

A new species of the genus *Megapeomys* (Mammalia, Rodentia, Eomyidae) from the Early Miocene of Japan

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ABSTRACT

In 1998, a large, peculiar eomyid rodent *Megapeomys* was described from the Czech Republic. An isolated lower molar found in Japan was identified as a species of the same genus. Direct comparison of the Japanese specimen with the European material makes distinction from the Czech species possible, and therefore a new species (*M. repenningi*) is described based on the characters of m1 with deeper synclinal III and single (non-splitting) distal root, in addition to a slight difference in size. The new species from Japan may represent a somewhat more primitive species, at least based on the root morphology, than Czech *M. lavocati*. Two apeomyine species, *Megapeomys bobwilsoni* and *Apeomyoides savagei* recently described from North America, can be distinguished from *M. repenningi* by clear morphological differences including size, crown height, and number of roots.

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KEY WORDS: description; Eomyidae; Rodentia; Early Miocene; paleobiogeography; new species

INTRODUCTION

Small mammal fossils from the Tertiary were extremely rare in Japan until recently. Following the first discovery of an eomyid jaw with p4 and an isolated m1 in 1989 (Tomida and Setoguchii 1994), more than 40 insectivore, lagomorph, and rodent specimens have been found from a locality on the left bank of Kiso River at Dota, Kani City, central Japan. Originally these specimens were collectively called the Dota local fauna, but because the term local fauna has not been favored recently, this assemblage is simply called the Dota fauna here. Although eight taxa of small mammals have been

identified in the Dota fauna (Tomida 2000), the majority of the specimens have remained undescribed, except for the beaver *Youngofiber* (Tomida et al. 1995). The present paper describes *Megapeomys*, which is one of those eight taxa. It is represented by only one isolated tooth. It was referred to *Megapeomys* sp. by Fejfar et al. (1998), but now direct comparison with the material of *M. lavocati* has confirmed distinction of the Japanese species from the Czech species.

For dental morphology, the nomenclature of Engesser (1990) and Fejfar et al. (1998) is used.

GEOLOGY AND AGE

The Dota fauna is from the outcrops intermittently exposed on the left bank of Kiso River near Dota, Kani City, Gifu Prefecture, central Japan (Tomida and Setoguchi 1994, figure 1-1). Stratigraphically, those exposures represent about 10 m of sediment near the top of the upper member of the Nakamura Formation (Shikano 1995, figure 10). That part of the formation consists of alternating thin beds of fine sandstone, siltstone, and mudstone, relatively thick sandstone with or without cross-beddings, and thin lignite beds (Shikano 1995). Other than small mammals, many isolated bones of fresh water fishes, including amiids (Yabumoto et al. 1999) and numerous isolated or partly articulated pharyngeal teeth of cyprinids (Yasuno 1982), and freshwater bivalves (mostly articulated) are known from near the top of the formation. Carbonized plant material is also occasionally found from the sandstones (Shikano 1995).

The geologic age of the Nakamura Formation has been generally thought to be slightly younger than the underlying Hachiya Formation, which is supposed to be 22 – 19 Ma, based on fission track dating. However, recent fission track ages obtained from the upper member of Nakamura Formation (Kobayashi 1989; Shikano 1995) and more detailed stratigraphic study of both formations suggest that the Nakamura and Hachiya Formations may have been deposited at about the same time, and the age of the upper member of the Nakamura Formation likely falls between 21 and 18 Ma at most (Shikano 1995). However, if this wide range of ages is correct, the maximum makes the age of the lower member too old. Therefore, the age of the upper member is more likely around 19 Ma.

The Dota fauna currently consists of the following eight taxa: one insectivore (*Plesiosorex* sp.), one lagomorph (cf. *Amphilagus* sp.), three castorid rodents (*Youngofiber sinensis*, *Anchitheriomys* sp., *Eucastor* ? sp.), and three eomyid rodents (*Megapeomys* sp. nov. (described below), gen. et sp. (= ancestral form of *Keramidomys*), gen. et sp. indet.) (Tomida 2000). They may be, in general, correlated with MN 3 or 4 of the European land mammal age zonation, but considering the absolute age mentioned above, the fauna is more likely correlative with MN 3. The absolute age of MN 3 is considered to be between 20.5 and 18 Ma in Europe (Steinger 1999).

SYSTEMATIC PALEONTOLOGY

Class MAMMALIA Linnaeus, 1758

Order RODENTIA Bowdich, 1821

Family EOMYIDAE Deperet and Douxami, 1902

Subfamily APEOMYINAE Fejfar, Rummel, and Tomida, 1998

Genus *MEGAPEOMYS* Fejfar, Rummel, and Tomida, 1998

Type Species. - *Megapeomys lavocati* Fejfar, Rummel, and Tomida, 1998, by original designation.

Megapeomys repenningi sp. nov.
Figures 1 – 3

1995 - *Geomyoidea* gen. et sp. indet. Tomida and Goda, p. 57A.

1998 - *Megapeomys* sp. Fejfar, Rummel, and Tomida, p. 138, figure 9.

Holotype: Isolated left lower first molar (m1) (NMNS-PV 20153). NMNS stands for the National Museum of Nature and Science in Tokyo, Japan, which was formerly called the National Science Museum.

Etymology: To the honor of the late Charles A. Repenning, for his great contribution to the paleontology of rodents and other mammalian groups.

Type locality and age: Exposures on the left bank of Kiso River near Dota, Kani City, Gifu Prefecture, central Japan (Tomida and Setoguchi 1994, figure 1-1), near the top of Nakamura Formation; likely around 19 Ma (21 – 18 Ma is greatest probable range) and is correlated with MN 3 zone of European land mammal age (see Geology and Age section above).

Diagnosis: Relatively small-sized species of the genus. Lower first molar with synclinid III deeper; lingual end of the synclinid III becomes shallower only slightly; distal root of m1 does not split toward the tip.

Measurements: length of occlusal surface, 2.08 mm; maximum length in lateral view, 2.20 mm; maximum width of mesial lobe (trigonid), ca. 2.16 mm; maximum width of distal lobe (taloid), 2.32 mm.

Description: Relatively deeply worn m1, barrel-shaped and relatively high crowned (for an eomyid). Mesial roots are broken at the base and not securely known for number and shape. Distal root is single with mesio-distally compressed plate-like shape, becoming only slightly narrower toward the tip, and not splitting toward the tip. The enamel is rather thick as seen on the occlusal surface. The occlusal surface is concave, and enamel wall on

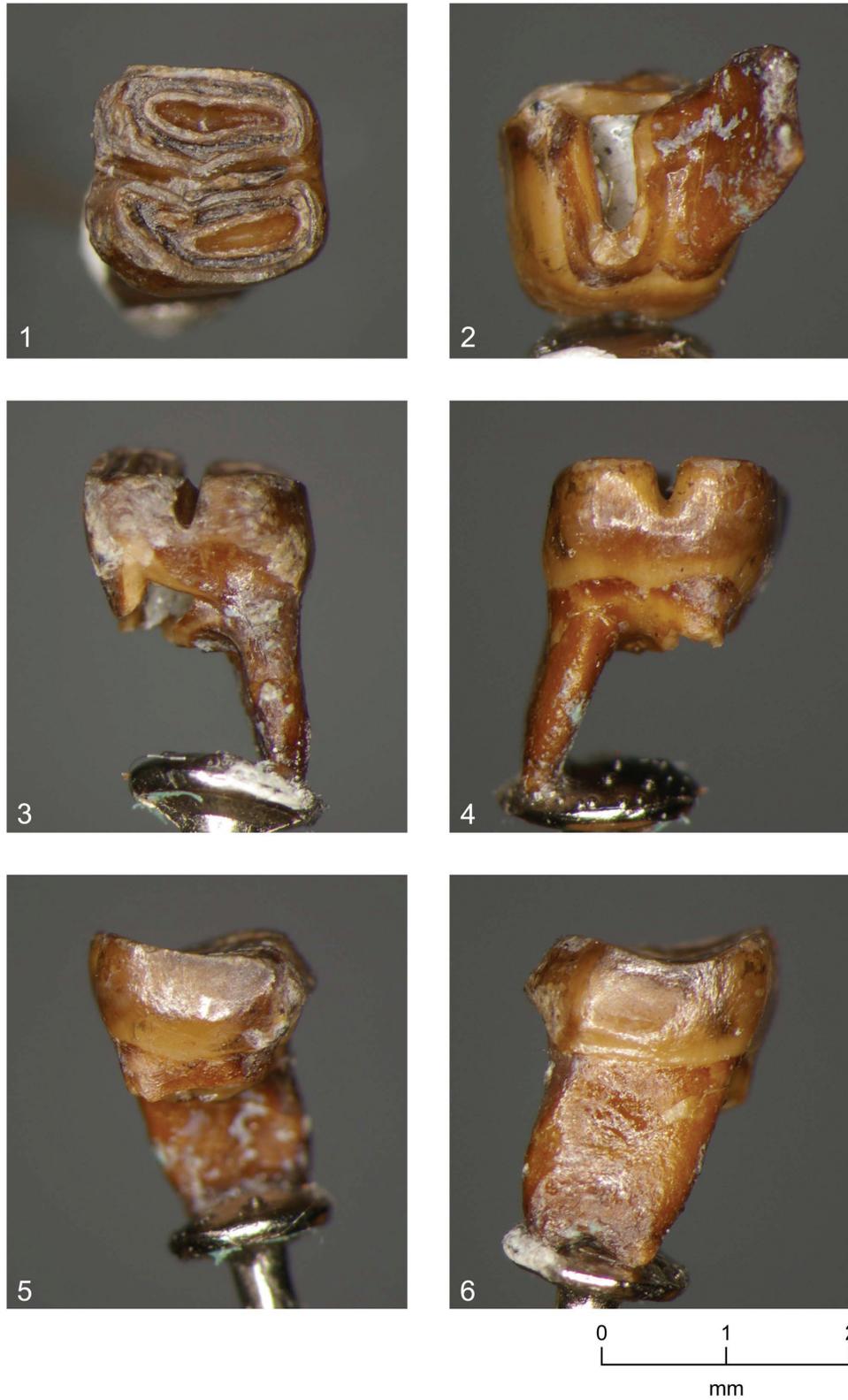


FIGURE 1. Photographs of the holotype (NMNS-PV 20153; left m1) of *Megapeomys repenningi*. 1 occlusal, 2 latero-basal, 3 buccal, 4 lingual, 5 mesial, and 6 distal views.

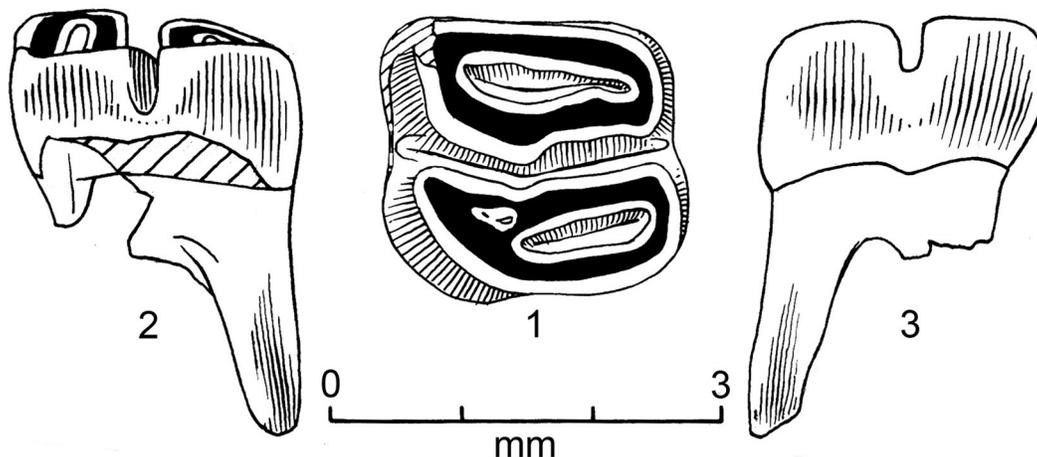


FIGURE 2. Line drawings of the holotype (NMNS-PV 20153; left m1) of *Megapeomys repenningi*. 1 occlusal, 2 buccal, and 3 lingual views.

the lingual side is higher than buccal side. The crown consists of two, laterally elongated oval lobes separated by a deep transverse valley (synclinid III), which becomes shallower only slightly toward the lingual end. Synclinid III is almost transverse, but in detail it bends rather sharply at a point somewhat buccal to the midpoint of the width. Mesial lobe is slightly narrower than distal lobe, but is about the same in mesio-distal length. Its central valley (synclinid II) is as wide as it can be relative to the width of mesial lobe and is nearly transverse, only slightly diagonal to the mesio-distal direction of the tooth. Distal lobe is slightly wider than mesial. Its central valley (synclinid IV) is short, only about two thirds of its maximum possible width, and is skewed lingually. Beyond where the synclinid ends, a small enamel island is present on the buccal one third of the distal lobe.

Discussion: The holotype (NMNS-PV 20153) was originally identified as m1 or m2 (Fejfar et al. 1998), but it is here considered to be m1 based on (1) mesial lobe is narrower (although slightly) than distal lobe and (2) hypoconid and posterolophid forms a moderately sharp angle, as observed in m1, rather than in m2 of *M. lavocati*.

M. repenningi is slightly larger (10%) than *M. lavocati* and is smaller than *M. lindsayi*, also from Bohemia. Although *M. lindsayi* is represented only by p4 (length 2.53 mm, width 2.50 mm in holotype), it is about 20% larger than *M. lavocati* (length 2.00 mm, width 2.17 mm in holotype; Fejfar et al. 1998). The height of the lingual edge of synclinid III above the enamel base is about 40% of tooth length in *M.*

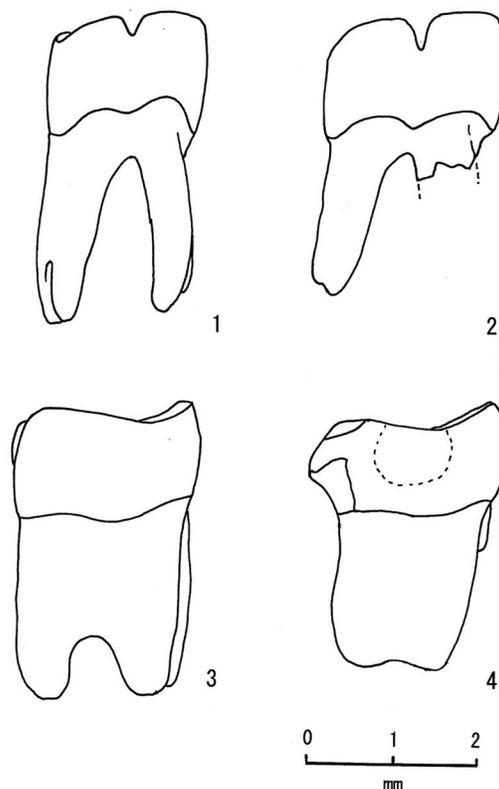


FIGURE 3. Comparison between *Megapeomys lavocati* and *M. repenningi*. 1 and 3, m1 of *M. lavocati*; 2 and 4, m1 of *M. repenningi*. 1 and 2, lingual and 3 and 4, distal views. Dashed pattern on 4 indicates the interdental wear facet.

repenningi, while it is nearly one half in *M. lavocati*, suggesting that synclinal III is deeper at its lingual end in *M. repenningi* than *M. lavocati* (Figure 3).

Distal roots of m1 and m2 in *M. lavocati* are split into two at approximately the lower one third of the root, unlike in *M. repenningi* (Figure 3; Figure 7 of Fejfar et al. 1998). This may suggest that *M. repenningi* is somewhat more primitive than *M. lavocati*, because the same root is always single in *Apeomys*, the ancestral form of the genus *Megapeomys* (Fejfar et al. 1998).

Although the genus *Megapeomys* was originally known from Europe (Czech Republic) and Asia (Japan), another species of the genus (*M. bobwilsoni*; Morea and Korth 2002) and a similar but derived genus (*Apeomyoides savagei*; Smith et al. 2006) were recently described from North America. In *A. savagei*, all cheek teeth are higher crowned than *Megapeomys* in general and moreso than *M. repenningi* in particular, although the size is similar to *M. repenningi*. *M. bobwilsoni* is the largest species of the genus and has four roots on m1-2, while *M. repenningi* is a much smaller species and has three roots on m1. Thus, *M. repenningi* can be easily distinguished from apeomyine species from North America.

ACKNOWLEDGMENTS

I deeply thank T. Goda who found most of the Dota small mammal specimens, including the holotype described above, and donated all his findings to the National Museum of Nature and Science in Tokyo. Also, I am indebted to O. Fejfar for his support and encouragement and for use of his research facilities when I examined the specimens of *Megapeomys lavocati* and other taxa from Merkur-North, northern Bohemia, Czech Republic. I sincerely thank L.J. Flynn and L.L. Jacobs for their criticism and suggestions on the manuscript. Figure 1 was prepared by Y. Okamoto, and an early version of Figure 2 was kindly provided by O. Fejfar. Financial support was provided in part by Grant-in-Aid for Scientific Research (C) No. 07640627 by Ministry of Education, Science, Sports and Culture of Japan and by Fujiwara Natural History Foundation for 1998.

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