864)

M a t e r i a l. Dranic-0. One fragment of I₁ (without apex); Podari. One M², two M₂ (one damaged in its lingual part) and two M₃, one toothless fragment of mandible, MNI = 2; Slatina 2. One I¹ (damaged); Izworu 2. One M¹ (metastyle damaged), and one M², MNI = 1.

D e s c r i p t i o n. For a detailed description see RZEBIK-KOWALSKA 1976, and REUMER, 1984.

M e a s u r e m e n t s. See Table I.

Table I

Beremendia fissidens (PETÉNYI, 1864). Dimensions of upper and lower dentition in mm.

		Dranic-0	Podari	Izworu-2
M ¹	L	–	–	2.57*
	W (med.)	–	–	2.09
	W	–	–	2.71
M ²	L	–	2.11	2.18
	W (med.)	–	1.76	1.85
	W	–	2.60	2.66
I ₁	L (bucc.)	*	–	–
	W (bucc.)	1.16	–	–
M ₂	L	*	2.28, 2.27	–
	W	–	1.36*, 1.38	–
M ₃	L	–	1.78, 1.62	–
	W	–	1.02, 0.89	–
H of mandible below M ₂		–	2.83	–

S y s t e m a t i c p o s i t i o n a n d d i s t r i b u t i o n. As seen above, the material is very limited but the measurements and morphology lie in the range of variation of *B. fissidens* from other European populations (RZEBIK-KOWALSKA 1976, REUMER 1984, and RZEBIK-KOWALSKA 2000a). Two lower molars, M₃, from Podari differ in reduction of their talonids, but this tooth (besides I¹, P⁴ and I₁) belonged to the most variable teeth of this species.

For the first time, *B. fissidens* appeared in Europe (Hungary and Poland) in the Early Pliocene (MN14) and a little later (MN15) in Asia (Russia, in West Siberia, STORCH et al. 1998). It was an ubiquitous species and survived until the beginning of the Middle Pleistocene in changing climatic and environmental conditions. It is known from more than 100 fossil localities (RZEBIK-KOWALSKA 1998).

In Romania *B. fissidens* was already listed from the Late Pliocene (MN16) of Podari (RĂDULESCU et al. 1993, 1995) and Slatina-2 (MN17) (RĂDULESCU and SAMSON 1987), from the Early Pleistocene of Izvoru 2 (FERU et al. 1978), Ursilor Cave (TERZEA 1983), Betfia XIII, X, XI, IX, VII/1, VII/2, V and VII/3 (RZEBIK-KOWALSKA 2000a), and from the Middle Pleistocene of Gesprengberg Cave (TERZEA 1983) and Betfia VII/4 (RZEBIK-KOWALSKA 2000a).

Tribe Blarinini KRETZOI, 1965

Genus *Blarinoides* SULIMSKI, 1959*Blarinoides mariae* SULIMSKI, 1959

M a t e r i a l. Dranic-0. One fragment of maxilla with P⁴-M¹, one M¹ and one M₃, MNI = 1; Dranic-3. One M¹ and one M₁, MNI = 1; Podari. Two I¹ (one apex only), two M¹ (one with damaged metastyle), one M², one I₁ (damaged in its proximal part), one P₄, one M₁, one fragment of M₂, one M₃ and one fragment of mandible with condyloid process and alveoli of M₁-M₃. MNI = 2;

D e s c r i p t i o n o f t h e m a t e r i a l. A detailed description is given in SULIMSKI (1959, 1962) and RZEBIK-KOWALSKA (1976).

M e a s u r e m e n t s. See Table II.

Table II

Blarinoides mariae SULIMSKI, 1959. Dimensions of upper and lower dentition in mm

		Dranic-0	Dranic-3	Podari
I ¹	L (bucc.)	—	—	3.84
	L of talon (bucc.)	—	—	1.74
	W (bucc.)	—	—	2.22
P ⁴	L (bucc.)	2.45	—	—
M ¹	L	2.11, 2.05	2.15	2.11
	L (med.)	1.89, 1.82	1.85	1.95, 1.85
	W	2.39, 2.25	2.31	2.58
M ²	L	—	—	1.80
	L (med.)	—	—	1.52
	W	—	—	2.50
I ₁	L (bucc.)	—	—	—
	W (bucc.)	—	—	1.53*
P ₄	W	—	—	1.33
M ₁	L	—	2.30	2.48
	W	—	1.63	1.61
M ₃	L	1.35	—	1.28
	W	—	—	0.79
H of mandible below M ₂		—	2.30	2.77
H of condyloid process		—	—	3.70

S y s t e m a t i c p o s i t i o n a n d d i s t r i b u t i o n. The morphology and dimensions of Romanian specimens agree with specimens of other European populations, only one I¹ from Podari being slightly longer (the longest known I¹ originates from Rebielice Królewskie, Poland, and its length = 3.51 mm, RZEBIK-KOWALSKA 1976).

B. mariae lived in Europe from Spain to Russia and from the Early Pliocene to the Early Pleistocene (RZEBIK-KOWALSKA 1998), but it was much less common than *Beremendia fissidens*, contemporaneous in time and similar in size. So far it has not been found in Asia. In Romania it was listed from the Early Pliocene (MN15) at Dranic-0 (RĂDULESCU et al. 1995, 1997) and Dranic-3 (RĂDULESCU et al. 1993, 1997), from the Late Pliocene (MN16) at Debren 1 (RĂDULESCU and SAMSON 1984) and Podari (RĂDULESCU et al. 1995), and from the Early Pleistocene at Betfia XIII (RZEBIK-KOWALSKA 2000a).

? *Blarinoidea* n. sp.

M a t e r i a l. Dranic-1. Two lower I_1 (one with damaged apex), MNI = 1.

D e s c r i p t i o n. The long and massive lower incisor I_1 is characterized by the presence of a wide, turned up apex, and three cusps on its cutting edge. The first cusp is long and flat, the second one the highest, and the last one very small. The crown of the tooth narrows towards the root and its proximal end is pointed. The lingual side of the crown is smooth. The cingulum is fairly wide.

M e a s u r e m e n t s. I_1 . No. 1. – L (bucc.) = 5.77 mm, W (bucc.) = 1.29 mm; no. 2 – W (bucc.) = 1.29*.

S y s t e m a t i c p o s i t i o n. In general, both teeth recall the first lower incisor, I_1 , of *Blarinoidea mariae*, although they are smaller and their last cusp is also much smaller. The length of I_1 of *B. mariae* from Csarnota 2 in Hungary, which are the shortest, amounts to 6.48 mm - 7.53 mm, n = 18 (REUMER 1984). In Poland, where this species lived from the Early Pliocene to the Early Pleistocene and has been found in seven localities, I_1 is longer and amounts to 6.62 mm - 8.24 mm, n = 23 (RZEBIK-KOWALSKA 1976).

The comparison of both I_1 from Dranic-1 with medium size Soricinae species of *Mafia*, *Sulimskia*, and *Sorex* (*Drepanosorex*) showed that they are different in morphology and much longer than the last ones.

Perhaps first lower incisors from Dranic-1 belonged to another *Blarinoidea* species, similar in morphology, but smaller in size. Small forms of *Blarinoidea* have been mentioned in literature, e.g. by CROCHET (1986) from Terrats in France (MN14) and by DAHLMANN (2001) from Wölfersheim in Germany (MN15). Such a couple of species (morphologically identical, but different in size) appeared already in the Pliocene of Europe and Asia e.g. as *Beremendia fissidens* and *B. minor* RZEBIK-KOWALSKA, 1976. Only additional material could help in this question.

Mafia REUMER, 1984

Mafia cf. *csarnotensis* REUMER, 1984

D r a n i c - 2 . One first lower molar, M_1 ; Podari. One fragment of mandible with condyloid process (the upper facet broken).

D e s c r i p t i o n. The M_1 has the entoconid placed close to the metaconid, the entoconid crest absent and the hypoconid conical. The hypolophid is present and the groove between the hypolophid and the entoconid is relatively broad. The buccal cingulum is broad and protruding, widest below the protoconid, and the lingual one is weak. The condyle has a broad interarticular area and the lower facet short and high. The two facets are nearly parallel.

M e a s u r e m e n t s. Dranic-2. M_1 – L = 1.75 mm, W = 1.02 mm; Podari. H of condyloid process = 2.00* mm, W of interarticular area = 0.91 mm.

S y s t e m a t i c p o s i t i o n a n d d i s t r i b u t i o n. Although the material is very poor and most diagnostic characters are lacking, the morphology and size of above described specimens do not differ much from these characters found in *Mafia csarnotensis* described from Csarnota 2 (REUMER 1984).

Besides the Late Pliocene (MN16) Csarnota 2 in Hungary, *M. csarnotensis* was also found in an older (MN15) locality Muselievo in Bulgaria (POPOV 1994). As *M. cf. csarnotensis*, it was also mentioned from four Pliocene (MN14 - MN16) localities of Poland (RZEBIK-KOWALSKA 1990b). It is the first record of this species in Romania.

Blarinellini REUMER 1998

Petenya KORMOS, 1934*Petenya hungarica* KORMOS, 1934

M a t e r i a l. Dranic-1. One I¹ with worn talon and apex; Izworu 2. One fragment of mandible with M₁-M₂.

D e s c r i p t i o n. The original description is to be found in the work of KORMOS (1934) and additional detailed description in REUMER (1984).

M e a s u r e m e n t s. Dranic-1. I¹ - L = 2.15* mm, L of talon (bucc.) = 1.24 mm, H of talon (bucc.) = 1.17* mm; Izworu-2. M₁ - L = 1.51 mm, W = 1.03 mm, M₂ - L = 1.36 mm, W = 0.95 mm, H of mandible below M₂ = 1.75 mm.

S y s t e m a t i c p o s i t i o n a n d d i s t r i b u t i o n. The morphology and size of the above listed specimens agree with these characters in *P. hungarica* KORMOS, 1934 from other European populations. The I¹ from Dranic-1 seems to be a little smaller than corresponding incisors from Csarnota 2 in Hungary (which are probably the smallest of all specimens known so far (L 2.16 mm - 2.46 mm, L of talon 1.07 mm - 1.24 mm, H of talon 1.25 mm - 1.51 mm (n = 7) (REUMER 1984), but it is slightly worn.

P. hungarica was described from Villany 3 in Hungary, a locality dated to the Late Pliocene (MN17) (KORMOS 1934). Later on it was found in more than 50 European localities (from France to Greece) dated from the Miocene/Pliocene boundary (MN13/MN14) to the Early Pleistocene.

In Romania *P. hungarica* was already listed from Izworu 2 (FERU et al. 1978), Ursilor Cave (TERZEA 1983) and Betfia XIII, X, XI, IX and VII/1 (RZEBIK-KOWALSKA 2000a), localities dated to the early Pleistocene. Dranic-1 is the oldest locality (Early Pliocene, MN15), where *P. hungarica* has so far been found in Romania.

Tribe Neomyini MATSCHIE, 1909

Genus *Asoriculus* KRETZOI, 1959*Asoriculus gibberodon* (PETÉNYI, 1864)

M a t e r i a l. Dranic-0. One lower molar, probably M₁; Dranic-2. One fragment of mandible with alveoli of M₂-M₃ and talonid of M₁ (without processes); Dranic-3. One lower molar, probably M₂.

D e s c r i p t i o n. The detailed description of *Asoriculus gibberodon* is given in REUMER 1984.

M e a s u r e m e n t s. Dranic-0. ?M₁. L = 1.39 mm, W = 0.91 mm; Dranic-3. ?M₂ - L = 1.38 mm, W = 0.86 mm.

S y s t e m a t i c p o s i t i o n a n d d i s t r i b u t i o n. The morphology of the mandible and molars fit the morphology of respective elements in *A. gibberodon*. Also their size lies in the range of variation of the latter species. It is, however, difficult to say which molar (M₁ or M₂) is present in particular localities. They are morphologically identical in *A. gibberodon* and only M₂ is smaller than M₁. Dimensions of M₁ and M₂ from similar in time (MN15) Csarnota 2 and Osztramos 7 in Hungary are respectively: M₁ - L 1.39 mm - 1.81 mm, W 0.80 mm - 1.02 mm (n=182) and M₂ - L 1.27 mm - 1.63 mm, W 0.71 mm - 0.92 mm (n=194). The teeth from Dranic-0 and Dranic-3 fall within the range of variation of them both. As the tooth from Dranic-0 is more massive, the suggestion is that this is probably M₁, and that from Dranic-3, M₂.

A. gibberodon was described by PETÉNYI (1864) from Beremend (?1-3, JÁNOSY 1986) in Hungary as *Crocidura gibberodon*. Until 1994 this species was placed in the genus *Episoriculus* ELLERMANN and MORRISON-SCOTT, 1951. HUTTERER proved that the fossil species known from Europe under the name of *Episoriculus* were not congeneric with the living *Soriculus* (*Episoricu-*

lus) and transferred them to the genus *Asoriculus*. The oldest remains of *A. gibberodon* come from Maramena in Greece, a locality dated to the Miocene/Pliocene boundary (DOUKAS et al. 1995). *A. aff. gibberodon* was also listed from an older, Late Miocene (MN13) locality in Italy (DE GIULI 1989). In Europe, *A. gibberodon*, very numerous during the Pliocene, disappeared in the Early Pleistocene. It was also found in Asia Minor, in three Early Pliocene localities of Turkey (STORCH et al. 1998).

In Romania, *A. cf. soriculus* was already listed from the end of the Early Pliocene (MN15) of Dranic-2 (RĂDULESCU et al. 1997) and *A. soriculus* from the Early Pleistocene of Betfia XIII, X, XI, IX and VII/1 (RZEBIK-KOWALSKA 2000a).

Soricinae gen. at spec. indet.

M a t e r i a l. Izworu 2. Most probably the first lower molar, M_1 .

Description. The tooth is very small and wide. It is very characteristic in its extremely small entoconid and lack of the entoconid crest. Its metaconid and protoconid are situated far from one another. The vestigial entoconid and the hypolophid are separated by a groove. The trigonid valley is profound and opens at the level of the lingual cingulum, but the buccal re-entrant valley does not reach the buccal cingulum. The anterior cingulum is wide and protruding, the buccal one straight and very narrow but widens in the postero-buccal corner of the tooth. The posterior cingulum is also narrow and the lingual one is wide but flat.

M e a s u r e m e n t s. ? $M_1 - L = 1.03$ mm, $W = 0.72$ mm.

S y s t e m a t i c p o s i t i o n. The size of the tooth lies in the range of variation of *S. minutus* and *S. minutissimus* ZIMMERMANN, 1780 M_1 , but its morphology is quite different. Lower molars of above-mentioned species have large entoconids and high entoconid crests, while the tooth from Izworu 2 has these elements vestigial or even absent. Such a type of molars (without entoconids and entoconid crests) is present in the species of *Paenelimnoecus* BAUDELOT, 1972, similar in size to *S. minutus* and *S. minutissimus*. However, in contrast to the above-described tooth, *Paenelimnoecus* molars have narrower trigonids, their metaconids and protoconids are situated close together, particularly in M_1 , the trigonid valleys are shallow and open at some distance above the cingulum, the lower lingual borders of molars are navicular in shape and their cingula are less protruding. Moreover, *Paenelimnoecus* species disappeared from Europe at the beginning of the Late Pliocene (MN16) and the locality Izworu 2 is dated to the Early Pleistocene (Q_1). More material is needed to identify this form of shrew.

Family Talpidae FISCHER VON WALDHEIM, 1817

Subfamily Talpinae FISCHER VON WALDHEIM, 1817

Tribe Talpini FISCHER VON WALDHEIM, 1817

Talpa sp.

M a t e r i a l. Dranic-3. One M^2 ; Podari. One proximal fragment of humerus and 1 fragment (trigonid) of M_3 , MNI = 1.

Description of the material. The teeth and the fragment of humerus do not differ morphologically from the recent *T. europaea* LINNAEUS, 1758, but they are smaller.

M e a s u r e m e n t s. Dranic-3. $M^2 - L = 2.02$ mm, $W = 2.04$ mm.

S y s t e m a t i c p o s i t i o n. The small size and morphology indicate that the specimens mentioned above could be included to *T. minor* FREUDENBERG, 1914 (= *T. gracilis* KORMOS, 1930) described from Hundsheim in Austria, locality dated to the Middle Pleistocene. In Europe, this mole inhabited a wide area, from England and Germany to Italy and Romania, and from the Early Pliocene to the beginning of the Middle Pleistocene (RZEBIK-KOWALSKA 2000b).

Another small fossil mole, *T. neagui* RĂDULESCU and SAMSON, 1989, which could be taken into consideration as present in Dranic-3 and Podari is known only from Romania. It has been described from the Early Pliocene (late phase of MN14) of Berești and then found in a second Romanian locality Mălușteni, dated to MN15a.

The difference between *T. minor* and *T. neagui* exist in the humerus diaphysis, which is wider in the latter species. According to RĂDULESCU and SAMSON (1989), specimens from the Early Pliocene localities of Europe described as *T. minor* could belong to *T. neagui*. As the holotype of *T. neagui* is humerus and its teeth are so far unknown, its comparison with small moles from Dranic-3 and Podari is impossible. Unique humerus present in Podari is broken in its central part and only the proximal part is present.

As the specimens from Dranic-3, and especially those from Podari, are geologically younger and all very badly represented, their specific identification must, for the time being, remain unknown.

Talpa fossilis PETÉNYI, 1864

M a t e r i a l. Slatina-2. One lower molar M_2 , broken between trigonid and talonid and stuck together, and one radius, MNI = 1.

D e s c r i p t i o n o f t h e m a t e r i a l. The tooth and radius belong to a large mole, whose size and morphology is comparable with those in the recent mole, *Talpa europaea* LINNAEUS, 1758.

M e a s u r e m e n t s. Slatina-2. $M_2 - L = 2.03 \text{ mm}^*$, $W = 1.36 \text{ mm}^*$.

S y s t e m a t i c p o s i t i o n a n d d i s t r i b u t i o n. The characters of tooth and radius as well as their size indicate that they belong to the recent mole, *T. europaea*. According to several authors (see RZEBIK-KOWALSKA 2000b), *T. europaea*, *T. praeglacialis* KORMOS, 1930 and *T. fossilis* as similar in size and morphology should be considered as one species. The name *T. fossilis* (= *T. praeglacialis*) should be used only as that of a chronospecies for older forms.

The presence in Slatina-2 of other fossil European species, such as *T. stromeri* BRUNNER, 1950 and *T. csarnotana* KRETZOI, 1959 can rather be excluded. *T. stromeri* had its molar cusps curved posteriorly and *T. csarnotana*, according to SULIMSKI (1962), differs from *T. fossilis* (and *T. europaea*) in the structure of the teeth.

T. fossilis was present in Europe in some of the Early Pliocene and many Early to Middle Pleistocene localities, among them at Betfia XIII, IX, VII/1, V, and VII/3 in Romania (see RZEBIK-KOWALSKA 2000b). Its presence in the Late Pliocene (MN17) Slatina-2 was to be expected.

Subfamily Talpinae FISCHER VON WALDHEIM, 1817 incertae sedis

Desmanella ENGESSER, 1972

Desmanella cf. *woelfersheimensis* DAHLMANN, 200

M a t e r i a l. Dranic-0. One upper molar, M^1 , buccally damaged, two isolated lower molars M_2 and one worn M_2 with a fragment of the mandible, MNI = 3; Dranic-1. Two lower molars (M_2 with the fragment of mandible and M_3), MNI = 1; Dranic-3. One upper molar M^3 ; Podari. One buccally damaged and worn upper molar, M^2 .

D e s c r i p t i o n. M^1 is damaged in its buccal side. Its lingual side is square and massive. It consists of three cusps forming a more or less pronounced crest. The largest cusp is the protocone, the protoconule and metaconule also being distinct. Between the protocone and metaconule, at their base, there is a shelf surrounded by a cingulum. A smaller shelf is situated between the protoconule and protocone. The plane between metacone and metaconule in the posterior side is small. The posterior emargination is only slightly concave. The wide cingula run on the anterior wall from protoconule and on the posterior wall from postero-lingual corner, both to the buccal side.

M^2 is also damaged in its buccal side. The tooth and its three lingual cusps (protoconule, protocone, and metaconule) are massive. The largest of them is protocone, the smallest the protoconule. The valley between protocone and metaconule on the lingual side is shallow and the shelf almost absent. Also absent is the lingual cingulum. The anterior and posterior cingula are present. The posterior one is wider than the anterior. There is only a small plate between the metacone and metaconule on the posterior side of the tooth.

M^3 is worn. The outline of its occlusal surface is sub-triangular. It is characterized by the parastyle curved anteriorly and the protoconul incorporated in protocone. Its small metaconule is separated from the protocone by a wide valley. The anterior cingulum is large but does not reach the buccal side.

Lower M_2 is sub-rectangular in the occlusal view. The oblique crest ends near the lingual side of the tooth. The re-entrant valley is very wide and reaches the cingulum. A cingulum runs uninterrupted along the anterior, buccal, and posterior sides. It is also present in the antero-lingual side, under a trigonid valley. Under the re-entrant valley the cingulum is provided with a bulge. The entostylid is present.

M_3 has the oblique crest ending as in M_2 . Its distinct cingulum continues along the anterior, buccal, and posterior sides, but on the lingual side a less distinct one is also visible.

M e a s u r e m e n t s. Dranic-0. $M^1 - L = 1.48^* \text{ mm}$, $W = 1.57^* \text{ mm}$; $M_2 - \text{No. 1} - L = 1.64 \text{ mm}$, $W = 1.13 \text{ mm}$; no. 2 - $L = 1.55^* \text{ mm}$, $W = 1.13^* \text{ mm}$; no. 3 - $L = 1.68 \text{ mm}$, $W = 1.25 \text{ mm}$.

Dranic-1. $M_2 - L = 1.59 \text{ mm}$, $W = 1.19 \text{ mm}$; $M_3 - L = 1.31 \text{ mm}$, $W = 0.76 \text{ mm}$.

Dranic-3. $M^3 - L = 0.97 \text{ mm}$, $W = 1.35 \text{ mm}$.

Podari. $M^2 - W (\text{ling.}) = 1.36 \text{ mm}$.

S y s t e m a t i c p o s i t i o n. Although the material is very limited and the teeth are mostly damaged and worn, their morphology (the quadrate lingual side of upper molars with 3 cusps forming a more or less continuing crest, lower molars short and wide with very large buccal cingulum) and size smaller than in all Desmaninae allow their identification as *Desmanella* ENGESSER, 1972.

This genus, whose systematic position within Talpidae is still not well understood (it was successively included into the Desmaninae and Uropsilinae, see ZIEGLER 1999) appeared in the Late Oligocene (*Desmanella* n. sp., ZIEGLER 1998) and survived to the Late Pliocene (MN16, CROCHET 1986). From Europe and Asia 12 named species of *Desmanella* [*D. engesseri*, ZIEGLER, 1985 (Petersbuch 2/D, Germany, MN4), *D. fejfari* GIBERT, 1975 (Rubielos de Mora II, Spain, MN4), *D. sickenbergi* ENGESSER, 1980 (Sari Çay, Turkey, MN7+8), *D. storchi* QIU, 1996 (Moergen II, China MN7+8), *D. cingulata* ENGESSER, 1980 (Eskihisar, Turkey, MN7+8), *D. stehlini* ENGESSER, 1972 (Anvil, Switzerland, MN8), *D. riet-scheli* STORCH and DAHLMANN, 2000 (Dorn-Dürkheim I, Germany, MN11), *D. crusafonti* RÜMKE, 1974 (Concud/ E, Spain, MN12), *D. dubia* RÜMKE, 1976 (Pikermi, Greece, MN12), *D. amasyae* ENGESSER, 1980 (Amasya, Turkey, MN13), *D. woelfersheimensis* DAHLMANN, 2001 (Wölfer-sheim, Germany, MN15) and *D. gardiolensis* CROCHET, 1986 (Balaruc/2F, France, MN16)] have been described so far. Most of them disappeared at the end of the Miocene. Only *D. dubia* survived until the Early Pliocene (MN14) and another two, *D. woelfersheimensis* and *D. gardiolensis*, appeared in the Early (MN15) and Late (MN16) Pliocene respectively.

Among these three Pliocene species, *D. gardiolensis* is the largest. The dimensions of the Romanian specimens (from localities Dranic-0, Dranic-1, Dranic-3, and Podari) are smaller and they lie below minima of measurements of *D. gardiolensis*. On the other hand, they approximate the dimensions of both remaining species, *D. dubia* and *D. woelfersheimensis*, which are similar in size.

As the buccal side of upper molar, M^1 , from Dranic-0 is damaged, its morphology (the presence or absence of the buccal cingulum and the parastyle, the state of the division of the mesostyle and the length ratio of the buccal/ lingual sides) remains unknown, and its identification with one of the Pliocene (or the Miocene) species is very difficult. The lingual side differs from typical *D. dubia* in its massiveness (because of the large protocone, metaconule, and protoconule) and its larger shelf

between protocone and metaconule. It is, however, similar in these features to *D. dubia* described from Maramena (DOUKAS et al. 1995) and to *D. woelfersheimensis* from Wölfersheim (DAHLMANN 2001). From *D. gardiolensis*, besides smaller size, the M^1 described above from Dranic-0 differs in having a much smaller plate situated in its posterior side, between the metacone and the metaconule.

Upper molar M^2 , from Podari is also damaged in its buccal side. Its lingual side, although robust with massive cusps as in *D. gardiolensis* and *D. woelfersheimensis*, differs from *D. gardiolensis* in having only a small plane in its posterior side, between the metacone and the metaconule. In this character, the M^2 from Podari is more similar to *D. woelfersheimensis* and *D. dubia* from Maramena, although in contrast with the Podari tooth the latter has more marked cingulum on its lingual side.

M^3 from Dranic-3, with its small metaconule separated by a wide valley from the protocone and with its large anterior cingulum, which does not reach the buccal side but ends at 3/4 of it, again recalls M^3 of *D. woelfersheimensis*. The typical *D. dubia* as well as that described from Maramena have their metaconule larger and their anterior cingula continuing to the end of the parastyle. As concerns M^3 of *D. gardiolensis*, CROCHET (1986) writes only that its cusps were relatively less marked than in M^1 and M^2 , the metastyle was lacking, and only the anterior cingulum was well developed. The tooth is, however, larger than that from Dranic-3.

The lower molars, M_2 and M_3 , from Dranic-0 and Dranic-1 differ from these teeth in *D. dubia* by having distinct cingulum on the lingual side of their trigonids (in typical *D. dubia* the lingual cingulum is lacking) and from *D. gardiolensis* by the lack of cingulum below the talonid (in *D. gardiolensis* lingual cingulum is present, although it narrows below the talonid). In this feature lower molars are again similar to *D. dubia* described from Maramena and to *D. woelfersheimensis*, where lingual cingulum is present under the trigonid valley.

The above comparisons indicate that the teeth from four Romanian localities differ to some degree from *Desmanella* species living in Europe in the Early and Late Pliocene. The material described above being very limited and its individual variation, as well as the variation within the most particular species of *Desmanella* not well known so far (although it is significant e.g. in the case of differences between *D. dubia* from Pikermi and Maramena), their specific identification is difficult. It seems, however, that they are the most similar to *D. woelfersheimensis* described from Wölfersheim in Germany (DAHLMANN 2001), a locality of the same age (MN15) as Dranic-0 and Dranic-1. In some characters they also recall specimens described as *D. dubia* from the Greek locality Maramena dated to the Turolian/Ruscinian boundary. Although such diagnostic elements as the P^4 and the labial sides of M^1 and M^2 are unknown in the Romanian specimens, on the basis of the other above mentioned characters the material is tentatively included in *D. woelfersheimensis* DAHLMANN, 2001.

In Romania, *Desmanella* was already listed (as *Desmanella* sp.) from Dranic-0 and Dranic-1 (RĂDULESCU et al. 1995, 1997) and from Podari (RĂDULESCU et al. 1993).

Subfamily Desmaninae THOMAS, 1912

In the modern classification of the Desmaninae given by RÜMKE in 1985, confirmed by numerical taxonomical methods by VAN DEN HOEK OSTENDE et al. in 1989 and adopted by other authors, genera are distinguished on the basis of the overall size and the morphology of first upper and lower incisors (I^1 and I_1) and species by the absolute and particularly the relative length of six selected antemolars: upper C , P^2 and P^3 (P^2/P^3 ratio) and lower P_2 , P_3 (P_2/P_3 ratio) and P_4 . The morphological features of particular teeth are used very seldom. In this situation whole jaws or their large fragments with above-mentioned teeth are needed for correct specific identification. Unfortunately these teeth were mostly lacking in the material described in the present paper. If present, they were always isolated and only one tooth from needed pair was available. Comparatively frequent Desmaninae molars (as the largest and hardest elements in the material) are in all forms of Desmaninae very uniform and useless in specific identification. For this reason only some speculation (based on the overall size of all teeth present in the collection and their geological age) could be made. More material is needed to obtain knowledge of Desmaninae which lived in the Pliocene of Romania.

Ruemkelia RZEBIK-KOWALSKA and PAWŁOWSKI, 1994*Ruemkelia* sp.

M a t e r i a l. Dranic-0. One M^1 ; Dranic-1. One I_3 , one M_1 , MNI = 1; Dranic-2. One P^4 , two M^2 , one M_3 , MNI = 1; Dranic-3. One M_1 .

D e s c r i p t i o n o f t h e m a t e r i a l. The upper premolar P^4 is small and has sharp cusps. Its protocone is rather low and connected by a high ridge to the paracone. Its anterior extension is protruding and its parastyle small. The anterocrista is almost absent, the posterocrista sharp. The postero-lingual basin is long and deep. The cingulum surrounding the tooth is missing only in the basal side of the paracone. The metacone and metastyle are absent.

The upper M^1 is typical of all Desmaninae described by RÜMKE in 1985. It is characterized by medium protruding parastyle attached to the paracone by a medium-high ridge. It is devoid of cingular cusp between the protocone and the metaconule.

Two upper second molars, M^2 , are also typical of all Desmaninae. They have a cingular cusp between the protocone and the metaconule, but one tooth (no. 3) is larger and its metastyle is more distinct (having the shape of a cusp).

The lower incisor, I_3 , has a small crown and is rather low. The anterior margin of its crown slopes upwards. Its anterior side is wide and flat, the labial one narrow and slightly convex and the lingual one wide and flat in its anterior and concave in its posterior part, which makes the crown strongly asymmetrical. The sharp posterocrista and wide postero-lingual cingulum are present.

The first lower molars, M_1 , are morphologically identical in the two localities, although the tooth from Dranic-1 is smaller. Their oblique crest is long and ends near the tip of the metaconid. Clear ribs are visible in their talonid valley. There is a short cingulum at the base of the protoconid/hypoconid valley and the anterior cingulum shows a narrow stretch at some distance from the antero-lingual corner.

The last lower molar, M_3 , is similar to the first and second ones, but is the smallest and devoid of entostylid.

M e a s u r e m e n t s. See Table III.

Table III

Ruemkelia sp. Dimensions of upper and lower dentition (in mm)

		Dranic-0	Dranic-1	Dranic-2	Dranic-3
P^4	L	–	–	1.95	–
	w	–	–	1.75	–
M^1	L	2.85	–	–	–
	w	2.03	–	–	–
M^2	L	–	–	1.79, 2.02	–
	w	–	–	2.28, 2.39	–
I_3	L	–	1.07	–	–
	w	–	0.84	–	–
M_1	L	–	2.24	–	2.47
	w	–	1.76	–	1.88
M_3	L	–	–	1.59	–
	w	–	–	1.10	–

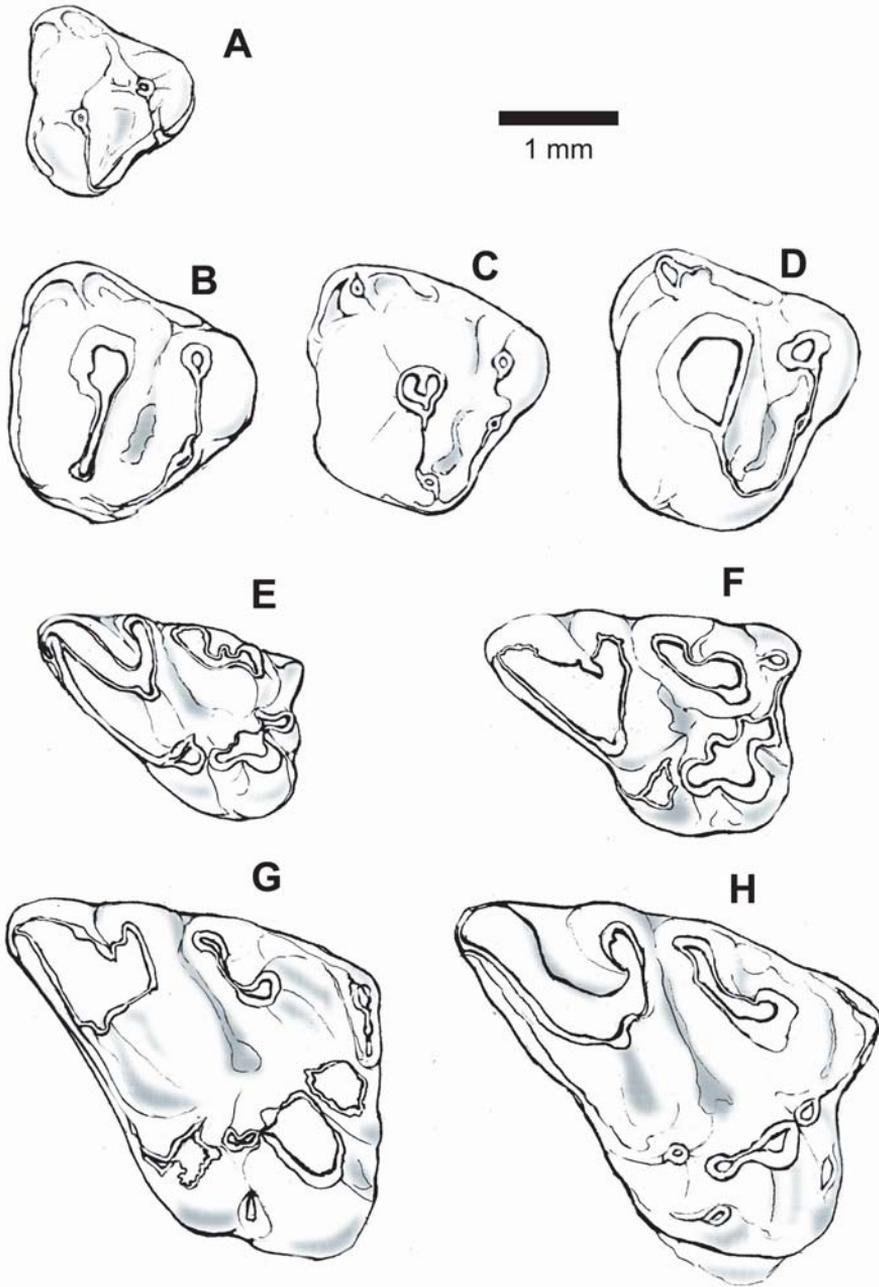


Fig. 2. *Ruemkelia* sp. Dranic-2. A – P⁴ dext., spec. No. 1; *Desmana* (large-sized). Dranic-0. B – P⁴ dext., spec. No. 2; Dranic-1. C – P⁴ dext., spec. No. 2; Dranic-2. D – P⁴ dext., spec. No. 1 (all occlusal view). *Ruemkelia* sp. Dranic-0. E – M¹ dext., spec. No. 1. *Galemys* sp. Slatina-1. F – M¹ dext., spec. No. 1. *Desmana* (large-sized). Valea Crișului. G – M¹ dext., spec. No. 1. *Desmana* (the largest-sized). Podari. H – M¹ dext., spec. No. 2 (all buccal view).

S y s t e m a t i c p o s i t i o n. The size of all above described teeth is small and comparable only with the dimensions of representatives of the genus *Ruemkelia*. This generic name replaced the name *Dibolia* established by RÜMKE (1985) for several small species of desmans characterized by “the peculiar two-lobed first upper incisor I¹”. Unfortunately *Dibolia* RÜMKE, 1985 turned out to be a junior homonym of *Dibolia* LATREILLE established by that author for Coleoptera species in 1829 (RZEBIK-KOWALSKA and PAWŁOWSKI 1994). Not all authors follow this correction. E.g. HUTTERER (1995) considers *Archaeodesmana* TOPACHEVSKI & PASHKOV, 1983 the correct generic name for *Dibolia* RÜMKE, 1985. This name is also used by DAHLMANN (2001).

So, far nine species of *Ruemkelia* have been described from Europe, six of which are known only from the Late Miocene, one, *R. dekkersi* (RÜMKE, 1985) described from Greece and found also in Spain and Poland, lived in the Late Miocene and Early Pliocene (Late Turolian and Early Ruscinian) and two others are known only from the Pliocene. There were: *R. brailloni* (RÜMKE, 1985) from the Early Pliocene (Late Ruscinian) of southern France and *R. bifida* (ENGESSER, 1980) described from Turkey and found also in Greece, Romania and perhaps Slovakia, in the Early and Late Pliocene (Early Ruscinian and Early Villanyan). Recently, DAHLMANN (2001) described new species of small Desmaninae with two-lobed I¹ and named it *Archaeodesmana acies*. It was found at Wölfersheim in Germany, a locality dated to the Late Ruscinian (MN15).

The teeth described above from Romania lie in the range of variation of the smallest *Ruemkelia* species, such as *R. dekkersi*, and slightly larger *R. bifida*, or in the range of variation of both species as well as in that of variation of *A. acies*. Concerning morphology, one antemolar, upper P⁴ from Dranic-2, whose dimensions are close to both species of *Ruemkelia* and to *A. acies*, does not greatly differ from these three species, although it is most similar to *R. bifida*. It is anteriorly elongated and its postero-lingual basin is deep and long. This elongation is visible in all compared species, although it seems to be slightly smaller in *A. acies* and in *R. dekkersi*. Some molars (M¹, M²), however, are too small to be included in *R. bifida* (although the variation of these teeth in *R. bifida* is far from being known, only 4 M¹ and 3 M² were found so far) and *A. acies*, and M² even too small for inclusion to *R. dekkersi*.

The presence of a small species of *Ruemkelia* had already been mentioned in Romania. It was described as *Desmana getica* TERZEA, 1980 from the Early Pliocene (Early Ruscinian) locality Ciurpereni. The species is known exclusively from its holotype, which consists of the mandible. In 1985 RÜMKE included it to *R. bifida* and in 1989 VAN DEN HOEK OSTENDE et al. to *R. dekkersi*.

Having such poor material it is difficult to say how many species of *Ruemkelia* lived in the Pliocene of Romania. Was there one species in all localities (Dranic-0, Dranic-1, Dranic-2, Dranic-3) or different species in particular localities? Were they already known or are they new? Without more material the position of the smallest Desmaninae from Dranic localities cannot be fixed.

Galemys sp.

M a t e r i a l. Dranic-X. One buccal fragment of M¹; Dranic-2. One buccal fragment of M²; Podari. One M²; Slatina-1. Two M¹, one P₄ slightly damaged at the base of its lingual and posterior part, one M₁ or M₂ damaged in its anterior and lingual part, one talon of M₃, and four fragments of toothless mandibles, MNI = 2.

D e s c r i p t i o n o f t h e m a t e r i a l. In general, upper molars are typical of all Desmaninae. The M¹ from Dranic-X is slightly larger than those from Slatina-1 and characterized by small, non-protruding parastyle separated from the paracone by a very shallow valley. It has deep emargination between two mesostyle arms. The two M¹ from Slatina-1 are slightly smaller and slender, their lingual side is wide, and their parastyle is more developed than in Dranic-X and attached to the paracone by a high ridge. The cingular cusp between protocone and metaconule is lacking.

Second upper molar, M^2 , from Podari is slightly smaller than that from Dranic-2. It has a cingular cusp between the protocone and the metaconule.

The occlusal outline of the lower P_4 from Slatina-1 is somewhat rectangular. Its paraconid is well developed. The protoconid is very massive, less convex in lingual and more in buccal, and slightly concave in posterior sides. As the tooth is damaged, the presence of metaconid, entoconid, hypoconid, and lingual and posterior cingula are questionable. The buccal cingulum is well developed and protruding.

? M_1 or ? M_2 (damaged on its lingual side) from Slatina-1 is characterized by the clear entostylid and the oblique crest ending near the metaconid tip. As it is damaged in its anterior corner it is difficult to determine whether the anterior cingulum widened before its end, as in M_2 , or showed a narrower stretch, as in M_1 .

The talonid of the lower M_3 from Slatina-1 is typical of lower molars, but it is devoid of the entostylid.

M e a s u r e m e n t s. See Table IV.

Table IV

Galemys sp. Dimensions of upper and lower dentition (in mm)

		Dranic-X	Dranic-2	Podari	Slatina-1
M^1	L	3.21	–	–	3.34, 3.09
	W	–	–	–	2.45, 2.40
M^2	L	–	2.35	2.27	–
	W	–	2.35*	2.64	–
P^4	L	–	–	–	1.88
	W	–	–	–	1.11
? M_1 or M_2	L	–	–	–	2.36*
	W	–	–	–	1.99*
M_3	W of talon	–	–	–	1.43
		–	–	–	–

S y s t e m a t i c p o s i t i o n. As mentioned above (see p. 14), the systematics of Desmaninae is based on antemolars, their size, and mutual proportions. Unfortunately there is only one antemolar, lower P_4 , in the material. Its size and morphology [“heavy paraconid, wide talonid basin moderately deep” (RÜMKE 1985)] are most similar to the P_4 of *Galemys kormosi* (SCHREUDER, 1940). Upper and lower molars are typical of all Desmaninae and it is difficult to say whether small differences, e.g. in morphology of M^1 from Dranic-X (small parastyle) and from Slatina-1 (one with moderately developed and one with protruding parastyle) demonstrate only individual variation in one species or belong to different species. Such differences were present, e.g., in two Spanish populations of *Ruemkelia brailloni* (RÜMKE, 1985) from Orrios and Gorafe 2. Their first lower molars, M^1 , presented two morphotypes: with very protruding parastyle in Orrios, and with a very small one in Gorafe 2 (see RÜMKE, 1985, p. 53).

The above measurements of the described molars lie in the range of variation of *G. kormosi*, *G. sulimskii* RÜMKE, 1985 or even the smallest *Desmana*, *D. verestchagini* TOPACHEVSKY, 1961. The last species, however, is older, dated to the Early Ruscinian (MN14), whereas the specimens from Romania are dated from the middle of MN15 to MN17.

So far RĂDULESCU et al. 1993 guided probably by the age of their localities, listed *G. sulimskii* from Dranic-2 (MN15) and *G. kormosi* from Podari (MN16). The first species was described from Weże 1 in Poland, locality dated to MN15 while the second one was found in Beremend 4 (MN16) and in other MN16 localities. This solution is possible, but the accessible material does not allow a definitive decision with regard to the specific membership of the specimens described above and probably only generic identification is accurate.

Desmana (medium-sized)

M a t e r i a l. Cherleştii Moşteni. Three M₁, one of them damaged in its antero-buccal part, MNI = 2.

D e s c r i p t i o n o f t h e m a t e r i a l. Teeth typical of first lower molars of the Desmaninae with oblique crest ending near the tip of the metaconid, clear cingulum between the protoconid and the hypoconid, and clear ribs in the talonid valley.

M e a s u r e m e n t s. No. 1 – L 3.06 mm, W 2.34 mm; no. 2 – L 3.01 mm, W 2.39 mm; no.3 – W 2.10* mm.

S y s t e m a t i c p o s i t i o n. As mentioned above, lower molars are of no use in the specific identification of the Desmaninae. However, the dimensions of teeth from Cherleştii Moşteni lie in the range of variation of the medium-size species of the genus *Desmana* such as *D. kowalskae* RÜMKE, 1985, *D. nehringi* KORMOS, 1913 and *D. amutriensis* RĂDULESCU, SAMSON and ŞTIUCĂ, 1989. Also some species of *Desmana* described from the Pliocene of Ukraine (e.g. *D. jalpugensis* PASHKOV and TOPACHEVSKY, 1990 and *D. kujalnikensis* PASHKOV and TOPACHEVSKY, 1990) as similar in size to *D. nehringi* could be taken into consideration in the identification of molars from Charleştii Moşteni.

D. amutriensis was described from the Early Pliocene (Late Ruscinian, MN15) of the Romanian locality Lupoaia Quarry (RĂDULESCU et al, 1992) and then found also in two older (Early Ruscinian, MN14) localities, Bereşti and Măluşteni. Lately DAHLMANN (2001) cited *D. cf. amutriensis* from the Late Ruscinian (MN15) locality Wölfersheim in Germany. *D. kowalskae* is known so far only from its type locality Weże 1 in Poland, dated to the Late Ruscinian (MN15) (RÜMKE 1985). As concerns the Ukrainian species, *D. jalpugensis* is also known only from its type locality Kotlovina, and *D. kujalnikensis* from Cherevichnoje near Odessa and Kryzhanovka. All three localities are dated to the Late Pliocene (MN16) (PASHKOV and TOPACHEVSKY 1990). *D. nehringi* had the widest range in space and time. It was described at Beremend 1-3 (MN16b) in Hungary (KORMOS 1913) and was also found in other Hungarian localities such as Villany 3 and 5, (MN17) as well as in Poland and Slovakia (MN16) (RÜMKE 1985). FERU et al. 1978 already listed *D. nehringi* from Cherleştii Moşteni. Its presence in this locality is very probable because, as seen above, the species lived at the same time in the vicinity of Romania, e.g. in Hungary and Slovakia. However, the presence of the Ukrainian species, *D. jalpugensis* and *D. kujalnikensis*, cannot be excluded in Romanian Charleştii Moşteni.

Desmana (large-sized)

M a t e r i a l. Dranic-0. One P¹, one P⁴, one M¹, one M², one M₁, MNI = 1; Dranic-1. 1 upper C, 1P⁴, 2M₁, 1M₂, MNI = 1; Dranic-2. 1P⁴, 1M₁, 1 fragment of M₂, 1M₃, MNI = 1; Dranic-3. One damaged M₁ or M₂; Valea Crişului. One M¹; Slatina-1. One lower C; Cherleştii-Moşteni. One P₁; Izworu-2. One M₁.

D e s c r i p t i o n o f t h e m a t e r i a l. The upper C is relatively long and narrow, with an elliptical outline and two divergent roots. Its labial side is convex and the lingual

side is flat. The anterocrista and posterocrista are obtuse. The anterior and posterior cingula are very short, although small cingular bulges are present on them.

The buccal side of P¹ is convex and the lingual side flat. As the tooth is very worn, only small lower parts of antero- and posterocrista are preserved. The posterocrista continues in cingulum which is visible only in its posterior and postero-lingual side. Single wide root is compressed antero-posteriorly and vertically grooved all the way down its buccal and lingual sides.

P⁴ from Dranic-0 is large, sub-triangular in its outline, with heavy paracone and protocone. The protocone clings to the paracone. The small metacone and metastyle as cingular cusps are also present. The parastyle is missing and the anterior extension does not protrude. The anterocrista is obtuse and posterocrista is sharp. The last one bends to the labial side. The postero-lingual basin is deep and rather short. There is also an other concavity on the postero-buccal side of the posterocrista. The cingulum is present around the tooth, with the exception of the paracone and protocone bases. Three roots are visible.

The P⁴ from Dranic-1 is smaller than that from Dranic-0; its parastyle is well developed, the anterior extension protruding, while the anterocrista is missing. The postero-lingual basin is long and deep. The postero-buccal concavity is small and shallow. The small metacone and metastyle are present.

The P⁴ from Dranic-2 is the largest and heaviest among these three teeth. Its paracone is extremely heavy and the protocone comparatively smaller. The parastyle is very well developed as well as the anterior extension. The postero-lingual basin is long and very shallow. The postero-buccal concavity is almost absent. The anterocrista is missing. The metacone and metastyle are barely visible.

The M¹ from both localities is typical of Desmaninae upper molar described by RÜMKE in 1985. They are massive, their lingual side in comparison with the buccal side is wide, their posterior emargination slight, and their parastyle are well developed, but not protruding, and separated from the paracone by the valley. There is a cingular cusp between their protocone and metaconule. The angle between the single paracone arm and the anterior metastyle arm is narrow (the metastyle is not very long).

The upper M² is similar to other Desmaninae M². It is devoid of cingular cusp between protocone and metaconule.

The lower canine (C) is buccally slightly convex and lingually inflated. The anterior part of the crown slopes upwards at an angle with the length axis of the root. The wide cingulum runs around the tooth. It is wider and thicker at the postero-lingual corner. The root has an oval cross-section.

The P₁ has a more or less rhombic occlusal outline. Its labial face is convex, the lingual one is flat in the anterior and slightly convex in the posterior part. Wide posterior cingulum narrows in the direction of the anterior face of the tooth in both sides (lingual and buccal). The anterocrista and posterocrista are blunt.

The M₁ is rather heavy, with obtuse cusps. The oblique crest ends against the protoconid-metaconid crest and only in one tooth from Dranic-1 near the tip of the metaconid. All teeth have rather strong anterior and posterior cingula, the anterior one (as generally in M₁) shows a narrow stretch at some distance from the antero-lingual corner. A trace of cingulum is visible between protoconid/hypoconid valley. A strong entostylid is present in all teeth. Only in Dranic-1 teeth faint short ribs radiating from the tips of the cusps of their talonids are present.

Both lower M₂ are similar to M₁, but smaller. Their anterior cingula widen (as usual in M₂) before their lingual borders.

The M₃ is typical of lower molars, smaller than M₁ and M₂ and devoid of entostylid.

M e a s u r e m e n t s. See Table V.

Table V

Desmana (large-sized). Dimensions of upper and lower dentition (in mm)

		Dranic-0	Dranic-1	Dranic-2	Valea Crisolui	Slatina-1	Cherleştii Moşteni	Izvoru-2
C upper		–	2.14	–	–	–	–	–
		–	1.43	–	–	–	–	–
P ¹	L	1.88	–	–	–	–	–	–
	W	1.57	–	–	–	–	–	–
P ⁴	L	2.70	2.70	3.10	–	–	–	–
	W	2.69	2.56	2.79	–	–	–	–
M ¹	L	4.00	–	–	4.06	–	–	–
	W	3.38	–	–	3.47	–	–	–
M ²	L	2.77	–	–	–	–	–	–
	W	3.54	–	–	–	–	–	–
C lower		–	–	–		1.71*	–	–
		–	–	–		1.50	–	–
P ₁	L	–	–	–	–	–	1.65	–
	W	–	–	–	–	–	1.51	–
M ₁	L	3.14	3.18,3.03	3.21	–	–	–	3.00
	W	2.62	2.47,2.64	2.64	–	–	–	2.33
M ₂	L	–	3.05	3.13	–	–	–	–
	W	–	2.20	–	–	–	–	–
M ₃	W of talon	–	–	2.32	–	–	–	–
		–	–	1.77	–	–	–	–

S y s t e m a t i c p o s i t i o n. The size of all teeth described above fits the size of *D. thermalis* KORMOS, 1930, with the exception of both upper M¹, and two lower M₁ (one from Dranic-1 and one from Izvoru) the dimensions of which also lie in the range of variation of the largest specimens of *D. nehringi*. Unfortunately, RÜMKE (1985) did not describe the upper and lower canines (C) and first upper and lower premolars, (P¹ and P₁) of *D. thermalis*. She only gave drawings of the upper C from Tegelen which show that it was very similar to the corresponding tooth from Dranic-1. Also upper and lower molars did not differ from those in *D. thermalis* although it is generally known that they are not diagnostic.

Only upper P⁴ from three localities cited above are different and indicate that particular teeth probably belong to different species.

P⁴ from Dranic-1 is the smallest and characterized by clear anterior extension with a large parastyle, and its protocone situated posteriorly to the paracone. The middle size P⁴ from Dranic-0 has the same position of the protocone, but its anterior extension is shorter and the parastyle is absent. The largest P⁴ from Dranic-2 is the most massive and its postero-lingual basin is very shallow and the postero-buccal one almost absent. It has heavy anterior extension and clear parastyle but its protocone lies in one line with the paracone.

The P⁴ with long anterior extension was present in *D. thermalis* but it only bore a cingular rim, not the parastylar cusp as in the teeth from Dranic-1 and Dranic-2. The last two teeth have not, however, postero-labial extension, which made the P⁴ of *D. thermalis* almost elliptical in its occlusal view.

The clear anterior extension and clear parastyle are present also in *D. verestchagini*, but the species was much smaller (even than the smallest P⁴ from Dranic-1) and older. It was described from Stavropol in Russia and later found also in Greece. All localities were dated to the Early Ruscinian (MN14) age. *D. amutriensis* (Early Pliocene, MN14 and MN15 of Romania), which was first described as *D. verestchagini amutriensis*, according to RĂDULESCU et al. 1992 was similar but larger than *D. verestchagini*. Unfortunately, the P⁴ of *D. amutriensis* is unknown.

As mentioned above, the large Desmaninae specimens from the above cited eight Romanian localities fit the best to *D. thermalis*. However, *D. thermalis* appeared only in MN17. Earlier (Early Ruscinian to Early Villanyian), such large Desmaninae species were so far unknown not only in Western and Central but also in Southern Europe. It would be interesting to know if only specimens from Cherleştii Moşteni and Izvoru (localities dated to MN17 and the Early Pleistocene respectively) belonged to *D. thermalis* or if this form had appeared earlier in southern Europe. However, the different morphology of P⁴ from Dranic-0, Dranic-1 and Dranic-2 indicates that at least these desmans probably belonged to other species. The very poor material (1 to 5 isolated, and often damaged teeth) of the *Desmana* (large sized) in Romanian localities did not permit identification of their specific position.

Desmana (the largest-sized)

M a t e r i a l. Podari. One, most probably upper C (slightly damaged in its lower buccal part), one M¹, and one I₂ very used, MNI = 1.

D e s c r i p t i o n o f t h e m a t e r i a l. ?Upper C is rather long. Its buccal side is convex and the lingual side slightly concave in its anterior and posterior parts. The antero and posterocrista are sharp. The buccal cingulum is probably damaged and the lingual one is rather wide but not protruding. There were two long roots, one is broken.

M¹ is large with long buccal and short medium and lingual sides. Its parastyle is large and protruding, separated from the paracone by a valley. There is the cingular cusp between the protocone and metaconule. The angle between the single paracone arm and the anterior arm of the mesostyle is wide, the single arm of the metastyle is long.

The I₂ is very much used. It has a triangular occlusal outline. Its buccal and lingual sides are flat. The postero-medial side is bordered by a sharp edge, comparable to the posterocrista of the premolars. The cingulum is absent. The strong root is flattened antero-posteriorly and elliptical in cross-section.

M e a s u r e m e n t s. Podari. Upper C – L = 2.62 mm, W = 1.80 mm; M¹ – L = 4.66 mm, W = 3.46 mm; I₂ – L = 1.40 mm, W = 1.64 mm.

S y s t e m a t i c p o s i t i o n. The measurements of teeth presented above exceed the size of respective teeth of *D. thermalis* (and *Desmana* large sized) and lie in the range of variation of the Recent *D. moschata* (LINNAEUS, 1758). So far, not so large species were known in Europe in the Early Villanyian (MN16). Species probably larger than *D. thermalis* were described by TOPACHEVSKY and PASHKOV (1990) from Moldova (*D. meridionalis*) and from Ukraine (*D. gureevi* and *D. nogaica*). As materials from Ukraine are not accessible only their description could be used to compare the characters of Podari and Ukrainian and Moldovian teeth.

Unfortunately, TOPACHEVSKY and PASHKOV (1990) did not present any features of upper canine (C) of the described species.

Lower incisor I₂ from Podari of *D. meridionalis* differs in the presence of a sharp ridge. This ridge is also visible in I₂ of *D. nogaica*. Nothing is known concerning I₂ of *D. gureevi*.

On the other hand, the first upper molar, M^1 , of *D. nogaica* is devoid of cingular cusp between protocone and metaconule, which differentiates it from the first upper molar in Podari (and from the first upper molar of *D. meridionalis* and *D. gureevi*), where this cusp was present.

As the teeth from Podari are not identical and older (MN16) than *D. meridionalis*, *D. nogaica* (MN17), and *D. gureevi* (MN17/Q1) presented by TOPACHEVSKY and PASHKOV (1990) their specific identification is not possible. It may be that they represent a new species, but the poor material (especially the lack of upper and lower premolars P_2 and P_3) does not allow its definition at this moment.

Family Erinaceidae FISCHER VON WALDHEIM, 1817

Subfamily Erinaceinae FISCHER VON WALDHEIM, 1817

Genus *Erinaceus* LINNAEUS, 1758

Erinaceus (small sized)

M a t e r i a l. Dranic-1. One M^1 broken on its buccal side (the parastyle, paracone and mesostyle are lacking); Podari. One M^1 .

D e s c r i p t i o n o f t h e m a t e r i a l. The first upper molar (M^1) from Dranic-1 has the pronounced metastyle and distinct metaconule. There is no trace of the protoconule in the used ridge joining the paracone and the protocone. The cingulum visible in undamaged parts of the tooth is wider in its anterior side. It is lacking under the tips of the protocone and the hypocone.

The M^1 from Podari is characterized by distinct parastyle and buccal cingulum. In comparison with M^1 from Dranic-1, the valley between its protocone and hypocone is deeper, the metastyle shorter, and the tooth seems to be shorter and wider. The M^1 from Dranic-1, although damaged, seems to be rather square (W/L ratio = 1.03) in occlusal view, while that from Podari (W/L ratio = 1.22) was rectangular.

M e a s u r e m e n t s. Dranic-1. $M^1 - L = 4.18^* \text{ mm}$, $W = 4.30^* \text{ mm}$.

Podari. $M^1 - L = 3.95 \text{ mm}$, $W = 4.84 \text{ mm}$.

S y s t e m a t i c p o s i t i o n. Both teeth belong to a small species of *Erinaceus*. So far, from Europe three small hedgehogs have been described: *E. lechei* KORMOS, 1934 (Beremend, Hungary, probably Early Pleistocene), *E. samsonowiczi* SULIMSKI, 1959 (Weże 1, Poland, MN15) and *E. ostramosi* JÁNOSSY, 1972 (Osztramos 8, Hungary, Early Pleistocene). The teeth from Romania have different proportions and probably belong to two different species. The M^1 from Dranic-1 is, however, although square as in *E. samsonowiczi*, much smaller ($M^1 - L = 4.8 - 5.2 \text{ mm}$, $W = 4.8 - 5.5 \text{ mm}$, $n = 5$, SULIMSKI 1962) and M^1 from Podari, which is also much smaller, has additionally different proportions. *E. lechei*, slightly smaller than *E. samsonowiczi*, is unfortunately known only from its lower teeth and M^1 of *E. ostramosi* is lacking in Osztramos 8 materials. Short and wide M^1 ($M^1 - L = 1.37 \text{ mm}$, $W = 5.5 \text{ mm}$, $n = 1$, $W/L = 1.49$) of *E. olgae* YOUNG, 1934 (often cited in the European literature) from the Choukoutien locality 1 in China seems to be similar to the first upper molar from Podari. However, this species lived in Asia in the Early Pleistocene and its relation to the Podari hedgehog is little probable.

Among Lipotyphla from Dranic-1 (RĂDULESCU et al. 1995, 1997) and Podari (RĂDULESCU et al. 1995) listed *Mioechinus* sp. The identification of specimens was probably made on the basis of the same teeth as in the present work.

The genus *Mioechinus* was established by BUTLER in 1948 for the Miocene hedgehogs described earlier as belonging to the genus *Erinaceus*. According to BUTLER, besides the cranial differences, three genera (*Ampechinus*, *Mioechinus* and *Erinaceus*) differ in the relative dimensions of their upper I^1 , P^4 , and M^1 and in their relation to the outer length of their upper M^1 , the *Mioechinus* always being intermediate between *Ampechinus* and *Erinaceus*. Very limited materials from

Dranic-1 and Podari do not allow the use of the criteria of BUTLER. However, three species of the genus *Mioechinus* known today lived in Europe in the Early and Middle Miocene (MN4 - MN7+8) and their presence in the late Early (MN15) and the beginning of the early Late (MN16) Pliocene seems to be less probable than of the *Erinaceus* species. More materials are needed to identify Romanian Pliocene hedgehogs.

III. LOCALITIES AND FAUNA OF LIPOTYPHLA

Table VI

Species	Localities											
	Dr-0	Dr-1	Dr-X	Dr-2	Dr-3	VC	Pd	SI-1	SI-2	CM	Iz-2	
SORICIDAE												
<i>Allosorex stenodus</i>	+	-	-	-	-	-	-	-	-	-	-	-
<i>Paenlimnoecus pannonicus</i>	-	-	-	+	-	-	+	-	-	-	-	-
<i>Beremendia fissidens</i>	+	-	-	-	-	-	+	-	+	-	-	+
<i>Blarinoides mariae</i>	+	-	-	-	+	-	+	-	-	-	-	-
<i>Blarinoides</i> n. sp.	-	+	-	-	-	-	-	-	-	-	-	-
<i>Mafia</i> cf. <i>csarnotensis</i>	-	-	-	+	-	-	+	-	-	-	-	-
<i>Petenya hungarica</i>	-	+	-	-	-	-	-	-	-	-	-	+
<i>Deinsdorfia</i> cf. <i>hibbardi</i>	+	-	-	-	-	-	+	-	-	-	-	-
<i>Deinsdorfia</i> cf. <i>kordosi</i>	-	-	-	-	+	-	-	-	-	-	-	-
<i>Deinsdorfia</i> sp.	-	-	-	+	-	-	-	-	-	-	-	-
<i>Sorex</i> (<i>Drepanosorex</i>) cf. <i>praeareaneus</i>	+	+	-	-	-	-	-	-	-	-	-	-
<i>Sorex</i> cf. <i>minutus</i>	+	-	-	-	-	-	-	-	-	-	-	-
<i>Asoriculus gibberodon</i>	+	-	-	+	+	-	-	-	-	-	-	-
Soricidae gen. et sp. indet.	-	-	-	-	-	-	-	-	-	-	-	+
TALPIDAE												
<i>Desmanella</i> cf. <i>woelfersheimensis</i>	+	+	-	-	+	-	+	-	-	-	-	-
<i>Talpa fossilis</i>	-	-	-	-	-	-	-	-	+	-	-	-
<i>Talpa</i> sp.	-	-	-	-	+	-	+	-	-	-	-	-
<i>Ruemkelia</i> sp.	+	+	-	+	+	-	-	-	-	-	-	-
<i>Galemys</i> sp.	-	-	+	+	-	-	+	+	-	-	-	-
<i>Desmana</i> (medium-sized)	-	-	-	-	-	-	-	-	-	-	+	-
<i>Desmana</i> (large-sized)	+	+	-	+	+	+	-	+	-	+	+	+
<i>Desmana</i> (the largest-sized)	-	-	-	-	-	-	+	-	-	-	-	-
ERINACEIDAE												
<i>Erinaceus</i> sp.	-	+	-	-	-	-	-	-	-	-	-	-

IV. HISTORY OF LIPOTYPHLA IN ROMANIA

Soricidae

The fossil shrews (Soricidae) are little known in Romania. So far, their oldest remains have been collected from the Middle Miocene locality Taut. Unfortunately they remain identified only as Soricidae gen. et sp. indet. (FERU et al. 1979). In other old Romanian localities, Comănești 1, dated to the end of the Middle Miocene (MN8), the early Late Miocene (MN9) Comănești 2 (FERU et al. 1980), as well as the Early Pliocene (Early Ruscian MN14) Berești (RĂDULESCU et al. 1993), Soricidae were not present.

Only the Late Ruscinian (MN15) localities: Dranic-0, Dranic-1, Dranic-2 and dated to the end of MN15 or MN15/MN16 Dranic-3 yielded comparatively rich fauna of shrews. The subfamily Allosoricinae was there represented by two forms, a very small *Paenelimnoecus pannonicus* (Dranic-2) and extremely rare *Allosorex stenodus* (Dranic-0). Besides, several species of the subfamily Soricinae appeared in Romania for the first time in the zone MN15. There were: ubiquitous in Europe, great *Beremendia fissidens* (Dranic-0) and *Blarinoides mariae* (Dranic-0, Dranic-3), slightly smaller *Mafia* cf. *csarnotensis* (Dranic-2), and a medium sized *Petenyia hungarica* (Dranic-1), *Asoriculus gibberodon* (Dranic-0, Dranic-2, Dranic-3), and two species of *Deinsdorfia*, *D.* cf. *hibbardi* (Dranic-0) and *Deinsdorfia* sp. (Dranic-2).

Among *Sorex* species, *S.* cf. *minutus* (Dranic-0) and *S.* (*Drepanosorex*) cf. *praeearaneus* (Dranic-0, Dranic-1) were present in the Late Ruscinian.

Hence, the Late Ruscinian (MN15) assemblage represented by localities of Dranic-0, Dranic-1, Dranic-2, and probably also Dranic-3 is almost complete and comparable to the MN15 assemblages from neighboring territories. It comprises 12-13 species (9 genera), whereas, e. g. in particular localities such as Weże 1 in Poland, Osztramos 7 and Csarnóta 2 in Hungary or Ivanovce in Slovakia 15 (12 genera), 15 (10 genera), 12 (10 genera), and 10 (9 genera) species of shrews were found respectively (RZEBIK-KOWALSKA 1995). From 12 genera present in localities mentioned above, four were never found in Romania. These were *Sulimskia* REUMER, 1984, *Zelceina* SULIMSKI, 1962, *Alloblarinella* STORCH, 1995 and *Kordosia* MÉSZÁROS, 1997.

In the end of the Late Ruscinian (or Ruscinian/Villanyan boundary) a third species of *Deinsdorfia*, *D.* cf. *kordosi* (Dranic-3), was found on this territory.

In the Late Pliocene (Early Villanyan, MN16) *Paenelimnoecus pannonicus* (Podari), *Beremendia fissidens* (Podari), *Blarinoides mariae* (Podari, Debren 1), *Mafia* cf. *csarnotensis* (Podari), and *Deinsdorfia* cf. *hibbardi* (Podari) were still present. Other Early Pliocene species, such as *Sorex minutus*, *S.* (*Drepanosorex*) *praeearaneus*, *Petenyia hungarica*, and *Asoriculus gibberodon*, although not found in the Late Pliocene localities, probably existed on Romanian territory, because *S. minutus* survived there to the Recent time and remaining species are known from younger fossil localities, dated to the Early Pleistocene (RĂDULESCU and SAMSON 1984, RZEBIK-KOWALSKA 2000a, this paper).

As seen above, the list of the Early Villanyan (MN16) shrews of Romania known from Podari 2 is again not complete. It consists of only five genera and five species (*Paenelimnoecus pannonicus*, *Beremendia fissidens*, *Blarinoides mariae*, *Mafia* cf. *csarnotensis*, *Deinsdorfia* cf. *hibbardi*), whereas in localities of Osztramos 7 (Hungary) similar in age, 15 species from 10 genera (REUMER 1984) and in Rębielice Królewskie 1A (Poland) 20 species from 11 genera (RZEBIK-KOWALSKA 1994) were listed.

The Late Villanyan (MN17) sediments in Romania are poorly known. They are represented in the locality of Slatina-2, where, however, only one species of shrew, *Beremendia fissidens*, was collected (RĂDULESCU and SAMSON 1987, and the present paper). In general, in Europe the number of shrew taxa was much lower during the Late Villanyan [e. g. 5-8 species have been found at Plešivec (Slovakia), Villány 3 (Hungary), Kielniki 3B (Poland), REUMER 1984, RZEBIK-KOWALSKA 1994] than in the early part of that period but, as mentioned above, in the comparable in age Romanian locality Slatina 2 only one species was present.

On the other hand, in the Early Pleistocene (Early Biharian) the number of shrews again increased. Among the Pliocene species *Beremendia fissidens* (Izworu 2, Betfia XIII, X, XI, IX, VII/1, VII/2, V, VII/3, Ursilor Cave), *Blarinoides mariae* (Betfia XIII), *Petenyia hungarica* (Izworu 2, Betfia XIII, X, XI, IX, VII/1, Ursilor Cave), *Asoriculus gibberodon* (Betfia XIII, X, XI, IX, VII/1), *Sorex minutus* (Betfia XIII, X, XI, IX, VII/1, V, VII/3) and *S.* (*Drepanosorex*) *praeearaneus* (Betfia XIII, X, XI) survived from earlier periods (TERZEA 1983, RZEBIK-KOWALSKA 2000a, this paper). Besides, new species appeared. These were: *Sorex runtonensis* HINTON, 1911 (Betfia XIII, X, XI, IX, VII/1, V, VII/3), *S.* cf. *subaraneus* HELLER, 1958 (Betfia XIII, IX, V, VII/3), *Crocidura kornfeldi* KORMOS, 1934 (Betfia XIII, X, XI, IX, VII/1, V, VII/3, XII), and *Amblycoptus* cf. *oligodon*

KORMOS, 1926 (Betfia XIII). Since representatives of the genus *Amblyoptus* did not survive the Miocene/ Pliocene boundary, the presence of this last form in the Pleistocene sediments has been considered as accidental (probably admixture from the older layers) (RZEBIK-KOWALSKA 2000a).

Towards the end of the Early Pleistocene (end of the Biharian) new shrews appeared in the Romanian fauna. *Sorex minutissimus* ZIMMERMANN, 1780 was found at Betfia VII/3, *S. (Drepanosorex) margaritodon* KORMOS, 1930 at Betfia IX, VII/1, V, VII/3, *Neomys cf. newtoni* HINTON, 1911 at Betfia VII/3 and *Crocidura cf. obtusa* KRETZOI, 1938 at Betfia IX, and Ursilor Cave (TERZEA 1983, RZEBIK-KOWALSKA 2000a).

Thus, the Early Pleistocene sediments again yielded rich fauna of shrews. It consists of 7 genera and 13 species, six of which belonged to the genus *Sorex*. A similar proportion was found, e. g., at Kozi Grzbiet (Poland, RZEBIK-KOWALSKA 1994), a locality dated to the Early/Middle Pleistocene, where among 10 species of shrews 7 belonged to the genus *Sorex*. It is generally known that, beginning with the Early Pleistocene, the number of *Sorex* species increased in Europe. They became dominant in the shrew faunas and today this genus is the most diversified in the Holarctic region.

Among the old Early Pliocene species, only *Beremendia fissidens* (Betfia VII/4) and *Sorex minutus* (Betfia VII/4, Sindominic 1), and among the Early Pleistocene ones *S. runtonensis* (Betfia VII/4), *S. subaraneus* (Brasov, Feldioara Cariera, Rotbav-Dealul Tiganilor), and *S. (Drepanosorex) margaritodon* (Betfia VII/4) survived to the Middle Pleistocene (TERZEA 1983, RĂDULESCU and SAMSON 1985, RZEBIK-KOWALSKA 2000a). New, Middle Pleistocene forms are represented in that period by *Sorex macrognathus* [Sindominic 1 (RĂDULESCU and SAMSON 1985 as *S. araneus macrognathus*) and Cave No. 10 in Lupsa Valley (RĂDULESCU and SAMSON 1992b as *S. cf. macrognathus*)], and by *S. (Drepanosorex) cf. austriacus* [Rotbav-Dealul-Tiganilor (RĂDULESCU and SAMSON 1985, as *S. savini cf. austriacus*)].

Besides, the Recent Romanian species, *Crocidura leucodon* (HERMANN, 1780) [Sindominic 1 (RĂDULESCU and SAMSON 1985)], *Crocidura suaveolens* (PALLAS 1811) [Cave No. 10 in Lupsa Valley (RĂDULESCU and SAMSON 1992b)], *Neomys fodiens* (PENNANT, 1771) [Cave in the Parului Valley (RĂDULESCU and SAMSON 1992b)], and *Sorex araneus* LINNAEUS, 1758 [Cave in the Parului Valley (RĂDULESCU and SAMSON 1992b)] appeared in Romania for the first time in the Middle Pleistocene sediments.

To summarize, in the Middle Pleistocene the old Pliocene forms were limited to only two species. On the other hand, the number of *Sorex* species was even higher than in the early Pleistocene (7 among 11 present) and first Recent species (with the exception of *S. minutus* known since the Early Pliocene) appeared. Elements of the recent Romanian fauna of shrews: *N. anomalus* CABRERA, 1907 and *S. alpinus* SCHINZ, 1837 have so far never been found as fossils in this territory.

Crocidura leucodon, *C. suaveolens*, *Neomys fodiens*, *Sorex araneus*, as well as *S. minutus* were also present in the Late Pleistocene and/or in the Holocene sediments, but only their Late Pleistocene localities are listed below.

S. minutus was collected at Măgura Cave (TERZEA 1970, as *S. biharicus*), La Adam Cave (TERZEA 1973), Bursucilor Cave (TERZEA 1974), Hotilor Cave (TERZEA 1986), Cioarei Cave (TERZEA 1987), Scocul Scorotei Cave 4 (RĂDULESCU et al. 1991), and in Sindominic 2 (RĂDULESCU and SAMSON 1985), *S. araneus* in Cioarei Cave (TERZEA 1987), Climente 1 Cave (TERZEA 1986), Gura Cheii Rasnov Cave (RĂDULESCU and SAMSON 1992a), Hotilor Cave (TERZEA 1986), Magura Cave (TERZEA 1970), Mare Cave (RĂDULESCU and SAMSON 1992a), Cave in the Parului Valley (RĂDULESCU and SAMSON 1992b), Scocul Scorotei Cave 4 (RĂDULESCU et al. 1991), Sindominic 2 (RĂDULESCU and SAMSON, 1975, as *S. cf. araneus*) and Valea Coacazei Cave (RĂDULESCU and SAMSON 1992a), *C. leucodon* in La Adam Cave (TERZEA 1973), Hotilor Cave (TERZEA 1986), Magura Cave (TERZEA 1970) and Valea Coacazei Cave (TERZEA 1971), and *N. fodiens* in Bursucilor Cave (TERZEA 1974) and Climente Cave (TERZEA 1979).

As seen above, the list of the fauna of shrews in Romania is far from being complete. To date, practically nothing is known concerning the Miocene and the Early Pliocene (Early Ruscinian,

MN14) shrews, which at that time were very abundant and diversified in Europe. In comparison with the European assemblages, the Villanyan ones are also far from complete. Only the Late Ruscinian (MN15) and the Pleistocene lists are comparable to these known from the neighboring territories, although *Neomys anomalus* and *Sorex alpinus* have, so far, never been found as fossils.

Talpidae

In Romania, the oldest representatives of the family Talpidae came from the end of the Middle Miocene (MN8). They were found at Comănești 1 and listed as Talpidae indet. cf. *Desmanella* (FERU et al. 1980). These remains were the only ones found in the Miocene deposits. Moreover, nothing is known concerning the Miocene moles, whose representatives were very numerous and diversified during that period in Europe (about 18 genera and 45 named species, among them five genera and 15 species of water-moles, ZIEGLER 1999).

Younger, Early Pliocene (Early Ruscinian, MN14) remains of moles were found in Ciuperceni and Berești. In Ciuperceni, the water-mole, *Ruemkelia dekkersi* (Desmaninae, see p. 17), described by TERZEA (1980) as *Desmana getica*, was present. From Berești, RĂDULESCU and SAMSON (1989) described a new species of mole, *Talpa neagui* (Talpinae, Talpini). This locality also yielded the representative of water-moles, *Desmana amutriensis* (RĂDULESCU, SAMSON and ȘTIUCĂ, 1989).

Thus, the Early Ruscinian (MN14) moles were represented in Romania by two subfamilies and three species, two of which belonged to the water-moles.

The late Ruscinian (MN15) Talpidae were more diversified and found in several localities. They were: *Desmanella* cf. *woelfersheimensis* (Dranic-0, Dranic-1), *Talpa neagui* (Mălușteni), *Ruemkelia* sp. (Dranic-0, Dranic-1, Dranic-2), *Galemys* sp. (Dranic-X, Dranic-2), *Desmana* (large-sized) (Dranic-0, Dranic-1, Dranic-2), and *Desmana amutriensis* (Lupoia Quarry and Mălușteni) (RĂDULESCU and SAMSON 1989, RĂDULESCU et al. 1989, this paper).

The end of the Late Ruscinian or the Ruscinian/Villanyan boundary is represented in Romania by the sediments of Dranic-3. In this locality *Desmanella* cf. *woelfersheimensis*, *Talpa* sp., *Ruemkelia* sp., and *Desmana* (large-sized) have been found (RĂDULESCU et al. 1989, RĂDULESCU et al. 1993, this paper).

As seen above, beginning with the Late Ruscinian, the fauna of moles became more diversified. It consisted mainly of the water-moles (Desmaninae). The remains of this group, numerous in the Miocene, Pliocene, and the Early Pleistocene of Europe, from Spain to the Caspian Sea, became rare in the Middle Pleistocene. Only two species have survived to the present day in the western and eastern parts of their ancient range: in the northern part of the Iberian Peninsula and in the Volga, Don, Oka, and Ural drainage area. Besides *T. neagui* and *D. amutriensis* known from the Early Ruscinian, *Desmanella* appeared again. New genera of water-moles, small *Ruemkelia* sp. and medium-sized *Galemys* sp. appeared in Romania.

The Early Villanyan (MN16) fauna of moles remained rich. In the localities of that time, *Desmana kormosi* was listed from Debren 1 (RĂDULESCU and SAMSON 1984), *Desmana* large-sized (size of *D. thermalis*) from Valea Crișului, *Desmanella* cf. *woelfersheimensis*, *Talpa* sp., *Galemys* sp., and the largest-sized *Desmana*, (larger than *D. thermalis*) from Podari (this paper). *D. kormosi*, listed by RĂDULESCU and SAMSON (1984), according to generally accepted Desmaninae taxonomy given by RÜMKE in 1985, is now placed in the genus *Galemys*. As the material was very poor it has been identified here only as *Galemys* sp.

The Late Villanyan (MN17) layers yielded only three species of moles. *Desmana* (large-sized) was found at Slatina-1 and Cherlești Moșteni, *Desmana* (medium-sized) at Cherlești Moșteni, and *Talpa fossilis* at Slatina-2 (this paper).

As mentioned above (p. 12), the name *T. fossilis* is used for the chronospecies from older localities, very similar to the recent *T. europaea*. The presence of *T. fossilis* at Slatina 2 (MN17) may be considered as the first appearance of the lineage of the recent mole in Romania.

The Early Pleistocene in Romania again yielded the diversified fauna of moles. *Desmana* sp. (large-sized) was collected at Izvoru-2 (this paper), *D. thermalis* KORMOS, 1930 at Betfia XIII and IX, *G. cf. semseyi* KORMOS 1913 at Betfia IX and VII/1, *T. minor* FREUDENBERG, 1914 at Betfia X, XI, IX, VII/1, VII/3, and XII, *Talpa cf. episcopalis* KORMOS, 1930 at Betfia XIII, IX, VII/1, V, VII/3, and *T. fossilis* PETÉNYI, 1864 at Ursilor Cave (TERZEA 1983), Betfia XIII, X, XI, IX, VII/1, V, and VII/3, (RZEBIK-KOWALSKA 2000b). Thus, from the Early Pleistocene seven taxa of moles were listed in Romanian localities, although probably only five are valid. As concerns desmans, it is very probable that the remains of *Desmana* sp. (large-sized) from the Early Pleistocene of Izvoru 2 belonged to *D. thermalis*. The latter species was present in other Romanian localities of this period. Among moles, both names, *T. fossilis* and *T. europaea*, are used, *T. fossilis* being reserved for geologically older forms. Nevertheless, in the Early Pleistocene the number of “true” mole species prevailed over the water-moles.

In the Middle Pleistocene, *D. moschata* cf. *mosbachensis* was listed from Rotbav-Dealul Titanilor (RĂDULESCU and SAMSON 1985), *T. fossilis* from Betfia VII/4 (RZEBIK-KOWALSKA 2000b), *T. europaea* from Sindominic 1 (RĂDULESCU and SAMSON 1985), Cave No. 10 in the Lușța Valley and Cave in the Părului Valley (RĂDULESCU and SAMSON, 1992b) and *Talpa* gr. *europaea* from Gura Dobrogei 2 (SAMSON and RĂDULESCU 1972).

As seen above, in the Middle Pleistocene the number of moles in Romania became limited to two species: one water-mole (*D. moschata* cf. *mosbachensis*), and one mole (under two names: *T. fossilis* and *T. europaea*). During the time from the Late Pleistocene to Recent only *T. europaea* populated the Romanian territory. It was found, among others, at Magura Cave (TERZEA 1970), Hottilor Cave (TERZEA 1986), Cioarei Cave (TERZEA 1987), Scoțul Scorotei Cave 4 (RĂDULESCU et al. 1991), Gura Cheii Rasnov Cave and Mare Cave (RĂDULESCU and SAMSON 1992a).

Thus, the review of the Romanian fossil moles presented above has shown that, similar to shrews, they are poorly known. As their fossil remains usually consist of isolated teeth (mostly molars insufficient for specific identification), in most cases only generic identification could be made.

Erinaceidae

Similar to shrews and moles, the oldest remains of hedgehogs were found in localities dated to the end of the Middle and the beginning of the Late Miocene. They represented two subfamilies: hairy hedgehogs (Galericinae POMEL, 1848) and spiny hedgehogs (Erinaceinae). One form, *Lanthanotherium* sp., belonging to the hairy hedgehogs and the second one, *Amphexchinus* sp. to the spiny hedgehogs, were listed by FERU et al. (1979) from Taut (MN8). Another hairy hedgehog, *Galerix socialis* MAYER, 1865, was found in Comanești 1, a locality of the same (MN8) age (FERU et al. 1980). In a slightly younger (MN9) Comenești 2, FERU et al. (1980) listed *Galerix* gr. *socialis*.

During the Miocene the family Erinaceidae was extremely diversified in Europe. It consisted of 9 genera and 35 species, 4 genera and 22 species of which belonged to the hairy hedgehogs (Galericinae) (ZIEGLER 1999). This last group survived until today only in south-eastern Asia. The spiny hedgehogs are widely distributed in the Old World.

The Early Pliocene (Early Ruscinian, MN14) and Villanyan (MN16 and MN17) localities of Romania are devoid of Erinaceidae. Only in the Late Ruscinian (MN15) Mălușteni (RĂDULESCU et al. 1995), and Dranic-1 (this paper) remains belonging to the recent genus *Erinaceus* were found. Those and younger (Pleistocene) remains were always so fragmentary that their specific identification was impossible.

In the Early Pleistocene the Romanian list of hedgehog species increased. A small *Erinaceus* (*Erinaceus* sp. 2) was found in Betfia IX and VII/1, a medium-sized (*Erinaceus* sp. 1) in Betfia XIII, and a large-sized (*Erinaceus* sp. 3) in Betfia V and VII/3 (RZEBIK-KOWALSKA 2000b).

In the Middle Pleistocene localities *Erinaceus* sp. was mentioned at Gura Dobrogei 2 (SAMSON and RĂDULESCU 1972) and Betfia VII/4 (RZEBIK-KOWALSKA 2000b, as *Erinaceus* sp. 3), the re-

cent species, *E. europaeus* was listed from other localities of this time: Cave No. 10, Cave in the Parului Valley (RĂDULESCU and SAMSON 1992b) and Sindominic 1 (RĂDULESCU and SAMSON 1985).

E. europaeus was also cited from several Late Pleistocene and Holocene localities such as Magura Cave (TERZEA 1970), Bursucilor Cave (TERZEA 1974), Climante Cave II (TERZEA 1986), and Cioarei Cave (TERZEA 1987). However, this identification is most probably wrong and the fossil remains belong to *E. concolor* MARTIN, 1838 today inhabiting South and Central Europe. This species was described from Romania as *E. roumanicus* BARRETT-HAMILTON, 1900. Both species, *E. concolor* and *E. europaeus* (which lives today in Northern and Western Europe), were previously confused.

In Romania as well as in the whole of Europe a revision of the Pleistocene and Holocene *Erinaceus* species is needed.

REFERENCES

- BURGHLEA A., RĂDULESCU C., SAMSON P., ȘTIUCĂ E. 1994. La première faune interglaciaire (eemien?) de micromammifères d'Olténie. *Travaux de l'Institut de Spéologie "Emile RACOVITZA"*, **33**: 101-106.
- BUTLER M. A. 1948. On the evolution of the skull and teeth in the Erinaceidae, with special reference to fossil material in the British Museum. *Proceedings of the Zoological Society of London*, 118, part II: 446-499.
- CROCHET J.-Y. 1986. Insectivores Pliocènes du sud de la France (Languedoc-Roussillon) et du nord-est de l'Espagne. *Palaeovertebrata*, **16**: 145-171.
- DAHLMANN T. 2001. Die Kleinsäuger der unter-pliozänen Fundstelle Wölfersheim in der Wetterau (Mammalia: Lipotyphla, Chiroptera, Rodentia). *Courier Forschungsinstitut Senckenberg*, **227**: 1-129.
- DE GIULI C. 1989. The rodents of the Brisighella latest Miocene fauna. *Bolletino della Società Paleontologica Italiana*, **28**:(2-3): 197-212.
- DOUKAS C. S., HOEK OSTENDE L. W. VAN, THEOCHAROPOULOS C. D., REUMER J. W. F. 1995. The vertebrate locality Maramena (Macedonia, Greece) at the Turolian-Ruscinian boundary (Neogene). *Münchner Geowissenschaftliche Abhandlungen (A)*, **28**: 43-64.
- DUMITRESCU M., SAMSON P., TERZEA E., RĂDULESCU C., GHICA M. 1963. Peștera "La Adam", stațiune pleistocenă. *Lucrarile Institutului de Spéologie "Emile RACOVITZA"*, **1-2**: 229-284.
- FEJFAR O. 1966. Die plio-pleistozänen Wirbeltierfaunen von Hajnáčka und Ivanovce (Slowakei), ČSSR. V. *Allosorex stenodus* n. g. n. sp. aus Ivanovce A. *Neues Jahrbuch für Geologie und Paläontologie. Abhandlungen*, **123**: 221-248.
- FERU M., RĂDULESCU C., SAMSON P. 1978. Biostratigraphie (Micromammifères) des dépôts Pliopléistocènes de la zone de Slatina (dép. d'Olt). *Travaux de l'Institut de Spéologie "Emile RACOVITZA"*, **17**: 117-134.
- FERU M., RĂDULESCU C., SAMSON P.-M. 1979. La fauna de micromammifères du Miocène de Taut (Dép. D'Arad). *Travaux de l'Institut de Spéologie "Emile RACOVITZA"*, **18**: 185-190.
- FERU M., RĂDULESCU C., SAMSON P. 1980. La fauna de Micromammifères du Miocène de Comănești (dép. D'Arad). *Travaux de l'Institut de Spéologie "Emile RACOVITZA"*, **19**: 171-190.
- GUERIN C., MEIN P. 1971. Les principaux gisements de mammifères Miocènes et Pliocènes du domaine rhodanien. *Documents du Laboratoire de Géologie de la Faculté des Sciences de Lyon*, **1**: 131-170.
- HOEK OSTENDE VAN DEN, L.W., RÜMKE C. G., HOGEWEG P. 1989. The use of time-constrained minimal-spanning subtrees in the reconstruction of the phylogeny of the European desmaninae moles (Desmaninae, Talpidae, Insectivora). *Proceedings of the Koninklijke Nederlandse Academie van Wetenschappen, series B*, **92**(1): 47-60.
- HUTTERER R. 1994. Generic limits among Neomyine and Soriculine shrews (Mammalia: Soricidae). [In:] Neogene and Quaternary mammals of the Palaearctic, Conference in honour of Professor Kazimierz KOWALSKI, Kraków, Abstracts: 32.
- HUTTERER R. 1995. *Archaeodesmana* TOPACHEVSKI and PASHKOV, the correct name for *Dibolia* RÜMKE, a genus of fossil water moles (Mammalia: Talpidae). *Bonner Zoologische Beiträge*, **45**(3-4): 171-172.
- JÁNOSY D. 1986. Pleistocene vertebrate faunas of Hungary. Akadémiai Kiadó (revised translation of Hungarian edition of 1979), 208 pp. Budapest. 171-172.
- KORMOS T. 1913. Trois nouvelles espèces fossiles des desmans en Hongrie. *Annales Musei Nationalis Hungarici*, **11**: 135-146.
- KORMOS T. 1934. Neue Insektenfresser, Fledermäuse und Nager aus dem Oberpliozän der Villanyer Gegend. *Földtani Közlöny*, **64**: 296-321.

- MEZH ZHERIN V. A. 1972. Shrews (*Sorex*, Insectivora, Mammalia) from Pleistocene deposits of the USSR. [In:] L. D. KOLOSOV, I. V. LUKJANOVA (eds) – Tjერიოლოგია 1, Izdatjel'stvo "Nauka", Sibirskoje Otdjeljenije, Novosibirsk 117-130. (In Russian with English summary).
- PASHKOV A. V., TOPACHEVSKY V. A. 1990. New representatives of the genus *Desmana* (Insectivora, Talpidae) from the Late Pliocene sediments of the Central Europe and south-western European part of the Soviet Union. *Vestnik Zoologii*, **5**: 25-34.
- PETÉNYI S. J. 1864. Hátrahagyott Munkái. F. Eggenberger, Budapest.
- POPOV V. V. 1994. Preliminary report on Middle Pliocene small mammals (Insectivora, Lagomorpha, Rodentia) from Muselievo (North Bulgaria). [In:] Neogene and Quaternary mammals of the Palaearctic. Conference in honour of Professor Kazimierz KOWALSKI, Abstracts, Kraków. 54-55.
- RĂDULESCU C., SAMSON P.-M. 1975. Présence de Micromammifères et le Riss du Bassin de Baraolt (Dép. de Braşov). *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **14**: 119-123.
- RĂDULESCU C., SAMSON P. 1984. Les micromammifères du Pliocène supérieur de Debren 1 (bassin de St. Gheorghe, dépression de Brasov, Roumanie). *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **23**: 39-47.
- RĂDULESCU C., SAMSON P. 1985. Pliocene and Pleistocene mammalian biostratigraphy in southeastern Transsylvania (Romania). *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **24**: 85-95.
- RĂDULESCU C., SAMSON P. 1987. *Dolomys* (Arvicolidae, Rodentia, Mammalia) in the Dacic Basin (Romania). *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **26**: 45-53.
- RĂDULESCU C., SAMSON P. 1989. Contributions to the knowledge of the mammalian faunas from Măluşteni and Bereşti (Romania). *Miscellanea Speologica Romanica*, **1**: 303-311.
- RĂDULESCU C., SAMSON P.-M. 1992a. Chronologie et paléoclimatologie de trois grottes des Carpates Orientales (Roumanie) d'après les Mammifères. I. Micromammifères. *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **31**: 95-104.
- RĂDULESCU C., SAMSON P.-M. 1992b. Small mammals of the penultimate glacial cycle (Saale/Riss) discovered in two caves from northwestern Oltenia, Romania. *Theoretical and Applied Karstology*, **5**: 203-211.
- RĂDULESCU C., SAMSON P.-M. 2001. Biochronology and Evolution of the Early Pliocene to the Early Pleistocene mammalian faunas of Romania. [In:] L. ROOK, D. TORRE (eds) – Neogene and Quaternary continental stratigraphy and mammal evolution. *Bollettino della Società Paleontologica Italiana*, **40**(2): 285-291.
- RĂDULESCU C., SAMSON P., SEN S., ŞTIUCĂ E., HOROI V. 1997. Les Micromammifères pliocènes de Dranic (Bassin Dacique, Roumanie). [In:] J.-P. AGUILAR, S. LEGENDRE, J. MICHAUX (eds) – Biochronologie mammalienne du Cénozoïque en Europe et domaine reliés, *Memoires et Travaux de l'Institut de Montpellier*, Actes du Congrès Biochron'97: 635-647.
- RĂDULESCU C., SAMSON P., ŞTIUCĂ E. 1989. Pliocene (Lower Romanian) micromammals in the Dacic Basin. *Miscellanea Speologica Romanica*, **1**: 313-326.
- RĂDULESCU C., SAMSON P.-M., ŞTIUCĂ E. 1991. Les faunes de mammifères Würmiens de la grotte No. 4 de Scocul Scorotei (Dép. de Hunedoara, Roumanie). I. Insectivora, Rodentia. *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **30**: 75-87.
- RĂDULESCU C., SAMSON P., ŞTIUCĂ E. 1992. Contributions to the knowledge of the Early Pliocene mammalian faunas from Măluşteni and Bereşti (Romania), order Insectivora, family Talpidae, subfamily Desmaninae. *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **31**: 75-81.
- RĂDULESCU C., SAMSON P., ŞTIUCĂ E., ENCIU P., POPESCU A. 1993. New fossil mammal associations of the Jiu Valley. A contribution to the Early and early Late Pliocene biostratigraphy of the Dacic Basin, Romania. *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **32**: 95-105.
- RĂDULESCU C., SAMSON P., ŞTIUCĂ E., HOROI V. 1995. Upper Neogene from the Dacic Basin. Romanian *Journal of Stratigraphy* **76**, Guidebook to excursions: 29-48.
- REUMER J. W. F. 1984. Ruscianian and Early Pleistocene Soricidae (Insectivora, Mammalia) from Tegelen (The Netherlands) and Hungary. *Scripta Geologica*, **73**: 1-173.
- REUMER J. W. F. 1992. The taxonomical position of the genus *Paenelimnoecus* BAUDELLOT, 1972 (Mammalia: Soricidae): a resurrection of the subfamily Allosoricinae. *Journal of Vertebrate Paleontology*, **12**: 103-106.
- REUMER J. W. F. 1998. A classification of the fossil and recent shrews. [In:] J. M. WÓJCIK, M. WOLSAN (eds) – Evolution of shrews, Mammal Research Institute Polish Academy of Sciences, Białowieża, pp. 5-22.
- RÜMKE C. A. 1985. A review of fossil and recent Desmaninae (Talpidae, Insectivora). *Utrecht Micropaleontological Bulletins*. Special publication, 4: 264 pp.
- RZEBIK-KOWALSKA B. 1976. The Neogene and Pleistocene insectivores (Mammalia) of Poland. III. Soricidae: *Beremendia* and *Blarinoides*. *Acta zoologica cracoviensia*, **22**: 359-385.
- RZEBIK-KOWALSKA B. 1990a. Pliocene and Pleistocene Insectivora (Mammalia) of Poland. VI. Soricidae: *Deinsdorfia* HELLER, 1963 and *Zelceina* SULIMSKI, 1962. *Acta zoologica cracoviensia*, **33**: 45-77.
- RZEBIK-KOWALSKA B. 1990b. Pliocene and Pleistocene Insectivora (Mammalia) of Poland. VII. Soricidae: *Mafia* REUMER, 1984, *Sulimskia* REUMER, 1984 and *Paenelimnoecus* BAUDELLOT, 1972. *Acta zoologica cracoviensia*, **33**: 303-327.

- RZEBIK-KOWALSKA B. 1991. Pliocene and Pleistocene Insectivora (Mammalia) of Poland. VIII. Soricidae: *Sorex* LINNAEUS, 1758, *Neomys* KAUP, 1829, *Macroneomys* FEJFAR, 1966, *Paenelinmoecus* BAUDELLOT, 1972 and Soricidae indeterminata. *Acta zoologica cracoviensia*, **34**: 323-424.
- RZEBIK-KOWALSKA B. 1994. Pliocene and Quaternary Insectivora (Mammalia) of Poland. *Acta zoologica cracoviensia*, **37**: 77-136.
- RZEBIK-KOWALSKA B. 1995. Climate and history of European shrews (family Soricidae). *Acta zoologica cracoviensia*, **38**: 95-107.
- RZEBIK-KOWALSKA B. 1998. Fossil history of shrews in Europe. [In:] J. M. WÓJCIK, M. WOLSAN (eds) – Evolution of shrews, Mammal Research Institute Polish Academy of Sciences, Białowieża, pp. 23-92.
- RZEBIK-KOWALSKA B. 2000a. Insectivora (Mammalia) from the Early and early Middle Pleistocene of Betfia in Romania. I. Soricidae FISCHER VON WALDHEIM, 1817. *Acta zoologica cracoviensia*, **43**(1-2): 1-53.
- RZEBIK-KOWALSKA B. 2000b. Insectivora (Mammalia) from the Early and early Middle Pleistocene of Betfia in Romania. II. Erinaceidae BONAPARTE, 1838 and Talpidae GRAY, 1825. *Acta zoologica cracoviensia*, **43**(1-2): 55-77.
- RZEBIK-KOWALSKA B., PAWŁOWSKI J. 1994. *Ruemkelia* (Mammalia, Insectivora, Talpidae) nom. nov. for *Dibolia* RÜMKE, 1985 (nec LATREILLE, 1829). *Acta zoologica cracoviensia*, **37**(1): 75-76.
- SAMSON P., RĂDULESCU C. 1972. Découverte de dépôts à faune mindélienne dans les grottes de la Dobrogea centrale. *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **11**: 317-326.
- STORCH G. 1995. The Neogene mammalian faunas of Ertemte and Harr Obo in Inner Mongolia (Nei Mongol), China. – 11. Soricidae (Insectivora). *Senckenbergiana lethaea*, **75**: 221-251.
- STORCH G., QIU Zh., ZAZHIGIN V. S. 1998. Fossil history of shrews in Asia. [In:] J. M. WÓJCIK, M. WOLSAN (eds) – Evolution of shrews, Mammal Research Institute Polish Academy of Sciences, Białowieża, pp. 93-120.
- SULIMSKI A. 1959. Pliocene insectivores from Weże. *Acta Palaeontologica Polonica*, **4**: 119-173.
- SULIMSKI A. 1962. Supplementary studies on the insectivores from Weże 1 (Poland). *Acta Palaeontologica Polonica*, **7**: 441-502.
- TERZEA E. 1970. La faune de mammifères quaternaires de la grotte Magura de Sighiștel (Bihor, Roumanie). *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **9**: 201-230.
- TERZEA E. 1971. Les Micromammifères quaternaires de deux grottes des Carpates roumaines. *Travaux de l'Institut de Spéologie "Émile RACOVITZA"* **10**: 279-300.
- TERZEA E. 1973. Les genres *Rattus* et *Lemmus* (Rodentia, Mammalia) dans le Pléistocène de Roumanie. Livre du cinquantenaire de l'Institut de Spéologie "Émile RACOVITZA", : 427-436.
- TERZEA E. 1974. Les mammifères quaternaires de la grotte "Peștera Bursucilor" et quelques remarques sur les dipodidés. *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **13**: 105-116.
- TERZEA E. 1979. Mammifères Quaternaires de quelques grottes et abris-sous-roche de la zone des "Portes de Fer". Seria monografica "Portile de Fier", Speologia, Academia Republicii Socialiste România, **5**: 105-138. (In Romanian with French summary).
- TERZEA E. 1980. Deux micromammifères du Pliocène de Roumanie. *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **19**: 191-201.
- TERZEA E. 1983. *Pliomys "lenki"* (HELLER, 1930) (Rodentia, Mammalia), dans le Pléistocène de Roumanie. *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **22**: 65-80.
- TERZEA E. 1986. Chronologie des faunes Pléistocènes supérieures du sud-ouest de la Roumanie. *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **25**: 85-101.
- TERZEA E. 1987. La faune du Pléistocène supérieur de la Grotte "Peștera Cioarei" de Boroșteni (Départ. de Gorj). *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **26**: 55-66.
- TERZEA E. 1988. La faune de vertébrés du Pléistocène inférieur de Betfia-IX (Départ. de Bihor, Roumanie). Note préliminaire. *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **27**: 79-85.
- TERZEA E., JURCSÁK T. 1976. Faune de mammifères de Betfia-XIII (Bihor, Roumanie) et son âge géologique. *Travaux de l'Institut de Spéologie "Émile RACOVITZA"*, **15**: 175-185.
- TOPACHEVSKY V. A., PASHKOV A. V. 1990. New representatives of the genus *Desmana* (Insectivora, Talpidae) from the Eopleistocene sediments of the south European part of the Soviet Union. *Vestnik Zoologii*, **1**: 28-38.
- ZIEGLER R. 1998. Marsupialia und Insectivora (Mammalia) aus den oberoligozänen Spaltenfüllungen Herrlingen 8 und 9 bei Ulm (Baden-Württemberg). *Senckenbergiana lethaea*, **77**(1/2): 101-143.
- ZIEGLER R. 1999. Order Insectivora. [In:] E. ROSSNER, K. HEISSIG (eds) – The Miocene Land Mammals of Europe. Verlag Dr Friedrich PFEIL. München, pp. 53-74.