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# Insectivora (Mammalia: Soricidae, Talpidae) from the Late Pliocene of Frechen, Germany

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The insectivores are described from the Reuverian deposits of a lignite pit at Frechen, Germany. The encountered taxa are: *Blarinoidea mariae*, *Deinsdorfia hibbardi*, *Sorex* cf. *S. minutus*, *Talpa* cf. *T. minor*, and *Galemys* cf. *G. kormosi*.

Insectivora (Mammalia: Soricidae, Talpidae) uit het laat Pliocene van Frechen, Duitsland - De insectivoren uit het Reuverien van een bruinkoolgroeve bij Frechen (Duitsland) worden in dit artikel beschreven. De soorten die werden aangetroffen zijn: *Blarinoidea mariae*, *Deinsdorfia hibbardi*, *Sorex* cf. *S. minutus*, *Talpa* cf. *T. minor* en *Galemys* cf. *G. kormosi*.

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## INTRODUCTION

The German region between Köln and Aachen, part of the Lower Rhine Basin, is known for its open-air lignite mines. One of these, Frechen, has yielded fossil mammals of Late Pliocene age. The faunas and the accompanying pollen remains have been correlated to the Reuverian substage B, while a paleomagnetic reversal found in the sediments has been correlated to the Gauss-Matuyama boundary (Gibbard et al. 1991). This latter boundary has an age of 2.48 million years.

Fossil mammal associations of this age (Reuverian) are rather rare in the northwest European realm. For this reason their study is important. The present study of the insectivores was undertaken within the framework of a larger research of the mammalian remains from Frechen, and its publication has been pending for several years. It is now published anticipating other research on the insectivores from the

Late Neogene and Quaternary from northwestern Europe.

Most remains of insectivores were found in the sample 'Frechen'; next to this, some teeth were found in 'Frechen B' and one shrew tooth in 'Frechen hoch 11 ZZ'. Measurements were taken with a Leitz Ortholux binocular microscope, fitted with a movable stage and measuring clocks. They were taken after Reumer (1984) in the case of Soricidae, after Roders (1987) in the case of Talpinae, and after Rümke (1985) in the case of Desmaninae. For morphological terms, the reader is referred to the same publications. The drawings were made with a Wild M5 microscope, fitted with a drawing prism. The material belongs to the collections of the Institute for Earth Sciences, University of Utrecht, the Netherlands, and is temporarily stored in the Natural History Museum Rotterdam.

## DESCRIPTIONS

order Insectivora Bowdich, 1821

family Soricidae Gray, 1821

subfamily Soricinae Fischer von Waldheim, 1817

tribe Blarinini Kretzoi, 1965

genus *Blarinoides* Sulimski, 1959

***Blarinoides mariae* Sulimski, 1959**

(figure 1)

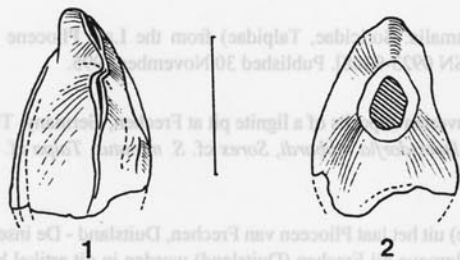


Figure 1 *Blarinoides mariae*, 1: right upper antemolar, 2: left p4. Scale bar = 1 mm.

#### description of the material

**upper antemolars (AA):** both preserved specimens possess a small cusplule on the lingual cingulum. The largest tooth (depicted in Fig. 1.1) shows a well developed S-shape of the central ridge. This characteristic was described by Reumer (1984) as being typical for *B. mariae*. It is apparently an A1 or an A2. The other, smaller, specimen is probably an A3; it lacks the S-shape of its ridge.

**right M1:** this tooth is severely damaged, but a small metaconule and a worn remnant of the protoconule can be seen. The following measurements could be taken: lingual length (LL) = ca. 2.10 mm; anterior width (AW) = 2.42 mm.

**talon of a left M1:** the hypocone and the ridge that surrounds the talon are clearly separated from each other. This characteristic, together with the size, allows the identification of the material as *B. mariae*. The hypocone is cone-shaped.

**left a2 (= p4):** the apex of the only cuspid is worn in an oval shape; the absence of the posterolingual basin is furthermore characteristic for this species. It is shown in Fig. 1.2.

**talonid of a left m1:** this fragment does not allow any detailed description. One measurement could be taken: talonid width (TAW) = 1.50 mm.

tribe Soricini Fischer von Waldheim, 1817

genus *Deinsdorfia* Heller, 1963

***Deinsdorfia hibbardii* (Sulimski, 1962)**

(figure 2)

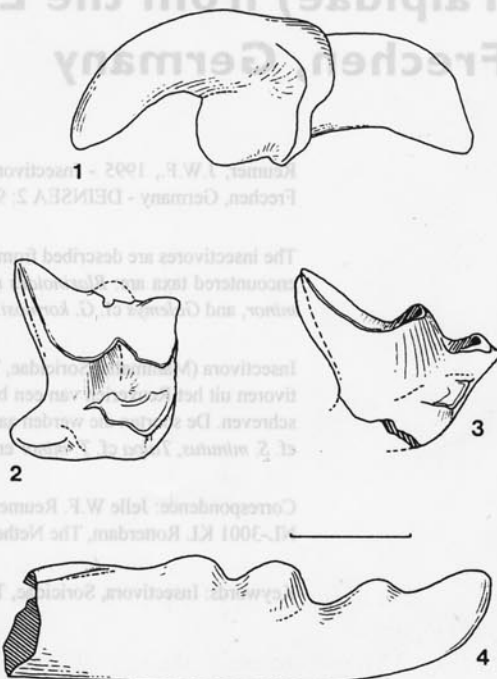


Figure 2 *Deinsdorfia hibbardii*, 1: left upper incisor, 2: right M1, 3: right P4, 4: right lower incisor. Scale bar = 1 mm.

This species is the most abundant insectivore in the material from Frechen. The following material is at our disposal:

I sup.: three fragments and one complete specimen;

A sup.: a left specimen;

P4: a buccal fragment;

M1: a complete one and a posterobuccal fragment;

i inf.: seven fragments, none of them is complete;

m1: two complete ones and a fragment;

m2: six complete ones and a fragment;

m3: one complete specimen.

There is, furthermore, a fragmentary ramus without teeth or condyle. The measurements of the material are summarized in Table 1. This all applies to material from the sample 'Frechen'. From 'Frechen hoch 11 ZZ' we have an m2, with the following sizes: trigonid width (TRW) = 0.76 mm; talonid width (TAW) = 0.75 mm; length (L) = 1.33 mm. These sizes comply well with those from 'Frechen' (Table 1).

Table 1 Measurements (in mm) of *Deinsdorfia hibbardi*

element	parameter	n	minimum	average	maximum
I sup.	L	1	-	1.95	-
	LT	3	0.80	0.93	1.00
	H	2	1.22	1.25	1.27
P4	BL	1	-	1.71	-
M1	PE	1	-	1.03	-
	LL	1	-	1.29	-
	BL	1	-	1.36	-
	AW	1	-	1.32	-
	PW	1	-	1.60	-
	TRW	2	0.75	0.77	0.78
m1	TAW	3	0.80	0.82	0.84
	L	2	1.39	1.42	1.45
m2	TRW	5	0.73	0.75	0.81
	TAW	7	0.73	0.75	0.81
	L	5	1.29	1.32	1.34
m3	W	1	-	0.63	-
	L	1	-	1.97	-

### description of the material

**I sup.** (Fig. 2.1): the posterior margin of the upper incisor is undulate and provided with a cingulum that broadens in the dorsal region. The tooth is not fissident; talon and apex are separated at the buccal side by a shallow, but well developed, groove.

**A sup.:** the only specimen preserved is unicuspid; it lacks any accessory cusplets on the lingual cingulum.

**P4** (Fig. 2.3): unfortunately, the lingual part is missing. The parastyle is situated relatively far from the paracone, which causes the paracone to be placed about half-way the buccal side. The parastylar crest, which connects paracone and parastyle, is not extremely high.

**M1** (Fig. 2.2): the best preserved specimen is heavily worn, but well recognizable as a typical *Deinsdorfia*-tooth. The talon is only weakly developed, there is no clear hypocone to be discerned and there is no ridge surrounding the talon. There is no furrow between protocone and metacone. The postero-buccal corner is strongly extruding.

**i inf.** (Fig. 2.4): the lower incisor is tricuspidate, and the three cusps are clearly inflated (exo-daenodonty) on their buccal sides. Of the three valleys between the cusps, the central one is the deepest; the second cuspule is the largest one. These characteristics, too, are typical for *Deinsdorfia*. A well developed cingulum is present along the postero-buccal edge of the tooth.

**m1-m2:** the trigonid is wide and open, especially so in m1. The entoconid crest is rather

low. The lingual cingulum is weakly developed: it is present below the trigonid and the entoconid crest, but it lacks below the cusps. The buccal cingulum is well developed but not very wide, and it is often somewhat undulate.

**m3:** contrary to the m3's of *D. hibbardi* that were described from Osztramos 7 (Hungary; see Reumer, 1984), the only m3 from Frechen possesses a two-cuspid talonid. It is, however, small and its general shape conforms that of the Osztramos material.

**mandible:** the single preserved specimen is heavily damaged. It shows the foramen mentale to have been situated below the talonid of m1.

### remarks

The following characteristics clearly identify our material as belonging to the genus *Deinsdorfia*: the morphology of the buccal half of P4 with the anterior position of the parastyle, the reduced shape of the talon in M1, the tricuspidate and slightly exo-daenodont lower incisor, the small talonid in m3, and the position of the mental foramen.

Five species have so far been described within the genus: *D. janossyi* Reumer, 1984 from Osztramos 9 (MN14), *D. reumeri* Rzebik-Kowalska, 1990, and *D. insperata* Rzebik-Kowalska, 1990, both from Podlesice (MN14), *D. hibbardi* (Sulimski, 1962) from Weze 1, Osztramos 7, Deinsdorf and many other localities in the range MN15 through MN17, and, finally, *D. kordosi* Reumer, 1984 from Csárnota 2 (MN16A); Reumer (1984), Rzebik-Kowalska, (1990).

The size of the P4 excludes *D. kordosi* as a possible identification, as in this species the buccal length is much greater. The measurement of 1.71 mm of the present P4, conforms *D. janosy*, *D. hibbardi* as well as *D. insperata*. *D. reumeri* is also somewhat longer in its P4, and larger in other respects as well. Both *D. hibbardi* and *D. reumeri* are characterized by their inflated cusps in the lower incisor. A combination of conforming sizes and the stratigraphical range of MN15 through MN17 argues in favour of *D. hibbardi*. This is also the most widespread species (Rzebik-Kowalska 1990).

genus *Sorex* Linnaeus, 1758

***Sorex* cf. *S. minutus* Linnaeus, 1766**

Two fragments of a small shrew are preserved: a condyle and an edentulous and fragmentary mandibular ramus. The condyle is rather strongly damaged, but it nevertheless allows some measurements to be taken: length of the lower facet (LLF): ca. 0.71 mm; condylar height (HC): ca. 1.15 mm. A comparison of these sizes with sizes of the smallest known Plio/Pleistocene shrews (from Reumer 1984) shows that LLF is smaller than with both *Sorex minutus* and *Paenlimnoecus pannonicus*. HC corroborates better the measurements of *S. minutus* from Osztamos 7.

The shape of the condyle and the interarticular area excludes an attribution to *P. pannonicus*, so that an identification of the material as *S. minutus* seems more likely. Since there is so little material available I prefer not to act too firmly, hence the *confer* identification.

family Talpidae Gray, 1825

subfamily Talpinae Murray, 1866

tribe Talpini Fischer von Waldheim, 1817

genus *Talpa* Linnaeus, 1758

***Talpa* cf. *T. minor* Freudenberg, 1914**

(figure 3)

The following material of a small mole species is available: from 'Frechen' a left P4 and a left M1, a right M3, a third phalanx of the manus and an indeterminate os carpale. From 'Frechen B' we have a second phalanx of the manus and a frag-



Figure 3 *Talpa* cf. *T. minor*, 1: left P4, 2: left M1. Scale bar = 1 mm.

mentary trigonid of a lower molar. The bones are characteristic for a burrowing mole, hence their attribution to this species.

**description**

**P4** (Fig. 3.1) lacks its posterior part; the width (W) = 1.03 mm. The protocone is well developed, the parastyle is small and connected to the protocone by a cingulum.

**M1** (Fig. 3.2) is nearly entirely preserved, only the lingual part of the protocone has flaked off. Parastyle and protocone are situated on a long ridge, which does not include a protocone, nor is there a hypocone. Sizes: L1 = 1.99 mm, L2 = 1.25 mm.

**M3** can also be measured: L = 0.97 mm. The width can not be taken, since the corner of the parastyle is broken.

**remarks**

The identification of the scanty mole remains can be argued as follows. There are three mole species that could theoretically be present in the Frechen faunule: *Talpa minor* Freudenberg, 1914 (synonym: *T. gracilis* Kormos, 1930); *T. fossilis* Petényi, 1864 (synonym: *T. praeglacialis* Kormos, 1930) and *T. csarnotana* Kretzoi, 1959. Furthermore, the younger (Biharian) species should be taken into account, such as *T. episcopalis* Kormos, 1930 and *T. stromeri* Brunner, 1934.

Our material has very small sizes. Roders (1987) thoroughly studied the small species *T. minor* from Tegelen. She found the following sizes that are important in the present context:

M1: L1 = (1.96) - 2.30 - (2.52) mm

L2 = (0.99) - 1.23 - (1.42) mm

M3: L = (1.15) - 1.29 - (1.45) mm

The material from Frechen is thus quite comparable in size as far as the M1 is concerned, but the Frechen M3 is considerably smaller.

*T. fossilis*, on the contrary, is much larger than our material, and therefore can be ruled out (Sulimski 1959, 1962).

*T. csarnotana* Kretzoi, 1959 was published without a diagnosis, illustration or even type-designation. Kretzoi (1959) wrote only: '(...) einer kleineren *Talpa*-Art von *T. minor*-Grösse, weichen von dieser im stärkeren Proximalteil und kürzeren Schaft des Humerus, usw. deutlich ab.' Sulimski (1962), on the contrary, compares the species in size with *T. fossilis*: 'In size this species comes near *T. fossilis* Petényi, but differs from it in structure of teeth and shoulder bones.' Unfortunately, Sulimski did not describe maxillary teeth, so that a comparison between his results and our Frechen material is impossible. On the basis of sizes, both species *T. csarnotana* and *T. fossilis* (= *T. praeglacialis*) can be excluded from our line of reasoning. That leaves us with *T. minor*. Younger species, such as *T. episcopalis* or *T. stromeri*, are larger than *T. minor* (Sulimski 1959). *T. minor* is the smallest of all known species. When taking into account the extreme scantiness of our material, which is partly even worn down or broken, a *confer* identification (*Talpa* cf. *T. minor*) seems desirable.

subfamily Desmaninae Thomas, 1912

genus *Galemys* Kaup, 1829

*Galemys* cf. *G. kormosi* (Schreuder, 1940)

(figure 4)

The last insectivore species at our disposal is a desmanine mole. From 'Frechen', we have a right M1, a right M3, a fragment of a right P4, a right p2/p3 and a left p4. There is, furthermore, half a chevron bone from this sample. From 'Frechen B' there are a right m1 and two left m2's. Results of the measurements are given in table 2.

#### descriptions

**P4** is preserved in too fragmentary a state to allow description.

**M1** (Fig. 4.2) has its enamel layer flaked away from most of its surface. Hence, the dentine is

Table 2 Measurements (in mm) of *Galemys* cf. *G. kormosi*

<b>M3</b>	L = 1.56	
<b>p2/p3</b>	L = 1.43 W = 0.92	W/L ratio = 0.64
<b>p4</b>	L = 1.79 W = 1.05	W/L ratio = 0.59
<b>m1</b>	W1 = 1.95 W2 = 2.24 L = 2.63	W1/W2 ratio = 0.87 W2/L ratio = 0.85
<b>m3</b>	W1 = (1.36) 1.45 (1.53) W2 = (1.27) 1.32 (1.36) L = (1.75) 1.85 (1.95)	W1/W2 ratio = 1.10 W2/L ratio = 0.71

visible. A parastyle is not present. The tooth possesses a paraconule and a metaconule that are well separated from the other cusps. There is a small accessory cusplet between protocone and metaconule. It is connected to the protocone by a ridge, but it is separated from the metacone. A cingulum runs from the metaconule to the metastyle. The mesostyle was most probably split. The tooth can not be measured due to the absence of the enamel.

**M3** (Fig. 4.1) also lost part of its enamel layer. The mesostyle is split. The metaconule is large and of about the same height as the protocone; it is situated close to the metacone. The protoconule is lower. A small accessory cusplet can be seen, but it is hardly developed. A small cusplet - rather the remains of the cingulum - is situated below the valley between protocone and protoconule.

**p2/p3** (Fig. 4.3) is almost unicuspid. With some effort, a hypocone can be discerned, and a very small furrow that could be considered the talonid. There is no paraconid.

**p4** (Fig. 4.4), on the other hand, has a well developed paraconid, and also the talonid is clearly present. The metaconid is weakly developed, it is smaller than an unidentifiable accessory cusplet that is situated close to the tip of the protoconid. The posterior margin is rounded and not flattened.

**m1** (Fig. 4.5) has a rather plumpy appearance. The oblique crest runs to the metaconid. A well developed entostylid is situated behind the hypopholid, at about one third of the distance between entoconid and hypoconid. Cingula are not present along the entire tooth: they lack at the ligual side, as well as below protoconid and hypoconid.

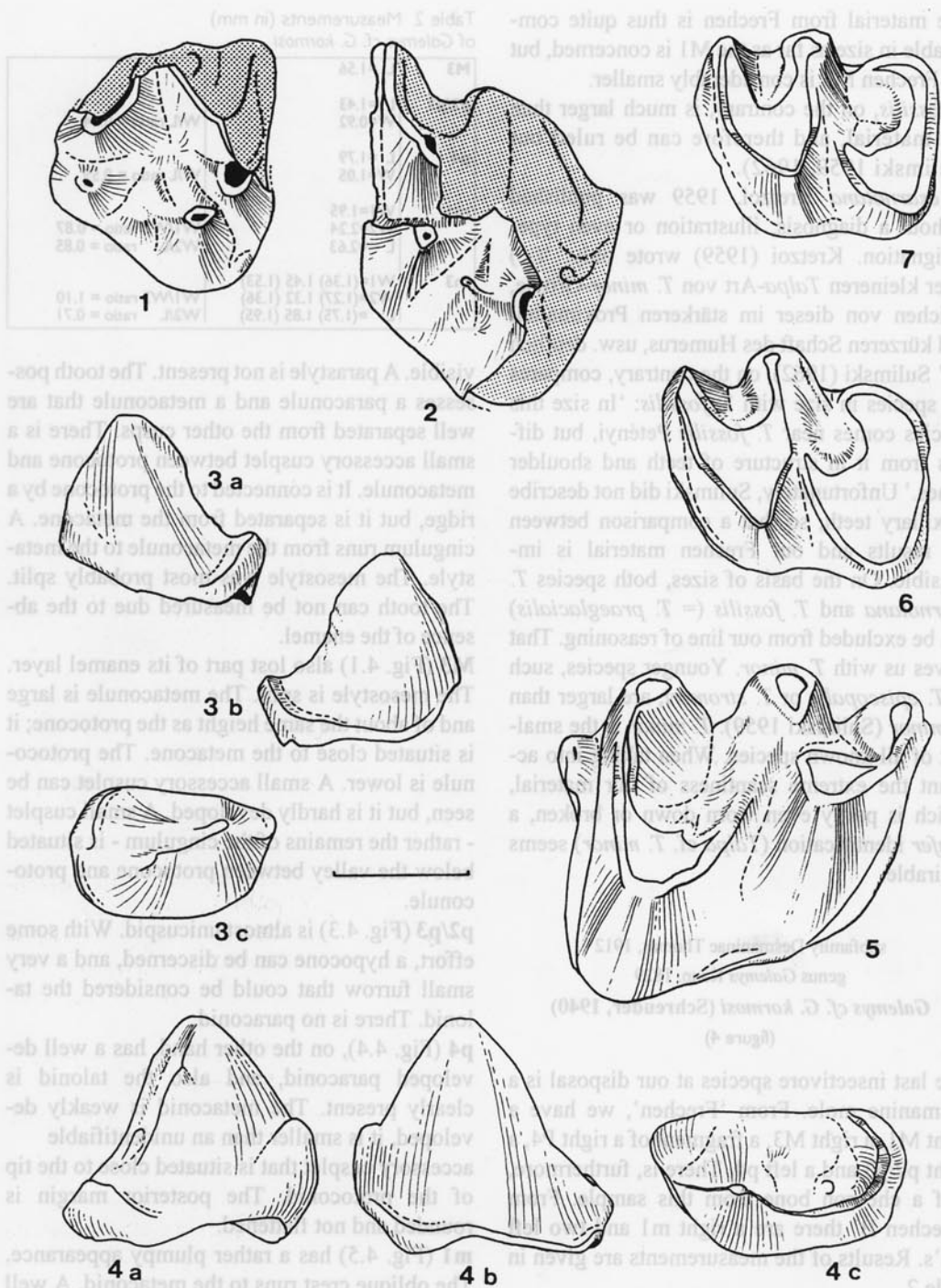


Figure 4 *Galemys* cf. *G. kormosi*, 1: right M3, 2: right M1, 3: right p2/p3 (in a: lingual view, b: buccal view, c: occlusal view), 4: left p4 (same views as 3), 5: right m1, 6: left m3, 7: left m3. Scale bar = 1 mm.

**m3's** (Figs. 4.6 and 4.7) both differ considerably in size, although morphologically they are very similar. The oblique crest does not run to the metaconid, instead of this, it ends between metaconid and protoconid. The metaconid is considerably higher than the protoconid. There is no entostylid. A cingulum is present only below the anterior part of the trigonid; it lacks along all other parts of the m3.

#### remarks

Rümke (1985) gave extensive descriptions of the European desmanine moles. The taxonomy of this interesting subfamily is primarily based upon the morphology of the anterior dentition, and not on the molar morphology. This is to be regretted in our case, as the Frechen samples yielded mostly molars. Yet an attempted identification is possible. Three genera of Desmaninae were present in Europe: *Ruemkelia* Rzebik-Kowalska & Pawlowski, 1994; *Galemys* Kaup, 1829 and *Desmana* Gueldenstaedt, 1777. It should be noted in this context that the genus *Dibolia* Rümke, 1985 proved to be a homonym and was renamed *Ruemkelia* by Rzebik-Kowalska & Pawlowski (1994).

*Desmana* can be separated from the two other genera by its larger size. A comparison of our measurements (table 2) with the data presented by Rümke (1985) shows that the material from Frechen is considerably smaller than *Desmana*. Also considering Rümke's (1985) diagnosis of the genus, *Desmana* can be ruled out. The genera *Ruemkelia* and *Galemys* can be distinguished by the incisor morphology; this element lacks from the Frechen sample. *Ruemkelia* is known only from southern Europe, while *Galemys* also lived in more northern areas. But the identification of the Frechen material should mostly rest upon the sizes, not on the distribution. Of all species from the interval MN 15B through MN 16B that should be taken into consideration (i.e. *Galemys sulimskii*, *G. kormosi*, *Ruemkelia brailloni* and *R. bifida*) our material most closely resembles *Galemys kormosi*. This latter species also conforms our material morphologically. However, because the diagnostically most important dental elements are lacking, I prefer - again - a tentative identification as *Galemys* cf. *G. kormosi*.

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