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GEOLOGIE UND PALÄONTOLOGIE

Die Fauna der altpliozänen Höhlen- und Spaltenfüllungen bei Kohfidisch, Burgenland (Österreich)

Small Mammals (Insectivora, Chiroptera, Lagomorpha, Rodentia) from the Kohfidisch Fissures of Burgenland, Austria

FRIEDRICH BACHMAYER [1]) and ROBERT W. WILSON [2])

(Mit 13 Tafeln, davon 9 Stereotafeln)

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Zusammenfassung

Die Spalten- und Höhlenfüllungen bei Kohfidisch, Burgenland, haben eine große Fauna besonders von Kleinsäugern geliefert. Diese Kleinsäuger-Fauna umfaßt zehn Insectivoren (vier neue Arten), drei Fledermäuse, einen Hasen (Ochotonide), zwölf Rodentier (ein neues Genus, sechs neue Arten). Die Anhäufung der Mikromammalier in der Höhle erfolgte als Beutetiere vorwiegend in Gewöllen. In dieser Fauna sind verschiedene Lebensräume repräsentiert. Sie umfaßt relativ wenige Waldbewohner (*Pliosciuropterus*, *Muscardinus*), ganz überwiegend Steppen- und Savannenelemente (*Hystrix*, *Protozapus*, *Kowalskia*, *Anourosorex* und andere Spitzmäuse und vielleicht die Mäuse), endlich einige Strom- und Seeufer-Bewohner (*Chalicomys*, *Desmana* und möglicherweise *Prolagus*). Das Klima war im allgemeinen wärmer als heute, oder zumindest mit milderen Wintern, und vielleicht auch trockener. Das geologische Alter ist eindeutig Oberpannon im Sinne der Stratigraphie des Wiener Beckens und scheint dem frühen Turolien (= Pikermien) der westeuropäischen stratigraphischen Terminologie zu entsprechen.

Faunenliste:

Galerix exilis (BLAINV.)
Galerix zapfei nov. spec.
Erinaceus ? sp.
Petényia dubia nov. spec.
Paracryptotis ? spec.
Petényiella repenningi nov. spec.
Anourosorex kormosi nov. spec.

[1]) Division of Geology and Paleontology, Natural History Museum of Vienna.
[2]) Museum of Geology, South Dakota School of Mines and Technology, Rapid City.

Desmana pontica ? SCHREUDER
Desmanine ? talpid. gen. indet.
Talpa ? spec.
Megaderma vireti MEIN
Rhinolophus delphinensis GAILLARD
Chiropteride gen. indet.
Prolagus cf. *P. oeningensis* (KÖNIG)
Spermophilinus cf. *S. bredai* (H. v. MEYER)
Pliosciuropterus ? nov. spec.
cf. *Chalicomys jaegeri* KAUP
Muscardinus pliocaenicus austriacus nov. subspec.
Peridyromys compositus nov. spec.
Protozapus intermedius nov. gen. et nov. spec.
Kowalskia fahlbuschi nov. spec.
Prospalax petteri nov. spec.
Progonomys woelferi nov. spec.
Parapodemus cf. *P. lugdunensis* SCHAUB
Hystrix cf. *H. suevica* SCHLOSSER
Rodentier gen. et spec. indet.

Introduction

In the southern part of the Austrian province of Burgenland are limestones of unknown, possibly Devonian age. Near the village of Kohfidisch, these outcrops have developed a small fissure system which was filled by bones and rock debris in Late Pannonian time (early Pliocene of the Austrian mammalian paleontologists).

It is more than ten years since the presence of fossils, especially an abundance of micromammalia, was made known to the staff of the State Museum of Natural History in Vienna, and a considerable amount of fossil material now is in the collections of the Museum. Although occasional mention of the occurrence has appeared in print (E. THENIUS, 1959, p. 88; H. ZAPFE, 1964, p. 144—145, BACHMAYER and ZAPFE 1964, p. 206—208), no description of the material has been available. The present report encompasses only a small part of the total collection, and is concerned only with four orders (Insectivora, Chiroptera, Lagomorpha, Rodentia), but these disadvantages are to be weighed against longer delays in publication, especially at a time when the smaller fossil mammals have aroused great interest.

In a preceding article, F. BACHMAYER and H. ZAPFE (1969) present an account of the geologic setting of the deposit, as well as make suitable acknowledgment to all those persons who have contributed to successful collection and preparation of the material. This information need not be repeated here. The junior author, however, has a special bill of thanks not readily particularized except by himself.

First, he thanks most warmly the Austrian-American Educational

Commission whose financial support accounted for his presence in Austria during the academic year 1967—68. Secondly, his sincere thanks are proffered to Professor E. Thenius, Director of the Paleontological Institute of the University of Vienna, and to his staff, for facilities offered to him during his visit of many months, and for many courtesies, large and small. Professor H. Zapfe was exceedingly helpful because of his long experience with the Miocene-Pliocene mammals of Austria, and especially because of his great familiarity with the fossil mammal collection of the Natural History Museum. Perhaps a special note of thanks should be extended to his Kollegin in the study of small mammals, Dr. G. Daxner of the Institute, who bore much of the burden of the junior author's orientation period in Vienna. Thirdly, he wishes to thank Professor F. Bachmayer, the senior author of this paper, for the opportunity to examine with him the important collection from Kohfidisch, as well as for use of the facilities of the Division of Geology-Paleontology of the Natural History Museum. The excellent photographs reproduced herein are also by Professor Bachmayer. Finally, he wishes to thank all those not specifically named who expedited his work in numerous small ways, and without whose help he would have accomplished so much less, and who collectively made his stay in Vienna so pleasantly memorable. Auf Wiedersehen!

Environment Surrounding the Kohfidisch Fissures

The early Pliocene age of the Kohfidisch microfauna, too remote in time from the present for much ecological extrapolation, together with its conditions of preservation, make positive statements concerning ecological conditions at the site very difficult. Moreover, only a small fraction of the total collection has been studied, and it has been found that the representation in individual samples from Kohfidisch may vary considerably. Hence, the following conclusions can be taken only as possible or probable, rather than certain.

Fossil mammals in stratified sediments usually occur in channel fills or adjacent flood plain deposits. The channel fills carry animals which lived in the streams or along their borders. Relatively rarely, animals of a more distant community may be present because of washing of bones into streams, or because individual animals (the young, the old, the sick or disabled), live there for special reasons, or come there for water. The deposits of ponds and lakes (standing bodies of water) do not as a rule yield many mammalian remains, except on their borders. Flood plain deposits carry, perhaps, a slightly purer community although contaminated occasionally by riparion elements, and by those from beyond the flood plain limits. Elements of the regional fauna which more or less permanently live beyond flood plain limits, and inhabitants of heavily wooded areas will in general be rarities in fossil faunal lists made from stratified deposits.

Considerably different conditions for recovery of fossils may prevail in fissure deposits and cave fills. Fossils of actual inhabitants of the fissure system should be present. Occasional victims of accidental entrapment may also be there. Frequently, however, the remains represent victims of such predatory animals as hyaenas, hawks, and owls living in or about the fissure system. Kohfidisch seems to be of this sort.

The activity of predators gives a considerably different sample of the total population than that prevailing under normal sedimentary processes. Forest dwellers, and especially those living beyond flood plain limits in open territory could be better or well represented, if these biotypes are present in the area. On the other hand, fossil material representing aquatic types, although not excluded, should be less well represented than in channel fills. Lastly, recovery methods employed by the paleontologist, usually result in the obtaining of many more species of small mammals from fissures than from stratified deposits.

The micromammalia of Kohfidisch, as now known, is given below.

Insectivora
- Family Erinaceidae
  - *Galerix exilis* (BLAINV.)
  - *Galerix zapfei*, nov. spec.
  - *Erinaceus* ? spec.
- Family Soricidae
  - *Petényia dubia*, nov. spec.
  - ?*Paracryptotis* spec.
  - *Petenyiella* ? *repenningi*, nov. spec.
  - *Anourosorex kormosi*, nov. spec.
- Family Talpidae
  - *Desmana pontica* ? SCHREUDER
  - Desmanine talpid ?, genus indet.
  - *Talpa* ? spec.

Chiroptera
- Family Megadermidae
  - *Megaderma vireti* MEIN
- Family Rhinolophidae
  - *Rhinolophus delphinensis* GAILLARD
- Family indet.
  - Chiropterid, genus indet.

Lagomorpha
- Family Ochotonidae
  - *Prolagus* cf. *P. oeningensis* (KÖNIG)

Rodentia
- Family Sciuridae
  - *Spermophilinus* cf. *S. bredai* (H. v. MEYER)
  - *Pliosciuropterus*, prob. nov. spec.

Family Castoridae
  cf. *Chalicomys jaegeri* Kaup
Family Gliridae
  Muscardinus pliocaenicus austriacus, nov. subspec.
  Peridyromys compositus, nov. spec.
Family Zapodidae
  Protozapus intermedius, nov. genus and nov. spec.
Family Cricetidae
  Kowalskia fahlbuschi, nov. spec.
?Family Cricetidae
  Prospalax petteri, nov. spec.
Family Muridae
  Progonomys woelferi nov. spec.
  Parapodemus cf. *P. lugdunensis* Schaub
Family Hystricidae
  Hystrix cf. *H. suevica* Schlosser
  Rodentia, genus and sp. indet.

In the several samples examined to the present, shrews and murines, possibly cricetines and *Galerix* to a lesser extent, may be regarded as common mammals at Kohfidisch. Sciurids, beavers, porcupines, dormice, jumping mice, and true hedgehogs are rare. Other elements of the fauna appear to be intermediate in abundance between these two categories.

With the exception of *Galerix*, those animals listed as abundant could be regarded as part of an invading fauna from the East, and hence more likely than not, to represent an open, grassland, or steppe environment. On the other hand, the mesoloph-mesolophid complication of pattern in *Kowalskia fahlbuschi* may suggest retention of a humid woodland habitat. Work by Hershkovitz (1955, p. 644; 1962, p. 82) and by Hooper (1957, p. 48) suggests that these dental structures, as well as several other pattern complications in cricetines are missing from dwellers of open, relatively arid, country. Moreover, Hartenberger, Michaux, and Thaler (1967, p. 505) think that certain species of *Progonomys*, *Parapodemus*, and *Apodemus* form a continuous line. The Recent *Apodemus sylvaticus* is a woodland type, although this is not necessarily the case with the early, invading murines, or with all species of *Apodemus*. As a Miocene relict, *Galerix* suggests woodland. Perhaps its primitive nature left it especially vunerable, among woodland types, to attack, or it may have been not so restricted environmentally as here implied. Rarer mammalian species suggesting, or at least fitting into, a steppe or grassland environment are: *Hystrix*, *Prospalax*, and *Protozapus*. *Hystrix* is a solitary, crevice- and cave-inhabiting animal that could have found a home in the fissure system at Kohfidisch. *Prospalax* (and its possible ancestor *Anomalomys*) is modified for an underground life, and surely in later times was a steppe animal. *Protozapus*, if related to *Sminthozapus*, *Pliozapus*, and *Eozapus*, suggests an eastern, steppe invader.

Species of certainly woodland or forest type seem rare. *Pliosciuropterus* and dormice, especially *Muscardinus*, represent this element. *Spermophilinus*, although seemingly a primitive ground squirrel could also have been a woodland type as its presence in the Miocene might suggest.

Aquatic species are represented by *Chalicomys* and *Desmana*. *Prolagus* could also be a stream or pond border lagomorph. Its absence in several of the Kohfidisch samples suggests that it was not an occupier of the fissure system nor of the steppe environment. Its earlier presence in the Miocene suggests, perhaps, a surviving woodland type. In this connection, it could be both, as presumably the stream or pond border area was wooded.

The Kohfidisch chiropterids could well have been inhabitants of the fissure system.

It is obvious that conditions were warmer than at present, or at least without as cold winters as now, possibly drier as well. Such European Miocene relicts as *Megaderma, Galerix, Spermophilinus, Prospalax-Anomalomys,* and *Prolagus*, as well as the presence of *Hystrix* and small shrews suggest this. Perhaps speaking as eloquently as any for warm climates is the relatively common presence of *Megaderma*. However, H. ZAPFE (oral communication) is of the opinion that the winters were cold enough to cause hibernation in turtles, whose complete skeletons have been recovered from the deposits, and to cause disappearance of the large Miocene Crocodilia.

In sum, the Kohfidisch area during the time of accumulation seems best visualized as largely open grassland, but with local bodies of water. Woodland areas were present, but perhaps restricted to stream borders. The climate was mild, warm, and with sufficient rainfall to maintain a permanent water supply and a varied animal population.

Geologic Age and Correlation of the Kohfidisch Microfauna

The Pannon stage of the Vienna Basin has been divided into eight zones (A to H) by A. PAPP (1948) on the basis of its invertebrate content. Zones A through D are referred to as lower; Zone E as middle; and Zones F through H as upper Pannon. Remains of fossil mammals occur at various levels. The most important localities are Gaiselberg bei Zistersdorf (Pannon C), Brunn-Vösendorf (Pannon E), and Eichkogel bei Mödling (Pannon H). Fragmentary, but important, microfaunas are found at the latter two localities.

The microfauna of Vösendorf (THENIUS, 1950; PAPP and THENIUS, 1954; FREUDENTHAL, 1963; and DAXNER, 1967) is at follows:

Gallerix exilis
Trimylus sansaniensis
Talpid indet. (?scalopine)
Monosaulax minutus

Megacricetodon aff. *minor*, n. subsp. ?
Megacricetodon (*Mesocricetodon*) *minutus*.

The microfauna of Eichkogel is largely unpublished. THENIUS, 1951, and PAPP and THENIUS, 1954, give:

Plesiodimylus cfr. *chantrei*
Desmana pontica
Monosaulax aff. *minutus*
Progonomys cf. *cathalai*.

Unpublished species expand this list considerably. The variety is much greater than at Vösendorf. As evidence of its younger age is the presence of murines and a cricetid approaching members of the Quaternary Cricetinae.

The Kohfidisch fauna agrees more closely with the Eichkogel than with the Vösendorf fauna, and the former two could be the same age. This agreement is partly the result of variety as opposed to the restricted Vösendorf assemblage. Nevertheless, Kohfidisch may be regarded as post-Vösendorf on the basis of: (1) abundance of murines which have not been recorded at Vösendorf, (2) an advanced cricetid, not related to those at Vösendorf, (3) overall resemblance to microfauna of Eichkogel which is stratigraphically demonstrable as younger than that at Vösendorf.

FREUDENTHAL and SONDAAR (1964) have suggested that the Pontian of western Europe, including middle Europe, may be divided into an older and a younger fauna, with the younger fauna (Turolian) characterized by, among other items, the presence of murines and cricetines in contrast to an older cricetodont fauna (Vallesian) with no, or few, murines. On that basis, Kohfidisch is post-Vösendorf. FREUDENTHAL and SONDAAR also stress for the older fauna its mixed character (e. g., *Hipparion* plus *Anchitherium*). On this basis, however, the Kohfidisch fauna suggests the older assemblage (Vallesian), because it contains such "old" elements as *Galerix*, *Megaderma*, and *Spermophilinus*. Although local ecology undoubtedly plays a large rôle in determining presence or absence of microfaunal types, the presence of species of eastern aspect at Kohfidisch, suggests that the ecological differences here are on a broader basis resulting from large scale environmental changes that permitted the invasion of increasing numbers of Asiatic types. In any case, there is no concrete evidence suggesting other than reference of the Kohfidisch fauna to a late or young Pannonian age, approximating that of the Eichkogel fauna.

The age relations of Kohfidisch and Polgárdi (Hungary) are interesting and puzzling. Both are faunas from fissure deposits with rich microfauna. FREUDENTHAL and SONDAAR (1964) and KRETZOI (1952) have regarded the Polgárdi fauna as late Pannonian in age. The composition of the micromammalian fauna is similar at the two localities although usually not at a specific level, and sometimes not at a generic level. The following comparative faunal list makes this clear.

KOHFIDISCH	POLGÁRDI
Galerix exilis	
Galerix zapfei	
Erinaceus ? spec.	*Erinaceus*
Anourosorex kormosi	*Amblycoptus oligodon*
Petenyiella ? *repenningi*	*Crocidura* spec.
Petényia dubia	*Sorex* spec.
? *Paracryptotis* spec.	
Desmana pontica ?	*Desmana pontica*
Desmanine talpid ?, genus indet.	*Mygalinia hungarica*
	aff. *Scaptonyx dolichochir*
Talpa ? spec.	*Talpa* spec.
Megaderma vireti	
Rhinolophus delphinensis	*Rhinolophus* spec.
Chiropterid, genus indet.	
Prolagus cf. *P. oeningensis*	*Prolagus* cf. *oeningensis*
Spermophilinus cf. *S. bredai*	*Spermophilinus* cf. *S. bredai*
Pliosciuropterus prob. nov. spec.	
cf. *Chalicomys jaegeri*	"*Palaeomys castoroides*"
Muscardinus pliocaenicus austriacus	*Muscardinus moloris* (nomen nudum ?)
Peridyromys compositus	
Protozapus intermedius	
Kowalskia fahlbuschi	*Cricetus kormosi*
Progonomys woelferi	
Parapodemus cf. *P. lugdunensis*	*Parapodemus schaubi*
Prospalax petteri	*Anomalomys* sp.
Hystrix cf. *H. suevica*	*Hystrix* cf. *primigenia*
Rodentia, genus and sp. indet.	

Formal nomenclature may obscure relationships. For example, the pair *Prospalax petteri* and *Anomalomys* sp. are surely closely related, and *Sorex* sp. is very likely not this genus, but what its relationships are to *Petényia*, other than that both are soricines, we do not know. Taking both lists essentially at face value, the degree of faunal correspondence (SIMPSON, 1960) at a generic level is $11/17 \times 100 = 65$. For rodents alone it is $6/7 \times 100 = 86$. It seems that the environments sampled covered about the same range of biotypes. If so, the usual lack of specific identity suggest to us a difference in age because geographically Kohfidisch and Polgárdi are not far apart. Detailed comparison of the two microfaunas is suggestive of this, but not conclusive.

Of the Kohfidisch species that may be compared, the following are long-ranging, known by too fragmentary material, or otherwise are not usable:

Erinaceus ? spec.
Talpa ? spec.

Rhinolophus delphinensis
Spermophilinus cf. *S. bredai*
cf. *Chalicomys jaegeri*
Muscardinus pliocaenicus austriacus.

Seven species offer some evidence of age relationships. Of these, *Desmana pontica*? suggests approximately equivalent age, and *Prospalax petteri* an equivalent or slightly younger age. *Prolagus* cf. *P. oeningensis* suggests an equivalent or older age for Kohfidisch, and the remaining four offer more positive evidence of an older age, as follows:

(1) *Anourosorex kormosi*: clearly more primitive than *Amblycoptus oligodon* in dental formula, and in parastyle development of the upper molars. However, the Recent *Anourosorex squamipes* of Asia is likewise more primitive in the same features. If *A. kormosi* is ancestral to *A. oligodon*, remarkably rapid evolution would have occured.

(2) *Kowalskia fahlbuschi*: seems more primitive than *Cricetus kormosi* in several features, but not ancestral in all differences.

(3) *Progonomys woelferi*: more primitive than *Parapodemus schaubi*. However, *Parapodemus* cf. *P. lugdunensis* is more progressive than *P. woelferi* and, again, introduces an ambiguous note.

(4) *Hystrix* cf. *H. suevica*: smaller (and hence more primitive?) than *H. primigenia*, if the Polgárdi species really is to be placed in this latter species.

Weak as this evidence is, collectively it suggests that Kohfidisch is slightly older than Polgárdi.

It is unfortunate that the Pontian of middle Europe is so largely divided between faunas from channel deposits containing bones and teeth of large mammals, but only rarely any microfauna, and fissure fills with abundant microfauna, but not significant stratigraphy. Although microfauna can be obtained frequently by the washing of bedded clays and marls, recovery is usually limited to isolated teeth. The channel faunas, as now known, usually do not suggest much difference in age from one to another, and much is to be said for the statement of THENIUS (1959, p. 88, 92), that ecology and geographic location are responsible for such differences as can be cited in distinguishing the various Pontian faunas of middle Europe.

The difficulty of paleontological dating of fissure deposits from the literature alone, may be exemplified by that of Csákvár, Hungary. It has been regarded as older Pannonian in age. Yet the published microfaunal list suggests an age younger (late Pannonian) than the published microfauna of Eichkogel, which is, in fact, highest Pannonian. Part of this evidence for younger age lies in the beavers. The Csákvár beaver is usually listed as *Dipoides problematicus*. KRETZOI (1952), however, lists instead *Chloromys* (?) *minutus* (MEYER), a beaver much more easily reconciled with the older Pannonian age.

Yet even in the larger mammals, there seems to be evidence for an older fauna with *Anchitherium* plus *Hipparion*, and a younger one in which *Hipparion* alone prevails, a division in general agreement with distinctions in the microfauna. In North America, time spans the equivalent of the Pannonian have produced changes in individual evolutionary lines such as the horses, as well as general distinctions in faunas. In France and Spain, also, changes take place which are only partly ecologic. Even in middle Europe, there may have been some progressive changes among horses. At Csákvár, *Hipparion gracile* (or *Hipparion primigenius* as FORSTÉN says) has a maximum crown height of 49 mm., whereas at Baltavar, it is 60 mm. (MOTTL, 1954, p. 55). In spite of FORSTÉN's recent work on *Hipparion* (1968), in which this species is said to exist over the interval here under discussion, it may be that if enough horse material is ever assembled, stratigraphic differences, not now apparent, will separate the various local assemblages.

In any case, lack of change among the larger mammals indicates stable environmental conditions, and not, necessarily, short time spans. It seems possible that what is a stable condition for large animals may not be so for the microfauna. Also, one should distinguish between faunal differences resulting from contemporaneous and contrasting local environments, and those resulting from secular environmental change on a broad scale, which must be the chief reason for the stratigraphic development of terrestrial faunas.

Long-range correlations to western Europe (southern France, Spain) are more difficult to make, obviously, than the relatively short-range correlations within Austria, or from Kohfidisch to Polgárdi. Conservatively, Kohfidisch is younger than faunas such as La Grive-St. Alban, and older than those of Plaisancian-Astian age such as Rousillon, Alcoy, Sète, and Nimes. On the basis of what appear to be more advanced murines, cricetines, and spalacids, we would regard Kohfidisch as somewhat, if only slightly, younger than Montredon. The position of Montredon itself, however, is a subject for debate. FREUDENTHAL and SONDAAR equate it with the Turolian (= Pikermian), HARTENBERGER and others (1967) with the Vallesian. Hence, if Montredon is late Vallesian, Kohfidisch could be regarded as early Turolian.

SYSTEMATIC DESCRIPTION

The specimens herein described are mostly from the 1,85 meter level of the cave and fissure deposits at Kohfidisch (see BACHMAYER and ZAPFE, 1969, p. 129).

Order Insectivora

Insectivores are relatively abundant and diversified in the Kohfidisch samples. A total of ten species, of which six can be given specific assignments, have been identified. Erinaceids, soricids, and talpids are represented. The Miocene Erinaceid relict, *Galerix*, and shrews, collectively, are common, talpids, chiefly desmanines, much less so.

Family Erinaceidae

Aside from three teeth of *Erinaceus*?, the hedgehog material is all of *Galerix*. Alone among all Kohfidisch genera of micromammalia, the genus is represented by two species. The first is *Galerix exilis*, a relict from the Miocene, also recorded from other Austrian Pliocene localities, and the second is a new, more highly specialized species.

Galerix exilis (Blainville) 1840

(Figures 1, 1a, 16, 16a)

A number of specimens seem to conform to *Galerix exilis*. This species is perhaps on the whole less abundant than *G. zapfei*, but in individual samples, it may alone be present. One sample, on the other hand, has both species present in a ratio of approximately three to one in favor of *G. zapfei*.

Only a few morphological features need comment. In the upper molars, the metaconule is large and prominent, the protoconule distinct, at least in unworn specimens. The mesostyles may be less developed than in *G. zapfei*. There is a large, single, oval socket for $P\overline{1}$. The alveolus for $P\overline{2}$ may consist of two distinct sockets, the usual condition, or one, partially divided as in a specimen from the 1957 collection. In the latter case, the tooth itself has "fused" roots with a groove on the external side: on the internal side, the roots are more deeply grooved, the boney septum of the alveolus more penetrating of the groove. In all specimens from La Grive that we have seen, $P\overline{2}$ has two, separate roots. Length of $M\overline{1}$—$M\overline{3}$ in Kohfidisch specimens of *Galerix exilis* measures 6,9—7,3 mm., thus agreeing well with La Grive specimens (Thenius, 1949).

Galerix zapfei nov. spec.

(Figures 2, 17, 17a, 18, 19, 19a)

This species is named in honor of Professor Dr. Helmut Zapfe in recognition of his many contributions, both in the field and in the laboratory, to the Miocene-Pliocene paleontology of Austria.

Holotype: Right lower jaw with $P\overline{3}$—$M\overline{3}$, Colls. Natural History Museum, Vienna, Div. Geol. Paleont., No. 1970/1386.

Referred Specimens: A number of lower jaw fragments. Upper dentitions not certainly identified.

Geological Age and Locality: Early Turolian (= Pikermian) fissure deposits near Kohfidisch, southern Burgenland.

Diagnosis: Mesostyles slightly more developed than in *Galerix exilis*? $P\overline{2}$ with single alveolus. Posterior cingula of $M\overline{1}$ and $M\overline{2}$ continuous to tip of entoconids.

Description: No clear way of distinguishing the upper dentition in the two species of *Galerix* is known since a sample containing only *G. zapfei* has not been available. There is some indication, however, that the mesostyles of

G. zapfei may be better developed. P$\underline{1}$ seems to have been provided with a single socket. P$\underline{2}$, perhaps of *G. zapfei*, is much smaller than P$\underline{3}$, two-rooted, and of simple premolar construction.

Only the alveoli of the three lower incisors are preserved. The alveolus for the first lower incisor is a relatively large, oval socket. It is followed by a smaller to subequal, more compressed socket. The alveolus for I$\overline{3}$ is much smaller than either of the other two. All slant anteriorly.

The alveolus for the canine is large (the size of that of I$\overline{1}$, or slightly larger), round, and somewhat slanting. The canine tooth is preserved in several jaws. The apex of the crown is placed anteriorly so that the shape is more premolariform than caniniform. Seemingly it can be worn down to a blunt stub of a tooth.

Measurements of *Galerix* (in mm.)

	G. zapfei	*G. exilis* (La Grive) [4])	*G. exilis* (Jamm bei Kapfenstein) [4])
P$\underline{2}$, L:	1,2	—	—
W:	0,8	—	—
P$\underline{3}$, L:	2,0[3])	—	1,8
W:	2,0	—	2,0
P$\underline{4}$, L:	2,5[3])	—	2,1
W:	2,5	—	2,9
Depth of jaw below M$\overline{1}$	3,3—3,9	4,0	4,0
P$\overline{1}$—P$\overline{4}$, alveolar length	4,4—4,8	—	—
M$\overline{1}$—M$\overline{3}$, occlusal length	7,0—7,2	7,0	7,7
P$\overline{3}$, L:	1,3—1,5	—	1,6
W:	0,8—1,0	—	0,75
P$\overline{4}$, L:	1,6—2,0	2,6	2,1
W:	1,2—1,3	1,6	1,3
M$\overline{1}$, L:	2,6—2,9	3,2	+2,9
W:	1,8—2,1	2,1	2,0
M$\overline{2}$, L:	2,3—2,7	2,8	2,5
W:	1,6—1,9	2,0	1,9
M$\overline{3}$, L:	2,0—2,1	—	2,0
W:	1,2—1,4	—	1,3

The first lower premolar is known only by its alveolus, which is a moderately large, round, slanting socket. P$\overline{2}$, behind it, is also known only by a socket, which by contrast is larger and more vertically placed. Its shape is variable since it may be either round, or anteroposteriorly, or transversely compressed. Presumably, it is always single-rooted.

The third lower premolar is significantly smaller than P$\overline{4}$, and the trigonid notably simpler in lacking a metaconid, and having only a minute para-

[3]) = length of paracone-metacone blade.

[4]) = after Thenius, 1949.

conid, although the strength of the paraconid varies somewhat in both *G. zapfei* and *G. exilis*. $P\overline{4}$ seems not to differ from that in *G. exilis*. Both species show some variation in outline of $P\overline{4}$, and in pattern details.

The lower molar construction of *Galerix zapfei* is essentially the same as in *G. exilis*, except in the posterior part of the talonid, where the two species are significantly different.

In $M\overline{1}$ and $M\overline{2}$ of *Galerix zapfei*, the posterior cingulum is continuous, mediad, to the tip of the entoconid, widening internally so that in some specimens the entoconid is twinned. The posterior horn of the hypoconid instead of intersecting the posterior cingulum at about two-thirds the way to the inner border of the tooth, is more transversely directed, and ends against the base of the entoconid. The horn swells into a distinct cuspule at this point. This heel construction is more pronounced in $M\overline{1}$ than in $M\overline{2}$.

The third lower molar is essentially like that in *Galerix exilis*. Only rarely is there a trace of the peculiar heel construction.

Wear and individual variation may, to a certain extent, bridge the morphological gap between the two species, but usually the two may be recognized without difficulty. In the material of *G. exilis* that the junior author has examined in Vienna and Basel, Switzerland, none seems to be of the *Galerix zapfei* type.

Comparisons and relationships: *Galerix zapfei* is clearly the most specialized known representative of the genus. At first it was thought to be a possibility that the specimens here assigned to *G. zapfei* were part of the Kohfidisch population of *G. exilis*. This possibility was abandoned because of the combination of a single alveolus for $P\overline{2}$ with distinct talonid characteristics of $M\overline{1}$—$M\overline{2}$. Moreover, if specimens ambiguous through wear or damage are eliminated, there seems no truly intermediate condition.

The anterior lower premolar dentition of *Galerix* exhibits morphologic variation which is in part stratigraphically controlled, as follows:

(1) *Galerix exilis*. Viehhausen (SEEMAN, 1938). $P\overline{1}$ with partially divided roots;

(2) *Galerix exilis*. La Grive. $P\overline{1}$ single-rooted; $P\overline{2}$ two rooted;

(3) *Galerix exilis*. Kohfidisch. $P\overline{2}$ usually with two distinct alveoli, but a few with only partially divided alveolus, and fused roots;

(4) *Galerix zapfei*. Kohfidisch. $P\overline{2}$ with single, undivided alveolus.

If the anterior dentition in *Galerix* were more frequently preserved, perhaps a considerable amount of individual variation would be observed, but variation which in time established significant changes.

Erinaceus? spec.

A single upper molar, $M\underline{1}$ or $M\underline{2}$, indicates the presence of a large (L = = 5,1 mm.; W = 5,3 mm.) hedgehog. The specimen probably does not differ greatly in size from molars of Recent *Erinaceus*.

Since writing the above, the collection has been augmented by the acquisition (July, 1968) of a heavily worn upper molar, and a jaw fragment with worn M$\overline{2}$, and a small, single-rooted alveolus for M$\overline{3}$. Identification, however, is not thereby improved.

Family Soricidae

Shrews are common in the Kohfidisch fauna, and are represented by four kinds. These show varying degrees of relationship to geologically later shrews in middle Europe and Asia, but not, apparently, to far western Europe. An eastern (Asiatic) source may be suggested, and possibly is to be correlated with encroaching steppe conditions.

Dental formula and nomenclature are after REPENNING, 1967.

Tribe Soricini

Petényia dubia nov. spec.

(Figures 6, 26, 27, 30, 31, 31a)

The species name indicates the element of doubt in assignment to the genus *Petényia.*

Holotype: Left lower jaw with M$\overline{1}$—M$\overline{3}$, Colls. Natural History Museum, Vienna, Div. Geol. Paleont., No. 1970/1387.

Referred Specimens: A number of lower jaw fragments, and several maxillae.

Geological Age and Locality: Early Turolian (= Pikermian) fissure deposits near Kohfidisch, southern Burgenland.

Diagnosis: Lower incisor relatively smooth in dorsal profile. Pigmentation present, but not intense as now preserved. Coronoid spicule not especially prominent. Size as in *Petényia hungarica.*

Description: If specimens with upper dentition are correctly associated with the lower dentition, then the chief characteristic of the upper molars is the very slight posterior emargination of M$\underline{1}$ and M$\underline{2}$. P$\underline{4}$ is triangular in outline with parastyle close to the paracone, and what appears to be the weak (worn) protocone, anteroexternal in position. It is not close to P$\underline{4}$ of *Blarinella* as figured by REPENNING (1967, fig. 24). The fifth upper antemolar, absent in later species of *Petényia,* may be represented by a small alveolus.

The maxillary process begins to flare away from the alveolar border immediately behind the mesostyle of M$\underline{2}$, as is seen in a figure of *P. hungarica* by KORMOS (1934), and in a specimen from SCHERNFELD (Germany), referred to *P. hungarica* by DEHM (1962), in the collections of the Paleontological Institute in Munich. REPENNING, however, states (1967, p. 34) that the zygomatic process of the maxillary originates posterior to M$\underline{2}$ in *P. hungarica.*

The reduced M$\underline{3}$ still has a small metacone.

Upper incisors, possibly associated with *P. dubia,* are without fissured tips, and are characterized by the peculiar straightness of the root.

The mental foramen of the lower jaw is under the middle of $M\overline{1}$. The interarticular area is rather broad, and the condylar articular surfaces relatively close together. The lower articular surface is visible externally, very nearly as in *P. hungarica*, but probably somewhat less anterior in position. The internal temporal vacuity is large and triangular. A coronoid spicule is present, but it is not so prominent as in *P. hungarica*, although the most developed spicules in those from Kohfidisch may not be much different from some of *P. hungarica*. The external temporal fossa is clearly marked down to the level of the superior temporal notch. A ridge on the posterior surface of the coronoid process runs from near the top of the process down to behind the internal temporal fossa.

Measurements (in mm.)

	Type Specimen	Others
$P\overline{4}$, L:	—	1,0
W:	—	0,8
$M\overline{1}-M\overline{3}$, L:	3,7	3,75—3,9
$M\overline{1}$, L:	1,5	1,5—1,6
W:	1,0	1,0
$M\overline{2}$, L:	1,4	1,4—1,5
W:	1,0	0,9—1,0
$M\overline{3}$, L:	1,0	1,1—1,25
W:	0,7	0,75—0,8
$\underline{I}$, L:	—	1,25
W:	—	0,6
$P\underline{4}$, L:	—	1,5
W:	—	1,4
$M\underline{1}-M\underline{3}$, L:	—	3,2
$M\underline{1}$, L:	—	1,5
W:	—	1,5—1,6
$M\underline{2}$, L:	—	1,4
W:	—	1,5—1,6
$M\underline{3}$, L:	—	0,6
W:	—	1,3

The lower incisor is without cusps, or with only irregular edges.

The fourth lower premolar is of soricine pattern.

The first lower molar is rectangular in outline. The entoconid is crested and anterior in position. The external cingulum is continuous to behind the hypoconid, but only moderately developed. The anterior arm of the hypoconid is directed obliquely so that it ends at the notch between protoconid and metaconid.

The second lower molar approaches the size of $M\overline{1}$, and agrees with it in character except that the anterior end is more rectangular.

The third lower molar has an unreduced trigonid, but a reduced talonid, thus distinguishing it from *Sorex* (s. l.). In the unworn talonid, the entoconid is absent, and the hypoconid is a high, centrally situated, slightly angulate crest. When sufficiently worn, however, the heel becomes relatively broad and concave, and thus could be mistaken for the bicuspid, basined type found in *Sorex*.

The tooth enamel of *Petényia dubia* is clearly pigmented on the tips of the cusps, where the enamel is now gray (originally red ?) in contrast to the cream color of the rest of the tooth. Very probably, the pigmentation was less prominent than in *P. hungarica*.

Comparisons and relationships: This medium-sized shrew agrees with *Petényia hungarica* in major features, but some obvious distinctions are present, and perhaps the position of the Kohfidisch species has been misjudged. As given in the diagnosis, *P. dubia* lacks the prominent serrations of the lower incisor, the intense, deep pigmentation, and the prominent coronoid spicule of *P. hungarica*, all features which permit ready identification of the latter in collections. Also, the pattern and outline of $P\underline{4}$ may be considerably different.

On the other hand, *Petényia* (and the closely related *Blarinella*) seems to be the only described genus with which there is general agreement with our material. Assignment to the Tribe Soricini (see Repenning, 1967) is made evident by tooth pigmentation, entoconid crests, and the relatively primitive state of condylar articulation. Within this tribe, the degree of separation of mandibular condyles, and the pronounced reduction of the talonid of $M\overline{3}$ suggest assignment to either *Petényia* or *Blarinella*, with a slight bias to the fossil *Petényia*. The heel of $M\overline{3}$, for example, is more like that of *Petényia* than of *B. quadraticauda* in stage of reduction. Maxillae establishing the dental formula of *P. dubia* are needed. As with *Anourosorex kormosi*, this species seems to have its relationship toward eastern Asia rather than to western Europe.

Tribe Blarinini

? *Paracryptotis* spec.

(Figures 28, 29, 29a, 29b)

Several fragments of upper and lower jaw, although agreeing in size with those of *Petényia dubia*, differ in other features. There is a lack of noticeable pigmentation. $M\underline{1}$—$M\underline{2}$ have emarginate posterior margins, with the hypocone area projecting almost as a hook. Entoconid crests are obscure or absent in $M\overline{1}$—$M\overline{2}$, and these teeth may have less rectangular outlines than in *P. dubia*. $M\overline{3}$ is reduced as a whole, and the talonid is slightly basined. No posterior lower jaw structures are preserved.

These fragments differ from *Paracryptotis rex* (Hibbard, 1950) in posterior emargination of $M\underline{1}$—$M\underline{2}$, and lack of observable pigment. On the other hand, lack of definite entoconid crests, and reduction of $M\overline{3}$ but with retention of a basined talonid suggest a member of the Tribe Blarinini (Repenning, 1967); of which *Paracryptotis* may be closest. Perhaps no generic determination is possible with the present remains.

Measurements (in mm.)

$P\underline{4}$,	L:	1,4–1,5
	W:	1,5
$M\underline{1}$,	L:	1,5
	W:	1,5–1,7
$M\underline{2}$,	L:	1,3
	W:	1,6
$\overline{I}$,	W (at base):	0,6
$P\overline{4}$,	L:	1,0
	W:	0,9
$M\overline{1}$–$M\overline{3}$,	L:	3,7
$M\overline{1}$	L:	1,4
	W:	1,0
$M\overline{2}$,	L:	1,3
	W:	0,9–1,0
$M\overline{3}$,	L:	1,0–1,1
	W:	0,6

Tribe Neomyini

Petenyiella ? repenningi nov. spec.

(Figures 7, 32, 32a, 33, 50, 50a)

The species is named in honor of Dr. C. A. Repenning because of his outstanding work on fossil and living shrews.

Holotype: Left lower jaw fragment with $M\overline{1}$–$M\overline{3}$, Colls. Natural History Museum, Vienna, Div. Geol. Paleont., No. 1970/1388.

Referred Specimens: A number of lower jaw fragments, but no upper jaws have been assigned to this species.

Geological Age and Locality: Early Turolian (= Pikermian) fissure deposits near Kohfidisch, southern Burgenland.

Diagnosis: Approximately 15 per cent larger than *Petenyiella pannonica* (= *P. gracilis* ?). No entoconid crests on $M\overline{1}$–$M\overline{2}$, heel of $M\overline{3}$ reduced to hypoconid only.

Description: The mental foramen of the lower jaw is under the middle of $M\overline{1}$. In one specimen, however, it is underneath the posterior edge of the trigonid root. Articular facets are separate, and the lower one is relatively posterior as in the Tribe Soricini. The upper articulation is relatively low, and little of it extends above the upper coronoid notch. Its facet is oval, inclined, and parallel to the lower surface. The lower articular facet is elongate, and the interarticular area relatively narrow.

If all specimens are correctly assigned, the coronoid process varies considerably in height, distinctness of the external temporal fossa, and details of the coronoid spicule. Generally, the external temporal fossa is weak, and not extending ventrally beyond the upper coronoid notch. Also, the internal temporal fossa varies in shape and size, but may be described as subtriangular, and higher than long. The dental foramen is distinctly anterior to the small internal temporal foramen (or postmandibular foramen of HUTCHISON, 1966, p. 21).

Cusp pigmentation, if originally present, can not now be certainly recognized.

The lower incisor is a large, powerfully-developed tooth. It is serrated in the one specimen available, with a weak anterior cuspule (in present wear), and a more powerful posterior cuspule.

The two antemolars exhibit the normal pattern of Pliocene soricines.

Complete, but relatively modest, external cingula are present on the lower molars. M$\overline{1}$ and M$\overline{2}$ lack entoconid crests. The trigonid of M$\overline{3}$ is somewhat reduced, and the talonid is considerably reduced to a single (hypoconid) cusp.

Petenyiella ? repenningi is a species of small shrew, somewhat (15 per cent) larger than *P. pannonica*, and approximately the size of *Sorex subminutus*.

Measurements (in mm.)

	Type Specimen	Others
M$\overline{1}$—M$\overline{3}$, L:	3,0	2,9—3,0
M$\overline{1}$, L:	1,2	1,2—1,3
W:	0,7	0,7—0,8
M$\overline{2}$, L:	1,2	1,1—1,3
W:	0,7	0,7—0,8
M$\overline{3}$, L:	1,0	0,9
W:	0,6	0,5

Comparisons and relationships: REPENNING says of *Petenyiella* (1967, p. 467), "It is a Neomyini shrew characterized by its small size, by its rather unspecialized mandibular condyles with the small lower condyle farther to the rear than in *Neomys*, and by a greatly reduced and single-cusped talonid on M$\overline{3}$." This description agrees with *P. ? repenningi*, except that *P. ? repenningi* is approximately 15 per cent larger than *P. pannonica* (KORMOS, 1934). However, entoconid crests are absent on M$\overline{1}$—M$\overline{2}$ of the Kohfidisch species. These crests have not been described as present in *P. pannonica*, but are assumed to be present by REPENNING in assigning *Petenyiella* to the Neomyini.

The absence of entoconid crests suggests assignment to the Blarini, and to such a genus as *Cryptotis*. Until information on the presence or absence of entoconid crests in *Petenyiella* becomes available, however, it seems better to assign *P. ? repenningi* to the latter genus. In either case, this shrew agrees with the others in the Kohfidisch fauna in suggesting eastern origins, and the spread of drier steppe conditions over the area.

Anourosorex kormosi nov. spec.

(Figures 3, 4, 4a, 20, 20a, 21, 22, 23, 23a, 24, 25)

This species is named for Theodor KORMOS, in recognition of his many contributions to mammalian paleontology, and especially for his description of *Amblycoptus* (1926).

Holotype: Right lower jaw with $\overline{1}$, $\overline{2}$, $\overline{3}$, Colls. Natural History Museum, Vienna, Div. Geol. Paleont., No. 1970/1389.

Referred Specimens: Numerous fragmentary upper and lower jaws.

Geological Age and Locality: Early Turolian (= Pikermian) fissure deposits near Kohfidisch, southern Burgenland.

Diagnosis: Size somewhat smaller than in living *Anourosorex squamipes*. Teeth faintly pigmented? Dental formula 1/1, 4/2, 3/3. Posterior borders of P$\underline{4}$—M$\underline{1}$ emarginate. P$\underline{4}$ with somwhat pointed anterior margin. M$\underline{1}$ relatively wide transversely. Upper articular condyle of lower jaw oval rather than triangular. Lower articular condyle slightly visible in external view, anterior edge not extending forward beyond posterior border of superior pterygoid fossa. A relatively obscure pterygoid spicule. M$\overline{3}$ reduced, but with small basined heel. Weak labial cingula in molars. Entoconids of molars slightly crested.

Description: Pigmentation of the dentition is uncertain, but possibly a pale orange coloration was present.

No upper incisors have been recovered in alveoli of *Anourosorex kormosi*. A number of isolated upper incisors, however, are presumed to pertain to the species. They have strongly curved, unfissured tips, and a large basal cuspule.

The first superior antemolar is a large, elongate tooth, approximately twice the size of the second antemolar. There is an internal cuspule about halfway back on the crown, and a low bicuspid heel. Antemolar two is an oval tooth with a posterointernal cusp in addition to the principal cusp. The third antemolar is represented in our specimens only by a small, round alveolus.

P$\underline{4}$ has an incised posterior margin. Parastyle, protocone, and hypocone are in an oblique line, and consequently the anterior border of the tooth is more or less acute.

M$\underline{1}$ has the enlarged parastyle and reduced mesostyle characteristic of *Anourosorex* (REPENNING, 1967) and *Amblycoptus*, but this feature is not so pronounced as in the latter genus. There is no noticeable anteroposterior lengthening, and the posterior margin of the tooth is emarginate. M$\underline{2}$, reduced relative to M$\underline{1}$, is subtriangular in shape, but still retains a projecting hypocone. M$\underline{3}$ is represented only by its alveolus. The zygomatic process of the maxillary originates opposite the parastyle of M$\underline{2}$.

The lower jaw is stout, with a low coronoid process which is broad at the level of the oval upper articular surface. The external temporal fossa is weak, and the internal temporal fossa subrounded, rather than triangular. The external coronoid spicule is moderately developed, but the superior pterygoid spicule is relatively obscure. At least part of the lower articular surface is beneath the coronoid process, and is not, or barely, visible in external view. The mental foramen is in a depression on the side of the ramus, and is situated below the middle of $M\overline{1}$, or slightly more posterior.

The lower incisor has a hooked tip, and bears two, low cuspules in an unworn condition.

The first lower antemolar is somewhat smaller than the second. Neither possesses any exceptional features.

The external cingula of the lower molars are weak to absent. $M\overline{1}$ is distinctly larger than $M\overline{2}$. The anterior arm of the hypoconid (metalophid) is relatively anteroposterior in position. The entoconid is large, and only slightly crested. $M\overline{2}$ is a smaller version of $M\overline{1}$. $M\overline{3}$ is much reduced, but still has a slightly basined heel in most specimens.

Measurements (in mm.)

	Type Specimen	Others
$\underline{I}$, L:	—	2,0
W:	—	1,0
1st antemolar, L:	—	1,8—2,0
W:	—	1,2—1,25
2nd antemolar, L:	—	1,1—1,2
W:	—	1,0
$P\underline{4}$, L:	—	2,5—2,8
W:	—	2,3—2,5
$M\underline{1}$, L:	—	2,2—2,3
W:	—	2,4—2,5
$M\underline{2}$, L:	—	1,3—1,4
W:	—	1,8—2,0
jaw depth below $M\overline{1}$:	—	2,4—2,6
$\overline{I}$, L:	—	1,2—1,3
W:	1,0	0,9—1,0
1st antemolar, L:	1,3	0,9
W:	1,0	1,2
2nd antemolar, L:	1,5	1,5—1,6
W:	1,2	1,2
$M\overline{1}$—$M\overline{3}$, L:	5,0	5,0—5,1
$M\overline{1}$, L:	2,6	2,5
W:	1,4	1,4—1,5
$M\overline{2}$, L:	1,8	1,8
W:	1,1	1,1—1,2
$M\overline{3}$, L:	1,0	1,1
W:	0,6	0,6

Comparisons and relationships: This species is clearly to be placed among the highly specialized members of the *Anourosorex-Amblycoptus* group of shrews. It is the most primitive known member of the group, but not so much so, in our opinion, as to warrant establishment of a new genus. The presence of a third molar in *Anourosorex kormosi* is perhaps an arbitrary but practical reason for assignment to the otherwise Asiatic genus.

Anourosorex kormosi agrees well in most ways with *Amblycoptus oligodon* (Kormos, 1926) of the Polgárdi Pliocene, but differs in: (1) absence of third molar, (2) less emphasized parastyles of the upper molars, (3) less triangular M2, (4) somewhat less specialized condition of the lower articular condyle, and perhaps in some other features in which *A. kormosi* is less specialized.

A number of differences between *A. kormosi* and the living *Anourosorex squamipes* of western China are evident, but most of these seem merely to represent less specialized features in the fossil. Distinctions in *A. kormosi* are: (1) smaller size, (2) P4 anterior margin somewhat pointed rather than anterior and medial basal outlines at right angles (because of reduced parastyle and medially shifted protocone), (3) P4—M2 posterior borders more emarginate, (4) M1 relatively wider transversely, (5) M3/3 not quite so reduced, (6) superior dental formula 1, 4, 3 (antemolar formula as in *Amblycoptus*) rather than 1, 3, 3, (7) upper articular condyle oval (as in *Amblycoptus*) rather than triangular, (8) lower articular condyle not so anterior in position, (9) labial cingulum not completely lacking in lower molars, and (10) possibly more of an entoconid crest in lower molars.

One other extinct species of *Anourosorex* has been described, *A. inexpectatus* (Schlosser) from the Ertemte Pliocene of Mongolia (Schlosser, 1924; Miller, 1927). This species is known only by the posterior, toothless, part of a lower jaw fragment. *A. kormosi* differs in: (1) slightly smaller size, (2) less sloping anterior edge of the coronoid process, and, most significantly, (3) anterior edge of the lower articular condyle, when viewed laterally, is not forward of the posterior margin of the superior pterygoid fossa, as it is in *A. inexpectatus*.

Morphologically, *Anourosorex kormosi* is surely not far removed from what the ancestor of *A. squamipes* and *Amblycoptus oligodon* was like. For the latter species, geographic proximity favors a real ancestry, but the morphological changes are great for the available geologic time. The geographic area of origin for the group is not known, but failure to identify remains in France and Spain suggest peripheral occurrences of an Asiatic group. Probably, *A. kormosi* and *A. oligodon* were easten invaders along with *Progonomys* and perhaps *Protozapus*.

Family Talpidae

The occurrence of several kinds of moles has been recognized. Both desmanine and talpine moles are present, but positive generic identification can be made only in the case of *Desmana* itself.

Desmana pontica ? SCHREUDER 1940

(Figures 5, 5a, 8, 36, 36a, 37, 38)

Description: A well-preserved maxillary with P$\underline{1}$—M$\underline{3}$, a lower jaw with P$\overline{1}$—M$\overline{3}$, additional lower jaw fragments, and some limb material establish the presence of a water-mole close to or identical with *Desmana pontica* of Polgárdi.

The bridge over the infraorbital canal is thin and inclined, its inferior base rising above M$\underline{2}$.

The first three premolars are simple, stout teeth in which the width is greater than the height. P$\underline{1}$ is slightly smaller than P$\underline{3}$, and more markedly smaller than P$\underline{2}$. P$\underline{4}$ has a distinct inner cusp, and a broad anterior cingular shelf. The principal cusp is rounded anteriorly, but somewhat shearing posteriorly.

The first upper molar has a relatively small and isolated parastyle. Consequently, the paracone-mesostyle crest is linear rather than in a V. Mesostyle, metacone, and metastyle, however, form a V, and the tooth, as a result, has a decidedly asymmetrical outline.

The second upper molar is a symmetrical, triangular tooth in which both paracone and metacone unite with cingular elements of the crown to form a typical double-V.

The third upper molar is, as in M$\underline{1}$, asymmetrical. Here, however, the anterior V is present, but the posteroexternal crest is linear. The hypocone is displaced posteroexternally more than in the other molars.

In the upper molars, the hypocone is about equal in size to the protoconule in M$\underline{1}$, smaller in M$\underline{2}$, and perhaps slightly larger in M$\underline{3}$.

The lower jaw has its posterior mental foramen under the anterior part of M$\overline{1}$. The anterior mental foramen is under P$\overline{1}$. A slitlike foramen is under P$\overline{2}$ in one specimen.

The second lower incisor has a relatively large, anteriorly projecting crown set on a strong root, which occupies a slanting alveolus. The crown has a posterointernal cingulum which rises posteriorly to a small cuspule.

The alveolus for I$\overline{3}$ is anteroposteriorly compressed. The canine socket behind it is approximately of the same size, but nearly circular.

The lower premolar series is of the usual *Desmana* type, simple, with relatively low, inflated crowns. P$\overline{4}$ has a paraconid and small, bicuspid, basined heel in one specimen. A second specimen has a heel which is much less basined and not bicuspid. All lower premolars are two-rooted. Cingula are absent, except on P$\overline{1}$, on the external faces of the teeth, and obscure to absent elsewhere.

The lower molars decrease in size from front to back. The external cingula are not very prominent, and tend to be interrupted across the protoconids. M$\overline{3}$ differs from the first two molars in lacking a "hypoconulid" projection.

Measurements (in mm.)

$P\underline{1}-M\underline{3}$, L:	10,5
$P\underline{1}-P\underline{4}$, L:	5,25
$M\underline{1}-M\underline{3}$, L:	5,6
$P\underline{1}$, L:	1,2
W:	1,0
$P\underline{2}$, L:	1,5
W:	1,2
$P\underline{3}$, L:	1,3
W:	1,2
$P\underline{4}$, L:	2,0
W:	1,75
$M\underline{1}$, L:	3,0
W:	2,2
$M\underline{2}$, L:	2,0
W:	2,6
$M\underline{3}$, L:	1,5
W:	1,9
$P\overline{1}-M\overline{3}$, L (alveolar):	10,8
$P\overline{1}-P\overline{4}$, L:	5,0
$M\overline{1}-M\overline{3}$, L:	6,25
$I\overline{2}$, L:	0,9
W:	1,0
$P\overline{1}$, L:	1,1
W:	0,8
$P\overline{2}$, L:	1,5
W:	1,0—1,1
$P\overline{3}$, L:	1,2
W:	1,0
$P\overline{4}$, L:	1,5—1,6
W:	1,1—1,2
$M\overline{1}$, L:	2,2—2,4
W:	1,6—1,75
$M\overline{2}$, L:	2,2
W:	1,6
$M\overline{3}$, L:	1,75
W:	1,4

Relationships: At Polgárdi, described specimens of *Desmana pontica* are poor, but better material is known from the Polish locality of Weže (SULIMSKI, 1959, 1962). The only discernible difference seems to be that in most of our specimens the external cingulum around the base of the protoconid is weaker, usually being at least slightly interrupted. To some extent, the Kohfidisch specimens exhibit a mixture of characters of Recent *Desmana* and *Galemys*, as these characters are listed by SCHREUDER (1940). Yet on the whole, *Desmana* is very sharply favored. Of applicable characters listed by SCREUDER, distribution in our specimens is as follows:

Desmana	*Galemys*
1. width of unicuspids ($P\underline{1}$—$P\underline{3}$) more than height	
2. main cusp of $P\underline{4}$ rounded anteriorly	
3. bridge over infraorbital canal thin and inclined	
	4. PM region about same length as M region (either neutral, or more like *Galemys*)
	5. cingulum at middle portion of upper molars hardly observable
	6. hypocone not stronger than protoconule (subequal ?)
7. para- and metastyles of $M\underline{2}$ not projecting noticeably beyond mesostyles	
8. $I\overline{3}$ probably considerably smaller than $I\overline{2}$	
9. in $P\overline{4}$, roots stradling, not coalesced	
10. lower molars with narrow and shallow valleys	
	11. weak cingulum on external side of protoconid (but fairly strong anterior cingulum suggests *Desmana*)
	12. crest from hypoconid running to top of metaconid (but not greatly different than in some *Desmana*, as for example, *D. pontica*).

Features of *Galemys* that are present seem to be: (a) primitive — 4 and 6, (b) relatively minor specializations — 5 and 11, or (c) somewhat ambiguous — 11 and 12. No definitely assignable specimens of *Galemys* are known from the Pliocene, suggesting that specializations associated with that genus were recently acquired. If this be true, perhaps some specimens now referred to *Desmana* are in the ancestry of *Galemys*.

Desmanine talpid ?, genus indet.

(Figures 34, 34a, 34b, 35, 35a)

Two fragmentary lower jaws, one with $P\overline{4}$—$M\overline{1}$, the other with $M\overline{1}$—$M\overline{2}$, represent a small mole clearly distinct from *Desmana pontica*, but otherwise of uncertain position.

This small mole is somewhat smaller than *Mygalinia hungarica* (SCHREUDER, 1940), lacks the strong external cingula of the Polgárdi species, the $\overline{P4}$, relatively, is distinctly smaller, and the proportions of $\overline{M1}$ and $\overline{M2}$ are different. The anterior horn of the hypoconid seems not to rise so high on the metaconid wall. It agrees with *Mygalea antiqua* (SCHREUDER, 1940), apparently, in distribution of the external cingulum, and position of the anterior horn of the hypoconid, but differs in considerably smaller size, and more posterior position of the posterior mental foramen.

These Kohfidisch specimens may not be desmanine moles. There is some resemblance to *Mydecodon martini* (WILSON, 1960), although the American species has a stronger external cingulum on the lower molar. In 1960, the junior author suggested that it is "not beyond possibility that *Mydecodon* is related to one or another of the fossil species of small moles now assigned to *Scaptonyx*" (p. 41). *Scaptonyx edwardsi* is not much larger, but probably differs in cingulum and other features. *Scaptonyx dolichochir* has been tentatively recorded from Polgárdi (as aff. *Scaptonyx dolichochir*). This species, although the type is a humerus, has supposed jaws of about the size of the Kohfidisch specimens.

Talpa? sp.

Two incomplete humeri, and a third, nearly complete specimen, record the presence of a true mole at Kohfidisch. The stage of fossorial adaptation is approximately as in *Talpa*. Although the length of humerus is about that in some specimens of *Proscapanus* (VIEHHAUSEN, SEEMAN, 1938), the length/width ratio seems less, more as in the former genus.

	Measurements (in mm.)
Length:	13,0
Maximum proximal width:	9,75
Maximum distal width:	8,0
Midshaft, ap diameter:	2,8—3,5
Midshaft, tr diameter:	3,2—3,6

Order Chiroptera

Two, probably three, genera of bats are present in the Kohfidisch fauna. Two are surely present in the typical Miocene of western Europe, and their presence, especially that of *Megaderma*, suggest continuing warm conditions into the earlier Pliocene.

Family Megadermidae

Megaderma vireti MEIN 1964

(Figures 43, 43a, 43b)

Specimens from Kohfidisch are complete enough to permit restoration of the lower jaw, and to establish the dental formula as $\overline{2}, \overline{1}, \overline{2}, \overline{3}$. A few fragments also give limited information concerning the upper dentition.

An upper canine does not differ in any significant feature from the description, figure, or measurements given by MEIN (1964).

The lower jaw specimens from Kohfidisch seemingly also do not differ from those of *Megaderma vireti* in morphology, and the dentition agrees closely. Two trifid incisors are present. The protoconid of P$\overline{4}$ may rise somewhat higher than in *M. vireti*, more as in *M. lugdunensis* (MEIN, 1964), but this is not certain. On the other hand, the entoconids of M$\overline{1}$—M$\overline{2}$ are "simple", not "dédoublé" as in *M. lugdunensis* (MEIN, 1964, p. 238), and the molars have a

Measurements (in mm.) of *Megaderma vireti*

	Holotype [5]	Kohfidisch
$\underline{\text{I}}$, L:	3,0 [6]	3,25
W:	2,0 [6]	2,0
H (ext.):	4,9 [6]	4,9
H (int.):	4,5 [6]	4,8
P$\overline{2}$—M$\overline{3}$, L:	12,0	12,3—13,0
P$\overline{4}$—M$\overline{3}$, L:	10,5	10,8—11,0
M$\overline{1}$—M$\overline{3}$, L:	8,4	8,6—8,75
Depth of jaw under M$\overline{1}$ (int.):	3,5	3,3
P$\overline{2}$/P$\overline{3}$, L:	1,85	1,8—2,0
W:	1,3	1,5
P$\overline{4}$, L:	2,25	2,4—2,5
W:	1,15	1,2—1,3
M$\overline{1}$, L:	2,95	2,75—3,0
W (trigonid):	1,25	1,25—1,5
W (talonid):	1,3	1,5
M$\overline{2}$, L:	3,0	2,9—3,0
W (trigonid):	1,45	1,5—1,7
W (talonid):	1,4	1,4—1,6
M$\overline{3}$, L:	2,95	3,0—3,1
W (trigonid):	1,45	1,5—1,6
W (talonid):	1,05	1,0—1,3

crown height equalling or slightly exceeding the condition of *M. vireti*. Degree of compression of the molars is variable in the Kohfidisch specimens, but some show compression nearly as in *M. vireti* (see measurements). Perhaps on the whole, the molars are less compressed, and hence more primitive, than in the type of *M. vireti*. If so, it would suggest an older age for Kohfidisch, than for Lissieu, France, type locality for *M. vireti*, a relation supported in other ways.

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[5]) After Mein, 1964.

[6]) Referred only.

Family Rhinolophidae

Rhinolophus delphinensis GAILLARD 1899

(Figures 9, 39, 40, 40a, 41)

Several jaw fragments permit the identification of *Rhinolophus delphinensis* at Kohfidisch. A socket for the vestigial $P\overline{3}$ is present, but the tooth itself has not been preserved in the available specimens. Measurements suggest a smaller animal than at Lissieu, France (late Turolian), but probably within the size range of La Grive specimens.

Measurements (in mm.)

	Kohfidisch	La Grive [7])	Lissieu [7])
$\overline{C}$–$M\overline{3}$, L:	8,6	8,7–9,0	8,9–9,0
$M\overline{1}$–$M\overline{3}$, L:	5,7	5,5–5,8	5,9–6,0

Family indet.

Chiropterid, genus indet.

(Figures 42, 42a)

A third species of bat is represented by a jaw fragment with $P\overline{4}$–$M\overline{1}$. In size, it is about that of specimens of *Rhinolophus grivensis*, but the Kohfidisch fragment suggests a kind of bat in which $P\overline{3}$ is not reduced or vestigial, and the molar entoconids are not detached, as, for example, in *Myotis boyeri* of Lissieu (MEIN, 1964). $P\overline{4}$, in the Kohfidisch species, however, has a notably short anteroposterior diameter.

Measurements (in mm.)

$P\overline{4}$,	L:	0,7
	W:	0,7
$M\overline{1}$,	L:	1,5
	W:	0,9

Order Lagomorpha

Although Kohfidisch is late enough in time for leporids to be present, they have so far not been identified. All lagomorphs are of the long-ranging ochotonid genus, *Prolagus*.

Family Ochotonidae

Prolagus cf. ***P. oeningensis*** (KÖNIG) 1825

(Figures 10, 44, 45, 46, 47, 48, 49)

The abundance of ochotonid remains varies considerably from one sample to another at Kohfidisch. In one large sample of micromammalia which the junior author examined, ochotonids were absent. On the other hand, in the

[7]) After Mein, 1964.

sample, "1960, Fundstelle II", they were relatively common. Presumably, these variations merely reflect the activities of particular predators (hawks, owls), and their roosting sites. Incidentally, this may be one reason for assuming that accumulation in the fissures was relatively rapid. Otherwise, one depositional site would in time record most of the total fauna as the home range and dietary preferences of one predator was replaced by another.

The Kohfidisch specimens consist of, so far as jaw parts are concerned, of isolated teeth, toothless jaws, and jaws with partial dentitions. Only rarely are complete dentitions still present in the jaws.

The Kohfidisch species is clearly much closer to the late Miocene *Prolagus oeningensis* of La Grive- St. Alban than to the Quaternary *P. sardus* of Sardinia. In fact, it may be inseparable from the former. An ochotonid from Polgárdi is said by TOBIEN (1963, p. 28) to be larger, and have a more advanced P$\underline{2}$ than the La Grive species. Several second upper premolars from Kohfidisch are also advanced in the formation of the "inner arm", but this character does not seem to be as consistently developed as in the small collection of Polgárdi specimens we have been able to examine. The internal reentrant folds of the upper cheekteeth may be slightly deeper on the whole than in the La Grive species. Size of toothrow varies considerably in available Kohfidisch specimens, and ranges in alveolar length from 7,1 to 8,5 mm. for P$\overline{3}$—M$\overline{2}$. The impression is gained that *Prolagus* from Kohfidisch is intermediate in respect to La Grive and Polgárdi, but this may only result from the small samples we examined.

Measurements (in mm.)

P$\underline{2}$—M$\underline{2}$, alveolar length:	7,0—8,5
P$\underline{2}$, L:	0,9—1,0
W:	1,7—1,8
P$\underline{3}$, L:	1,5
W:	2,4
P$\underline{4}$, L:	1,4
W:	2,8
M$\underline{1}$, L:	1,4
W:	2,8
P$\overline{3}$,—M$\overline{2}$, L:	7,1—8,5
P$\overline{3}$ L:	1,4—1,8
W:	1,5—1,75
P$\overline{4}$, L:	1,3—1,5
W:	1,5—1,75
M$\overline{1}$, L:	1,4—1,6
W:	1,5—1,75
M$\overline{2}$, L:	2,0—2,4
W:	1,4—1,8

Order Rodentia

Rodents are the most abundant elements of the Kohfidisch microfauna, and, expectedly, the most diversified as well. Twelve genera and species are present, of which all but two have been given some kind of specific determination. At least seven families are recorded, a number equalling the total of the other three micromammalian orders.

The dominant rodents are the murines, followed by the cricetines, with all other rodents not very frequent in the samples studied. In fact, four genera (*Pliosciuropterus*, *Chalicomys*, *Muscardinus*, and *Rodentia*, genus indet.) are so far known only by single specimens. Only two of the genera can be even nominally identified as Recent genera. Only three (*Spermophilinus*, *Chalicomys*, *Peridyromys*), at most four (*Prospalax*?), are typically late Miocene (pre-Vallesian). Thus, the rodent fauna is strongly Pliocene in appearance, with the dominant elements invaders from the East.

Family Sciuridae

Squirrels are seemingly rare in the Kohfidisch fauna. Several fragmentary specimens represent the primitive ground-squirrel, *Spermophilinus*, and a single tooth of a flying squirrel indicates the presence of *Pliosciuropterus*.

Spermophilinus cf. ***S. bredai*** (v. Meyer) 1848

(Figures 13, 64, 65, 67)

A primitive ground-squirrel is recorded by a $DP\underline{4}$, $M\overline{3}$, $P\overline{4}$ in a jaw fragment, and a jaw with $P\overline{4}$—$M\overline{3}$.

The deciduous upper molar has a short, transverse protoloph without visible protoconule. The metaloph joins the protocone with the metaconule fused indistinctly into the loph.

The lower jaw has the masseteric fossa terminating under the middle of $M\overline{1}$, although the scar area for muscle insertion extends beyond to the anterior border of this tooth. The middorsal surface of the diastema ($\overline{I}$—$P\overline{4}$) dips below the alveolar level of the cheektooth row, but the anterior end rises above it. This diastema is relatively short, although the two specimens showing this part differ in length. Consequently, the ratio value of jaw depth to diastemal length is much higher than for *S. bredai* of La Grive. The mental foramen is well in advance of $P\overline{4}$, and one-third to one-half the way below the dorsal surface of the diastema.

The lower incisor has five, or more, longitudinal furrows, and is compressed (ratio: 1,7—1,8) about as in *S. bredai*.

The fourth lower premolar has well-separated protoconid and metaconid cusps, and a broadly raised, but not cuspidate entoconid area. It, and the following molars, are moderately basined.

The molars show protoconids and hypoconids of nearly equal size. A metastylid seems to be indicated in $M\overline{1}$, and unworn teeth, if available, might show it present on other molar teeth. Distinctness of the entoconid is difficult to determine. Perhaps some is present in little worn teeth. The molars increase in size from front to back, and $M\overline{3}$ seems unusually large in respect to the first two molars. An anteroconid, if present, is very slight.

DE BRUIJN and MEIN have recently placed *Sciurus bredai* in a new genus, *Spermophilinus*, and described a new species of *Spermophilinus*, *S. turolensis*. They state (1968, p. 87) that these two species may be distinguished by: (1) the appreciably larger size of *S. turolensis*, (2) the wider $M\overline{1}$—$M\overline{2}$, and (3) the greater length of $M\overline{3}$ relative to $M\overline{1}$—$M\overline{2}$. The Kohfidisch specimens seem hardly to differ from *S. bredai* in size, but the relative length of $M\overline{3}$ is even more, although only slightly, than in *S. turolensis*. Relative molar width is ambiguous because $M\overline{1}$ of our species is more than in the ratio L/W for *S. turolensis*, and $M\overline{2}$ less.

Although the Kohfidisch specimens are more closely related in time to *S. turolensis* than is material from La Grive, we are tentatively referring our material to *S. bredai* until more specimens of *S. turolensis* are known. It may be that reference should be to neither.

Measurements (in mm.) of *Spermophilinus*

	Kohfidisch	*S. turolensis* after DE BRUIJN and MEIN [8])	S. *bredai* after WILSON [9]), and DE BRUIJN and MEIN
$DP\underline{4}$, L:	1,8	1,71—1,77	—
W:	1,8	1,61—1,91	—
L/W:	1,0	0,988 (aver.)	1,0
$\overline{I}$-$P\overline{4}$, diastemal length	5,4—6,5	—	—
Depth of jaw beneath $M\overline{1}$:	5,9	—	—
Ratio, jaw depth/diast. length:	0,90—1,40	—	0,76
$P\overline{4}$—$M\overline{3}$, alveolar length:	8,4	—	8,5
Ratio, diast. length/$P\overline{4}$—$M\overline{3}$, L:	0,64	—	0,85
$\overline{I}$, L:	2,6—2,7	—	—
W:	1,5	—	—
L/W:	1,73—1,8	—	1,84
$P\overline{4}$, L:	1,8—1,9	—	—
W:	1,6	—	—
L/W:	1,12—1,18	—	1,0—1,16
$M\overline{1}$, L:	2,0	—	—
W:	2,1	—	—
L/W:	0,952	—	0,87—0,95
$M\overline{2}$, L:	2,1	?2,33—2,35	—
W:	2,4	?2,5—2,52	—
L/W:	0,875	0,932 (aver.)	0,90
$M\overline{3}$, L:	2,5—2,7	2,57—2,72	—
W:	2,3	2,2—2,4	—
L/W:	1,08—1,17	1,15	1,20

[8]) DE BRUIJN and MEIN, 1968.

[9]) WILSON, 1960.

Pliosciuropterus SULIMSKY 1964, prob. nov. spec.

An $M\underline{1}$ or $M\underline{2}$ in a fragment of maxilla demonstrates the presence of flying squirrels in the Kohfidisch fauna. In occlusal pattern, this tooth is similar to species in the genera *Pliosciuropterus* (SULIMSKY, 1964) and *Sciuropterus* (= ?*Pteromys*), especially to species of the former genus. Very probably the Kohfidisch species is new because the dimensions (L: 1,8; W: 2,2) of the upper molar are less than in *P. dehneli*, and a small mesostyle is present.

Family Castoridae

cf. ***Chalicomys jaegeri*** KAUP 1832

A fragment of left maxillary with $P\underline{4}$ pertains to the group of beavers usually assigned to *Steneofiber*. The $P\underline{4}$ is larger than in "*S.*" *minutus*, and smaller than in most specimens of "*S.*" *jaegeri*. It is in the size range of specimens which have been assigned to "*S.*" *eseri*. If Pliocene specimens in this range should be assigned to "*S.*" *jaegeri* (= *Chalicomys jaegeri*), as has sometimes been done, then the Kohfidisch specimen may be referred to this species also.

On the assumption that *Palaeomys castoroides* is an early Miocene species (STIRTON, 1951, p. 77; R. DEHM, oral communication), we are referring our specimen to the name combination *Chalicomys jaegeri* as originally proposed by KAUP.

Measurements (in mm.)

$P\underline{4}$,	L:	5,8
	W:	5,8

Family Gliridae

Two dormice genera have been recognized at Kohfidisch: *Muscardinus*, by a unique specimen; and *Peridyromys*, by relatively rare fragments. Limitation of glirids to these two genera is also encountered in the Vallesian of the Calatayud-Teruel Basin of Spain near Daroca.

Muscardinus pliocaenicus austriacus nov. subspec.

(Figures 14, 71)

The new subspecific name indicates the geographic locality of the subspecies.

Holotype: Incomplete right lower jaw with $P\overline{4}$—$M\overline{1}$, Colls. Natural History Museum, Vienna, Div. Geol. Paleont., No. 1970/1390.

Geological Age and Locality: Early Turolian (= Pikermian) fissure deposits near Kohfidisch, southern Burgenland.

Diagnosis: $P\overline{4}$ with four crests, the second one interrupted, the fourth, low. $M\overline{1}$ three-rooted.

Description: The single-rooted, fourth lower premolar is a small, transversely compressed, oval tooth, which is widest posteriorly. The most anterior ridge is irregular, and ends in a small cuspule. The second ridge is incomplete, extending only over the inner half of the occlusal surface. External to it, however, is a small, isolated cuspule. The third ridge extends entirely across the tooth surface, and is the most marked element of the crown. It is somewhat concave anteriorly. Behind it, and at a lower elevation, is a posterior cingulum, which is here considered to be the fourth ridge in such a tooth as that of *Muscardinus p. hispanicus* (De Bruijn, 1966, p. 5), inasmuch as it rises internally to the general level of the other ridges.

The first lower molar has a pattern of six, nearly parallel, transverse ridges. The first two ridges are joined at their ends; the third is independent; the fourth and fifth are joined internally; and the fifth and sixth at both ends. The tooth is three-rooted.

The type specimen is the only specimen from Kohfidisch so far recovered.

Measurements (in mm.)

$P\overline{4}$,	L:	0,6
	W:	0,7
$M\overline{1}$,	L:	1,5
	W:	1,3

Comparisons and relationships: *Muscardinus pliocaenicus austriacus* agrees in size with *M. davidi* (Hugueney and Mein, 1965), and with some specimens of *M. p. pliocaenicus* (Kowalsky, 1963). It is larger than *M. p. hispanicus* (De Bruijn, 1966), and slightly larger than *M. vireti* (Hugueney and Mein, 1965). $M\overline{1}$ of *M. p. austriacus* differs in pattern from that in *M. davidi* in lacking the additional incomplete ridge. It seems obviously most closely related to *M. pliocaenicus*.

The fourth lower premolar is more complex than in *M. p. pliocaenicus* of the "Late Pliocene" of Poland, and less than in *M. p. hispanicus* of the Vallesian of Spain. *M. p. pliocaenicus* has two ridges and the rudiment of a third; *M. p. austriacus* has four, the posterior ridge reduced to a cingular ledge, the third interrupted, and the most anterior ridge irregular; *M. p. hispanicus* has four parallel transverse ridges.

The first lower molar of *M. p. austriacus* is three-rooted as in *M. p. pliocaenicus*, rather than two-rooted as in *M. p. hispanicus*.

Muscardinus pliocaenicus austriacus is clearly more advanced than the early Vallesian *M. p. hispanicus*.

Peridyromys compositus nov. spec.

(Figures 15, 72, 73, 74)

The species name indicates the composite character of the species, combining features of *Peridyromys dehmi* and *P. multicrestatus*.

Holotype: Left lower jaw with incisor and $M\overline{1}$—$M\overline{2}$, Colls. Natural History Museum, Vienna, Div. Geol. Paleont., 1970/1391.

Referred Specimens: Several isolated upper teeth and lower jaw fragments.

Geological Age and Locality: Early Turolian (= Pikermian) fissure deposits near Kohfidisch, southern Burgenland.

Diagnosis: Slightly larger than *Peridyromys dehmi*, more nearly the size of *P. multicrestatus*. Upper molar pattern more complex than in *P. dehmi*; lower molar pattern less complex than in *P. multicrestatus*. Lower molars relatively broad.

Description: The examined material consists of an isolated left $P\underline{4}$, three first or second upper molars, and several lower jaw fragments with $M\overline{1}$ or $M\overline{2}$ or both.

The fourth upper premolar is a three-rooted(?) tooth of oval shape. The anterior, first ridge (anteroloph) is short, not reaching the external border of the tooth. Ridges two and four (protoloph and metaloph) unite internally, but end labially in separate swellings of the ridges. A well-developed third ridge (centroloph [10])) lies between these. Ridge five (posteroloph) unites at either end with the fourth ridge.

A first or second upper molar (probably $M\underline{2}$) has a quadrate crown of concave occlusal surface, supported by three roots. The usual four main ridges are present, together with a complex centroloph area. The anterior and posterior centralophs are about equally developed although the anterior ridge is longer. Additionally, there are four "extra" ridges in this area. The one between the two centrolophs (extra no. 2) is best developed. The other extras are no. 1 between protoloph and anterior centroloph; no. 3, posterior to extra ridge 2; and no. 4, between posterior centroloph and metaloph. There is also a tiny cuspule between metaloph and posteroloph.

A second specimen of an upper molar, probably an $M\underline{1}$, has a somewhat simpler pattern inasmuch as only two "extra" ridges are present. The anterior, between protoloph and anterior centroloph, is much better developed. The other, lying between posterior centroloph and metaloph, is only a small cuspule.

The type lower jaw, with $M\overline{1}$—$M\overline{2}$, has three-rooted molars. The usual basic pattern of anterolophid, metalophid, centrolophid, mesolophid, and posterolophid is present. The centrolophid of $M\overline{1}$ is long, penetrating almost two-thirds of the distance across the crown surface. The centrolophid of $M\overline{2}$ is shorter, reaching to about the midpoint. A well-developed posterior "extra" ridge is present between mesolophid and posterolophid of both teeth.

Additional lower jaws with molars agree well with the type specimen in molar morphology.

Comparisons and relationships: *Peridyromys compositus* is a species combining characteristics of the Vallesian *P. dehmi* and *P. multicrestatus* (De Bruijn, 1966b), in that the upper molars are more complex than in the former, the lower molars less complex than in the latter. The lower molars are in fact

[10]) For nomenclature of glirid teeth see De Bruijn, 1966a, p. 2.

Comparative Measurements (in mm.)

	P. compositus		*P. d. dehmi* 11)	*D. multicrestatus* 11)
	Type	Others		
$P\underline{4}$, L:	—	0,8	0,64—0,71	0,71
W:	—	1,0	0,81—0,88	0,91
$M\underline{1}/M\underline{2}$, L:	—	1,2—1,3	0,86—0,96	1,05—1,13
W:	—	1,3—1,5	0,93—1,11	1,29—1,33
Depth of jaw beneath $M\overline{1}$:	2,7	—	—	—
$P\overline{4}$—$M\overline{3}$, alveolar L:	3,6 (est)	3,6—3,9	—	—
$\overline{I}$, ap:	1,0	—	—	—
tr:	0,75	—	—	—
$M\overline{1}$, L:	1,0	1,0—1,1	0,88—1,04	1,21
W:	1,0	1,0—1,1	0,81—1,00	1,18
$M\overline{2}$, L:	1,1	1,1	0,88—1,07	1,13—1,15
W:	1,1	1,0—1,2	0,89—1,07	1,21—1,22

essentially as in *P. dehmi* except for their slightly larger size and broader proportions. There is slightly better agreement in size with *P. multicrestatus*, and the complexity of upper molar pattern is clearly more like that of *P. multicrestatus*. There seems no reason for thinking that the upper and lower molars represent separate species, although this is a possibility.

If a single species is represented, and if De Bruijn's thesis that the ancestor of *P. dehmi* had a *multicrestatus*-like pattern (1966b, p. 17) is correct, then the Kohfidisch lineage is simplifying at a slower tempo. The alternative that Kohfidisch is older than Nombrevilla (Spain) seems quite unlikely.

Reference of the Kohfidisch material to *Peridyromys* follows De Bruijn. It must be remembered, however, that the type of the genus, *Peridyromys murinus*, is upper Aquitanian.

Family Zapodidae

Protozapus, nov. genus

Type Species: *Protozapus intermedius* nov. spec.

Generic Diagnosis: Approximate size of *Sminthozapus janassyi*. $M\underline{1}$ larger than $M\underline{2}$. Protocone of $M\underline{1}$ and $M\underline{2}$ united to mesocone-hypocone structures. Protocone of $M\underline{2}$ transversely compressed, internal embayment shallow. Paracone of $M\underline{2}$ connected more anteriorly to protocone, metacone connected more posteriorly to hypocone, than in most *Plesiominthus*. $M\overline{1}$ smaller than $M\overline{2}$, chevron-shaped alignment of protoconid-metaconid; anteroconid small or absent. $M\overline{2}$ with metaconid separated from protoconid by valley; protostylid spur absent.

11) After De Bruijn, 1966b.

Protozapus intermedius, nov. spec.

(Figures 60, 61, 62)

Both the generic and specific names indicate the intermediate position of the fossil remains in zapodid evolution.

Holotype: Left maxillary fragment with P4—M2, Colls. Natural History Museum, Vienna, Div. Geol. Paleont., No. 1970/1392.

Referred Specimens: Several lower jaw fragments.

Geological Age and Locality: Early Turolian (= Pikermian) fissure deposits near Kohfidisch, southern Burgenland.

Diagnosis: Only species known. Diagnosis as given in genus.

Description: The fragment of upper jaw offers no characters except that the posterior edges of the incisive foramina are about at the level of the middle of P4.

The nearly circular crown of P4 has a cusp near the anterior edge, and extending from either side of it posteriorly, is a marginal cingulum.

The first upper molar is a rectangular tooth which narrows somewhat across the heel region. Its crown is somewhat heightened, and is supported by three roots. The protocone is obliquely compressed, and is continued anteroexternally by the anteroloph. The hypocone is more transversely compressed, and consequently the internal fold is asymmetrically triangular. The paracone joins the protocone-mesocone area at the posterior margin of the protocone. Neither an anterocone nor a mesocone is evident at the present stage of wear. There is a strong mesoloph extending to the external border of the tooth. The metacone is joined with the hypocone at the midpoint of the latter. A posteroloph forms the posterior edge of the tooth, and unites with the metacone to enclose an anteroposteriorly narrow lake.

The second upper molar is smaller than M1, and its posterior half more constricted. The pattern is not essentially different from that in M1 except that the anteroloph is less oblique, the paracone-protocone connection much more anterior, and, most important, both protocone and hypocone are transversely compressed, and the internal embayment extremely shallow.

The masseteric crest of the lower jaw ends in a ledgelike process which extends to beneath the anterior root of M1, and the mental foramen is large. Seemingly, these characters are comparable to those in *Sminthozapus* (SULIMSKI, 1964, pl. 16, fig. 8). A complex of foramina is present between the posterior part of M3 and the ascending ramus.

The first lower molar is an elongate tooth which narrows in the trigonid area. A small, slightly internally placed anteroconid is present on one specimen, but completely absent on another. Protoconid and metaconid unite posteriorly, but their anterior tips are widely separated, thus producing a chevron-shaped alignment of these cusps. The ectolophid runs from the posteroexternal edge of the protoconid to the anterointernal edge of the hypoconid. A strongly developed mesolophid is present. The hypolophid joins the hypoconid anteriorly. A post-entoconid valley varies from partially open to closed.

The second lower molar is larger than the first. There is a distinct embayment of the inner wall of the tooth between metaconid and entoconid. An oblique valley separates anteroconid-metaconid from protoconid-mesoconid, a condition also found in *Schaubeumys grangeri* and *Megasminthus tiheni* (KLINGENER, 1966) of the American mid-Tertiary. Otherwise the occlusal patterns in the first two molars are comparable.

Comparative Measurements (in mm.)

	Protozapus intermedius Type	*Protozapus intermedius* Others	*Sminthozapus janassyi* [12])
$P\underline{4}$, L:	0,5	—	0,7
W:	0,5	—	0,7
$M\underline{1}$, L:	1,2	—	1,0—1,3
W:	1,0	—	0,8—1,0
$M\underline{2}$, L:	1,0	—	0,9—1,3
W:	0,9	—	0,7—0,9
$M\overline{1}$—$M\overline{3}$, alveolar length	—	2,9	3,1—3,5
$M\overline{1}$, L:	—	1,0—1,1	1,0—1,3
W:	—	0,8—0,9	0,7—1,0
$M\overline{2}$, L:	—	1,2	1,0—1,4
W:	—	0,9	0,7—1,0

Comparisons and relationships: *Protozapus* may be compared to *Plesiosminthus* on the one hand, and to the generic group formed by *Sminthozapus*, *Pliozapus*, and *Eozapus* on the other. *Protozapus* differs from *Plesiosminthus* (SCHAUB, 1930a; WILSON, 1960, etc.) in transverse compression of the protocone in $M\underline{2}$. This results in a lack of a distinct internal embayment, and the flatness of the tooth wall is like that in *Sminthozapus*. In $M\overline{1}$, *Protozapus* differs little from that of *Plesiosminthus* except perhaps in the more frequent absence of anteroconid, and the more chevron-shaped alignment of protoconid-metaconid. $M\overline{2}$ is larger than $M\overline{1}$, and this size relation may be more characteristic of *Pliozapus* than of *Plesiosminthus*. *Protozapus* is, in general, more advanced than *Plesiosminthus*.

Comparisons with *Pliozapus* (WILSON, 1936; SHOTWELL, 1956) are difficult to make because the American genus is known only by relatively worn lower dentitions. Geographic separation makes it improbable that the two are related at a generic level. Of the genera known by comparable material, *Protozapus* seems related to the Recent *Eozapus*, but can be distinguished through its relatively short $M\underline{2}$, and close to the Pliocene genus *Sminthozapus* of Poland (SULIMSKI, 1962, 1964). In comparison with the Polish genus, *Protozapus* differs in: (1) relatively short $M\underline{2}$, (2) no "pseudoprotoloph" in $M\underline{2}$, and (3) no protostylid spur in $M\overline{2}$.

[12]) After SULIMSKI, 1964.

Megasminthus of North America (Klingener, 1966) differs from *Protozapus* in several features including isolation of protocone in M1—M2, and larger size.

Sulimski (1964, p. 233) regards *Sminthozapus* as a steppe form related to more eastern types such as *Pliozapus* and *Eozapus*. Klingener (1966, p. 8) supports this view and says: "Perhaps *Sminthozapus, Pliozapus,* and *Eozapus* belong to a rather isolated subgroup of zapodines centered in Asia, with a history extending at least as far back as the early Pliocene." *Protozapus* seems to be a representative of this same group.

Family Cricetidae

The Kohfidisch cricetids are relatively abundant, but only a single hamster or hamsterlike species is present. This is a species closely allied to members of *Kowalskia*, a genus recently named and described by Fahlbusch (1969). The relatively well-preserved specimens from the Burgenland locality suggest that the Kohfidisch species, and hence *Kowalskia* as well, is a primitive, but genuine cricetinine. So far at least, there is no trace of the typical mid-Tertiary cricetodontines.

We are tentatively referring the genus *Prospalax* to the Cricetidae, following the views of Petter (1961) and others on the systematic position of the spalacids. Our own studies suggest the correctness of Petter's position, at least as it applies to the systematic position of *Prospalax* itself.

Kowalskia fahlbuschi, nov. spec.

(Figures 12, 57, 58, 59)

The species is named in honor of Dr. Volker Fahlbusch, in recognition of his outstanding work on fossil Cricetidae.

Holotype: Left maxillary with M1—M3, Colls. Museum of Natural History, Vienna, Div. Geol. Paleont., No. 1970/1393.

Referred Specimens: Numerous, but usually fragmentary, upper and lower jaws.

Geologic Age and Locality: Early Turolian (= Pikermian) fissure deposits near Kohfidisch, southern Burgenland.

Diagnosis: Slightly smaller than *Kowalskia magnus*, and larger than *K. polonica*. Posterior paracone spur on M1.

Description: The root of the zygomatic plate is somewhat concave. At its base, and just behind the constricted, ventral part of the entrance to the infraorbital canal, is a scar for origin of a slip of the masseter. The incisive foramina terminate immediately anterior to the forward root of M1.

The first upper molar is sometimes three-rooted with broad inner root, or less often, a four-rooted tooth (about 30 per cent of the specimens). The anterocone is divided into two distinct cusps by grooves fore and aft, but principally behind, of which the external is the larger. This pair is lightly joined to the trigon at the midpoint between paracone and protocone. A minute accessory cusp may be present on the outer border of the tooth between paracone and metacone. A pit or lake is isolated between the protocone and paracone by crests originating principally from the protocone. A rather pronounced spur (paracone spur) runs posteroexternally from the paracone in some specimens, but may be nearly absent in others. A mesoloph is present which remains free of the metacone so that the posterior pit or lake is more or less open anteriorly. The posteroloph reaches to the posterior surface of the metacone, but this cusp also joins the posteroloph more internally, so that a small, secondary pit may be present posteroexternal to the main pit.

The second upper molar has four roots, and is distinctly smaller than $M\underline{1}$. An anterior cingulum, divided into external and internal sections by a connection with the trigon, is present. The pattern is similar to that of the posterior half — that less the anterior lobe — of $M\underline{1}$, except that the posterior pit is more enclosed anteriorly.

The three-rooted, third upper molar is relatively large, but with narrowed talon. Consequently, the hypocone and metacone are both reduced, but the former is larger, sometimes considerably larger, and may occasionally approach the protocone in size. Enclosed anterior and posterior pits are present. Accessory crests of variable development may enclose other smaller basins. The internal part of the anterior cingulum is absent in some specimens.

The lower jaw is strongly curved along its lower border in the manner of *Cricetus kormosi*. The mental foramen lies immediately beneath the anterior root of $M\overline{1}$, but is not so near the dorsal surface as in the specimen of *C. kormosi* figured by SCHAUB (1930b, fig. 25).

The lower incisor is characterized by having two shallow furrows on the more anterointernal part of the enamel band. A somewhat similar condition on *Cricetus kormosi* is described by SCHAUB (ibid., p. 42) as distinguishing this species from Quaternary hamsters.

The first lower molar has an anteroconid which, in little-worn teeth, has a divided tip, mostly by incision from behind. In worn teeth this division may be obliterated. Usually, the external one of the anteroconids connects with the anterior yoke of the protoconid-metaconid pair of cusps, but the connection may be double, with both anteroconids directly and independently connected. The mesolophid is relatively well-developed and transversely directed. Strong cingula close off the external valleys.

In $M\overline{2}$, the mesolophid is also usually transversely directed and independent, but it can join the metaconid to wall off the trigonid pit posteriorly. As in $M\overline{1}$, strong external cingula are present.

The third lower molar may be slightly smaller than $M\overline{2}$, the same size, or even slightly larger. The mesolophid touches the metaconid, but may also continue internally to the inner margin of the tooth. An anterointernal cingulum is present which is more strongly developed than in $M\overline{2}$ where it is reduced to the vanishing point.

Measurements (in mm.)

	Type Specimen	Others
$M\underline{1}-M\underline{3}$, L:	5,4	5,0—5,4
$M\underline{1}$, L:	2,3	2,1—2,3
W:	1,5	1,5
$M\underline{2}$, L:	1,8	1,5—1,8
W:	1,5	1,5
$M\underline{3}$. L:	1,6	1,4—1,5
W:	1,5	1,4—1,5
$\overline{I}$, ap:	—	1,9
tr:	—	1,2
$M\overline{1}-M\overline{3}$, L:	—	5,3—5,8
$M\overline{1}$, L:	—	2,0—2,2
W:	—	1,3—1,4
$M\overline{2}$, L:	—	1,7—1,8
W:	—	1,3—1,5
$M\overline{3}$, L:	—	1.75—1.9
W:	—	1,3—1,5

Comparisons and relationships: The Kohfidisch cricetid seems to be a primitive cricetinine related most closely to *Cricetus kormosi* SCHAUB (Hungary), to the recently (1969) described *Kowalskia polonica* and *K. magna* FAHLBUSCH (Poland), and to undescribed material from Eichkogel (Vienna Basin) now being studied by Dr. G. DAXNER. All localities are Turolian or Astian.

The Kohfidisch species suggests assignment to the cricetinines in possessing a concave zygomatic plate, and a strongly curved inferior border to the lower jaw. Moreover, the dental pattern has a strong resemblance to various Quaternary members of this group.

Kowalskia fahlbuschi resembles *Cricetus kormosi* to a marked degree, including having slightly grooved lower incisors, but differs in somewhat smaller size, better developed mesolophs and mesolophids, more frequent closure of the anterior pit of $M\underline{1}$ and poorer closure of the posterior pits of $M\underline{1}-M\underline{2}$, the usual development of a posterior spur on the paracone of $M\underline{1}$, and the less frequent presence of divided inner roots on $M\underline{1}$ (30 per cent rather than 50 per cent). Of these differences, only the closure of the anterior pit of $M\underline{1}$ suggests a more advanced species than *C. kormosi*. The presence of the paracone spur is probably a specialization not indicative of geological age, and the remaining features suggest a slightly older stage of evolution at Kohfidisch.

Still fewer differences separate *K. fahlbuschi* from *K. polonica* and *magna*. The most certain distinctions are one of size. *K. polonica* is smaller, *K. magna* slightly larger than the Austrian species. Otherwise, several inconsistent dental features suggest some further distinctions, the most important of which is the presence of a paracone spur on $M\underline{1}$ of *K. fahlbuschi*. Resemblance to *K. magna* is closer than to *K. polonica*. As a matter of fact, measurements indicate little if any size distinction from *K. magna*, if our measurements are compared with those made by FAHLBUSCH (1969). Direct inspection, however, establishes a size distinction more evident than in the measurements. According to FAHLBUSCH (oral communication), the Eichkogel cricetid is more like *K. polonica*, but perhaps slightly larger.

Kowalskia fahlbuschi is approximately the size of *Allocricetus bursae* (SCHAUB, 1930b), but differs in: usual lack of an anterior notch in the anteroconid of $\overline{M1}$, better-developed mesolophs and mesolophids (mesolophids often completely lacking in *Allocricetus*), damming of posterior pit of upper molars by hypolophule I rather than by mesoloph, which remains free, and grooving of the lower incisors. SCHAUB states (ibid., p. 33) that the dentition of *Allocricetus* is entirely comparable to *Cricetulus*. *Kowalskia fahlbuschi* is less closely related to *Allocricetus* and *Cricetulus* than to *Cricetus kormosi*, and other species of *Kowalskia*.

Perhaps *Cricetus kormosi* should be transferred to the genus *Kowalskia*, but it would be premature for us to do so on the basis of our limited studies.

?Family Cricetidae

Prospalax petteri, nov. spec.

(Figures 66, 66a, 66b, 68, 69, 70)

This species is named in honor of Professor F. PETTER in recognition of his work on the relationships of cricetids and spalacids.

Holotype: Fragmentary right lower jaw with $\overline{M1}$—$\overline{M3}$, Colls. Museum of Natural History, Vienna, Div. Geol. Paleont., No. 1970/1394.

Referred Specimens: several isolated cheekteeth, a maxillary with $\underline{M1}$—$\underline{M3}$, another with $\underline{M1}$—$\underline{M2}$, and two additional fragments of lower jaw.

Geological Age and Locality: Early Turolian (= Pikermian) fissure deposits near Kohfidisch, southern Burgenland.

Diagnosis: Approximate size of *Prospalax priscus*, but lower jaw less robust; larger, and with more specialized jaw than in *Anomalomys gaudryi*. $\overline{M1}$ more elongate than in *Pliospalax*. Development of sigmoid pattern in cheekteeth intermediate between *A. gaillardi* and *P. priscus*.

Description: After wear, the first upper molar [13]) has a simple sigmoid pattern with anterointernal and posteroexternal folds. A relatively unworn left $\underline{M1}$ reveals more detail. The anterior part of the sigmoid pattern is isolated as an L-shaped loph. The anterolabial end of the posterior loph is elongate with a distinct posterior cusp (mesostyle). Behind, and clearly separated from this cusp, are two transversely-placed cusps (metacone and metaconule ?), which with continued wear unite posteriorly with the external termination of the sigmoid pattern. The second upper molar is more quadrate in outline than the first, but has the same sigmoidal pattern. An enamel lake is present at the labial end of the oblique part of the sigmoid. A more worn $\underline{M2}$ has the external

[13]) For purposes of description, we use the formula 0.0.0.3 rather than 0.0.1.2.

fold isolated. M3, in a worn tooth, shows a central, elongated lake, with two small, vestigial lakes or pits external to it. The upper molars are three-rooted so far as can be determined.

The lower jaw in all of our specimens is incompletely preserved. It seems to be less massive, less specialized than in *P. priscus* (Sulimski, 1964, pl. 11), but more so than in *Anomalomys gaudryi*. The mental foramen is posterior in position, being under the anterior part of M1. The masseteric crest extends forward to the posterior part of M1. The ascending ramus originates opposite the middle of M2, and seems to be externally displaced. Although incompletely preserved, the capsular process of the incisor appears to have been prominent and high in position.

The lower incisor shows two faint ribs on the anterior enamel face with an intervening, almost flat area. Possibly a third rib is present at the antero-internal edge of the incisor, but if so, it is very faint. Similarly developed ribs are present in both *Anomalomys* and *Prospalax* (Fejfar, 1964, fig. 32).

The first lower molar, in a relatively unworn state, has an anteroexternal fold extending to the inner margin, and opposing posteroexternal and internal folds meeting at about the midpoint (at a very early stage of wear, the dentine isthmus was probably cut through). The relatively narrow anterior lobe or loph may be, as it is in the type specimen, isolated in early wear. A crescentic enamel lake is present in this lobe. In a highly worn stage, the pattern is reduced to a long, obliquely placed, enamel lake in the anterior half of M1, a very shallow internal fold at the midpoint of the tooth, and a strong posteroexternal fold.

The second lower molar, when relatively little worn, has three independent, somewhat curved and obliquely aligned lophs. The anterior and middle lophs have short reentrant folds on their anterointernal borders. As wear progresses, union of the lophs takes place both labially and lingually between the anterior two lophs, thus isolating a lake, and lingually between the two posterior lophs. An open posteroexternal fold, however, remains as a persistent feature, although in advanced wear the fold may extend only halfway across the tooth surface, the remainder of the fold being isolated as a posterointernally situated enamel lake.

The third lower molar, in our most unworn specimen, exhibits anterior and posterior lophs, the former bifurcate internally. The internal reentrant fold responsible for the Y-shape of the anterior loph, is soon isolated as a lake. The posterior loph is a simple, transverse crest, independent at first, but quickly uniting with the anterior loph at the internal border. A pattern of isolated anterior lake, and deep posteroexternal fold is persistent in wear.

Comparisons and relationships: *Prospalax petteri* is clearly more advanced in dentition, jaw structure, and size than *Anomalomys gaudryi*, type of *Anomalomys*, and it is less advanced in dentition, and probably jaw structure, although agreeing in size, than *Prospalax priscus*, type of *Prospalax*. Although intermediate, *P. petteri* seems closer to *P. priscus* than to *A. gaudryi*, and consequently the new species is assigned to *Prospalax* rather than to *Anomalomys*.

Anomalomys gaudryi is from the upper Miocene (Vindobonian and Sarmatian), whereas *P. priscus* is recorded from upper Pliocene (Astian) and lower Pleistocene (Villafranchian) deposits. *Anomalomys gaillardi* (HARTENBERGER and THALER, 1963) from the uppermost Miocene or lowermost Pliocene (lower Pontian or Vallesian) is, as would be expected, closer to *P. petteri* than is *A. gaudryi* (SCHAUB and ZAPFE, 1953). It is of an equivalent size in dentition, although perhaps slightly smaller, and worn teeth of *P. petteri* are identical with some stages of wear in *A. gaillardi*. There are pattern differences, however, that distinguish the two as given in the specific diagnosis, and in these *P. petteri* has advanced toward *P. priscus*.

VIRET and SCHAUB (1946, fig. 7) figured and identified an $M\overline{2}$ fromPolgárdi as *Anomalomys* sp., stating that it was more hypsodont, more simplified in structure, and larger than that of *A. gaillardi* from Montredon. In size, this $M\overline{2}$ is larger than one $M\overline{2}$ from Kohfidisch, but no larger than a second. The second lobe of the Polgárdi tooth, with slight additional wear, will connect with the third in the middle of the tooth rather than internally as in *P. petteri* and *P. priscus*. Hence, in this instance, the Kohfidisch species may be more advanced than that from Polgárdi, the only case among the microfauna in which this is true. This circumstance, certain pattern distinctions in $M\overline{1}$ of *P. priscus* as compared with *P. petteri*, and the lack of much overlap of the ranges of *Anomalomys* and *Prospalax* suggest caution in supposing a simple evolutionary line from *A. gaudryi* to *P. priscus*. As a matter of fact, the dominantly eastern, southeastern distribution in Europe of *Prospalax* suggests a rodent invading from the east together with the murines, shrews, *Hipparion*, and others.

More material, however, may do away with some discrepancies. Patterns in spalacids are highly variable with wear so that conditions in small samples may be misleading. The junior author is convinced that *Anomalomys* and *Prospalax* are closely related, and that some sort of an ancestor-descendant relationship exists. That there is a close superficial resemblance can be seen by the fact that STROMER (1928) described two species from Großlappen bei München, *Miospalax monacensis*, n. gen. and sp., and *Anomalomys gaudryi*. The former was based largely on worn uppers, the latter on less worn lowers. VIRET and SCHAUB (1946) stated these were synonyms, and the present junior author reached, independently, the same conclusion. KORMOS also, identified in the Polgárdi fauna *Spalax* (*Microspalax*) which is the *Anomalomys* sp. of VIRET and SCHAUB (KRETZOI, 1952).

Anomalomys has been regarded universally as a member of the Cricetidae (Muroidea). *Prospalax* has been assigned usually with *Rhizospalax* and *Pliospalax* to the Spalacoidea. Recently, PETTER (1961) has maintained that *Spalax* is a cricetid related to *Anomalomys*. HARTENBERGER and THALER (1963), and MEIN (1967) have furnished data supporting this view. Less

Comparative Measurements (in mm.)

	Prospalax petteri Type	Others	*Prospalax priscus* [14]	*Pliospalax simionescui* [15]	*Anomalomys* sp. Polgárdi	*Anomalomys gaillardi* [16]	*Anomalomys gaudryi* [17]
$M\underline{1}-M\underline{3}$, L (alveolar):	—	5,5	6,0—7,5	—	—	—	—
$M\underline{1}-M\underline{3}$, L (occlusal):	—	5,0	4,7—6,8	—	—	—	—
$M\underline{1}$, L:	—	2,0	1,7—2,5	—	—	1,85—1,88	1,70—1,84
W:	—	1,5	1,4—2,0	—	—	1,35—1,62	1,30—1,50
$M\underline{2}$, L:	—	1,6	1,6—2,2	—	—	1,70	1,48—1,64
W:	—	1,5	1,3—2,0	—	—	1,53	1,26—1,60
$M\underline{3}$, L:	—	1,0	1,3—1,9	—	—	1,25	1,18—1,20
W:	—	1,1	1,1—1,6	—	—	1,10	1.02—1,14
Depth of lower jaw beneath $M\overline{1}$ (external):	—	5,3	—	—	—	—	—
Depth of lower jaw beneath $M\overline{2}$ (internal):	—	4,3	—	—	—	—	—
$M\overline{1}-M\overline{3}$, L (alveolar):	5,9	6,5	6,0—9,0	—	—	—	—
$M\overline{1}-M\overline{3}$, L (occlusal):	5,1	6,3	4,8—7,0	7,0	—	—	—
$M\overline{1}$, L:	1,9	2,4	1,7—2,6	2,3	—	2,00—2,02	1,66—1,86
W:	1,4	1,7	1,3—2,8	1,6	—	1,42—1,46	1,16—1,46
$M\overline{2}$, L:	1,8	2,4	1,6—2,4	2,1	2,2	1,58	1,56—1,86
W:	1,6	1,9	1,3—2,0	1,6	1,7	1,25	1,26—1,60
$M\overline{3}$, L:	1,5	1,7	1,4—2,0	1,9	—	1,54—1,71	1,30—1,60
W:	1,3	1,6	1,2—1,6	1,6	—	1,16—1,53	—

[14]) SULIMSKI (1964).
[15]) KORMOS (1932).
[16]) HARTENBERGER and THALER (1963).
[17]) SCHAUB and ZAPFE (1953).

attention has been paid to the relation of *Prospalax* (except THALER, 1966, p. 262) to *Anomalomys*, although workers have all stressed the close relationship of *Prospalax* to *Spalax*.

STEHLIN (1923) argued that the dental formula of *Rhizospalax* was $\overline{1}$, $\overline{0}$, $\overline{1}$, $\overline{2}$ rather than $\overline{1}$, $\overline{0}$, $\overline{0}$, $\overline{3}$, on the basis of a supposed milk tooth, and a specimen with an errupting P$\overline{4}$ with alveoli for M$\overline{1}$—M$\overline{2}$ behind it. Additional specimens, unknown to STEHLIN, seem to confirm his argument. STEHLIN applied his formula to the Spalacidae on the basis of the supposed relationship of *Rhizospalax*, and suggested that the same dental formula might also apply to the Muroidea. In the opinion of the junior author, however, if *Rhizospalax* has the dental formula $\overline{1}$, $\overline{2}$, then it is not related to *Anomalomys* or to *Prospalax*. It seems much easier to regard *Rhizospalax* as an aberrant offshoot of a primitive group with dental formula $\overline{1}$, $\overline{0}$, $\overline{1}$, $\overline{3}$, than to make its formula basic for the Muroidea. Inspection of literally thousands of cricetid jaws from the Oligocene has shown no indication of a DP$\overline{4}$, nor do the few Late Eocene rodents with three cheekteeth. A last point in this relationship is that *Anomalomys*, *Prospalax*, and *Spalax* all show characteristic ridges in the lower incisor, and *Rhizospalax* (STEHLIN, 1923) does not.

Family Muridae

Murines are common at Kohfidisch. Two genera seem represented, *Progonomys* and *Parapodemus*. FREUDENTHAL and SONDAAR (1964) have suggested that murines are not present until Turolian time. On the other hand, according to HARTENBERGER, MICHAUX, and THALER (1967), the Vallesian of France and Spain is represented by *Progonomys* only; the lower Turolian by a *Progonomys-Parapodemus* level of evolution; and the upper Turolian by a *Parapodemus-Apodemus* stage. If these latter conditions hold for middle Europe, Kohfidisch is evidently early Turolian. In either case, it is Turolian (= Pikermian).

Progonomys woelferi, nov. spec.

(Figures 11, 51, 51a, 52, 53, 54, 55)

The specific name is in honor of Mr. SEPP WÖLFER, Kohfidisch, discoverer of the fissure deposits at this locality.

Holotype: Maxillary fragment with M$\underline{1}$—M$\underline{2}$, Colls. Natural History Museum, Vienna, Div. Geol. Paleont., No. 1970/1395.

Referred Material: Numerous fragmentary upper and lower jaws.

Geological Age and Locality: Early Turolian (= Pikermian) fissure deposits near Kohfidisch, southern Burgenland.

Diagnosis: Larger than *Progonomys cathalai* by approximately 15 per cent. M$\underline{1}$ and M$\underline{2}$ three-rooted, but may have broad inner root with sulcus.

Perhaps a slightly greater approach to stephanodonty than in *P. cathalai* (cusps 6 and 9 may be closer together). M$\overline{1}$ without, or with only rudimentary anterior cuspule.

Description: In the first upper molar, cusps 2 and 3 are opposite each other, but cusp 1, which is usually larger than 3, is distinctly posterior in position. Its anterior edge is about opposite the posterior edge of 3. Cusp 6 is somewhat posterior to 5, but anterior to 4. Cusp 9 is usually smaller than 6, and well separated from it. Cusp 4 may be joined to 8 by a narrow crest, but no cusp 7 is present. A distinct posterior cingulum is present.

In the second upper molar, cusp 1 is much larger than 3, 2 is absent, and cusp 4 is distinctly larger than 9. Cusps 6 and 9 are distinctly separated, but 4 and 8 are connected by the usual narrow crest. A small posterior cingulum is present, relatively smaller than in M$\underline{1}$.

In the third upper molar, cusp 2 is absent, and cusp 3 minute. Cusps 4—5—6—8—9 are all joined in more or less of a stephanodont chain. Cusps 6 and 9 are relatively small and close together, whereas 4 and 8 are large and relatively far apart.

All three upper molars are three-rooted, the inner root not progressing in any known case beyond a broad root with sulcus.

The first lower molar is characterized by lack of a prominent anteromedian cuspule. Generally this cuspule is absent or represented only by a low strip of cingulum between the anterior edges of the anterior cusps. In only a small number of specimens can a cuspule be described as actually present, and even in these cases it is tiny. The anterior four cusps tend to join in the middle of the tooth but slightly to the inside, and to remain separate from the posterior pair of cusps. There are essentially two external accessory cuspules. One is along side of the posterior pair of cusps, and the second, of more variable development, is situated between the anterior and second pair. Sometimes a third accessory cuspule is present between these two. The posterior cingulum is moderately developed between the posterior pair of cusps.

The second lower molar has the usual two sets of paired cusps plus accessory cuspules. The principal accessory is at the anteroexternal border of the tooth. Smaller, more variable, cuspules may be present along the external cingulum.

The third lower molar has paired cusps anteriorly, and a single, broad cusp posteriorly. An accessory, cingular cuspule is present on the anteroexternal border of the tooth.

Comparisons and relationships: The common species of murine in the Kohfidisch fauna seems to lack stephanodonty, or to have only the beginnings of it, and hence to belong to the genus *Progonomys*. From *P. cathalai* (Schaub, 1938), it is to be distinguished by slightly larger size (approximately 15 per cent longer than type M$\overline{1}$), and perhaps cusps 6 and 9 are closer together, evidence of somewhat more stephanodonty. M$\underline{1}$ and M$\underline{2}$ are three-rooted, although some individuals may have a broad inner root with sulcus, a distinguishing feature from Kohfidisch specimens assigned to *Parapodemus cf. P. lugdunensis*.

Comparative Measurements (in mm.)

	Progonomys woelferi Type Specimen	Others	*Progonomys cathalai* [18]
M1 – M3, L (occlusal):	—	4,2	—
M1 – M3, L (alveolar):	—	4,6	—
M1, L:	2,3	1,8 – 2,3	2,0 – 2,1
W:	1,6	—	—
M2, L:	1,6	1,3 – 1,7	1,4
W:	1,5	—	—
M3, L:	—	1,0 – 1,2	1,0
M1 – M3, L (occlusal):	—	4,5 – 4,7	—
M1 – M3, L (alveolar):	—	4,5 – 4,9	—
M1, L:	—	1,8 – 2,0	1,7 – 1,8
M2, L:	—	1,4 – 1,6	1,3
M3, L:	—	1,1 – 1,25	1,0

Progonomys woelferi is probably a species without further issue. It seems possible, however, that the morphologic level of *Parapodemus* was reached more than once, in which case some of the later species of *Parapodemus* may prove to be descendants.

Parapodemus cf. P. lugdunensis SCHAUB 1938
(Figure 56)

Distinctly less common than *Progonomys woelferi* is a species seemingly to be assigned to *Parapodemus*, and perhaps nearest to *P. lugdunensis* (SCHAUB, 1938). *P. lugdunensis*, or something similar to it, seems characteristic of the Turolian or Pikermian. The Kohfidisch specimens consist of several maxillary fragments (three with M1), and some uncertainly assignable lower jaws.

Parapodemus cf. P. lugdunensis is somewhat smaller than *Progonomys woelferi*, and in M1, cusps 6 and 9 are connected in an early stage of wear. Moreover, at least one M2 is four-tooted, whereas in *P. woelferi*, this tooth is never truly four-rooted.

The Kohfidisch species is approximately the size of *P. lugdunensis*, but cusp 9 is not so anterior. However, *P. cf. lugdunensis* (THALER, 1966, p. 126) from Los Mansuetos is not far different in position of this cusp.

A reference of the Kohfidisch species to *Parapodemus schaubi* (PAPP, 1947) is perhaps possible, with *P. lugdunensis* being a western, and *P. schaubi* an eastern species. Among the smaller lower jaws from Kohfidisch, however,

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[18]) After SCHAUB, 1938.

which may be assignable to *Parapodemus*, only one has an M$\overline{1}$ with a distinct anterior cuspule, and the relative size and position of cusps in M$\underline{1}$ seem closer to *P. lugdunensis*. The four-rooted M$\underline{2}$ seems a distinction from both *P. lugdunensis* and *P. schaubi*.

The presence of *Parapodemus* in the Kohfidisch fauna suggests an evolutionary stage which is post-Vallesian.

Measurements (in mm.)

M$\underline{1}$—M$\underline{3}$, L:	4,0
M$\underline{1}$, L:	2,0
W:	1,2—1,25
M$\underline{2}$, L:	1,4
W:	1,25
M$\underline{3}$, L:	1,0
	0,9
M$\overline{1}$—M$\overline{3}$, L (alveolar):	3,9—4,3
M$\overline{1}$—M$\overline{3}$, L (occlusal):	4,4
M$\overline{1}$, L:	1,8 [19])—2,0
W:	1,1 [19])—1,2
M$\overline{2}$, L:	1,3—1,5
W:	1,1—1,2
M$\overline{3}$, L:	1,0—1,2
W:	1,0—1,1

Family Hystricidae

Hystrix cf. H. suevica Schlosser 1884

Four isolated upper cheekteeth, tentatively identified as P$\underline{4}$, M$\underline{1}$, M$\underline{2}$ or M$\underline{3}$, and M$\underline{3}$, indicate the presence of a small species of *Hystrix*, seemingly close to *H. suevica* (Schlosser, 1884, 1902) in size. The species is distinctly smaller than *H. primigenia,* and somewhat smaller than *H. cristata* (Sulimski, 1960, p. 327, and table 1). The teeth are moderately hypsodont, with distinct roots.

Hystrix primigenia, as figured by Sulimski (1960, fig. 1) has an "anterior lobe" in P$\underline{4}$ lacking in P$\underline{4}$? of *H. cf. H. suevica*. The little-worn "P$\underline{4}$" of *H. suevica* figured by Schlosser (1902, pl. I, fig. 11) is much like our M$\underline{3}$?, insofar as one can judge from the figure. The cheekteeth from Kohfidisch, however, have free mesolophs even when, as in M$\underline{1}$?, the internal reentrant fold is nearly isolated. In *H. suevica, primigenia,* and *cristata,* some fusion of the mesoloph crest seems characteristic.

In sum, the Kohfidisch species is closer to *Hystrix suevica* of the fissures of Salmendingen, where the hystricid material is associated with *Dipoides problematicus*, than to other species of *Hystrix*, although perhaps not identical with any.

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[19]) With distinct anteroconid cuspule.

		Measurements (in mm.)
$P\underline{4}$?,	L:	7,9
	W:	7,9
$M\underline{1}$?,	L:	6,7
	W:	7,3
$M\underline{2}$?/$M\underline{3}$?,	L:	7,1
	W:	6,4
$M\underline{3}$?,	L:	6,8
	W:	6,9

Rodentia, genus and species indet.

(Figures 63, 63a, 63b)

A prismatic and hypsodont cheektooth in the Kohfidisch collection is of extremely doubtful affinities. Opposing reentrant folds cut the tooth into three, narrowly-connected lobes. Assuming that this tooth is a left $M\overline{1}$, the external reentrants are shallower than the internal. The somewhat circular anterior lobe has a rounded external margin, but a triangular internal one. The middle lobe is anteroposteriorly compressed. The third lobe is not so compressed as the second, and a secondary reentrant partially subdivides it. Relict pit structures are present on the crown surface, indicating the presence of a previously more complicated occlusal pattern.

Measurements are: L, 2,1; W, 1,2 mm.

This tooth resembles somewhat the cheekteeth of *Trilophomys* and *Meriones* without being referable to either.

Summary

Fissure deposits near Kohfidisch in the Austrian province of Burgenland have produced a large fauna, especially of micromammalia. Of these small mammals, ten species are insectivores (four new), three are bats, one is a pika, and twelve species are rodents (one new genus, six new species). The micromammalia in the fissures accumulated as a result of predation and perhaps some occupation of the site by animals. The sample is drawn from varied habitats, and include relatively rare woodland and forest elements (*Pliosciuropterus*, *Muscardinus*), abundant steppe and grassland species (*Hystrix*, *Prospalax*, *Protozapus*, *Kowalskia*, *Anourosorex* and other shrews, and perhaps the murines), and some stream or lake border kinds of mammals (*Chalicomys*, *Desmana*, and possibly *Prolagus*). The general climate was warmer than now, or at least with milder winters, and possibly drier as well. The geological age is clearly Late Pannonian in terms of the Vienna Basin sequence, and seems early Turolian (= Pikermian) on a broader time scale as this age is represented in southwestern Europe.

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Explanation of the Plates

Plate: 1

Fig. 1 *Galerix exilis* (BLAINVILLE)
Right lower jaw with $P\bar{4}$-$M\bar{3}$.
Lateral view. 4,2×.

Fig. 1a *Galerix exilis* (BLAINVILLE)
Right lower jaw with $P\bar{4}$-$M\bar{3}$.
Lingual view. 4,2×.

Fig. 2 *Galerix zapfei*, nov. spec.
Right lower jaw with $P\bar{4}$-$M\bar{3}$.
Lateral view. 5,6×.

Fig. 3 *Anourosorex kormosi*, nov. spec.
Right lower jaw with $\bar{1}$, $\bar{2}$, $\bar{3}$.
Holotype.
Lateral view. 5,9×.

Plate: 2

Fig. 4 *Anourosorex kormosi*, nov. spec.
Left upper jaw with $P\underline{4}$-$M\underline{1}$.
Lateral view. 5,8×.

Fig. 4a *Anourosorex kormosi*, nov. spec.
Left upper jaw with $P\underline{4}$-$M\underline{1}$.
Occlusal view. 5,8×.

Fig. 5 *Desmana pontica* ? SCHREUDER
Right lower jaw with $I\bar{2}$, $P\bar{1}$-$P\bar{3}$.
Lateral view. 5,1×.

Fig. 5a *Desmana pontica* ? SCHREUDER
Right lower jaw with $I\bar{2}$, $P\bar{1}$-$P\bar{3}$.
Occlusal view. 5,1×.

Fig. 6 *Petényia dubia*, nov. spec.
Left lower jaw with $M\bar{1}$-$M\bar{3}$.
Holotype.
Lateral view. 11,4×.

Fig. 7 *Petenyiella ? repenningi*, nov. spec.
Right lower jaw with $M\bar{1}$.
Lateral view. 16,7×.

Plate: 3

Fig. 8 *Desmana pontica* ? SCHREUDER
Right lower jaw with $P\bar{1}$-$M\bar{2}$.
Lateral view. 6,3×.

Fig. 9 *Rhinolophus delphinensis* GAILLARD
Left lower jaw with $M\bar{1}$-$M\bar{3}$.
Lateral view. 6,5×.

Fig. 10 *Prolagus cf. P. oeningensis* (KÖNIG)
Left lower jaw with incisor.
Lateral view. 3,6×.

Fig. 11 *Progonomys woelferi*, nov. spec.
Left lower jaw with $\bar{I}$ and $M\bar{1}$-$M\bar{3}$.
Lateral view. 6,3×.

Plate: 4

Fig. 12 *Kowalskia fahlbuschi*, nov. spec.
Right lower jaw.
Lateral view. 4,2×.

Fig. 13 *Spermophilinus* cf. *S.bredai* (v. MEYER)
Right lower jaw with $P\bar{4}$.
Lateral view. 4,6×.

Fig. 14 *Muscardinus pliocaenicus austriacus*, nov. spec.
Right lower jaw with $P\bar{4}$-$M\bar{1}$.
Holotype.
Lateral view. 10×.

Fig. 15 *Peridyromys compositus*, nov. spec.
Left lower jaw with $\bar{I}$ and $M\bar{1}$-$M\bar{2}$.
Holotype.
Lateral view. 10×.

Plate: 5 (all stereographic pairs)

Fig. 16 *Galerix exilis* (BLAINVILLE)
Left lower jaw with $P\bar{2}$-$M\bar{3}$.
Lateral view. 3,3×.

Fig. 16a *Galerix exilis* (BLAINVILLE)
Left lower jaw with $P\bar{2}$-$M\bar{3}$.
Occlusal view. 3,3×.

Fig. 17 *Galerix zapfei*, nov. spec.
Right lower jaw with $P\bar{3}$-$M\bar{3}$.
Holotype.
Lateral view. 2,5×.

Fig. 17a *Galerix zapfei*, nov. spec.
Right lower jaw with $P\bar{3}$-$M\bar{3}$.
Holotype.
Occlusal view. 2,5×.

Fig. 18 *Galerix zapfei*, nov. spec.
Right lower jaw with $P\bar{4}$-$M\bar{3}$.
Occlusal view. 3,4×.

Fig. 19 *Galerix zapfei*, nov. spec.
Left lower jaw with $P\bar{3}$-$M\bar{1}$.
Lateral view. 3,5×.

Fig. 19a *Galerix zapfei*, nov. spec.
Left lower jaw with $P\bar{3}$-$M\bar{1}$.
Occlusal view. 3,5×.

Fig. 20 *Anourosorex kormosi*, nov. spec.
Right lower jaw with $\bar{1}$, $\bar{2}$, $\bar{3}$.
Holotype.
Lingual view. 3,4×.


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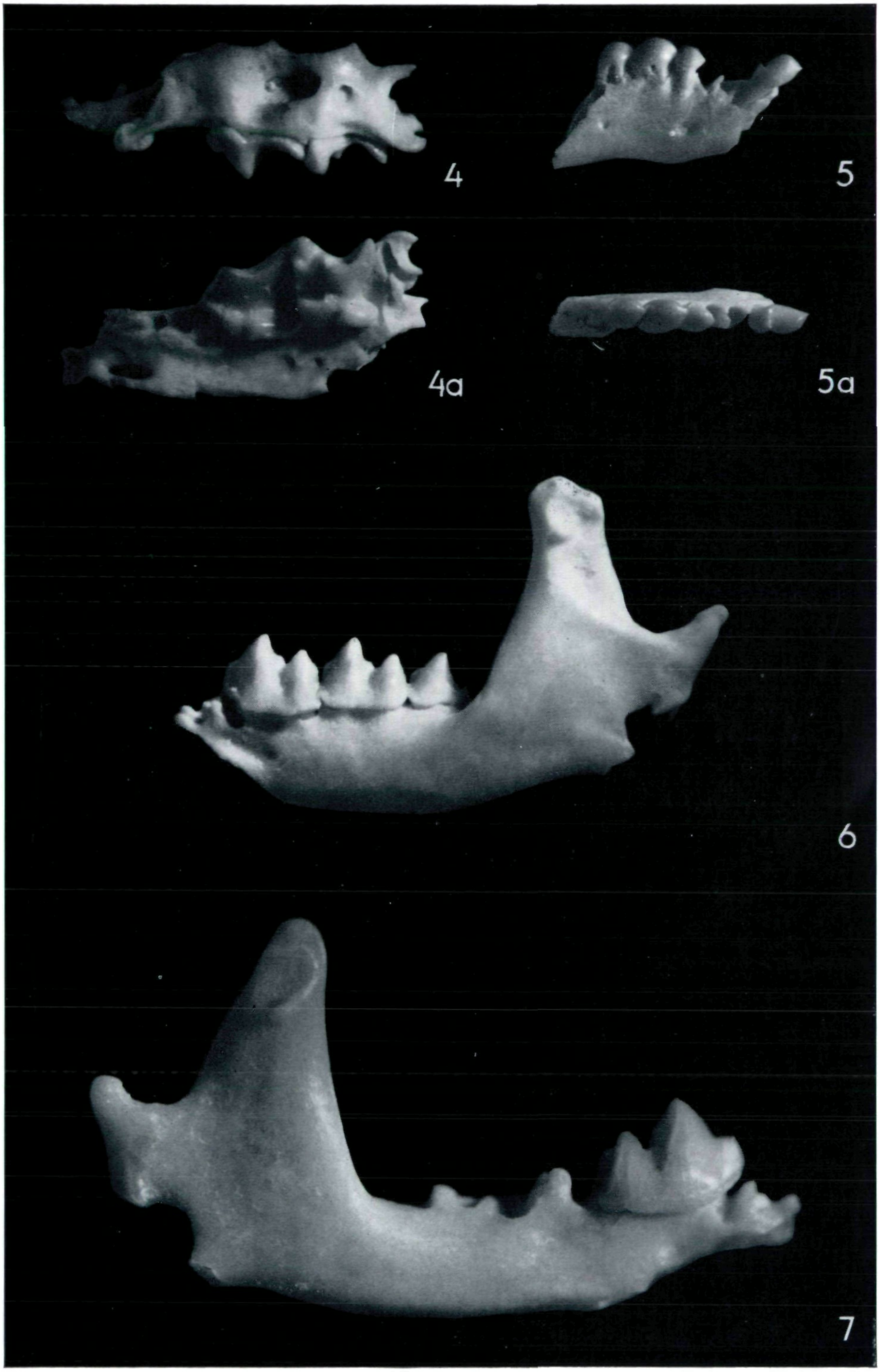
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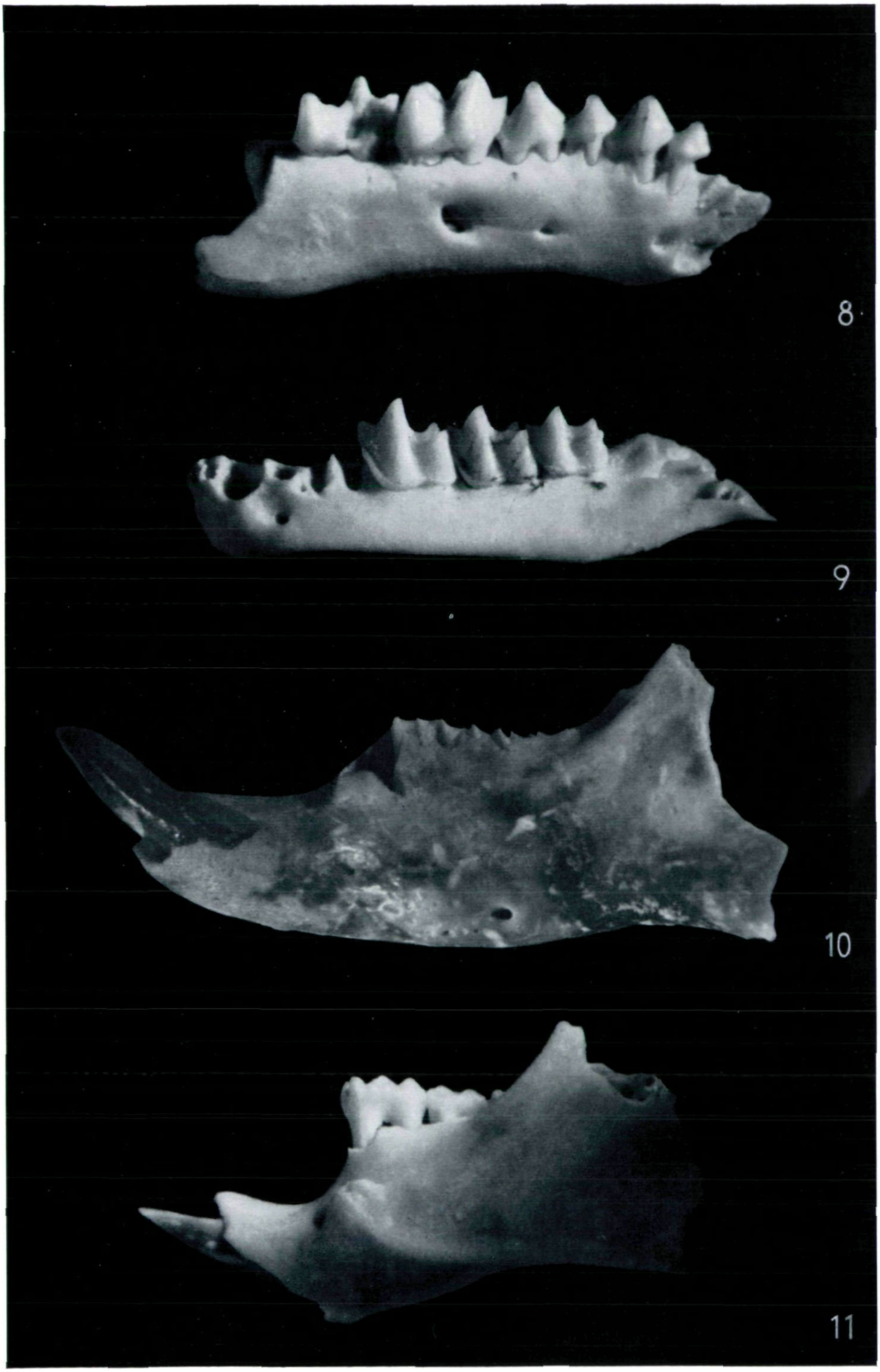
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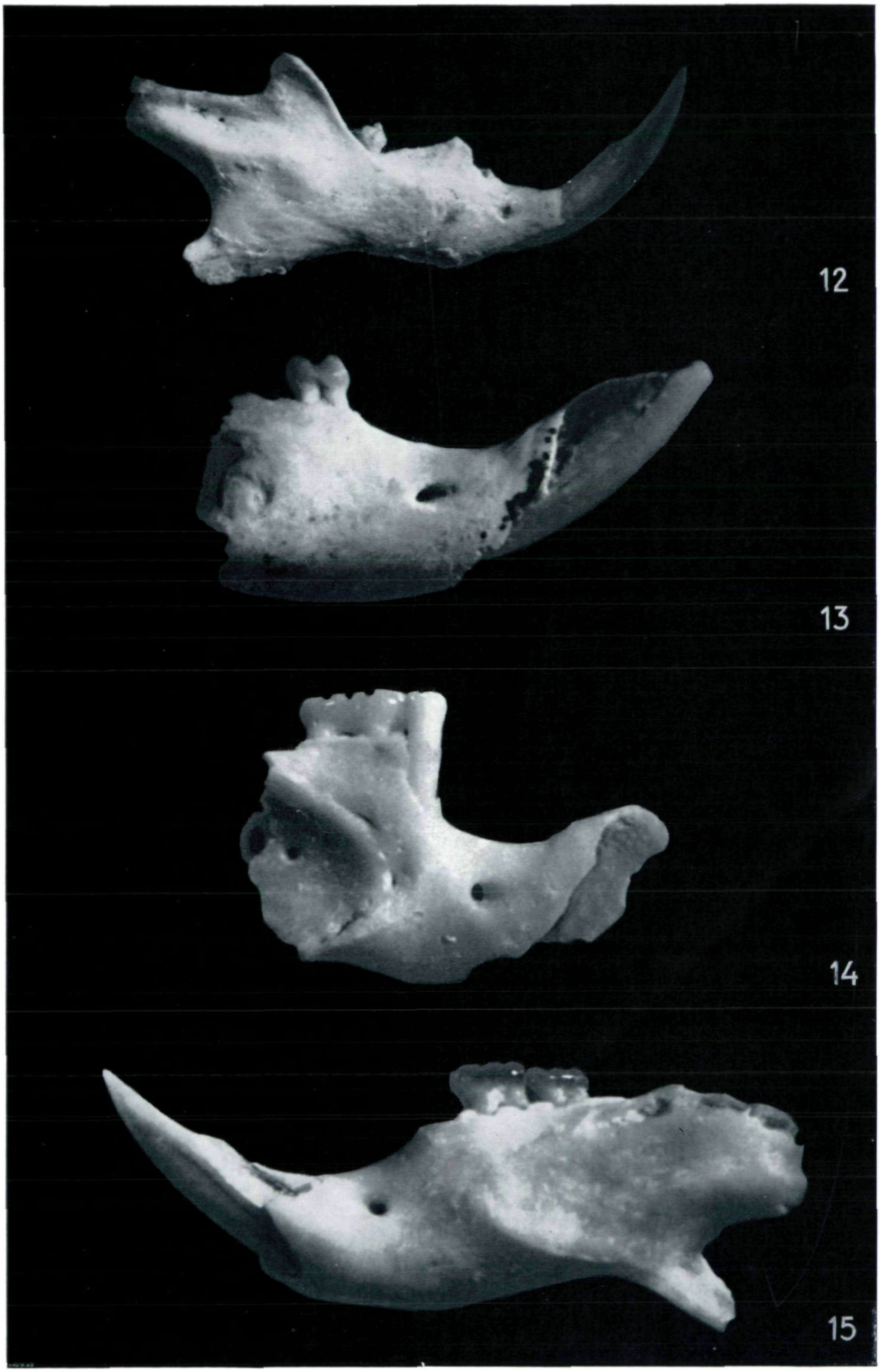
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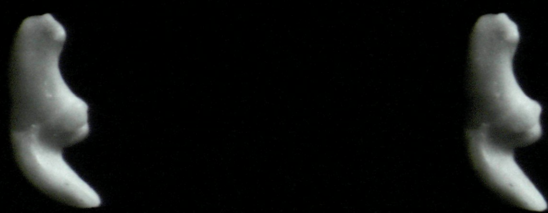

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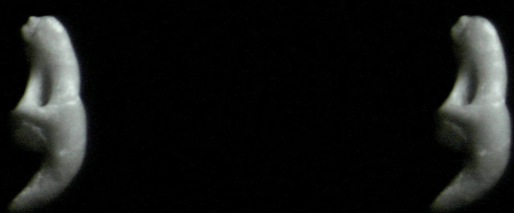

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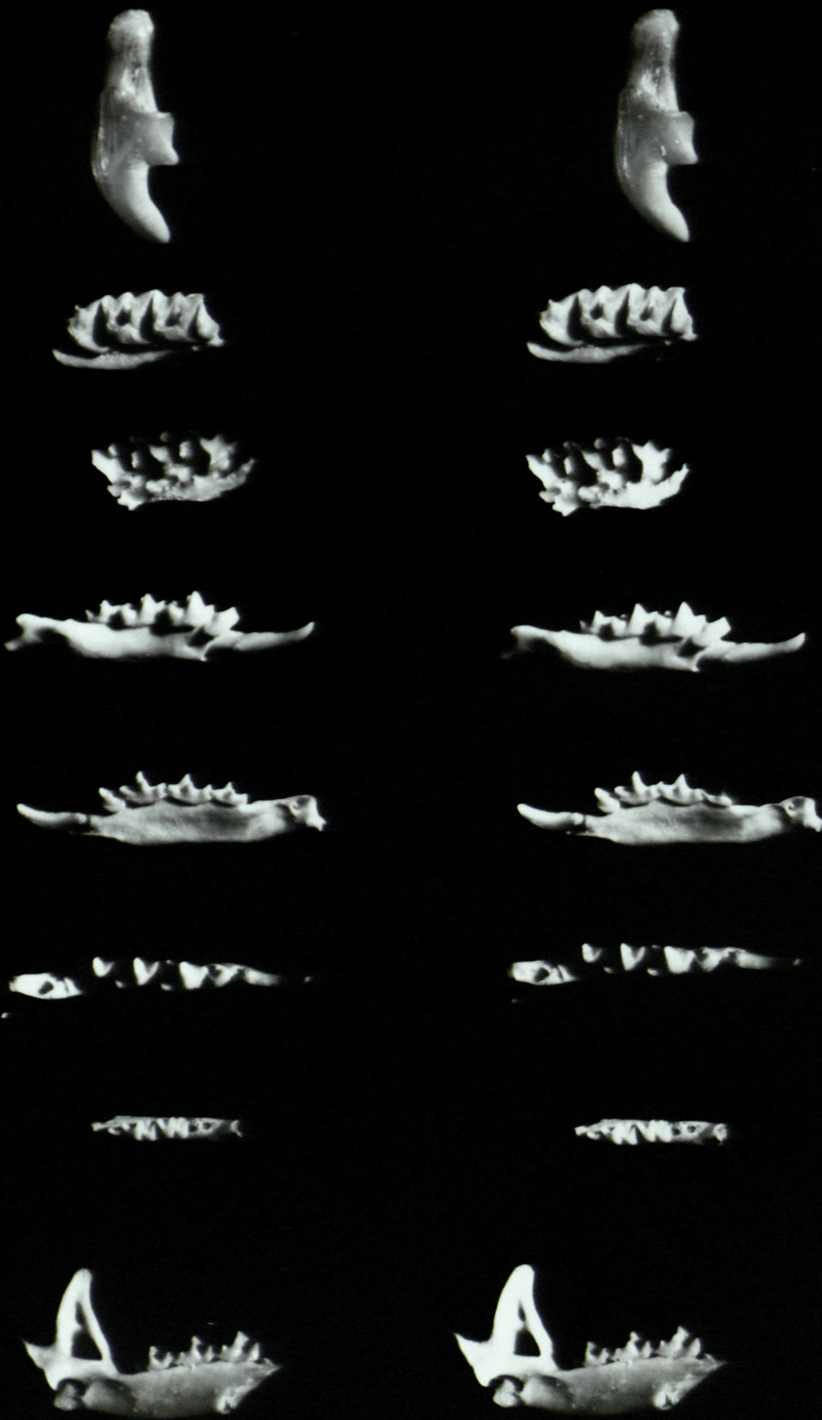

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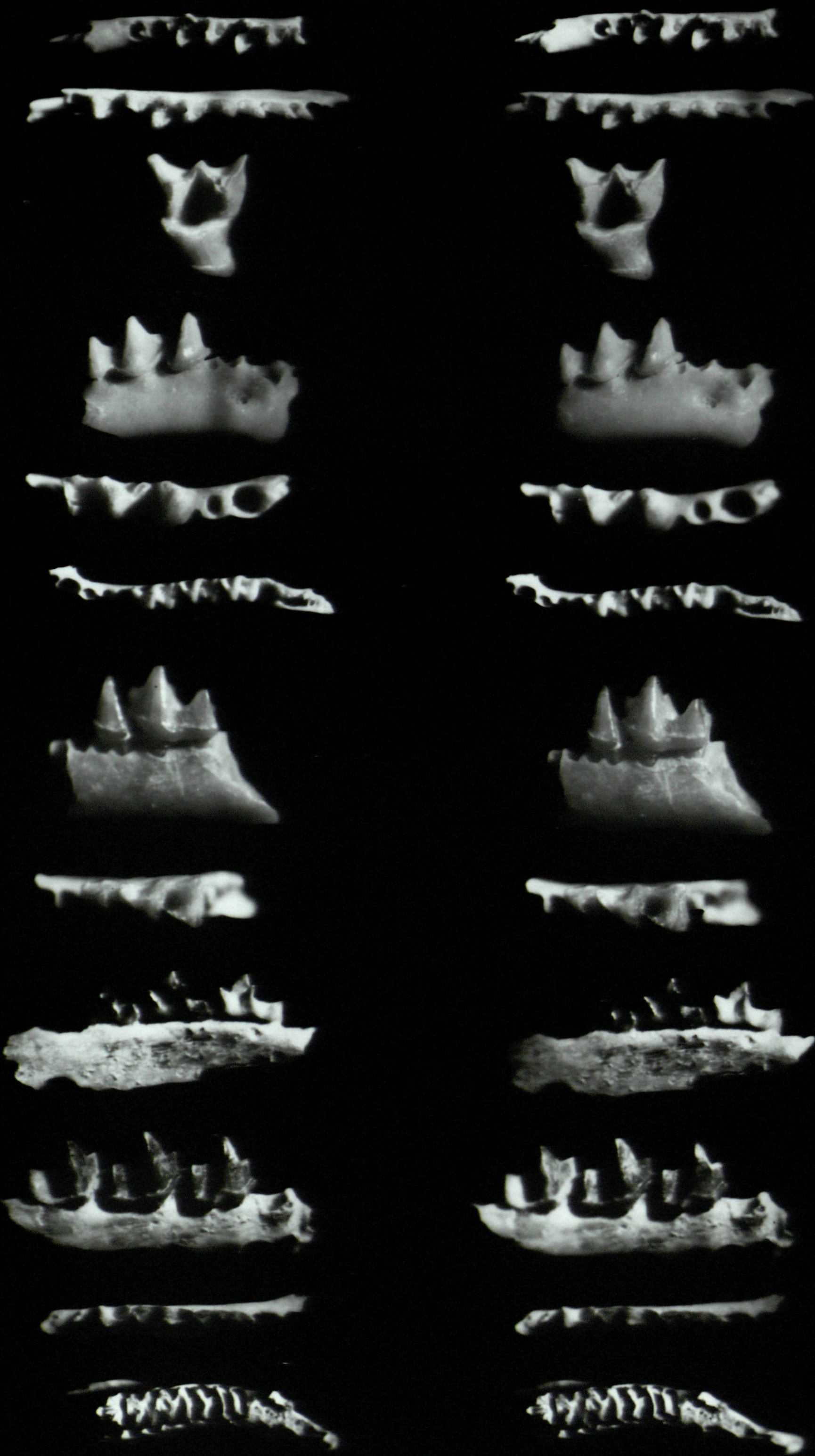

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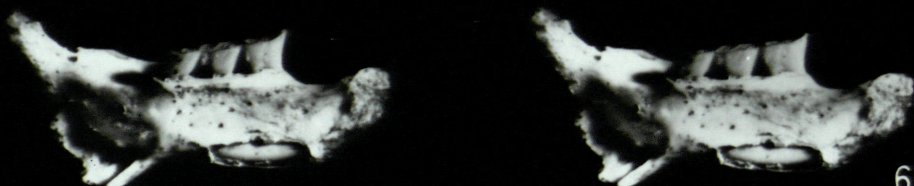

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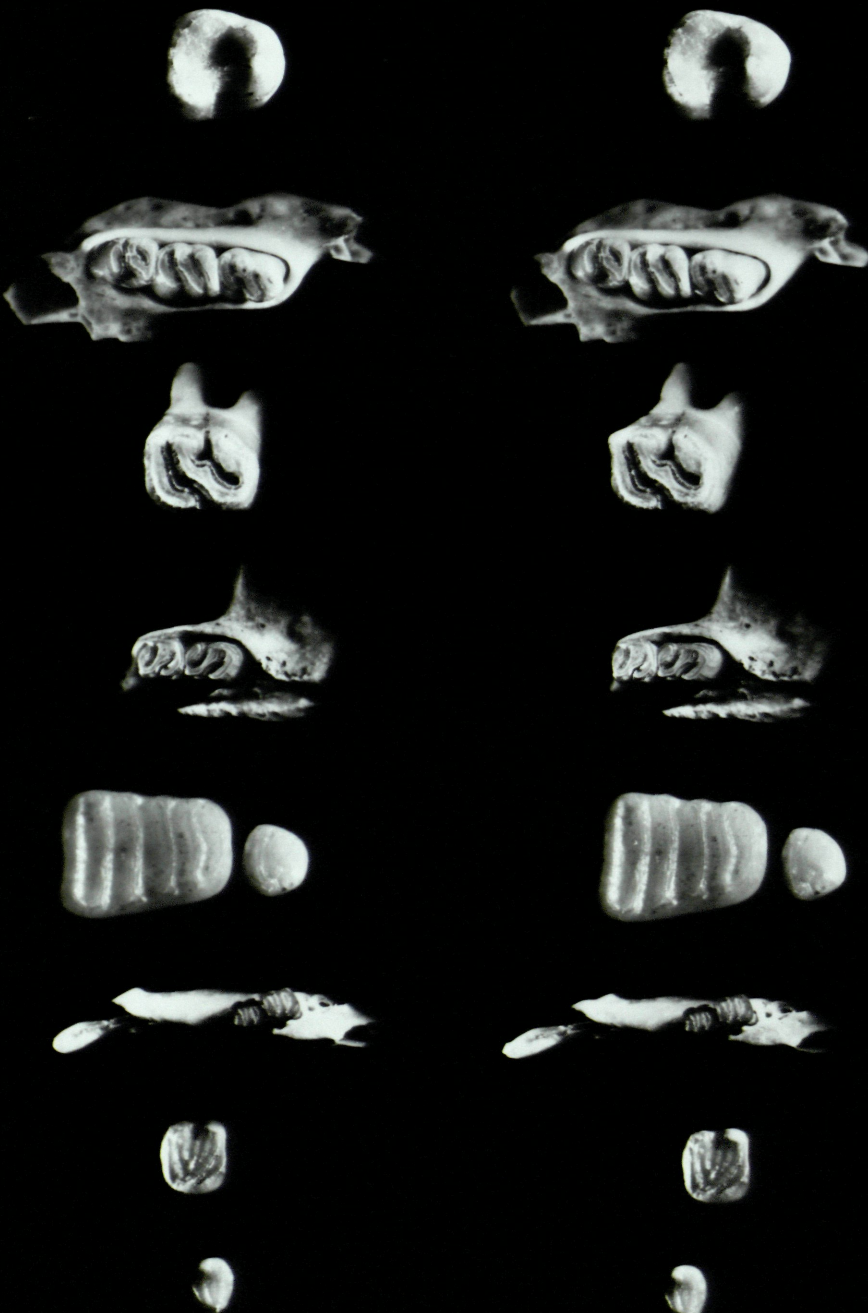

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Plate: 6 (all stereographic pairs)

Fig. 20a *Anourosorex kormosi*, nov. spec.
Right lower jaw with $\bar{I}$, $\bar{2}$, $\bar{3}$.
Holotype.
Occlusal view. 3,4×.

Fig. 21 *Anourosorex kormosi*, nov. spec.
Right P$\underline{4}$-M$\underline{2}$.
Occlusal view. 3,5×.

Fig. 22 *Anourosorex kormosi*, nov. spec.
Right upper jaw with M$\underline{1}$-M$\underline{2}$ and alveolus of M$\underline{3}$.
Occlusal view. 3,2×.

Fig. 23 *Anourosorex kormosi*, nov. spec.
Upper incisor.
Lateral view. 5,8×.

Fig. 23a *Anourosorex kormosi*, nov. spec.
Upper incisor.
Lingual view. 5,8×.

Fig. 24 *Anourosorex kormosi*, nov. spec.
Superior antemolars.
Occlusal view. 6×.

Fig. 25 *Anourosorex kormosi*, nov. spec.
Left upper jaw with P$\underline{4}$-M$\underline{1}$.
Occlusal view. 3,5×.

Plate: 7 (all stereographic pairs)

Fig. 26 *Petényia dubia*, nov. spec.
Upper incisor.
Lingual view. 10×.

Fig. 27 *Petényia dubia*, nov. spec.
Left P$\underline{4}$-M$\underline{3}$.
Occlusal view. 4,6×.

Fig. 28 ?*Paracryptotis* spec.
Right P$\underline{4}$-M$\underline{2}$.
Occlusal view. 4,2×.

Fig. 29 ?*Paracryptotis* spec.
Right lower jaw with $\bar{I}$, antemolar, and M$\bar{1}$-M$\bar{3}$.
Lateral view. 4,5×.

Fig. 29a ?*Paracryptotis* spec.
Right lower jaw with $\bar{I}$, antemolar, and M$\bar{1}$-M$\bar{3}$.
Lingual view. 4,5×.

Fig. 29b ?*Paracryptotis* spec.
Right lower jaw with $\bar{I}$, antemolar, and M$\bar{1}$-M$\bar{3}$.
Occlusal view. 4,5×.

Fig. 30 *Petényia dubia*, nov. spec.
Left lower jaw with P$\bar{4}$-M$\bar{2}$.
Occlusal view. 3,3×.

Fig. 31 *Petényia dubia*, nov. spec.
Left lower jaw with M$\bar{1}$-M$\bar{3}$.
Holotype.
Lingual view. 4,4×.

Plate: 8 (all stereographic pairs)

Fig. 31a *Petényia dubia*, nov. spec.
Left lower jaw with M$\bar{1}$-M$\bar{3}$.
Holotype.
Occlusal view. 6,1×.

Fig. 32 *Petenyiella* ? *repenningi*, nov. sp.
Right lower jaw with M$\bar{1}$.
Lingual view. 5,5×.

Fig. 32a *Petenyiella* ? *repenningi*, nov. spec.
Right lower jaw with M$\bar{1}$.
Occlusal view. 5,5×.

Fig. 33 *Petenyiella* ? *repenningi*, nov. spec.
Left lower jaw with M$\bar{1}$-M$\bar{3}$.
Holotype.
Occlusal view. 10×.

Fig. 34 Desmanine talpid ?, genus indet.
Left lower jaw with M$\bar{1}$-M$\bar{2}$.
Lateral view. 5,4×.

Fig. 34a Desmanine talpid ?, genus indet.
Left lower jaw with M$\bar{1}$-M$\bar{2}$.
Lingual view. 5,4×.

Fig. 34b Desmanine talpid ?, genus indet.
Left lower jaw with M$\bar{1}$-M$\bar{2}$.
Occlusal view. 5,4×.

Fig. 35 Desmanine talpid ?, genus indet.
Left lower jaw with P$\bar{4}$-M$\bar{1}$.
Lateral view. 6×.

Fig. 35a Desmanine talpid ?, genus indet.
Left lower jaw with P$\bar{4}$-M$\bar{1}$.
Occlusal view. 8×.

Fig. 36 *Desmana pontica* ? SCHREUDER
Right upper jaw with P$\underline{1}$-M$\underline{3}$.
Lateral view. 3×.

Fig. 36a *Desmana pontica* ? SCHREUDER
Right upper jaw with P$\underline{1}$-M$\underline{3}$.
Occlusal view. 3×.

Plate: 9 (all stereographic pairs)

Fig. 37 *Desmana pontica* ? SCHREUDER
Right lower jaw with M$\bar{1}$-M$\bar{2}$.
Occlusal view. 3,6×.

Fig. 38 *Desmana pontica* ? SCHREUDER
Right lower jaw with P$\bar{1}$-M$\bar{1}$.
Occlusal view. 3,7×.

Fig. 39 *Rhinolophus delphinensis* GAILLARD
Left upper molar.
Occlusal view. 8×.

Fig. 40 *Rhinolophus delphinensis* GAILLARD
Right lower jaw with P$\bar{4}$-M$\bar{1}$.
Lateral view. 5×.

Fig. 40a *Rhinolophus delphinensis* GAILLARD
Right lower jaw with P$\bar{4}$-M$\bar{1}$.
Occlusal view. 6×.

Fig. 41 *Rhinolophus delphinensis* GAILLARD
Left lower jaw with M$\bar{1}$-M$\bar{3}$.
Occlusal view. 3,2×.

Fig. 42 Chiropterid, genus indet.
Left lower jaw with P$\bar{4}$-M$\bar{1}$.
Lateral view. 8,6×.

Fig. 42a Chiropterid, genus indet.
Left lower jaw with P$\bar{4}$-M$\bar{1}$.
Occlusal view. 8,6×

Fig. 43 *Megaderma vireti* MEIN
Right lower jaw with M$\bar{1}$-M$\bar{3}$.
Lingual view. 3,5×.

Fig. 43a *Megaderma vireti* MEIN
Right lower jaw with M$\bar{1}$-M$\bar{3}$.
Lateral view. 3,5×.

Fig. 43b *Megaderma vireti* MEIN
Right lower jaw with M$\bar{1}$-M$\bar{3}$.
Occlusal view. 3,3×.

Fig. 44 *Prolagus* cf. *P. oeningensis* (KÖNIG)
Left lower jaw with P$\bar{3}$-M$\bar{2}$.
Occlusal view. 3,4×.

Plate: 10 (all stereographic pairs)

Fig. 45 *Prolagus* cf. *P. oeningensis* (KÖNIG)
Left P$\bar{3}$.
Occlusal view. 7,5×.

Fig. 46 *Prolagus* cf. *P. oeningensis* (KÖNIG)
Right P$\underline{2}$.
Occlusal view. 11×.

Fig. 47 *Prolagus* cf. *P. oeningensis* (KÖNIG)
Right P$\underline{2}$.
Occlusal view. 10×.

Fig. 48 *Prolagus* cf. *P. oeningensis* (KÖNIG)
Right P$\underline{3}$.
Occlusal view. 10×.

Fig. 49 *Prolagus* cf. *P. oeningensis* (KÖNIG)
Right upper jaw with P$\underline{4}$-M$\underline{1}$.
Occlusal view. 3,8×.

Fig. 50 *Petenyiella ? repenningi*, nov. spec.
Right lower jaw with $\bar{I}$ and P$\bar{3}$-M$\bar{2}$.
Lateral view. 10×.

Fig. 50a *Petenyiella ? repenningi*, nov. spec.
Right lower jaw with $\bar{I}$ and P$\bar{3}$-M$\bar{2}$.
Occlusal view. 10×.

Fig. 51 *Progonomys woelferi*, nov. spec.
Right upper jaw with M$\underline{1}$-M$\underline{3}$
Occlusal view. 6×.

Fig. 51a *Progonomys woelferi*, nov. spec.
Right upper jaw with M$\underline{1}$-M$\underline{3}$.
Lingual view. 6×.

Plate: 11 (all stereographic pairs)

Fig. 52 *Progonomys woelferi*, nov. spec.
Right M$\underline{3}$.
Occlusal view. 15×.

Fig. 53 *Progonomys woelferi*, nov. spec.
Right upper jaw with M$\underline{1}$-M$\underline{2}$.
Holotype.
Occlusal view. 6×.

Fig. 54 *Progonomys woelferi*, nov. spec.
Left M$\bar{1}$-M$\bar{3}$.
Occlusal view. 10×.

Fig. 55 *Progonomys woelferi*, nov. spec.
Left M$\bar{1}$-M$\bar{3}$.
Occlusal view. 10×.

Fig. 56 *Parapodemus* cf. *P. lugdunensis* SCHAUB
Right upper jaw with M$\underline{1}$-M$\underline{3}$.
Occlusal view. 10×.

Fig. 57 *Kowalskia fahlbuschi*, nov. spec.
Left upper jaw with M$\underline{1}$-M$\underline{3}$.
Holotype.
Occlusal view. 6×.

Fig. 58 *Kowalskia fahlbuschi*, nov. spec.
Left M$\bar{1}$-M$\bar{3}$.
Occlusal view. 10×.

Fig. 59 *Kowalskia fahlbuschi*, nov. spec.
Right M$\bar{1}$-M$\bar{3}$.
Occlusal view. 10×.

Fig. 60 *Protozapus intermedius*, nov. spec.
Left upper jaw with P$\underline{4}$-M$\underline{2}$.
Holotype.
Occlusal view. 7×.

Fig. 61 *Protozapus intermedius*, nov. spec.
Right lower jaw with M$\bar{1}$.
Occlusal view. 10×.

Plate: 12 (all stereographic pairs)

Fig. 62 *Protozapus intermedius*, nov. spec.
Left lower jaw with $M\bar{1}$-$M\bar{2}$.
Occlusal view. 10×.

Fig. 63 Rodentia, genus and spec. indet.
?Left $M\bar{1}$.
Lateral view. 6×.

Fig. 63a Rodentia, genus and spec. indet.
?Left $M\bar{1}$.
Lingual view. 6×.

Fig. 63b Rodentia, genus and spec. indet.
?Left $M\bar{1}$.
Occlusal view. 13×.

Fig. 64 *Spermophilinus* cf. *S. bredai* (v. MEYER)
Right $DP\underline{4}$.
Occlusal view. 4,7×.

Fig. 65 *Spermophilinus* cf. *S. bredai* (v. MEYER)
Left $M\bar{3}$.
Occlusal view. 4×.

Fig. 66 *Prospalax petteri*, nov. spec.
Left lower jaw with $M\bar{1}$-$M\bar{3}$.
Lingual view. 2,8×.

Fig. 66a *Prospalax petteri*, nov. spec.
Left lower jaw with $M\bar{1}$-$M\bar{3}$.
Lateral view. 2,8×.

Fig. 66b *Prospalax petteri*, nov. spec.
Left lower jaw with $M\bar{1}$-$M\bar{3}$.
Occlusal view. 2,8×.

Plate: 13 (all stereographic pairs)

Fig. 67 *Spermophilinus* cf. *S. bredai* (v. MEYER)
Right $P\bar{4}$.
Occlusal view. 10×.

Fig. 68 *Prospalax petteri*, nov. spec.
Right lower jaw with $M\bar{1}$-$M\bar{3}$.
Holotype.
Occlusal view. 4,4×.

Fig. 69 *Prospalax petteri*, nov. spec.
Left $M\underline{1}$.
Occlusal view. 10×.

Fig. 70 *Prospalax petteri*, nov. spec.
Right upper jaw with $M\underline{1}$-$M\underline{2}$.
Occlusal view. 4,3×.

Fig. 71 *Muscardinus pliocaenicus austriacus*, nov. subspec.
Right lower jaw with $P\bar{4}$-$M\bar{1}$.
Holotype.
Occlusal view. 16×.

Fig. 72 *Peridyromys compositus*, nov. spec.
Left lower jaw with $\bar{I}$ and $M\bar{1}$-$M\bar{2}$.
Holotype.
Occlusal view. 4,2×.

Fig. 73 *Peridyromys compositus*, nov. spec.
Right $M\underline{1}$.
Occlusal view. 9×.

Fig. 74 *Peridyromys compositus*, nov. spec.
Left $P\underline{4}$.
Occlusal view. 7,3×.