A C T A   P A L A E O N T O L O G I C A   P O L O N I C A

Vol. 24 | 1979 | No. 3

ANDRZEJ SULIMSKI, ADAM SZYNKIEWICZ and BRONISŁAW WOŁOSZYN

THE MIDDLE PLIOCENE MICROMAMMALS FROM CENTRAL POLAND

SULIMSKI, A., SZYNKIEWICZ, A. and WOŁOSZYN, B.: The Middle Pliocene Micromammals from Central Poland. — Acta Palaeont. Polonica, 24, 377—403. October 1979.

A small fauna of Middle Pliocene Microvertebrates (Insectivora, Chiroptera, Rodentia: Mammalia) is described from the cave Mała (Jaskinia Mała) at Zelce Hill near Działoszyn (Northern Kraków—Wieluń Jurassic Upland in Central Poland). This mammalian fauna provides some analogies with the fauna of Early (Turolian, Pannonian or Pontian) or Middle Pliocene localities of Central and West Europe. Among the 18 species from the cave Mała, *Epimeriones austriacus* and *Parapodemus lugdunensis* were not known previously in the Pliocene fauna of Poland. *Amblycoptus topali* is recorded here for the second time in Poland and for the third time in Central Europe. All forms described in the present paper are found in layers 4+5 of the cave Mała.

K e y   w o r d s: Micromammalian fauna, taxonomy, ecology, cave deposits, Middle Pliocene, Poland.

Andrzej Sulimski: Zakład Paleobiologii PAN, Al. Żwirki i Wigury 93, 02-089 Warszawa, Poland. Adam Szynkiewicz: COBPGO — Poltegor, ul. Rosenbergów 25, 51-616 Wrocław, Poland. Bronisław Wołoszyn: Zakład Zoologii Systematycznej i Doświadczalnej PAN, ul. Sławkowska 17, 31-016 Kraków, Poland. *Received: March 1979.*

INTRODUCTION

The description and geological setting of the recently discovered cave Mała (Jaskinia Mała), at Zelce Hill near Działoszyn in Central Poland, were given earlier by Szynkiewicz (1971*a*, 1971*b*, 1977). Two paleontological sites have been known on this hill: Węże 1 and Węże 2 (fig. 1, and pl. 19:1).

The cave Mała developed at the boundary between biohermal limestones (fig. 2:1*a*) and bedded limestones (fig. 2:1*b*) of Middle Oxfordian age, crossed by vertical fissures (Member 1). Excavations were made in

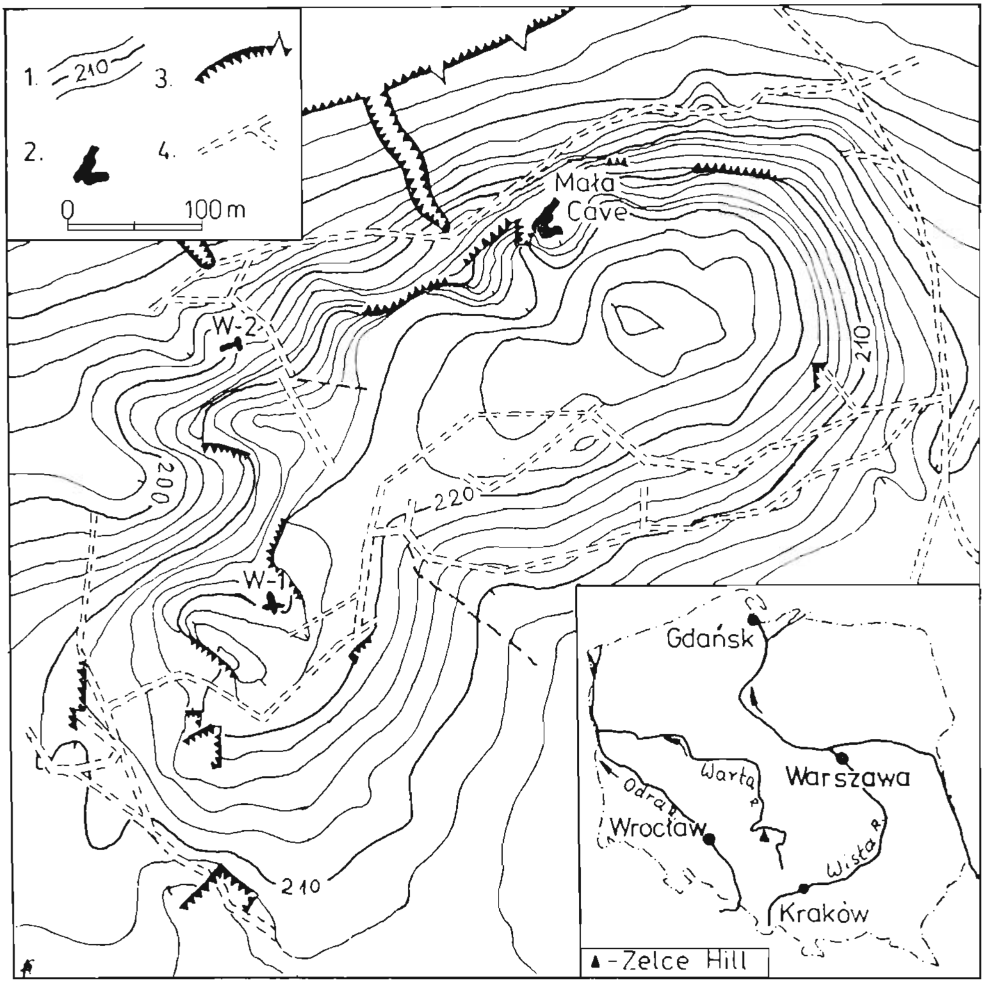


Fig. 1. Zelce Hill. Situation of the paleontological sites. *1* isohypses in meters a.s.l.; *2* paleontological sites: Węże 1 (W — 1), Węże 2 (W — 2), cave Mała; *3* escarpment; *4* cart-roads.

the entry-chamber of this cave in 1970—1978 and an interesting sequence of cave deposits with bone material was discovered (see pl. 20, and figs 3—7). The investigations in this cave are in progress. Hence in this preliminary report only a short description of cave deposits (A. Szynkiewicz) and a first analysis of bone material are presented (A. Sulimski: Insectivora and Rodentia, B. Wołoszyn: Chiroptera).

The specimens described in the present paper are housed in the Paleozoological Laboratory of the Wrocław University. Figures 1 and 2 are prepared by A. Szynkiewicz, and from 3 to 7 by A. Sulimski.

Abbreviations used for Institutions:

NHMV — Natural History Museum, Vienna.
PIUW — Paläontologisches Institut der Universität, Wien.

ZPAL — Institute of Paleobiology of the Polish Academy of Sciences, Warsaw.
ZPAL WR — Paleozoological Laboratory of the Wrocław University.
ZZSD — Institute of Systematic and Experimental Zoology, Cracow.

The authors are indebted to Dr. T. Czyżewska and Dr. T. Wiszniowska (Paleozoological Laboratory of the Wrocław University) for help in field investigations in 1977 and in the selection of the bone material, and to Dr. L. D. Martin (Museum of Natural History, University of Kansas, Lawrence) for reading the manuscript and useful comments.

GEOLOGICAL SETTING

In the cave Mała, the lower unit deposits (Member 2) are yellow marly clays with corroded limestones debris (fig. 2:2). The residuum of a washed 20 kg test sample contained numerous silicified fragments of Jurassic echinoids, brachiopods, crinoids, pelecypods, gastropods, ostracods and foraminifera, occurring here as a secondary deposit. Besides these fossils, a few teeth and fragments of long bones of bats (Rhinolophidae), some vertebrae of fishes and two teeth of *Glis* sp. were found.

Member 3 — black clay layer of 2—3 cm thickness which does not contain fossils.

Member 4 — reddish sands, in places cemented by calcite containing black nodules of "Bohnerze" and numerous bones of small vertebrates (insectivores, bats and rodents).

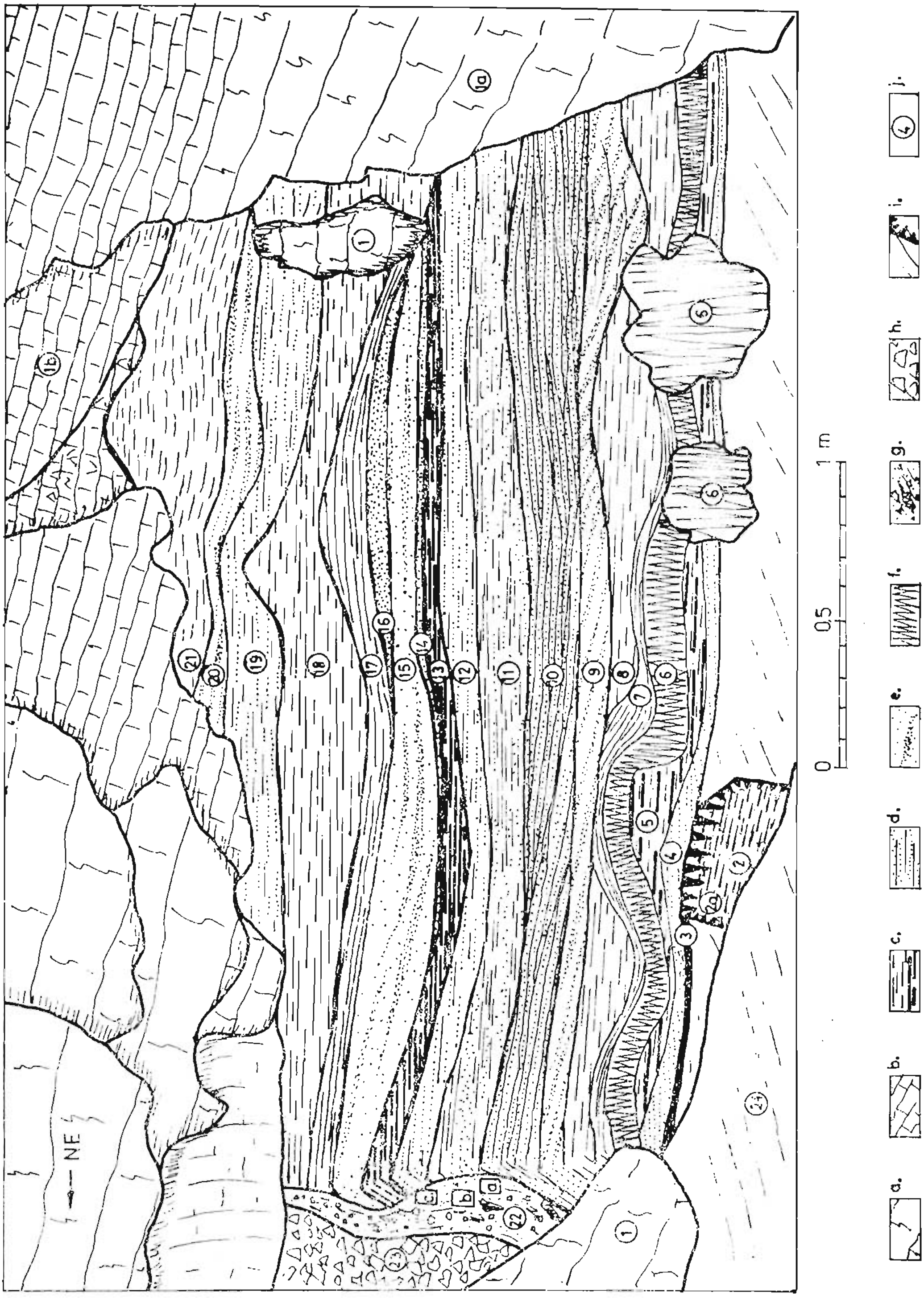
Member 5 — red clays with numerous bones of small vertebrates which are described together with vertebrates from layer No. 4 in the systematic part of this paper.

Member 6 — differentiated calcite flowstone layer 15—60 cm thick. In the lower part it is a white microcrystalline calcite laminated with red clay a few centimeters thick, the higher part consists of macrocrystalline calcite (15—25 cm thick), fissured and weathered at the top. These calcites are overlain by reddish sands and clays to 1.5 cm thick and various calcite flowstones: "waterfalls", "rice fields", with rich bone beds of small vertebrates: different talpids and soricids with *Beremendia fissidens* (Petényi, 1864), bats (Rhinolophidae and Vespertilionidae), and numerous rodents such as *Pliopetes* sp., ?*Mimomys* sp., *Baranomys* sp., *Glis* sp., *Muscardinus* sp., and Muridae gen. et sp. indet.

Member 7 — brown clays.

Member 8 — laminated brown clays and light-brown silt, from 10 to 15 cm thick. In the layers Nos. 7—8 there are numerous bones of small vertebrates, such as: Anura gen. et sp. indet. (Amphibia), *Anguis* sp. (Reptilia), and *Erinaceus* sp. and Microtinae gen. et sp. indet. (Mammalia).

Member 9 — laminated fine-grained sands with "Bohnerze" nodules (15—20 cm thick).


NE
1a
1b
1
2
2a
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
a
b
c
0
0,5
1 m
a.
b.
c.
d.
e.
f.
g.
h.
i.
j.

Member 10 — fine-grained sands horizontally laminated by brown clays and "Bohnerze" nodules.

Member 11 — brown sands laminated by white sands and clays.

Member 12 — white sands laminated by brown clays.

Member 13 — red clay 2—6 cm thick, at the top dark coloured by manganese hydroxides.

In the layers Nos. 9—13, bones are scarce; some of them belong to *Mimomys* sp. or Microtinae group at whole.

Member 14 — fine-grained ferrugineous sands laminated with brown clay, up to 3 cm thick.

Member 15 — grey silts laminated with white sands.

Member 16 — fine-grained sands, white and laminated.

Member 17 — laminated grey clay with grey sands at the top.

Member 18 — laminated brown clays.

Member 19 — white sands laminated with brown clays.

Member 20 — fine-laminated white sands.

Member 21 — brown silty-clays at the top of the cave deposits; in the present stage of investigation there is no information about the fossil fauna in the layers 14—21.

Member 22 — granulated talus formed by material from laminated cave deposits and pieces of calcite flowstones. This material was taken from the lateral wall of the excavation in the cave. It contained much bone material: *Rana* sp. and *Bufo* sp. (Amphibia), *Anguis fragilis* L. and *Lacerta* sp. (Reptilia), Aves gen. et sp. indet., numerous bones of Mammals such as Vespertilionidae (Chiroptera) and *Microtus agrestis-arvalis* group, ?*Lemmus* sp., *Apodemus* sp. (Rodentia), and *Meles meles* (L.) (Carnivora). A test sample taken from the niche in the laminated cave deposits contained grey clays with fine pieces of charcoal and bone of voles (*Microtus* sp., and ?*Lagurus* sp.).

Member 23 — limestone debris on the surface of cave sediments.

Member 24 — heap at the entrance.

The micromammals from the layers 4+5 described in the present paper provide some analogies with the fauna of Early or Middle Pliocene localities of Central and West Europe, particularly such as: Kohfidisch and Eichkogel in Austria, Devinska Nova Ves and Ivanovce near Trenčin in Czechoslovakia, Osztramos, Beremend and Csarnóta in Hungary, Gundersheim and Dorn-Dürkheim in FRG, Podlesice near Kroczyce, Węże 1 (lower layers), partly Węże 2 and Zamkowa Dolna in Poland, La Grive Saint-Alban, Lissieu, Lobrieu, Vieux-Collonges in France, and Los Mansuetos and Cervilente in Spain.

Fig. 2. Cave Mala profile of sediments in the entry-chamber: *a* biohermal limestones, *b* bedded limestones, *c* clays, *d* sands, silts, clays, *e* sands, *f* calcite, *g* talus deposits, *h* limestones debris, *i* heap with pit in bottom-furrow, *j* members of deposits described in the text.

DESCRIPTIONS

Order **Insectivora** Bowdich, 1821
Family **Soricidae** Gray, 1821
Subfamily **Soricinae** Fischer von Waldheim, 1817
Tribe **Soricini** Fischer von Waldheim, 1817

Genus *Sorex* Linnaeus, 1758
Sorex sp.

Material (ZPAL Wr). — Fragment of right mandible with M_3 (M-675/1/1); left mandible with I_1, M_1, M_3 and detached P_4 (M-675/1/2); left I^1 (M-675/1/3); left mandible with I_1, P_4 and M_1 trigonid (M-675/1/4).

Dimensions (in mm): alveolar length I_1 — M_3 5.8; length of M_3 — 0.9; height of mandible beneath M_3 — 0.8; height of coronoid process — 3.1 (M-675/1/2).

Remarks. — Pigmentation at the tips of the cusps dark-cherry coloured; entoconid crest absent; cingulum equal in thickness; mental foramen beneath of M_1 hypoconid; I_1 with three cusps on its cutting edge; P_4 with two weak tips; condylar process of *Sorex* type. The small mandibular and tooth dimensions, a weak reduction of the M_3 talonid, and the above mentioned characters indicate the presence of a small shrew similar to *Sorex subminutus* Sulimski, 1962 (see Sulimski 1962a: 461, fig. 2:4 a-b, 5; pl. 2:2—3).

Tribe **Blarinini** Stirton, 1930
Subtribe **Blarinina** Stirton, 1930

"*Sorex*" cf. *dehneli* Kowalski, 1956
(fig. 3: 5—6; pl. 20: 5)

Material (ZPAL Wr). — Left mandible with I_1—M_3, but without articular processes (M-675/2/1); posterior fragment of right mandible with well preserved condylar process (M-675/2/2).

Dimensions: (in mm): length I_1 — M_3 — 7.94; length M_1 — M_3 4.52; length I_1 (crown) — 3.83; length and width C — 1.15×1.10; P_4 — 1.42×0.95; M_1 — 1.86×1.15; M_2 — 1.54×1.10; M_3 — 1.26×0.89 (in talonid — 0.50); height of mandible beneath M_2 — 1.77 (M-675/2/1). Height of condylar process — 2.10; length of lower articular facet — 1.42 (M-675/2/2).

Remarks. — The large shrew from the cave Mała is similar in morphology and dimensions to the Middle Pliocene species *Sorex dehneli* Kowalski, 1956 described from the Podlesice near Kroczyce (Kowalski 1956). Specimens from the cave Mała are however somewhat bigger with a less developed P_4, and have a more delicate lateral cingulum on the molars. The condylar process (see fig. 3: 5b), especially the lower facet, does show a similar structure as in *Sorex dehneli* (see Kowalski *l.c.*: 345, fig. 1c).

In Repenning's opinion (1967: 42) *Sorex dehneli* is a representative of the tribe Blarinini and perhaps belongs to the genus *Paracryptotis* Hibbard, 1950. Jánossy (1974: 18) proposed to assign them to the genus *Petenyia* Kormos, 1934. Kowalski (1960: 170) suggested the congenereity of *Sorex dehneli* and *Blarinoides mariae* Sulimski, 1959. The differences between the last two species are shown in the

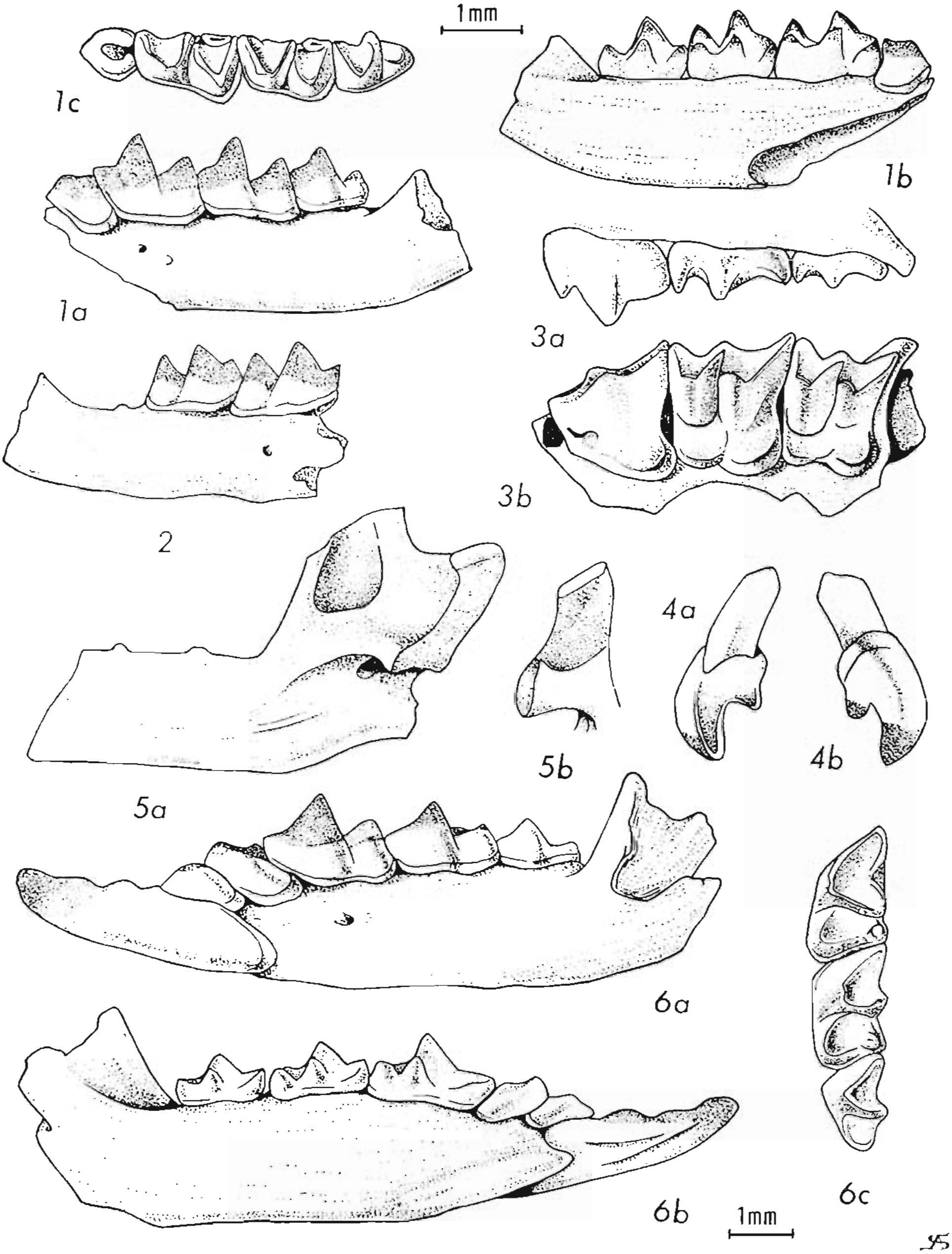


Fig. 3. 1. *Petenyia hungarica* Kormos, 1934. Left mandible with P_4—M_3 (ZPAL Wr M-675/3/1): *a* outer view, *b* inner view, *c* P_4—M_3 in occlusal view. 2. The same species. Right mandibular fragment with M_{1-2} (ZPAL Wr M-675/3/2) in outer view. 3. The same species. Left maxillary fragment with P^4—M^2 (ZPAL Wr M-675/3/3): *a* lateral view, *b* occlusal view. 4. The same species. Right I^1 (ZPAL Wr M-675/3/4): *a* palatal view, *b* labial view. 5. "*Sorex*" cf. *dehneli* Kowalski, 1956. Posterior right mandibular fragment with condylar process (ZPAL Wr M-675/2/2): *a* inner view, *b* condylar process from behind. 6. The same species. Left mandible with I — M_3 (ZPAL Wr M-675/2/1): *a* outer view, *b* inner view, *c* M_{1-3} in occlusal view. Scale for *Petenyia hungarica* — above, for "*Sorex*" cf. *dehneli* — below.

structure of P_4 and M_3, and the shape of the condylar process (see Kowalski 1956: fig. 1c; pl. 1: 5*a*-*c*, 6*a*-*c*; Sulimski 1959: 146, fig. 4: 2*a*-*f*, pl. 3: 6*a*-*c*; Rzebik-Kowalska 1976: 376—378, figs. 19, 20, 22, 24, 26, 27, 30—32, 36—38).

The analysis of additional material from the cave Mała especially the previously unknown upper teeth (the usual identification of the three teeth from the Podlesice, as P^4, M^1 and M^2 is very doubtful), and the comparison with specimens from Podlesice and Węże 1 will permit the generic assignment of „*Sorex*" *dehneli*.

Subtribe **Beremendina** Gureev, 1971

Genus *Petenyia* Kormos, 1934

Petenyia hungarica Kormos, 1934

(fig. 3: 1—4)

1934. *Petenyia hungarica* Kormos: 301, figs. 34—35.
1970. *Petenyia dubia* Bachmayer and Wilson: 546, pl. 1: 6; pl. 7: 26—27, 30—31; pl. 8: 31a.

Material (ZPAL Wr). — Fragment of left mandible with P_4 — M_3 but without articular processes (M-675/3/1); fragment of right mandible with M_1—M_2 and M_3 (alveoli) (M-675/3/2); fragment of left maxilla with P^4—M^2 and P^1 (alveola with root) (M-675/3/3); right I^1 (M-675/3/4); right M_1 (M-675/3/5); maxillary fragment with P^4 (M-675/3/6); maxillary fragment with M^2—M^3 (M-675/3/7).

Dimensions: (in mm):

Length	*Petenyia hungarica* Kormos, 1934 cave Mała		*Petenyia dubia* Bachmayer and Wilson, 1970 Kohfidisch	
	ZPAL Wr M-675/3/3	ZPAL Wr M-675/3/2	NHMV No. 1970/1387	
M_1 — M_3	3.8	3.6 alv.	3.7	
M_1	1.6	1.5	1.5	
M_2	1.4	1.4	1.4	
M_3	1.1	0.9 alv.	1.0	
Length	ZPAL Wr M-675/3/3	ZPAL Wr M-675/3/7	other specimens from the Kohfidisch	
M^1 — M^3	3.75 alv.	3.7 alv.	3.2	3.5
M^1	1.6	—	1.5	
M^2	1.5	1.5	1.4	
M^3	—	0.6	0.6	

Remarks. — Specimens from the cave Mała do not differ in morphology and dimensions from the Plio-Pleistocene representatives of *Petenyia hungarica* Kormos, 1934 in Europe (Kormos 1934; Heller 1936; Kowalski 1956; Sulimski 1959, 1962*a*; Dehm 1962; Kretzoi 1956, 1959, 1962; Rabeder 1970; Jánossy 1970, 1972, 1974; Terzea 1973; Terzea and Jurcsák 1976). The mandibular fragment M-675/3/2 is an exception, because it does show a slightly lower horizontal ramus. Nevertheless it is also assigned to *Petenyia hungarica* on the basis of tooth dimensions, pigmentation and general structure of teeth. The smaller specimens of this species are known in Osztramos 1 (Jánossy 1972). The tooth pigmentation of specimens from the cave Mała is dark red to black. Some reduction of the talonid of M_3 is also clearly visible.

The specimens described from Lower Pliocene fauna of Kohfidisch in Austria as *Petenyia dubia* (Bachmayer and Wilson 1970) also belong to the Hungarian species, because the holotype (NHMV 1970/1387) and other specimens (see Bachmayer and Wilson 1970: 546, pl. 2: 6; pl. 7: 26, 27, 30, 31, 31*a*) do not differ in morphology and dimensions. Moreover, the diagnosis of *P. dubia* consists of characters which are included within the range of *P. hungarica* variability.

Petenyia hungarica is a well known species in numerous localities of Middle Europe from the Early Pliocene to the Middle Pleistocene.

Tribe **Neomyini** Repenning, 1967

Genus *Petenyiella* Kretzoi, 1956

Petenyiella gracilis (Petényi, 1864)

(fig. 4: 1)

1864. *Sorex gracilis* Petényi: 54.
1962*a*. *Petenyiella gracilis* (Petényi); Sulimski: 479.
1962*a*. *Petenyiella zelcea* (Sulimski); Sulimski: 480, fig. 2: 1; pl. 2: 1.
1967. *Petenyiella gracilis* (Petényi); Repenning: 46.
1971. *Petenyiella gracilis* (Petényi); Gureev: 193.

Material (ZPAL Wr). — Right mandible with P_4—M_1 and articular processes (M-675/4/1).

Dimensions: (in mm): length P_4—M_1 — 1.72; length and width P_4 — 0.75×0.64; M_1 — 1.15×0.70; height of mandible beneath M_2 — 1.2; height of coronoid process — 3.0; height of condylar process — 1.2; length of lower facet — 0.9; alveolar length P_4—M_3 — 3.31 (M-675/4/1).

Remarks. — The small mandible from the cave Mała does not differ in morphology and size from the Hungarian specimens of Csarnóta 2 (Kretzoi 1959, 1962). Pigmentation is conspicuous, but weaker than in true soricids. The condylar process is *Neomys* like with a narrow interarticular area and an elongated lower facet. M_1 has a distinct entoconid crest, and the coronoid process is well developed with a prominent spicule.

Specimens from the Węże 1 described previously as *Suncus pannonicus* and *S. zelceus*, but later assigned to the genus *Petenyiella* (Sulimski 1959, 1962*a*) are referred now to *P. gracilis*.

Petenyiella gracilis is less frequent in the Middle and Late Pliocene faunas than *Petenyia hungarica*. It occurs sporadically also in the Upper Villafranchian faunas of Central Europe (Betfia XIII — Terzea and Jurcsák 1976). A large collection of mandibles and maxillae from the Węże 2 (Sulimski 1962*b*), may also be assigned to the same species.

Petenyiella aff. *repenningi* Bachmayer and Wilson, 1970

(fig. 4: 2; pl. 20: 4)

Material (ZPAL Wr). — Posterior fragment of right mandible with M_2—M_3 and articular processes (M-675/5/1).

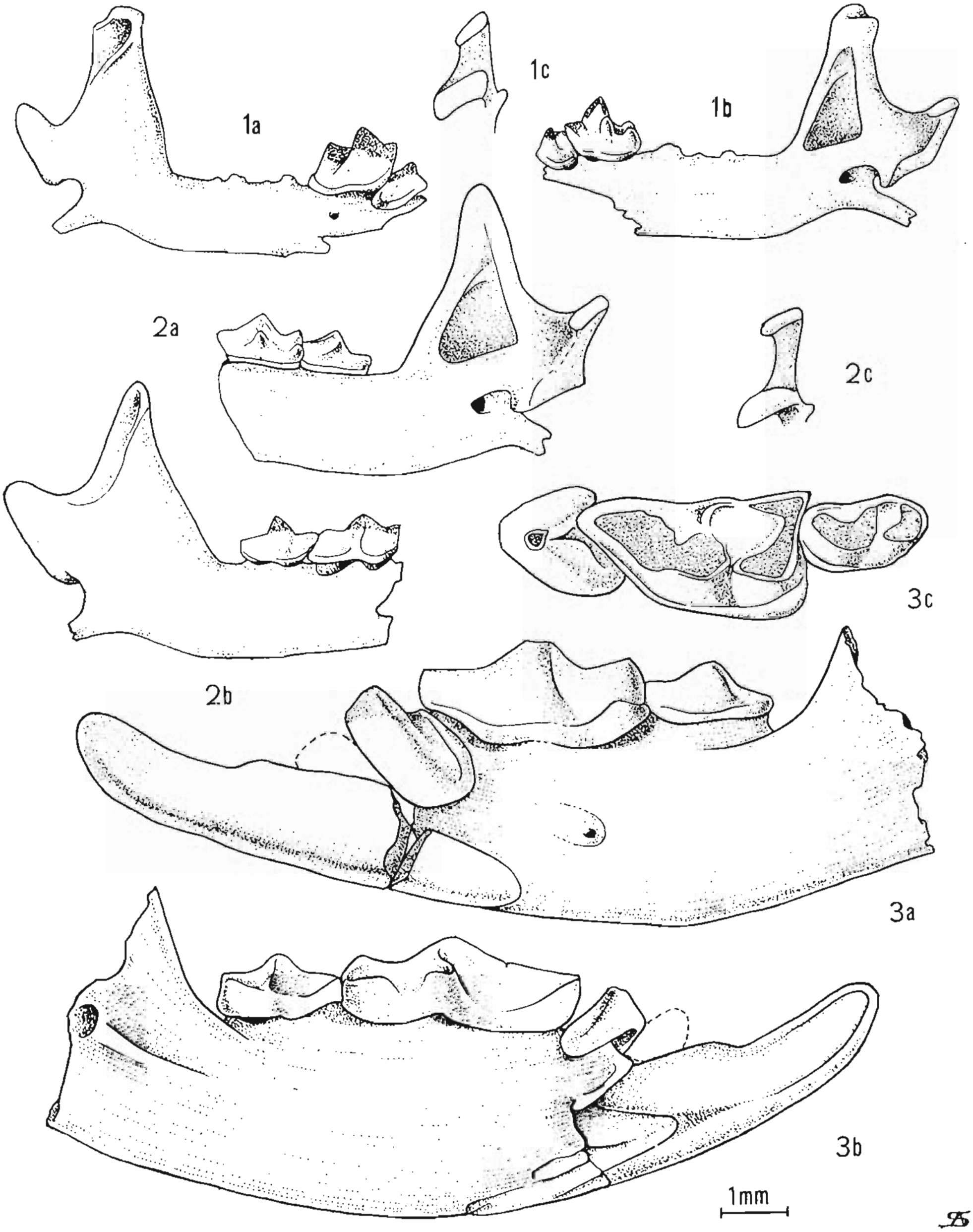


Fig. 4. 1. *Petenyiella gracilis* (Petényi, 1864). Right mandible with P_4—M_1 (ZPAL Wr M-675/4/1): *a* outer view, *b* inner view, *c* condylar process from behind. 2. *Petenyiella* aff. *repenningi* Bachmayer and Wilson, 1970. Posterior right mandibular fragment with M_2—M_3 (ZPAL Wr M-675/5/1): *a* inner view, *b* outer view, *c* condylar process from behind. 3. *Amblycoptus topali* Jánossy, 1972. Left mandible with P_4—M_2 (ZPAL Wr M-675/6/1) (I_1 (ZPAL Wr M-675/6/2) is added): *a* outer view, *b* inner view, *c* P_4—M_2 in occlusal view. Scale for all specimens — below.

Dimensions: (in mm): length M_2—M_3 — 2.21; length M_2 — 1.31; M_3 — 1.05; height of mandible beneath M_2 — 1.31; height of coronoid process — 3.47; height of condylar process — 1.57; length of lower facet — 1.2 (M-675/5/1).

Remarks. — The mandibular fragment is somewhat larger than that of *Petenyiella gracilis* from the cave Mała (M-675/4/1). It rather resembles in morphology the Lower Pliocene small shrew described by Bachmayer and Wilson (1970) as *P. ?repenningi.* The slender, pointed shape of the coronoid process, reduced talonid of M_3 and weak coronoid spicule indicate the presence of this species in the cave Mała. The incompleteness of the material, lack of upper teeth and of the skull, prevents an adequate statement of generic position.

Tribe **Anourosoricini** Stirton, 1930
Subtribe **Amblycoptina** Kretzoi, 1965

Genus *Amblycoptus* Kormos, 1926
Amblycoptus topali Jánossy, 1972

(fig. 4: 3; pl. 20: 6)

1972. *Amblycoptus topali* Jánossy: 38, pl. 3: 6—10.
1975. *Amblycoptus* cf. *topali* Jánossy; Rzebik-Kowalska: 178, figs. 4—5.

Material (ZPAL Wr). — Left mandible with P_4—M_2 and base of the crown of I_1, but without C and articular processes (M-675/6/1); left I_1 without root and base of the crown (M-675/6/2).

Dimensions: see table 1.

Additional description and remarks. — Lower incisor massive with one occlusal cuspule on the crown, without cingulum; canine (alveola), small and closed between I_1 and P_4; P_4 large, unicusped, but with two posteriorly directed ridges; posterolower end of the P_4 crown does reach almost to the trigonid-half of M_1; P_4 extends almost twice as lowe labially than it does lingually; M_1 very large, with strongly elongated trigonid and prominent labial cingulum, maximally widened below the hypoconid; cingulum disappears below the paraconid; metaconid large and close to the protoconid; trigonid of M_1 and M_2 twice longer than talonid; entoconid without distinct crest; trigonid and talonid valleys open; paralophid long, protolophid short — both are sharp; M_1 more labially placed than M_2; M_2 one half the size of M_1 with reduced talonid; labial cingulum equal in thickness for its whole length; talonid with a weak hypoconid; metaconid low, and close to protoconid; mental foramen somewhat displaced beneath the protoconid in a depression (anteroposterior diameter is about 11 mm). The ascending ramus to the horizontal one at the angle of 115°.

The assignment of the mandible to the genus *Amblycoptus* Kormos, 1926, in spite of the lack of articular processes is not difficult, because of the complete atrophy of the last molars. The specimen from the cave Mała does not differ from that of the Hungarian species described from the Middle Pliocene locality Osztramos 1 (Jánossy 1972: pl. 2: 7—10). Jánossy (*l.c.*: 38) pointed out the allometric enlargement of M_1 and the larger reduction of I_1, C and P_4 than in *A. oligodon* (Polgárdi, Hipparion Fauna). In Jánossy's opinion the position of the infraorbital foramen, the structure of P^4 and the molars in both species are nearly the same. *A. topali* differs from *A. oligodon*, however, in the stronger development of the M^1 parastyle, the enlargement of P^4, the structure of the coronoid process (this process is distinctly lower than that in *A. oligodon* — see Kormos 1926: 378 and Jánossy 1972:

Table 1

Dimensions in mm:

		Amblycoptus oligodon Kormos, 1926 Polgárdi after Kormos 1926	*Amblycoptus oligodon* Kormos, 1926 Polgárdi after Jánossy 1972	*Amblycoptus topali* Jánossy, 1972 Osztramos 1 after Jánossy 1972	*Amblycoptus topali* Jánossy, 1972 Osztramos 1 after Rzebik-Kowalska 1975	*Amblycoptus* cf. *topali* Jánossy, 1972 Zamkowa Dolna after Rzebik-Kowalska 1975 ZZSD MF/1350	*Amblycoptus topali* Jánossy, 1972 cave Mała after Sulimski 1979
Length I_1 crown		6.38	—	—	—	—	7.1*
P_4	L	—	2.01	2.1	—	—	1.9
	W	—	2.01	2.1	—	—	1.52
M_1	L	3.33	2.7 — 2.8	3.08 — 3.4	3.22	3.14	3.32
	W	—	1.5 — 1.7	1.35 — 1.75	1.51	1.43; 1.31	1.68
M_2	L	1.90	1.7 — 1.9	1.56 — 1.75	1.65	1.74	1.78
	W	—	1.05 — 1.08	0.90 — 0.98	0.94	0.83; 0.81	1.00
Length I_1 — M_2		10.09	—	—	—	—	10.15**
Length M_1 — M_2		5.23**	4.4 — 4.7**	4.64—5.11**	4.87**	4.88**	5.00
Height of coronoid process		7.80	—	6.6 — 7.2	—	—	—
Depth of mandible below M_2		3.3	—	2.5 — 2.9	—	—	2.78

Abbreviations: L — length, W — width, * — ZPAL Wr M-675/6/2, ** — estimated

39), and in the elongation of the trigonid and the talonid with short meta- and entolophids. The posterior end of the I_1 crown in specimens from Osztramos 1 and cave Mała reaches backwards further than in specimens from the Polgárdi (after Jánossy a very important diagnostic character). *Amblycoptus topali* has been placed in the subfamily Soricinae and in accordance with Gureev's (1971) systematic arrangement in the tribe Anourosoricini. *Amblycoptus* is the end of an evolutionary process within this tribe, resulting in the complete atrophy of the last teeth of both jaws (Jánossy 1972: 38).

The left mandible with M_{1-2} (ZZSD MF/1350/1) described by Rzebik-Kowalska (1975: 178, fig. 4: 1—3) from the Middle Villafranchian fauna (?) of Zamkowa Dolna at Olsztyn near Częstochowa, comes from the layer C of this site. It is not impossible that this layer is stratigraphically older than the fauna of remaining deposits. The presence of *Blarinoides mariae* Sulimski, 1959 and representatives of the family Eomyidae, genera such as *Ungaromys* Kormos, *Baranomys* Kormos, *Pliopetaurista* (?) *pliocaenica* (Depéret) and ? *Sciurus warthae* Sulimski (Black and Kowalski 1974) appear to confirm to this supposition. Rzebik-Kowalska pointed out on the specimen from the Zamkowa Dolna a lack of tooth pigmentation, elongation of the trigonid and an obtuse angle between the paralophid and protolophid in M_1, close position of metaconid and protoconid, united entoconid with the hypolophid, a weak entolophid, shallow and short external valley between the protoconid and hypoconid, and well developed cingulum with the extension beneath the protoconid. The above mentioned differences and tooth dimensions (in spite of some morphological differences) indicate resemblances to the specimens from the Osztramos 1, and cave Mała in Poland.

Order **Chiroptera** Blumenbach, 1779

Some remains of bats were discovered in different layers of deposits from the cave Mała. The material that the author investigated is not abundant and not very well preserved. It consists almost exclusively of parts of mandibles and maxillae. They are, as a rule, fragmentarily preserved and mostly lacking teeth and processes. All specimens investigated represent adult individuals. The nature of the remains suggests that we have a thanatocenosis of bats, which most likely died in the cave during hibernation. The state of bone preservation, however, suggests that some specimens may be derived from owl-pellets.

The bat fauna the older layers (from 2 to 6) from the cave shows close analogies with some other Pliocene faunas of small mammals from Poland, i.e. with those of Podlesice and Węże 1 (Kowalski 1956, 1962*a*). The fauna from Gunderheim described by Heller (1936) exhibits also a close similarity to that from the cave Mała, as like as faunas from Ivanovce near Trenčin (Horaček 1976) and Osztramos (Topal 1974).

Among the bats collected from the cave Mała there are no silvan species. All forms known from this locality represent, above all, the species living in rocky areas and taking shelter in caves. The bat fauna gives some information of the paleoclimate condition. The composition of bats from the older layers suggests a climate a little milder than the present one, perhaps resembling that of the Mediterranean. The fauna of the younger layers suggests that the climate was fairly cool, resembling a climate of the Central European type.

In the present work the discussion is limited only to remains of bats belonging to layer 4+5.

Family **Rhinolophidae** Bell, 1836

Genus *Rhinolophus* Lacépède, 1799

Rhinolophus cf. *delphinensis* Gaillard, 1899

Material (ZPAL Wr). — 24 mandibular and maxillary fragments and separate teeth of different categories (M-675/7/1—24).

Remarks. — *Rhinolophus delphinensis* was so far known from the Vindobonian of La Grive-Saint-Alban, Lissieu, Vieux-Collonges in France (Gaillard 1899; Mein 1958, 1964), from Upper Turolian at Kohfidisch in Austria (Bachmayer and Wilson 1970), and the Helvetian of Nova Veš (Zapfe 1950). "*R. aff. ferrum-equinum* Schreber" described by Heller (1936) from Gundersheim corresponds in dimensions to *R. delphinensis.* Numerous specimens from Podlesice near Kroczyce described by Kowalski (1956) as "*R. cf. ferrum-equinum*" also later determined as *R. delphinensis* (Kowalski 1962*a*) and remains of a big rhinolophid bat from Kadzielnia and Węże 1 (Kowalski 1958) belong to this species. *Rhinolophus delphinensis* has been recorded from other Pliocene localities in Europe such as Osztramos in Hungary (Topal 1974), and Ivanovce near Trenčin in Czechoslovakia (Horaček 1976).

Rhinolophus cf. *neglectus* Heller, 1936

Material (ZPAL Wr). — 18 mandibular and maxillary fragments (M-675/8/1—18).

Remarks. — Among the fossil bats from Pliocene deposits there are two forms which approach the recent *R. euryale euryale: R. e. neglectus* from Gundersheim and *R. e. praeglacialis* from Beremend and Csarnota (Kormos 1934; Heller 1936). The difference between these subspecies is slight. P_3 of the first subspecies is larger and more robust than that in the Recent form, and in the second one this tooth is shorter and smaller than in the Recent species. The specimens from the cave Mała resemble in P_3 characters that from Gundersheim.

Rhinolophus sp. (*euryale* group)

Material (ZPAL Wr). — 8 mandibular fragments and 14 isolated teeth (M-675/ /9/1—22).

Remarks. — It was impossible to identify such poor material to species.

Rhinolophus cf. *variabilis* Topal, 1975

Material (ZPAL Wr). — 4 mandibular fragments and 15 isolated teeth (M-675/ /10/1—19).

Remarks. — These remains are somewhat larger than Recent *R. hipposideros* and especially resemble the fossil species *R. variabilis* in the shape of P_4. *R. variabilis* was described by Topal (1975) from Osztramos Hill in Hungary.

Family **Vespertilionidae** Gray, 1821

Genus *Myotis* Kaup, 1829

Myotis podlesicensis Kowalski, 1956

1956. *Myotis podlesicensis* Kowalski: 362, pl. 2: 7—8.
1962*a*. *Myotis podlesicensis* Kowalski; Kowalski: 41.

Material (ZPAL Wr). — 3 maxillary and 9 mandibular fragments (M-675/11/1—12).

Remarks. — These fragments are identical with those described from Podlesice near Kroczyce and Węże 1 by Kowalski (1956, 1962a) and represent the largest species of *Myotis* Kaup investigated here.

Myotis bechsteini (Kuhl, 1818)

Material (ZPAL Wr). — 8 maxillary fragments (M-675/12/1—8).

Remarks. — The remains of *M. bechsteini* (Kuhl) have been recorded from many Early Pleistocene localities in Central Europe (Horaček 1976, Kowalski 1972). It is the commonest form of subfossil bat in Poland, which proves that this species was sometimes more numerous in the past (Wołoszyn 1970). At present *M. bechsteini* (Kuhl) occurs in Europe from the Atlantic ocean to the European part of Russia and the Caucasus.

Myotis nattereri (Kuhl, 1818)

Material (ZPAL Wr). — 1 rostrum with M^1—M^3 (M-675/13/1).

Remarks. — This specimen is identical with those of the contemporary *M. nattereri* (Kuhl) from Poland. The fossils of this species have been hitherto recorded from the Early Pleistocene of Brassó in Roumania, from the layers of Riss-Würm Interglacial of the Drachenhöhle near Mixnitz in Austria, from Koneprusy in Czechoslovakia (after Kowalski 1962*b*), Dobrkowice near Czeské Krumlové (Horaček 1976), and from a Pleistocene site from Bacho Kiro in Bulgaria (Wołoszyn 1979). The subfossil remains of this species were recorded from numerous localities in Poland (Wołoszyn 1970) and Czechoslovakia (Horaček 1976). At present *M. nattereri* occurs in Europe and in Asia as far as Japan and Korea. It ranges fairly far to the North, but is lacking in Southern Italy and in the Balkan Peninsula.

It must be stated that the bat fauna of layer 4+5 corraborates the Pliocene age and is probably simultaneous with the faunas of Podlesice and Węże 1.

Order **Rodentia** Bowdich, 1821
Family **Microtidae** Cope, 1891
Microtinae gen. et sp. indet.

(fig. 5: 5—11)

Material (ZPAL Wr). — Left M_1 (M-675/14/1); right M_1 (M-675/14/2); left M_2 (M-675/14/3); right M_2 (M-675/14/4); left M_3 (M-675/14/5); right M_3 (M-675/14/6); left M^1 (M-675/14/7); right M^1 (M-675/14/8); left M^2 (M-675/14/9); right M^2 (M-675/14/10); left M^3 (M-675/14/11); fragment of right M^3 (M-675/14/12). All teeth probably belong to one individual.

Dimensions (in mm):

ZPAL Wr:		Length	Width
		lower teeth	
M-675/14/1	left M_1	2.73	1.35
M-675/14/2	right M_1	2.78	1.30
M-675/14/3	left M_2	1.84	1.15
M-675/14/4	right M_2	1.83	1.15
M-675/14/5	left M_3	1.60	0.90
M-675/14/6	right M_3	1.57	1.00
M-675/14/1	height of M_1 crown	2.63	
M-675/14/4	height of M_2 crown	2.62	

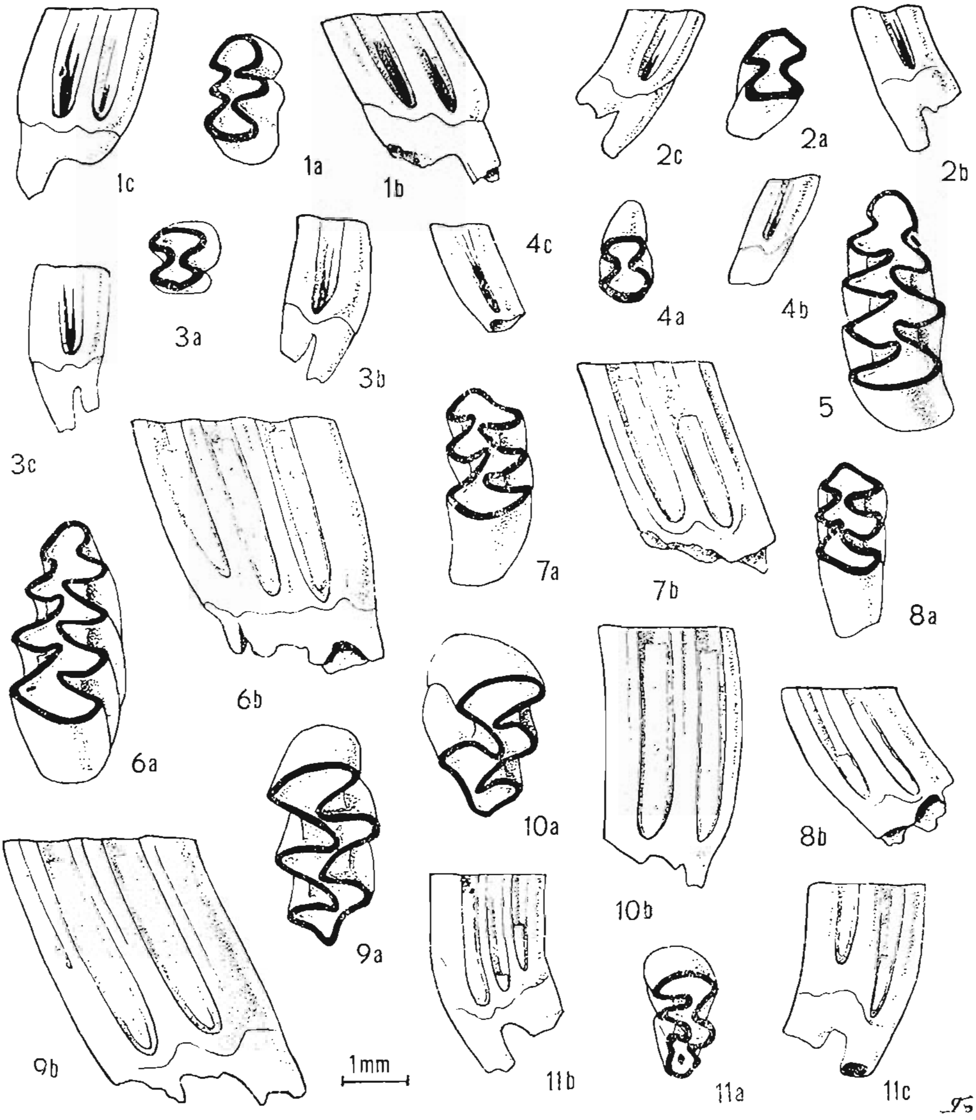


Fig. 5. *1—4 Epimeriones austriacus* Daxner-Höck, 1972. *1* left M_1 (ZPAL Wr M-675/ /10/1); *2* right M_2 (ZPAL Wr M-675/10/4); *3* right ? M^2 (ZPAL Wr M-675/10/8); *4* left M_3 (ZPAL Wr M-675/10/5). *1a—4a* in occlusal views, *1b—4b* labial views, *1c—4c* lingual views. *5—11* Microtinae gen. et sp. indet. *5* right M_1 (ZPAL Wr M-675/9/2) in occlusal view; *6* left M_1 (ZPAL Wr M-675/9/1); *7* left M_2 (ZPAL Wr M-675/9/3); *8* left M_3 (ZPAL Wr M-675/9/5); *9* left M^1 (ZPAL Wr M-675/9/7); *10* left M^2 (ZPAL Wr M-675/9/9); *6a—10a* in occlusal views, *6b—10b* in lateral views; *11* left M^3 (ZPAL Wr M-675/9/11); *a* occlusal view, *b* lingual view, *c* labial view. Scale for all specimens — below.

		upper	teeth
M-675/14/7	left M^1	2.63	1.57
M-675/14/8	right M^1	2.60	1.50
M-675/14/9	left M^2	1.94	1.26
M-675/14/10	right M^2	1.90	1.24
M-675/14/11	left M^3	1.55	0.88
M-675/14/12	right M^3	—	0.82

Remarks. — In spite of relatively numerous bone material the determination of the systematic position of this primitive vole from the cave Mała is not possible yet. The prismatic and hypsodont teeth indicate the presence of a representative of the subfamily Microtinae Miller. The structure of the anterior loop of M_1 and the arrangement of triangles 1—3 resemble those in genera *Allophajomys* or *Arvicola*. In all teeth cement is present in reentrant folds and roots are well developed. It is not unlikely that in the cave Mała there is a previously primitive vole (perhaps a new genus). It may be well to add that in the Early Pliocene faunas at Kohfidisch and Eichkogel (Austria) and Dorn-Dürkheim in FRG (Bachmayer and Wilson 1970; Daxner-Höck 1970, 1972*a*, *b*, 1975, 1977; Franzen and Storch 1975) the remains of voles have not as yet been recorded.

Promimomys insuliferus (Kowalski 1956) (after Kretzoi (1959) — *Polonomys insuliferus*) redescribed in the Middle Pliocene fauna of Podlesice near Kroczyce (Kowalski 1958) differs from our small vole distinctly in the structure of the anterior loop of M_1 and in the different construction of M^3.

The vole *Pannonicola brevidens* described by Kretzoi (1965) from the Pliocene of Hungary has extremely brachyodont molars and alternate synclines and anticlines (it is closer to the genus *Promimomys* (*sensu Kretzoi* (1955)).

The definite settlement of the systematic position of the primitive vole from the cave Mała is presently impossible.

Family **Cricetidae** Rochebrune, 1883
Subfamily **Gerbillinae** Alston, 1876

Genus *Epimeriones* Daxner-Höck, 1972
Epimeriones austriacus Daxner-Höck, 1972

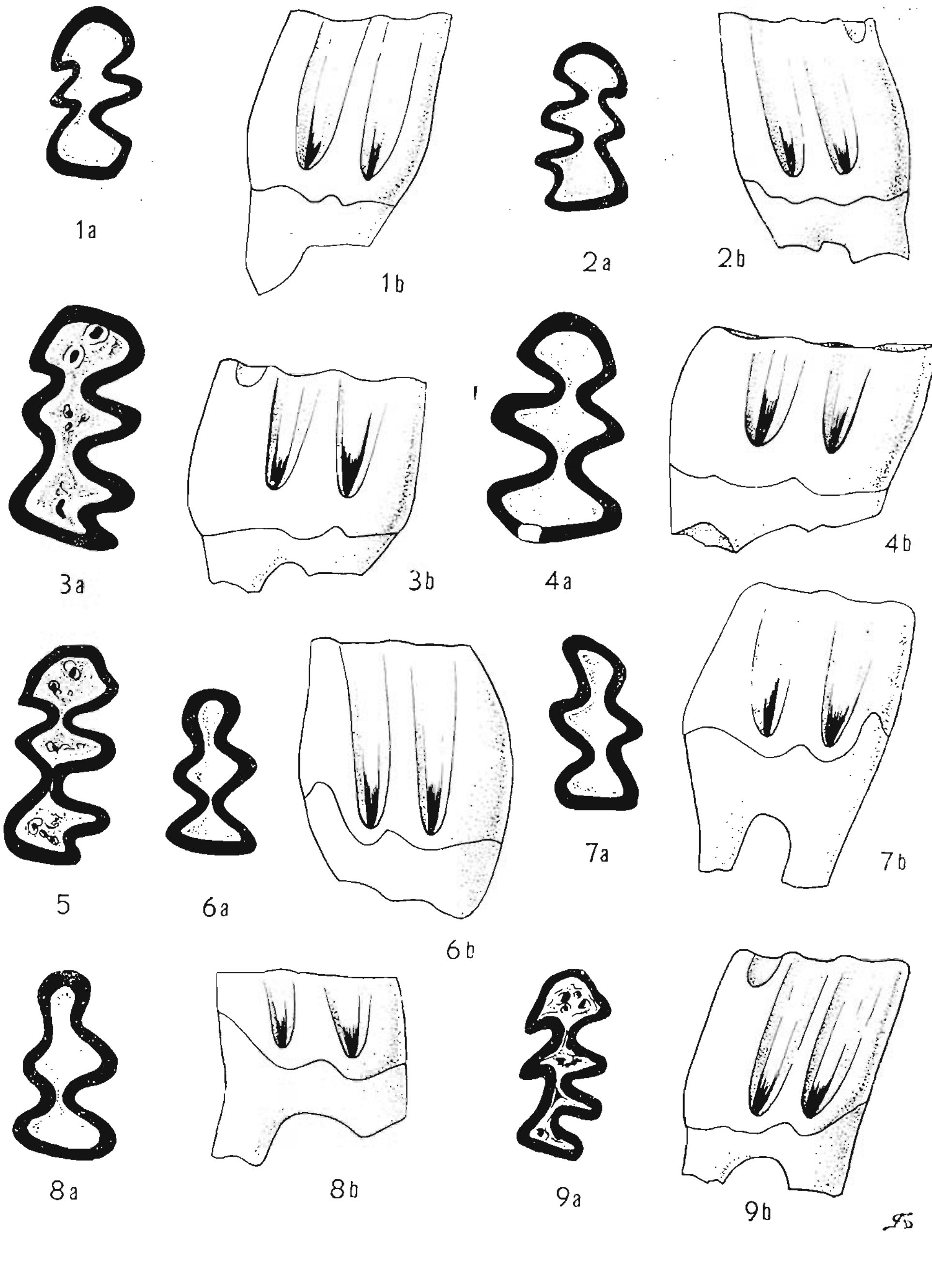
(fig. 5: 1—4; fig. 6: 1—2; pl. 20: 1)

1972*a*. *Epimeriones austriacus* Daxner-Höck: 145, figs. 1—2.
1975. *Epimeriones austriacus* Daxner-Höck; Franzen and Storch: 268.

Material (ZPAL Wr). — Left M_1 (M-675/15/1); right M_1 (M-675/15/2); left M_2 (M-675/15/3); right M_2 (M-675/15/4); left M_3 (M-675/15/5); left M^1 (M-675/15/6); right M^1 (M-675/15/7); right ? M^2 (M-675/15/8); fragment ? M^2 (M-675/15/9). All teeth most probably belong to one individual.

Dimensions (in mm):

ZPAL Wr:		Length	Width
		lower	teeth
M-675/15/1	left M_1	1.63	0.83
M-675/15/2	right M_1	1.60	0.82
M-675/15/3	left M_2	1.00	0.85
M-675/15/4	right M_2	1.05	0.84
M-675/15/5	left M_3	0.90	0.76


1a
1b
2a
2b
3a
3b
4a
4b
5
6a
6b
7a
7b
8a
8b
9a
9b

		upper teeth	
M-675/15/6	left M^1	1.00	0.80
M-675/15/7	right M^1	1.54	0.82
M-675/15/8	right ? M^2	1.58	0.85

Remarks. — Gerbillid remains from the cave Mała are represented by several detached molars. M_1 (M-675/15/1) in the structure of the anterior loop is very similar to that from Eichkogel (see figs. 5: 1a-c, fig. 6: 1a-b, pl. 20: 1a-b, in the present paper and fig. 1: 1a-b, 2a; pl. 1: 3a-b, 5 in Daxner-Höck 1972*a*). The anterior loop is broad and rounded, of the *Baranomys* type, and nearly as wide as the width of both the mesial triangles together. The differences occurring here are limited to the middle lingual triangle and the small mesial labial one. The triangle 1 in the specimen M-675/15/1 is longer and nearly perpendicular to the long axis of the crown, while the triangle 2 is directed more nearly backwards. Moreover, the anterior loop is somewhat wider than the width of the posterior one. The M_1 from Eichkogel (see Daxner-Höck 1972*a*: fig. 1: pl. 1: 5 — PIUW 1953/1/9) has enamel islets, dentine pits and an additional posterior lingual reentrant fold. This tooth probably belongs to a young individual, because the additional lingual re-entrant fold is shallow in both vertical and horizontal directions. A similar structure is also found in M_1 (M-675/15/2; see fig. 6: 2*a*-*b*). It has a somewhat narrower anterior loop and a rudiment of an additional lingual re-entrant fold. The remaining teeth from the cave Mała do not differ in morphology from those of Eichkogel. They are, however, smaller and more delicate.

Gerbillid remains are also recorded from the Hungarian Pliocene localities Osztramos 1 and 9, but they are smaller than *E. austriacus* (Jánossy 1972: 27; 1974: 18). Remains from Osztramos 9 assigned previously to the genus ?*Meriones* sp., have been recently redescribed by Jánossy and Kordos (1977) as *E. progressus* Kowalski 1974. Specimens resembling *E. austriacus* have been recorded also from the Middle Villafranchian fauna of Betfia XIII in Roumania (Terzea 1976). Recently, Franzen and Stroch (1975) described *E. austriacus* from the Lower Pliocene fauna (Upper Turolian) of Dorn-Dürkheim.

Bachmayer and Wilson (1970) described only one M_1 (NHMV No. 1970/—) from the Kohfidisch in Burgenland (Austria) as Rodentia gen. et sp. indet. The structure, (especially the width and shape of the anterior loop and an additional lingual re-entrant fold), and size are the same as in the M_1 from Eichkogel. Some traces of enamel islets and dentine pits on the occlusal surface are also present (see fig. 6: 3*a*-*b*).

Kowalski (1974) described several detached teeth of small gerbillid as *Epimeriones progressus* from the Middle Pliocene fauna of Podlesice near Kroczyce. The fundamental differences occurring in this species are as follows: the lack of enamel islets and dentine pits, and a distinct narrowing of the anterior loop of M_1 (see fig. 6: 6—8).

Fig. 6. *Epimeriones austriacus* Daxner-Höck, 1972. Cave Mała (Poland). 1. Left M_1 (ZPAL Wr M-675/10/1): *a* occlusal view, *b* inner view. 2. Right M_1 (ZPAL Wr M-675/10/2): *a* occlusal view, *b* inner view. Rodentia gen. et sp. indet. Kohfidisch in Burgenland (Austria). 3. Left M_1 (NHMV 1970): *a* occlusal view, *b* inner view (after Bachmayer and Wilson 1970, pl. 12: 63*a*-*b*). *Epimeriones austriacus* Daxner-Höck, 1972. Eichkogel near Mödling (Austria). 4. Right M_1 (PIUW 1953/1/9 Sch. 4—6): *a* occlusal view, *b* outer view. 5. Left M_1 (PIUW 1953/1/8 Sch. 4—6) in occlusal view (after Daxner-Höck 1972*a*: 147, fig. I: 1*a*-*b*, 2; pl. 1: 3*a*-*b*, 5). *Epimeriones progressus* Kowalski, 1974. Podlesice near Kroczyce (Poland). 6. Left M_1 (ZZSD Mf/1143/1), holotype: *a* occlusal view, *b* inner view. 7. Right M_1 (ZZSD Mf/1143/2): *a* occlusal view, *b* inner view. 8. Left M_1 (ZZSD Mf/1143/6): *a* occlusal view, *b* inner view (after Kowalski 1974: 593, figs 1*a*-*b*, 2*a*-*b*, 6*a*-*b*). *Epimeriones austriacus* Daxner-Höck, 1972. Cave Mała (Poland). Supposed view of left M_1 of the young individual: *a* occlusal view, *b* inner view. Not to scale.

Family **Gliridae** Thomas, 1897
Subfamily **Glirinae** Thomas, 1897

Genus *Muscardinus* Kaup, 1829
Muscardinus pliocaenicus Kowalski, 1963
(fig. 7: 1—3)

1963. *Muscardinus pliocaenicus* Kowalski: 538, figs. 3—5.
1970. *Muscardinus pliocaenicus austriacus* ssp.n.; Bachmayer, and Wilson: 563, pl. 4: 14; pl. 13: 71.

Material (ZPAL Wr). — Left M_1 (M-675/16/1); right M_1 (M-675/16/2); left M_2 (M-675/16/3); right M_2 (M-675/16/4); right ? M_3 (M-675/16/5); left M^1 (M-675/16/6); right M^1 (M-675/16/7); left M^2 (M-675/16/8); right M^3 (M-675/16/9). All specimens probably belong to one individual.

Dimensions (in mm):

ZPAL Wr:		Length	Width
		lower	teeth
M-675/16/1	left M_1	1.55	1.15
M-675/16/2	right M_1	1.56	1.10
M-675/16/3	left M_2	1.20	1.08
M-675/16/4	right M_2	1.25	1.05
		upper	teeth
M-675/16/6	left M^1	1.54	1.10
M-675/16/7	right M^1	1.56	1.08
M-675/16/8	left M^2	1.15	1.22
M-675/16/9	right ? M^3	1.05	1.11

Remarks. — Numerous detached teeth of a small Pliocene hazel dormouse from the Pliocene faunas at Węże 1, Podlesice near Kroczyce and Rębielice Królewskie (Poland) have been described by Kowalski (1963) as *Muscardinus pliocaenicus*. This species is known also at Węże 2 (Sulimski 1962b), and Eichkogel near Mödling in Austria (Daxner Höck 1970).

The dentition of the Pliocene hazel dormouse indicates a wide morphological variability (Kowalski 1963). Hence it is possible that the bone materials described by Jánossy (1972, 1974) from the Middle Pliocene faunas in Osztramos 1, 7, 9 and 10 belong also to this species.

The right mandible with P_4—M_1 (holotype only — NHMV No. 1970/1390) described by Bachmayer and Wilson (1970) from the Early Turolien fauna of Kohfidisch as a new subspecies — *austriacus* does not differ significantly from the nominal species. Kowalski (1963) believed that the Pliocene hazel dormouse really does not differ in morphology from the Recent *M. avellanarius* (Linnaeus), except for smaller size and more delicate structure of teeth and jaws.

Genus *Glis* Brisson, 1972
Glis minor Kowalski, 1956
(fig. 7: 4—12)

1956. *Glis sackdillingensis minor*: Kowalski: 384, fig. 2f; pl. 4: 8.
1963. *Glis minor* Kowalski; Kowalski: 545, figs. 8 A-H, 9 A-H, 10 A-H.

1964. *Glis minor* Kowalski; Sulimski, A.: 228, pl. 14: 1—11.
1975. *Glis* sp., *Glis minor* Kowalski; Franzen and Storch: 274, pl. 5: 54—57.

Material (ZPAL Wr). — maxillary fragment with M^1—M^2 (M-675/17/1); maxillary fragment with M^2—M^3 (M-675/17/2); DP^4 (M-675/17/3); left and right P^4 (M-675/17/4—15); left and right M^1 (M-675/17/16—43); left and right M^2 (M-675/17/44—59); left and right M^3 (M-675/17/60—65); left and right P_4 (M-675/17/66—75); left and right M_1 (M-675/17/76—85); left and right M_2 (M-675/17/86—95); left and right M_3 (M-675/17/96—100).

Dimensions (in mm):

ZPAL Wr:		Length	Width
		lower	teeth
M-675/17/66—75	P_4	1.00—1.30	1.00—1.25
M-675/17/76—85	M_1	1.65—1.75	1.50—1.65
M-675/17/86—95	M_2	1.55—1.75	1.40—1.80
M-675/17/96—100	M_3	1.20—1.60	1.20—1.50
		upper	teeth
M-675/17/1	M^{1-2}	3.10	—
M-675/17/2	M^{2-3}	2.65	—
M-675/17/3	DP^4	1.15	0.85
M-675/17/4—15	P^4	1.05—1.07	1.10—1.12
M-675/17/16—43	M^1	1.60—1.70	1.55—1.70
M-675/17/44—59	M^2	1.55—1.65	1.55—1.70
M-675/17/60—65	M^3	1.20—1.40	1.30—1.55

Remarks. — The maxillary fragments and numerous detached teeth from the cave Mała do not differ from *Glis minor* described from the Middle Pliocene fauna of Podlesice near Kroczyce and Węże 1 (Kowalski 1956, 1963, Sulimski 1964).

Glis minor is also known from the Middle and Late Pliocene sites of Osztramos 1, 7, 9 as cf., 10 in Hungary (Jánossy 1972, 1974; Jánossy and Kordos 1977), and in the Early Pliocene (Upper Turolian) as *Glis* sp., *G. minor* from Dorn-Dürkheim (Franzen and Storch 1975). In the Uppermost Pliocene (or Upper ? Villafranchian) fauna of Betfia XIII in Roumania there are also some remains of a small fat dormouse, *Glis* sp. *minor* (Terzea 1973; Terzea and Jurcsák 1976).

Presently the genera *Glis* Brisson and *Muscardinus* Kaup are well known forest forms. It is not unlikely that the Early Pliocene glirids were more distributed ecologically than are the Recent species (Kowalski 1966: 3). *Glis minor* and *Muscardinus vireti* from the Dorn-Dürkheim occur together with numerous castoroid forms (Franzen and Storch 1975).

Family **Muridae** Gray, 1821

Genus *Parapodemus* Schaub, 1938

Parapodemus lugdunensis Schaub, 1938

(fig. 7: 13—18; pl. 20: 2—3)

1938. *Parapodemus lugdunensis*; Schaub: 26, pl. 1: 24.
1977. *Parapodemus lugdunensis* Schaub; Daxner-Höck: 20, fig. 1; pl. 3; 1—15; pl. 4: 1—6.

Material. (ZPAL Wr). — Left and right M_1 (M-675/18/1—7); left and right M_2 (M-675/18/8—14); left and right M_3 (M-675/18/15—17); left and right M^1 (M-675/18/18—

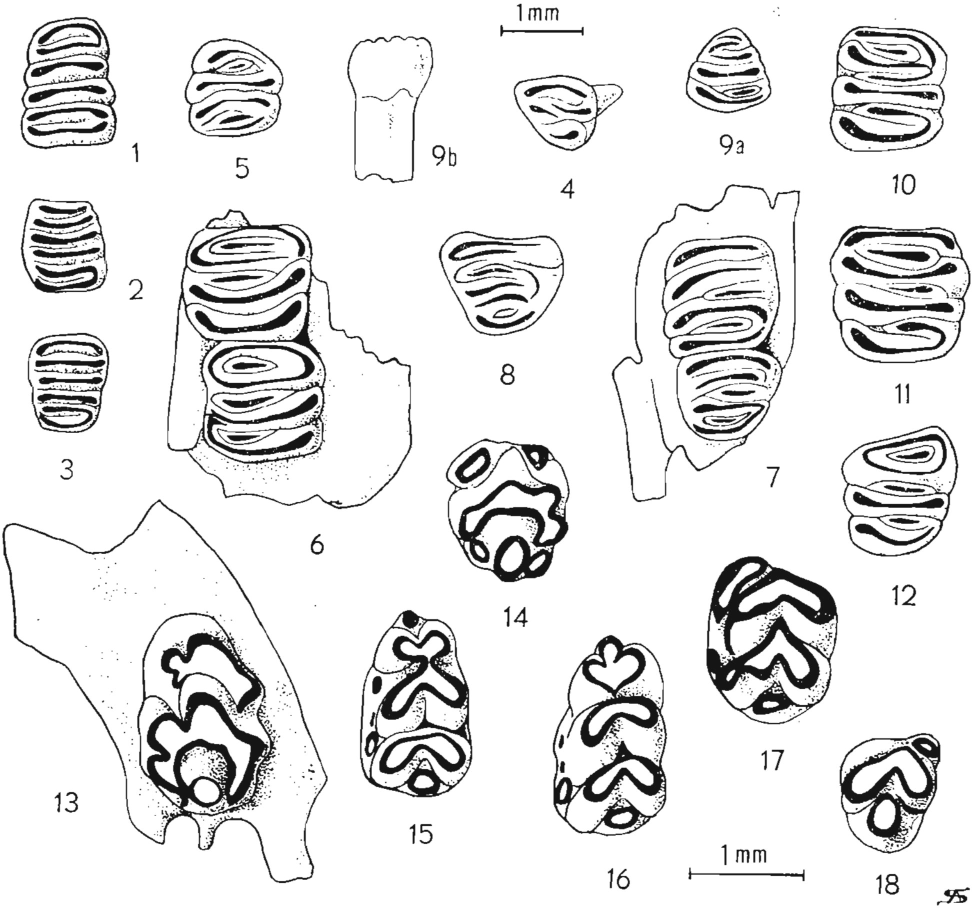


Fig. 7. *1—3 Muscardinus pliocaenicus* Kowalski, 1963: *1* left M_1 (ZPAL Wr M-675/ /11/1); *2* left M_2 (ZPAL Wr M-675/11/3); *3* right M_3 (ZPAL Wr M-675/11/5). All teeth in occlusal views. *4—12 Glis minor* Kowalski, 1956: *4* right DP^4 (ZPAL Wr M-675/ /12/3); *5* left P^4 (ZPAL Wr M-675/12/7); *6* maxillary fragment with M^1—M^2 (ZPAL Wr M-675/12/1); *7* maxillary fragment with M^2—M^3 (ZPAL Wr M-675/12/2); *8* left M^3 (ZPAL Wr M-675/12/48); *9* left P_4 (ZPAL Wr M-675/12/67); *10* left M_1 (ZPAL Wr M-675/12/76); *11* left M_2 (ZPAL Wr M-675/12/88); *12* left M_3 (ZPAL Wr M-675/12/97). All figures, except for *9a*, in occlusal views. *13—18 Parapodemus lugdunensis* Schaub, 1938: *13* right maxillary fragment with M^1 (ZPAL Wr M-675/13/27); *14* left M^2 (ZPAL Wr M-675/13/22); *15* left M_1 (ZPAL Wr M-675/13/5); *16* left M_1 (ZPAL Wr M-675/13/7); *17* left M_2 (ZPAL Wr M-675/13/12); *18* right M_3 (ZPAL Wr M-675/13/15). All teeth in occlusal views. Scale for *Muscardinus pliocaenicus* and *Glis minor* — above, for *Parapodemus lugdunensis* — below.

20): left and right M^2 (M-675/18/21—24); left and right M^3 (M-675/18/25—26); maxillary fragment with M^1—M^2 (M^2 alveoli only) (M-675/18/27).

Dimensions (in mm):

ZPAL Wr:		Length	Width
		lower teeth	
M-675/18/1—7	M_1	1.54—1.71	0.93—1.00
M-675/18/8—14	M_2	1.28—1.46	1.10—1.20
M-675/18/15—17	M_3	0.90—1.00	0.80—0.90

		upper teeth	
M-675/18/18—20	M^1	1.67—1.85	1.06—1.13
M-675/18/21—24	M^2	1.27—1.38	1.10—1.20
M-675/18/25—26	M^3	0.70—1.16	0.80—1.10

Remarks. — Remains of small mouse from the cave Mała do not differ in morphology and size from those of *Parapodemus lugdunensis* described by Schaub (1938) from the Vallesian fauna at Mollon. The same species occurs also in younger sites of the Middle and Upper Turolian in France and Spain (Lissieu, Lobrieu, Los Mansuetos: Hungueney and Mein 1965; Thaler 1966; Mein and Truc 1966; Michaux 1967; Hartenberger, Michaux and Thaler 1967).

Parapodemus lugdunensis is recorded in Middle Turolian faunas with *Valerimys vireti or Occitanomys* sp. as components at Cervilente 1, 2, 3 (Bruijn, Mein, Montenat and Van de Weerd 1975), and frequently represented in Early Pliocene (Pannonian, Pontian or Upper Turolien) faunas at Kohfidisch and Eichkogel (especially), and Dorn-Dürkheim (Bachmayer and Wilson 1970; Daxner-Höck 1977; Franzen and Storch 1975).

Parapodemus lugdunensis Schaub from the cave Mała is the first record of this species in the Pliocene fauna of Poland. It is possible that there is a close relationship between this species and *P. schaubi* Papp from the *Hipparion* fauna of Polgárdi (Papp 1947).

REFERENCES

BACHMAYER, F. and WILSON, R. W. 1970. Die Fauna der altpliozänen Höhlen- und Spaltenfüllungen bei Kohfidisch, Burgenland (Österreich). — *Ann. Naturhist. Mus. Wien,* **74**, 533—587.

BLACK, C. C. and KOWALSKI, K. 1974. The Pliocene and Pleistocene Sciuridae (Mammalia, Rodentia) from Poland. — *Acta Zool. Cracov.,* **19**, 461—486.

BRUIJN, H. de, MEIN, P. MONTENAT, C. and Van de WEERD, A. 1975. Correlations entre les gisements de rongeurs et les formations marines du Miocène terminal d'Espagne meridionale (Province d'Alicante et des Murica). — *Koninklj. Nederl. Akad. Wetensch. Proc., Ser. B,* **78**, 4, 1—32.

DAXNER-HÖCK, G. 1970. Die Wirbeltierfauna aus dem Alt-Pliozän (O-Pannon) vom Eichkogel bei Mödling (NÖ), III, Rodentia. — *Ann. Naturhist. Mus. Wien,* **74**, 597—605.

— 1972*a*. Die Wirbeltierfauna aus dem Alt-Pliozän (Pont) vom Eichkogel bei Mödling (Niederösterreich), IV — Gerbillinae (Rodentia, Mammalia). — *Ibidem,* **76**, 143—160.

— 1972*b*. Cricetinae aus dem Alt-Pliozän vom Eichkogel bei Mödling (Niederösterreich) und von Vösendorf bei Wien. — *Paläont. Z.,* **46**, 3—4, 133—150.

— 1975. Sciuridae aus dem Jungtertiär von Österreich. — *Ibidem,* **49**, 1—2, 56—74.

— 1977. Muridae, Zapodidae und Eomyidae (Rodentia, Mammalia) des Eichkogels bei Mödling (Niederösterreich). — *Ibidem,* **51**, 1—2, 19—31.

DEHM, R. 1962. Altpleistozäne Säuger von Schernfeld bei Eichstätt in Bayern. — *Mitt. Bayer. Staatssam., Paläont. Geol. hist.* **2**, 17—61.

FRANZEN, J. L. and STORCH, G. 1975. Die unterpliozäne (Turolische) Wierbeltierfauna von Dorn-Dürkheim, Rheinhessen (SW-Deutschland) — 1. Entdeckung, Geologie, Mammalia: Carnivora, Proboscidea, Rodentia, Grabungsergebnisse 1972—1973. — *Senckenb. Lethaea*, **56**, 4—5, 233—303.

GAILLARD, C. 1899. Mammifères miocènes nouveaux ou peu connus de la Grive-Saint-Alban (Isère). — *Arch. Mus. Hist. Nat. Lyon*, **7**, 1—79.

(GUREEV, A. A.) ГУРЕЕВ, А. А. 1971. Землеройки (Soricidae). — Фауны мира, 1—253, Издат. „Наука", Ленингр. Отдел., Ленинград.

HARTENBERGER, J. L., MICHAUX, J. and THALER, L. 1967. Remarques sur l'histoire des rongeurs de la faune à *Hipparion* en Europe sud-occidentale. *In: Probl. Act. Paléont.* (*Évol. Vert.*), **163**, *C.N.R.S., Coll. Intern.*, 503—513.

HELLER, F. 1936. Eine oberpliozäne Wierbeltierfauna aus Rheinhessen. — *N. Jhb. Min. B.-Bd.*, **76** B, 99—160.

HORAČEK, I. 1976. Review of Quaternary bats in Czechoslovakia. — *Lynx*, n.s., **18**, 35—58.

HUGUENEY, M. and MEIN, P. 1965. Lagomorphes et rongeurs du Néogène de Lissieu (Rhône). — *Trav. Lab. Géol. Fac. Sci. Lyon*, N. S., **12**, 109—123.

JÁNOSSY, D. 1970. Ein neuer Eomyide (Rodentia, Mammalia) aus dem ältespliozän (oberes Villafrankium) des Osztramos (Nordostungarn). — *Ann. Hist. Nat. Mus. Nat. Hung., Pars Min. Pal.*, **62**, 99—113.

— 1972. Middle Pliocene Microvertebrate fauna from the Osztramos Loc. 1 (Northern Hungary). — *Ibidem*, **64**, 27—52.

— 1974. New "Middle Pliocene" Microvertebrate fauna from Northern Hungary (Osztramos Loc. 9). — *Fragm. Min. Pal.*, **5**, 17—28.

— and KORDOS, L. 1977. Az Osztramos gerinces lelöhelyeinek faunisztikai és karsztmorfológiai áttekintése (1975-ig). — The faunistical and karst-morphological review of paleontological localities for vertebrates at Osztramos (Northern Hungary). — *Ibidem*, **8**, 39—72.

KORMOS, T. 1926. *Amblycoptus oligodon* n.g., n.sp. eine neue Spitzmaus aus dem ungarischen Pliozän. — *Ann. Hist. Nat. Mus. Nat. Hung.*, **24**, 370—391.

— 1934. Neue Insektenfresser, Fledermäuse und Nager aus dem Oberpliozän der Villányer Gegend. — *Földt. Közl.*, **64**, 296—321.

KOWALSKI, K. 1956. Insectivores, bats and rodents from the Early Pleistocene bone breccia of Podlesice near Kroczyce (Poland). — *Acta Palaeont. Polonica*, **1**, 4, 331—394.

— 1958. An Early Pleistocene fauna of small Mammals from the Kadzielnia hill in Kielce (Poland) — *Ibidem*, **3**, 1, 1—47.

— 1960. Pliocene Insectivores and Rodents from Rębielice Królewskie (Poland). — *Acta Zool. Cracov.*, **5**, 5, 155—200.

— 1962*a*. Fauna of Bats from the Pliocene of Węże in Poland. — *Ibidem*, **7**, 3, 39—51.

— 1962b. Bats of the Early Pleistocene from Koneprusy in Czechoslovakia. — *Ibidem*, **7**, 9, 145—156.

— 1963. The Pliocene and Pleistocene Gliridae (Mammalia, Rodentia) from Poland. — *Ibidem*, **8**, 14, 533—566.

— 1966. Stratigraphic importance of Rodents in the studies on European Quaternary. — *Folia Quaternaria*, **22**, 1—16.

— 1972. Fossil fauna. In: Studies on Raj Cave near Kielce (Poland) and its deposits. — *Ibidem*, **41**, 45—59.

— 1974. Remains of Gerbillinae (Rodentia, Mammalia) from the Pliocene of Poland. — *Bull. Acad. Pol. Sci.*, **22**, 9, 591—595.

KRETZOI, M. 1956. Die Altpleistozänen Wirbeltierfaunen des Villányer Gebirges. — *Geol. Hung., S. Pal.*, **27**, 1—264.

— 1959. Insectivoren, Nagetiere und Lagomorphen der jüngstpliozänen Fauna von Csarnóta im Villányer Gebirge (Südungarn). *Vert. Hung.*, **1**, 2, 237—246.

— 1962. Fauna und Faunenhorizont von Csarnóta. — *Hung. Geol. Inst. Ann. Rept.*, **1959**, 344—395.
— 1965. *Pannonicola brevidens* n.g., n.sp., ein echter Arvicolide aus dem ungarischen Unterpliozän. — *Vert. Hung.*, **7**, 131—139.
MEIN, P. 1958. Les Mammifères de la faune siderolithique de Vieux-Collonges. — *Nouv. Arch. Mus. Hist. Nat. Lyon*, **5**, 1—122.
— 1964. Chiroptera Miocène de Lissieu (Rhône). — *89th Congress Soc. Savantes*, 237—253
— and TRUC, G. 1966. Faciès et association faunique dans le Miocène supérieur Continental des Haut-Comtat Venaissin. — *Trav. Lab. Géol. Fac. Sci. Lyon, N.S.*, **13**, 273—276.
MICHAUX, J. 1967. Origine du dessin dentaire "*Apodemus*" (Rodentia, Mammalia). — *C.R. Acad. Sci. Paris*, **264**, 711—714.
PAPP, A. 1947. Über *Mus Gaudryi* Dames aus den pontischen Schichten von Pikermi. — *Österreich. Akad. Wiss. math. — naturw.* Kl., Sitz. Abt. I, **156**, 5—6, 371—374.
RABEDER, G. 1970. Die Wierbeltierfauna aus dem Alt-Pliozän (O-Pannon) von Eichkogel bei Mödling (NÖ) — I. Allgemeine, II Insectivora. — *Ann. Nat. Hist. Mus. Wien*, **74**, 589—595.
REPENNING, C. A. 1967. Subfamilies and genera of the Soricidae. — *Geol. Surv. Prof. Pap.*, 565, 1—74.
RZEBIK-KOWALSKA, B. 1975. The Pliocene and Pleistocene Insectivores (Mammalia) of Poland. II — Soricidae — *Paranourosorex* and *Amblycoptus*. — *Acta Zool. Cracov.*, **20**, 6, 167—182.
— 1976. The Neogene and Pleistocene Insectivores (Mammalia) of Poland. III — Soricidae — *Beremendia* and *Blarinoides*. — *Ibidem*, **21**, 12, 359—386.
SCHAUB, S. 1938. Tertiäre und Quartäre Murinae. — *Abh. Schweiz. Pal. Ges.*, **61**, 2, 1—39.
SULIMSKI, A. 1959. Pliocene Insectivores from Węże. — *Acta Palaeont. Polonica*, **4**, 2, 119—173.
— 1962*a*. Supplementary studies on the Insectivores from Węże 1 (Poland). — *Ibidem*, **7**, 3—4, 441—498.
— 1962*b*. O nowym znalezisku kopalnej fauny kręgowców w okolicy Działoszyna. — *Przegl. Geol.*, **4—5**, 219—223.
— 1964. Pliocene Lagomorpha and Rodentia from Węże 1 (Poland). — *Acta Palaeont. Polonica*, **9**, 149—244.
SZYNKIEWICZ, A. 1971*a*. WK-W. 526. Jaskinia Mała. Inwentarz Jaskiń Polskich. Uzupełnienie XI. — *Speleologia*, **4**, 1—2, 113—115.
— 1971*b*. Rozmieszczenie jaskiń na Górze Zelce koło Działoszyna. — *Ibidem*, 6, 1—2, 49—57.
— 1977. Rezerwat przyrodniczo-geologiczny "Węże" na Górze Zelce koło Działoszyna nad Wartą. — *Acta Univer. Lodz., ser.* II, **5**, 123—142.
TERZEA, E. 1973. À propcs d'une faune villafranchienne finale de Betfia (Bihor, Roumanie). — *Trav. Inst. Spéol. "Emile Racovitza"*, **12**, 229—242.
— 1976. Présence des Gerbillinés dans la Villafranchien supérieur de Roumanie. — *Ibidem*, **15**, 191—199 (171—174).
— and JURCSÁK, T. 1976. Faune de Mammifères de Betfia XIII (Bihor, Roumanie) et son age géologique. — *Ibidem*, **15**, 195—205 (175—185).
THALER, L. 1966. Les Rongeurs fossiles du Bas-Languedoc dans leurs rapports avec l'histoire des faunes et la stratigraphie du Tertiaire d'Europe. — *Mém. Mus. Nat. Hist. Nat., N.S., sér. C*, **17**, 1—295.
TOPAL, G. 1974. The first record of *Megaderma* in Hungary. — *Vert. Hung.*, **15**, 95—104.

— 1975. A new fossil horsehoe bat (*Rhinolophus variabilis* n.sp.) from the Pliocene sediments of the Osztramos Hill, NE Hungary (Mammalia, Chiroptera). — *Fragm. Miner. Palaeont.*, **6**, 5—28.

WOŁOSZYN, B. 1970. Holoceńska fauna nietoperzy (Chiroptera) z jaskiń tatrzańskich. — *Folia Quatern.*, **35**, 1—52.

— 1979. Excavation in the Bacho Kiro cave (Bulgaria). Animal remains: Chiroptera. — *In press.*

ZAPFE, H. 1950. Die Fauna der miozänen Spaltenfüllung von Neudorf a.d. March (ČSR). Chiroptera. — *Sitzb. österr. Akad. Wiss., Mathem.-naturw. Kl., Abt.* I, *Wien*, **159**, 51—64.

ANDRZEJ SULIMSKI, ADAM SZYNKIEWICZ I BRONISŁAW WOŁOSZYN

ŚRODKOWO PLIOCEŃSKIE DROBNE SSAKI Z CENTRALNEJ POLSKI

Streszczenie

W utworach krasowych, na wzgórzu Zelce koło Działoszyna (północna część Wyżyny Jury Krakowsko-Wieluńskiej) A. Szynkiewicz (1971*a*, *b*, 1977) odkrył w wapieniach wieku oksfordzkiego (jura) małą jaskinię z nienaruszonym namuliskiem, zawierającym drobne kości kręgowców (płazy, gady i ssaki). Zamieszczony w niniejszej pracy opis szczątków dotyczący ssaków ma charakter analizy wstępnej. W warstwie 4+5 namuliska stwierdzono obecność 6 gatunków owadożernych, 7 gatunków nietoperzy i 5 gatunków gryzoni.

Zespół ten wykazuje bliskie analogie do zespołów wczesnego pliocenu (Pannonian, Pontian, Turolian) z Eichkogel i Kohfidisch (Austria), Dorn-Dürkheim (RFN), Devinska Nova Veš (Czechosłowacja), do środkowego pliocenu Osztramós 1, 7, 9, Csarnóta, Beremend (Węgry), Podlesic i Wężów 1 (Polska), jak również do zespołów późno plioceńskich lub wczesno plejstoceńskich (willafransz) z Eichstädt (RFN) i Betfia (Rumunia). Istnieją także pewne podobieństwa do zespołów zachodnio europejskich wieku wczesno plioceńskiego z La Grive-Saint-Alban, Lissieu, Lobrieu i Vieux-Collonges (Francja) oraz Los Mansuetos i Cervilente (Hiszpania). Z Polski bliskie zdają się być ponadto zespoły drobnych ssaków z Rębielic Królewskich (1, 2), Wężów 2 oraz ze starszej części osadów z Zamkowej Dolnej w Olsztynie koło Częstochowy. Drobne ssaki z dolnych warstw jaskini Małej zaliczyć można zatem do starszych zespołów plioceńskich.

Na podstawie zawartych w namulisku płazów, gadów i ssaków (patrz opis namuliska p. 379—381) można wstępnie podać, że osady leżące powyżej warstw 7+9 są osadami wyraźnie młodszymi. Potwierdza to, niezależnie od innego charakteru fauny, istniejąca między warstwami 7+9 a 10+22 niezgodność erozyjna.

Szczątki drobnych ssaków z jaskini Małej, jak się wydaje, pochodzą ze zrzutków drapieżnych ptaków, na co wskazywałby ich stan zachowania. Podobnie jak zespół nietoperzy, owadożerne i gryzonie są znakomitymi wskaźnikami paleoklimatycznymi i paleoekologicznymi. I tak, zarówno u tych pierwszych, jak i u drugich, brak jest z reguły typowych przedstawicieli arealów leśnych. Popielica i orzesznica występują dziś w zwartych kompleksach leśnych, lecz nie jest wykluczone, iż we wczesnym pliocenie i wcześniej, Gliridae mogły zajmować szersze areały, także i pozaleśne. Pozostałe gatunki gryzoni i większość lub wszystkie owadożerne z jaskini Małej są bez wątpienia mieszkańcami terenów otwartych (zapewne stepowych). Zestaw opisanych w pracy drobnych ssaków sugeruje klimat nieco cieplejszy niż obecnie, zbliżony do śródziemnomorskiego. Natomiast fauna z młodszych warstw (powyżej warstw 7+9) sugeruje klimat dość chłodny, zbliżony do klimatu typu środkowo-europejskiego.

Jaskinia Mała jest obecnie drugim punktem występowania *Amblycoptus topali* w Polsce, a trzecim w Europie, oraz pierwszym stanowiskiem *Epimeriones austriacus* i *Parapodemus lugdunensis* w pliocenie Polski.

EXPLANATION OF THE PLATES 19 and 20

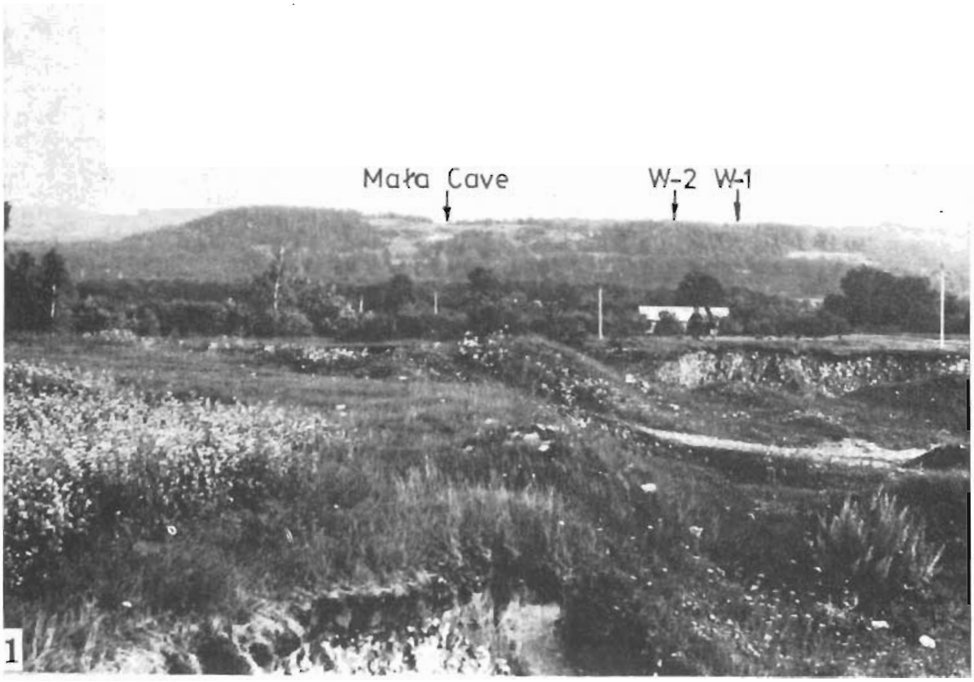
Plate 19

1. General view of Zelce Hill from northern side of Warta River valley. W — 1, W — 2, cave Mała — paleontological sites.
2. Cave Mała — cross section of the cave deposits in the entry-chamber.

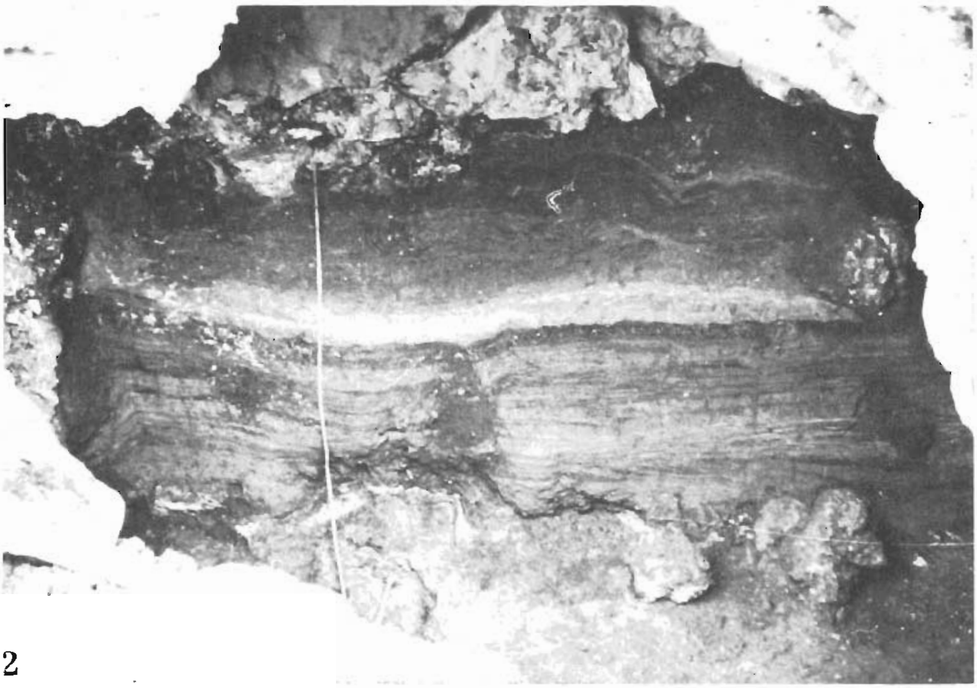
Plate 20

Cave Mała (Jaskinia Mała) near Działoszyn, Poland

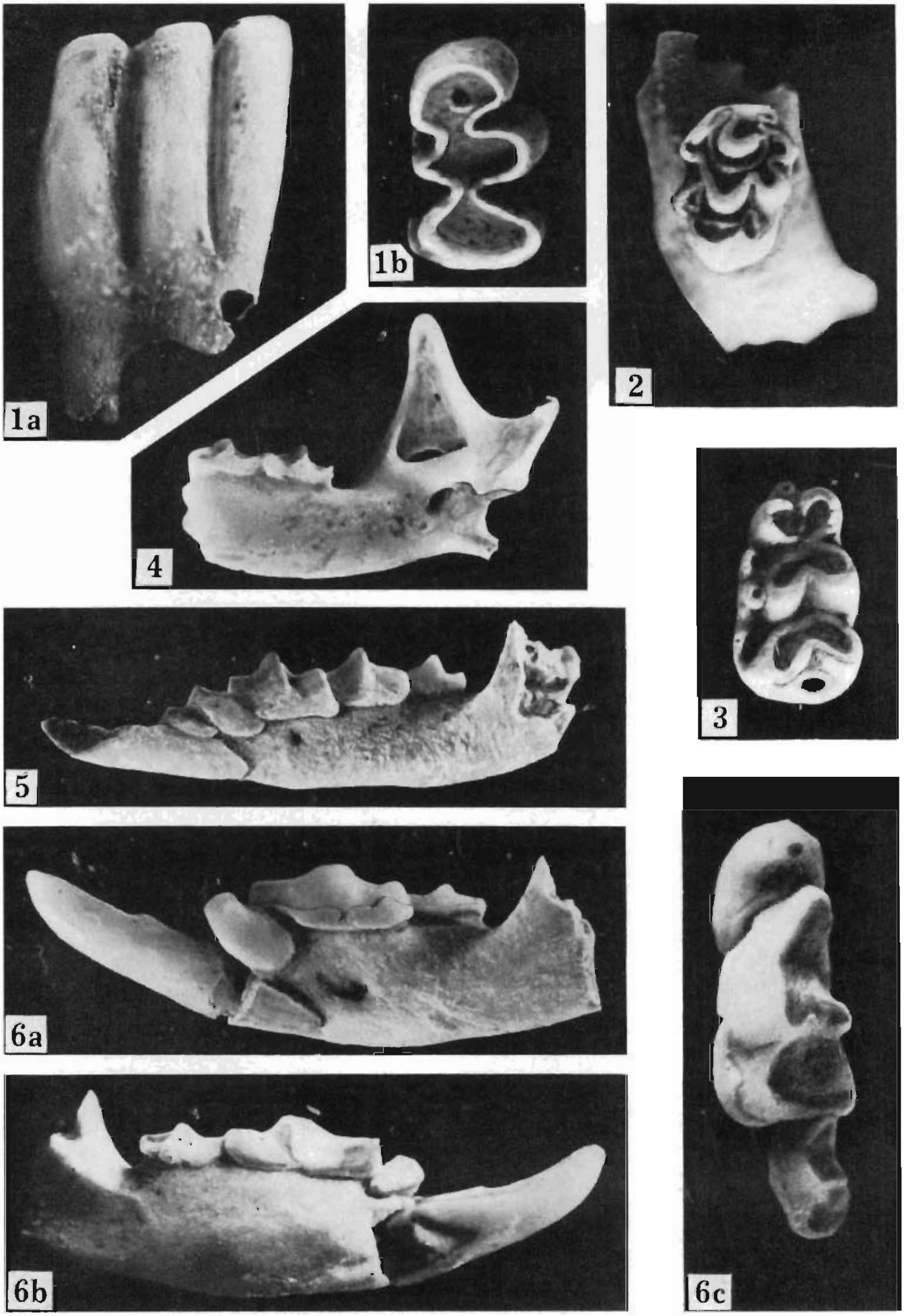
1. *Epimeriones austriacus* Daxner-Höck, 1972. Left M_1 (ZPAL Wr M-675/10/1): *a* inner view, *b* occlusal view, ×20.
2. *Parapodemus lugdunensis* Schaub, 1938. Left maxilla with M^1 (ZPAL Wr M-675/ /13/27) in occlusal view, ×15.
3. The same species. Left M_1 (ZPAL Wr M-675/13/7) in occlusal view, ×15.
4. *Petenyiella* aff. *repenningi* Bachmayer and Wilson, 1970. Right mandible with M_{2-3} (ZPAL Wr M-675/5/1) inner view, ×10.
5. "*Sorex*" cf. *dehneli* Kowalski, 1956. Left mandible with I—M_3 (ZPAL Wr M-675/ /2/1) outer view, ×10.
6. *Amblycoptus topali* Jánossy, 1972. Left mandible with P_4—M_2 (ZPAL Wr M-675/ /6/1): *a* outer view, *b* inner view, ×7, *c* P_4—M_2 in occlusal view, ×10.



1



2


1a
1b
2
4
3
5
6a
6c
6b