内蒙古始新世梳趾鼠类化石

王 伴 月

(中国科学院古脊椎动物与古人类研究所 北京 100044)

摘要  描述了4属10种梳趾鼠类化石(Gobiomys neimongolensis, G. exiguus(新种), G. cf. G. exiguus, G. asiaticus(新种), Gobiomys sp., Advenimus cf. A. bohlini, A. cf. A. burkei, Yuomys sp.和 Protataomys sp.)。以Mergenomys neimongolensis作属型种建了一新属,Gobiomys。其特征是: 门齿孔大; 前齿列低、斜列明显,下颊列明显,但不膨大,齿列开阖; P4/p4非臼齿化; 上下颌骨长于下后上部; 下下颌骨和下前骨部。G. exiguus 的特点是: 个体较小,上领骨颇易发在 P3 之前,下臼齿槽下缘尖后上部; 下下颌骨和下前骨部。G. asiaticus 的上领骨颇易发在 P3 的外缘; 上下颌骨较发达的齿骨; 上下颌骨较宽,后下小尖部; 下下颌骨较发达的内下骨和下前骨部。

Gobiomysidae 新科包括 Gobiomys, Mergenomys, Youngomys 和哈萨克斯坦的未命名的新属等 4 属,组成与梳趾鼠科相似的姐妹群。其主要特征是: 下颌骨缺咬肌窝上方,颊骨低冠,近似上齿形, P3 存在。P4/p4 非臼齿化, 上下颌骨状较明显, 后下小尖部较明显, 后下小尖部较明显, 下下颌骨较明显。Gobiomysidae fam. nov.

1 系统描述

梳趾鼠科 Ctenodactyloidea Tullberg, 1899

戈壁鼠科(新科)Gobiomyidae fam. nov.

正型属 Gobiomys gen. nov.

包括属 Mergenomys, Youngomys 和哈萨克斯坦的 Ctenodactyloidea gen. nov.[见 Wang et al., (MS)].

地质时代分布 中-晚始新世。

地理分布 中国、蒙古和哈萨克斯坦。

特征 具有斜嘴骨和松鼠型下颌骨的梳趾鼠类。下颌骨连于下颌骨上缘或 m1 下方, 具明显的下缘,上颌骨明显下缘, 下上颌骨明显下缘, 牙式 1/1, 0/0, 2(1?)/1, 3/3。颊齿骨冠低, 主尖发

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育，齿脊较细弱。第四前臼齿非臼齿化。上臼齿无原小尖，后脊向原尖方向斜伸或无，后小尖通常明显，内脊较细弱或无。p4 无下后脊。下臼齿下原尖后脊较明显后伸，其舌部弱小或无；下三角凹向后开口；下外脊位于齿的纵中轴处；无下中尖；下次尖脊通常较弱或无。ml～2 下次小尖发育，位于齿的后缘中部。

比较 Gobiomyidae 与 Ctenodactylidae 的区别是，颊齿齿冠较低，齿尖较发育，齿脊较弱。P3 通常存在。上臼齿后脊向原尖斜伸或无，后小尖通常发育。p4 无下后脊。下臼齿下内尖脊通常较弱或缺等。与 Cocomyidae, Tamquammymidae, Chapattimyidae 和 Yuomyidae 的区别在于下领骨缺咬肌窝上痕，下臼齿具较高的前齿带，下臼齿具较长的三角座和较向后伸的下原尖后脊，下外脊位于齿的纵中轴处，下中凹与下外凹约等宽。下次小尖大等。此外，Gobiomyidae 不同于 Cocomyidae 在于具鹰嘴型的头骨；不同于 Cocomyidae, Tamquammymidae 和 Chapattimyidae 在于上臼齿缺原小尖，下臼齿缺下中尖；与 Chapattimyidae 和 Yuomyidae 的区别在于具非臼齿化的 P4/p4。

戈壁鼠（新属）Gobiomyys gen. nov.

属型种 Mergenomys neimongolensis Meng, Ye, Huang, 1999。
归入种 Gobiomyys exiguus sp. nov. 和 G. asiaticus sp. nov。
地质和地理分布 中-晚始新世，中国内蒙古。
特征 中-小型梳趾鼠。上颌骨颊突后缘位于 P3 外方或稍前，门齿孔大，后端达 P4 舌侧，齿式：1/1，0/0，2/1，3/3。侧向从前往后增大，齿尖明显，但不膨大，齿凹较开颌；P4 前尖和原尖圆锥形，后脊弱或无，后齿带发育，具三齿根；上臼齿宽大于长，从 M1 到 M3 后小尖逐渐变弱小，而后脊由无到完全发育；M1 和 M2 具弱的内脊；p4 下外脊靠近颊侧，下臼齿下外脊位于齿的中轴偏颊侧，下外凹横向稍窄；ml～2 下次小尖位于齿后缘中部；m3 无明显下次小尖。

名称来源 Gobi, 英文, 戈壁, 沙漠, mys, 希腊文, 鼠类。

内蒙古戈壁鼠 Gobiomyys neimongolensis (Meng, Ye, and Huang, 1999)

(Meng, Ye, and Huang, 1999) 1/8
Ctenodactylidae gen. et sp. nov., 王, 王, 1997: 122, 124, 128.

标本 6 个上颌骨 (IVPP V 12518.1～5, V 12519.1), 10 下颌骨 (V 12518.7～15, V 12519.19), 1 dP4 (V 12519.2), 2 P4 (V 12519.3～4), 5 M1 (V 12519.5～9), 6 M2 (V 12519.10～14, V 12520), 5 M3 (V 12518.6, V 12519.15～18), 2 p4 (V 12519.20～21), 3 ml (V 12519.22～24), 9 m2 (V 12519.25～33) 和 3 m3 (V 12518.16～17, V 12519.34).

地点和层位 内蒙古阿拉善左旗浩来呼热都盆地绿根扎大盖, IVPP Loc. 74097 (94-1) (V 12518), 上始新统初下布格组第三层; 二连浩特火车站东 IVPP Loc. 88001 (V 12519) 和二连盆地西南段 IVPP Loc. 88003 (V 12520), 上始新统呼尔井
修订特征 上领骨颧突后缘与 P3 相对。M1 具较发育的后小尖，但无后脊。下臼齿具
游离的下原尖后臂舌部，下前齿带很弱或无，无明显的下内尖臂。

比较与讨论 上述标本在下颌骨的咬肌窝及其上，下喙和前喙的形状和位置，颊孔
的位置，颊齿为低冠，近形齿，下臼齿具短的下原尖后臂舌部，下外脊和下次下小尖位于齿的纵
中轴稍偏颊侧，下内尖臂不发育等特点都与 Mergenomys neimongolensis 的相似，而且上
述标本的尺寸也与该种的相近。显然，上述标本应归入 M. neimongolensis 种。

孟津等(1999)认为 M. neimongolensis 与 Mergenomys 属的属型种 M. orientalis 的区
别在于个体较大，外下脊和下次小尖的位置偏外等。较多的标本表明，M. orientalis 的尺
寸是在 M. neimongolensis 的变异范围内外，但两者在颊齿的冠面形态结构上的确有明显的区
别。除了下外脊和下次小尖位置不同外，M. neimongolensis 在齿冠较低，下臼齿具下原
尖后臂舌部，下后尖和下内尖不膨大，而且向前倾。齿凹较开阔，下次下小尖不膨大等特点
都与 M. orientalis 的不同。此外，归入 neimongolensis 种的上颊齿与 M. orientalis 的有
明显区别：如上臼齿后小尖不膨大，从 M1 往 M3 逐渐变小；后脊往后由无变得较发育；中
凹和后凹较开阔；M1 和 M2 具内脊等。笔者认为 neimongolensis 应代表不同于 Mergenomys
的新属，定名为戈壁鼠 Gobiomys。Gobiomys 与 Youngomys 的区别在于颊齿较
宽短，上臼齿后脊和内脊较发育，后小尖较弱小；与哈萨克斯坦的 Ctenodactyloidea gen.
nov.[见 Wang et al., (MS)]的区别是颊齿冠面结构较简单。

小戈壁鼠(新种)Gobiomys exiguus sp. nov.

(图版 II. 3～8)

正型标本 一段左上领骨具 M1～M2(IVPP V 12521.1).

归入标本 三段上领骨(V 12521.2～4)，2 P4(V 12521.5，V 12522.1)，1 M1
(V 12522.2)，1 M2 (V 12522.3)，1 M3 (V 12522.4)，1 p4 (V 12521.6) 和 3 m1/2
(V 12522.5～7)。

地点和层位 四子王旗额尔登牧包 IVPP Loc. 91004 (V 12521)，中始新统沙拉木
伦组“下白层”；二连浩特火车站东 IVPP Loc. 88001 (V 12522)，下始新统呼尔井组。

特征 小型的戈壁鼠，近 G. neimongolensis 约小 1/3，上领骨颊突后缘在 P3 之前，其
腹侧咬肌附着的崎的位置靠近后缘，下臼齿下原尖后臂舌部、下内尖臂和下前齿带。

名称来源 Exiguus，拉丁文，小，稀少，意寓该种个体小，发现的化石标本较稀少。

比较 上述标本在颊齿为低冠，近形齿；主尖、后小尖和下次下小尖不膨大；P4/p4 非臼
齿化；其 P3，P4 前尖和原尖为近形，具三齿根；M1～2 具低弱的内脊；M3 后脊发育，后小
尖退化；p4 下原尖和下后尖为近形，无下后脊，下次下尖与下内尖有沟分开；下臼齿下外脊
和下次小尖的位置偏颊侧等特征都与 Gobiomys neimongolensis 的相似，而与 Mergenomys
的不同，应归入 Gobiomys 属。但它们比 G. neimongolensis 小得多。其尺寸仅为后者的 2/3
左右。此外，它们的颧弓的位置较靠前，颧弓腹侧的棱的位置相对靠后，颊齿齿冠相对较
低，M1 具弱的后脊，m1/2 的下外脊较明显靠颊侧和下原尖后臂舌部等。这些特点除了
颧弓位置较靠前外，其余的均较 G. neimongolensis 的原始，它们很可能代表比 G.
neimongolensis 较小、较原始的新种，称为 G. exigus.

亚洲戈壁鼠（新种）Gobiomys asiaticus sp. nov.

(图版 II, 12～14)

正型标本 一段左上颌骨具 M1～2（IVPP V 12524.1）。

归入标本 一段左上颌骨具 M1（IVPP V 12524.2），1 P4（V 12524.3）、一段右下
颌骨具 m1～2（V 12524.4）和 1 m1/2（V 12524.5）。

地点和层位 四子王旗额尔登敖包 IVPP Loc. 91004，中始新统沙拉木伦组“下白
层”。

特征 小型的戈壁鼠，上颌骨颧突后缘位于 P3 的颊方，上臼齿较宽短，后尖较弱，
后齿较发达。下臼齿前齿带较强，下内内尖骨完全。伸达下犬齿。

名称来源 Asiaticus，拉丁文，Asia，亚洲。

比较 上述标本在上颌骨颧突、门齿孔和下颌骨的形态结构上都与 G. neimongolensis 的一致。其上齿和下齿的结构形态也与 Gobiomys 的相似，它与 G. neimongolensis 和 G. exigus 的区别是：上臼齿后的尖小尖弱小，后齿较发达，下臼齿具完
全的下内尖骨和发达的下前尖骨。此外，它们比 G. neimongolensis 的尺寸小，下臼齿较明
显的下原尖后骨部，它们的上颌骨颧突后缘的位置较 G. exigus 的后缘，下臼齿比例上
较宽短等。

在二连浩特火车站东 IVPP Loc. 88001 呼尔井组中还发现了 10 来枚单个牙齿。它们
分属似小戈壁鼠（Gobiomys cf. G. exigus）、戈壁鼠（Gobiomys? sp.）、似步
林陌生鼠（Adveninus cf. A. bohlini Dawson, 1964）、似贝克陌生鼠（Adveninus cf. A.
burkei Dawson, 1964）、原塔鼠（未定种）（Protataromys sp.）和豫鼠（未定种）（Yuomys
sp.）。

2 讨论

关于 Gobiomys 的分类位置 用 PAUP 3.1.1 对 Gobiomys 的分类位置进行了分析。图
1 显示了 Ctenodactyloidea 最简约的合意树的一部分。图 1 表明 Gobiomys 与 Mergeronmys
Yougongmys 和哈萨克斯坦的 Ctenodactyloidea gen. nov. 组成一个科，戈壁鼠科
Gobiomyidae。该科组成 Ctenodactylidae 的姐妹组。

额尔登敖包产梳齿鼠化石地层的层位和时代 额尔登敖包地点的梳齿鼠化石产自灰
色含砾砂岩，系中亚考察团额尔登敖包剖面“下白层”的下部，或江浩贤（1983）的第 10
层。与沙拉木伦区典型地点的乌兰戈楚组和沙拉木伦组的岩性比较，笔者认为“下白
层”似应为沙拉木伦组的上部。根据该层所产的哺乳动物化石，“下白层”时代很可能为
中始新世。

呼尔井组的时代长时期被认为是渐新世，现被认为是晚始新世（王学月，1997b）。上
述梳齿鼠类的化石表明，二连浩特附近的呼尔井组中还产有原仅在中始新世地层中发现
EOCENE CTENODACTYLOIDS (RODENTIA, MAMMALIA) 
FROM NEI MONGOL, CHINA

WANG Ban-Yue
(IInstitute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences Beijing 100044)

Abstract The ctenodactyloids from the Eocene of Nei Mongol include 10 species representing 4 genera (Gobiomys neimongolensis, G. exigus sp. nov., G. cf. G. exigus, G. asiaticus sp. nov., Gobiomys spp., Adveninus cf. A. bohlini, A. cf. A. burkei, Yuomys sp. and Protaromys sp.). The new genus, Gobiomys, is erected based on the species, neimongolensis, which has previously been referred to Mergonomys. The main characters of Gobiomys are: incisive foramen large; P3 present; cheek teeth lower crowned, with distinct but not swollen main cusps and broad sinuses; P4/p4 non-molariform; upper molars wider than long, with rather developed metaloph; M1 and M2 with entoloph; lower molars metaconid and entoconid inclining forwards and ectolophid and hypoconulid slightly buccally located. The main features of G. exigus include small size, zygomatic process of maxillary anterior to P3, absence of lingual part of posterior arm of protoconid, arm of entoconid and anterior cingulum on lower molars. In G. asiaticus the posterior edge of the zygomatic process of maxillary is buccal to P3; the molars have more developed lophs; the upper molars are relatively wide and have weaker metaconid; and the lower molars have more developed arm of entoconid and anterior cingulum.

The new family, Gobiomyidae, includes Gobiomys, Mergonomys, Youngomys and Ctenodactyloidea gen. nov. from Kazakhstan [see Wang et al., (MS)]. In the family the lower jaw lacks upper crest of masseteric fossa. The cheek teeth are brachydont and more bunodont than lophodont. P3 is usually present. P4/p4 are nonmolariform. On the upper molars the protoconule is absent, the metaloph extends towards protocone or absent and the metaconule is usually well-developed. The p4 has no metalophid. On lower molars the posterior arm of protoconule extends rather posteriorly and the arm of entoconid is weak or
absent. The ectolophid is near centrally located and has no mesoconid. The Gobiomyidae
represent the sister group to the Ctenodactyloidea.

Key words Nei Mongol, Eocene, Ctenodactyloidea

The living forms of the Ctenodactyloidea are restricted to North and Eastern
Africa. However, from Paleogene through early Miocene they lived exclusively in Asia,
where they flourished and were widely diverse, becoming dominant rodent group.
Because of the abundance in fossils, high diversity, and rapid evolution, they are
particularly important for the biostratigraphy of the Paleogene and Miocene in Asia.
Up to now the study of the Ctenodactyloidea has been mostly concentrated on the
fossils from the early and middle Eocene, Oligocene and Miocene. Only very few
papers (Wang, 1984, 2001; Dashzeveg and Meng, 1998) have dealt with the late
geologic survey in the vicinity of Erenhot (= Iren), Erden Obo (= Urtyn Obo) of
Siziwang Qi, and Haosibuldu Basin of Alxa Zuqi, in Nei Mongol, China, and
collected a variety of mammal fossils from middle and upper Eocene, mainly by
screening method. Among the fossils the ctenodactyloids from middle and upper
Eocene are abundant and important. The discovery of the ctenodactyloids furnishes
important information on the evolution of the group during the middle and late Eocene.

The terms used in this paper mainly follow Wang (1997b).

Abbreviations: IVPP, Institute of Vertebrate Paleontology and Paleoanthropology,
Chinese Academy of Sciences; IVPP Loc., locality of IVPP; IVPP V, catalogue
number of the vertebrate fossils of IVPP.

1 Systematics

Ctenodactyloidea Tullberg, 1899
Gobiomyidae fam. nov.

Type genus Gobiomys gen. nov.

Included genera Mergenomys, Youngomys and Ctenodactyloidea gen. nov. from
Kazakhstan [see Wang et al., (MS)].

Geological range Middle-late Eocene.

Geographic distribution China, Mongolia and Kazakhstan.

Diagnosis Ctenodactyloids with hystricomorphous skull and sciuropnathous mandible;
masseteric fossa on mandible extending to below anterior edge of m2 or m1,
with distinct lower crest, but without distinct upper crest; dental formula 1/1, 0/0, 2(1?)/1, 3/3;
cheek teeth brachydont and more bunodont than lophodont; fourth premolar
non-molariform; on upper molars protoconule absent, metaolph extending towards
protocone or absent, metaconule usually distinct, entoloph weak or absent; p4 without
metalophid; on lower molars posterior arm of protoconid extending rather posteriorly,
with or without weak lingual part, trigonid basin open posteriorly, ectolophid located near middle longitudinal line, mesoconid absent, arm of entoconid usually weak or absent; distinct hypoconulid located on the middle of posterior margin of m1～2.

Comparison The Gobiomyidae are different from the Ctenodactylidae in tooth morphology. Their cheek teeth are lower crowned, with more distinct cusps but weaker lophs. P3 is present. On the upper molars the metaloph extends towards the protocone or absent, and the metaconule is usually well developed. The p4 lacks metalophid. The arm of entoconid is usually weak or absent on the lower molars. The Gobiomyidae differ from Cocomyidae, Tamquanmyidae, Chapattimyidae and Yuomyidae in lacking upper crest of massecetar fossa of lower jaw, having higher anterior cingulum on upper molar, lower molar having a longer trigonid, a rather posteriorly extended posterior arm of protoconid, centrally located ectolophid and subequal mesosinusid and sinusid in width and a large hypoconulid; furthermore from the Cocomyidae in having a hystericomorphous skull; from the Cocomyidae, Tamquanmyidae and Chapattimyidae in lacking protocone on upper molars and mesoconid on lower molars; from Chapattimyidae and Yuomyidae in having non-molariform P4/p4.

_Gobiomys_ gen. nov.

Type species _Mergenomys neimongolensis_ Meng, Ye, Huang, 1999.

Included species _Gobiomys exigus_ sp. nov. and _G. asiaticus_ sp. nov.

Geological range and geographic distribution Middle-late Eocene; Nei Mongol, China.

Diagnosis Middle- and small-sized ctenodactyloids; posterior edge of zygomatic process of maxillary located buccally to P3 or more anteriorly; large incisive foramen reaching posteriorly to P4; dental formula 1/1, 0/0, 2/1, 3/3; cheek teeth increasing backwards in size, with distinct, but not swollen main cusps, and broad sinuses; P4 with conic paracone and protocone, weak or absent metaloph, well-developed anterior and posterior cingula and three roots; upper molars wider than long, from M1 to M3 metaconule varies from distinct to weak and metaloph from absent to complete; M1 and M2 with weak entoloph; ectolophid located buccally on p4; lower molars with ectolophid located slightly buccally to middle longitudinal line and narrow sinusid; hypoconulid located at middle of posterior margin of m1～2 and absent on m3.

Etymology Gobi, English, desert, and mys, Greek, mouse.

Remarks The type species, _Gobiomys neimongolensis_, was referred to the genus _Mergenomys_ by Meng et al. (1999). It seems to me that the species represents a new genus distinct from _Mergenomys_, here named as _Gobiomys_ (detail see below).

_Gobiomys neimongolensis_ (Meng, Ye, and Huang, 1999)

(pl. 1, 1～8)

**Specimens**  6 upper jaws (IVPP V 12518.1–5, V 12519.1), 10 lower jaws (V 12518. 7–15, V 12519.19), 1 dP4 (V 12519.2), 2 P4 (V 12519.3–4), 5 M1 (V 12519.5–9), 6 M2 (V 12519.10–14, V 12520), 5 M3 (V 12518.6, V 12519.15–18), 2 p4 (V 12519.20–21), 3 ml (V 12519.22–24), 9 m2 (V 12519.25–33) and 3 m3 (V 12518.16–17, V 12519.34).

**Localities and horizons**  IVPP Loc. 74097 (94-1) (V 12518), Lügenuzhagai, Haosibuldu Basin, Alxa Zuoqi, 3rd layer of upper Eocene Qagan Bulag (=Chaganbulage) Formation; IVPP Loc. 88001 (V 12519), east to the Railway Station of Erenhot and IVPP Loc. 88003 (V 12520), the front of the scarp southwest to Eren Dabasu (=Eren salt marsh), upper Eocene Houldjin Formation.

**Emended diagnosis**  Posterior edge of zygomatic process of maxillary opposite to P3; M1 with well-developed metaconule but without metaloph; lower molars with free lingual part of posterior arm of protoconid, anterior cingulum weak or absent, and without distinct arm of entoconid.

**Remarks**  The above listed specimens are almost identical with those of Mergenomys neimongolensis of Meng et al. (1999) in both size and morphology. The common features are the following. The large masseteric fossa of the lower jaw extends to the level of anterior edge of the m2 or even more anteriorly, and has a well-developed lower crest, but no distinct upper crest. The crest anterior to the masseteric fossa extends obliquely to below the posterior root of p4. The mental foramen is under the anterior root of p4. The lower cheek teeth have weak metalophid I and short lingual part of posterior arm of protoconid. The metaconid and entoconid are not swollen but incline forwards. The ectolophid and hypoconulid are situated slightly buccal to the middle longitudinal line. The arm of entoconid is weak. The size of the holotype (V 11701) of M. neimongolensis is within the range of variation of the specimens from Nei Mongol. The specimens mentioned above belong to the species, M. neimongolensis.

The specimens from Nei Mongol show more features of G. neimongolensis. The skull is hystricomorphous. The infraorbital foramen is large. The posterior edge of the flat zygomatic process of the maxillary is opposite to P3. On its ventral surface there is a distinct crest near the anterior edge. The large incisive foramen extends posteriorly to the level of P4. The body of the mandible is high. The lower jaw is typical sciurognathous. The anterior end of the angular process arises from below the alveolus of the lower incisor. The high and large ascending ramus has higher coronoid process and condyle than the tooth row. The pterygoid fossa is large and deep. The mandible foramen is as high as the occlusal surface of the tooth row. The P3 is
present. The upper cheek teeth have distinct, but not swollen main cusps. The P4 is non-molariform and has conic paracone and protocone. The upper molars have broad sinuses and lack protoconule. From M1 to M3 the metaconule decreased and the metallocph varies from absent to developed. The M1 and M2 have entoloph.

Meng et al. (1999) pointed out that the differences of his material of *M. neimongolensis* from the type species, *M. orientalis* Dashzeveg and Meng (1998), are in being larger sized and having more buccally positioned ectolophid and hypoconulid. Additional specimens from Nei Mongol show that the size of *M. orientalis* is within the range of the variation of *M. neimongolensis*. But the occlusal pattern of the cheek teeth of the two species is quite different. Except those mentioned by Meng et al. (1999), in *M. neimongolensis* the cheek teeth are more lower-crowned than in *M. orientalis*. The posterior arm of protoconid has a lingual part. The metaconid, entoconid and hypoconulid are not so swollen as in *M. orientalis*, and the two former cuspids incline forwards. The sinuses are broad. The metaconule is not swollen, but decreases from M1 to M3. The metallocph varies from absent to developed backwards.

| Table 1 Measurements of cheek teeth of Gobiomys neimongolensis | (mm) |
|-------------------|-----|-----|-----|-----|-----|-----|
|                   | N   | Min | Max | Aver | SD  | CV |
| M1~3L             | 3   | 1.11| 1.25| 1.16 | 0.06| 0.05|
| P4 L              | 4   | 1.4 | 1.5 | 1.47 | 0.05| 0.03|
| P4 W              | 7   | 1.53| 1.94| 1.82 | 0.15| 0.08|
| M1 L              | 7   | 1.7 | 2.18| 1.95 | 0.14| 0.07|
| M2 L              | 10  | 1.85| 2.63| 2.06 | 0.13| 0.06|
| M2 W              | 9   | 2   | 2.46| 2.17 | 0.15| 0.07|
| M3 L              | 5   | 2.05| 2.28| 2.19 | 0.07| 0.03|
| M3 W              | 5   | 1.19| 2.2 | 2.08 | 0.11| 0.05|
| dP4 L             | 1   | 1.17|     |      |     |     |
| dP4 W             | 1   | 1.2 |     |      |     |     |
| p4~m3 L           | 1   | 6.46|     |      |     |     |
| m1~3L             | 2   | 5.24| 5.8 | 5.52 | 0.28| 0.05|
| p4 L              | 2   | 1.13| 1.17| 1.15 | 0.02| 0.02|
| p4 W              | 2   | 1   | 1   | 1    | 0   | 0   |
| m1 L              | 7   | 1.5 | 1.9 | 1.74 | 0.14| 0.08|
| m1 W              | 7   | 1.3 | 1.63| 1.47 | 0.14| 0.09|
| m2 L              | 12  | 1.6 | 2.45| 2.04 | 0.19| 0.1 |
| m2 W              | 14  | 1.53| 2.1 | 1.81 | 0.17| 0.1 |
| m3 L              | 5   | 1.91| 2.2 | 2.11 | 0.11| 0.05|
| m3 W              | 5   | 1.42| 1.83| 1.62 | 0.14| 0.08|

* Abbreviations: L, length; W, width; N, number of specimens; Min, minimum; Max, maximum; Aver, average; SD, standard deviation; CV, coefficient of variation.
The M1 and M2 have entoloph. It seems that *neimongolensis* represents a new genus distinct from *Mergenomy*, *Gobiomys*.

*Gobiomys* differs from *Youngomy* in having wider upper cheek teeth, more developed metaloph, entoloph and weaker metaconule on upper molars; from Ctenodactyloidea gen. nov. from Kazakhstan [see Wang et al., (MS)] in having simpler occlusal pattern on cheek teeth.

**Gobiomys exigus** sp. nov.

(Pl. II, 3-8)

**Holotype** One segment of left maxillary with M1-M2 (IVPP V 12521.1).

**Referred specimens** Three upper jaws (IVPP V 12521.2-4), 2 P4 (V 12521.5, V 12522.1), 1 M1 (V 12522.2), 1 M2 (V 12522.3), 1 M3 (V 12522.4), 1 P4 (V 12521.6) and 3 m1/2 (V 12522.5-7).

**Localities and horizons** IVPP Loc. 91004 (V 12521), Erden Obo, Siziwang Qi, "Lower White" of middle Eocene Shara Murun Formation; IVPP Loc. 88001 (V 12522), east to the Railway Station of Erenhot, upper Eocene Houjdjin Formation.

**Diagnosis** Small-sized *Gobiomys*, one-third smaller than *G. neimongolensis*; zygomatic process of maxillary anterior to P3 and crest on its ventral surface near the posterior edge of zygomatic process; lower molars lack lingual part of posterior arm of protoconid, arm of entoconid and anterior cingulum.

**Etymology** Exiguus, Latin: little, meager.

**Description** The posterior edge of the flat zygomatic process of maxillary is slightly anterior to P3. The crest on its ventral surface is near the posterior edge of the zygomatic process. The large incisive foramen extends to opposite to the anterior side of P4 or more anteriorly. Based on the alveolus the P3 has single root.

On P4 the paracone and protocone are conic. The posterior arm of the paracone is weak and does not reach to the posterior cingulum. The protocone is larger than the paracone. Its anterior arm may be short (in one P4) or absent (in 2 P4). Its posterior arm reaches to the posterior cingulum. The protoloph is low and slender or absent. The anterior and posterior cingula are well developed, but low. P4 has three roots.

The M1 is somewhat trapezoidal in occlusal view, with narrower anterior side than posterior one. The subequal paracone and metacone are smaller than the protocone and hypocone. The hypocone is posterior to the protocone. The entoloph is complete but weak. The protoloph is complete and the protoconule is absent. The metaconule is subequal to and anterolingual to the metacone. The weak and slender metaloph extends to the protocone or entoloph and sometimes interrupted between the metacone and metaconule. The anterior cingulum is shorter than the posteroloph and joins with the protoloph. The anterocone is present. The mesosinus and posterosinus...
are broad. The shallow sinus is transverse.

The M2 is larger than M1 and relatively wider and shorter. The anterior cingulum is more developed and reaches to the protoloph. But on V 12522.3 the anterior cingulum is much lower than the protoloph and does not join with the latter. The entoloph is weaker or absent.

Unlike M2, M3 has a reduced posterior part. The metacone is much smaller than the paracone. The well-developed metaloph extends to the protocone. The hypocone is much smaller than the protocone and closer to the latter in the position. The short posteroloph extends anterolingually. The entoloph is indistinct.

p4 is oval in occlusal view, with a narrower and higher trigonid than talonid. The weak anteroconid is near metaconid. The subequal and conic protoconid and metaconid are separated by a longitudinal groove. No metalophid is present. The posterior arm of the protoconid extends posterolingually. The low ectolophid is located slightly buccal to the middle longitudinal line. The lower hypoconid extends anterobuccally and separated from the conic entoconid by a groove.

The m1/2 (= m1 or m2) is oval in occlusal view, with wider posterior side. The subequal metaconid and entoconid are conic but not swollen, The protoconid and hypoconid are larger than the two lingual cuspids. The metalophid I is complete but low. The posterior arm of the protoconid extends rather posteriorly and has no distinct lingual part. The ectolophid is complete and located buccally to the middle longitudinal line. The arm of entoconid weakly extends posterobuccally or absent. The distinct hypoconulid is not swollen and located at the middle of the posterior side of the m1/2. The weak arm of the hypoconulid joins with the hypoconid. The well-developed posterolophid extends from the hypoconulid to both buccally and

<table>
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<th>Table 2 Measurements of cheek teeth of Gobiomys exiguis sp. nov. *</th>
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<tr>
<td>P4 L</td>
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<td>P4 W</td>
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<td>m1/2 L</td>
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* Abbreviations see table 1.
lingually. No distinct anterior cingulum is present. The trigonid basin, mesosinusid and posterosinusid are broad and communicated. The sinusid is transverse U-shaped and slightly oblique posterolingually. Two roots are present.

**Comparison** The specimens described above are similar to those of *Gobiomys neimongolensis* rather than *Mergenomys* in the following features. The cheek teeth are brachydont and bunodont. The main cusps, metaconule and hypoconulid are not swollen. The P4/p4 are non-molariform. The P3 is present. The P4 has conic paracone and protocone and three roots. The M1～2 have weak and low entoloph. The M3 has rather developed metaloph and reduced metaconule. The p4 has conic protoconid and metaconid and separated entoconid and hypoconid, and lacks metalopliid. The lower molars have slightly more buccally located ectolophid and hypoconulid, and lack anterior cingulum. However, they are smaller than those of *G. neimongolensis* in size. The posterior edge of the zygomatic process of maxillary is anterior to the P3.

The ventral crest for the masseter muscle is more posteriorly located. The cheek teeth are lower crowned. The M1 has a weak metaloph. On m1/2 the ectolophid is more buccally located and the posterior arm of protoconid lacks lingual part. It seems that the specimens may represent a smaller and more primitive species than *G. neimongolensis*, here named as *G. exiguus*.

**Gobiomys cf. G. exiguus**

(pl. I, 9)

One P4 (IVPP V 12523) was collected from IVPP Loc. 88001, east to the Railway Station of Erenhot, upper Eocene Houldjin Formation. It is similar to *G. exiguus* in the basic pattern. But it is much smaller than P4 of *G. exiguus* in size (L × W: 0.5 × 0.62) and the posterior arm of the protocone is not developed.

**Gobiomys asiaticus** sp. nov.

(pl. II, 12−14)

**Holotype** One segment of left maxillary with M1～2 (IVPP V 12524.1).

**Referred specimens** A segment of left maxillary with M1 (IVPP V 12524.2), 1 P4 (V 12524.3), 1 right mandible with m1～2 (V 12524.4) and 1 m1/2 (V 12524.5).

**Locality and horizon** IVPP Loc. 91004, Erden Obo, Siziwang Qi; “Lower White” of middle Eocene Shara Murun Formation.

**Diagnosis** Small-sized *Gobiomys*; posterior edge of zygomatic process of maxillary opposite to P3; upper molars wide and short, with weak metaconule and relatively developed metaloph; lower molars with anterior cingulum, complete arm of entoconid reaching to hypoconid.

**Etyymology** Asiaticus, Latin, Asia.

**Description** As in *G. neimongolensis* the zygomatic process of the maxillary is
flat and has a well-developed ventral crest for maseter muscle. The posterior edge of the zygomatic process is opposite to P3. The large incisive foramen reaches the level of P4. The upper and lower crests and anterior crest of the massteric fossa are similar to those of *G. neimongolensis*, but the fossa extends anteriorly to the posterior part of m1. The P3 is present.

As in *Gobiomys* the P4 has conic and subequal paracone and protocone. The short posterior arm of paracone does not reach to the posterior cingulum. The two arms of the protocone are also short. The anterior arm is free and the posterior one reaches to the base of the posterior cingulum. The metacone is weak. Both the anterior and posterior cingula are well developed.

The M1 is wide rectangular in occlusal view. As in *Gobiomys* the subequal paracone and metacone are smaller than the lingual cusps. The protoloph is complete and low, and has no protoconule. The slender metacone extends obliquely to the protocone or entoloph. The metaconule is distinct. The entoloph is low and weak. A mesostyle is present. Both the anterior cingulum and posteroloph are well developed. The mesosinus and posterosinus are broad. The sinus is symmetric. The M2 is larger than M1 in size. The posterior side is narrower than the anterior one. The metacone and hypocone are smaller than the two anterior ones. The metaconule is small. The metaeeph is well developed. The sinus shifts slightly posteriorly.

The m1 has wider posterior side than anterior one. The subequal and conic metaconid and entoconid incline anteriorly but are not swollen. The protoconid is larger than the metaconid and located slightly posteriorly. The metaloph I is low and short. The posterior arm of protoconid extends rather posteriorly to fuse with the ectolophid and has no distinct free lingual part. The trigonid basin is widely open posteriorly. The straight ectolophid is slightly buccal to the middle longitudinal line. The well-developed hypoconulid is not swollen and has a weak arm reaching to the hypoconid. One of the particular features is that the arm of entoconid is transverse and reaches to the hypoconid. The anterior cingulum is present. The posterolophid is short and does not much extend transversely. The mesosinusid is broad and communicates with the trigonid but separates from the posterosinusid. The broad sinusid is slightly narrower than the mesosinusid and slightly oblique posteriorly. The m2 is larger than m1. The trigonid is relatively wide. The posterior arm of protoconid is slightly oblique lingually and has a short lingual part. The posterolophid is well developed.

**Dimensions** (L × W): P4: 0.95 × 1.4; M1: 1.38 × 1.53, 1.33 × 1.6; M2: 1.53 × 1.77; m1: 1.15 × 0.96; m2: 1.28 × 1.12, 1.35 × 1.25.

**Comparison** As described above, the specimens described here are similar to those of *Gobiomys* in basical features. However, the upper molars have weaker metaconule and more developed metaloph than those of *G. neimongolensis* and *G.*
exiguus. The lower molars have complete arm of entoconid reaching to the hypoconid and a distinct anterior cingulum. In addition, their size is much smaller than those of G. neimongolensis and the posterior arm of protoconid of the lower molars lacks lingual part. They are different from those of G. exigus in having wider and shorter upper molars and posteriorly located zygomatic process of the maxillary.

*Gobiomys? spp.*

(pl. II, 1–2)

From the late Eocene Houdjin Formation at IVPP Loc. 88001, east to the Railway Station of Erenhot, three upper molars [1 M1/2 (IVPP V 12651) and 2 M3 (IVPP V 12652.1–2)] are close to G. exigus in size (L×W: M1/2: 1.3×1.2; M3: 1.3×1.23, 1.22×1.28). But the M1/2 is longer than wide, and has a low anterior cingulum. The protocone is V-shaped. The metaconule is very weak. No distinct entoloph is present. There is an accessory crest at the entrance of the sinus. In M3 the longer protoloph bends posteriorly. The metacone is small. The posteroloph is more developed than the metaloph. The hypocone is not so close to protocone as in other Gobiomys.

*Advenimus cf. A. bohlini* Dawson, 1964

(pl. II, 9–10)

Three lower molars [m1, m2 and m3 (IVPP V 12525.1–3)] were collected from the late Eocene Houdjin Formation at IVPP Loc. 88001, east to the Railway Station of Erenhot. They are similar to *Advenimus bohlini* in the basical pattern and size. But they have more developed posterolophid and smaller sized m1. Dimensions (L×W): m1: 1.28×1.02; m2: 1.65×1.36; m3: −×1.33.

*Advenimus cf. A. burkei* Dawson, 1964

(pl. II, 15)

From the late Eocene Houldjin Formation at IVPP Loc. 88001, east to the Railway Station of Erenhot, two lower molar (m1/2 and m3, IVPP V 12526.1–2) were collected. They are different from A. burkei of Dawson (1964) but similar to A cf. A. burkei of Averianov (1996) in having rather developed ectolophid, more lingually extending posterior arm of protoconid, and no distinct mesoconid on m1/2. Dimension (L×W): m1/2: 2.3×1.86.

*Protataromys sp.*

(pl. II, 11)

From the late Eocene Houldjin Formation at IVPP Loc. 88001, east to Railway Station of Erenhot, one P4 (IVPP V 12527) has a V-shaped paracone and protocone,
well-developed lophs and cingula, and two roots. All these features are similar to those of Protataromys. It differs from that of P. mianchiensis in having a weaker posterior arm of paracone and a posterior cingulum not joining with the protocone. Dimension (L × W): 0.95 × 1.4.

Yuomys sp.

(pl. 1, 10)

Two upper molars (M1/2, IVPP V 12528.1~2) were collected from the late Eocene Houdjin Formation at IVPP Loc. 88001, east to Railway Station of Erxianhot. They are unilateral hypsodont, and have well-developed four lophs. The hypocone is large and the entoloph is high. All of these are similar to Yuomys. But it is smaller than known species of Yuomys in size. The metaloph is slender and the buccal part joining the metacone with the metaconule is long and parallel to the protoloph. The sinus is shallow and the short hypoatria extends dorsally to 1/4 part of the lingual crown. Dimensions (L × W): 3.1 × 3.3; 3.0 × 3.4.

2 Discussion

2.1 Systematic position of Gobiomys in the Ctenodactyloidea

Systematic position of the Gobiomys in the Ctenodactyloidea is analyzed using PAUP 3.1.1. The character analysis and terminal taxa used follow Wang (2001). The 26 characters of Gobiomys are as follows: 1:1, 2:2, 3:1, 4:1, 5:0, 6:0, 7:0, 8:1, 9:0/1; 10:0, 11:1, 12:0, 13:3, 14:0, 15:0, 16:1, 17:0, 18:1, 19:1, 20:2, 21:0, 22:0/1, 23:1, 24:1, 25:1, 26:?. All characters are unordered and unweighted. The ACCTRAN

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* Detail see Wang, 2001.

** Ctenodactyloidea gen. nov. from Kazakhstan [see Wang et al. (MS)].

Fig.1 Diagram of the part of the phylogenetic relationships of the Paleogene Ctenodactyloidea of Asia, showing the position of Gobiomys
optimization was used. Heuristic search yielded three equally most parsimonious trees as in Wang (2001), but the tree length is 95 steps. Each tree has the following properties: Consistency index (CI) = 0.589, Homoplasy index (HI) = 0.474, CI excluding uninformative characters = 0.545, HI excluding uninformative characters = 0.484, Rentention index (RI) = 0.773 and Rescaled consistency index (RC) = 0.456. Part of the strict consensus of the three trees is illustrated in fig.1. The other part of the tree is seen in the complete tree in Wang (2001, fig.2). As fig.1 shows, Gobiomys, Youngomys, Mergenomys and Ctenodactyloidea gen. nov. from Kazakhstan [see Wang et al., (MS)] may belong to one family, which is named as the Gobiomyidae. The Gobiomyidae may form a sister group to the Ctenodactyloidae.

2.2 The layer and age of the deposits yielding the ctenodactyloids in the Erden Obo area

The ctenodactyloids from the Erden Obo area were collected from the “Lower White” of Central Asiatic Expedition (= the 10th layer of the Erden Obo section of Jiang, 1983). Originally the boundary between the Ulan Gochu Formation and the Shara Murun Formation was left unsettled as the Section 2 in Osborn (1929) shows. Later the lower part of the “Lower White” was considered to belong to the Ulan Gochu Formation (Chang, 1931; Qi, 1990) or Erden Obo Formation (Jiang, 1983). According to the original description at the type locality, the Shara Murun Formation included two parts: the upper one consists chiefly of white and light gray sandstone and the lower one is almost wholly sandy clay, richly variegated in color, in which red beds predominate (Berkey and Morris, 1927: 182, 209–210, 362, 371), and the Ulan Gochu Formation is composed of red clay (Berkey et al., 1929: 11). In comparison with the lithology of the classic localities it seems that the “Lower White” represents the upper part of the Shara Murun Formation rather than the lower part of the Ulan Gochu Formation. According to the mammalian fauna the “Lower White” is probably middle Eocene in age.

The age of the Houdjin Formation is considered as late Eocene (Wang, 1997a). As shown above, the Houdjin Formation near Erenhot bears some middle Eocene taxa: Advenimus cf. A. bohlini, A. cf. A. burkei, Yuomys sp. and Protataromys sp. However, the specimens of these taxa are too few to determine the age of the Houdjin Formation. There are two possibilities: 1) their geological age can last to late Eocene, thus longer than previously expected; or 2) the taxa found in the formation may be transported from some underlying deposits.

References
Explanations of plates

Plate I
1–8. *Gobiomys neimongolensis*, 1. occlusal view of right dp4 (V 12519.2), ×20; 2. buccal view of right lower jaw with m1−3 (V 12518.8), ×3; 3. occlusal view of left P4 (V 12519.4), ×20; 4. occlusal view of left M1 (V 12519.5), ×20; 5. occlusal view of right M2 (V 12519.13), ×20; 6. occlusal view of right M3 (V 12519.18), ×20; 7. occlusal view of right p4−m3 (V 12518.7), ×15; 8. occlusal view of left M1−3 (V 12518.1), ×15; 9. occlusal view of right P4 (V 12523) of *Gobiomys cf. G. exiguus*, ×30; 10. occlusal view of left M1/2 (V 12528.1) of *Hyomys* sp., ×10

Plate II
Occlusal view of cheek teeth of Eocene ctenodactyloid rodents from Nei Mongol, scale = 1 mm. 1. Left M1/2 (V 12651) of *Gobiomys?* sp., 2. right M3 (V 12652.2) of *Gobiomys?* sp., 3−8. *Gobiomys exiguus* sp. nov. 3. left P4 (V 12521.5), 4. right p4 (V 12521.6), 5. right M2 (V 12522.3), 6. left M1−2 (V 12521.1, holotype), 7. left M3 (V 12522.4), 8. left m1/2 (V 12522.5), 9−10. *Advenimus cf. A. boldini*, 9. right m1 (V 12525.1), 10. left m2 (V 12525.2), 11. left P4 (V 12527) of *Protaromys* sp., 12−14. *Gobiomys asiaticus* sp. nov., 12. right m1−2 (V 12524.4), 13. right P4 (V 12524.3), 14. left M1−2 (V 12524.1, holotype), 15. right m1/2 (V 12526.1) of *A. burkei*