The late Pliocene *Mimomys hordijki* sp. nov. from the Zuurland borehole (The Netherlands)

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Keywords: Rodentia, Late Pliocene, Villanyian, The Netherlands.

Manuscript: accepted November 1997

Abstract

A new aberrant species of the genus Mimomys is described from the late Pliocene deposits of the Zuurland borehole. The new species, *Mimomys hordijki* is characterised by thick, almost undifferentiated enamel, a prominent Mimomys-ridge, an advanced stage of hypsodonty and high dentine tracts also on the Mimomys-ridge.
Introduction

Mr. L.W. Hordijk from Brielle (The Netherlands) started to investigate the geology of his neighbourhood with primitive drilling equipment as a young boy. Since 1999, after obtaining more sophisticated drilling equipment with a sediment-catcher, he was able to reach depths of 44 metres. On his private land in the Zuurland polder, just south of the city of Brielle, he was able to go even deeper. In the period from 1980 to 1983 he made a borehole to a depth of 95.02 m. (Zuurland-1) by hand and without any help (Hordijk, 1988; 1993). More boreholes in the neighbourhood followed and now, November 19, 1997, Mr Hordijk is at a depth of 43.30 metres in the Zuurland-6 borehole. The drilling technique used by Mr. Hordijk, in particular the prevention of sinking of the casing, makes it possible to collect a large amount of sediment which wells up into the casing from a certain interesting level. The sediment samples are sieved, dried and sorted. Botanical as well as faunal remains have been collected at various levels in the different boreholes. Deposits rich in fossil remains alternate with sterile levels. Burger et al., (1988) the levels that are particularly rich in mammal fossils are -27 to -37m, -42.20 to -42.60m, -43.75 to -46.00m, -50 to -56m, -62 to -66m and -91 to -96m (Van Kolfschoten, 1988). The level -62 to -66 m. has yielded a large amount of fossil voles, representing different species of the genus Mimomys (Van Kolfschoten, 1988, 1990; Van Kolfschoten & Van der Meulen, 1996). The voles are referred to as Mimomys plicaeacticus, M. reidi, M. tigliensis and M. pitymyoides. Not all the Mimomys molars could be referred to the species mentioned above. A few medium-sized molars show a peculiar morphology, which justifies using them as a basis for the description of a new species, presented in this paper. The fauna is of Villanyian age. The second author studied the M. plicaeacticus voles in great detail and concluded on the basis of the height of the dentine tracts of the molars that the fauna from level -62 to -66 hardly differs from that of the fauna from the Tegelen stratotype (Egypte pit) (Tesakov, 1998).

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Table 1
Dimensions of the m1 of Mimomys hordijkii sp. nov. from Zuurland

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Table 2
Dimensions of the m2 of Mimomys hordijkii sp. nov. from Zuurland

Family Cricetidae Fischer, 1817
Subfamily Arvicolinae Gray, 1821
Genus Mimomys F. Major, 1902

Mimomys hordijkii sp. nov.
(Figure 1 and 2)(Table 1 and 2)

Derivatio nominis
The species name has been chosen to honour L.W. Hordijk, 'amateur' geologist who put down the Zuurland boreholes and collected the molars of this new species.

Locality
Zuurland, the Netherlands: boreholes Zuurland-2, -3 and -5; depth between -62 and -66 m.

Age
Late Pliocene (Late Villanyian, MN17: Mimomys plicaeacticus Subzone)

Diagnosis
Medium-sized hypsodont Mimomys species with sparse cement in the re-entrants, without an enamel islet, with a very prominent Mimomys-ridge, which continues to the base of the crown, and thick mostly undifferentiated enamel. Dentine tract of the Mimomys-ridge is very high.

Differential diagnosis
Distinct from the Villanyian small species of the M. reidi group, species of the M. torensis group (see Tesakov, 1997), species of the Mimomys plicaeacticus group and species of the Mimomys pitymyoides group because of less differentiated, thicker enamel and a more pronounced Mimomys-ridge and its dentine tract (mimosinuid). Besides, the new species is distinct from forms of the M. torensis group (see Tesakov, 1997) in having much less abundant cement, less developed hypsodonty and more pronounced Mimomys-ridge. M. hordijkii sp. nov. is distinct from species of the M. reidi group, and the M. plicaeacticus group in the absence of an enamel islet in the m1 and a pleurorhizal m2, and a more developed hypsod-
Figure 1
Lower molars (m1) of Mimomys hordijki sp. nov. from Zuurland; 1-4 occlusal surface (25x);
1: m1 dext. (Zuurland-2, 62-63);
2: m1 sin.;
3: m1 sin. (Zuurland-2, 65-66);
4: m1 sin. (holotype) (Zuurland-3, 64-65).
a - labial side (12x), b - lingual side (12x)
Figure 2
Lower molars (m1 and m2) of Mimomys hordijki sp. nov. from Zuurland:
1-3 occlusal view (×25x);
1: m2 sin. (Zuurland-3, 64-66);
2: m1 sin.;
3: m1 sin. (Zuurland-5, 62.30-64.00).
a - labial side (×12x);
b - lingual side (×12x)
onty. It is also distinct from species of the Mimomys pliocenaecus group in its smaller size. It is distinct from species of the Mimomys pitymyoides group in the alternating triangles in m1 (T2 and T3 not broadly confluent), thicker enamel, more developed Mimomys-ridge and a mimosinuid. It is distinct from North American Pleistocene (Irvingtonian) Cromeromys species in having somewhat thicker enamel and less abundant cement.

Holotype
Left first lower molar from Zuurland-3 -64 to -65 m; collection L.W. Hordijk, Brielle (the Netherlands), number Zuurland-3, 64-66; - 1 (Figure 1: 4).

Studied material
Zuurland-2, 62-63: 1m1; Zuurland-2, 65-66: 2 m1; Zuurland-3, 64-65: 1 m1 and 1 m2; Zuurland-5, 62.90-64.00: 2 m1.

Description
Vole of medium size (Tables 1 and 2). The enamel band is rather thick and hardly differentiated; worn molars show a slightly negative (Mimomys-type) enamel differentiation (Figure 1 and 2). The triangles alternate, the re-entrants angles are strongly vergent. The amount of cement differs from sparse in younger animals to moderate in older ones; it never fills more than half of the depth of the re-entrant angles. The molars of Mimomys hordiكي are hypsodont and the denteine tracts are well developed and high (more than 4 mm). The tips of the denteine tracts are interrupted by wear at an early ontogenetical stage when the tooth base is still open. It is, however, possible to measure a few complete denteine tracts (Figure 1, Table 1).

m1: The anteroconid complex bears a prominent Mimomys-ridge, often with the high denteine tract interrupted by wear at an early ontogenetical stage. LRA4, BRA3, and the re-entrant angles between T4 and the Mimomys-ridge are deep, having the tendency to separate the T4 from the T5-ACC complex in younger animals. The enamel islet is absent even in the early stages of wear.

m2: The single known m2, found in association with the holotype, has two confluent pairs of triangles: T1-T2 and T3-T4. The morphology of the molar suggests a pleurohiatal position against the lower incisor.

Comparison
Mimomys hordiكي sp. nov. is distinct from most European Villanyian and Biharian Mimomys species in having thick, poorly differentiated enamel, a prominent Mimomys-ridge, and an anteroconid which is somewhat dissected by deep labial and lingual re-entrant angles (see the Differential diagnosis). The overall structure of the m1 resembles M. pitymyoides and some advanced Borsodia species. However, it is distinct from the former in the lack of the typical pytymioid confluence pattern, in thicker enamel and a more developed Mimomys ridge, and in an overall more robust appearance of the molars. M. hordiكي sp. nov. is distinct from Borsodia in the presence of cement, and negative (Mimomys) differentiation of the enamel.

The new species is amazingly close in its general structure of the m1 to the North American Pleistocene (Irvingtonian) Cromeromys virginianus (Repennig & Grady, 1988), and Cromeromys dakotaensis (Martin, 1989). It seems to differ from these forms by having somewhat thicker enamel, and less abundant cement. Besides, the m2 illustrated for Mimomys dakotaensis (R. Martin, 1989, fig.5D) has paired triangles completely separated in T1-T2, and almost separated in T3-T4. Both North American species have a typical Cromeromys complex structure of the upper M3 with a deep second lingual re-entrant angle (LRA3). The structure of the M3/ at M. hordiكي sp. nov. is unknown so far.

Discussion
Clearly distinct from most European Mimomys species, the new form from Zuurland shows striking similarity to North American Cromeromys species. Zazhigin (1989) proposed Cromeromys as a genus of mimicomyoid voles in which the posterior enamel islet of M3 is never formed. Insufficiently defined in the original description, Cromeromys most likely represents a natural group of Pliocene-Pleistocene rooted voles closely related to typical Mimomys (van Kolfschoten, 1993; Tesakov, 1998). Abundant remains of small Cromeromys species are known from late Pliocene deposits in the Kolyma lowland, northeastern Siberia (Sher, et al., 1979). A Beringian and North American distribution area of the group makes the record of a very similar form in Late Pliocene deposits of Western Europe questionable. However without recovering the upper M3 of M. hordiキー it is impossible to assign the species to any of the Mimomys subgroups.

Acknowledgements
The authors are greatly indebted to Mr. L.W. Hordijk for all the energy he put into his Zuurland project and for his permission to study his important collections. We also would like to thank Dr. Ph. Gibbard for critically reading of the manuscript.
References


