

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

Th. van Kolfschoten

Faculty of Archaeology, Leiden University, P.O. Box 9515, 2300 RA Leiden, The Netherlands

A.S. Tesakov

Laboratory of Quaternary Stratigraphy, Geological Institute, Russian Academy of Sciences,
Pyzhevsky 7, Moscow 109017, Russia

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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 1969, 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, 1986). The voles are referred to as *Mimomys pliocaenicus*, *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. pliocaenicus* 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).

Variable	n	Mean	Minimum	Maximum
Length	6	2.82	2.66	3.06
Width	6	1.06	0.96	1.15
Anteroconid index (A/L)	6	43	39	45
Anterosinuid	1	4.33		
Hyposinuid	1	4.22		
Hyposinulid	1	4.62		
HH-index	1	6.25		

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

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

Mimomys hordijki 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 pliocaenicus* 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. tornensis* group (see Tesakov, 1997), species of the *Mimomys pliocaenicus* 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. tornensis* group (see Tesakov, 1997) in having much less abundant cement, less developed hypsodontology and more pronounced *Mimomys*-ridge. *M. hordijki* sp. nov. is distinct from species of the *M. reidi* group, and the *M. pliocaenicus* group in the absence of an enamel islet in the m1 and a pleurorhizal m2, and a more developed hypsod-

Variable	n	
Length	1	1.72
Width	1	1.03
Anterosinuid	1	>4.14
Hyposinuid	1	3.33
Hyposinulid	1	3.91
HH-index	1	5.14

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

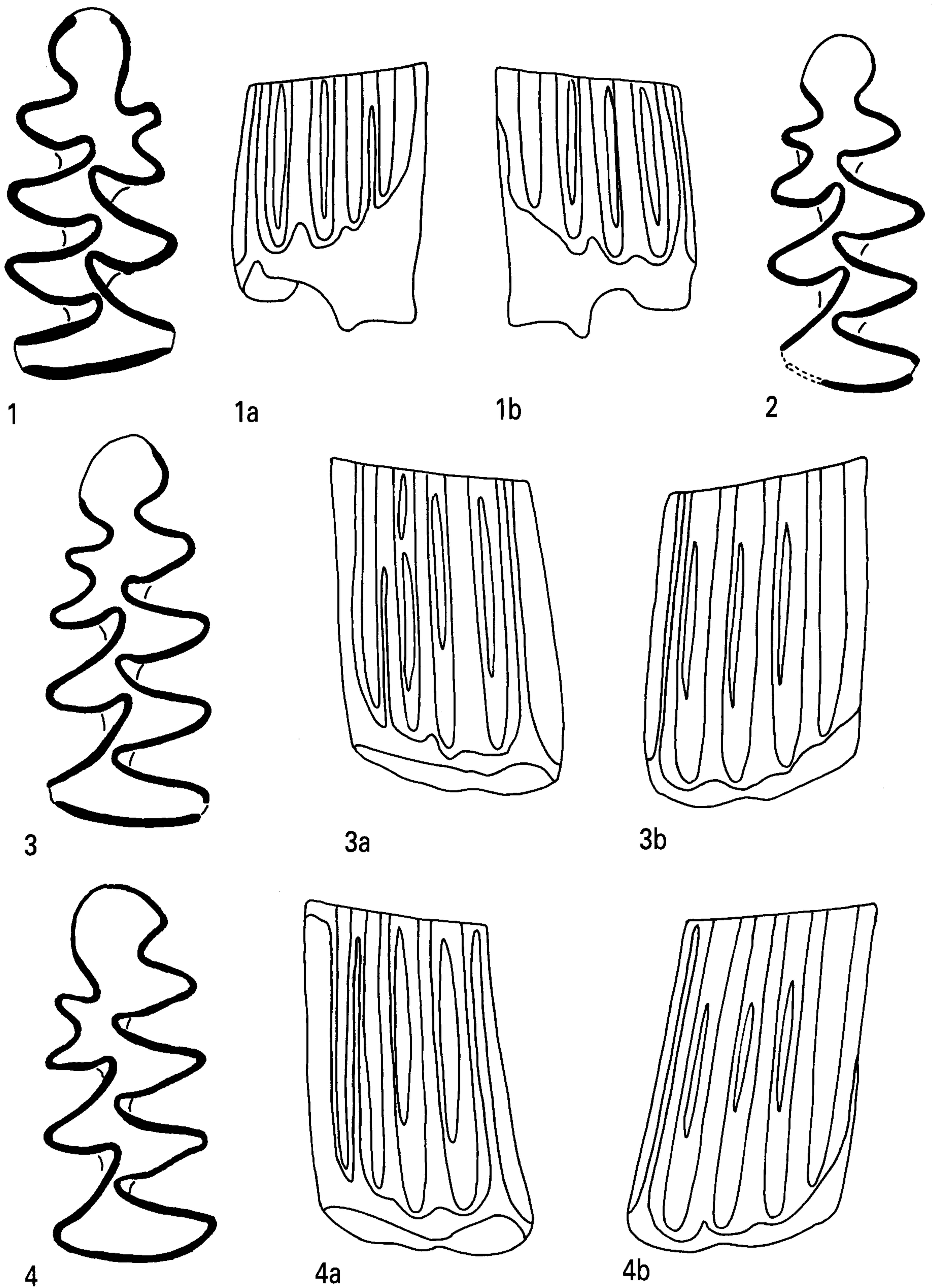


Figure 1
 Lower molars (m1) of *Mimomys hordijki* sp. nov. from Zuurland; 1-4 occlusal surface (25x);
 1: m1 dext. (Zuurland-2, 62-63);
 2: m1 sin.;
 3: m1 sin. (Zuurland-2, 65-66);
 4: m1 sin. (holotype) (Zuurland-3, 64-65).
 a - labial side (12x), b - lingual side (12x)

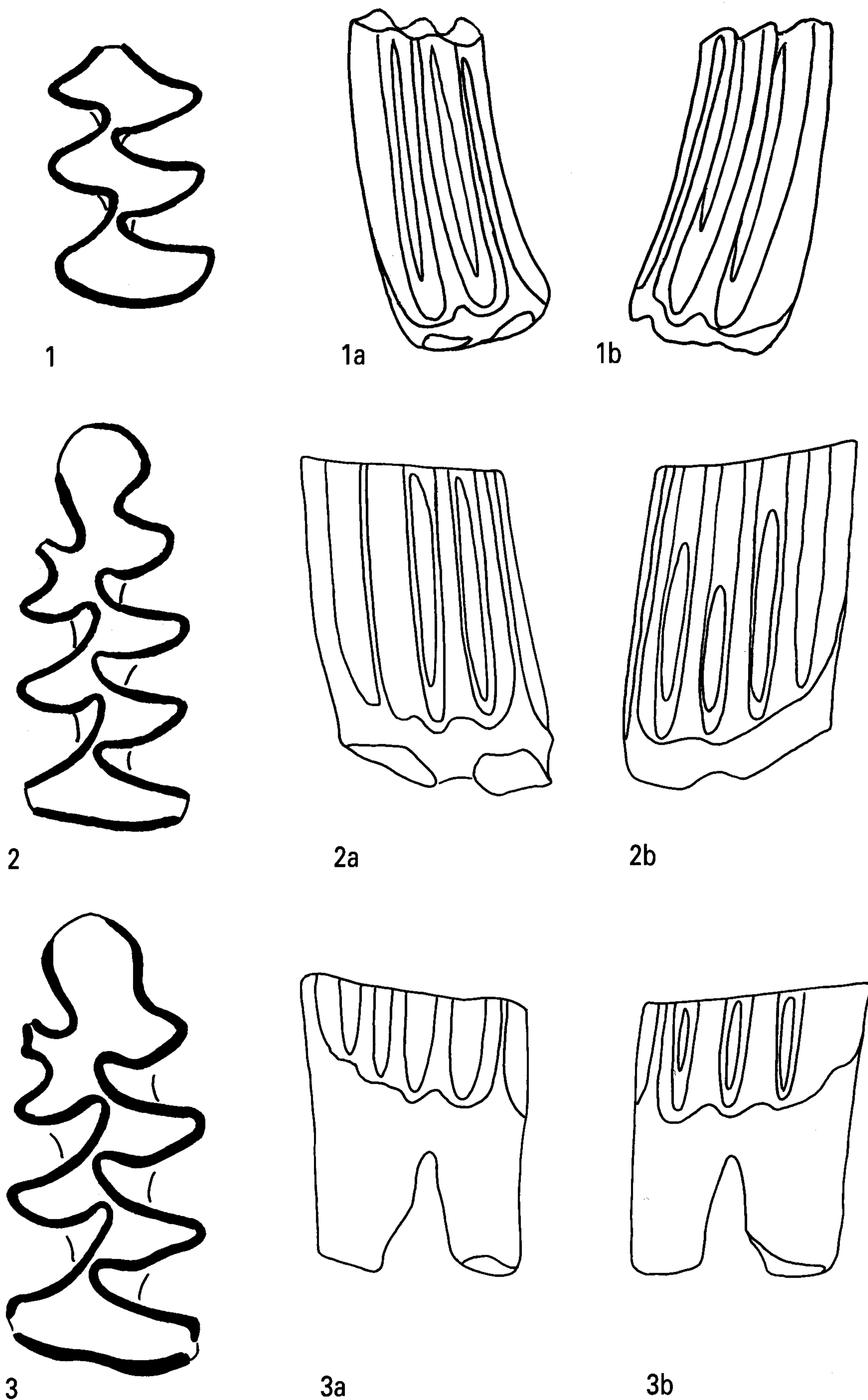


Figure 2
 Lower molars (m1 and m2) of
Mimomys hordijki sp. nov.
 from Zuurland:
 1-3 occlusal view ($\pm 25\times$);
 1: m2 sin. (Zuurland-3, 64-
 65);
 2: m1 sin.;
 3: m1 sin. (Zuurland-5, 62.90-
 64.00).
 a - labial side ($\pm 12\times$),
 b - lingual side ($\pm 12\times$)

onty. It is also distinct from species of the *Mimomys pliocaenicus* 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, 64-65: - 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-entrant 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 hordijki* are hypsodont and the dentine tracts are well developed and high (more than 4 mm). The tips of the dentine 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 dentine tracts (Figure 1, Table 1).

m1: The anteroconid complex bears a prominent *Mimomys*-ridge, often with the high dentine 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 pleurohizal position against the lower incisor.

Comparison

Mimomys hordijki 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 pytymoid confluence pattern, in thicker enamel and a more developed *Mimomys* ridge, and in an overall more robust appearance of the molars. *M. hordijki* 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* (Repenning & 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. hordijki* 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 (1980) proposed *Cromeromys* as a genus of mimomyoid 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. hordijki* it is impossible to assign the species to any of the *Mimomys* subgroups.

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