Discovery of Yuomys from Altun Shan, Xinjiang, China (Postprint)

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Abstract

Specimens reported in this note represent the first discovery of Yuomys in Altun Shan. A new species, Yuomys altunensis, is established based on the following features: molars large and wide in proportion; metaconule distinctly separated from metacone, metaloph long, but incomplete; hypocone smaller than protocone; sinus extending to base of crown on lingual side; postcingulum connecting lingual side of metacone; metacone crescent and postcingulum short in M3. Yuomys altunensis is similar to Y. cavioides, Y. eleganes and Y. huangzhuangensis of late Middle Eocene in molar morphlogy. According to its evolutionary level, Y. altunensis is supposed as of late Middle Eocene in age, or slightly later.

Full Text

Discovery of Yuomys from Altun Shan, Xinjiang, China

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Abstract

The specimens reported in this note represent the first discovery of *Yuomys* from the Altun Shan region. A new species, *Yuomys altunensis*, is established based on the following features: molars that are large and proportionally wide; metaconule distinctly separated from the metacone; metaloph long but incomplete; hypocone smaller than protocone; sinus extending to the base of the crown on the lingual side; postcingulum connecting to the lingual side of the metacone; and in M3, metacone crescent-shaped with a short postcingulum. *Yuomys altunensis* exhibits molar morphology similar to *Y. cavioides*, *Y. eleganes*, and *Y. huangzhuangensis* from the late Middle Eocene. Based on its evolutionary level,

Y. altunensis is inferred to be of late Middle Eocene age, or possibly slightly younger.

Key words: Altun Shan, Xinjiang, Middle Eocene, Xishuigou Formation, *Yuomys*

The genus *Yuomys* has previously been considered an extinct endemic rodent genus from the Middle–Late Eocene of China, with fossils known only from the eastern and southern parts of the country (east of 100°E). In 2011, several *Yuomys* specimens were collected from Altun Shan in the Xinjiang Uygur Autonomous Region, from a site located near 91°E. This discovery clearly demonstrates that the distribution of *Yuomys* extended much further westward than previously recognized. Furthermore, the Altun Shan specimens represent a new species of *Yuomys* worthy of special note.

Systematic Paleontology

Superfamily Ctenodactyloidea Simpson, 1945
Genus *Yuomys* Li, 1975
***Yuomys altunensis* sp. nov.** (Fig. 1)

Holotype. Right maxilla with M1–3 and roots of P4 (IVPP V 16295.1).

Paratypes. Left maxilla with M1–2 (IVPP V 16295.2), left maxilla with M2–3 (V 16295.3), and right maxilla with M2 (V 16295.4).

Locality and horizon. East of Caihong Gou (91°30 57.21 E, 38°55 30.65 N), Altun Shan in Ruoqiang County, Bayingolin Mongol Autonomous Prefecture, Xinjiang Uygur Autonomous Region, China; lower part of the Xishuigou Formation, late Middle Eocene.

Diagnosis. Larger-sized *Yuomys*; upper molars higher-crowned, much wider than long, with mesostyle; metaconule distinctly separated from metacone by a longer, lower, and incomplete metaloph; hypocone smaller than protocone; postcingulum connecting to lingual side of metacone; sinus extending to base of crown on lingual side; M3 having more lingually situated and crescent-shaped metacone, short postcingulum, and distinct hypocone.

Description. Technical terms used in this paper follow Li and Meng (2015).

The holotype and three paratypes preserve only portions of maxillae. The zygomatic process of the maxilla is positioned opposite P3 and P4, with its lateral part bending posteriorly to form the anterior root of the zygomatic arch. The anteriormost point of the emarginated posterior border of the zygomatic arch is opposite the middle of P4.

The specimens described here possess two premolars (P3 and P4). V 16295.1 and V 16295.3 preserve alveoli of P3, indicating that P3 has a single root. V 16295.1 preserves roots of P4, while V 16295.2 and V 16295.3 preserve only

alveoli of P4, showing that P4 consists of three roots. The lingual root is the largest, and the postero-buccal root is the smallest.

The molars are buno-lophodont and lingually hypsodont, much wider than long. M1 and M2 are rectangular in outline, wider than long (see Table 1). The M1 of V 16295.1 is heavily worn, while that of V 16295.2 is only partly preserved. The M2 specimens are well preserved.

The protocone is the largest cusp in occlusal view. The paracone is slightly larger and higher than the metacone. The protoloph is complete and slightly lower in its middle part. No protoconule is visible. The metaconule is smaller than the metacone and distinctly separated from it. Thus, the metaloph connecting the metacone with the metaconule is relatively longer but lower in height than the protoloph. The incomplete metaloph extends toward the protocone but does not reach it. The hypocone is located posterior to the protocone and is distinctly smaller in size. On the lingual side, the sinus extends to the base of the crown. The parastyle is distinct but smaller and lower than the metacone. At the junction of the precingulum and protoloph, there is a distinct groove on the lingual side. The postcingulum, which connects to the lingual side of the metacone, and the precingulum are subequal in length and nearly parallel to each other. The mesostyle is present but small.

M3 is trapezoidal in outline, with the anterior side wider than the posterior side, and the buccal side longer than the lingual side. The anterior part of M3 is similar to M2 in basic features, but the anterosinus between the precingulum and protoloph is longer anteroposteriorly than that of M2 and opens more widely buccally. The metacone is crescent-shaped in occlusal view and is situated slightly more lingually than the paracone. The metaconule is positioned slightly more anteriorly relative to the metacone than in M2. The metaloph is low and incomplete, and no ridge is visible between the metaconule and protocone. The mesostyle is more developed than in M1–2. The hypocone is distinct. The postcingulum is much shorter than the precingulum and connects to the lingual end of the metacone.

[Figure 1: see original paper]

Measurements. See Table 1.

Comparison. The Altun Shan specimens are similar to *Yuomys* in having the zygomatic process of the maxilla opposite P3 and P4, upper cheek teeth with P3 and P4, molars that are lingually hypsodont and buno-lophodont, a distinct metaconule, and a hypocone located posterior to the protocone. It appears justified to refer the Altun Shan specimens to the genus *Yuomys*.

To date, *Yuomys* is known to include seven species (*Y. cavioides*[1], *Y. eleganes*, *Y. weijingensis*, *Y. huangzhuangensis*, *Y. huheboerhensis*, *Y. minggangensis*, and *Y. yunnanensis*) and several indeterminate species (Li, 1975; Wang, 1978; Wang and Zhou, 1982; Ye, 1983; Shi, 1989; Huang and Zhang, 1990; Wang, 2001; Li and Meng, 2015). Since the latter two species (*Y. minggangensis* and *Y.*

yunnanensis) are known only from lower jaws, comparison is confined to the first five species.

As Table 1 shows, the upper molars of the Altun Shan specimens are subequal in size to those of *Y. cavioides* and *Y. huangzhuangensis*, longer than those of the other three species, but much wider than those of all five species mentioned above. In addition, they differ from all five species in having a paracone higher than the metacone, a postcingulum reaching the lingual side of the metacone, and in M1–2 having hypocones smaller than protocones.

Furthermore, they differ from *Y. cavioides*, *Y. eleganes*, *Y. weijingensis*, and *Y. huheboerhensis* in M2–3 having a metaconule distinctly separated from the metacone and a metaloph that is relatively longer and lower, and in M2 (or M3) lacking a short ridge extending from the metaconule to the protocone; from *Y. cavioides* and *Y. huheboerhensis* in M3 having a more lingually located, crescent-shaped metacone and a shorter, less curved postcingulum reaching the lingual end of the metacone; from *Y. weijingensis* and *Y. huheboerhensis* in having a sinus extending to the base of the crown on the lingual side; and from *Y. eleganes* and *Y. huangzhuangensis* in having a mesostyle on the molars. Additionally, the Altun Shan specimens are larger than *Y. yunnanensis*.

Based on these differences, a new species *Yuomys altunensis* is established.

Discussion. To date, the genus *Yuomys* is known only from the Middle–Late Eocene of China. Among known *Yuomys* species, *Y. cavioides*, *Y. huangzhuangensis*, and *Y. eleganes* are known exclusively from the late Middle Eocene, while the others are from the early Middle Eocene. The former two are larger than the other species. Among the remaining four species, *Y. huheboerhensis* was collected from the lower part of the Irdin Mahan Formation (IM-1) in the Erlian Basin, Nei Mongol, and represents the oldest species of *Yuomys* (Li and Meng, 2015).

The molars of this species are the smallest in *Yuomys*. They are lower-crowned and have a shorter sinus extending only halfway to the crown on the lingual side, similar to other early Middle Eocene species (*Y. weijingensis*), whereas late Middle Eocene species, including *Y. cavioides*, *Y. eleganes*, and *Y. huangzhuangensis*, have higher-crowned molars with a longer sinus extending to the base of the crown on the lingual side. From these observations, general evolutionary trends in *Yuomys* molars can be deduced: size increases from smaller to larger, crown height increases from lower to higher, and the sinus on the lingual side evolves from shorter to longer, eventually extending to the base of the crown.

It should be noted that Wang (2001) described two molars (IVPP V 12528.1–2) from the Late Eocene Houldjin Formation near Irenhot as *Yuomys* sp. These specimens exhibit some primitive features: the molars are smaller in size (smaller than *Y. cavioides*, *Y. eleganes*, *Y. weijingensis*, and *Y. huangzhuangensis* but larger than *Y. huheboerhensis*) and have a shorter sinus on the lingual side. On the other hand, they display more lophodont features than all known *Yuomys* species: a more developed metaloph parallel to the protoloph. The *Yuomys* sp.

from Irenhot may represent a distinct branch separate from the main evolutionary lineage of all known *Yuomys* species.

As described above, the molars of *Y. altunensis* are similar in general morphology to those of *Y. cavioides*, *Y. eleganes*, and *Y. huangzhuangensis* from the late Middle Eocene and may be at the same evolutionary level as these three species. If so, *Y. altunensis* may also be of late Middle Eocene (Sharamurian ALMA) age. Consequently, the lower part of the Xishuigou Formation may be of late Middle Eocene age.

Alternatively, given that the molars of *Y. altunensis* are wider than those of all known *Yuomys* species, *Y. altunensis* may represent a more advanced species, and its age may be slightly younger than that of *Y. cavioides*, *Y. eleganes*, and *Y. huangzhuangensis*. If this proves true, the lower part of the Xishuigou Formation bearing *Y. altunensis* may be of latest Middle Eocene or younger age.

[1] Tong (1997) referred two specimens (IVPP V 10293.1, 2) from Rencun of Henan to *Yuomys cavioides*. It seems to the author that the two specimens may not belong to that species, because the M3 has a crescent metacone and shorter postcingulum connecting the lingual end of the metacone, which are quite different from those of *Y. cavioides*.

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Note: Figure translations are in progress. See original paper for figures.