第48卷 第1期
2010年1月

古脊椎动物学报
VERTEBRATA PALASIATICA

pp.27-47
figs.1-6

江苏泗洪早中新世下草湾组仓鼠科化石[1)]

邱铸鼎
（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20世纪80年代在江苏泗洪早中新世下草湾组采集的5属5种仓鼠类动物化石，其中包括1新属和4新种，即Eumyarioninae亚科的*Alloeumyarion sihongensis* gen. et sp. nov.，Cricetodontinae亚科的*Cricetodon wanhei* sp. nov.，Copemyinae亚科的*Primus pusillus* sp. nov.和*Democricetodon suensis* sp. nov.，以及Megacricetodontinae亚科的*Megacricetodon sinensis* Qiu et al.，1981。*Cricetodon*，*Democricetodon*和*Megacricetodon*属常见于早、中新世地层，并有较广泛的地理分布；*Primus*属仅发现于印度次大陆下中新统；新属*Alloeumyarion*可能与*Eumyarion*属有较接近的亲缘关系。泗洪发现的仓鼠是该哺乳动物群中种类最多、材料最丰富的一类啮齿动物。泗洪地点位于现代东洋界与古北界的过渡地带，这一化石组合的出现为我国中新世哺乳动物地理及其演变的研究提供了有用的证据。根据仓鼠类化石的研究，下草湾组的时代很可能属于早中新世晚期，或者是中国陆相哺乳动物时代的山旺期，大体相当于欧洲陆相哺乳动物时代的奥尔良期或MN4带的时代。这些新属和新种的特征如下：

异美鼠（新属）（*Alloeumyarion* gen. nov）：美鼠亚科中个体中等者。牙齿低冠；齿尖中度鼓胀、趋于脊形。上臼齿三根，内谷前指向，原脊和后脊近横向平行排列，无前尖后刺；M1前叶前后向伸长，前边尖简单，有宽大的后边谷，但无前脊刺；M2的原脊稍前指向，舌侧与原尖前边连接；M3的后部明显退化。下臼齿双根，下外谷横向、近对称；m1下前边尖简单，下前脊单一，下原尖和下次尖的后臂不很发育；m2无下次尖后臂。

万合古仓鼠（新种）（*Cricetodon wanhei* sp. nov.）：个体中等大小。M1和M2四齿根，在早期磨蚀的牙齿中有清楚的后边谷，但外脊发育弱；M1的前边尖简单或略微分开；M2前边脊舌侧支模糊；M3冠面近圆形，多数牙齿的内谷为连接原尖和次尖的脊封闭，时见原脊后刺；m1具双下后脊和短的下中脊；m3与m2等长或比m2稍大，具短的下前边脊舌侧支。

细先鼠（新种）（*Primus pusillus* sp. nov.）：个体小。M1的前叶前后向较短，前边尖和前边脊弱，原脊略后指与原尖后臂连接，后脊稍前指与次尖前臂相连；m1具较宽且呈刀形的前边尖，下次脊前指向。

苏众古仓鼠（新种）（*Democricetodon suensis* sp. nov.）：个体中等大小，颊齿低冠，齿尖和齿脊较弱，臼齿中脊的长度一般在中长至长之间，上臼齿的双原脊不甚发育。M1的前边尖简单而窄，原尖前臂和原脊II间常有一脊相连；M2的后脊横向或稍前向；M2和M3多具“轴脊”（“axioloph”）；m1的下前边尖单一而窄小；多数m1和m2有下外中脊；m3的下中脊通常显著。

关键词：江苏泗洪，早中新世，下草湾组，仓鼠科

中图法分类号：Q915.873 **文献标识码**：A **文章编号**：1000-3118(2010)01-0027-21

1）中国科学院知识创新工程重要方向项目（编号：KZCXZ-YW-120）、国家重点基础研究发展规划项目（编号：2006CB806400）和国家自然科学基金重点项目（编号：40730210）资助。

收稿日期：2009-07-13

CRICETID RODENTS FROM THE EARLY MIOCENE XIACAOWAN FORMATION, SIHONG, JIANGSU

QIU Zhu-Ding
(*Institute of Vertebrate Paleontology and Paleoanthropology*, *Chinese Academy of Sciences* Beijing 100044 zdqiu@263.net)

Abstract This paper describes the cricetid material collected from the Xiacaowan Formation at Sihong, Jiangsu Province in the 1980s. The cricetid assemblage consists of 5 species and 5 genera, including 1 new genus and 4 new species. These hamsters are assigned to 4 subfamilies of Cricetidae, e. g. *Alloeumyarion sihongensis* gen. et sp. nov. of Eumyarioninae, *Cricetodon wanhei* sp. nov. of Cricetodontinae, *Primus pusillus* sp. nov. and *Democricetodon suensis* sp. nov. of Copemyinae, and *Megacricetodon sinensis* Qiu et al., 1981 of Megacricetodontinae. The assemblage represents the most diverse and abundant group of mammals in the Sihong Fauna, having 3 genera (*Cricetodon*, *Democricetodon* and *Megacricetodon*) in common with some Early/Middle Miocene faunas of northern China, as well as Europe and West Asia, sharing *Primus*, *Democricetodon* and *Megacricetodon* with Early/Middle faunas from Indian Subcontinent. The new genus *Alloeumyarion* shows affinities with *Eumyarion* of Europe and western Asia. The cricetid community, occurring in the modern "Transitional Zone" of zoogeographic regions between the Oriental Region and the Palaearctic Region, provides evidence for the study of Miocene zoogeographic provinces. This association argues for an age of Early Miocene for the Xiacaowan Formation, corresponding to Shanwangian of Chinese Land Mammal Age, or correlated, in European terms, with MN4.

Key words Sihong, Jiansu; Miocene; Xiacaowan Formation; Cricetidae

1 Introduction

This study concerns a group of small to medium sized cricetids from Early Miocene fluviolacustrine deposits in Sihong, Jiangsu Province, China. The material described was collected mainly by wet screening from three localities (Songlinzhuang, Shuanggou and Zhengji) attributed to the Xiacaowan Formation during the field seasons of 1980s. Associated with these hamsters are more than 40 forms of small to large mammals, including primates, as well as other vertebrates (fishes, amphibians, reptiles and birds; Li et al., 1983). As for the descriptions of small mammals, Aplodontidae, Sciuridae, Castoridae, Gliridae and Ochotonidae have been published in separate works (Chow and Li, 1978; Qiu and Lin, 1986; Wu, 1986, 1995; Qiu, 1987). Studies of the mammals, especially these micromammals, argued for an age of Early Miocene for the fossil-bearing beds, corresponding to Shanwangian of Chinese Land Mammal Age, which could be correlated with Orleanian or MN4 of Europe (Qiu and Qiu, 1995).

Remains of Cricetidae from Sihong have been preliminarily reported (Li et al., 1983; Qiu and Qiu, 1995). The interest of this group is that: 1) cricetids are commonly known rodents found in the Neogene deposits and have been frequently used for biostratigraphy; 2) they are the most diverse and abundant rodents in this Sihong Fauna and 3) the fossil localities are situated in the modern "Transitional Zone" of zoogeographic division between the Oriental Region and the Palaearctic Region, and the fauna consists of some members particular to the recent Oriental Region and others restrictive to the Palaearctic Region. It is obvious that a further description of these materials is significant in clarifying their stratigraphic range and biogeographical relationships.

A detailed description of the Sihong cricetids is given in this paper. For the geographic location of the fossil sites and the geological background of these localities, the reader is referred to the paper by Li and others (1983).

2 Systematics

Cricetidae Fischer von Waldheim, 1817
Eumyarioninae Ünay-Bayraktar, 1989
Alloeumyarion gen. nov.

Type species *Alloeumyarion sihongensis* sp. nov.

Etymology After allos (Greek) – different, a prefix; *Eumyarion* – a genus of Eumyarioninae; referring the difference of the new genus from *Eumyarion*.

Diagnosis Medium-sized eumyarionines with low-crowned molars. Cusps of cheek teeth moderately "inflated" and subordinate to lophs. Upper molars with three roots, distinctly anteriorly-directed sinus, nearly transverse and parallel protolophule and metalophule, and lacking posterior spur of paracone; M1 with distinctly anteroposteriorly-elongated prelobe, simple anterocone and pronounced posterosinus, but without spur of anterolophule; protolophule in M2 more or less directed forwards and lingually connected to the anterior side of the protocone; M3 reduced posteriorly. Lower molars with two roots, transverse and slightly symmetric sinusid; m1 with simple anteroconid, single anterolophulid, and poorly developed posterior arm of protoconid and hypoconid; m2 lacking posterior arm of hypoconid.

Differential diagnosis *Alloeumyarion* differs from *Eumyarion* Thaler, 1966 in larger size, lacking posterior spur of paracone in upper molars, absence of anterolophule spur in M1, distinct reduction of M3, poorly developed posterior arms of protoconid and hypoconid in m1, and lacking posterior arm of hypoconid in m2.

Alloeumyarion differs from *Mirabella* De Bruijn, 1987 in smaller size, having long and transverse protolophule and metalophule in M1 and M2, and long and transverse metalophulid and hypolophulid in m1 and m2.

Alloeumyarion differs from *Cricetodon* Lartet, 1851 in low-crowned molars with compressed cusps and prominent crests, in M1 and M2 having three roots and nearly transverse and parallel protolophule and metalophule, but lacking posterior spur of paracone, in m1 having single metalophulid, and in m2 having distinct lingual branch of anterolophid.

Alloeumyarion sihongensis sp. nov.

(Fig. 1A–J; Table 1)

1983 Cricetidae gen. et sp. indet., Li et al., p. 318, tab. 1
1995 Cricetidae gen. et sp. indet., Qiu and Qiu, p. 61, appendix 1

Etymology After the Sihong locality where produces the new species.

Holotype Right M1, V 16687(2.55 mm×1.60 mm).

Type locality Songlinzhuang, Sihong, Jiangsu Province.

Geological age and horizon Shanwangian, Early Miocene, Xiacaowan Formation.

Paratypes Ten molars (2 damaged M1, 5 M2, 1 m1, 2 m2), V 16688.1–10.

Referred specimen Shuanggou: two molars (1 m1, 1 m3), V 16689.1–2. Zhengji: seven molars (2 M2, 1 M3, 1 m1, 2 m2, 1 m3), V 16690.1–7.

Measurements (see Table 1)

Diagnosis Same as for genus.

Description The molars are low-crowned with somewhat anteroposteriorly compressed cusps and pronounced ridges. The lingual and labial main cusps are oppositely arranged on the upper molars, while the lingual main cusps on the lower molars are more or less anterior to the labial ones in position. The upper molars have three roots and the lower molars have two roots. Sinus on the upper molars is distinctly anteriorly-directed, while sinusid on lower molars is transverse and nearly symmetric.

Table 1 Measurements of molars of *Alloeumyarion sihongensis* (mm)

Tooth	Length			Width		
	N	Mean	Range	N	Mean	Range
M1	1	—	2.55	2	1.68	1.60 ~ 1.75
M2	5	1.82	1.75 ~ 1.95	5	1.67	1.60 ~ 1.70
M3	1	—	1.20	1	—	1.45
m1	2	2.25	2.20 ~ 2.30	3	1.43	1.30 ~ 1.55
m2	3	1.82	1.80 ~ 1.85	4	1.56	1.50 ~ 1.60
m3	2	1.85	1.80 ~ 1.90	1	—	1.45

M1 has a distinctly anteroposteriorly-elongated prelobe; the anterocone is single-cusped with rounded and smooth anterior slope, and a distinct lingual branch of anteroloph; a labial spur of anterocone is present in the two determinable specimens, one of which is strong and free, and the other is weak and incorporated in the anterolophule; the anterolophule is straight, joining the anterior arm of protocone with the anterocone lingually; the transversely-directed protolophule connects to the middle of protocone; the mesoloph is of short or medium length; the metalophule is transverse and connected to the anterior arm of hypocone; the posteroloph continues labially to the metacone as a low and separate ridge; the entoloph is slightly curved, connecting the anterior arm of hypocone to the protolophule; the sinus is more or less stretched anterolabially and the posterosinus is prominent. M2 has a pronounced anteroloph, of which the labial branch is higher and longer than the lingual one; the protolophule is directed anteriorly and turns transversely to join the anterior arm of protocone; the mesoloph is evident in all the seven teeth, but variable in development, extending closely to the labial margin in four specimens, of medium length in two, and short in one of the specimens; the metalophule is somewhat anteriorly-directed to join the anterior arm of hypocone or transverse to connect to the middle of hypocone; the posteroloph is pronounced, but fails to enclose the large posterosinus in the majority; the entoloph is slightly curved, joining either the protocone or the protolophule; the sinus bends anterolabially; a small anterosinus is present. M3 is subtriangular in shape due to the distinct reduction of the metacone and hypocone; the anteroloph is similar to that of the M2 in structure; the protolophule and entoloph join the anterior arm of protocone at the same point; a remnant of a mesoloph is present; the reduced metacone and hypocone are confluent into a low cusp posteriorly.

The m1 is longer than wide; the anteroconid is unbifid, either delimited or nearly blade-shaped; the anterolophid is distinct, with the lingual branch being higher than the labial one; the anterolophulid is single and straight, joining the junction of the anterior arm of protoconid and the anterolophulid to the base of anteroconid; the metalophulid is forwardly directed; a short and free posterior arm of the protoconid is observed in one of early wear tooth; the mesolophid is distinct, extending closely to the labial margin in one of the three teeth; the transversely directed hypolophulid is connected with the anterior arm of hypoconid; a free posterior arm of hypoconid occurs in one m1; the posterolophid is strong, reaching the base of entoconid to enclose the large posterosinusid; the ectolophid is straight and joins the posterior arm of protoconid anteriorly; a shallow sulcus (original hyposinusid?) is present in two early wear teeth. The m2 has a developed anterolophid, with the lingual branch is only slightly shorter than the labial one; the anterolophulid is very short but thick, joining the connection between the anterior arm of protoconid and the forwardly-directed metalophulid to the anteroconid; the posterior arm of protoconid is prominent and confluent with the mesolophid if it is present; the mesolophid is poorly developed, short in 2 and absent in 2 teeth; the hypolophulid is transverse and connected to the anterior arm of hypoconid; the posterolophid is distinct and encloses the posterosinusid at the base of entoconid; the ectolophid is straight, joining the connection between the hypolo-

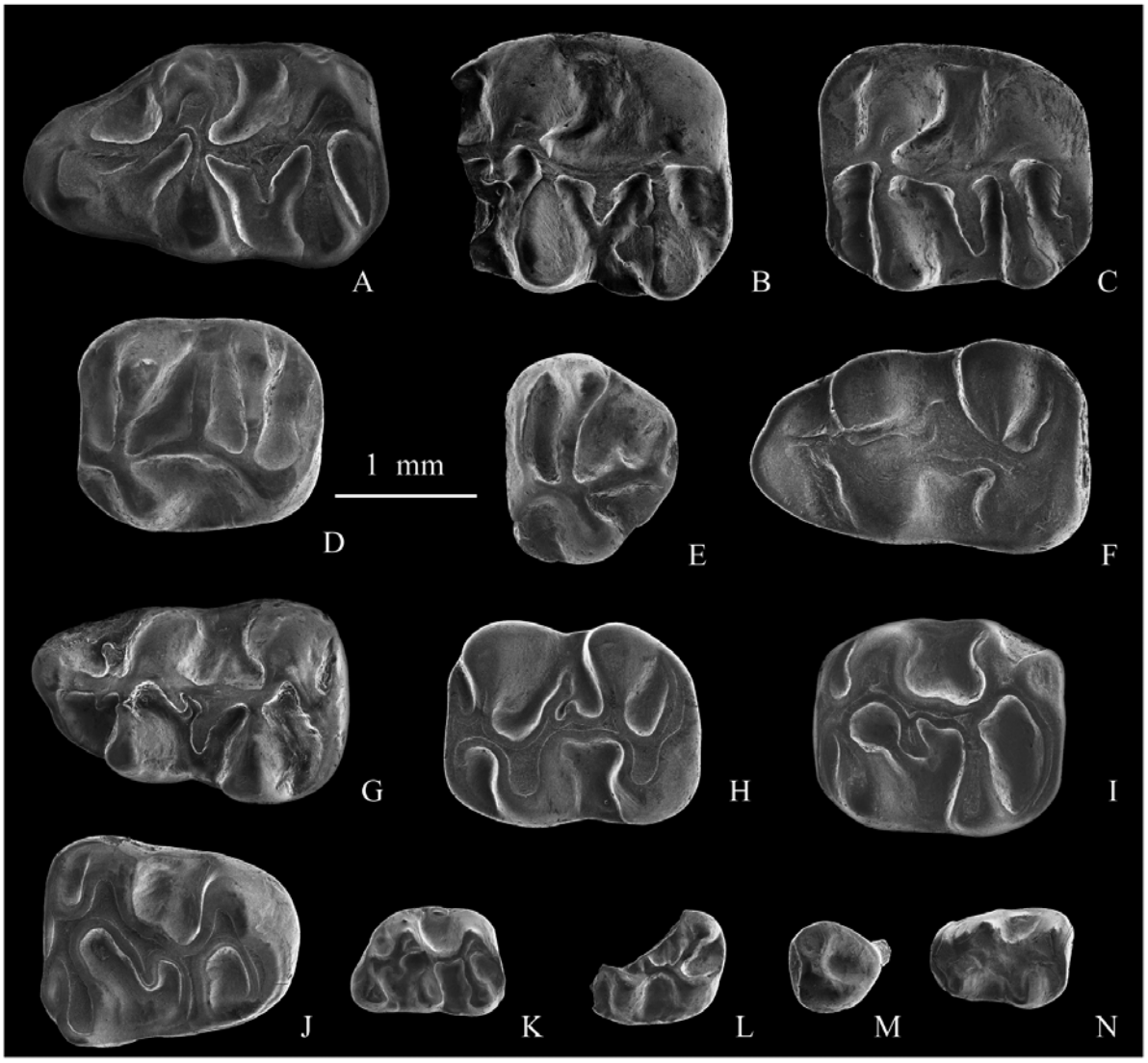

Fig. 1　Occlusal view of *Alloeumyarion sihongensis* and *Primus pusillus*
Alloeumyarion sihongensis: A. r M1, Holotype (V 16687), B. r M1(damaged, V 16688.2), C. r M2 (V 16688.3), D. l M2(V 16688.4), E. l M3(V 16690.3), F. l m1(V 16688.8), G. r m1(V 16689.1), H. l m2(V 16688.9), I. r m2(V 16690.5), J. r m3(V 16689.2); *Primus pusillus*: K. r M1, Holotype (V 16695), L. damaged l M2(V 16696.1), M. l M3(V 16696.2), N. l m1(V 16696.3)

phulid and the anterior arm of hypoconid; the posterosinusid is large; a small but distinct anterosinusid is present. The m3 is long-triangular in shape and shows similarities to the m2 in dental pattern, present a lingual branch of anterolophid, a distinct and free posterior arm of protoconid, an anteriorly directed metalophulid and a transversely directed hypolophulid, a small anterosinusid, and a large posterosinusid; but the hypoconid and entoconid are rather reduced.

Remarks　*Alloeumyarion* is similar to the genus *Eumyarion* in having three-rooted upper molars with relatively transverse protolophule and metalophule, and distinctly anteriorly-directed sinus, two-rooted lower molars with transverse and nearly symmetric sinusid, m1 with free posterior arm of hypoconid. The similarity may indicate that the two genera are allied. *Alloeumyarion* seems to possess some dental characters which are considered to be more derived than those of *Eumyarion*, such as the larger size, the weakly developed posterior arm of hypoconid in lower molars, and distinctly reduced M3. Nevertheless, it is unlikely that *Alloeumyarion* is derived

from *Eumyarion* recorded first in MN1 of Asia Minor (De Bruijn and Saraç, 1991), because some characters in *Alloeumyarion*, i. e. the simple anterocone and the lack of anterolophule spur in M1, the poor development of entoloph in upper molars, and the forwardly directed protolophule of M2 connected lingually to the anterior side of the protocone, are regarded as primitive dental characteristics in cricetids.

Cricetodontinae Schaub, 1925
Cricetodon Lartet, 1851
Cricetodon wanhei sp. nov.

(Fig. 2; Table 2)

1983 *Cricetodon* aff. *C. meini*, Li et al., p. 318, tab. 1
1995 Cf. *Cricetodon* sp., Qiu and Qiu, p. 61, appendix 1

Etymology Named in honor of Mr. Wanhe Li, an administrative leader from the IVPP, who helped to made the collection in 1985.

Holotype Left M1, V 16691(2.65 mm×1.80 mm).

Type locality Songlinzhuang, Sihong, Jiangsu Province.

Geological age and horizon Shanwangian, Early Miocene, Xiacaowan Formation.

Paratypes Two mandible fragments with m1 to broken m3 and m1-2, respectively, 55 molars (13 M1, 10 M2, 4 M3, 6 m1, 14 m2, 8 m3), V 16692.1-57.

Referred specimen Shuanggou: seven molars (1 M1, 1 damaged M2, 3 M3, 1 damaged m1, 1 m3), V 16693.1-7. Zhengji: 11 molars (1 M2, 3 M3, 2 m1, 3 m2, 2 m3), V 16694.1-11.

Measurements (see Table 2)

Table 2 Measurements of molars of *Cricetodon wanhei* (mm)

Tooth	Length			Width		
	N	Mean	Range	N	Mean	Range
M1	13	2.68	2.55~2.85	13	1.74	1.60~1.90
M2	10	2.04	1.85~2.25	10	1.73	1.65~1.80
M3	10	1.69	1.55~1.85	10	1.62	1.50~1.85
m1	9	2.30	2.00~2.40	9	1.45	1.35~1.55
m2	15	2.02	1.90~2.15	15	1.66	1.55~1.75
m3	10	2.06	1.85~2.20	11	1.56	1.40~1.65

Diagnosis Medium-sized species of *Cricetodon*. M1 and M2 with four roots, clear posterosinus in early stage of wear, but poorly developed ectoloph; M1 with simple or indistinctly divided anterocone; M2 with vague indication of lingual branch of anteroloph; M3 occlusal surface rounded, with the lingual sinus closed by a connection between the protocone and hypocone in a majority of the specimens and a posterior spur of protolophule in a few; m1 with short mesolophid and double metalophulid; m3 equally long as or even slightly longer than m2, with short lingual branch of anterolophid.

Description The molars are medium-crowned with slightly inflated cusps, relatively short ridges and rather narrow valleys. The lingual and labial main cusps are essentially oppositely arranged on the upper molars, while the lingual main cusps on the lower molars are distinctly anterior to the labial ones in position. M1 and M2 have four roots, M3 has three toots, and the lower molars are two-rooted.

M1 has a moderately wide anterocone which is single-cusped or slightly divided into two subequal cusps by a valley on its anterior face; the valley is so shallow that the cusp becomes single in early stage of wear; the anterocone shows a weak labial spur or cingulum in 8 of 14

specimens, but only two of which does the cingulum reach the base of the paracone; the anterolophule is thick and straight, joining the anterior arm of protocone to the anterocone lingually; a short spur of anterolophule is present in half of the teeth; a protolophule I is absent, but a short protolophule II is present; the mesoloph is poorly developed, extending less than half way to the labial margin; the metalophule is short and connected to the posteroloph or the posterior arm of hypocone; the weak posteroloph continues beyond the point where the metalophule joins the posteroloph and labially reaches the metacone, closing a narrow posterosinus in the early stage of wear; the entoloph is short and thick, connecting the anterior arm of hypocone to the connection between the posterior arm of protocone and the protolophule II; a visible posterior spur of the paracone can be recognized in half of the specimens. M2 has a robust labial branch of anteroloph, extending to the base of paracone, but the lingual branch of anteroloph is almost absent; the protolophule is directed transversely to join the protocone; the mesoloph is short; the metalophule is transversely-directed to join the middle of hypocone in the majority, and slightly posteriorly-directed to connect the posterior of hypocone in a few; the posteroloph reaches the base of metacone and encloses a small posterosinus; the entoloph is thick and straight, joining the hypocone to the protolophule; a distinct posterior spur of paracone is present in all the specimens, but in one tooth it nearly touches the base of metacone; the sinus is nearly symmetric. M3 is subrounded in occlusal surface; the labial branch of anteroloph is prominent, and a very weak lingual branch of the crest can be seen in four of ten teeth; the protolophule is directed transversely to join the protocone or slightly forward-directed to connect the anterior of protocone; a distinct but variably developed mesoloph is present in all specimens; the metalophule and posteroloph enclose a small posterosinus with the reduced hypocone and metacone; the entoloph is thick, connected with the protolophule and metalophule lingually; the posterior spur of paracone can be observed in seven of ten teeth, which tends to join the mesoloph or to connect the metacone via a crest; a pronounced posterior spur of protocone is present and joins the anterior arm of hypocone to enclose the sinus in eight specimens; a posterior spur from the protolophule is present in four teeth.

The m1 has a single-cusped and well-defined anteroconid situated labially to the longitudinal axis of the occlusal surface; the anterolophid has a rather long and low labial branch reaching to the base of protoconid; the anterior arm of protoconid (as in the anterolophulid) is thick and reaches the base of anteroconid or the connection of the metalophulid I and the anterolophid; the metalophulid I is short and high, connecting the metaconid to the lingual of anteroconid; the metalophulid II is connected to the posterior arm of protoconid, but it is variable from distinct to absent (completely lacking in one of eleven specimens); a connection of the posterior arm of protoconid with the mesolophid can be recognized in four specimens, but a free posterior arm of the protoconid is seldom present; the mesolophid is variable in development, usually short but extending to or closely to the labial margin in three teeth; a remnant of an ectomesolophid is present in a few specimens; the hypolophulid is short and connected to the anterior arm of hypoconid or the ectolophid; a free posterior arm of hypoconid is absent, but an anteriorly directed spur from the posterolophid occurs in one tooth; the posterolophid is strong and descends rapidly from the hypoconid, lingually it reaches or fails to reach the base of entoconid; the ectolophid joins the posterior arm of protoconid to the anterior arm of hypoconid; the sinusid is nearly symmetric. The m2 is of rounded rectangle in the shape of the occlusal surface; the labial branch of anterolophid is distinct and reaches to the base of protoconid, but the lingual branch is rather short and disappears very early in wear; the anterolophulid is very short but thick, joining the connection between the anterior arm of protoconid and the metalophulid I to the anteroconid; a metalophulid II is absent; the mesolophid is distinct but short, ending free in the valley in ten of 19 specimens, being posteriorly directed to connect the entoconid in the others; the short hypolophulid is more or less backwards and connects the ectolophid just in

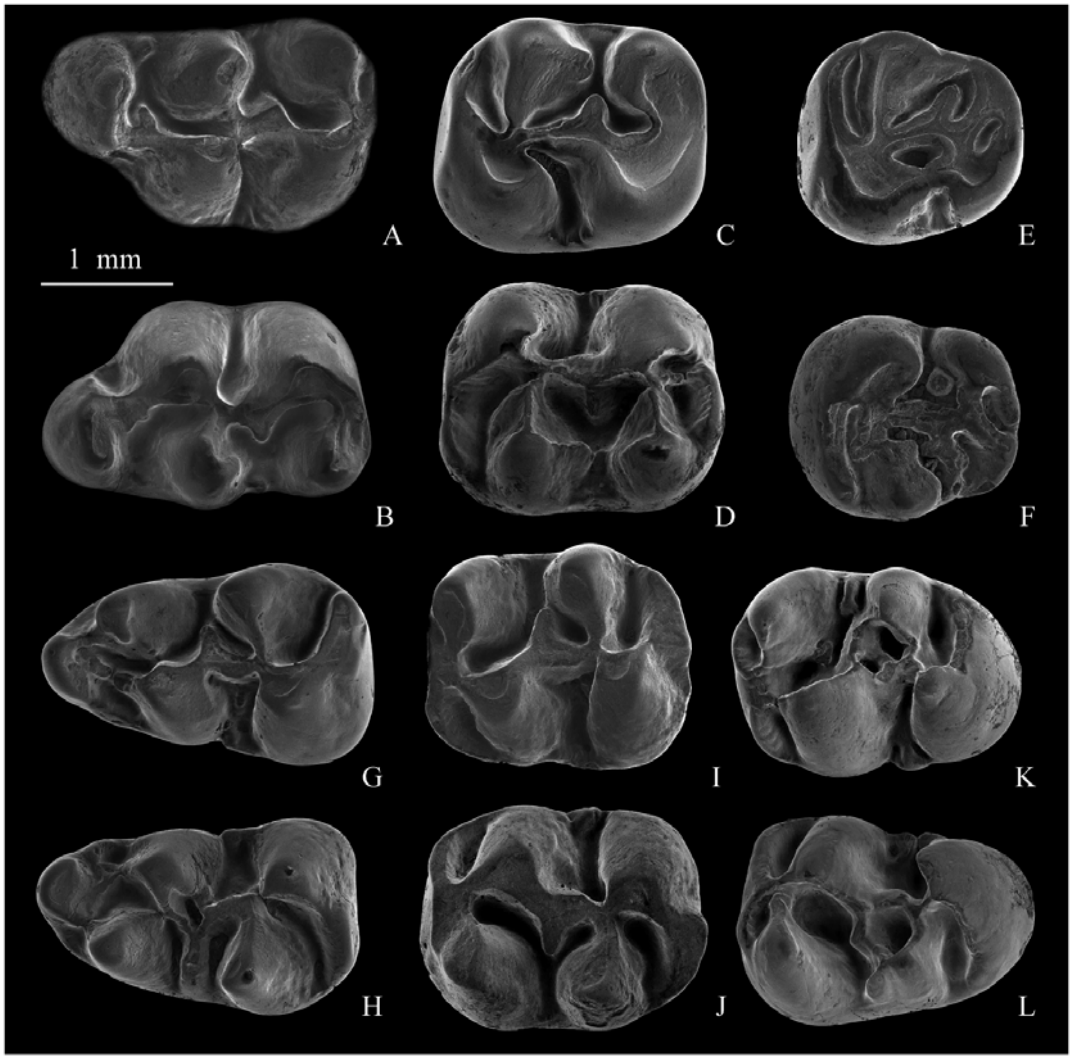

Fig. 2 Occlusal view of *Cricetodon wanhei*
A. l M1, Holotype (V 16691), B. r M1(V 16692.1), C. l M2(V 16692.2), D. r M2(V 16692.3), E. l M3(V 16692.4), F. r M3(V 16692.5), G. l m1(V 16692.6), H. r m1(V 16692.7), I. l m2 (V 16692.8), J. r m2(V 16692.9), K. l m3(V 16692.10), L. r m3(V 16692.11)

front of the hypoconid; the posterolophid is prominent, but fails to enclose the posterosinusid in the majority; the ectolophid is short, but pronounced. The m3 is as long as, or slightly longer than m2; it is similar to m2 in morphology, except for the reduced entoconid and hypoconid; a longer labial branch and short lingual branch of anterolophid are present in all the moderately worn specimens, but the lingual branch disappears with advanced wear of the tooth; the metalophulid is anteriorly directed and connects the anterolophulid with the anterior arm of protoconid; either a mesolophid or a posterior arm of protoconid is distinctly present in all the specimens, which connects to the reduced entoconid in most specimens; the hypolophulid is complete, joining the ectolophid.

Comparisons and remarks The teeth described correspond in character to the diagnosis of *Cricetodon* emended by De Bruijn and others in 1993. These characters are the bunodont molars with "inflated" cusps, the M1 with single anterocone, the m1 with single-cusped and well-defined anteroconid, double metalophulid, the m2 with very vague indication of the lingual branch of anterolophid, and the labial branch of the anterolophid incorporated in the metalophulid.

Cricetodon is rather diverse, widely found in the Early and Middle Miocene of Europe and

Asia Minor (De Bruijn et al., 1993; Rummel, 1999). The new species *C. wanhei* from Sihong represents the first named species of the genus known in eastern Asia. It is characterized by its medium size, four-rooted M1 and M2 with clear posterosinus but poorly developed ectoloph, with simple or indistinctly divided anteroconid of M1, round-shaped and rather complicated M3 in occlusal surface, and rather long m3.

In smaller size, having weakly developed ectoloph and distinct posterosinus on M1 and M2, missing a clear lingual branch of anteroloph on M2, and in the presence of double metalophulid on m1, *C. wanhei* differs from all the known *Cricetodon* species of the Middle Miocene, i. e. *C. hungaricus* (from Haszonos, MN6), *C. sansaniensis* (Sansan, MN6), *C. jotae* (Manchones, MN6), *C. albanensis* (La Grive, MN7/8) of Europe, and *C. candirensis* (Çandir, MN6), *C. pasalarensis* (Paşalar, MN6) and *C. cariensis* (Sariçay, Koçgazi, MN7-8) of Asia Minor. It differs from *C. meini* (Vieux Colonges, MN4/5) in having less development of ectoloph and less reduction of posterosinus and mesoloph on M1, less poor lingual branch of anteroloph and more transverse metalophule on M2, the sinus of M3 being closed by a connection between the hypocone and protocone, and the presence of double metalophulid on m1. It is different from *C. aliverensis* (Klein Hofmeijer and De Bruijn, 1988, MN4) on somewhat larger size, simpler or less divided anterocone of M1, near absence of lingual branch of anteroloph on M2, presence of a new connection between the protocone and hypocone on M3, no distinct ectomesolophid and sulcus on m1, and the hypolophulid of m1 being transverse rather than forwardly directed. *C. wanhei* can be easily distinguished from *C. versteegi* (Kilcak, MN1), *C. kasapligili* (Kesekoy, MN3) and *C. tobieni* (Horlak, MN3/4) by having four-rooted M1 and M2. In addition, it differs from *C. versteegi* in larger size, having less divided anterocone and single protolophule on M1, in undeveloped lingual branch of anteroloph on M2; from *C. kasapligili* in single protolophule on M1, double metalophulid on m1; from *C. tobieni* in slightly larger size, having less divided anterocone on M1, undeveloped lingual branch of anteroloph on M2, the lingual sinus closed by a connection on M3, and double metalophulid on m1.

Comparison of *Cricetodon wanhei* with the formerly named species of the genus shows that it more resembles *C. meini*, *C. aliveriensis* and *C. tobieni* in many respects than *C. versteegi*, the first appearance of the genus and any other species from the Middle Miocene. The size of molars, the weakly developed posterior spur of paracone, the relatively transverse protolophule and metalophule, and the clear posterosinus on upper molars, the double metalophulid on m1, and the long m3 suggest that the four species are relatively closely related.

Three-rooted M1, rounded M3, and double metalophulid of m1 are considered as original character status for the genus (De Bruijn et al., 1993). Furthermore, *Cricetodon* seems to display an evolutionary tendency to increase in size and root number of M1 and M2, and shows development of ectoloph, reduction of the transversal ridges (including mesoloph and entomesoloph on upper molars, and mesolophid and ectomesolophid on lower molars), gradual disappearance of the posterosinus, lack protolophule I of M1 and metalophulid I of m1, and reduction of the third molars. It is evident that *Cricetodon wanhei*, with four-rooted M1 and without protolophule I on M1, is more advanced than *C. versteegi*, *C. kasapligili* and *C. tobieni*, but the former is definitely more primitive than the species from the Middle Miocene for its smaller size, weakly developed ectoloph, presence of distinct posterosinus on upper molars, double metalophulid on m1, and less reduction of the third molars. The relative similarity of the new species to *C. aliveriensis* and *C. meini* appears to indicate their close evolutionary stage, but the Asiatic species seems to be younger than *C. aliveriensis* because of its larger size and older than *C. meini* for the less developed ectoloph, the less reduction of mesoloph and posterosinus on upper molars, the presence of double metalophulid on m1 (Klein Hofmeijer and De Bruijn, 1988; Freudenthal, 1963).

Copemyinae Jacobs & Lindsay, 1984
Primus De Bruijn et al., 1981
Primus pusillus sp. nov.

(Fig. 1K–N)

1995 *Primus* sp., Qiu and Qiu, p. 61, appendix 1

Etymology Pusillus, Latin – tiny, referring to its smaller size compared with the type species of the genus.

Holotype Right M1, V 16695(1.08 mm×0.76 mm).

Type locality Shuanggou, Sihong, Jiangsu Province.

Geological age and horizon Shanwangian, Early Miocene, Xiacaowan Formation.

Paratypes One damaged M2(1.00 mm×— mm), one m1(1.00 mm×0.72 mm), one M3(0.65 mm×0.65 mm), V 16696.1–3.

Diagnosis Small-sized species of *Primus*. M1 with less anteroposteriorly-elongated prelobe, narrow anterocone and anteroloph, slightly posteriorly directed protolophule connecting the posterior arm of protocone, and slightly anteriorly directed metalophule connecting the anterior arm of hypocone; m1 with relatively wide and blade shaped anteroconid, and anteriorly directed hypolophulid.

Description The molars are low-crowned with less striking cusps relative to the valleys separating them. The lingual main cusps of M1 are somewhat anterior to the labial one, while the lingual main cusps of m1 are distinctly anterior to the labial ones in position.

M1 has a relatively short prelobe and three roots; the single-cusped anterocone is well-defined and situated labially in line with the paracone and the metacone; the wide anteroloph extends from the base of protocone nearly to the base of paracone; the anterolophule is thick but low, bifurcating anteriorly to join the anterocone lingually and the lingual branch of anteroloph; a short spur of anterolophule is present; the protolophule is slightly posteriorly directed, connecting with the entoloph or the posterior arm of protocone; the mesoloph is poorly developed, showing as a remnant of the ridge; the metalophule is slightly anteriorly directed, joining the anterior arm of hypocone; the posteroloph is weak but distinct, reaching the base of metacone to enclose the rather wide posterosinus; the entoloph is short but complete, connected the anterior arm of hypocone to the connection of the posterior arm of protocone and the protolophule; a pronounced entostyle is present; the sinus is wide and nearly symmetric. The M2 is rather damaged; a protolophule is judged to connect with the entoloph or the posterior arm of protocone; the mesoloph is short; the metalophule is anteriorly directed and connected the anterior arm of hypocone; the posteroloph is distinct, reaching the metacone to enclose the posterosinus; the entoloph is short and curved, connecting the anterior arm of hypocone to the posterior arm of protocone; the sinus is wide and symmetric. The M3 is slightly eroded: the anteroloph is developed, with the labial branch higher than the lingual; the protolophule is anteriorly directed and connects the anteroloph with the anterior arm of protocone; the hypocone and the matacone are rather reduced, which are fused to the posteroloph connected the protocone to the paracone; a conule, situated in the posterocentral portion of the tooth, appears to be the fusion of the entoloph and the metalophule.

The m1 has two roots; the anteroconid is not a well defined cusp, but a blade shaped low crest situated centrally; the wide and smoothly curving anterolophid extends all the way from the metaconid to the base of protoconid; the anterolophulid is thick and reaches the base of anteroconid; the posteriorly directed metalophulid and hypolophulid are weakly developed and meet the posterior arm of protoconid and the anterior arm of hypoconid, respectively; a mesolophid is absent; the posterolophid is strong but fails to close the posterosinusid; the ectolophid joins the

posterior arm of protoconid to the anterior arm of hypoconid; the sinusid is symmetric.

Remarks *Primus* is a genus of cricetids with small size and simple dental pattern. Record of this taxon is rather rare and only one species *P. microps* was documented from the Early Miocene of the Indian subcontinent (De Bruijn et al., 1981; Kumar and Kad, 2002). The new species *P. pusillus* is similar to *P. microps* in having unicuspid anterocone of M1 and anteroconid of m1, striking valleys relative to cusps, weak mesoloph of M1 and M2, missing mesolophid of m1. It differs from *P. microps* in slightly smaller size, and in M1 having less anteroposteriorly-elongated prelobe, narrower anterocone, the protolophule connecting the posterior arm of protocone rather than the protocone, more anteriorly directed metalophule connecting the anterior arm of hypocone rather than the hypocone, and in m1 having blade shaped anteroconid and anteriorly directed hypolophulid.

Democricetodon Fahlbusch, 1964

Democricetodon suensis sp. nov.

(Figs. 3, 4; Table3)

1983 *Democricetodon* cf. *brevis*, Li et al., p. 318, tab. 1
1983 ? *Spannocricetodon* sp. nov., Li et al., p. 318, tab. 1
1995 *Democricetodon* sp., Qiu and Qiu, p. 61, appendix 1

Etymology After Su, Chinese abbreviated form of Jiangsu Province, the provenance of the fossil.

Holotype Left M1, V 16697(1.80 mm×1.15 mm).

Type locality Shunggou, Sihong, Jiangsu Province.

Geological age and horizon Shanwangian, Early Miocene, Xiacaowan Formation.

Paratypes 86 molars (12 M1, 23 M2, 6 M3, 14 m1, 23 m2, 8 m3), V 16698.1–86.

Referred specimen Songlinzhuang: 17 molars (4 M1, 4 M2, 1 M3, 1 m1, 6 m2, 1 m3), V 16699.1–17. Zhengji: 76 molars (11 M1, 25 M2, 5 M3, 15 m1, 12 m2, 8 m3), V 16700.1–76.

Measurements (see Table 3)

Table 3 Measurements of molars of *Democricetodon suensis* (mm)

Tooth	Length			Width		
	N	Mean	Range	N	Mean	Range
M1	25	1.72	1.55 ~ 1.85	26	1.10	1.00 ~ 1.30
M2	50	1.35	1.20 ~ 1.50	49	1.18	1.00 ~ 1.30
M3	11	1.06	1.00 ~ 1.15	11	1.08	1.00 ~ 1.15
m1	29	1.43	1.25 ~ 1.60	30	1.05	0.90 ~ 1.15
m2	38	1.36	1.20 ~ 1.50	40	1.12	1.00 ~ 1.20
m3	17	1.24	1.15 ~ 1.25	17	0.97	0.90 ~ 1.05

Diagnosis Medium-sized species of *Democricetodon* with low crowned cheek teeth, relatively weak cusps and crests, medium length to long mesoloph(id)s, and poorly developed double protolophule in upper molars. M1 with simple and narrow anterocone, and a connection between the anterior arm of protocone and protolophule II in some specimens; M2 with transverse or slightly anteriorly directed metalophule; M2 and M3 usually with an "axioloph"; m1 with simple and narrow anteroconid; m1 and m2 frequently with an ectomesolophid; m3 usually with distinct mesolophid.

Description M1 has a narrow, single and crest-like anterocone situated labially to the midline of tooth; the anterocone in 4 out of 25 specimens shows a cingulum-like ledge on its anterior wall; the crescent-shaped anteroloph extends all the way from the base of protocone to the

base of paracone; the prominent anterolophule joins the anterior arm of protocone to the anterocone lingually; a short and weak anterolophule spur is present in 3 out of 26 teeth; the protolophule I is poorly developed, usually low and weak, completely absent in 10, as a connection between the anterior arm of protocone and protolophule II in 6 of 27 speciemens; the protolophule II is short, but present in all the specimens; the mesoloph is low and weak, long in 13 (of which some extend to the labial edge and terminate with a tiny mesostyle), of medium length in 9, and short in 3; the metalophule is short and weak, connected to the posteroloph or the posterior arm of hypocone in 27, to the hypocone in 1 case; a thin connection joining the metalophule to the weak mesocone is present in 2 teeth; the posteroloph is weak, ends low against the metacone in most specimens; the entoloph is thick and curved; the sinus is slightly posteriorly directed, which is closed by a low and variable ridge originating from the hypocone; a narrow posterosinus is present. M2 has a complete anteroloph extending to both bases of protocone and paracone, but the labial branch is in general higher and stronger than the lingual; a distinct protolophule I joining the anterior arm of the protocone or the short anterolophule is present in 48 out of 49, and interrupted in 1 M2; the "protolophule II" is relatively poorly and variably developed (present as a weak connection between the paracone and entoloph in 31, as an "axioloph" (a connection between the protolophule I and the entoloph) in 13, and it is absent in 5); the mesoloph is low, long in 38, of medium length in 8, and short in 3; the metalophule is anteriorly directed to connect the anterior arm of hypocone or the entoloph (33), or the mesocone (2), transversely to join the hypocone in 13, and posteriorly directed to connect the posteroloph in 1 case; the posteroloph ends against the base of metacone and encloses the posterosinus; the entoloph is curved; there is a prominent ridge originating from the hypocone and closing the sinus and extending to the protocone posterolingually in some specimens. M3 is semicircular in occlusal surface; the anteroloph is prominent, but the lingual branch of the crest is developed as a ledge in a few specimens; the protolophule I connects the short anterolophule with the anterior arm of the protocone; the protolophule II is developed in 2 specimens; the mesoloph is thin, long in 4, of medium length in 3, and absent in 4 out of 11 specimens; the hypocone is very reduced and the metacone is fused to the posteroloph, which encloses the small posterosinus with the metalophule; the posterior part of the old entoloph and the neo-entoloph (see Theocharopoulos, 2000) are present in all M3; an "axioloph" can be observed in 6 teeth; a pronounced hypocone-ridge is present in most specimens.

The m1 has a small single-cusped or crest-like anteroconid; the anterolophid is semi-rounded with the labial branch lower but longer than the lingual; the anterior arm of protoconid is complete and reaches the anteroconid; the metalophulid I is forward-directed and connects the anterior arm of protoconid in 28 out of 29 m1, and transverse joining the protoconid in 1, in one it is absent; a metalophulid II is lacking; the mesolophid (or psudomesolophid) is present in all specimens but low and variable in development, long in 19 (terminated with a tiny mesostylid in some specimens), of medium length in 7, short in 4 cases; an ectomesolophid is present in 7 specimens, extending to the labial border in 5 and medium length in 2; the hypolophulid is transverse or slightly anteriorly directed to join the ectolophid, an additional backward-directed hypolophulid is present in 1 tooth; the posterolophid is strong and extends to the base of entoconid; the ectolophid is prominent and curved; the sinusid is more or less anteriorly directed. The m2 has a distinct anterolophid, with the longer and steeper labial branch ending against the base of protoconid, and the shorter and gently lingual branch extending to the anterior wall of metaconid and restricting a minuscule anterosinusid; the metalophulid is connected to the anterior arm of protoconid or the short anterolophulid; a metalophulid II is absent; the mesolophid is distinct, long in 17, of medium length in 16, short in 4, and absent in 2 out of 39 specimens; a short or medium length of ectomesolophid is present in 10 cases; the hypolophulid is slightly anteriorly directed and connects the ectolophid; a low and weak connection (hypolo-

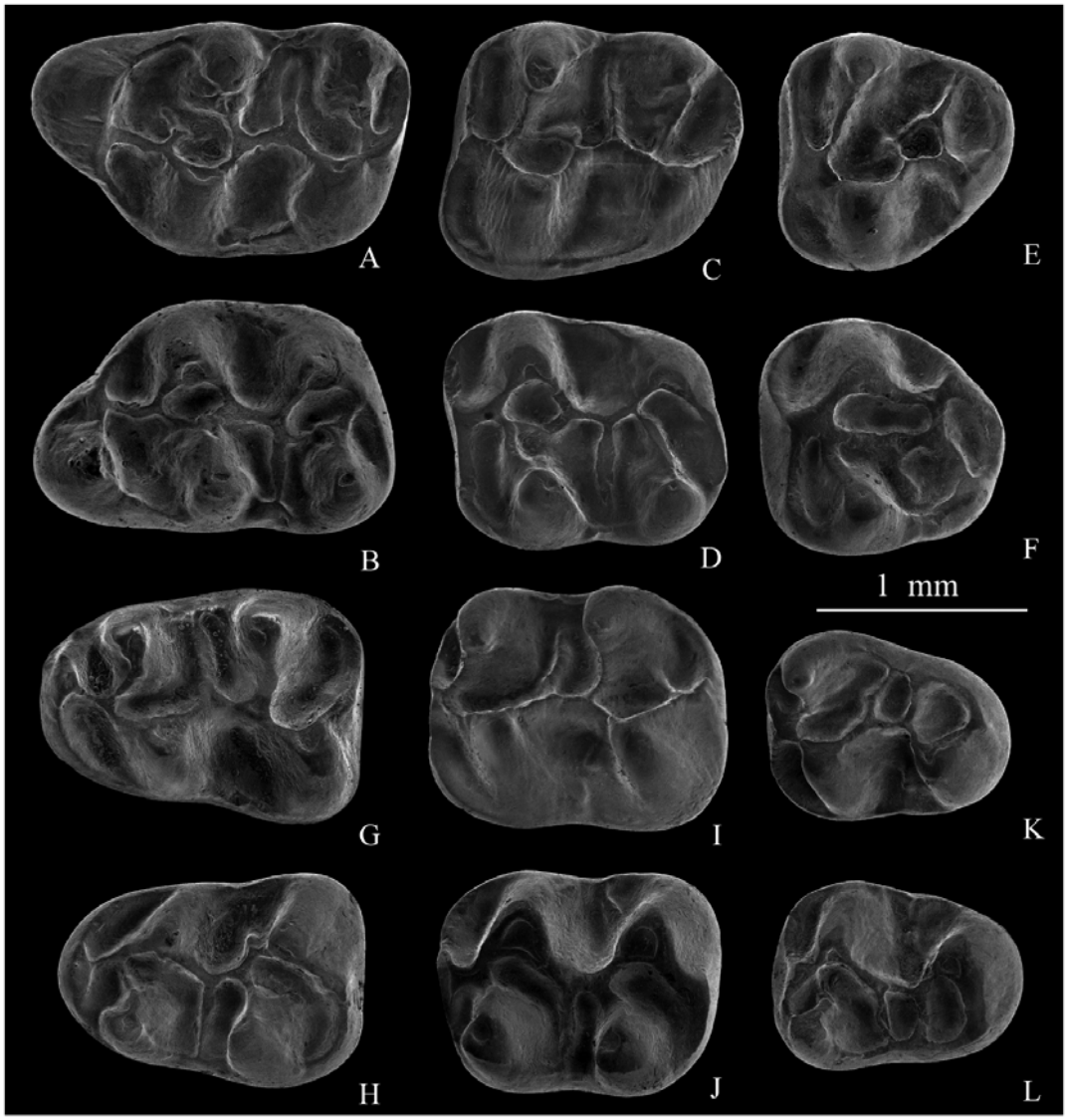

Fig. 3　Occlusal view of *Democricetodon suensis*
A. l M1, Holotype (V 16697), B. r M1(V 16698.1), C. l M2(V 16698.2), D. r M2(V 16698.3), E. l M3(V 16698.4), F. r M3(V 16698.5), G. l m1(V 16698.6), H. r m1(V 16698.7), I. l m2 (V 16698.8), J. r m2(V 16698.9), K. l m3(V 16698.10), L. r m3(V 16698.11)

phulid II?) between the entoconid and posterolophid is present in 11 teeth; the posterolophid is connected to the entoconid; the ectolophid is prominent and curved; the sinusid is slightly anteriorly directed, and the anterosinusid is present, but small and narrow. The m3 has an anterior portion similar to that of m2 in morphology; the metalophulid is connected to the anterolophid or to the short anterolophulid together with the anterior arm of protoconid; the mesolophid extends to the lingual border of the tooth in 10 out of 17 specimens, is of medium length in 4, short in 2 and absent in 1; the hypoconid is reduced, but still conspicuous, while the entoconid is very reduced and fused to the ridge that runs from the metaconid to the hypoconid; a transverse or slightly anteriorly directed hypolophulid, a pronounced ectolophid and a closed posterosinusid are present in all m3.

Comparisons and remarks　More than 20 species of the genus *Democricetodon* have been recognized in Eurasia (Fahlbusch, 1964; Freudenthal, 1967; Wessels et al., 1982; Kordos, 1986; Tong and Jaeger, 1993; Qiu, 1996; Theocharopoulos, 2000; Maridet et al.,

2000). Some of these named species show obviously intraspecific variation in dental morphology, and subtle interspecific differences. So far as the size of teeth, the new species *D. suensis* is comparable to *D. crassus* (Freudenthal, 1969), *D. brevis* (Schaub, 1925), *D. romieviensis* (Freudenthal, 1963), *D. franconicus* Fahlbusch, 1966, *D. sulcatus* Freudenthal, 1967, *D. hispanicus* Freudenthal, 1967, but smaller than *D. affinis* (Schaub, 1925), *D. gailardi* (Schaub, 1925), *D. mutilus* Fahlbusch, 1964, *D. freisingensis* Fahlbusch, 1964, *D. kohatensis* Wessels et al., 1982, *D. hasznosensis* Kordos, 1986, *D. walkeri* Tong & Jaeger, 1993, and *D. fourensis* Maridet et al., 2000, and larger than *D. gracilis* Falhbusch, 1964, *D. anatolicus* Theocharopoulos, 2000, and *D. doukasi* Theocharopoulos, 2000.

Democricetodon suensis differs from *D. crassus* in having wider anterocone in M1 and anteroconid in m1, and the anterocone being situated more distant to the anterior cusps in M1. The former can be distinguished from *D. brevis* by the narrower anterocone in M1 and anteroconid in m1, less developed double protolophule in M1 and M2, much lower frequency of posteriorly directed metalophule in M2, and poorly developed ectomesolophid in m1 and m2. It differs from *D. romieviensis* in less developed double protolophule in M1 and M2, and longer mesolophid in lower molars. The new form is distinguishable from *D. franconicus* by its wider anterocone in M1 and anteroconid in m1, more developed double protolophule and higher frequency of posteriorly directed metalophule in M1, usually longer mesolophid in lower molars. It can be easily distinguished from *D. sulcatus* by the simple anterocone in M1, less developed double protolophule in M2; much developed mesolophid in lower molars, and the less reduced M3 and m3. *D. suensis* is on average larger than *D. hispanicus*, with the anteroconid less close to the anterior cusps, but without a distinct cingulum ridge connecting the metaconid and entoconid in m1.

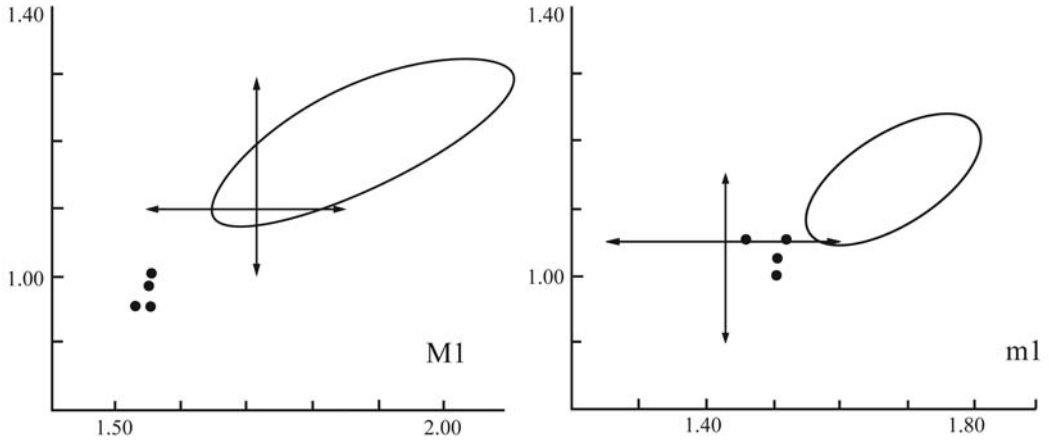

Fig. 4 Scatter diagrams showing length and width of molars of *Democricetodon* from China
⬭ *D. lindsayi* from Moergen II, Nei Mongol;
• *D. tongi* from Moergen II, Nei Mongol; ⟷ *D. suensis* from Sihong, Jiangsu

Two species *Democricetodon lindsayi* and *D. tongi* from the Middle Miocene of Tunggur, Nei Mongol are documented in China (Qiu, 1996). The new taxon is closer to *D. lindsayi* than *D. tongi* in size (Fig. 4). In morphology, it differs from *D. lindsayi* in lower crowned molars with relatively weaker cusps and crests, in having narrower and simpler anterocone in M1 and anteroconid in m1, anterolophule ending against in general more lingual edge of the anteroloph, mesoloph being on average longer in M1, less developed double protolophule, presence of an "axioloph" instead of protolophule II in some M2, less presence of double metalophule in M2 (a posteriorly directed metalophule present in more than half M2 of *D. lindsayi*), and in higher frequency of ectomesoloph and double hypolophulid in m2. The smaller size, the lower crowned

teeth with relatively weak cusps and crests, the narrower anterocon(id)s in the first molars, the poorly developed double protolophule in M2 may be interpreted as more primitive features for the new species.

In general, the Asiatic species of *Democricetodon* show great similarities to the European species in the dental character, and no "continent-specific features" could be recognized among the known taxa. Thus, the phylogenetic relationships of the Asian species with the European ones are difficult to value at this moment. A phylogenetic reconstruction for the Asiatic species also awaits further discovery and evidence.

Megacricetodontinae Mein & Freudenthal, 1971

Megacricetodon Fahlbusch, 1964

Megacricetodon sinensis Qiu et al., 1981

(Figs. 5, 6; Table 4)

1983 *Megacricetodon* aff. *collongensis*, Li et al., p. 318, tab. 1
1995 *Megacricetodon* sp., Qiu and Qiu, p. 61, appendix 1

Referred specimen Songlinzhuang: 20 molars (5 M1, 3 M2, 1 M3, 5 m1, 4 m2, 2 m3), V 16701.1–20. Shuanggou: two maxillary fragments with M1 and M1–2, respectively, two mandiblar fragments with m1 and m2–3, respectively, 76 molars (15 M1, 14 M2, 2 M3, 18 m1, 22 m2, 5 m3), 16702.1–80. Zhengji: 80 molars (16 M1, 22 M2, 1 M3, 16 m1, 21 m2, 4 m3), V 16703.1–80.

Measurements (see Table 4)

Table 4　Measurements of molars of *Megacricetodon sinensis* (mm)

Tooth	Length			Width		
	N	Mean	Range	N	Mean	Range
M1	27	1.50	1.40 ~ 1.65	36	0.95	0.82 ~ 1.05
M2	37	1.09	0.95 ~ 1.20	37	0.96	0.85 ~ 1.06
M3	3	0.83	0.65 ~ 0.85	3	0.75	0.65 ~ 0.80
m1	29	1.31	1.20 ~ 1.50	33	0.86	0.75 ~ 0.95
m2	47	1.08	1.00 ~ 1.25	47	0.90	0.75 ~ 1.00
m3	11	0.87	0.75 ~ 0.95	10	0.74	0.65 ~ 0.85

Description M1 has a low ledge on its anterior face in some specimens and a narrow lingual cingulum continued from the anterocone to the hypocone in a few; the anterocone is divided by a longitudinal groove into a smaller lingual conule and a larger labial one; the anterolophule joins anteriorly to the lingual anteroconule in 25 of 32 specimens, to the connection between the conules in the remainders; a short and weak anterolophule-spur is present in one of 26 teeth; the protolophule I is poorly developed in three teeth; the protolophule II is short, slightly posteriorly directed to connect the entoloph in the majority of specimens (31 cases), transversely connects to the posterior arm of protocone in a few (2), and interrupted in one specimen; the mesoloph is low and variable in length, extending to the labial edge in 3, of medium length in 11, and short in 19; the metalophule is single, connected to the posteroloph or the posterior arm of hypocone in 28, to the hypocone in 6 cases; the posteroloph is week, and ends low against the metacone; the entoloph is short, but complete; a weak posterior spur of paracone is present in 4 specimens; the sinus is wide, transverse, and asymmetric. M2 has well developed lingual and labial branches of anteroloph, which are about equal in length; the anterolophule is short and thick; the anteriorly directed protolophule I is present in all the specimens; a very thin and low protolophule II is present in 4 of 36 teeth; the mesoloph is long in 3, of medium length in 15, short in 16, and absent in 4; the metalophule is variable in direction

and connection, either anteriorly directed to connect the anterior arm of hypocone (11), or transversely to join the hypocone (19) and posteriorly to connect the posteroloph (7), and lacking in one tooth; the posteroloph ends against the base of metacone and encloses the posterosinus; the entoloph is complete and curved; in 35 M2s, the posterior spur of paracone is present in 12, one of which connects to the mesoloph. M3 is subtriangular in occlusal surface; the hypocone and metacone are rather reduced; the protolophule and metalophule are single, distinct and anteriorly directed; a short mesoloph is present in one of three specimens.

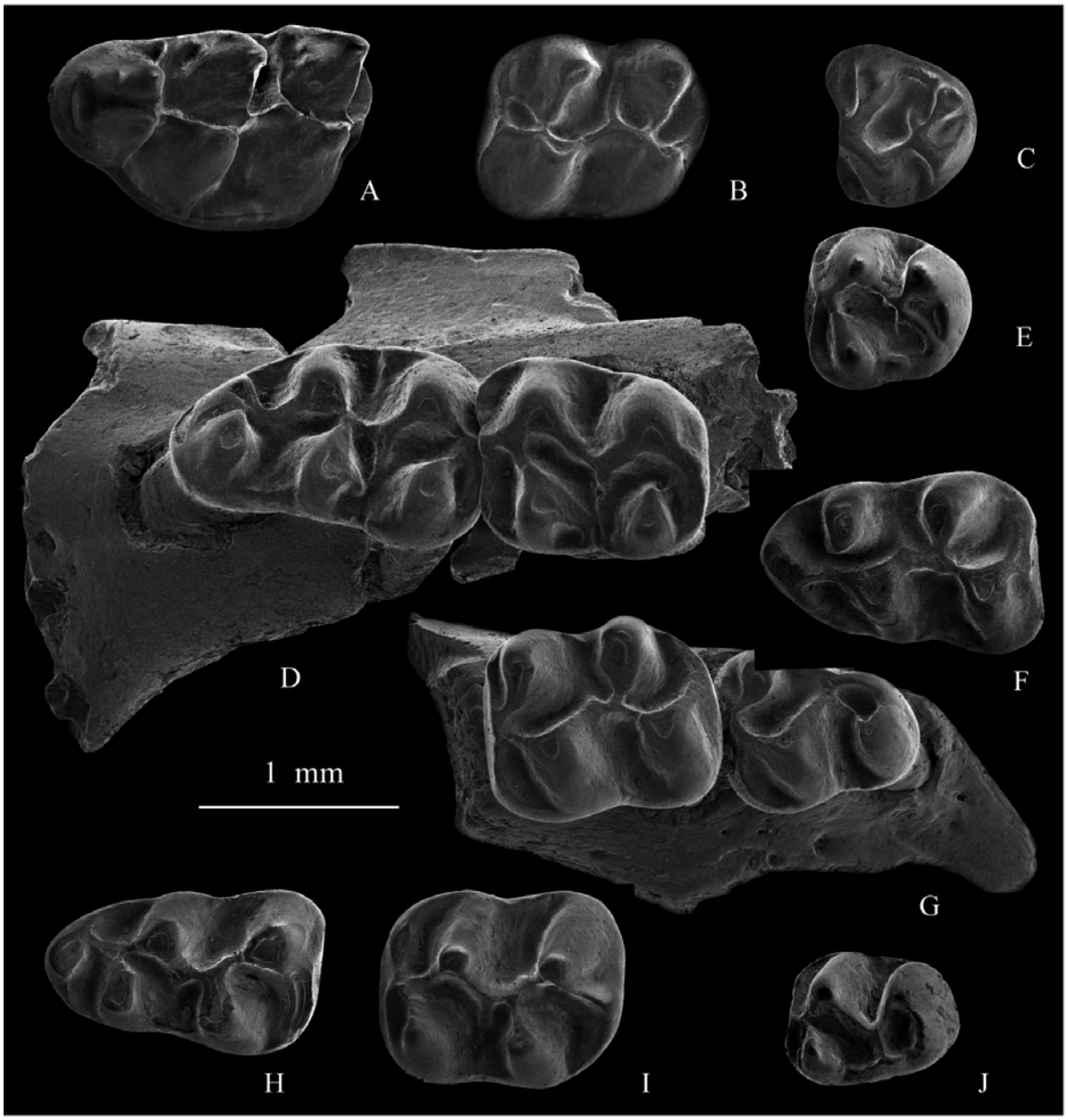

Fig. 5 Occlusal view of *Megacricetodon sinensis*
A. l M1(V 16702.1), B. l M2(V 16702.2), C. l M3(V 16702.3), D. r maxillary fragment with M1–2(V 16702.4), E. r M3(V 16702.5), F. l m1(V 16702.6), G. l mandiblar fragment with m2–3 (V 16702.7), H. r m1(V 16702.8), I. r m2(V 16702.9), J. r m3(V 16702.10)

The m1 has a single-cusped anteroconid situated on the longitudinal axis of the tooth; Both the lingual and labial branches of anterolophids are usually well developed, with the latter lower

but longer than the former; the low and thin anterolophulid, present in 36 of 37 specimens, extends mostly from the labial side of the anteroconid and from the posterior side in others; the metalophulid and the hypolophulid are short and single, the former is distinctly forward-directed to connect the anterior arm of protoconid or the anterolophulid, while the latter is slightly anteriorly directed (in most) or transverse (in some) to join the ectolophid; the mesolophid is poorly developed, of medium length in four, short in 22 and lacking in 12; a short ectomesolophid is present in 2 specimens; the posterolophid is relatively strong and ends low against the entoconid; the ectolophid is more or less curved; the sinusid is wide and slightly forwardly-directed. The m2 has a long labial branch of anterolophid, descending to the base of protoconid; the lingual branch of anterolophid is short, while it is absent in 8 out of 47; the metalophulid and hypolophulid are slightly anteriorly directed; the mesolophid extends toward the metaconid, of medium length in 2, short in 28, and absent in 15; the posterolophid reaches the entoconid in majority and stops before the entoconid base in a few; the ectolophid is curved; the sinusid is slightly anteriorly directed. The m3 has an anterior portion similar to that of m2 in morphology; the hypoconid is small, while the entoconid is very reduced and fused to the ridge that runs from the metaconid to the hypoconid; the mesolophid is absent in all the 11 specimens; the hypolophulid, the ectolophid and the posterolophid encloses the posterosinusid.

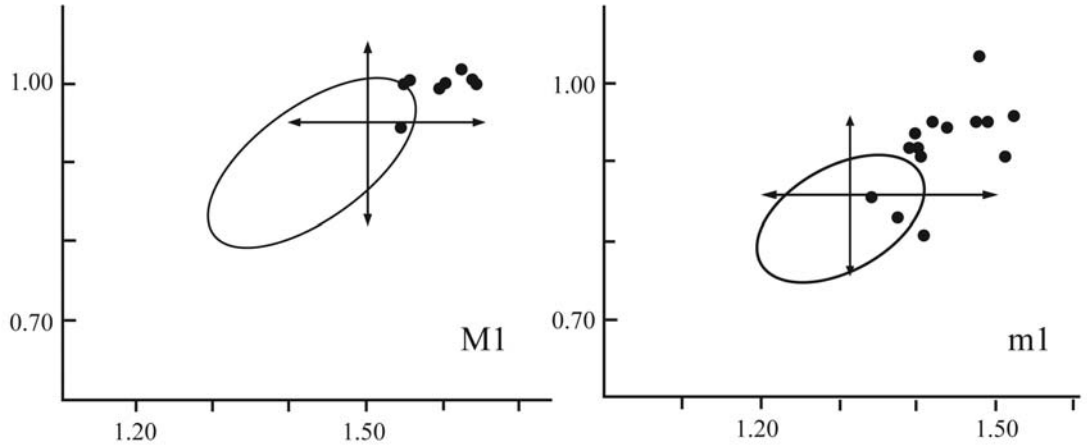

Fig. 6　Scatter diagrams showing length and width of molars of *Megacricetodon* from China
⬭ *M. sinensis* from Moergen II, Nei Mongol;
• *M. yei* from Junggar, Xinjiang; ⟷ *M. sinensis* from Sihong, Jiangsu

Remarks　The teeth described above have morphology consistent with the diagnosis of the genus *Megacricetodon*, i. e. the low crowned and relatively more elongated molars, the three-rooted upper molars, the split anterocone of M1, the presence of posterosinus and usually single connection between the protocone and paracone in M1 and M2, the single anteroconid of m1, the distinctly reduced m3, and the variable mesoloph(id). They were originally referred to *Megacricetodon* aff. *M. collongensis* because of the similarity in size and general dental morphology (Li et al., 1983), and later to an indeterminate species of *Megacricetodon* (Qiu and Qiu, 1995). The absence of split anteroconid of m1 in these specimens seems to prevent assignment of this taxon to *M. collongensis* of Europe, but instead attributable to *M. sinensis* of China. In size these teeth almost fall within the range of *M. sinensis* molars from Moergen II, Tunggur, Nei Mongol (Qiu, 1996), and are only somewhat larger in average dimensions (Fig. 6). In morphology they also show variation in the development of the anterolophule spur of M1, in the development of the anterolophulid and the mesolophid of m1, and the posterior spur of paracone of M1, in the direction of the metalophule of M1 and M2, in the connection of the anterolophule of M1, and in the development of double protolophule of M2, but they fall within

the range variation exhibited by the Moergen *M. sinensis*. Compared to *M. sinensis* from Tunggur, the material from Sihong has in general a deeper anterior groove on the anterocone and relatively larger lingual conules of the anterocone in M1, more anterolophule connecting to the lingual conule of anterocone in M1, less anteriorly directed but more transverse metalophule in M2, more complete anterolophulid in m1. These minor differences may probably be interpreted as more primitive features for the Sihong population of *M. sinensis*.

In addition to *M. sinensis*, two other species of the genus *Megacricetodon pusillus* Qiu et al., 1981 and *M. yei* Bi et al., 2008 have been reported in the Neogene of northern China. Bi et al. (2008) is right that *M. pusillus* might be a synonym of *M. sinensis*. *Megacricetodon yei* known from Junggar Basin, Xinjiang is slightly larger on average than *M. sinensis* from Sihong (Fig. 6), and differs from the latter in having higher percentage of anterolophule spur in M1, frequent occurrence of the posterior spur of paracone in M1 and M2, and higher frequency of double protolophule in M2.

3 Discussion

Association The 6 fragmentary jaws and 552 isolated rodent teeth from Songlinzhuang, Shuanggou, and Zhengji of the Sihong area represent 4 subfamilies, 5 genera and 5 species of the family Cricetidae. These are *Alloeumyarion sihongensis* gen. et sp. nov. of Eumyarioninae, *Cricetodon wanhei* sp. nov. of Cricetodontinae, *Primus pusillus* sp. nov. and *Democricetodon suensis* sp. nov. of Copemyinae, and *Megacricetodon sinensis* Qiu et al. 1981 of Megacricetodontinae. They are of the most diverse and abundant group of mammals in the Sihong Fauna.

The specimens of the five taxa described occur in all three sites in Sihong area. Measurements and morphology of each species for these localities are within the normal variation. This means that these materials from Sihong can be treated as a cricetid association from the Xiacaowan Formation.

Biogeography Two of the identifiable genera (*Democricetodon* and *Megacricetodon*) are commonly recorded in the Early and Middle Miocene in Europe (Kälin, 1999), in northern Asia from the Mongol Plateau to the Junggar Basin and Kazakhstan (Daxner-Höck and Badamgarav, 2006; Qiu et al., 1981, 2006; Qiu, 2001; Wang et al., 2009; Meng et al., 2006, 2008; Bi et al., 2008), in southern Asia (De Bruijn et al., 1981; Wessels et al., 1982; Lindsay, 1988; Kordikova and De Bruijn, 2001), and in western Asia (Pelaez-Campomanes and Daams, 2002). The genus *Cricetodon* occurs in the Early and Middle Miocene of Nei Mongol, Anatolia and Europe (Wang et al., 2009; De Bruijn et al., 1993; Rummel, 1999). This suggests wide dispersal of the three genera in Eurasia during the Early and Middle Miocene, and the Sihong taxa represent their eastern extension of distribution. In addition, the genus *Primus* is also present in the fauna of the Murree Formation in Pakistan. No evidence of immigration of these animals between Eurasia and North America can be confirmed. However, the similarity of *Democricetodon* to the North American *Copemys* Wood, 1936 in dentition seems to show their close affinity. The author would follow American students (Lindsay, 1972; Jacobs and Lindsay, 1984) in suggesting that the idea of *Democricetodon* as a candidate for the ancestry of *Copemys* can not be excluded.

The Sihong fossil localities are situated in the modern "Transitional Zone" of zoogeographic regions between the Oriental Region and the Palaearctic Region, where animals particular to the two regions occur in sympatry. The Sihong Fauna also demonstrates modern zoogeographic region relationships in character of composition. It contains a number of groups particular to or mainly distributed in the Holarctic and Palearctic regions, such as Castoridae, Ochotonidae and Gliridae, and some groups restricted to the Oriental Region, such as Platacanthomyidae and Echinosoricinae, for example. It is clear that the cricetids from Sihong in the "Transitional

Zone" possess Palearctic property, because the family is confined today to North China. *Alloeumyarion* in the Sihong Fauna may be a representative of local speciation, which might have derived from *Eucricetodon* in Oligocene or very early Miocene.

Biochronology The joint occurrence of *Cricetodon*, *Democricetodon* and *Megacricetodon* characterize the Sihong Fauna of the Xiacaowan Formation as an Early or Middle Miocene age. Qiu and Qiu (1995) correlated the fauna to MN4 of Europe on the basis of the fossil evidence of mammals. This study of cricetids seems to essentially approve such an assignment. *Cricetodon* are mainly known from the Ageanian ranging to the Astaracian (MN1–8) in Europe and western Asia (Rummel, 1999). *C. wanhei* from Sihong shows closer evolutionary stage in morphology to *C. aliveriensis* and *C. meini* from the MN4/5 zones than to any other species of the genus. The relatively more primitive feature of the *Democricetodon* and *Megacricetodon* from Sihong relative to those from the Middle Miocene of Tunggur, Nei Mongol implies an older age for the Sihong association. Comparisons with the Siwalik faunas of Pakistan, the presence of *Primus* in the Sihong Fauna indicates its closer age to the Early Miocene fauna of the Murree Formation than to the Middle Miocene fauna of the Chinji Formation (*Primus* is absent in this fauna). It seems likely that the Sihong Fauna can be restrained to the Early Miocene age, and correlated, in European terms, with MN4. Nevertheless, an early MN5 equivalence of the fauna cannot be excluded.

Acknowledgements Wu Wenyu, Lin Yipu, Gu Yumin, Li Wanhe, Luo Yining and Zhou Zheng from the IVPP participated partly in field work and collected the materials. The author would like to express his gratitude to Zhijie Jack Tseng from the Natural History Museum of Los Angeles, California for his discussion and critiquing the manuscript and English content. Many thanks are also given to Zhang Wending for the photographs.

References

Bi S D, Meng J, Wu W Y, 2008. A new species of *Megacricetodon* (Cricetidae, Rodentia, Mammalia) from the Middle Miocene of northern Junggar Basin, China. Am Mus Novit, (3602): 1–22

Bruijn H de, Hussain S T, Leinders J M, 1981. Fossil rodents from the Murree Formation near Banda Daud Shah, Kohat, Pakistan. Proc K Ned Akad Wet, Ser B, **84**(1): 71–99

Bruijn H de, Fahlbusch V, Garaç G et al., 1993. Early Miocene rodent faunas from the eastern Mediterranean area. Part III. The genera *Deperetomys* and *Cricetodon* with a discussion of the evolutionary history of the Cricetodontini. Proc K Ned Akad Wet, Ser B, **96**(2): 151–216

Bruijn H de, Saraç G, 1991. Early Miocene rodent faunas from the eastern Mediterranean area. Part 1 – The genus *Eumyarion*. Proc K Ned Akad Wet, Ser B, **94**(1): 1–36

Chow M C(周明镇), Li C K(李传夔), 1978. A correction of the age of the Hsiatsaohwan Formation and its mammalian fauna. J Stratigr(地层学杂志), **2**(2): 122–130(in Chinese)

Daxner-Höck G, Badamgarav D, 2006. 1. Geological and stratigraphic setting. In: Daxner-Höck G ed. Oligocene-Miocene Vertebrates from the Valley of Lakes (Central Mongolia): morphology, phylogenetic and stratigraphic implications. Ann Naturhist Mus Wien, **108A**: 1–24

Fahlbusch V, 1964. Die Cricetiden (Mammalia) der Oberen Susswassermolasse Bayerns. Abh Bayer Akad Wiss, **118**: 1–136

Freudenthal M, 1963. Entwicklungsstufen der miozanen Cricetodontinae (Mammalia, Rodentia) Mittelspaniens und ihre stratigrafischen Bedeutung. Beaufortia, **10**(119): 51–157

Freudenthal M, 1967. On the mammalian fauna of the Hipparion-beds in the Calatayud-Teruel Basin. Part 3: *Democricetodon* and *Rotundomys* (Rodentia). Proc K Ned Akad Wet, Ser B, **70**(3): 298–315

Freudenthal M, Fahlbusch V, 1969. *Cricetodon munus* Lartet, 1851(Mammalia Rodentia). Request for a decision on interpretation Z. N. (S) 1854. Bull Zool Nomencl, **25**(4/5): 178–182

Jacobs L L, Lindsay E H, 1984. Holarctic radiation of Neogene muroid rodents and the origin of South American cricetids. J

Vert Paleont, **4**(2): 265-272

Kälin D, 1999. Tribe Cricetini. In: Rössner G, Heissig K eds. The Miocene Land Mammals of Europe. München: Verlag Dr F Pfeil. 373-388

Klein Hofmeijer G, Bruijn H de, 1988. The mammals from the Lower Miocene of Aliveri (Island of Evia, Greece). Proc K Ned Akad Wet, Ser B, **91**(2): 185-204

Kordikova E G, Bruijn H de, 2001. Early Miocene rodents from the Aktau Mountains (south-eastern Kazakhstan). Senckenbergiana Lethaea, **81**: 391-405

Kordos L, 1986. Upper Miocene hamsters (Cricetidae, Mammalia) of Hasznos and Szentendre. A taxonomic and stratigraphic study. Magyar Állami Földt Int, 523-553

Kumar K, Kad S, 2002. Early Miocene cricetid rodent (Mammalia) from the Murree Group of Kalakot, Rajauri District, Jammu and Kashmir, India. Curr Sci, **82**(6): 736-740

Li C K(李传夔), Lin Y P(林一璞), Gu Y M(顾玉珉) et al., 1983. The Aragonian vertebrate fauna of Xiacaowan, Jiangsu. Vert PalAsiat(古脊椎动物学报), **21**(4): 313-327(in Chinese with English summary)

Lindsay E H, 1972. Small mammal fossils from the Barstow Formation, California. Univ Calif Publ Geol Sci, **93**: 1-104

Lindsay E H, 1988. Cricetid rodents from Siwalik deposits near Chinji Village. Part I: Megacricetodontinae, Myocricetodontinae and Dendromurinae. Palaeovertebrata, **18**(2): 95-154

Maridet O, Berthet D, Mein P, 2000. Un nouveau gisement karstique polyphasée Miocène moyen de Four (Isère): étude des Cricetidae (Mammalia, Rodentia) et description de *Democricetodon fourensis* nov. sp. Geol France, (2): 71-79

Meng J(孟津), Ye J(叶捷), Wu W Y(吴文裕) et al., 2006. A recommended boundary stratotype section for Xiejian Stage from northern Junggar Basin: implications to related biochronostratigraphy and environmental changes. Vert PalAsiat(古脊椎动物学报), **44**(3): 227-238

Meng J(孟津), Ye J(叶捷), Wu W Y(吴文裕) et al., 2008. The Neogene Dingshanyanchi Formation in northern Junggar Basin of Xinjiang and its stratigraphic implications. Vert PalAsiat(古脊椎动物学报), **46**(2): 90-110

Pelaez-Campomanes P, Daams R, 2002. Middle Miocene rodents from Pasalar, Anatolia, Turkey. Acta Palaeont Pol, **47**: 125-132

Qiu Z D(邱铸鼎), 1987. The Aragonian vertebrate fauna of Xiacaowan, Jiangsu - 7. Aplodontidae (Rodentia, Mammalia). Vert PalAsiat(古脊椎动物学报), **25**(4): 283-296(in Chinese with English summary)

Qiu Z D(邱铸鼎), 1996. Middle Miocene Micromammalian Fauna from Tunggur, Nei Mongol. Beijing: Science Press. 1-216(in Chinese with English summary)

Qiu Z D(邱铸鼎), 2001. Cricetid rodents from the Middle Miocene Quantougou Fauna of Lanzhou, Gansu. Vert PalAsiat(古脊椎动物学报), **39**(3): 204-214(in Chinese with English summary)

Qiu Z D(邱铸鼎), Li C K(李传夔), Wang S J(王士阶), 1981. Miocene mammalian fossils from Xining Basin, Qinghai. Vert PalAsiat(古脊椎动物学报), **19**(2): 153-173(in Chinese with English summary)

Qiu Z D(邱铸鼎), Lin Y P(林一璞), 1986. The Aragonian vertebrate fauna of Xiacaowan, Jiangsu - 5. Sciuridae (Rodentia, Mammalia). Vert PalAsiat(古脊椎动物学报), **24**(3): 191-205(in Chinese with English summary)

Qiu Z X, Qiu Z D, 1995. Chronological sequence and subdivision of Chinese Neogene mammalian faunas. Palaeogeogr Palaeoclimatol Palaeoecol, **116**: 41-70

Qiu Z D(邱铸鼎), Wang X M(王晓鸣), Li Q(李强), 2006. Faunal succession and biochronology of the Miocene through Pliocene in Nei Mongol (Inner Mongolia). Vert PalAsiat(古脊椎动物学报), **44**(2): 164-181

Rummel M, 1999. Tribe Cricetodontini. In: Rössner G, Heissig K eds. The Miocene Land Mammals of Europe. München: Verlag Dr F Pfeil. 359-364

Theocharopoulos C D, 2000. Late Oligocene-Middle Miocene Democricetodon, Spanocricetodon and Karydomys N. Gen. from the eastern Mediterranean area. Athens: Nat Kapodistrian Univ Athens, Gaia 8. 1-91

Tong H, Jaeger J J, 1993. Muroid rodents from the Middle Miocene Fort Ternan locality (Kenya) and their contribution to the phylogeny of muroids. Palaeontogr, Abt A. **229**: 51-73

Wang X M(王晓鸣), Qiu Z D(邱铸鼎), Li Q(李强) et al., 2009. A new Early to Late Miocene fossiliferous region in central

Nei Mongol: lithostratigraphy and biostratigraphy in Aoerban strata. Vert PalAsiat(古脊椎动物学报), **47**(2): 111-134

Wessels W, Bruijn H de, Hussain S T et al., 1982. Fossil redents from the Chinji Formation, Banda Daud Shah, Kohat, Pakistan. Proc K Ned Akad Wet, Ser B, **85**(3): 337-364

Wu W Y(吴文裕), 1986. The Aragonian vertebrate fauna of Xiacaowan, Jiangsu - 4. Gliridae (Rodentia, Mammalia). Vert PalAsiat(古脊椎动物学报), **24**(1): 32-42(in Chinese with English summary)

Wu W Y(吴文裕), 1995. The Aragonian vertebrate fauna of Xiacaowan, Jiangsu - 9. Ochotonidae (Lagomorpha, Mammalia). Vert PalAsiat(古脊椎动物学报), **33**(3): 47-60(in Chinese with English summary)

消息

纪念北京猿人第 1 头盖骨发现 80 周年 国际古人类学术研讨会在北京召开

2009 年是北京猿人第 1 头盖骨发现 80 周年,也是中国科学院古脊椎动物与古人类研究所成立 80 周年。为纪念这一重要事件,交流 75 周年以来的新成果,中国科学院古脊椎动物与古人类研究所、中国第四纪科学研究会、中国科学院地质与地球物理研究所于 2009 年 10 月 19-23 日在北京召开了国际古人类学术研讨会暨第一届亚洲第四纪研究学术大会。大会主题是“亚洲人类演化与环境变迁”,会议还设立了亚洲旧石器考古联合会“垂杨介及她的邻居们”学术专场。

古人类学和旧石器考古学一直是国际科学界的热点之一。来自非洲、西亚的一系列发现正改写着人类起源与演化的历史,冲击着传统的理论和观念。我国科学家近年在此领域也取得了一系列突破性进展,引起了国内外学术界和社会传媒的高度重视。在此情形下,在中国召开一次国际性的学术会议,交流最新科学发现和科研成果,对于解决古人类学及旧石器考古学领域的一些难点和热点问题,促进古人类学和第四纪地质学等相关学科的发展,具有重要意义。

这次会议有 130 名国外代表和 110 名国内代表参加。与会知名学者包括俄罗斯科学院院士、远东分院院长 Anatoley Derevianko, 著名古人类学家、南非 WITS 大学教授 Ronald Clarke, 国际知名学者、英国谢菲尔德大学教授 Robin Dennell, 日本第四纪科学研究会前会长、大阪市立大学教授熊井久雄, 韩国先史研究院院长、旧石器考古学家李隆助, 中国科学院院士、第四纪地质学家、中国科学院地质与地球物理所研究员丁仲礼、刘嘉麒、朱日祥和中国科学院院士、古人类学家、中国科学院古脊椎动物与古人类研究所研究员吴新智等。其他代表来自国内外高校、博物馆(院)、文物考古研究机构等。会议安排了 11 场大会学术报告、119 场分会报告和 30 余个展板报告,涵括了人类演化与环境变迁、古人类行为与文化、亚洲地质环境演变与人类活动 3 个大专题 9 个小专题的各个方面。这是围绕北京猿人发现所举办的纪念和学术活动规模最大、参与领域最多、所涉及的前沿课题影响力最大的一次大型国际会议。会议期间还组织了周口店遗址(包括田园洞及新发掘剖面)参观考察,会后组织了赴泥河湾遗址和广西百色遗址群-崇左洞穴化石地点两条考察路线。会议推动了古人类起源与演化、现代人起源机制等重大并有高度争议性的研究课题的深入开展,提高了我国相关领域基础研究的水平和国际影响力。

(崔　宁)