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记安徽和县猿人地点䶄科(Arvicolidae)一新属新种——变异华南鼠(*Huananomys variabilis*)

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关键词 安徽和县 更新世 复齿和县鼠

内 容 提 要

本文着重描述了 1980—1981 年采自安徽和县龙潭洞的一类䶄科化石。根据臼齿的特殊性状及其与相关属种的比较,建立了一新属新种——变异华南鼠(*Huananomys variabilis*)。这种田鼠可能与水䶄(*Arvicola*)有共同的起源,属早更新世——中更新世中晚期一绝灭的支系。

在与和县猿人共生的小哺乳动物群中,笔者曾发现一种特殊的䶄科化石。由于当时未曾定名,因此在其《和县猿人小哺乳动物群的性质及意义》(1982)以及《和县猿人地点小哺乳动物群》(1983)初步报道的短文中均未曾列出此种动物。其后,笔者曾征求过 C. A. Repenning 博士的意见并在《Comments on fossil arvicolids of China》(Zheng and Li, 1990)一文中首次使用"*Hexianomys complicidens*"这一属种名称。Repenning C. A., Fejfar O. and W.-D. Heinrich (1990)在《Arvicolid rodents biochronology of the Northern Hemisphere》一文中多次提及"*Hexianomys*"并指出它类似 *Microtus*,且将其与 *Lasiopodomys*、*Microtus* 及 *Proedromys* 一起置于 Microtini 族中。"*Hexianomys complicidens*"也在《Quaternary mammals of China》一文中再次被引用(Zheng S. H. and D. F. Han, 1991)。然而"*Hexianomys complicidens*"这一属种名称本应在《和县猿人地点哺乳动物群》专著中描述,但因出版时间的延误,这一名称已变得无效。为了不致引起更大的混乱,也基于该类动物在䶄科中的重要位置,现不得不将其提前单独发表,并以新的属种名称——变异华南鼠 *Huananomys variabilis* 来代替原有的复齿和县鼠 *Hexianomys complicidens*。

在已发表的三篇文章中有关"*Hexianomys*"的材料既包含了和县猿人地点的,也包含了 1982 年采自贵州咸宁观风海天桥裂隙的。本文主要对前一地点的材料加以详细描述。感谢欧阳涟同志为本文摄制图版。

駍科 Arvicolidae Gray, 1821
駍亚科 Arvicolinae Gray, 1821
駍族 Arvicolini Kretzoi, 1955
华南鼠(新属) *Huananomys* gen. nov.

属型种 *Huananomys variabilis* sp. nov.

特征 中型。臼齿无根。下门齿在 M_2 和 M_3 间横向唇侧。齿褶内白垩质发育。珐琅质层厚度在三角凸侧较在凹侧明显厚。M^1、M^2 和 M_2 冠面形态似 *Microtus*；M^3 前环之后具 4 个封闭三角；M_1 前帽和后环之间具 3—5 个封闭三角；M_3 后环之前具 3 个封闭三角，唇侧前褶角缺失。

命名 汉语拼音 Huanan (华南)作属名。

变异华南鼠(新属新种) *H. variabilis* gen. et sp. nov.

(图版 I)

正型标本 1 段右下颌带门齿及 M_{1-3} (IVPP v6788)

归人材料 2 段右上颌骨带 M^{1-2} (v6788.1—2)； 1 段左上颌带 M^1 (v6788.3)； 1 段右下颌带 M_{1-3} (v6788.4)； 21 件 M^1 (v6788.5—25)； 2 件 M^2 (v6788.26—27)； 6 件 M^3 (v6788.28—33)； 27 件M_1 (v6788.34—60)； 13 件 M_2 (v6788.61—73)。

特征 同属，

命名 以 M_1 后环之前具 3—5 个封闭三角的复杂齿形命名。

描述 正型标本 (v6788) (图 1, A—C) 下颌升枝部分残缺；另一件标本 (v6788.1) 水平枝亦相当残破。下颌水平枝较粗重，唇侧视，颏孔位于 M_1 前缘之前下方；咬肌脊上下支清楚，同时始于 M_1 前帽之正下方，下支后端下降到角突下缘，上支缓慢向后向上抬升；升枝始于 M_1 唇侧第 2 褶沟处并遮掩 M_2 的后半部。唇侧视，水平枝前后方向轻微凹并被许多小孔所点缀；下颌联合部呈鞍状，其前上方突出于下门齿之后，中部向下凹，后端止于 M_1 舌侧第 1 褶沟之下，其上方有一宽大的突起。咀面视，齿槽和升枝之间清楚向下凹，其凹坑中亦有许多小孔。下门齿断面呈圆三角形，其尖端明显低于臼齿咀嚼面，其齿干在 M_2 和 M_3 之间从舌侧横向唇侧。

3 件上颌标本中保存最好的是 v6788.1 (图 1, D—E)。这件标本显示出门齿孔后端稍位于 M^1 槽孔前缘之前，颧弓前根正好位于 M^1 唇侧第 1 褶沟旁，颧弓板前面适度凹。

关于駍类臼齿的描述，在各类文献中采用了不同的术语，且有越来越复杂的趋势。为方便起见，Martin R. A. (1987) 建议采用 van der Meulen (1973, 1978) 的模式作为对 *Microtus* 牙齿分析的标准。这种模式一方面包括了 Hinton M. A. C. (1926) 所使用的主要术语，已为大多数人所接受和应用；另一方面使用起来确实简单明了，例如在M_1，无论下前边尖组合 (anteroconid complex) 多么复杂，其内外褶角(褶沟)数和三角数仍可依次向前排列；又如在 M^3，无论前环之后有多少三角，其数字顺序也可依次向后排列。本文描述的变异华南鼠上下臼齿构造较为简单，所使用的术语基本为 Meulen 的模式

(图 2)。

为了更直接说明 *Huananomys* 的特点，模式图所示下臼齿为正型标本 (v6788)，上臼齿为两件标本 (v6788.1 和 v 6788.33) 拼组而成，分别代表 M^{1-2} 和 M^3。由于 M_1 在 Arvicolids 鉴定中具有十分重要的意义，为表示其三角间的封闭程度，这里还使用了齿峡 (dentine ithmus) 这一概念，意指三角间的齿质空间。在 *Huananomys*，一般具有 6 个这样的齿峡，从后向前计数分别为 Is 1, 2, 3, 4, 5, 6。为了说明珐琅质层厚度在臼齿不同部位的变化，本文也引用了正差异 (positive differentiation) 和负差异 (negative differentiation) 概念，即后壁(下臼齿)和前壁 (上臼齿) 厚度相对于前壁(下臼齿)和后壁(上臼齿)为大的为负差异，相反为正差异。

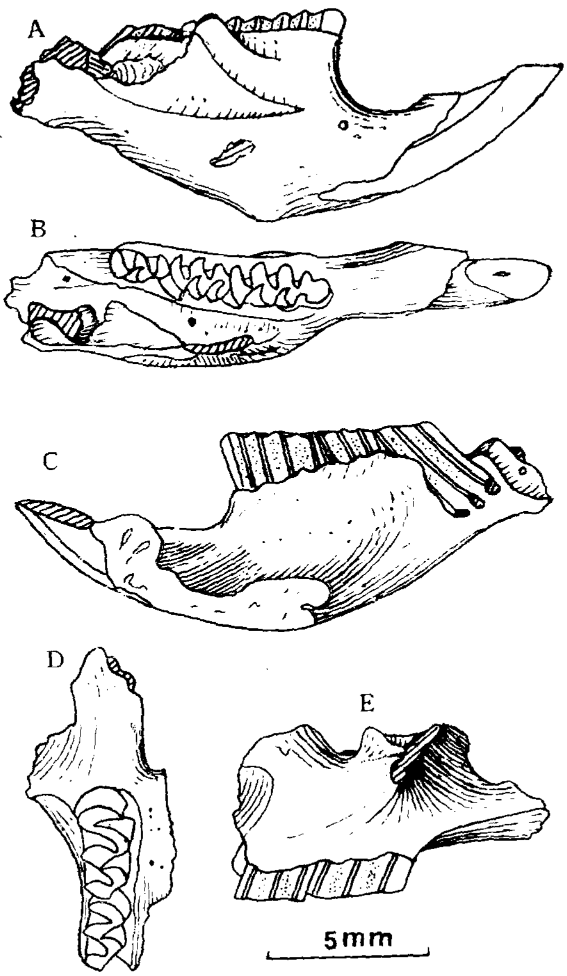

图 1 *Huananomys* 下颌骨与上颌骨

A—C. 升枝残缺的右下颌带门齿及 M_{1-3} (正型标本, v6788): A. 唇侧视; B. 咀面视; C. 舌侧视。D—E. 段右上颌带 M^{1-2} (v6788.1): D. 咀面视; E. 唇侧视。

fig. 1. Mandibula and maxilla of *Huananomys*.

A—C. A broken right lower jaw with I and M_{1-3} (Type, v6788): A. buccal view; B. occlusal view; C. lingual view. D—E. A broken right maxilla with M^{1-2} (v6788.1): D. occlusal view; E. buccal view.

测量项目中，臼齿的长度为最大长度；宽度指最大宽度，在下臼齿为 T_1 和 T_2 之间，在 M^1 在 T_1 和 T_2 之间，在 M^2 和 M^3 在 T_2 和 T_3 之间；M_1 前帽宽度指 LSA_5 和 BSA_4 之间的宽度；Is 5 的宽度为 LRA_3 谷底与 T_4 前壁之最短距离；Is 6 的宽度指 LRA_4 与 BRA_3 谷底之间的最短距离。

M_1 由一前帽、5 个三角和一后环构成，因此舌侧有 5 个褶角、4 个褶沟，唇侧有 4 个褶角、3 个褶沟。舌侧褶角较唇侧的显著为大，褶角尖端都较圆钝。牙齿前帽前壁和后环两侧珐琅质层中断，有时内外褶角端亦有中断现象。在年轻个体(图 3, L—N)，三角间，特别是齿峡 Is 5 和 Is 6 宽宽开放，Is 1—4 亦封闭不严密。属于年轻个体的标本只 3 件，占总数 (29) 的 10.3%。在成年个体，齿峡 Is 1, Is 2, Is 3 和 Is 4 通常均呈封闭状态，但其下前边尖组合 (ACC) 的形态是变化的。这种变化可归并为三种基本类型。第一类是前帽椭圆，其结构稍复杂，

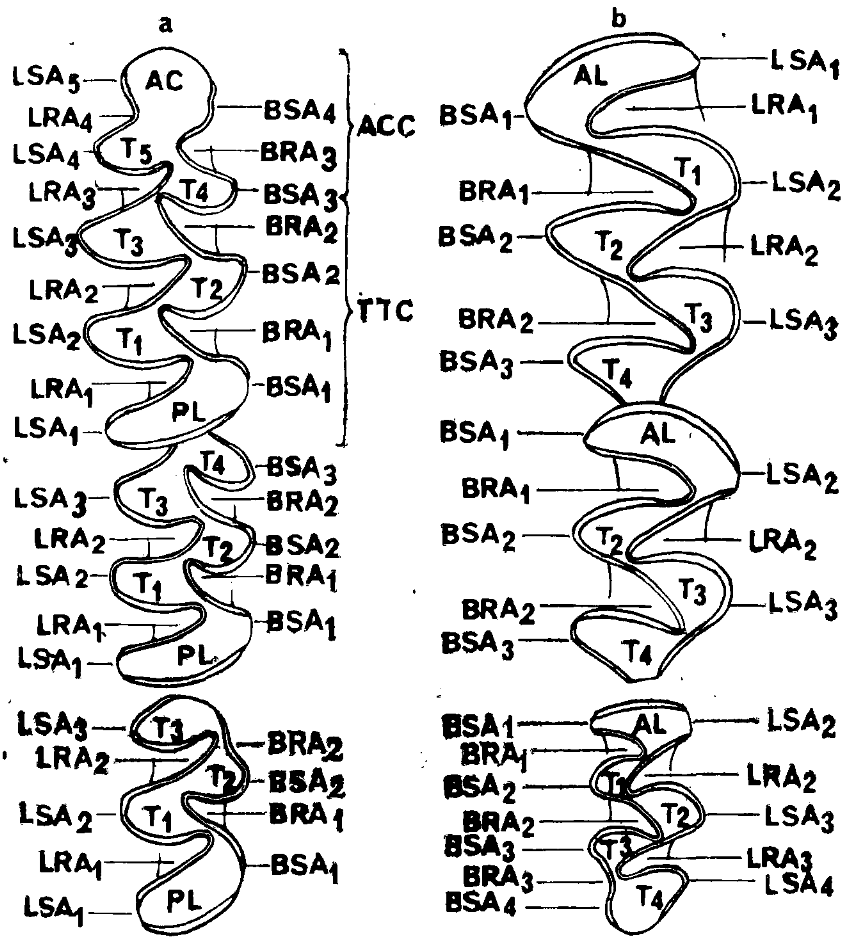

图 2 *Huananomys* 臼齿咀面构造术语（Terminology of occlusal surface of molars of *Huananomys*）

a. 右下齿列（right lower molars, type, v6788） b. 右上臼齿（right upper molars: M^{1-2}-v6788.1; M^3-V6788.33）

AC = anterior cap（前帽） ACC = anteroconid complex（下前边尖组合） AL = anterior loop（前环） BRA = buccal reentrant angle（唇侧褶沟） BSA = buccal salient angle（唇侧褶角） LRA = lingual reentrant angle（舌侧褶沟） LSA = lingual salient angle（舌侧褶角） PL = posterior loop （后环） T = triangle （三角） TTC = trigonid-talonid compiex（齿座—跟座组合）。

唇侧有一极弱的附加褶沟；齿峡 Is 6 通常是开放的，Is 5 较 Is 6 窄，除一件封闭较严外，一般也是开放的；BRA_3 的狭窄程度几乎和 LRA_4 相当。因此该种类型后环之前通常具有 3—4 个封闭三角(图 3，A—D)。可归入这种类型的标本（9 件）占总数的 31%。第二类是前帽小而简单，唇侧无任何附加褶皱痕迹；BRA_3 特别宽浅(图 3 E—G)。归入这类的 5 件标本中的 3 件 Is 5 较开放，2 件封闭，因此这种类型后环之前亦具有 3—4 个封闭三角。占总数的 17.3%。第三类是前帽短宽，呈半圆形，唇侧无附加褶皱；Is 5 和 Is 6 通常是封闭或亚封闭的，因此前帽和后环之间有 5 个封闭三角（图 3，H—K）。这种

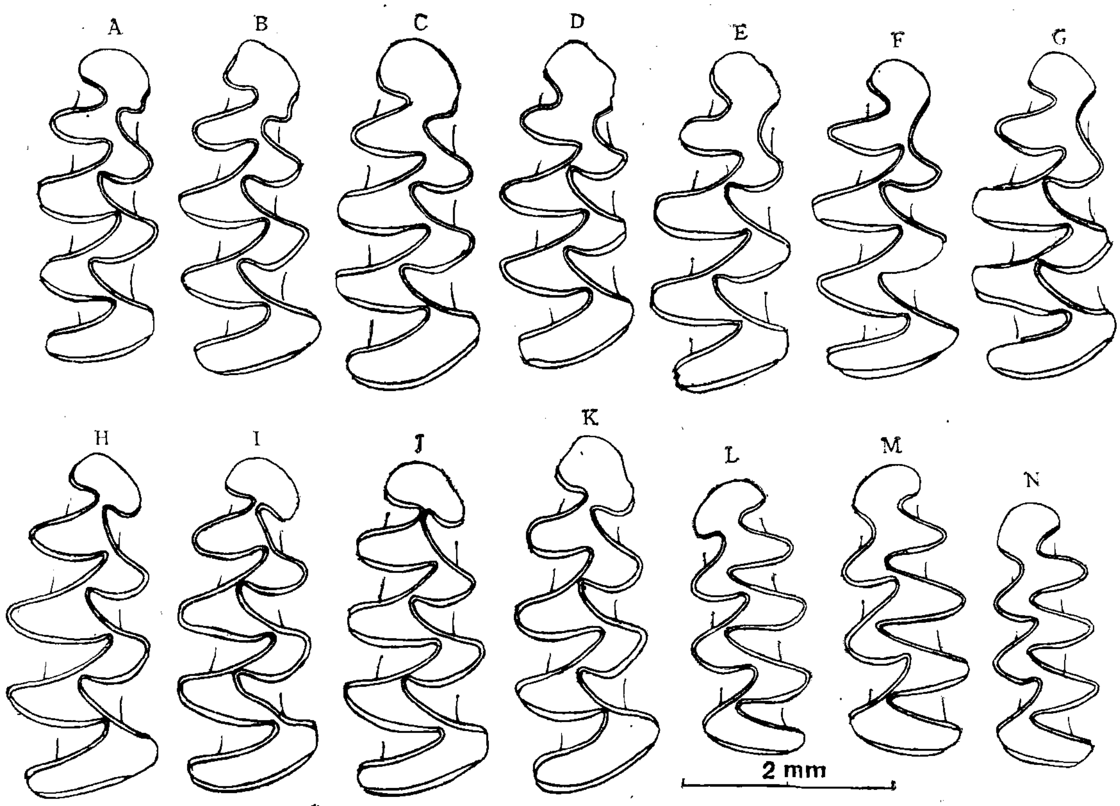

图3 *Huananomys* M_1 的形态类型

fig. 3. Dental morphotypes of M_1 of *Huananomys*.

The first lower molars of *Hexianomys* are designated as four morphotypes: A—D with 3—4 closed triangles and an AC with a small fold on buccal side; E—G with 3—4 closed triangles and a simple AC; H—K with five closed triangles and a semi-circle AC; L—N, the younger, with subclosed triangles.

类型数量最多(12件),占总数的41.4%。

由于Is 5和Is 6宽度在不同类型中是变化的,如果作为整体考虑,并假定其宽度小于0.1毫米(接近于Is 1—4的最大值)为封闭状态,那么在Is 5封闭的标本(17件)比不封闭的标本(12件)数目为大,且多数在0—0.05毫米级别;而在Is 6呈封闭状态的标本(7件)比不封闭标本(22件)数目为小,且多在0.15—0.20毫米级别(图4)。也就是说,*Hexianomys* 的Is 5多数呈封闭状态,而Is 6多数呈不封闭状态。

所测28件标本前帽宽度变化范围为0.60—0.87毫米,平均0.77毫米。

M_2 形态较单一。后环之前,除正型标本(v6788) T_3 和 T_4 间齿峡较开敞外,其余标本均有4个封闭三角。内外侧各具3褶角、2褶沟;内外褶角在大小上的差异不如 M_1 的明显,但其尖端亦圆钝。。牙齿前壁及后环两端珐琅质层中断。

M_3 后环之前只3个大小相当的三角。正型标本的 T_1 和 T_2 间齿峡较开敞,另一件标本则较封闭。由于 T_4 缺失,因此唇侧只2褶角,BRA_2 几乎接近消失。像 M_2 一样,牙齿

前壁及后环两端珐琅质层亦中断。

M^1 由前环及其后 4 个封闭的、交错排列的三角构成，因而每侧各有 3 褶角、2 褶沟。前环前壁微向前凸，珐琅质层在两端中断。舌侧褶角端浑圆。由于 LSA_1 比 LSA_2 和 LSA_3，BSA_1 比 BSA_2 和 BSA_3 更偏向唇侧，因此 T_1 总是向唇侧方向加长，而不呈典型的三角形；而 BRA_1 的前壁也适当加长并时有轻微弯曲。T_2 和 T_3 均呈三角形，其前壁几相互平行。T_3 类似 T_1，但少向唇侧延伸。牙齿后端珐琅质层中断。

M^2 前环之后只 3 个封闭三角，因此舌侧只 2 褶角、1 褶沟，唇侧 3 褶角、2 褶沟。前环前缘微向前凸，珐琅质层在其两端中断。T_2 比 T_3 和 T_4 略小。

M^3 由一前环和 4 个交错排列、近于封闭的三角构成，因此舌侧有 3 褶角、2 褶沟，唇侧有 4 褶角、3 褶沟，其中 BRA_3 和 BSA_4 十分微弱。唇侧三角较舌侧的小，其中 T_1 最小，T_4 最大。6 件标本中，只 1 件的 T_2 和 T_3 间以及 T_3 和 T_4 间较开敞。几乎没有后跟存在。牙齿前环两端及后端珐琅质层中断。

所有臼齿无牙根。褶沟内白垩质发育。珐琅质层厚度在三角的凸缘较凹缘为厚，在褶沟底最薄。

测量：见表 1。

比较　駍科动物是适应于全北区温带和寒带草原生活为主的啮齿类，地域分布广泛。从目前的资料看，已有 5 百多万年的历史（Chaline, 1990; Repenning, et

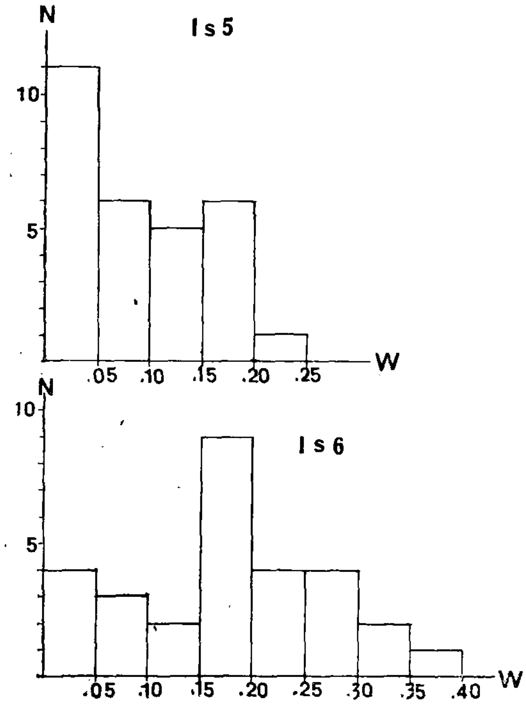

图 4　*Huananomys* M_1不同级别齿峡（Is 5，Is 6）宽度与标本数

fig. 4.　Histograms showing the number of M_1 of *Huananomys complicidens* in different width of the Is 5 and Is 6.

表 1　*Huananomys* 臼齿测量（单位：毫米）

Table 1.　Measurements of molars (in mm)

标本 specimens		M^1	M^2	M^3	M_1	M_2	M_3
标本数N		22	4	4	25	15	2
长 L	最小 min.	2.65	2.15	1.92	2.68	1.90	1.70
	最大 max.	3.19	2.28	2.27	3.46	2.22	1.90
	平均 mean	2.79	2.21	2.13	3.16	2.02	1.80
宽 W	最小 min.	1.34	1.23	0.92	1.07	1.10	1.00
	最大 max.	1.69	1.30	1.04	1.42	1.30	1.00
	平均 mean	1.51	1.27	0.99	1.31	1.22	1.00

al., 1990)。由于自中新世以来的迅速演化,形成了一个相当繁杂的群体,是动物学家,特别是古生物学家最为重视的研究对象。 Hinton M. A. C. (1926) 关于它们的现生的和化石种类的专著《Monograph of Voles and Lemmings》列举了31个属的特征并详细描述了其中的14个属121种,这为后来研究该类动物奠定了基础。近年来,现生的该类动物被归并为17属、111种 (Nowak and Paradiso, 1983) 或18属、110种 (Corbet and Hill, 1980)。古生物学家从进化的观点出发,认为现生属达25个之多 (Repenning, 1987; Repenning, Fejfar and Heinrich, 1990)。这种认识的不一致,造成了分类工作的混乱,以致目前关于 Arvicolidae 究竟包含多少属种还未有一个较统一的认识。 然而由于研究工作的深入,研究方法的改进,特别是新的材料的不断增加,属种的数量不可避免地有增加的趋势, *Huananomys* 的发现就是一例。

首先, *Huananomys* 以其臼齿无根,可与现生的 *Clethrionomys*, *Dinaromys* (*Dolomys*), *Phenacomys*, *Ondatra*, *Prometheomys*, *Ellobius* 以及那些原始的化石属,如 *Mimomys*, *Borsodia*, *Pliomys* 等相区别; 以其齿褶内有白垩质发育可与 *Dicrostonyx*, *Lagurus*, *Prometheomys*, *Ellobius*, *Hyperacrius* 相区别; 以其下门齿在 M_2 和 M_3 之间从舌侧横向唇侧不同于完全位于舌侧的 *Synaptomys*, *Myopus* 和 *Lemmus* 属。

在臼齿无根、齿褶内有白垩质、下门齿在 M_2 和 M_3 间横过臼齿列的属中,北美的 *Neofiber* 以其上颌门齿孔较远离 M^1 槽孔前缘、M_3 前环之后4个三角少封闭且有一较明显的后跟发育以及 M_1 只具5个封闭三角等与 *Huananomys* 相区别。

亚洲的 *Alticola* 在齿褶内少白垩质、上臼齿前环前缘、下臼齿后环后缘较平直、M^1 和 M^2 的 LRA_3 较明显、M^3 的 BSA_1 浅而后跟长、M_1 前帽较复杂且只4个封闭三角、M_2 的 LRA_3 较明显、M_3 的 BSA_3 发育且三角间少封闭以及珐琅质层的正差异等不同于 *Huananomys*。

古北区的 *Arvicola* 在上臼齿的一般形态上非常类似 *Huananomys*, 不同的是前者 M^3 的 T_3 和 T_4 间通常是开敞的; M_1 只3个封闭三角;尤其是 M_3 具有深的 BRA_2 和突出的 BSA_3 以及 T_1 和 T_2, T_3 和 T_4 间通常开通成斜横脊。

亚洲的 *Eothenomys* 是一很复杂的田鼠类,其分类迄今仍存在着不同的看法。按照 Hinton (1923, 1926) 的描述,其臼齿珐琅质层厚度在三角前后缘几乎相当、下臼齿褶角的排列属相对而不是相错的特征应是区别于 Arvicolidae 中任何一个属的标志。此外,它的 M^1 和 M^2 具或强或弱的 LSA_4 和 LRA_3、M^3 齿冠的复杂多变、M_1 具发育的 BSA_4 和 LSA_5 及复杂的前帽、M_3 具深的 BRA_2 和突出的 BSA_3 等都不同于 *Huananomys*。应该指出的是,被 Hinton (1926) 以 "*Evotomys*"(=*Clethrionomys*) 记述的 "*E. rufocanus shanseius*", "*E. r. regulus*" 和 "*E. r. smithii*" 以及以 *Anteliomys* 和 *Aschizomys* 两属所包含的种均被一些动物学家归入 *Eothenomys* 属内 (Allen, 1940; Corbet and Hill, 1980; Nowak and Paradiso, 1983), 但一些学者(如 Ellerman, 1941—42; Repenning et al., 1990) 仍然坚持使用 *Eothenomys*, *Anteliomys* 和 *Aschizomys* 作为属名。 Kawamura Y. (1988) 甚至重新启用了 *Paulomys* 属名来记述日本的 "*E. r. smithii*" 种。尽管存在着这种分类上的不一致,但下臼齿三角相对排列的特征完全可以将 *Eothenomys* 一类与 *Huananomys* 区别开来。

全北区的 *Microtus* 属的内容恐怕是研究田鼠类学者争论最多的。Nowak and Paradiso (1983) 根据 Hall (1981), Corbet (1978), Ellerman and Morrison-Scott (1966), Hassinger (1973), Orlov and Kovalskaya (1978), Kovalskaya and Sokolov (1980), Meier and Yatsenko(1980) 等以 *Microtus* 作属名，下含 6 个亚属，即 *Microtus*, *Proedromys*, *Lasiopodomys*, *Neodon*, *Pitymys* 和 *Stenocranius*。古生物学家多倾向于将一些亚属作属名，例如 Repenning, Fejfar and Heinrich (1990) 就列举了 *Phaiomys*, *Lasiopodomys*, *Microtus*, *Proedromys*, *Herpetomys*, *Neodon*, *Orthriomys*, *Pitymys* 等属名。

Phaiomys 的 M^1 和 M^2 有较清楚的 LRA_3，M^3 前环后 4 个三角较少封闭，M_1 只 3 个封闭三角，M_3 无封闭三角等与 *Huananomys* 不同。

Pitymys 和 *Neodon* M_1 后环之前只 3 个封闭三角，其 T_4 和 T_5 总是汇通成菱形，在一些种甚至还有 T_6 和 T_7 汇通成菱形者；其 M_3 从未有封闭三角存在，但有 BSA_3；其 M^3 多数种较复杂。van der Meulen (1978) 提出只有北美的 *Pitymys* 型的田鼠应视作 *Pitymys* 属；Chaline J., Brunet-Locomte and J.-D. Graf (1988) 根据生物化学和古生物资料认为 *Pitymys* 作为 *Microtus* 的亚属应局限于新北区，而古北区的被作为 *Pitymys* 的种类应归入 *Terricola* Fatio, 1867。它们有一共同祖先 *Allophaiomys pliocaenicus*。

Lasiopodomys M_1 后环前通常有 5 个封闭三角，其前环是变化的；在现生种 *L. brandti*，其前环两侧通常有一附加浅褶沟；而在原始种 *L. probrandti*，附加褶沟通常缺失。其 M_3 虽无明显的 BSA_3，但有较深的 BRA_2；它的 T_1 和 T_2 总是汇通成一斜横脊。M^3 前环之后虽亦有 4 个三角，但其 T_3 和 T_4 间从不封闭。

中国的 *Proedromys* 是一珍稀动物，现生标本极少，化石标本亦仅记载于陕西蓝田公王岭 (Repenning, 1988; Zheng and Li, 1990)。其 M^1 和 M^2 类似 *Huananomys*，但 M^3 前环之后只 3 个封闭三角；其 M_1 后环之前只 4 个封闭三角；其 M_3 虽无 BSA_3 但 T_1 和 T_2 汇通呈斜横脊。

Microtus 和 *Stenocranius* 的 M_1 通常有 4—5 个封闭三角，其前帽有时是复杂的，常具唇侧附加褶皱；M_3 常具 BSA_3 和 BRA_2，T_1 和 T_2 总是汇通成斜横脊；M^3 在早期的化石种较简单，进步的和现生种则较复杂，一般舌侧都有 4 个褶角或更多。

Huananomys 在臼齿珐琅质层厚度具负差异、褶角圆钝及 M_3 具封闭的 T_1 和 T_2 等方面也和动物学家归入 *Microtus* 属的现生于中美的 *Orthriomys* 和 *Herpetomys* 相似。但 *Orthriomys* M_1 只 3 个封闭三角，M_3 具有 T_4 和深的 BRA_2，M^3 前环后虽有 4 个三角，然 T_3 和 T_4 不封闭。*Herpetomys* M_1 具 5 个三角，前帽两侧有附加褶皱，T_4 和 T_5 成菱形汇通，以致被归入 *Pitymys* 亚属之内 (Martin, 1987)。M_3 虽无 T_4，但 BRA_2 是明显的。M^1 和 M^2 有一浅但明显的 LRA_3。M^3 前环之后除具 3 个封闭三角处，还有一个 C 字型的后跟。

被动物学家归入 *Microtus* 亚属的欧洲雪䶄 (*Chionomys*)，近年来又被古生物学家作为亚属 (Fejfar and Horacek, 1983; Chaline, 1987) 应用于化石的研究。这个亚属的牙齿特征基本像 *Microtus*，但 M^3 每侧只 2 褶沟 (Miller, 1912)，则像 *Arvicola* 和

表2 *Huananomys* 和相近属或亚属臼齿特征比较

Table 2. Comparisons of dental morphology between *Huananomys* and the related genera or subgenera

characters 特征 / 属或亚属（典型种） gen. or subgen. (typical species)	M_1							M_3						M^1 and M^2				M^3								enamel differ-renti ation 珐琅质层差异		salient angles 褶角	
	三角不封闭 triangles opened	封闭三角数目 number of closed triangles				anterior cap 前帽		T_1-T_2		BRA_2		BSA_3		LRA_3		LSA_4		T_1-T_2		T_4		T_3-T_4		heel 后跟					
		3	4	5	3—5	simple 简单	complex 复杂	closed 封闭	open 开放	shallow 浅	deep 深	present 存在	absent 缺失	inclear 不明显	clear 明显	present 存在	absent 缺失	closed 封闭	open 开放	present 存在	absent 缺失	closed 封闭	open 开放	present 有	absent 无	positive 正差异	negative 负差异	sharp 尖	rounded 圆
Huananomys (*variabilis*)					×	×		×		×			×	×			×	×		×		×			×		×		×
Alticola (*stoliczkanus*)			×			×			×		×	×		×			×	×		×			×	×		×		×	
Arvicola (*amphibius*)		×				×			×		×	×		×			×	×		×			×		×	×			×
Eothenomys (*melanogaster*)	×						×		×		×	×			×	×			×	×			×	×		×		×	
Anteliomys (*chinensis*)	×					×			×		×	×		×			×	×		×			×	×		×		×	
Aschizomys (*lemminus*)				×		×			×		×	×		×			×	×		×			×	×		×		×	
Phaulomys (*smithii*)	×					×			×		×	×		×			×		×	×			×	×			×		×

Caryomys (*eva*)	*Microtus* (*arvalis*)	*Proedromys* (*bedfordi*)	*Lasiopodomys* (*brandti*)	*Neodon* (*sikimensis*)	*Pitymys* (*pinetorum*)	*Stenocranius* (*gregalis*)	*Chionomys* (*nivalis*)	*Phaiomys* (*lucurus*)	*Allophaiomys* (*pliocaenicus*)	*Herpetomys* (*guatemalensis*)	*Orthriomys* (*umbrosus*)	*Pedomys* (*austerus*)	*Neofiber* (*alleni*)
		×							×	×	×		×
	×		×	×	×	×	×	×				×	
		×							×	×	×		?×
×	×		×	×	×	×	×	×				×	
		×	×					×			×	×	
×	×			×		×	×		×	×			×
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×	×		×	×	×	×	×	×	×	×	×	×	×
×					×								
	×	×	×	×		×	×	×	×	×	×	×	×
×	×	×	×	×	×	×	×	×	×	×	×	×	×
×				×	×			×				×	
	×	×	×			×	×		×	×	×		×
		×								×			×
×	×		×	×	×	×	×	×	×		×	×	
×	×		×	×	×	×	×					×	
		×						×	×	×	×		×
×	×	×	×	×	×	×		×	×			×	
							×			×	×		×
×	×				×	×				×		×	
		×	×	×			×	×	×		×		×
	×		×			×	×						×
×		×											
				×	×			×	×	×	×	×	

某些 *Pitymys* 种。这一特征虽与 *Huananomys* 相似，但它的 M^1 和 M^2 有较明显的 LRA_3，M_1 有 5 个封闭三角，M_3 存在 BRA_2 和 BSA_3、T_1 和 T_2 不封闭，珐琅质层厚度的正差异等与新属种不同。

化石的 *Allophaiomys* 广泛发现于全北区，其臼齿形态十分类似 *Phaiomys* 和 *Arvicola*，其 M_1 后环之前只 3 个封闭三角，T_4 和 T_5 间及 T_5 与前帽间汇通，前帽简单近圆形；其 M^3 前环之后亦有 4 个三角，但 T_3 发育不充分且与 T_4 之间少封闭。由于臼齿的这些特征，它和 *Phaiomys*，*Arvicola*，一齐被置于 Arvicolini 族中 (Repenning, Fejfar and Heinrich, 1990)。至于 *Allophaiomys* 是作为一个真正的属还是作为 *Microtus* 的亚属目前还没有一致认识。

总之，*Hexianomys* 和那些臼齿无根、齿褶内具白垩质、下门齿干在 M_2 和 M_3 间横过臼齿列的䶄科属(亚属)的差异是清楚的(表 2)。

从表 2 可见，*Hexianomys* 臼齿褶角端圆的性状有些相似于 *Arvicola*，*Phaulomys*，*Proedromys*，*Herpetomys*，*Orthriomys* 及 *Neofiber*；M_3 T_1 和 T_2 封闭的特征又相似于 *Chionomys*，*Herpetomys*，*Orthriomys* 及 *Neofiber*；M_3 缺失 BSA_3 的特征还相似于 *Proedromys*，*Herpetomys* 及 *Neofiber*；M^3T_3 和 T_4 封闭的特点只相似于 *Chionomys*；珐琅质层厚度的负差异则又与 *Phaulomys*，*Proedromys*，*Allophaiomys*，*Herpetomys*，*Orthriomys* 及 *Neofiber* 一致。然而上述相似特征从不完全体现在一个属(亚属)之上，尤其是它的 M_1 具有 3—5 个封闭三角的性状更是区别于表中所列的所有属(亚属)。正因为如此，该属的典型种才取名为变异华南鼠 (*H. variabilis*)。

讨论 到目前为止，*Huananomys* 除发现于安徽和县猿人地点外，更多的材料还发现于贵州咸宁观风海天桥裂隙。根据共生小哺乳动物组合特征，和县猿人地点的地质时代相当于北京猿人地点第 5 层的时代 (郑绍华，1982，1983)；根据动物牙釉质所作氨基酸测得为 20—30 万年 (王将克等，1986)；根据铀系法测得为 15—27 万年 (陈铁梅等，1987)；根据热释光测得 18.4—19.5 万年(李虎侯、梅屹，1983)。综合考虑，被置于周口店期 (Zheng and Li, 1990; Zheng and Han, 1991)。

天桥地点因含有 *Beremendia* 及较原始的啮齿动物群，其时代被视为狭义的泥河湾期 (Zheng and Li, 1990; Zheng and Han, 1991)，相当于欧洲的早 Biharian 或北美的 Irvingtonian I (Repenning, Fejfar and Heinrich, 1990)。这个时代，正是无根臼齿的䶄类，如 *Allophaiomys*，*Alticola*，*Dicrostonyx*，*Lasiopodomys*，*Microtus*，*Neodon* 和 *Pitymys*，大量出现的时代。这说明 *Huananomys* 在此一时期已经处于与这些属平行进化的阶段，并代表无根田鼠类中一较原始的类型。

如果视天桥地点为最早出现，和县猿人地点为最晚出现，那么两地点在 M^1、M^2、M^3，M_2 和 M_3 的形态上及所有臼齿在尺寸大小上无甚明显变化。但在 M_1 的形态上似乎存在着如下微弱的进化趋势。

首先，统计天桥地点 145 个 M_1，属于和县地点第一种类型的 (43 件)占 30%；第二种类型的 (7 件)占 5%；第三种类型的 (95 件) 占 65%。除第一种类型与和县猿人地点

* 见郑绍华《川黔地区第四纪啮齿类》(待刊)

(31%)接近外，第二种类型比和县(17.3%)小，第三种类型的比例较和县(41.4%)大。这种情况似乎表明，时代越早，*Huananomys* M_1 具 5 个封闭三角数目的比例越大。

其次，属于第一种类型的 M_1 前帽唇侧附加褶皱在天桥地点的标本上大多缺失，因此M_1 前帽构造有从简单到复杂的变化趋势。这种情况有些类似于从 *Lasiopodomys probrandti*——*L. brandti* 或从 *Microtus minoeconomus*——*M. oeconomus* 的演变趋势(郑绍华、蔡保全，1991)。但是 *Huananomys* 的这种变化还未达到这两类那样明显的程度。

然而从进化角度看，M_1 封闭三角数目的增多应该是进步的标志，三角数目少才是原始的性质。*Huananomys* M_1 具三个封闭三角者，其 T_4 和 T_5 汇通但不成菱形以及简单的前帽形态，M^3 的简单、臼齿珐琅质层厚度负差异等均与 *Arvicola* 十分类似。由此可以推断出 *Huananomys* 与 *Arvicola* 似乎应有共同的起源，后者的直接祖先被确认为 *Mimomys savini* (Chaline, 1987)。*Huananomys* M_3 后环前 3 个三角封闭的特点应视为特殊环境下一种特化现象。因此，与其将 *Huananomys* 置于 Microtini 族(Repenning, Fejfar and Heinrich, 1990)不如置于 Arvicolini 族更为恰当。

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HUANANOMYS, A NEW GENUS OF ARVICOLIDAE(RODENTIA) FROM THE HEXIAN HOMINID SITE, ANHUI

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Key words Anhui; Hexain; Pleistocene; *Huananomys*

Summary

Some specimens of arvicolid rodents were collected from the Hexian hominid site but not recorded in the list of the original mammalian fauna (Zheng Shaohua, 1982, 1983) and Huang Wanbo et al., 1982) due to their particularity unknown at that time. The genus *Hexianomys* named by these specimens in the monograph about the mammalian fauna from the Hexian hominid site was first mentioned by Zheng and Li in 1990 and quoted by Repenning et al. at the same time and by Zheng and Han in 1991. The name *Hexianomys,* however, has become invalid with the delayed publication of the monograph. In order to avoid further confusion, I have to use a new generic and species name *Huananomys variabilis* to replace the previous *Hexianomys complicidens* and offer independently it in this paper considering its important position in the Arvicolidae. The material of this new genus in the literature include those from not only the Hexian but also the Tianqiao locality of Guizhou. In this paper, the stress will be put on the description of the specimens from the Hexian hominid site.

Family Arvicolidae Gray, 1821
Subfamily Arvicolinae Gray, 1821
Tribe Arvicolini Kretzoi, 1955
Genus *Huananomys* gen. nov.

Type species *H. variabilis* sp. nov.

Diagnosis Size medium. Cheek teeth rootless. Lower incisor passing from lingual to labial side of molars between the base of M_2 and M_3. Cement filling in the reentrant angles of molars developed. Enamel thicker on covex than on concave sides of salient angles. M^1, M^2 and M_2 normal as in *Microtus*. M^3 with four closed triangles behind the anterior loop. M_1 with three to five and M_3 with three closed triangles before the posterior loop, and M_3 without BSA_3.

Derivation nominis Name the typical locality, Hexian, being situated in South China after the new genus.

Huananomys variabilis sp. nov.

Holotype One broken right mandible with I and M_{1-3} (IVPP, v6788).

Referred material Two broken right maxilla with M_{1-2} respectively (v6788. 1—2); one broken left maxilla with M^1 (v6788.3); one broken right mandible with M_{1-3} (v6788.4); 21 M^1 (v6788.5—25); two M^2 (v6788.26—27); 6 M^3 (v6788.28—33); 27 M_1 (v6788.34—60); 13 M_2 (v6788.61—73).

Diagnosis As for the genus.

Derivation nominis *variabilis* means the first lower molar with three to five closed triangles between the posterior loop and the anterior cap.

Description M^1, M^2 and M_2 are essentially as in normal members of *Microtus* in patterns. All the lower and the upper molars are of rootless and filled with cement in the reentrant angles. The enamel is thicker on the convex than on the concave sides.

M_1 consists of an anterior cap, five triangles and a posterior loop. There exists five salient and four reentrant angles on the lingual side and four salient and three reentrant angles on the buccal side. The lingual salient angles are obviously larger than the buccal ones. The salient angles are slightly blunt and rounded. The enamel is broken off on the anterior wall of the anterior cap and on both buccal and lingual salient angles of the posterior loop, sometime also on the ends of inner or outer triangles. The immature specimens (10.3% of the total) show the dentine space between triangles not tight closed and the anterior cap simple (fig. 3, L-N). In the mature specimens, the Is 1—4 are usually narrow, but the patterns of the anteroconid complex have great variation and can basically be assigned as the following three morphotypes: The first one has an elliptic AC with a small secondary fold on the buccal side, an wider Is 6 than Is 5, a BRA_3 as deep as the LRA_4, three to four closed triangles before the posterior loop (31% of the total) fig.3, A-D). The second has a small and simple AC, a wide but shallow BRA_3 and three closed triangles when Is 5 widened or four ones when it narrowed (fig. 3, E-G) (17.3%). The third has a simple and semicircle AC, five closed or subclosed triangles before the posterior loop (41.4%) (fig. 3, H-K).

The width of Is 5 and Is 6 are variable in different morphotypes. If regarding it less than 0.01 mm (near to the largest value of Is 4 as the closed, the number of specimens with closed

Is 5(17) are satistically larger than those unclosed Is 5(12) and most of them occupy the range of 0.00—0.05 mm, while the closed Is 6(7) are smaller than the unclosed(22) and in range of 0.15—0.20 mm (fig. 4). This seems clearly to indicate that the Is 5 is relatively narrower than the Is 6.

M_3 has three triangles before the posterior loop. The dentine space between T_1 and T_2 is more confluent on the type specimen(fig. 2, a) than on the otherone. There is only two buccal salient angles due to disappearing of T_4 and a shallow BRA_2. As with M_2, the enamel is broken off on the anterior wall of tooth and both sides of the posterior loop

M^3 is composed of an anterior loop and four alternate but almost closed triangles on the occlusal surface. There is three lingual and four buccal salient angles and two lingual and three buccal reentrant angles, of which, both BRA_3 and BSA_4 are very obscure. The buccal triangles are smaller than the lingual ones. The dentine space between T_2 and T_3, T_3 and T_4 are closed

Measurements see table 1.

Comparison The modern arvicolid rodents are animals adapted mainly to temperate and to arctic grasslands and are of Holarctic distribution. According to the present fossil records they have a long evolutionary history more than 5 M.Y. (Chaline, 1990; Repenning et al., 1990). With the rapid evolution, they have formed a complicated colony which is the most important object of study for zoologists and paleontologists. Thirty-one fossil and living genera listed and 121 species described by Martin A. C. Hinton(1926) laid a good foundation for us to understand arvicolid rodents. Recent years, the modern animals of this family have been classified into 17 genera and 111 species(Nowak and Paradiso, 1983) or 18 genera and 110 species(Corbet and Hill, 1980). From evolutionary point of view, however, paleontologists thought the living arvicolid rodents to have possibly as many as 25 genera (Repenning, 1987; Repenning et al., 1990). This disagreement bring about such a situation that no one result about number of genera of this family can be accepted by everyone. The increase of genera and species in number, however, seems an inexorable trend with improvement of study method and new discovery. Fossil *Huananomys* is a good instance in this respect.

First of all, the new genus *Huananomys* differs from the living genera, *Clethrionomys*, *Dinaromys* (*Dolomys*), *Phenacomys*, *Ondatra*, *Prometheomys*, *Ellobius* and fossil genera, for example, *Mimomys*, *Borsodia* and *Pliomys* in the rootless of molars, and from those genera, *Dicrostonyx*, *Lagurus*, *Prometheomys*, *Ellobius* and *Hyperacrius* in the development of cement in the reentrant angles of molars, and from *Synaptomys*, *Myopus* and *Lemmus* in the position of the lower incisor shaft passing from lingual to buccal sides between the base of M_2 and M_3.

The main difference between the genus *Huananomys* and those genera without the abovementioned three traits has been listed in table 2. All the characters of the new genus never concentrate completely on one known genus or subgenus, though some of it are common with the other one, for example, the closed dentine space between T_1 and T_2 on M_3 can also be observed in these genera, *Chionomys*, *Herpetomys* and *Orthriomys*. Especially, the M_1 of *Huananomys* differs from those forms listed in this table in having three to five closed triangles.

Discussion Up to now, the material of *Huananomys* have only been found from two localities, Hexian hominid site, Anhui and Tianqiao, Weining of Guizhou. The geological age of the Hexian site has been determined in different ways (Zheng, 1982, 1983; Wang 1986; Chen et al., 1987; Li and Mei, 1983). Though there exists various results among the different authors, it can be considered as the Zhoukoudianian (Zheng and Li, 1990; Zheng and Han, 1991). The Tianqiao fauna including *Beremendia* and some primitive rodents(*) may be regarded as Nihewanian in age (s.s.) (Zheng and Li, 1990; Zheng and Han, 1991) and can be compared with European early Biharian or American Irving tonian I (Repenning et al., 1990). Many genera or subgenera with rootless cheek teeth, such as *Allophaiomys, Alticola, Dicrostonyx, Lasiopodomys, Microtus, Neodon* and *Pitymys* began to occur in the world. This state probably indicate that the new genus is of one of the relative primitive arvicolid rodents and in the evolutionary stage parallel to these genera or subgenera.

If regarding the Tianqiao as the earliest and the Hexian as the latest, no obvious variation can be observed on the size of all the molars and on the patterns of occlusal surface of M^1, M^2, M^3, M_2 and M_3 except M_1 which seems to show some slight evolutionary trends: the age is older, the number of the closed triangles is larger and the secondary fold on the buccal side of AC is inclearer. However, three rather than five closed triangles are generally considered as the primitive trait. The M_1 with three closed triangles in the specimens of *Huananomys* is very similar to that of *Arvicola* in having a simple AC and an unrhomboid space between T_4 and T_5. Accordingly it can be inferred that the *Huananomys* has a common origin with the *Arvicola* which derived from *Mimomys savini*. So it is better to put the *Huananomys* to Tribe Arvicolini rather than to Tribe Microtini.

(*) Zheng shaohua: Quaternary rodents of sichuan and Quizhou area (in press).

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