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A preliminary report on the first results of the re-excavation of the middle Miocene palaeovertebrate locality Szentendre, Cseresznyés-árok (Hungary, Pest County)

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Abstract. In 2018 the middle Miocene paleovertebrate locality Szentendre, Cseresznyés-árok was re-excavated. New fossiliferous layers were unearthed, and rich microvertebrate material was collected. In this publication the elaboration of the amphibians, reptiles and rodents is given. From biochronological point of view the *Cricetodon aureus* population is the most important element of the fauna. In the Northern Alpine Foreland Basin the *C. aureus* faunas are situated between the "Brock horizon" and the Main bentonite horizon. In the Neogene vertebrate biochronology it is referable to the MN 6 zone. In the Paratethys stratigraphy it is equivalent to the middle Badenian, 15.0–14.9 Ma.

Key words. Miocene, Badenian, Microvertebrata, Carpathian Basin.

Introduction

Szentendre is a historical town North to Budapest. Sporadic Miocene palaeovertebrate finds have been collected from the vicinity of the settlement from the 19th century. The remains of *Listriodon splendens*, *Dorcatherium sp.* and *Mastodon*

arvernensis are stored in the Palaeontological Collection of the Hungarian National Museum (Kordos, 1985). A *Listriodon* tooth was found in 1860 and it was mentioned by Koch (1900). Freshwater mollusc shells were described from the surroundings of Szentendre by Szalai (1928). *Mastodon* bone fragments were mentioned by Wein (1939) from a well-digging close to the Serbian Calvary. As a result of different occasional collections *Testudo* sp., *Gomphotherium* sp. and Rhinocerotidae indet. finds are stored in the Collection of the Hungarian Mining and Geological Survey (earlier Hungarian Geological Institute). During the 1970's *Mastodon* and *Chalicotherium* bones were found during the course of a cellar digging in no. 66. of the Vörös Hadsereg Str. of Szentendre.

The fossiliferous diatomite of the "Cseresznyés-árok" (="Cherry Trench") was found by Mr. József László geologist assistant in 1979. First he reported it as a palaeobotanical locality. In 1980 a sampling activity was managed by Dr. László Kordos and Mr. Peter Solt. After the preparation Kordos (1982) published the following faunal list:

Salientia indet.
Testudo sp.
Cricetodon (*Cricetodon*) *albanensis* (Mein & Freudenthal)
Cricetodon sp. (s. l.)
Democricetodon minor (Lartet)
Suidae indet. (? *Listriodon*)
Lagomeryx seu *Palaeomeryx* sp.
Eocerus sp.
Chalicotherium grande (Blainville)
Aceratherium tetradactylum (Lartet)
Anchitherium aurelianense Cuvier

Later Kordos (1986) gave the detailed description of the cricetid material of the localities Hasznos and Szentendre and founded the taxa:

Deperetomys hagni hungaricus n. ssp.
Democricetodon hasznosensis n. sp.

The holotypes of both new species were chosen from the Hasznos material, because the number of the teeth from Szentendre were very limited *(Deperetomys*: 7 teeth, *Democricetodon*: 2 intact teeth + 1 fragment). De Bruijn et al (1993) verified that *Deperetomys hagni hungaricus* has a closer relationship to *Cricetodon*

and emended it as *Cricetodon hungaricus*. An *Anomalomys* M2 from Szentendre was described as *Anomalomys kowalskii* n. sp. by Kordos (1989). For a long time the locality was abandoned. Korpás (1998) edited a detailed explanation for the geological map of Börzsöny and Visegrád Mountains, where, unfortunately, the fossiliferous middle Miocene nonmarine sediments and the vertebrate finds are not mentioned.

Previous report on the frog remains of Szentendre has been provided by Venczel (2004) with the following taxa: *Latonia gigantea*, *Pelobates sanchizi* and *Pelophylax* (= *Rana*) *esculenta* synklepton.

The new field activity

In 2017 Lukács Mészáros and János Hír identified the locality on the field again (Fig. 1). GPS: N 47° 41.119', E 18° 41.617'.

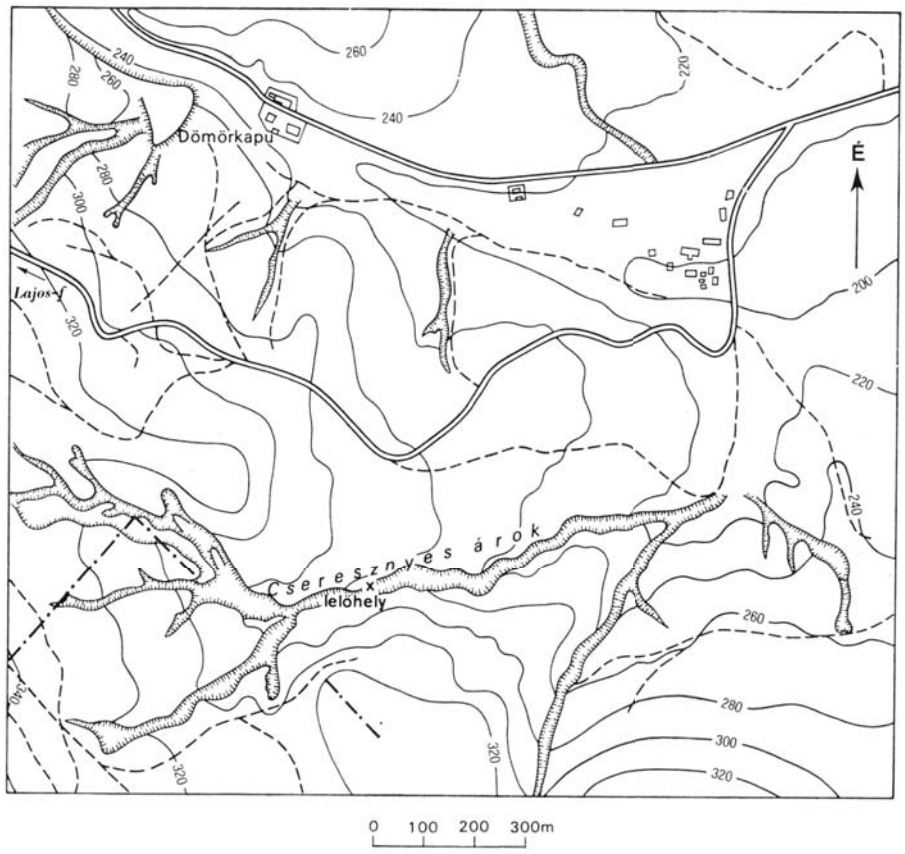

Figure 1. Geographical position of the paleovertebrate locality Szentendre (After Kordos1982: fig. 1.).

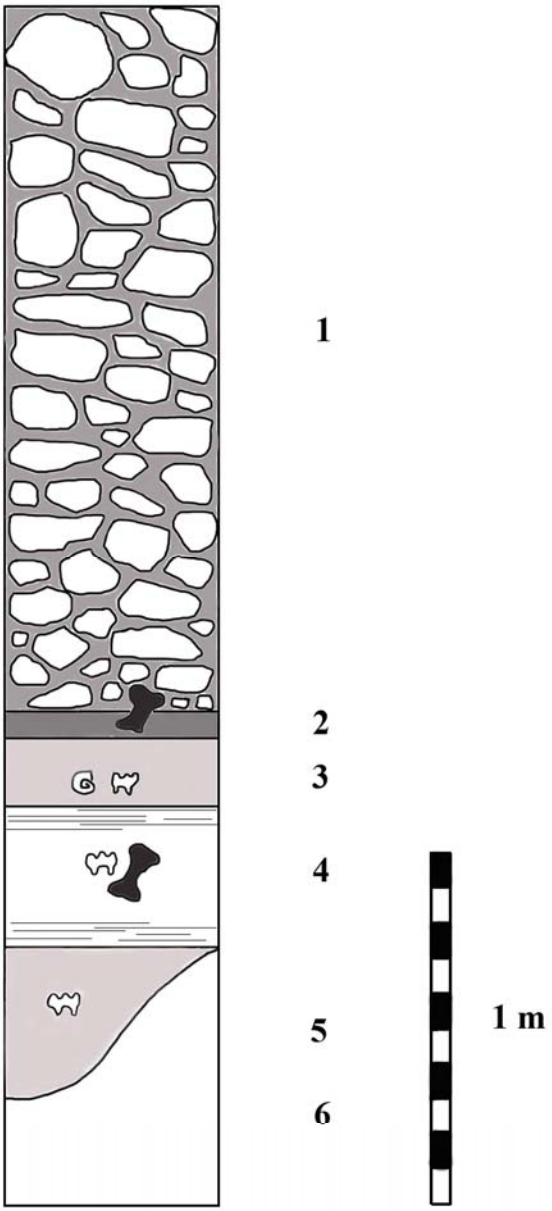

Figure 2. The section of the paleovertebrate locality Szentendre.

1. White coloured hard diatomite
2. Green clay
3. Yellow diatomite
4. Gray diatomitic earth
5. Light gray diatomitic earth bedded in a lense
6. Whiteish diatomitic earth

In 2018 we cleaned the section of the locality and we could distinguish the following layers (Fig. 2):

1. White coloured hard diatomite: this level were visible on the top of the section without cleaning of the overburden. During the field activity in 1980 it

was sampled by László Kordos and Peter Solt. It contains bones but those are very difficult to extract from the cemented matrix. During the field campaign in 2018 this level was not sampled.

2. Green clay: it is a 5 cm thick compact level in the lower border of the first layer. It contains bone fragments of large vertebrates. In 2018 it was not sampled.
3. Yellow diatomite: it consists of 30 cm thick soft ochre diatomitic earth, which is easy to wash. A test sample was taken from this level in 2017. In 2018 400 kg of sediment was collected and washed. It contains pieces of silicified trunks, microvertebrate bones and teeth, shells of freshwater and land snails and fragments of bird eggs.
4. Gray diatomitic earth: It consists of 40 cm thick soft diatomitic earth with some thin coal bands. 400 kg sample was taken. It contains pieces of silicified trunks, microvertebrate bones and teeth, bones of large sized mammals, shells of freshwater and land snails and fragments of bird eggs.
5. Light gray diatomitic earth bedded in a lense: It is not a continuous layer, but a lense below the darker gray fourth layer. It is bordered by coal bands. 200 kg sample was taken, but during the washing and sorting we realized that this part of the studied sectiont is the richest in vertebrate fossils. Beyond the bones it produced shells of land molluscs, fragments of bird eggs and *Celtis* stones.
6. Whiteish diatomitic earth: 50 cm thick layer at the lower part of the section. It is very rich in small pieces of silicified trees and *Celtis* stones. The vertebrate material is relatively poor.

Material and methods

The washing of the sampled material took place in Pásztó. The sediment samples were air dryed. After drying, the material was soaked in water and H_2O_2. We used a sive sat with 0.5 mm mesh for washing. The collected finds belong to the Natural-history Collection of the Municipal Museum of Pásztó.

Dental morphological nomenclatures followed in the text: for Sciuridae: Cuenca-Bescos (1988), for Gliridae: Daams (1981, 1999), Wu (1993), Daxner-Höck & Höck (2009), for Cricetodontini: Mein & Freudenthal (1971b), Rummel (1998), Lopez-Guerrero et al (2013) and for Cricetini: Mein & Freudenthal (1971b), Daams & Freudenthal (1988).

Abbreviations used in the text:

D4:	deciduous (milk) upper premolar
P4:	upper permanent premolar
M1-M2-M3:	upper permanent molars
d4:	deciduous (milk) lower premolar
p4:	lower permanent premolar
m1-m2-m3:	lower permanent molars
fr:	fragment
L:	maximal antero-posterior length on the occlual surface of a tooth
W:	maximal linguo-labial width on the occlusal surface of a tooth
Hyps:	hypsodonty of the *Cricetodon* molars, measured after Weerd (1976)
Min.	minimal value in a sample
Max.	maximal value of a sample
X:	arythmetic average of a sample

All the numeric data are given in mm. The digital images of lissamphibians and squamates were taken by a Canon Eos 400 D digital camera with a Canon Macro Lens EF-S 60mm, and images were processed using a Combine ZP Image Stacking Software by Alan Hadley, whereas the micrographs with the Rodent teeth in the plates were taken by a Canon Eos 400 D digital camera with a Canon MP-E65 mm macro objective. Retouching of the micrographs with the rodent teeth was made by HJ using Photoshop.

Systematic part

Order: Caudata Scopoli, 1777
Family: Salamandridae Goldfuss, 1820
Genus: *Salamandra Laurenti*, 1768
Salamandra sp.

Referred material: 2 humeri (MMP. 2019.1.1-2); 4 fragmentary vertebrae (MMP. 2019.2.1-4).

Description. All the vertebrae are fragmentary. The largest specimens represents the anterior part of a precaudal vertebra (Fig. 3B). The specimen is opistocoelous provided with a large condyle, clearly separated from the vertebral centrum. The neural arch is strongly flattened and in ventral view the centrum preserves part of

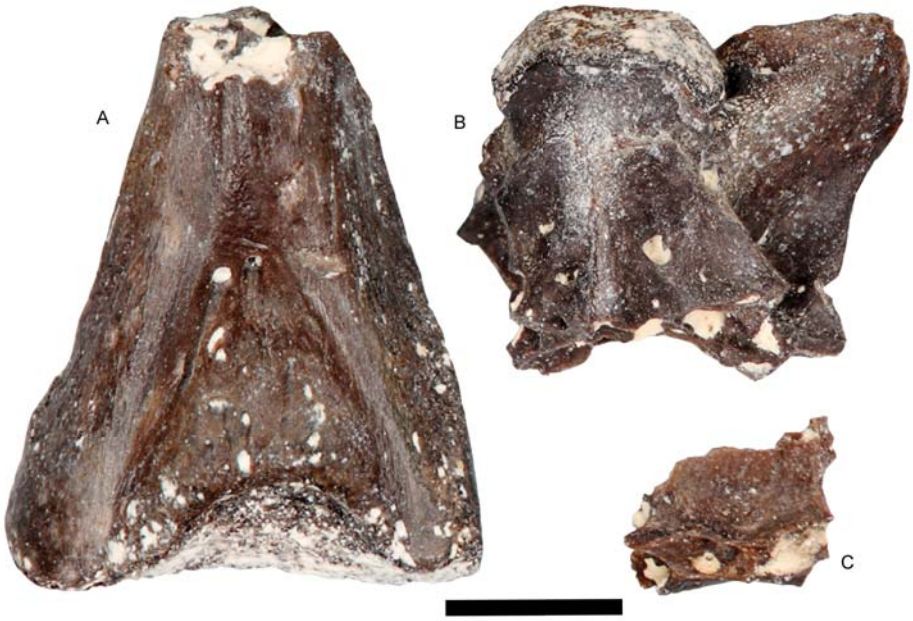

Figure 3. Remains of Salamandridae from Szentendre. A – *Salamandra* sp. (MMP.2019.1.1) distal humeral fragment in ventral view; B – *Salamandra* sp. (MMP.2019.2.1) fragmentary precaudal vertebra in ventral view; C – *Lissotriton* sp. (MMP.2019.3.1) fragmentary precaudal vertebra in lateral view. Scale = 2 mm.

a subcentral keel. A small caudal vertebra preserves the remnants of the haemal arch. The other specimens preserve part of the neural arch showing a low neural crest. Two humeral fragments of relatively large size (Fig. 3A) represent the distal part of these bones. The ventral cubital fossa is deep and of triangle shape.
Comments. The relatively large sized opistocoelous vertebrae with strongly flattened neural arch and low neural crista is typical for the genus *Salamandra*. The material in hand is too fragmentary for a more closer assignment.

Genus: *Lissotriton* Bell, 1839
Lissotriton sp.

Referred material: 1 precaudal vertebra (MMP. 2019.3.1).

Description. The only vertebra is of small size (Fig. 3C). The centrum is opistocoelous, however the condyle and the transverse processes are damaged. The centrum is gently concave dorsally and provided with relatively small subcentral

foramina; the neural arch is flattened, whereas the neural spine is high and long extending from the anterior part of the neural lamina to the posterior border of the postzygapophyses; the only prezygapophysis preserved has a nearly horizontal articular surface.

Comments. The small-sized opistocoelous precaudal vertebrae, provided with a high and long neural spine occur typically in the members of *Lissotriton. Carpathotriton* is another salamandrid taxon provided with an extremely high neural spine, known from the middle Miocene of Mátraszőlős 1 and 2 (N-Hungary) and Tauț (W-Romania) (Venczel 2008, Venczel & Știucă 2008). However, the neural spine of *Carpathotriton* has a gradual posterior enlargement bearing pit and ridge sculpture (Venczel 2008).

Order: Anura Fischer von Waldheim, 1813
Family: Alytidae Fitzinger, 1843
Genus: *Latonia*
Latonia gigantea (Lartet, 1851)

Referred material: 18 fragmentary frontoparietals (MMP.2019.4.1-3, 2019.10.1-12, 2019.26.1-3); 23 fragmentary maxillae (MMP.2019.5.1-3, 2019.11.1-13, 2019.27.1-9); one fragmentary pterygoid (MMP.2019.6.1); one fragmentary premaxilla (MMP.2019.12.1); four angulospelnials (MMP.2019.13.1-3, 2019.28.1); two presacral vertebral centra (MMP.2019.15.1, 2019.29.1); one fragmentary urostyle (MMP.2019.14.1); one fragmentary scapula (MMP.2019.7.1); one fragmentary distal humerus (MMP.2019.30.1); three left posterior ilial fragments (MMP.2019.16.1-3).

Description and comments. The material has belonged to various sized individuals. Typical features of *L. gigantea* include: the azygous frontoparietal is covered by a strong secondary scultpure (see e.g. Venczel 2004: text.fig.1A) that is visible even in the relatively small (i.e. young) individuals (Fig. 4B, C); the labial surface of the posterior part of maxillae is covered by a secondary sculpture; the angulosplenial bears two coronoid processes (Fig. 4A); the ventral process of the pterygoid is wide (Fig. 4D). The remaining material include two presacral vertebrae of relatively small size having opistocoelous centra; the centrum of the single sacral vertebra is bicondylar (Fig.E). A fragmentary scapula is provided with an extremely short and wide scapular blade. The ilial fragments are strongly damaged preserving only the acetabular region.

Figure 4. Remains of *Latonia gigantea* from Szentendre. A – fragmentary angulosplenial (MMP.2019.28.1) in dorsal view; B, C – fragmentary frontoparietal in ventral (B) and dorsal (C) views; D – fragmentary pterygoid in dorsal view; E – fragmentary sacral vertebral centrum in ventral view. Scale = 2 mm.

Family: Pelobatidae Bonaparte, 1850
Genus: *Pelobates* Wagler, 1830
Pelobates sanchizi Venczel, 2004

Referred material: three fragmentary frontoparietals (MMP.2019.17.1-3); four fragmentary maxillae (MMP.2019.18.1-3, 2019.31.1).

Description. Only small fragments are available. One of the best preserved specimen (MMP.2019.31.1) preserves the middle part of a maxilla (Fig. 5A, B). The sculpture on the labial surface consists of various sized pits enclosed completely by bony ridges that is typical for *Pelobates sanchizi*. The lamina horizontalis is flattened labio-lingually and terminated posteriorly in a small pterygoid process, as it is preserved in the specimen MMP. 2019.18.1. Three foramina (one larger and two smaller ones) are present posterior to the pterygoid process of the latter specimen.
Comments. *P. sanchizi* Venczel, 2004 is known from the late early (MN 4) to the late Miocene of Central Europe (Ivanov 2008, Roček 2013) and previously it has been listed from Szentendre (Venczel 2004).

Family: Bufonidae Gray, 1825
Genus: *Bufotes* Rafinesque, 1815
Bufotes sp.

Referred material: one fragmentary squamosal (MMP.2019.25.1).

Description. The single specimen preserves a short and pointed zygomatic process and a similarly short but widened posterodorsal process (Fig. 5C, D). The distal part of the posterolateral process is broken off. The above morphology is reminiscent of recent *B. viridis* (e.g. see Bailon 1999: Plate 6D).
Comment. Another taxon with a comparable morphology to *Bufotes viridis* is *Bufo priscus*, described from the middle Miocene (MN 6) of Devinska Nova Ves (= Neudorf, Dévényújfalu), near Bratislava, Slovakia. The status of that species (i.e. synonymy to *B. viridis* is possible) has been commented by Rage & Roček (2003) and Venczel (2004).

Family: Scincidae Gray, 1825
Scincidae indet.

Referred material: one fragmentary maxilla (MMP.2019.20.1); one fragmentary dentary (MMP.2019.21.1).

Description. The referred material is extremely fragmentary. The maxillary

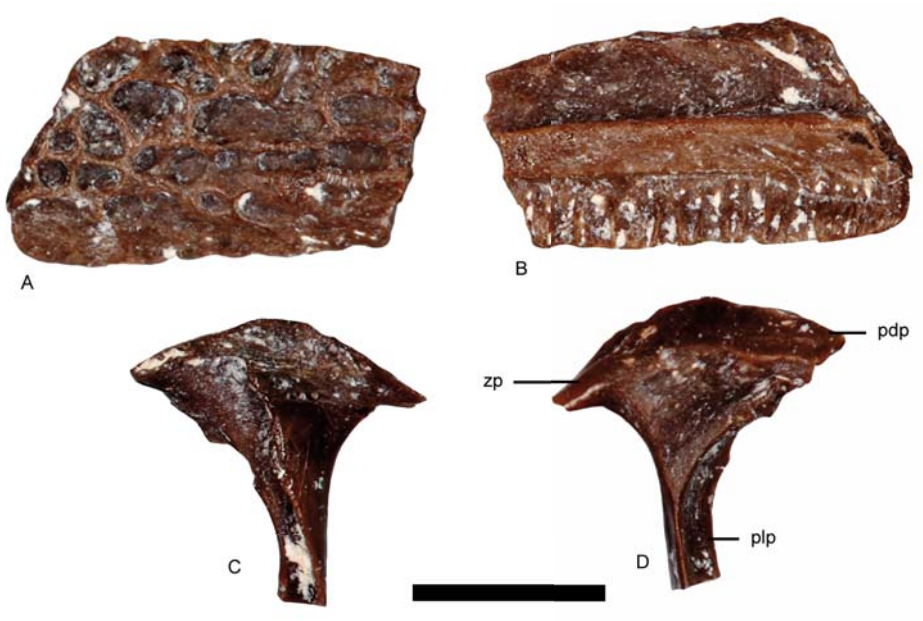

Figure 5. Remains of Anura from Szentendre. A, B – fragmentary maxilla of *Pelobates sanchizi* (MMP.2019.31.1) in labial (A) and lingual (B) views; C, D – fragmentary squamosal of *Bufotes* sp. (MMP.2019.25.1) in medial (C) and lateral (D) views. Abbreviations: pdp - posterodorsal process, plp - posterolateral process, zp - zygomatic process. Scale = 2 mm.

fragment represent the anterior part of the bone; the labial surface is smooth and displays several nutritive foramina; there is no intact tooth is preserved. The dentary fragment represents the anterior part of a right dentary with six tooth positions (two tooth crowns are preserved only). The tooth crown apparently is monocuspid bearing striations only lingually. The meckelian groove is open up to the symphyseal region and oriented ventrally being roofed by a moderately wide subdental shelf. Unfortunately the material is too fragmentary for a more closer assignment.

Comments. Scincid remains have been reported from the Sarmatian (MN 7/8) localities of Felsőtárkány Basin, Hungary by Venczel & Hír (2013) and from the early Pannonian (MN 9) of Crețești, Romania by Codrea et al. (2017).

Family Lacertidae Bonaparte, 1831

Lacertidae indet.

Referred material: three fragmentary dentaries (MMP.2019.22.1-3).

Description. The specimens are fragmentary preserving parts of the dentaries (two

specimens are larger and one is rather small) of small lacertid lizards. The meckelian groove is open extending up to the symphysis and oriented ventromedially; the lamina horizontalis is thin with convex lingual margin; the subdental shelf is shallow and moderately wide. The teeth are pleurodont with their crown bicuspid without any trace of labial or lingual striations; the main cusp is situated distally; the labial surface is smooth and convex and a single row of nutritive foramina is present.
Comments. The lacertids are quite common in the middle Miocene localities of the Central and Eastern Paratethys area (Codrea et al. 2017).

Family Anguidae Gray, 1825
Anguidae indet.

Referred material: 12 osteoderms (MMP.2019.8.1, 2019.19.1-6, 2019.32.1-5).

Description. The specimens are of rectangular shape or with rounded margins (Fig. 6A). The outer surface displays a prominent medial ridge delimited by several anastomosed lateral ridges, irregular pits and grooves. The outer surface has an ornamentation free gliding surface positioned anteriorly.
Comments. The shape and morphology of the osteoderms is reminiscent of the genus *Ophisaurus*, but the material is too limited for such an assignment.

Suborder Serpentes Linnaeus, 1758
Family Colubridae Oppel, 1811
“Colubrinae”
Colubrinae indet.

Referred material: five fragmentary vertebrae (MMP.2019.9.1-5, 2019.23.1).

Description. The material consist of three trunk vertebrae and two caudal vertebrae. Two of the trunk vertebrae are of larger size (the centrum length of the largest specimen = 5,65 mm). The neural arch is moderately vaulted and provided with relatively high neural spines. The haemal keel is slightly sinuous with a more prominent part at mid-length of the centrum (Fig. 6C). Another specimen has a more flattened haemal keel with rounded subcentral surface (Fig. 6B).
Comment. The material probably represent two different colubrine taxa. However, the material is too limited for a more closer assignment.

“Natricinae”
Natricinae indet.

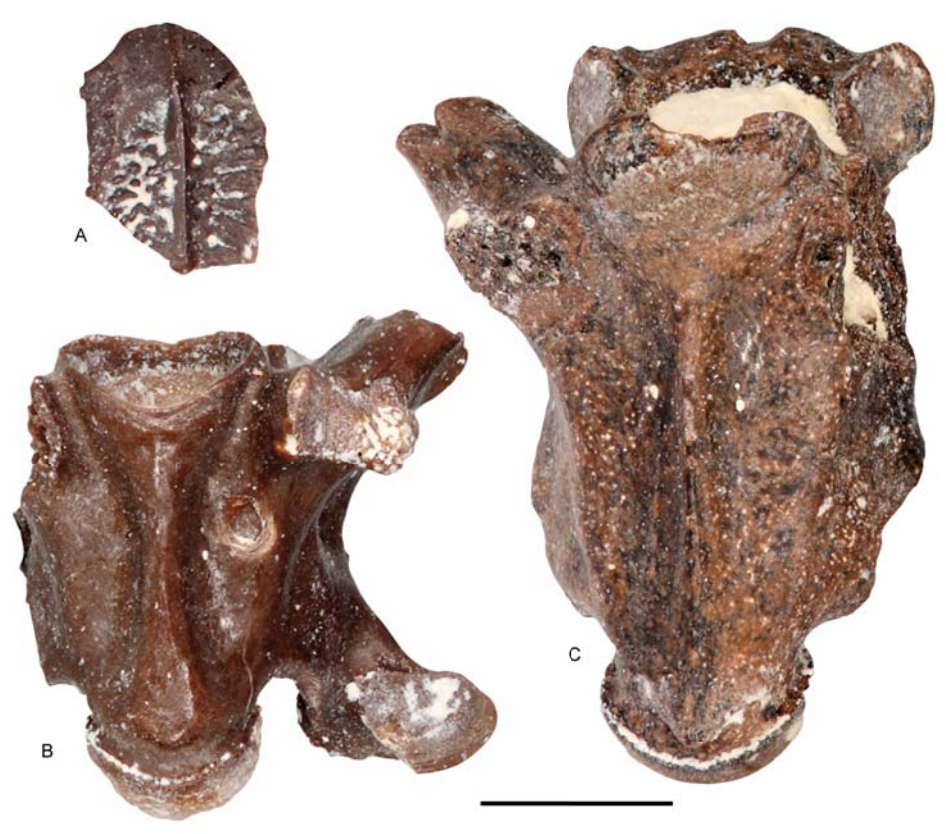

Figure 6. Remains of squamates from Szentendre. A – fragmentary osteoderm of Anguidae indet. in dorsal (outer) view; B – fragmentary trunk vertebral centrum in ventral view; C – fragmentary trunk vertebra in ventral view. Scale = 2 mm.

Referred material: one fragmentary vertebra (MMP.2019.24.1).

Description. The only specimen is a fragment of a vertebral centrum. The vertebral centrum is elongated, whereas the hypapohysis is prominent with a sinuous and deep ventral margin, however, the distal part is missing.

Comment. The morphology of the specimen approaches those of natricine snakes. In colubrine snakes the anterior trunk vertebrae also possess hypapophyses resembling superficially that of the specimen, but the hypapophyses in that group are long and with more or less straight ventral margins. It is not suprising the presence of natricine snakes in the sediments of this locality, a group of snakes rather common in the middle Miocene of the Pannonian basin.

Family: Sciuridae Fischer von Waldheim, 1817
Sub-family: Sciurinae Fischer von Waldheim, 1817
Genus: *Spermophilinus* De Bruijn & Mein, 1968
Spermophilinus bredai De Bruijn & Mein, 1968

Material and measurements: 1 P4: 1.55x1.82, 1M1-2: 1.82x2.25, 1d4: 1.2x1.09, 1m1: 1.76x1.95, 1m2: 1.86x2.10.

Description. The description of the rather general morphology of the species was given in the previous publications of Hír (2006) and Hír & Kókay 2010). The Szentendre material has no special characters and a repeated description is not necessary. The species is a constant element of the Central European Middle Miocene vertebrate faunas (Hír et al. 2017).

Genus: *Palaeosciurus* Pomel, 1853
Palaeosciurus sp.

Material: 2 M1-2: 2.17x2.44, 2.2x2.52, 1 m1: 2.28x2.27

Description. The teeth are rather worned. The morphological description is difficult, but the general sciurid structure is visible and the dimensions are similar to the *Palaeosciurus* genus. After giving a review of the last occurrences of the genus in the different regions in Europe we can see that *Palaeosciurus* disappeared from Spain, Greece and Turkey during the early Miocene. In Central Europe it existed up to the late middle Miocene. In the Carpathian Basin the genus was found in Hasznos (Hír & Pászti, 2012) and Subpiatră 2/2.

Tribus: Pteromyini Brandt,1855
Genus: *Albanensia* Daxner-Höck & Mein, 1975
Albanensia sansaniensis (Lartet, 1851)

Material and measurements (see Table 1.).

Description. **M 1-2.** Subrectangular outline with rounded lingual side because the concave lingual wall of the protocone. Width of the crown is larger than the length. Anteroloph developed as a continuous ridge on the mesial margin of the crown between the protocone and the anterior basis of the paracone. This ridge is without cuspulas. Protoloph and metaloph converge to the labial side of the protocone in V shape. Protoconule is incipient. Protoloph is a continuous ridge between the pro-

Table 1. Material and measurements of *Albanensia sansaniensis* (Lartet, 1851)

NO. inv.	Position:	L:	W:	Figure:
MMP. 18. 431.	M1-2	2.65	3.30	Pl. I.-1
MMP. 18. 432.	M3	2.50	2.55	
MMP. 18. 433.	d4	2.07	1.77	
MMP. 18. 434.	p4	2.70	2.50	
MMP. 18. 435.	m1	2.65	2.77	Pl. I.-2
MMP. 18. 436.	m1	2.62	2.75	
MMP. 18. 440.	m1	2.67	2.90	
MMP. 18. 437.	m2	2.95	3.0	Pl. I.-3
MMP. 18. 438.	m2	2.87	2.90	
MMP. 18. 439.	m2	2.95	3.12	
MMP. 18. 441.	m3	3.37	3.21	

tocone and the paracone. It does not form a “zigzag line” which is characteristic in *A. grimmi* (Daxner-Höck 2004a). The mesostyle christa on the posterior side of the paracone is underdeveloped and the mesostyle is a tiny but distinct cuspula. The metaloph connects the protocone, metaconule and metacone. A secondary ridge starts from the metacone to the posteroloph. The metaconule has a large posterior ledge, but it does not reach the posteroloph. Hypocone is incipient. Posteroloph is thiner and lower developed than the other main ridges. In all the secondary ridges are much less developed than those in the molars of *A. albanensis* and *A. grimmi*.
M3. Subtriangular outline with rounded angles. Anteroloph and protoloph are nearly parallel. Protoconule, mesostyle and mesostyle christa are absent. Metaloph is a short curved ridge between the posterior side of the protocone and the postero-lingual part of the posteroloph. Secondary ridges are absent.
d4. Trapezoidal outline with rounded angles. Anterior width is narrower than the posterior one. The greatest part of the occlusal surface is occupied by a large talonid basin. The cusps are definitely smaller than the cusps of the permanent molars. Protoconid and the metaconid are situated in the mesial surface. Those are close to each other. In the postero-labial angle the hypoconid is developed. The entoconid is incorporated into the posterolophid. Mesoconid is a low-developed cuspula between the protoconid and the hypoconid. There is an incision between the hypoconid and the metaconid in the lingual margin.
p4. Trapezoidal outline with rounded angles. Anterior margin is narrower than the posterior one. Three cusps are developed on the mesial part of the crown: the

well developed protoconid and metaconid and a lower developed anteroconulid. A narrow trigonid basin is closed by these three cusps. Anteroconulid and metaconid are connected by a narrow anterolophid. The V shaped metalophid is developed on the posterior slope of the protoconid and metaconid. An enamel ridge is developed on the posterior slope of the metaconid reaching to the mesolophid. It is less expressed than the same structure in *A. grimmi*. The mesoconid is a low developed cuspula. The trench between the mesoconid and the labial margin (which is found in *A. grimmi*) is not developed. Mesoconid is connected to the base of the protoconid and hypoconid by enamel ridges. The posterolophid is a continuous ridge between the hypoconid and the entoconid. It is not dissected by minor cusps which is visible in *A. albanensis* and *A. grimmi*. No incision between the posterolophid and the entoconid. A deep and wide incision is found between the entoconid and mesolophid. The surface of the talonid basin is not complicated by secondary ridges and crenulation. Twoo roots are present.

m1-2. Rhomboidal outline. Related to the p4 the anterior margin is wider. A strong anterolophid is extending on the mesial margin between the protoconid and the metaconid.

These two ridges are connected by the lower developed metalophid too. This metalophid is straight, transversal and not V-shaped (the V-shaped configuration is visible in *A. grimmi)*. A trigonid basin is rounded by the protoconid-metaconid-anterolophid- metalophid system. An enamel ridge is developed on the posterior slope of the metaconid reaching to the mesolophid.

There is a closed C-shaped basin between the labial cingulum and the mesoconid. The posterolophid is a continuous ridge between the hypoconid and the entoconid. It is not dissected by minor cusps which is visible in *A. albanensis* and *A. grimmi*. No incision between the posterolophid and the entoconid. There is a deep and narrow incision between the mesolophid and the entoconid. The surface of the central basin is complicated by secondary ridges and crenulation, but these ridges are less developed than those in *A. albanensis* and *A. grimmi*. Four roots are present.

m3. The basic structure is similar to the crown of m1-2. The differences are the followings: more elongated rhomboid outline; no closed basin on the labial side of the mesoconid, because the labial cingulum is not so strong; four roots are present; the hypoconulid is not developed.

Discussion. The classification of the finds is based on the small dimensions and the morphology. Up to the present *A. sansaniensis* has not been reported from Hungary. *Albanensia grimmi* (Black, 1966) populations are known from the late

Sarmatian (MN 7+8) fauna of Felsőtárkány 3/2 (Hír, 2003) and the early Pannonian (MN9) material of Rudabánya (Kretzoi & Fejfar 2004). An only *A. albanensis* m3 was found in the Early Sarmatian (MN 7+8) assemblage of Kozárd (N-Hungary, Nógrád County) (Hír, 2015).

Albanensia sansaniensis differs from *A. albanensis* in the following morphological characters (Ginsburg & Mein (2012): in the smaller dimensions; in the more simple parastyle in the upper molars; in the absence of hypoconulid in the lower molars. In the Szentendre material there are some additional morphological specialities: the two impressions on the lingual surface of the M1-2 are absent; the mesostyle christa is underdeveloped, mesostyle is a distinct small cusp in M1-2; posteroloph is continuous, it is not a "string of pearls"; the crenulation of the enamel surface is less developed, during the wearing process it can be disappeared.

The earliest occurrence of *A. sansaniensis* is reported from the Early Miocene fauna of Montalvos 2 in the Calatayud-Teruel Basin, Spain (Hordijk et al. 2015). Among the *Albanensia* species, *A. sansaniensis* is unambiguously the smallest one. But consequent time transgressiv magnification of the dimensions is not found when we compare the *Albanensia albanensis* and *Albanensia grimmi* finds collected from the faunas of the MN 7/8 and MN 9 zones. Moreover the *A. grimmi* molars from Felsőtárkány 3/2 (late MN7/8) are definitely larger than the *A.grimmi* teeth from Rudabánya (MN9). The dimensions of the later population is closer to *A. albanensis* materials from La Grive and Gratkorn. (Remarkabler that the finds from Rudabánya were first described as *A. albanensis* by Kretzoi et al, 1974 and finally revised and determined as *A. grimmi* by Kretzoi & Fejfar (2004).

Family: Gliridae Thomas, 1897
Genus: *Muscardinus* Kaup, 1829
Muscardinus sansaniensis (Lartet, 1851)

Material and measurements.

No. inv.	**Position:**	**L:**	**W:**	**Figures**
MMP. 18. 453.	P4	0,63	0,77	
MMP. 18. 451.	M1	1,04	1,13	Pl. III.-21.
MMP. 18. 452.	m1	1,06	1,01	Pl. III.-22.
MMP. 18. 495.	m2	1,13	1,05	

Description. **P4**. Oval outline. 3 main ridges (protoloph, metaloph and posteroloph), 2 shorter centrally positioned ridges: anteroloph, anterior centroloph (?).

M1. Rectangular outline. Width is larger than the length. Posterior width is slightly larger than the anterior one. The 1th ridge (anteroloph) is free in both sides. The 2nd, 8th, 9th ridges are always complete and connected to the endoloph. 3rd, 4th, 5Th, 6th, 7th ridges are incomplete and labially positioned.
m1. Trapezoidal outline, posterior width is slightly larger than the anterior one. 8 ridges. 1th, 5th, 7th, 8th, 9th ridges are complete. 2nd, 4th ridges are short lingually positioned ridges. 6th ridge is ended just before the labial margin.
m2. Trapezoidal outline, anterior width is slightly larger than the posterior one. 7ridges. 1th, 3th, 5th, 7th ridges are complete. 2nd and 4th ridges are shorter and lingually positioned. 6th ridge is labially positioned. This is the only ridge which is not connetted to the endolophid. Endolophid is interrupted between the 4th and 5th ridges.

Discussion. These *Muscardinus* M1, m1 molars show the most plesiomorph characters in the Carpathian Basin (nearly isodiametric M1 with numerous additional ridges, m1 with 3 additional ridges). The morphology of the molars from Szentendre are similar to the pattern of the "*Eomuscardinus* aff. *sansaniensis*" specimen described from Puttenhausen (Wu 1990).

Genus: *Miodyromys* Kretzoi, 1943
Miodyromys sp.

Material and measurements.

No. inv.	Position:	L:	W:	Figures:
MMP. 2018. 479.	M1	1.06	1.26	
MMP. 2018. 483.	M1	1.02	1.19	
MMP. 2018. 484.	M1	1.05	1.18	
MMP. 2018. 486.	M1	1.12	1.19	
MMP. 2018. 487.	M1	1.06	1.23	
MMP. 2018. 478.	M2	0.99	1.33	Pl. III.-16.
MMP. 2018. 482.	M2	1.05	1.29	
MMP. 2018. 484.	M2	1.04	1.32	Pl. III.-17.
MMP. 2018. 488.	m1	1.12	1.11	Pl. III.-18.
MMP. 2018. 494.	m1	1.15	1.11	
MMP. 2018. 491.	m2	1.22	1.12	
MMP. 2018. 492.	m2	1.13	1.12	
MMP. 2018. 496.	m3	1.06	0.99	

Description. **M1-2**. Rectangular outline, concave occlusal surface. Four main ridges (anterolop, protoloph, metaloph, posteroloph). Lingual and labial ends of the anteroloph are free. The lingual ends of the other three main ridges are lingually merged. Anterior centroloph is long and connected to the protoloph in the paracone. Posterior centroloph is shorter than the anterior one and connected to the metaloph in the metacone. There is a short anterior extra ridge in (3/8) cases. Anterior and posterior extra ridges are found together in (1/8). Exra ridges are absent in (4/8).

m1. Trapezoidal outline, anterior with narrower than the posterior one. Four main ridges (anterolophid, centrolophid, mesolophid, posterolophid). The labial ends of the ridges are free. In the lingual side anterolophid and centrolophid are connected in the metaconid. Mesolophid and posterolophid are connected in the entoconid. Metalophid is developed in diagonal position in the anterior sinusid and connected to the anterolophid and the metalophid. Beyond this "irregular ridge" there are 1 or 2 small pearl-like extra ridges in the anterosinusid.

m2. Trapezoidal outline, anterior width is slightly larger than the posterior one. The four main ridges are: anterolophid, metalophid, mesolophid, posterolophid. Beyond the main ridges there are the shorter centrolophid and posterior extra ridge. The connections of the ridges is like in m1, but the lingual end of the metalophid is ended just before the metaconid.

m3. Subtriangular outline, posterior part is narrower. The structure of the ridges is similar to the m2, but there is an anterior extra ridge between the anterolophid and metalophid.

Discussion. The taxonomy and evolution of the *Miodyromys* genus is best documented and studied in the Northern Alpine Foreland Basin (Mayr 1979, Heissig 2006, Wu 1990, 1993, (Kälin & Engesser 2001). In this region a time transgressive increase of the mean measurements of the *M.* aff. *aegercii* and *M. aegercii* populations was found (Kälin & Engesser 2001: Abb. 27.) from MN5 to MN9. Later Heissig (2006) verified that two sympathric *Miodyromys* species left in Southern Germany from the Early MN5 to the MN6 faunas.

The evolution of the *Miodyromys* finds from Hungary are not possible to explain on the score of the scheme of the OSM. During the elaboration of the late MN5 "*Cricetodon meini* faunas" of Litke (Hír 2013) we found that the *Miodyromys* teeth are definitely smaller than the *Miodyromys* finds from the "*C. meini* faunas" of the OSM (eg. Edelbeuren-Maurerkopf, Sach (1999); Wannenwaldtobel 2, Sach (1999); Hohenraunau, Seehuber (2008); Unterneul 1a, Heissig (1989); Ebershausen, Heissig (2006). Larger difference is found when we compare the dimensi-

ons of the *Miodyromys* teeth of the "*Cricetodon aueus* faunas" of Szentendre and Rümikon (Kälin & Engesser 2001). The founded explanation of this phenomenon needs more material.

Genus: *Microdyromys* De Bruijn, 1966
Microdyromys koenigswaldi De Bruijn, 1966

Material and measurements.

No. inv.	**Position:**	**L:**	**W:**	**Figures:**
MMP. 2018.480.	M1	0,97	1,05	Pl. III.-15
MMP. 2018.481.	M1	1,05	1,13	
MMP. 2018.489.	m1	1,12	1,01	Pl. III.-19.

Description. **M1.** Trapezoidal outline, posterior width is a bit larger than the anterior one. 6 main ridges: anteroloph, protoloph, anterior centroloph, posterior centroloph, metaloph, posteroloph. One extra ridge between the protoloph and anterior centroloph. A tiny lingually positioned extra ridge is found between anteroloph and protoloph. Endoloph is continuous in the specimen no. 481. It is interrupted between the anteroloph and the protoloph in no. 2018. 480.
m1. Trapezoidal outline, posterior width is a bit larger than the anterior one. 5 main ridges: anterolophid, metalophid, centrolophid, mesolophid, posterolophid. The position and development of the extra ridges are referable to the original diagnosis. Labial end of the mesolophid is strongly curved anteriorly. Endolophid is interrupted between the centrolophid and mesolophid.

Discussion. *Microdyromys koenigswaldi* is a rare species in the Miocene of the Carpathian region. Beyond Szentendre it was reported only from Sámsonháza (Hír & Mészáros 2002).

Genus: *Glirulus* Thomas, 1897
Glirulus lissiensis (Hugueney & Mein 1965*)*

Material and measurements.

No. inv.	**Position:**	**L:**	**W:**	**Figure:**
MMP. 2018. 497	m2	0,92	0,85	Pl. III.-20.

Description. Rectangular outline. Anterior width is slightly larger than the posterior one. Four main ridges: anterolophid, metalophid, mesolophid, posterolophid. All of them and the centrolophid are connected to the endolophid. Anterolophid and metalophid have a labial connection. The labial ends of the metalophid and the mesolophid are anteriorly curved. Centrolophid reaches the center of the toothcrown. The endolophid is interrupted between the centrolophid and the mesolophid. There are two extra ridges: one between the centrolophid and the metalophid, one between the mesolophid and the posterolophid. There is a short longitudinal ridge on the anterior side of the mesolophid.

Discussion. The *Glirulus lissiensis* occurences in Eastern Central Europe are as follows: Rudabánya (MN9): Daxner-Höck (2005); Richardhof –Golfplatz (MN9): Daxner-Höck (2005); Richardhof-Wald (MN9): Daxner-Höck (2005); Borsky Sväty Jur (MN9): Sabol et al (2004), Joniak (2005); Belchatow A (MN9): Kowalski (1997), Garapich (2002); Schernham (MN10): Daxner-Höck (2004b); Kohfidisch (MN 11) Daxner-Höck & Höck (2009); Eichkogel (MN 11) Daxner-Höck & Höck (2009); Egerszólát (MN 7+8) Hír (2011); Subpiatră 2/2 (MN 6) Hír & Venczel (2005); Felsőtárkány 3/8 (MN 9) Hír & Kókay (2010).

Genus: *Myoglis* Baudelot, 1965
Myoglis meini (De Bruijn, 1966)

Material and measurements.

No. inv.	**Position:**	**L:**	**W:**	**Figures:**
MMP. 2018. 464	P4	1,62	1,81	Pl. III.-11.
MMP. 2018. 466	P4	1,47	1,58	
MMP. 2018. 465	M2	1,65	2,06	Pl. III.-12.
MMP. 2018. 467	M2	1,61	1,96	
MMP. 2018. 468	M3	1,64	1,85	
MMP. 2018. 469	M3	1,51	1,82	
MMP. 2018. 470	M3	1,65	1,88	
MMP. 2018. 471	p4	1,29	1,29	
MMP. 2018. 472	p4	1,26	1,22	
MMP. 2018. 473	p4	1,26	1,19	
MMP. 2018. 474	m1	1,83	1,75	Pl. III.-13.
MMP. 2018. 475	m2	1,82	1,90	
MMP. 2018. 476	m3	1,79	1,74	Pl. III.-14.

Description. General characters: flat occlusal surface, the cross section of the valleys between the main ridges are V-shaped.

P4. The outline of the occlusal surface is oval. Four main ridges: anteroloph, protoloph, metaloph, posteroloph. The lingual end of the protoloph, metaloph and posteroloph are merged into the protocone. A slender extra ridge (anterior centroloph?) occures between the protoloph and the metaloph. Three roots.

M2. The outline of the occlusal surface is rectangular, broader than it' s own length. 5 main ridges: anteroloph, protoloph, anterior centroloph, metaloph, posteroloph. Anteroloph is independent, protoloph, metaloph and posteroloph are merged in the protocone. Anteroloph, protoloph and anterior centroloph are diagonally positioned, metaloph and posteroloph are transversal. There are two labially positioned extra ridges: one between the protoloph and anterior centroloph, another one between the anterior centroloph and the metaloph. The earlier one has a labial connection to the protoloph. There is an incipient extra ridge between the anteroloph and the protoloph. Three roots.

M3. The outline of the occlusal surface is subtriangular, posteriorly narrowed. A continuous endoloph is developed. 5 main ridges are connected to the endoloph. The nomenclatural homology of them is uncertain. 2-3 extra ridges are found in the posterior segment of the occlusal surface. Three roots.

p4. The outline is subtriangular. There are four ridges with free lingual and labial ending. In one juvenile molar the two anterior ridges are connected. One root.

m1. The outline of the occlusal surface is rectangular: the posterior margin is wider than the anterior one. Four main ridges: anterolophid, metalophid, mesolophid, posterolophid. The anterior extra ridge is developed as a lingually positioned curved ridge between the anterolophid and the metalophid. The anterior end of the anterior extra ridge has a nearly central connection to the anterolophid. Among the Middle Miocene *Myoglis* populations of the Carpathian region this connection is developed only in the Subpiatră material (Hír & Venczel, 2005) beyond the Szentendre finds.

m2. The outline of the occlusal surface is rectangular. Broader than it' s own length. The four main ridges are regular like in m1. Three secondary ridges are developed, one lingually positioned between the anterolophid and the metalophid, a second one between the metalophid and the mesolophid and a third one between the mesolophid and the posterolophid. Tiny secondary ridges by the side of the anterior extra ridge are not developed.

Discussion. In the Carpathian Basin *Myoglis* was first mentioned in Neudorf Spalte (Fejfar 1990, Sabol et al. 2004). The absence of the genus in the faunas of Litke

1-2 (MN5), Hasznos, Sámsonháza (MN6), Mátraszőlős 1-2-3, Tasád (MN7/8) can be casual, but not impossible that during the time interval of the MN6-MN7/8 zones there were periods when the climate of the Carpathian Basin was not suitable for *Myoglis*. The flourishing of the genus is found in the late Astaracian–early Vallesian faunas (e.g. in the Felsőtárkány Basin: Hír 2003, 2006, Hír & Kókay 2010) and Rudabánya (Daxner-Höck 2005).

Family: Cricetidae, Fischer, 1817
Subfamily: Cricetodontinae, Simpson, 1945
Tribe: Cricetodontini, Simpson, 1945
Genus: *Cricetodon* Lartet, 1851
Cricetodon aureus Mein & Freudenthal, 1971

1982 *Cricetodon (Cricetodon) albanensis* (Mein & Freudenthal), *Cricetodon* sp. (s.l.), Kordos, p. 381 (Hung.), 383 (Eng.).
1986 *Deperetomys hagni hungaricus* n. ssp., Kordos, p. 524 -529 (Hung.), 539-542 (Eng.), Pl. III, figs 1-6.
1993 *Cricetodon hungaricus*, De Bruijn et al, p.208., pl., figs 1-9, pl. 19, figs 1-9.

Measurements.

		No.	**Min.**	**X**	**Max.**		**No.**	**Min.**	**X**	**Max.**
M1	L	23	3.07	3.26	3.50	W	23	1.87	2.06	2.20
M2	L	29	2.25	2.51	2.77	W	29	1.72	1.97	2.17
M3	L	29	1.82	2.08	2.32	W	29	1.69	1.88	2.10
m1	L	20	2.50	2.70	2.87	W	20	1.62	1.75	1.92
m2	L	23	2.35	2.57	2.82	W	23	1.80	1.95	2.12
m3	L	24	2.37	2.64	2.92	W	24	1.75	1.93	2.15

Description. **M1.** Anterocone is mainly split and consists of two equally developed conelets, which are divided by a shallow groove on the mesial surface. In the subsenile-senile specimen the anterocone is undivided. The posterior ectoloph of the labial unit of the anterocone is mainly absent, or it can be middle developed but does not reaches the anterior surface of the paracone. A short protolophule II is regular, protolophule I is absent. Paracone posterior spur is mainly short, never reaches the anterior surface of the metacone, or absent. The mesoloph is variable: it can be absent (8/23), or short (6/23) or it is only a small enamel knob on the entoloph (9/23). A short entomesoloph is rare 3/23. The lingual margin is straight, (not

undulated after the sense of Carro-Rodriguez et al 2018). A shallow vertical groove on the anterior surface of the paracone and the metacone is developed mainly in the juvenile unworn molars (18/23). This character is described by Maridet & Sen (2012), and Lopez –Guerrero et al (2014 a) in *C. sansaniensis*.

M2. Rectangular outline. The lingual anteroloph is a ridge, the labial anteroloph is a cusp. The anterosinus is deep and labially curved, the protosinus is shallow and transversally directed. The connection between the lingual anteroloph and the paracone anterior surface is rare 4/26. Protolophule I is absent, protolophule II is regular. Paracone posterior spur is short (2/26) or middle developed (24/26), but never reaches the anterior surface of the metacone. Metacone anterior spur is found only in 2/26. Those are not connected with the paracone posterior spur. A short mesoloph is rare. Short entomesoloph is similarly rare (3/26).

M3. Trapezoidal outline. Anterior width is larger than the posterior one. Labial anteroloph is well developed (mainly ridge like, sometimes cusp like) and the anterosinus is deep. Lingual anteroloph is less developed and the protosinus is shallow, sometimes disappeared. Labial anteroloph–paracone anterior surface connection is rare: 2/28. Paracone posterior spur is long and in most cases reaches the apex of the long mesoloph or the anterior spur of the metacone. Tendency for the development of neo-entoloph is absent.

m1. Anteroconid is simple, unicuspid. Labial anterolophid and the protosinusid are well developed and regular. Lingual anterolophid is absent, or it is developed only as a short remnant ridge on the lingual side of the anteroconid. Posterior metalophulid is regular, specimen having both posterior and weaker (but continuous) anterior metalophulid are rare (2/20). Mesolophid is mainly absent (13/20), or short (5/20) or long (2/20) but low developed. Ectomesolophid is similarly rare (6/20). It is long and reaches the labial cingulum (3/20 15%) or short (3/20 15%). The sinusid is regularly closed by a cingulum, the lingual sinusid is open.

m2. Rectangular outline. Labial anterolophid and closed protosinusid are well developed and regular. Lingual anterolophid is absent. The mesolophid is short. It's terminal part is free (14/23), or in subsenil and senil worned specimen it reaches the posterior basis of the metaconid (9/23). A short ectomesolophid is rarely found (5/23). Sinusid is closed by a cingulum, lingual sinusid is open. Posterosinusid is mainly open 13/23, or closed 10/23. The narrow neck between the hypoconid and the posterolophid and the impression in the posterior margin is similarly developed to the same structures on m1.

m3. Subtriangular outline with rounded angles. Labial anterolophid and closed protosinusid are well developed and regular. Lingual anterolophid is absent. The mesolophid is short 4/24, or middle developed 17/24, or long 3/24. In 11/24 ca-

ses the middle developed mesolophid is connected to the posterior basis of the metaconid. Ectomesolophid is absent. Sinusid is closed, but the cingulum is less developed than those on m2s. Lingual sinusid is open. Posterosinusid is closed in 19/24, or open in 5/24.

Table 2. Comparision of the typical characters of *Cricetodon aureus* in the type material and in the fauna of Szentendre

	C. aureus López-Guerrero et al. 2013	*C. aureus* Mein & Freudenthal 1971b	*C. aureus* Szentendre
M1 anterocone posterior ectoloph		short or absent	43%, but never reaches the paracone
M1 entomesoloph	absent	rare	13%
M1 Lingual quersporn II		33%	65%
M2 paracone posterior ectoloph	"some M2s with styls and complete posterior ectolophs"	"paracone always has a posterior ectoloph, which is mainly well developed and reaches the basis of the paracone"	short: 25% middle developed: 75% never reaches the paracone.
M2 mesoloph		short or rarely middle developed	absent: 61% short: 39% middle developed: 0
m1 metalophulid	"some m1 displaying exclusively type I or type II metalophulid"	metaconid posterior connection 77% anterior connection 3% double connection 18% no connection 2%	posterior connection 90% anterior connection 0 double connection 10% no connection 0
m1 mesolophid	"mesolophids are longer than the ones from *C. soriae"*	short 53% middle 32% long 2% absent: 13%	short : 25% middle: 0 long: 10% absent: 65%
m1 ectomesolophid		more than 50%	43%
m2 ectomesolophid		10%	9%

In some respects the morphology of the Szentendre population seems to be more archaic, than that of the type population of Vieux-Collognes because the less developed ectolophs in M1, M2; the better developed and more frequent lingual quersporn II in M1 and the more frequent metalophulid II (posterior metalophulid) in m1.

The origin and evolutionary position of *Cricetodon aureus* and *Cricetodon* aff. *aureus* is discussed in the literature. According to Prieto & Rummel (2016) *C. aureus* and *C.* aff. *aureus* are the members of the same evolutionary line. The two species *C. meini* and *C. aureus* are characterized by Lopez-Guerrero et al (2015) which are widely distributed through Europe from the earliest Middle Miocene having basal morphology with low intraspecific variability and little diversification.

Mein & Freudenthal (1971 b) found that *C. albanensis* is the descendant of *C. aureus*, because the better developed ectolophs and more frequent metalophulid I in m1. Maridet & Sen (2012) postulated that the presume of an anagenetic evolutionary line of *C. aureus, C. sansaniensis* and *C. albanensis* is the most probable hypothesis, but these species arrived to Europe independently.

Remarkable, that up to the present *C. aureus* has been reported nor from Anatolia and neither from the Balkan. For this reason we think, that a local European evolution of the species is not impossible.

Tribe: Copemyini Jacobs & Lindsay 1984
Genus: *Democricetodon* Fahlbusch, 1964
Democricetodon hasznosensis Kordos, 1986

1982 *Democricetodon minor* (Lartet), Kordos, p. 381, 383 (Hung.), p. 384 (Eng.).
1986 *Democricetodon hasznosensis* n. sp., Kordos, p. 529- 533 (Hung.), 542- 544 (Eng.), Pl. IV, figs. 6, 13, 18.

Measurements.

Description. **M1.** Anterocone is undivided, narrow, blade-like. The lingual part of the

	L	**no.**	**min**	**X**	**max**	**W**	**no.**	**min**	**X**	**max**
M1	L	41	1.74	1.87	2.02	W	41	1.16	1.26	1.34
M2	L	46	1.36	1.46	1.61	W	46	1.19	1.27	1.36
M3	L	16	1.05	1.13	1.26	W	16	1.08	1.16	1.26
m1	L	34	1.47	1.60	1.76	W	34	0.99	1.11	1.26
m2	L	31	1.34	1.47	1.58	W	30	1.12	1.21	1.32
m3	L	22	1.29	1.36	1.47	W	21	1.02	1.11	1.19

anterocone is continued in the lingual anteroloph. This ridge reaches the anterior basis of the protocone and closes the protosinus. The labial anteroloph developed between the labial basis of the anterocone and the anterior basis of the paracone and closes the anterosinus. In some cases (6/39) a comma shaped cingulum developed on the mesio-lingual surface of the anterocone. Normal paracone posterior spur is not found. Mesoloph is variable. It can be short (9/39), middle developed (25/39), or long, but doesn't reach the labial margin (2/39), or long and reaches the labial margin (3/39). Metaloph is short and posteriorly directed.

M2. Rectangular outline. The lingual and the labial anteroloph are equally well developed. Protosinus and anterosinus are closed. Anterosinus is deeper than the protosinus. Protolophule I and II are equally developed. Mesoloph is regular but variable. It can be short (14/45), middle developed (26/45), long, but doesn't reach the labial margin (4/45), long and reaches the labial margin (1/45). Normal paracone posterior spur is rare (2/45), it is continued in the labial cingulum between the paracone and the metacone. The metalophule can be anterior (3/45), posterior (31/45), doubled (9/45), or completely absent (2/45).

M3. Subtriangular outline, the width is larger than the length. The lingual and the labial anteroloph are well developed, but the lingual one is longer. Anterior protolophule is regular. Axioloph and centrocone forms a continuous longitudinal ridge. Paracone posterior spur is found in 7/16 and continued in the labial cingulum. Short mesoloph is rare (3/16). Metacone can be ridge-like or cusp-like.

m1. The tooth is relatively short. The anteroconid is cusp like (7/32), mainly in the juvenile unworn specimen, or triangular. Labial anterolophid is always well developed between the anteroconid and the antero-labial basis of the protoconid. The protosinusid is bordered by this ridge. Lingual anterolophid is weekly developed or substituted by metastylid, but it is mainly absent. In the latter cases the narrow anterosinusid is open. Anterolophulid is a short ridge between the anteroconid and the anterior angle of the protoconid. Metalophulid is short, antero-labially directed. Mesolophid can be middle developed (2/32), short (25/32), or absent (5/32). Ectomesolophid is developed only in 1 m1, but it is well developed and complete (reaches the labial border).

m2. Rectangular outline. Labial anterolophid is well developed and reaches the antero-labial basis of the protoconid. In 5/31 cases it is continued in the labial side of the protoconid and in the labial cingulum, which is closing the sinusid and reaches the anterio-labial basis of the hypoconid. Mesolophid is short (14/31) (never reaches the posterior basis of the metaconid) or absent (17/31). Metalophulid is short, in 2/31 cases it doesn't reach the anterolophulid.

m3. Triangular outline, the posterior part of the toothcrown is narrowed, because

the strong reduction of the entoconid. Lingual anterolophid is absent (10/20), short (9/20) or middle developed (1/20). Labial anterolophid is regular and reaches the antero-labial basis of the protoconid. In 2/20 cases it is continued on the labial side and reaches the anterior basis of the hypoconid. Mesolophid is absent, because the posterior arm of the protoconid and the anterior arm of the hypoconid are connected at the lingual margin.

Discussion. The *Democricetodon* from Szentendre was first reported by Kordos (1982) as *D. minor*. Later he modified the classification as *Democricetodon hasznosensis* n. sp. Kordos (1986) after 1m1, 1m2 and 1 m3 fragm. However at the end of the description he emphasized that *Democricetodon hasznosensis* is a member of the "minor s. l." group (Kordos 1986, p. 533 only in the Hungarian text).

After a long nomenclatural discussion cleared that *Democricetodon minor* is not a valid name. The details of this labyrinthine history is given by Maridet & Sen (2012). *D.* sp. aff. *D. gracilis* is accepted for the small sized *Democricetodon* from Sansan and *D. gracilis* is accepted for the material of Sandelzhausen and the later one is the type species of the *Democricetodon* genus (Maridet & Sen 2012).

Up to the present *Democricetodon hasznosensis* is known only from the Hungarian localities of Hasznos, Szentendre and Sámsonháza. In the OSM two *Democricetodon* species are characteristic from the early MN5 to the MN6 faunas: *D. gracilis* and *D. mutilus*. The origin of *D. hasznosensis* is uncleared. However the comma shaped cingulum in the antero-lingual surface of the M1 is described in the Early Miocene *Democricetodon suensis* from Shunggou, Sihong, Jiangsu Province, China (Qiu 2010). This only common character is interresting, but without detailed comparision is inadequate for any founded conclusion.

Genus: *Megacricetodon* Fahlbusch, 1964

Megacricetodon minor (Lartet, 1851)

Measurements.

Description. **M1.** Anterocone is always divided. The anterior apex of the anterolo-

	L	**no.**	**Min.**	**X.**	**Max.**	**W**	**no.**	**Min.**	**X.**	**Max.**
M1	**L**	17	1.40	1.50	1.58	**W**	17	0.91	0.95	0.99
M2	**L**	16	1.12	1.17	1.26	**W**	15	0.91	0.96	1.02
M3	**L**	2	0.80	0.82	0.85	**W**	2	0.83	0.84	0.85
m1	**L**	23	1.26	1.39	1.51	**W**	23	0.78	0.86	0.98
m2	**L**	27	1.08	1.13	1.20	**W**	27	0.87	0.94	1.04
m3	**L**	3	0.95	0.98	1.02	**W**	3	0.74	0.80	0.84

phule is connected to the lingual unit of the anterocone or terminated between the two units of the anterocone. In 3/16 cases it forms an "Y" and the two branches are connected to the two units of the anterocone. Mesial cingulum is developed in 3/16.Protolophule I is long, reaches the anterior basis of the paracone in 7/16. It is short, doesn't reach the anterior basis of the paracone in 4/16. It is absent in 5/16. Protolophule II is mainly started from the centroloph (12/16), or started from the posterior angle of the protocone. Mesoloph is variable: short (4/16), middle developed (6/16), long, but doesn't reach the labial margin (4/16) or reaches the labial margin (2/16). Paracone posterior spur is mainly short (8/16), reaches the mesoloph (2/16) or absent (6/16). Metalophule connected to the posteroloph (6/16) or connected to the posterior angle of the hypocone.

M2. Labial anteroloph is regularly well developed and the anterosinus is deep. Lingual anteroloph is mainly week and the protosinus is shallow or disappeared. Only protolophule I. is found in 9/15. Protolophule I and II are equally developed in 5/15. In one tooth protolophule II is stronger and protolophule I is remnant. Mesoloph is variable. It can be long, reaches the labial margin (2/15), or long, but doesn't reach the labial margin (7/15), middle developed (4/15), or short (2/15). Paracone posterior spur is frequent. In 9/15 it is continued in the cingulum between the paracone and the metacone. It reaches the apex of the mesoloph in 3/15, it is short in 2/15. In one case it is absent. Metalophule started from the hypocone (11/15), or started above the hypocone (4/15).

M3. Subrectangular outline. Labial anteroloph, protocone, protolophule, metacone, centrocone are developed. There is an incision from the protocone and the hypocone. Axioloph and neo-entoloph are absent.

m1. Anteroconid is always unicuspid and undivided. The anterolophulid is connected to the center of the anteroconid (21/25) or connected to the labial angle of the anteroconid (4/25). Anterolophulid bears a labial spur (19/25) in two cases it reaches the antero-labial margin. In 6/25 the spur is absent. The labial anterolophid between the anteroconid and the basis of the protoconid is regular. The lingual anterolophid is mainly developed (21/25), or substituted by a metastylid (1/25), or absent (3/25). In 8/25 cases the metaconid is anteriorly pushed and the anterolophulid is connected only to the metalophulid (Pl. III.-6.). Mesolophid is mainly short (24/25) or middle developed (1/25).

m2. Rectangular outline. Lingual anterolophid is absent (5/27), short (6/27), middle developed (13/27) or long (3/27). Mesolophid can be absent (8/27), short (13/27) or middle developed (6/27). In two cases a postero-labial branch of the posterolophid is developed.

m3. Subtriangular outline. Labial anterolophid is constat, it closes the protosinu-

sid. Lingual anterolophid is absent (1/3) or middle developed (2/3). Mesolophid is absent, entoconid is strongly reduced. *Democricetodon* and *Megacricetodon* m3s are possible to distinguish only after the dimensions (*Democricetodon* teeth are larger).

Discussion. *Megacricetodon* was not reported from Szentendre in the publications of Kordos (1982, 1986). The rich material of the new sampling is not surprising, because *Megacricetodon* is a regular element of the Badenian and Sarmatian (MN5 –MN7+8) faunas in the Pannonian Basin (Hír et al. 2017). Furthermore in the Vienna Basin the genus was reported from the early MN9 assemblages (e.g. Richardhof-Golfplatz, Vösendorf, Inzersdorf Daxner-Höck & Höck 2015, Borsky Sväty Jur (Joniak 2005).

Up to the present the *Megacricetodon minor* and the slightly smaller *Megacricetodon minutus* the most frequent representatives of the genus in the Carpathian region. The earlier one is characterisitic in the Badenian faunas: Litke 1-2, Hasznos, Szentendre. The later one occurred first in the early Sarmatian faunas Kozárd and Varciorog, but those samples have not statistic amount. Rich material was collected from the Felsőtárkány Basin (e.g. Felsőtárkány 3/2). A well elaborated population was described from Borsky Sväty Jur, Slovakia by (Joniak, 2005). *Megacricetodon minor* and *Megacricetodon minutus* are distinguishable only in rich materials.

Beyond the "*minor-minutus* group" only *Megacricetodon similis* is known from the localities Subpiatră 2/1, 2/2, 2/3 (Hír & Venczel 2005). Up to the present the representatives of the "large sized" west European *Megacricetodon* species are unknown from the Carpathian Basin.

Subfamily: Paracricetodontinae Mein & Freudenthal, 1971
Tribe: Eucricetodontini Mein & Freudenthal, 1971
Genus: *Eumyarion* Thaler, 1966
Eumyarion sp.

Description. **M1**. Anterocone is wide, it consists of two units, which are not divided. Mesial surface is without any groove. A short lingual anteroloph and a small protosinus is developed. Anteromesoloph is diagonally positioned and connected to the labial unit of the anterocone. Sinus is anteriorly curved. Paracone posterior spur is found in speciemen 18. 455. The mesoloph is medium developed and free ended. **M2.** Rectangular outline. Lingual anteroloph is absent, the labial one is well developed and transversally directed. Protoloph and metaloph are also transversal. Mesoloph is medium sized, paracone posterior spur is long.

Table 3. Material and measurements of teeth in *Eumiarion* sp.

No. inv.	Position:	L:	W:	Figures:
MMP. 18. 454.	M1	2.03	1.45	Pl. II.-4.
MMP. 18. 455.	M1	2.10	1.50	
MMP. 18. 461.	M2	1.48	1.50	
MMP. 18. 456.	M3	1.22	1.15	
MMP. 18. 457.	m1	2.0	1.25	Pl. II.-8
MMP. 18. 458.	m2	1.61	1.39	Pl. II.-18.
MMP. 18. 459.	m2	1.44	1.19	
MMP. 18. 460.	m3	1.64	1.26	

M3. Subtriangular outline. The anterior portion is similar to the same part of M2. Protocone and hypocone are connected by a short labial ridge (neo-entoloph ?). Axioloph is not developed. Centrocone and a medium developed mesoloph is found.

m1. Anteroconid is unicuspid. Labial anterolophid is strong and closes the protosinusid, lingual anterolophid is incipient. Anterolophulid is relative long. Metalophulid I and II are incipient. Mesolophid and ectomesolophid are equally middle developed. Hypocone posterior arm is short.

m2. Rectangular outline. Labial anterolophid is longer than the lingual one. Protoconid posterior arm is middle developed, the mesolophid is short. Hypoconid posterior arm is found in the specimen 18. 458.

m3. Subtriangular outline. Lingual anterolophid is short, the labial one is long. Protoconid posterior arm is long, mesolophid is not found. A short hypoconid posterior arm is developed.

Discussion. The dentition of the medium-sized *Eumyarion* species do not show a consistent change through time, the reconstruction of phylogenetic lineages on the basis of the available record is hypothetical. (De Bruijn 2009). The Szentendre material is limited and an “exact” species determination would not be founded.

Genus: *Anomalomys* Gaillard, 1900

Anomalomys gaudryi Gaillard, 1900

1989 *Anomalomys (Myospalax) kowalskii* n. sp., Kordos, p. 293 (Hun.), p. 301, 302 (Eng.), Fig. 2:5.

Material and measurements.

Description. General characters: hypsodont molars with flat occlusal surface and

No. inv.	Position:	L:	W:	Figures:
MMP. 2018. 462.	m1	1.50	0.81	Pl. II.-11.
MMP. 2018. 463.	m2	1.54	0.91	Pl. II.-12.

thick enamel.

m1. Elongated subrectangular outline. The posterior width is larger than the anterior width. The occlusal surface consists of three main enamel folds: anterior fold: involves the anteroconid and the metaconid; central fold: involves the protoconid, mesoconid, entoconid; posterior fold: involves the hypoconid and the posterolophid. The anterior- and central folds are completely divided by the confluent protosinusid–anterior mesosinusid. The central- and posterior folds are connected by a narrow posterolabial isthmus. These folds are divided by the posterosinusid. Two enamel islets are found in the anterior fold. Two enamel bays are found in the anterior side of the central fold. One enamel islet is found in the lingual part of the posterior fold.

m2. The anterior- and the central folds are divided by the confluent protosinusid and anterosinusid. The central- and the posterior folds are divided by the mesosinusid and the posterosinusid. The development and position of enamel islets and enamel bays are similar to m1.

Discussion. Kordos (1989) described an M2 from Szentendre as *Anomalomys kowalskii* n. sp., but the validity of this taxon was strongly criticised by Kowalski (1994). The newly collected two teeth are the smallest representatives of *A. gaudryi* in the Carpathian Basin. Remarkable plesiomorph character is the long m2 (it is longer than m1!).

In Southern Germany *A. gaudryi* appeared at the base of the OSM F, in company with *C.* aff. *aureus* Abdul-Aziz et al (2008), Prieto & Rummel 2016 (early MN6 zone). In Switzerland *A. gaudryi* appeared slightly earlier in the *Megacricetodon lappi* taxon range zone (in the localities Chatzloch, Uzwil-Nutzenbuech). Chatzloch is magnetostratigraphically dated of about 14.7 Ma.

Conclusions

The new sampling of the locality Szentendre, Cseresznyés-árok produced a rich microvertebrate fauna. Having new material the taxonomic revision of the *Cricetodon* finds is possible. *C. hungaricus* is deleted, *C. aureus* is verified.

The biostratigraphic and biochronologic importance of *C. aureus* is possible to understand in the Northern Alpine Foreland Basin. Abdul-Aziz et al (2008) found that the localities belonging to OSMF are found between the Brock horizon and the main bentonite layer, both in the Landshut (e.g. Sallmannsberg) and the Augsburg area (e.g., Laimering 3) (Heissig 1997). The characteristic element of these faunas is *C. aureus*. In the faunas collected under the Brock horizon *C. meini* and *Megacricetodon lappi* were found (Heissig 2006).

The radiometric age of the Ries impact has been intensively studied. Referring to the latest results of Rocholl et al (2017) the Ries impact occured between 14.94 and 15.00 Ma. The age of the Laimering bentonite is classified as 14.925 ± 0,01 MY by Rocholl et al (2017). Taking into consideration the above data, it is clear that *C. aureus* is possible to correlate with a time period of about 14.90-15.00 Ma.

The presence of *Democricetodon hasznosensis* is confirmed, but some special morphologic characters were found, which are absent in the type material of Hasznos.

From faunistical point of view the occurrence of *Albanensia sansaniensis* and *Muscardinus sansaniensis* are remarkable, but these species have biochronological importance as well. These are referable to the early period of the MN6 zone.

The actual faunal list of the rodent material from Szentendre is:

Albanensia sansaniensis
Spermophilinus bredai
Palaeosciurus sp.
Myoglis meini
Microdyromys koenigswaldi
Miodyromys sp.
Glirulus lissiensis
Cricetodon aureus
Democricetodon hasznosensis
Megacricetodon minor
Eumyarion sp.
Anomalomys gaudryi

An unsolved question is the lithostratigraphical relation of the fossiliferous diatomaceous sediment to the volcanites of the surroundings. Referring to Wein (1939), Majzon (1953), Kordos (1982) the diatomit is bedded on the top of the andesite complex. However the diatomitic claymarl was put into the Fót Formation

and the tufit on the top of the diatomit was classified as the member of the Tar Dacite Tuff by Halmai (1982). His opinion is based on the study of the well-logs from the cores Fót 1, Mogyoród 1, Budapest 4.

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References

Abdul-Aziz, H., Böhme, M., RocholIA., Zwing A., Prieto J., Wijbrans J., Heissig K., Bachtadse, V. 2008. − Integrated stratigraphy and 40Sr/39Ar chronology of the Early to Middle Miocene Upper Freshwater Molasse in eastern Bavaria (Germany). *International Journal of Earth Sciences (Geologische Rudschau)* **97**:115–134.

Baudelot, S. 1965. − Complément á l'étude de la faune der rongeurs de Sansan: les Gliridés. *Bulletin de la Société géologique de France* **7**(7): 758–764.

Black, D. 1966. − Tertiary sciuridae (Mammalia: Rodentia) from Bavaria. *Mitteilungen der Bayerischen Staatssammlung für Paläontologie und historische Geologie* **6**: 51–63.

Carro-Rodríguez, P. M., López-Guerrero, P. 2018. − Fourier analysis applied to *Cricetodon* and *Hispanomys* (Rodentia, Mammalia): its use as a taxonomical criterion. *Historical Biology*, DOI: 10. 1080/08912963.2018. 1472254.

Codrea, A. V., Venczel, M., Ursachi, L. 2017. − Amphibians and squamates from the early Vallesian of Crețești (Vaslui County, E-Romania). *Nymphaea* **44**: 37–56.

Cuenca-Bescos, G. 1998. − Revision de los Sciuridae del Aragoniense y del Rambliense en la fossa de Calatayud-Montalban. *Scripta Geologica* **87**: 1–115.

Daams, R. 1981. − The dental pattern of the Dryomys, Myomimus, Microdyromys and Peridyromys. *Utrecht Micropaleontological Bulletins Special Publication* **3**: 1–115.

Daams, R. 1999. Family Gliridae. In: Rössner G. & Heissig K. (eds): Miocene Land Mammals of Europe. Verlag Drt. Friedrich Pfeil, München, p. 301–319.

Daams, R., Freudenthal, M. 1988. − Cricetidae (Rodentia) from the type-Aragonian; the genus Megacricetodon. In: Freudenthal M. (ed): Biostratigraphy and paleoecology of the Neogene micromammalian faunas from then Calatayud-Teruel Basin (Spain). *Scripta Geology, Special Issue* **1**: 39–132.

Daxner-Höck, G. 2004a. − Flying Squirrels (Pteromyinae, Mammalia) from the Upper Miocene of Austria. *Annalen des Naturhistorischen Museums in Wien, Serie A* **106**: 387–423.

Daxner-Höck, G. 2004b. − *Pseudocollimys steiningeri* nov. gen. nov. spec (Cricetidae, Rodentia, Mammalia) aus dem Ober-Miozän der Molassezone Oberösterreichs. *Courier Forschungsinstitut Senckenberg* **246**: 1–13.

Daxner-Höck, G. 2005. − Eomyidae and Gliridae from Rudabánya. *Palaeontographia Italica* **90** (2003): 143–155.

Daxner-Höck, G., Höck, E. 2009. − New data on Eomyidae and Gliridae (Rodentia, Mammalia) from the Late Miocene of Austria. *Annalen des Naturhistorischen Museums in Wien Serie A* **111**: 375–444.

Daxner-Höck, G., Höck, E. 2015. − Rodentia neogenica. In: Piller W.(ed): Catalogus Fossilium Austriae, Band 4, Verlag der Österreichischen Akademie der Wissenschaften, p. 1–158.

Daxner-Höck, G., Mein, P. 1975. − Taxonomische Probleme um das Genus *Miopetaurista* Kretzoi, 1962 (Fam. Sciuridae). *Paläontologische Zeitschrift* **49**(1-2): 75–77.

De Bruijn, H. 1966. − Some new Miocene Gliridae from the Calatayud area (Prov. Zaragoza, Spain). *Proceedings of the Koninklijke Nederlandse Akademie van Wetenschappen, Ser. B*. **69**(3): 58–78.

De Bruijn, H. 2009. − The Eumyarion (Mammalia, Rodentia, Muridae) assemblage from Sandelzhausen (Miocene, Southern Germany): a test on homogeneity.*Paläontologische Zeitschrift* **83**: 77–83.

De Bruijn, H., Fahlbusch V., Saraç G., Ünay, E. 1993. − Early Miocene rodent faunas from the eastern Mediterranean Area. Part III. The genera Deperetomys and Cricetodon with a discussion of the evolutionary of the Cricetodontini. *Proceedings of the Koninklijke nederlandse Akademia van Wetenschappen, Series B* **96**(2): 151–216.

De Bruijn, H., Mein, P. 1968. − On the mammalian fauna of the Hipparion-beds in the Calatayud-Teruel Basin (Prov. Zaragoza, Spain).Part V. The Sciurinae. *Proceedings of the Koninklijke Nederlsndse Akademie van Wetenschappen, Ser. B* **71**: 73-90.

Fahlbusch, V. 1964. Die Cricetiden (Mamm.) der Oberen Süsswasser-Molasse Bayerns. *Bayerische Akademie der Wissenschaften, matematisch-naturwissenschaftliche Klasse, Abhandlungen, Neue Folge* **118**: 1–136.

Fejfar, O. 1990. The Neogene VP sites of Czechoslovakia: a contrinution to the Neogene terrestric Biostratigraphy of Europe based on Rodents. In: Lindsay E, Fahlbusch V. & Mein P. (eds): European Neogene Mammal Chronology, Plenum Press, New York, London, p. 211–236.

Garapich, A. 2002 − An overview of Miocene rodents from Belchatow (Poland). *Folia Zoologica* **51**(suppl. 1): 59-66.

Ginsburg, M., Mein, P. 2012. − Les Sciuridae (Rodentia) de Sansan. In: Peigné S. & Sen S. (eds): Mammiféres de Sansan. Muséum national d'Historie naturelle, Paris: 81–94 *Mémoires du Muséum national d'Histoire naturelle* **203**.

Halmai, J. 1982. − Diatomás agyagmárga betelpülés a Fóti Formációban [Diatomaceous clay-marl in the Fót Formation]. *A Magyar Álami Földtani Intézet Jelentése az 1980. Évről* [Annual Report of the Hungarian Geological Institute on 1980]: 41–44.

Heissig, K. 1989. − Neue Ergebnisse zur Stratigraphie der mittleren Serie der Oberen Süßwassermolasse Bayerns. *Geologica Bavarica* **94**: 39–52.

Heissig, K. 1997. − Mammal faunas intermediate between the reference faunas of MN4 and MN6 from the Upper Freshwater Molasse of Bavaria. *Actes du Congrès BiochroM'97, Mém. Trav. E.P.H.E. Inst. Montpellier* 21: 537–546.

Heissig, K. 2006. − Biostratigraphy of the "main bentonite horizon of the Upper Freshwater Molasse Bavaria. *Palaeontographica Abt. A* **277**: 93–102.

Hír, J. 2003. − The Middle Miocene (Late Astaracian, MN7/8) Rodent Fauna of Felsőtárkány 3/2 (Hungary). *Acta Palaeontologica Romaniae* **4**:125–136.

Hír, J. 2006. − Late Astaracian (Late Sarmatian) Lagomorphs and Rodents from Felsőtárkány–Felnémet (Northern Hungary). *Beiträge zur Paläontologie* **30**: 155–173.

Hír, J. 2011. − Miocene microvertebrate finds from the vicinity of Egerszólát. *Agria, az egri Dobó István Vármúzeum Évkönyve* [Annales of the Castel Museum I. Dobó at Eger] **2011**: 57–71. [In Hungarian with English abstract].

Hír, J. 2015. − A preliminary report on the vertebrate finds collected from the type section of the Kozárd Formation. *A Dornyay Béla Múzeum Évkönyve* [Yearbook of the Dornyay Béla Museum at Salgótarján] **38**: 328–347. [In Hungarian with English abstract].

Hír, J., Kókay, J. 2010. − A systematic study of the middle-late Miocene rodents and lagomorphs (Mammalia) of Felsőtárkány 3/8 and 3/10 (Northern Hungary) with stratigraphic relations. *Geodiversitas* **32**(2): 307-329.

Hír, J., Mészáros L. 2002. − Middle Miocene insectivores and rodents (Mammalia) from Sámsonháza (Northern Hungary). *Fragmenta Palaeontologica Hungarica* **20**: 9–23.

Hír, J., Pászti, A. 2012. − *Palaeosciurus ultimus* Mein & Ginsburg, 2002 leletek a hasznosi ősgerinces faunában. (A *Palaeosciurus* nemzetség első előfordulása a Kárpát-medencében). [*Palaeosciurus ultimus* finds in the vertebrate fauna of Hasznos. First occurence of the *Palaeosciurus* genus in the Carpathian Basin]. *A Nógrád Megyei Múzeumok Évkönyve* **35**: 207–221. [In Hungarian with English abstract].

Hír, J., Venczel, M. 2005. − New Middle Miocene vertebrate localities from Subpiatră (Bihor District, Romania). *Acta Palaeontologica Romaniae* **5**: 211–221.

Hír, J., Venczel, M., Codrea, V., Rössner, G., Angelone, Ch., Van den Hoek Ostende, L., Rosina, V., Kirscher, U., Prieto, J. 2017. − Badenian and Sarmatian s. str. from the Carpathian area: Taxonomic notes concerning the Hungarian and Romanian small vertebrates and report on the Ruminants from the primate bearing Felsőtárkány Basin. *Comptes Rendus Palevol* **16**: 312–332.

Hordijk, K., Bosma, A., De Bruijn, H., Van Dam, J., Geraedts, G., Van den Hoek Ostende, L., Reumer, J., Wessels, W. 2015. − Biostratigraphical and palaeoecological implications of the small mammal assemblage from the late early Miocene of Montalvos 2, Teruel Basin, Spain. *Palaeobiodiversity and Palaeoenvironments* **95**: 321-346.

Hugueney, M., Mein, P. 1965. − Lagomorphes et rongeurs du Néogène de Lissieu (Rhône). *Travaux du Laboratoire de Géologie de la Faculté de sciences de Lyon, NS* **12**: 109–123.

Ivanov, M. 2008. − Early Miocene Amphibians (Caudata, Salientia) from the Mokrá-Western Quarry (Czech Republic) with comments on the evolution of Early Miocene amphibian assemblages in Central Europe. *Geobios* 41: 465-492.

Jacobs, L., Lindsay, E. 1984. − Holarctic radiation of Neogene muroid rodents and the origin of South-American Cricetids. *Journal of Vertebrate Paleontology* **4**: 265–272.

Joniak, P. 2005. − New Rodent assemblages from the Upper Miocene deposits of the Vienna Basin and Danube Basin. Thesis, Department of Geology and Paleontology. Faculty of Natural Sciences. Comenius University. 1–126. Pozsony.

Kälin, D., Engesser, B. 2001. Die jungmiozäne Säugetierfauna vom Nebelbergweg bei Nunningen (Kanton Solothurn, Schweiz). *Schweizerische Paläontologische Abhandlungen* **121**: 1–61.

Koch, A. 1900. A magyar korona országai kövült gerinczesállat maradványainak rendszeres átnézete [A systematic review of the fossil vertebrate remains in the countries of the Hungarian Crown]. *Magyar Orvosok és Természetvizsgálók Vándorgyűlésének munkálatai* [Studies of the Meetings of Hungarian Physicians and Naturalists]: 526–560. [In Hungarian].

Kordos, L. 1982. − Felső-miocén gerinces fauna Szentendréről. [An upper Miocene vertebrate fauna from Szentendre.] *A Magyar Állami Földtani Intézet Jelentése az 1980. évről* [Annual Report of the Hungarian Geological Institute on 1980]: 381–384.

Kordos, L. 1985. − Terrestrial vertebrate remains from the Eggenburgian to Sarmatian of Hungary: biozonation and stratigraphic correlation. *A Magyar Állami Földtani Intézet Jelentése az 1983. évről* [Annual Report of the Hungarian Geological Institute on 1983]: 157–165.

Kordos, L. 1986. − A hasznosi és szentendrei felső miocén hörcsögök (Cricetidae, Mamalia) rendszertani és rétegtani vizsgálata. [Upper Miocene hamsters (Cricetidae, Mammalia) of Hasznos and Szentendre (Cricetidae, Mammalia): a taxonomic and stratigraphic study]. *A Magyar Állami Földtani Intézet Jelentése az 1984.évről* [Annual Report of the Hungarian Geological Institute on 1984]: 523–553.

Kordos, L. 1989. Anomalomyidae (Mammalia, Rodentia) remains from the Neogene of Hungary. *A Magyar Állami Földtani Intézet Jelentése az 1987. évről* [Annual Report of the Hungarian Geological Institute on 1987]: 293–311.

Korpás, L. (ed) 1998. − Magyarázó a Börzsöny és a Visegrádi-hegység földtani térképéhez, 1: 50 000. Magyar Állami Földtani Intézet, [Explanation for the Geological Map of the Börzsöny and Visegrád Mountains 1: 50 000] p. 1–216. Hungarian Geological Institute. [In Hungarian with English abstract].

Kowalski, K. 1994. − Evolution of *Anomalomys* Gaillard, 1900 (Rodentia, Mammalia) in the Miocene of Poland. *Acta zoologica cracoviensia* **37**(1): 163–176.

Kowalski, K. 1997. − Gliridae (Mammalia: Rodentia) from the Miocene of Belchatów in Poland. A*cta zoologica cracoviensia* **40**(2): 173–198.

Kretzoi, M. 1943. Ein neuer Muscardinidae aus dem Ungarischen Miozän. *Földtani Közlöny* **73**(1-3): 271–273.

Kretzoi, M., Fejfar, O. 2004. Sciurids and Cricetids (Mammalia, Rodentia) from Rudabánya. *Palaeontographia Italica* **90**: 113–148.

Kretzoi, M., Krolopp, E., Lőrincz, H., Pálfalvy, I. 1974. − Flora, Fauna und stratigraphische Lage der unterpannonischen Prähominiden Fundstelle von Rudabánya (NO-Ungarn). *A Magyar Állami Földtani Intézet Jelentése az 1972. évről* [Annual Report of the Hungarian Geological Institute on 1972]: 365–394.

López-Guerrero, P., García-Paredes, I., Álvarez-Sierra, M. 2013. − Revision of Cricetodon soriae (Rodentia, Mammalia), new data from the middle Aragonian (Middle Miocene) of the Calatayud-Daroca Basin (Zaragoza, Spain). *Journal of Vertebrate Paleontology* **33**(1): 169–184.

López-Guerrero, P., Álvarez-Sierra, M., Garcia-Paredes, I., Peláez-Campomanes, P. 2014. − New Cricetodontini from the middle Miocene of Europe: an example of mosaic evolution. *Bulletin of Geosciences* **89**(3): 573–592.

López-Guerrero, P., García-Paredes, I., Prieto, J., López-Antoňanzas, R., Álvarez-Sierra, M. 2015. Palaeodiversity of Cricetodontini during the late Aragonian (middle Miocene) from the European basins. *Palaeobiodiversity and Palaeoenvironments* **95**: 415–431.

Majzon, L. 1953. − Előzetes földtani jelentés a Visegrád és Szentendre közötti területről [Predvaritelnij geologicheskij otchet o territorii nahodjacheijcja mezdu Vishegradom i Sentendre]. *A Magyar Állami Földtani Intézet Jelentése az 1944.évről*, p. 41–43. [In Hungarian with Russian abstract].

Maridet, O., Sen, S. 2012. Les Cricetidae (Rodentia) de Sansan. In: Peigné S., Sen S. (eds), Mammiféres de Sansan, Muséum national d'Histoire naturelle, Paris, pp. 29–65.

Mayr, H. 1979. Gebissmorphologische Untersuchungen an miozänen Gliriden (Mammalia, Rodentia) Süddeutschlands.Thesis, p. 1–380, München.

Mein, P., Freudenthal, M. 1971a. − Une nouvelle classification des Cricetidae (Mammalia, Rodentia) du Tertiaire de l'Europe. *Scripta Geologica* **2**: 1–37.

Mein, P., Freudenthal, M. 1971b. − Les Cricetidae (Mammalia, Rodentia) du Néogéne Moyen de Vieux-Collonges. Partie 1: Le genre *Cricetodon* Lartet, 1851. *Scripta Geologica* **5**: 1–51.

Prieto, J., Rummel, M. 2016. Some consideration on small mammal evolution in Southern Germany, with emphasis on Late Burdigalian-Earliest Tortonian (Miocene) cricetid rodents.*Comptes Rendus Palevol* **15**: 837–854.

Qiu, Z. 2010. − Cricetid rodents from the Early Miocene Xiacaowan Formation, Sihong, Jiangsu. *Vertebrata Palasiatica* **48**: 27–47.

Rage, J. C., Roček, Z. 2003. − Evolution of anuran assemblages in the Tertiary and Quaternary of Europe, in the context of palaeoclimate and palaeogeography. *Amphibia-Reptilia* **24**(2): 133–167.

Rocholl, A., Schaltegger, U., Gilg, A., Wijbrans, J., Böhme, M. 2017. The age of volcanic tuffs from the Upper Freshwater Molasse (North Alpine Foreland Basin) and their possible use for tephrostratigraphic correlations across Europe for the Middle Miocene. *International Journal of Earth Sciences (Geologische Rundschau)*, DOI 10. 1007/s00531-017-1499-0

Roček, Z. 2013. Mesozoic and Tertiary Anura of Laurasia. *Palaeobiodiversity and Palaeoenvironments* **93**(4): 397–439.

Sabol, M., Joniak, P., Holec, P. 2004. − Succession(-s) of mammalian assemblages during the Neogene − a case study from the Slovak part of the Western Carpathians. *Scripta Facultatis Scientarium Naturalis Universitatis Masaryk, Brunensis* **31-32**: 65–84.

Sach, V. 1999. Litho- und biostratigraphische Untersuchungen in der Oberen Süßwassermolasse des landkreises Biberach a.d. Riß (Oberschwaben). *Stuttgarter Beiträge zur Naturkunde Series B* **276**: 1–167.

Seehuber, U., 2008. Litho- und Biostratigraphische Untersuchungen in der oberen Süßwassermolasse in der Umgebung von Kischeim in Schwaben. Inaugural-Dissertetion zur Erlagung des Doktorgrades der Fakultät für Geowissenschaften der Ludwig-Maximilians Universität, München, p. 1–276.

Szalai, T. 1928. Kontinentales Sarmatium von Szentendre. *Neues Jahrbuch für Mineralogie* **60**: 307–314.

Thaler, L. 1966. − Les rongeurs fossiles du Bas-Languedoc dans leurs rapports avec l' histoire des faunes et la stratigraphie du Tertiaire d' Europe. *Mémoires du Muséum National d'Histoire Naturelle, nouvelle serie V* **42**: 3–284.

Wein, Gy. 1939. Szentendre környékének földtani viszonyai [Über die geologischen Verhältnisse der Umgebung von Szentendre]. *Földtani Közlöny* **69**(1): 26-52.

Van de Weerd, A. 1976. − Rodent faunas of the Mio-Pliocene continental sediment of the Teruel-Alfambra region, Spain. *Utrecht Micropaleontological Bulletins, Special Publications* **2**: 1–217.

Venczel, M. 2004. − Middle Miocene anurans from the Carpathian Basin. *Palaeontographica abteilung A.* **271**: 151-174.

Venczel, M. 2008. − A new salamandrid amphibian from the Middle Miocene of Hungary and its phylogenetic relationships. *Journal of Systematic Palaeontology* **6**: 41-59.

Venczel, M., Hír, J. 2013. - Amphibians and squamates from the Miocene of Felsőtárkány Basin, N-Hungary. *Palaeontographica Abteilung A* **300**: 117–158.

Venczel, M., Știucă, E. 2008. − Late middle Miocene amphibians and squamate reptiles from Tauț, Romania. *Geodiversitas* **30**(4): 731-763.

Wu, V. 1990. Die Gliriden (Mammalia, Rodentia) aus der Oberen Süsswassermolasse von Puttenhausen (Niederbayern). *Mitteilungen der Bayerischen Staatssammlung für Paläontologie und Historische Geologie* **30**: 65–105.

Wu, V. 1993. Neue Gliridae (Rodentia, Mammalia) aus untermiozänen (orleanischen) Spaltenfüllungen Süddeutschlands. *Documenta Naturae* **81**: 1–149.

Plate I.

1.	MMP. 18. 431.	*Albanensia sansaniensis*	M1-2	reversed
2.	MMP. 18. 435.	*Albanensia sansaniensis*	m1	
3.	MMP. 18. 437.	*Albanensia sansaniensis*	m2	
4.	MMP. 18. 5.	*Cricetodon aureus*	M1	
5.	MMP. 18. 14.	*Cricetodon aureus*	M1	reversed
6.	MMP. 18. 17.	*Cricetodon aureus*	M1	reversed
7.	MMP. 18. 31.	*Cricetodon aureus*	M2	
8.	MMP. 18. 32.	*Cricetodon aureus*	M2	
9.	MMP. 18. 39.	*Cricetodon aureus*	M2	reversed
10.	MMP. 18. 74.	*Cricetodon aureus*	M3	reversed
11.	MMP. 18. 75.	*Cricetodon aureus*	M3	reversed
12.	MMP. 18. 102.	*Cricetodon aureus*	M3	reversed
13.	MMP. 18. 106.	*Cricetodon aureus*	m1	
14.	MMP. 18. 112.	*Cricetodon aureus*	m1	reversed
15.	MMP. 18. 124.	*Cricetodon aureus*	m1	reversed
16.	MMP. 18. 131.	*Cricetodon aureus*	m2	
17.	MMP. 18. 142.	*Cricetodon aureus*	m2	reversed
18.	MMP. 18. 79.	Cricetodon aureus	m3	
19.	MMP. 18. 89.	Cricetodon aureus	m3	

Bare: 1 mm

Plate I.

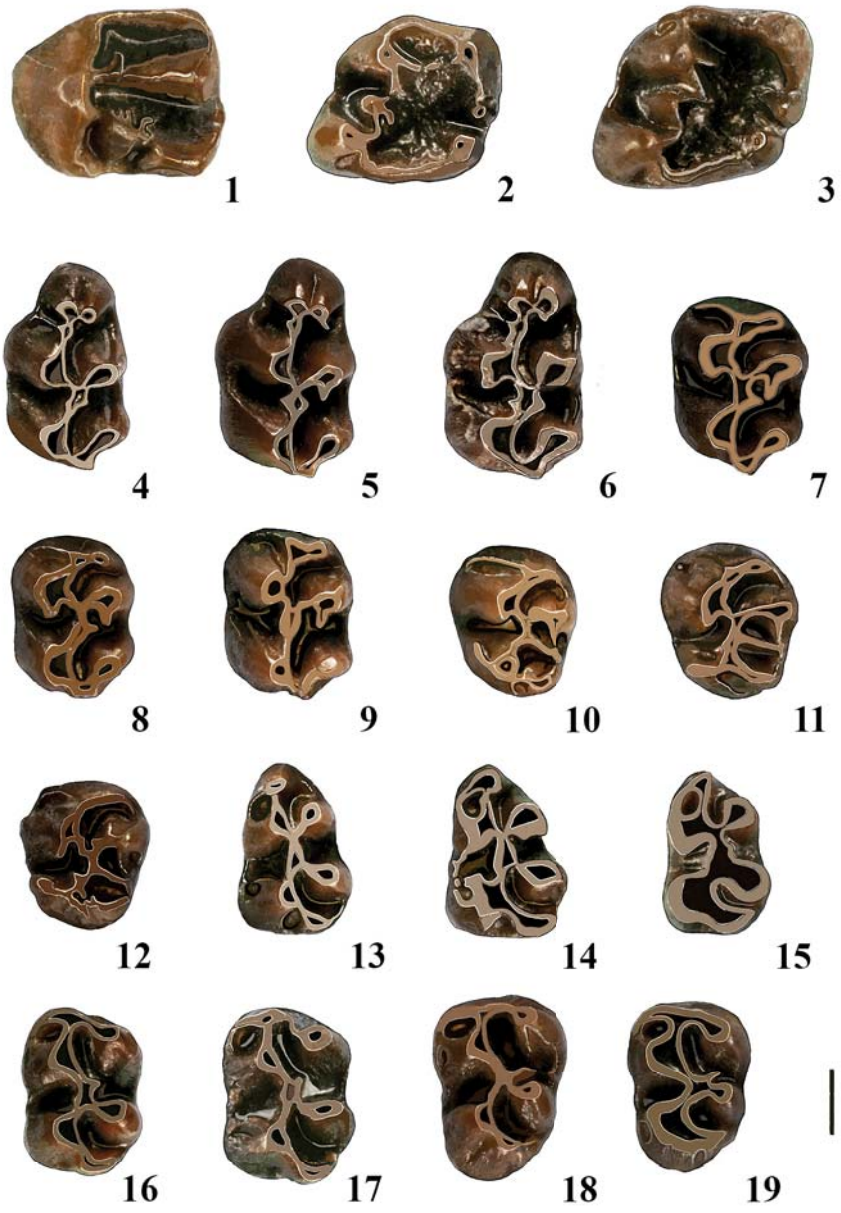

Plate II.

1.	MMP. 18. 175.	*Democricetodon hasznosensis*	M1	reversed
2.	MMP. 18. 187.	*Democricetodon hasznosensis*	M1	
3.	MMP. 18. 167.	*Democricetodon hasznosensis*	M1	
4.	MMP. 18. 454.	*Eumyarion* sp.		M1
5.	MMP. 18. 197.	*Democricetodon hasznosensis*	M2	
6.	MMP. 18. 202.	*Democricetodon hasznosensis*	M2	
7.	MMP. 18. 205.	*Democricetodon hasznosensis*	M2	
8.	MMP. 18. 457.	*Eumyarion* sp.	m1	
9.	MMP. 18. 238.	*Democricetodon hasznosensis*	M3	
10.	MMP. 18. 242.	*Democricetodon hasznosensis*	M3	
11.	MMP. 18. 462.	*Anomalomys gaudryi*	m1	reversed
12.	MMP. 18. 463.	*Anomalomys gaudryi*	m2	reversed
13.	MMP. 18. 288.	*Democricetodon hasznosensis*	m1	
14.	MMP. 18. 301.	*Democricetodon hasznosensis*	m1	reversed
15.	MMP. 18. 302.	*Democricetodon hasznosensis*	m1	reversed
16.	MMP. 18. 382.	*Democricetodon hasznosensis*	m2	
17.	MMP. 18. 294.	*Democricetodon hasznosensis*	m2	reversed
18.	MMP. 18. 458.	*Eumyarion* sp.	m2	reversed
19.	MMP. 18. 256.	*Democricetodon hasznosensis*	m3	
20.	MMP. 18. 262.	*Democricetodon hasznosensis*	m3	reversed

Bare: 1 mm

Plate II.

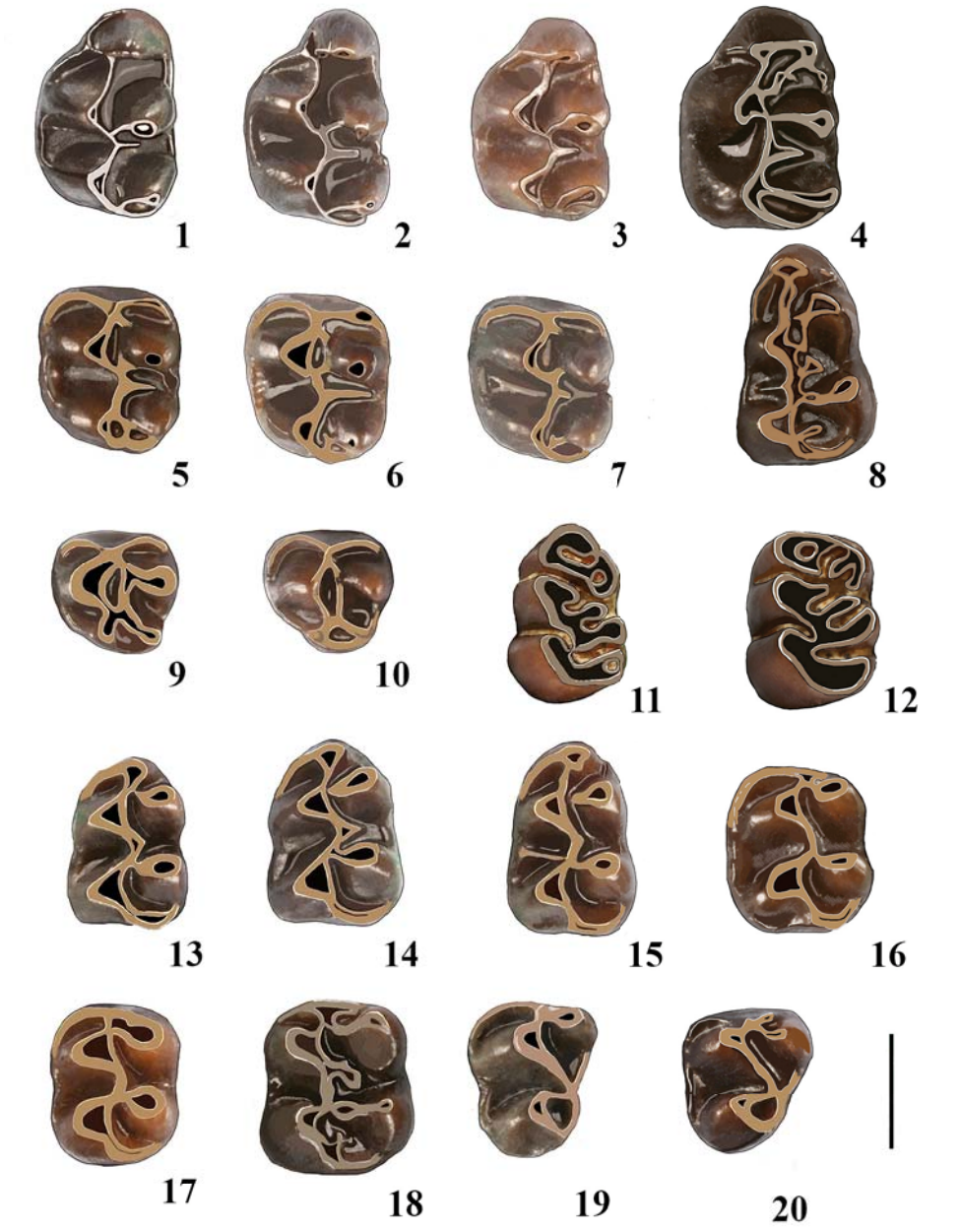

Plate III.

1.	MMP. 18. 339.	*Megacricetodon minor*	M1	
2.	MMP. 18. 340.	*Megacricetodon minor*	M1	
3.	MMP. 18. 415.	*Megacricetodon minor*	M2	
4.	MMP. 18. 416.	*Megacricetodon minor*	M2	
5.	MMP. 18. 252.	*Megacricetodon minor*	M3	
6.	MMP. 18. 314.	*Megacricetodon minor*	m1	
7.	MMP. 18. 321.	*Megacricetodon minor*	m1	
8.	MMP. 18. 362.	*Megacricetodon minor*	m2	
9.	MMP. 18. 357.	*Megacricetodon minor*	m2	reversed
10.	MMP. 18. 275.	*Megacricetodon minor*	m3	
11.	MMP. 18. 466.	*Myoglis meini*	P4	
12.	MMP. 18. 465.	*Myoglis meini*	M2	reversed
13.	MMP. 18. 474.	*Myoglis meini*	m1	
14.	MMP. 18. 476.	*Myoglis meini*	m3	reversed
15.	MMP. 18. 480.	*Microdyromys koenigswaldi*	M1	reversed
16.	MMP. 18. 478.	*Miodyromys* sp.	M2	
17.	MMP. 18. 484.	*Miodyromys* sp.	M2	reversed
18.	MMP. 18. 488.	*Miodyromys* sp.	m1	
19.	MMP. 18. 489.	*Microdyromys koenigswaldi*	m1	reversed
20.	MMP. 18. 497.	*Glirulus lissiensis*	m2	
21.	MMP. 18. 451.	*Muscardinus sansaniensis*	M1	reversed
22.	MMP. 18, 452.	*Muscardinus sansaniensis*	m1	

Bare: 1 mm

Plate III