

## 两栖犀科的新材料\*

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最近十年来,中国科学院古脊椎动物与古人类研究所的野外队,在河南的淅池、济源、卢氏,和山西的垣曲等县的上始新统中,采集了许多哺乳类化石,其中包括好几种两栖犀科的化石。两栖犀科的化石过去在我国及亚洲其它地区,发现的化石种类及数量都较少,近年来在蒙古人民共和国,苏联(哈萨克斯坦),以及我国的内蒙、云南、陕西、山西和河南都有不少新材料发现。这些新资料表示两栖犀科在东亚的上始新统和渐新统中,分布十分广泛,种类也很繁多。因而在地层和动物群对比上有重要的意义。云南和陕西的主要材料已由徐余璋等(徐,1961;徐、邱,1962;周、徐、甄,1964;徐,1965)研究发表。内蒙地区材料不久也可发表。这篇报告简略地记述了近年来在河南和山西境内采集的两栖犀化石。这些材料初步被归入两个属和六个种,其中有一个新属和五个新种。

### 分类记述

角形亚目 *Ceratomorpha* Wood

两栖犀科 *Amynodontidae* Scott et Osborn

属 *Lushiamynodon* gen. nov.

(卢氏犀, 新属)

属型种: *L. menchiapuensis* sp. nov.

属的特征: 身材中等或相当大, 头骨及颊齿的构造不十分特化的两栖犀属。前臼齿列退缩不太强烈;  $P^1$  臼齿化, 形态与早期真犀类的近似; 外脊的内壁有一明显的小刺, 外壁圆凸, 前尖褶和后尖褶都较发育, 前者特别大, 成圆柱状; 原尖与原脊间有不十分明显的收口趋势, 后脊很长, 向舌面延伸到原尖后内侧附近。臼齿齿冠比较起来不十分高, 轮廓显得相当肥大;  $M^2$  前后引长, 外壁微凸;  $M^3$  后半部分变窄, 后脊倾斜度大, 有与外脊连接成一条直线的趋向。头骨脑颅部分比较膨大, 有发达的矢状脊。颧弓壮大, 上颌骨颧突位置较靠腹面, 在  $M^2$  后部及  $M^3$  前部齿根上方。

种 *Lushiamynodon menchiapuensis* sp. nov.

(孟家坡两栖犀, 新种)

(图版 I, 图 1)

正型标本: 一个保存完美的左上颌骨, 带有  $P^1-M^3$  (古脊椎动物与古人类研究所编号 V. 3016); 本文作者等 1957 年夏季采集。

\* 1965 年 3 月 3 日收到。

**其它材料：**最近作者描述一个采自云南路南美邑的标本（周、徐、甄，1964，358 页，图版 I，图 1、1a），初步归入 *Amyndodon* 属（种别未定），应归入这个新种；另外，在卢氏收集的两个  $M^3$ （V. 3017，V. 3017.1）和一个单一的右  $P^1$ （V. 3016.1）可能也属同一种。

**地点和层位：**正型标本产自河南卢氏孟家坡（57202 地点）上始新统下部卢氏组底部白色泥岩层。

**种的特征：**一种不十分特化的两栖犀，身材中等偏小，比 *Sianodon sinensis*（Zdansky）（见后）大得多， $P^1-M^3$  长约 114mm。 $P^1$  比较短宽，退缩程度较甚，有明显的前尖褶及后尖褶；臼齿横脊的倾斜度不大； $M^1$  近于正方， $M^2$  前后延长，外壁微微圆凸， $M^3$  后端窄，后脊倾斜较甚。

**标本描述：**正型标本（V. 3016）的牙齿保存完美，磨蚀程度不深， $M^3$  刚开始磨蚀。上颌骨上颧骨的颧突十分壮大，位置较靠近腹面，在臼齿（ $M^2$  后部及  $M^3$  前部）根部上方。

与后面的臼齿（ $M^1$ ）比较， $P^1$  显著缩小，但退缩程度远不如在晚期的两栖犀中那样厉害，与坝河西安犀（*Sianodon bahoensis*, Xu, 1965）的情况相近。臼齿的齿冠不十分高，轮廓显得十分肥大。 $M^1$  略成正方形； $M^2$ 、 $M^3$  前后引长，与有一些同时代的两栖犀属（如 *Amyndodon*, *Paramyndon*）比较起来，齿冠轮廓较为窄长，臼齿横脊的倾斜度不太大，原脊与外脊的夹角在  $M^2$  及  $M^3$  中分别为  $50^\circ$  及  $55^\circ$ 。

$P^1$  的构造与某些原始真犀类的相似，外壁有两条纵褶（前尖褶和后尖褶），褶间形成一深的凹；前尖褶显著地凸出成柱状，后尖褶较平缓。外脊的内壁上，在后脊的基部前、后方各有一小刺。原脊伸长到牙齿舌面的边缘，原尖在与原脊连接处有不十分明显的收口现象，表示原尖有与原脊进一步分化的趋向。另一单独的  $P^1$ （野外号 5788）为一右侧  $P^1$ ，可能也属于这个种，但比正型标本的  $P^1$  较长大，特别是后脊后坡更为宽大。 $M^1$  的冠面略近正方形。 $M^2$  前后引长，后端较窄，后脊短，外壁向外凸出，外脊的后端向外弯曲。 $M^3$  比  $M^2$  稍小，外脊的中部内凹，后部强烈外翘，形成一粗大的纵褶。后脊强烈倾斜，与外脊在靠中部相接触，有成为一直线的趋势。齿带在前臼齿前、内、后侧特别发达，外侧仅微有发育；臼齿的前、后齿带也相当发育，在内侧面上不连续，在横脊的舌端缺失。

卢氏发现的两个确实地点和层位不明的单独的臼齿（V. 3017，V. 3017.1），大概也属于同一种。V. 3017  $M^3$  的齿冠顶面稍受磨蚀，原脊因受挤压显得异常倾斜。V. 3017.1 标本保存较好，但也已有一部分破损，原脊稍受挤压。两个臼齿的大小都与孟家坡两栖犀的  $M^3$  相近，外脊的外壁向内凹曲，与原脊的夹角都约为  $50^\circ$ 。

这两个牙齿与孟家坡两栖犀  $M^3$  的主要差别是牙齿显得较为长而窄，外壁前、后褶间的内凹面较深而宽。V. 3017.1 的宽度为长度的 91.1%（长 34mm，宽 31mm）。

**正型标本（V. 3016）测量（单位 mm）**

$P^1-M^3$ 的长 (Length of $P^1-M^3$ )	110
上臼齿列长 (Length of $M^1-M^3$ )	95
$P^1$ 长 (Length, $P^1$ )	18.6
$P^1$ 宽 (Width, $P^1$ )	27.4
$P^1$ 宽/长% (W/L %, $P^1$ )	144.2
$M^1$ 长 (L, $M^1$ )	32
$M^1$ 宽 (W, $M^1$ )	30
$M^1$ 宽/长% (W/L %, $M^1$ )	93.7

M <sup>2</sup> 长 (L, M <sup>2</sup> )	40
M <sup>2</sup> 宽 (W, M <sup>2</sup> )	33.5
M <sup>2</sup> 宽/长% (W/L %, M <sup>2</sup> )	83.7
M <sup>3</sup> 长 (L, M <sup>3</sup> )	33
M <sup>3</sup> 宽 (W, M <sup>3</sup> )	31
M <sup>3</sup> 宽/长% (W/L %, M <sup>3</sup> )	93.9
M <sup>2</sup> 、M <sup>3</sup> 原脊与外脊的夹角	50°; 55°
(M <sup>2</sup> , M <sup>3</sup> angles between protoloph and ectoloph)	

**附記:** 孟家坡两栖犀, 显然与我国及亚洲其它地区发现的已知的两栖犀有显著的不同, 代表一种时代較早的, 头骨上的关节后突与听后突远远分离, 臼齿横脊傾斜度不大, 而前臼齿較为退縮, 臼齿較为引长的两栖犀类。P<sup>4</sup> 及 M<sup>3</sup> 的形态沒有达到后期的两栖犀中那样, 前臼齿強烈退縮, 和臼齿异常狹长, 外壁非常长和平直等情况。在有一些特点上, 如 P<sup>4</sup> 的前、后尖褶发达, 外脊內壁有小刺, M<sup>3</sup> 的后脊与外脊几成一条直綫, 与原始真犀的牙齿有些相似。

孟家坡两栖犀是目前亚洲发现的时代最早的两栖犀。

### 种 *Lushiamynodon obesus* sp. nov.

(图版 II, 图 1, 2)

**正型标本:** 一个头骨殘存部分, 包括头顛后半部分, 左右上颌骨, 保存有上颌骨的颧突部分, 和不完整的 M<sup>2</sup>、M<sup>3</sup>, 和部分左 M<sup>1</sup>。编号: V. 3023, 野外编号: 53022。

**地点及层位:** 河南济源东张村附近上始新統紅色砂岩层。化石层可能相当于滎池任村垣曲組化石层, 即 *Sianodon sinensis* (Zdansky)(見后)正型标本发现地点。

**种的特征:** 一种臼齿构造与孟家坡两栖犀相似, 但 M<sup>2</sup> 較寬, 牙齿大得多的两栖犀。

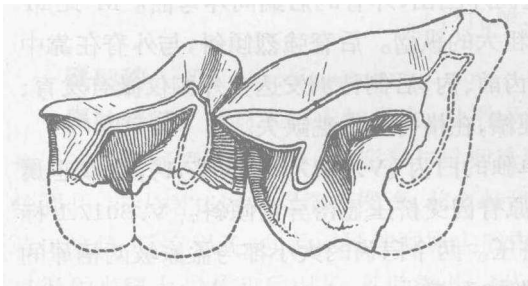


插图 1. *Lushiamynodon obesus* gen. et sp. nov., 右 M<sup>2</sup>、M<sup>3</sup> 的齿冠面, × 2/3, V. 3023。

**标本描述与比較:** 从保存部分看, 头骨的主要特征是, 脑顛部分比較膨大, 有很发达的、高而长的矢状脊, 上颌骨颧突位于 M<sup>2</sup> 及 M<sup>3</sup> 之間上方, 关节后突与听后突之間的距离很远, 关节后突显得窄而厚, 基枕骨較长而寬, 基結节与关节后突在一直綫上, 翼骨比較发达。这些性質和大小相近的垣河两栖犀 (*Sianodon bahoensis* Xu, 1965) 比較有很大不同, 后者的脑顛狹窄, 矢状脊不甚发达, 短而低, 关节后突寬而薄, 与听后突較为靠近。上颌骨颧突壮大, 位置較靠腹面, 与孟家坡两栖犀相同。

臼齿齿冠相对不十分高, 但是輪廓异常寬大, 前半部更要寬一些。原脊上的反前刺很弱, 横谷很开闊。牙齿的外脊不很平, 中部微向外凸出, 与孟家坡两栖犀相似。臼齿輪廓不十分狹长, M<sup>2</sup> 的寬 (55.5mm) 为长 (61mm) 的 90.9%; 臼齿横脊的傾斜度不大, M<sup>2</sup> 及 M<sup>3</sup> 的原脊与外脊的夹角均为 50°。M<sup>3</sup> 的外脊的后端 (与后脊接触点的后方部分) 較垣河两栖犀 (*Sianodon bahoensis* Xu, 1965) 的短, 后脊傾斜度也較大, 与外脊前端近似成一条直綫, 和孟家坡两栖犀及早期的真犀类 (如 *Eotrigonias*) 中的相象。

济源的两栖犀从头骨及牙齿的性质看,显然和垣河两栖犀不同,虽然大小比较接近。和孟家坡种比较,牙齿的性质相似,但大小几乎为后者的一倍。格罗莫娃(1958)曾描述过一种蒙古晚始新世(?)的两栖犀(*Amynodon giganteus* Gromova),仅有一个 $M^3$ 为代表。这个牙齿的轮廓近正方形,后脊倾斜度小,整个形态与我们的标本很不一样,大小也比我们的大一些。

杨鍾健(Young, 1937, P. 424, fig. 8, a)曾记述一个河南滎池发现的 $M^3$ ,认为属于*Amynodon mongoliensis*。这个牙齿大小和后脊倾斜情况与我们的标本相似,可能属于同一个种,不过杨氏记述的牙齿的外壁较短,向内凹,近似于蒙古种。另外,师丹斯基(Zdansky, 1930, PP. 49, 50; Taf. III, figs. 7, 8)也记述过一个与杨氏的标本在同一处发现的牙齿,可能为 $M^2$ ,和我们的最为相近,似属于同一种。

### 属 *Sianodon* Xu, 1965 (西安犀)

#### 种 *Sianodon mienchiensis* sp. nov.

(图版 IV, 图 2—4)

**正型标本:** 一个右 $M^3$ (V. 30212; 野外编号: 5314.115), 一个不完整的、属于幼年个体的左下颌骨, 带有 $P_4-M_2$ 及部分 $P_3, M_3$ (V. 3021; 野外编号: 5314.2)。

**其它材料:** 一个带有 $P_4$ 及 $M_2$ 的左下颌骨破块(V. 3021.1; 野外编号: 5312.3)。

**地点及层位:** 河南滎池任村; 垣曲组。

**种的特征:** 一种 $M^3$ 的构造与垣河两栖犀很相似, 但牙齿小得多, 下臼齿外壁上前后叶相接处有明显的纵沟的两栖犀。

**标本描述:**  $M^3$ 的前附尖褶已破损。 $M^3$ 的齿冠较长, 后脊的内端向后弯曲, 因而齿冠的后部变得较窄, 轮廓呈近似前宽后窄的梯形。牙齿的外壁很平, 外脊的后端仅微微向外翘。横脊的倾斜度不大, 原脊与外脊的夹角为 $65^\circ$ 。前、内、后齿带很发达。中横谷开阔。齿冠相对的不十分高。

V. 3021 下颌骨较高。下颌联合不十分长, 其后沿达 $P^3$ 的前端。下颊齿的数目可能是2—3个前臼齿, 3个臼齿; 前臼齿列( $P_3-P_4$ )的长(约为25mm)约等于臼齿列长(约为50mm)的1/2。每个颊齿的前端窄后端宽, 齿冠轮廓呈前窄后宽的梯形; 前臼齿的前、后宽度变化更为剧烈, 整个颊齿列由前向后逐渐变窄。所有颊齿的外壁上都有明显的纵沟。下臼齿齿冠轮廓较为窄,  $M_2$ 的宽(9.5mm)为长(16.6mm)的57.2%; 横脊倾斜度不大,  $M_2$ 后脊与外脊的夹角为 $65^\circ$ 。前后齿带较发达。

**附记:** 新种的牙齿虽小, 但有一些非常明显的特征, 与垣河两栖犀很相似,  $M^3$ 除牙齿小得多外, 其形态特征几乎与垣河两栖犀的完全一样。新种为已知两栖犀中个体最小的一种, 与河南济源、山西垣曲的

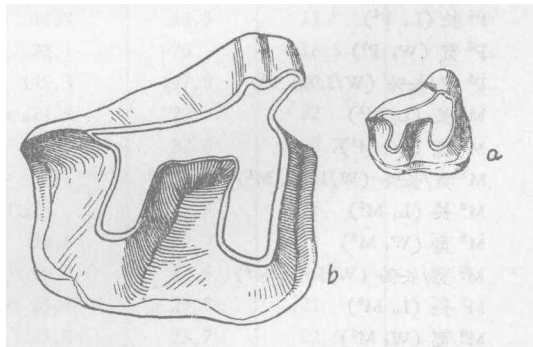


插图 2. a, *Sianodon mienchiensis* sp. nov., 右 $M^3$ 的齿冠面,  $\times 2/3$ , V. 3021.2; b, *Sianodon bahoensis* Xu, 右 $M^3$ 的齿冠面,  $\times 2/3$ , V. 3015.

中国西安犀相近。M<sup>3</sup> 横脊倾斜度相对较小。下臼齿外壁上的纵沟很明显, M<sub>2</sub> 的宽度为长度的 57.2%, 齿冠不十分引长。这个标本显然代表一种比较原始的两栖犀, 与坝河两栖犀最为接近。

### 种 *Sianodon honanensis* sp. nov.

(图版 I, 图 2—3)

**正型标本:** 一个右上颌骨, 带有完整的 P<sup>4</sup>—M<sup>3</sup> (V. 3020), 和同一个体的左上颌骨, 带有 M<sup>1-3</sup> (V. 3020.1)。

**其它材料:** 一个单独的左 M<sup>2</sup> (V.3020.3) 和一个带有 M<sup>1</sup> 及 M<sup>2</sup> 的右上颌骨破块 (V. 3020.2)。

**地点及层位:** 河南卢氏孟家坡 (57202 地点, 1957 年夏采集), 与 *Lushiamynodon menchiapuensis* (见前) 正型标本一起产出。

**种的特征:** 个体很小, P<sup>4</sup> 的构造与孟家坡两栖犀相同。M<sup>1</sup> 及 M<sup>2</sup> 相当引长; M<sup>3</sup> 后脊较短, 使齿冠轮廓成前宽后窄的梯形; 臼齿外壁平坦; 外壁上的前尖褶及前附尖褶不很膨大, 成上下较为均匀的细稜, 位置都靠近外壁的极前端; 臼齿齿冠较高; 横脊倾斜度较大, 原脊与外脊的夹角在 M<sup>2</sup> 及 M<sup>3</sup> 分别为 45° 及 55°; 横谷开闊。

**标本描述与比较:** 卢氏孟家坡的三个上颌骨, V. 3020 的上颊齿的外壁稍有破损; V. 3020.1 和 V. 3020.2 的臼齿保存完好。三个标本上的牙齿的磨蚀程度都不深。牙齿都很小, 前臼齿退化的程度, 从保存的 P<sup>4</sup> 看来, 比孟家坡种的稍小。P<sup>4</sup> 比较宽, 原脊很发达, 后脊较长, 伸达原脊舌端的后内侧。M<sup>1</sup> 及 M<sup>2</sup> 的轮廓显得特别狭长, 与孟家坡两栖犀的相当牙齿差不多。M<sup>3</sup> 的轮廓成前宽后窄的梯形, 比孟家坡两栖犀的宽, 更接近于 *Amynodon* 属的性质。M<sup>2</sup> 及 M<sup>3</sup> 的横脊的倾斜度较大, 原脊和外脊的夹角分别为 45° 及 55°, 比孟家坡种的倾斜度稍大。M<sup>1</sup> 和 M<sup>2</sup> 的外壁比较平坦, 只是在后脊和外脊连接的地方, 外壁稍向

#### 标本测量 (单位 mm):

	V. 3020	V. 3020.1	V. 3020.2
P <sup>4</sup> —M <sup>3</sup> 的长 (Length of P <sup>4</sup> —M <sup>3</sup> )	80	—	—
上臼齿列长 (Length of M <sup>1</sup> —M <sup>3</sup> )	69	—	—
P <sup>4</sup> 长 (L, P <sup>4</sup> )	15	—	—
P <sup>4</sup> 宽 (W, P <sup>4</sup> )	20	—	—
P <sup>4</sup> 宽/长% (W/L %, P <sup>4</sup> )	133.3	—	—
M <sup>1</sup> 长 (L, M <sup>1</sup> )	—	—	23
M <sup>1</sup> 宽 (W, M <sup>1</sup> )	—	—	20.5
M <sup>1</sup> 宽/长% (W/L %, M <sup>1</sup> )	—	—	89.1
M <sup>2</sup> 长 (L, M <sup>2</sup> )	—	29.3	27.3
M <sup>2</sup> 宽 (W, M <sup>2</sup> )	—	24.2	22
M <sup>2</sup> 宽/长% (W/L %, M <sup>2</sup> )	—	82.2	80.7
M <sup>3</sup> 长 (L, M <sup>3</sup> )	25.8	22	—
M <sup>3</sup> 宽 (W, M <sup>3</sup> )	24.8	23	—
M <sup>3</sup> 宽/长% (W/L %, M <sup>3</sup> )	96	104.5	—
M <sup>2</sup> , M <sup>3</sup> 原脊与外脊的夹角 (M <sup>2</sup> , M <sup>3</sup> angles between protoloph and ectoloph)	45°, 50°—55°	45°, 50°—55°	45°

外凸出；臼齿的齿冠相对的也比孟家坡种稍高。这些性质上都显示出 V. 3020 上颊齿要比孟家坡种的特化，更趋近于晚期的两栖犀。

与 *Sianodon sinensis* (Zdansky) (见后) 相比较，大小虽然相近，但在形态上有明显的差别，主要的是：P<sup>4</sup> 比较臼齿化，后脊较长，与孟家坡种相同，与中国西安犀很不一样（见后）；臼齿横脊的倾斜度较大，舌面齿带较为发达；M<sup>3</sup> 的后脊较短，使 M<sup>3</sup> 的轮廓成前宽后窄的梯形。

河南两栖犀的时代，与孟家坡卢氏两栖犀相同，为目前亚洲发现的时代最早、牙齿很小臼齿的形态较为特化的一种两栖犀类。

### 种 *Sianodon sinensis* (Zdansky)

(中国西安犀，新组合)

(图版 III, 图 1—5; 图版 IV, 图 5)

**材料：**我们观察到的标本，除师丹斯基描述 (1930) 的正型标本的模型，和楊鍾健 (1937) 记述的标本外，尚有近年来在河南、山西黄河沿岸四个地点采集的下列材料：

(1) 带有 P<sup>4</sup>—M<sup>3</sup> 的右上颌骨一个，单独的上颊齿 7 个 (V. 3018<sub>2-8</sub>)，及一个带有 M<sub>2</sub>、M<sub>3</sub> 的右下颌骨破块 (V. 3018.1)。化石采自河南澠池任村，与正型标本同一地点。

(2) 带 P<sup>4</sup>—M<sup>3</sup> 的上颌骨一个 (V. 3019)，1956 年夏，王择义等采自山西垣曲塞里村头桥沟，相当于师丹斯基和安特生的“河岸剖面”或“第一地点”(Loc. 1)，或同一露头附近。

(3) 上颌骨一段，带 M<sup>1-3</sup> (V. 3024)；1964 年刘宪亭等采自河南济源东张村，与 *Lushiamynodon obesus* (见前) 正型标本同一地点。

**种的特征(修订)：**齿式  $\frac{2 \cdot 1 \cdot (? 4 - 3) \cdot 3}{? \cdot 1 \cdot 3 \cdot 3}$ 。个体很小，臼齿齿冠高度中等，上犬齿向前方斜伸。前臼齿列长度约为臼齿列长度的一半；P<sup>3</sup>、P<sup>4</sup> 的构造原始，外壁上有两条纵褶

#### 标本测量 (单位 mm)：

	正型标本 (Type)	V. 3018	V. 3019	V. 3024
P <sup>4</sup> —M <sup>3</sup> 的长 (Length of P <sup>4</sup> —M <sup>3</sup> )	—	78	74	—
上臼齿列长 (Length of M <sup>1</sup> —M <sup>3</sup> )	73.5	68	63.5	Ca54
P <sup>4</sup> 长 (L, P <sup>4</sup> )	14.8	14.5	13	—
P <sup>4</sup> 宽 (W, P <sup>4</sup> )	22.1	20	18.5	—
P <sup>4</sup> 宽/长% (W/L %, P <sup>4</sup> )	149.3	137.8	142	—
M <sup>1</sup> 长 (L, M <sup>1</sup> )	Ca24.5	22	22	—
M <sup>1</sup> 宽 (W, M <sup>1</sup> )	25	22.6	20.7	—
M <sup>1</sup> 宽/长% (W/L %, M <sup>1</sup> )	102	102.7	94	—
M <sup>2</sup> 长 (L, M <sup>2</sup> )	Ca29	29.3	27	23
M <sup>2</sup> 宽 (W, M <sup>2</sup> )	28.8	24.2	24	21
M <sup>2</sup> 宽/长% (W/L %, M <sup>2</sup> )	99	82.6	88.8	91.3
M <sup>3</sup> 长 (L, M <sup>3</sup> )	25.1	23.5	21	20.5
M <sup>3</sup> 宽 (W, M <sup>3</sup> )	27.8	23.7	22.5	19.5
M <sup>3</sup> 宽/长% (W/L %, M <sup>3</sup> )	110.6	100	107.1	95.1
M <sup>2</sup> 、M <sup>3</sup> 原脊与外脊的夹角 (M <sup>2</sup> 、M <sup>3</sup> angles between protoloph and ectoloph)	55°, 60° (根据模型测)	50°, 60°	45°, 55°	55°

(前尖褶和后尖褶),前尖褶更为凸出;原脊长而粗;后脊短而细,其长仅为原脊长的 1/2。上臼齿前附尖褶壮大,外壁平直,舌面齿带不发育。 $M^2$  前后伸长,横脊倾斜度不十分大; $M^3$  较短,后脊很长,使齿冠轮廓近于正方形,后脊的后角强烈外翘。下犬齿强烈向上弯曲;齿缺长中等; $P_2$  很小、单根; $P_3$ 、 $P_4$  臼齿化;下臼齿根座部分比齿座部分长得多,两者间在外壁上由一明显的凹沟分开。

**标本描述与比较:** 浞池任村的标本(V. 3018),与正型标本采自同一地点,和正型标本的构造基本相同。 $P^3$  及  $P^4$  的原脊都较长而宽,伸达内齿带;后脊短而细,其长仅为原脊长的 1/2;外脊的外壁上有前尖褶和后尖褶凸出。臼齿外壁平直,横脊倾斜度不大, $M^2$  及  $M^3$  的原脊与外脊的夹角分别为  $50^\circ$  及  $60^\circ$ , $M^3$  的后脊很长,使齿冠轮廓近于正方形;舌面齿带不发达。与正型标本比较,主要的差别是:牙齿稍小, $P^4$  相对稍长;上臼齿齿冠稍高,且较狭长,前尖褶相对不十分壮大; $M^3$  的外脊的后端短,不强烈外翘,与前尖褶之间的凹面宽而浅,舌面齿带也有进一步退化的趋势。从这些差别看来,浞池的材料,虽然目前也归入同一种,似乎比正型标本进步一些。

V. 3019 采自山西垣曲塞里村,化石层位比任村的稍高。这个标本的个体比任村的小得多。颊齿的形态与 V. 3018 基本相同,其差别在于:颊齿的内齿带稍较发达, $P^4$  的原脊在舌端与齿带相连; $M^2$  及  $M^3$  相对的较宽,横脊的倾斜度较大;齿冠稍高一些; $M^3$  的后端相对较窄。横谷较狭窄。

特别值得注意的是河南济源发现的一个上颌骨(V. 3024)。这个标本特别细巧,比 V. 3019 更小,比正型标本小 30% 左右(臼齿列长约 54mm)。它的一个最显著的特点是  $M^2$  并不十分伸长,但外壁面则十分平直; $M^3$  近方形,横谷开阔。牙齿的釉质层很薄,牙齿显得十分细致。这个标本可能代表另一个较小的种或亚种。

在采集中有一个采自浞池任村的、带有磨蚀程度很深的  $M_1$  及  $M_2$  的右下颌骨破块(V. 3018.1;野外编号 5313.51)。材料很少,标本保存也不好。 $M_1$  已磨蚀成一平的台面,前、后谷都已看不出来, $M_2$  的前、后谷还留有残迹。臼齿的外壁很平坦,前叶和后叶间没有明显的界纹(纵沟),仅有极微弱凹陷可见。下臼齿相当引长, $M_1$  的宽(13mm)为长(22mm)的 59%; $M_2$  的宽(12.5mm)为长(26.5mm)的 47.2%。师丹斯基的正型标本中包括有一个左下颌骨(Zdansky, 1930, Taf. 3, figs. 5,6)。V. 3018.1 下臼齿与师氏的左下颌骨相比较,无论从大小及形态上看都有明显的差别,后者个体稍小,下臼齿齿冠相对的不十分引长,外壁上有明显的纵沟,两者显然是属于两种构造类型。V. 3018.1 臼齿的大小,与 V. 3018 上颊齿列的大小可相对应;在形态上,上、下臼齿都比较引长,横脊倾斜度都较大,下臼齿的外壁平直,这些特点表示两者似乎具有相应的进步性质。另外,正型标本中的上、下颊齿似乎也表现了相应的较为原始的性质。由于材料太少,这些标本又是夹杂在一起发现的,目前还难以确切的说出它们之间的关系,暂将 V. 3018.1 下颌骨归于这一种,以后如能有更完整的标本,可能证明外壁平直的一类系属于另一种。

从上述不同地点发现的标本,特别是下颊齿的大小和构造不一致的情况看来,目前归入这个种的材料,可能至少包括两个独立的种在内。

### 种 *Sianodon chiyuanensis* sp. nov.

(图版 IV, 图 1)

**正型标本：**部分上颌骨，带不很完整的  $P^4-M^2$  和  $M^3$  的前面部分(V. 3022)。

**地点和层位：**同 *Lushiamynodon obesus* (見前)，河南济源上始新统。

**种的特征：**与中国西安犀相似，但牙齿较大(約大 30%)， $P^4-M^2$  的长 = 78mm，接近或者超过中国西安犀  $P^4-M^3$  的长度， $P^4$  显得較寬大，后脊长；臼齿外壁特別平直，齿冠較低，横谷寬广。

**附記：**这个标本虽然保存不好，但有一些非常鮮明的特征与現知的其它两栖犀不同。頰齿的整个形态和中国西安犀較相近；但它的牙齿大小远超过中国西安犀， $M^1$  和  $M^2$  特別狹长，以致臼齿列引长程度超过已知的任何始新

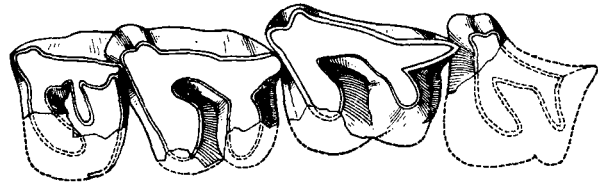


插图 3. *Sianodon chiyuanensis* sp. nov., 左  $P^4-M^3$  的齿冠面,  $\times 2/3$ , V. 3022。

世的两栖犀类，外壁也特別平坦，趋近于某些渐新世的两栖犀(如 *Cadurcodon*)。所以这个标本显然代表一时代較早，但是比較特化的两栖犀的新种，与亚洲現知的一些种类比較，和中国西安犀最为相近。

#### 标本测量 (单位 mm):

$P^4$ 长 (L, $P^4$ )	17
$P^4$ 寬 (W, $P^4$ )	26
$P^4$ 寬/长% (W/L %, $P^4$ )	152.9
$M^1$ 长 (L, $M^1$ )	32
$M^1$ 寬 (W, $M^1$ )	26
$M^1$ 寬/长% (W/L %, $M^1$ )	81.2
$M^2$ 长 (L, $M^2$ )	35
$M^2$ 寬 (W, $M^2$ )	25
$M^2$ 寬/长% (W/L %, $M^2$ )	71.4
$M^2$ 原脊与外脊的夹角	$45^\circ$
( $M^2$ angle between protoloph and ectoloph )	

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## AMYNODONTS FROM THE UPPER EOCENE OF HONAN AND SHANSI

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Eocene amynodonts, including one new genus and five new species, are described in the present notes. The material investigated are for the most part upper cheek teeth rows, and were mostly collected during the past decade by the writers and their associates of the Institute (IVPP) from the various Upper Eocene localities in Honan (Lushi, Chi-yuan and Mienchih) and Shansi (Yuanchü).

Many amynodont remains from the Upper Eocene and Lower Oligocene of China and Mongolia were described in recent years by Gromova (1954, 1958), Xu and others (*vide infra*). Including those described in this paper, at least fifteen species allotting to six or seven genera are now known to be present therein. Though most of these forms are still very imperfectly known, they do indicate that the group as a whole was already much diversified and wide spread in the eastern part of Asia in late Eocene time.

### Suborder CERATOMORPHA Wood

#### Family Amynodontidae Scott et Osborn

#### Genus *Lushiamynodon* gen. nov.

**Type species:** *L. menchiapuensis* sp. nov.

**Diagnosis:** A genus of rather unspecialized amynodont of moderate to large size. P<sup>4</sup> molarized, comparatively large, with prominent paracone and metacone styles and much lingually extending metaloph connected to the posterior of the slightly constricted protocone. Molar crown burly looking and not quite hypsodont; M<sup>2</sup> elongated and with convex external wall; M<sup>3</sup> narrows posteriorly and with metaloph appears to be confluent with the ectoloph. Skull with swollen braincase and strong sagittal crest; zygomatic arches stout, transversely thick and comparatively ventrally situated.

#### *Lushiamynodon menchiapuensis* sp. nov.<sup>1)</sup>

(Pl. I; fig. 1)

**Type:** A left maxilla with P<sup>4</sup>—M<sup>3</sup> (IVPP V.3016), collected by the writers in the summer of 1957.

**Horizon and Locality:** Lower part of Upper Eocene Lushi Formation; Menchiapu village, Lushi, Honan.

**Referred specimens:** A fragment of maxilla with DP<sup>3</sup>, DP<sup>4</sup> and M<sup>1</sup>, mentioned in a recent paper by the writers (Chow, Xu and Zhen, 1964, pp. 358 and 360; figs. 1, 1a) as *Amyndon* sp. from the Upper Eocene of Lunan, Yunnan; belongs certainly to this species; two isolated molars (M<sup>3</sup>) and an isolated right P<sup>4</sup> from the same district of

1) The generic and specific names are referred to locality names Menchiapu (or Mengchiapu), a village in Lushi County, southwestern Honan.

Lushi (V.3017), exact locality unknown.

**Diagnosis:** A relatively unspecialized amynodont of moderate size (length of P<sup>4</sup>—M<sup>3</sup> 114 mm), being much larger than *Amynodon sinensis* Zdansky; P<sup>4</sup> comparatively broad and short, not particularly reduced as in *Sianodon bahoensis* (*vide infra*), with more developed metaloph and two prominent external ribs on ectoloph; posterior molars slightly elongate anteroposteriorly, subhypodont and with transverse loph only slightly slanting; ectoloph of M<sup>2</sup> with broadly convex external surface and everted posterior end; M<sup>3</sup> narrows posteriorly and with metaloph tending to be confluent with ectoloph.

**Description:** The characters of the maxillary bone as shown on the type are that the zygomatic arches are very stout, with ventral border close to the base of M<sup>2</sup> and M<sup>3</sup>, and shelf-like in ventral aspect. All the teeth are moderately worn and beautifully preserved with milk white dentine encircled by black enamels. P<sup>4</sup> not particularly reduced for an amynodont but small in comparison with the molars, transversely elongate and quite like that of a rather primitive true rhinoceros with ectoloph carrying a small lingual "crista" and two prominent ribs on the external wall, of which the anterior one is larger and pillar-like. The protoloph extends internally to the cingular border and with this protocone slightly but distinctly constricted. The metaloph is likewise well developed and connected to the protoloph at the base. Cingula strongly developed on all but the labial side, where it is only faintly indicated. The molars are in general unspecialized and comparatively low-crowned. M<sup>1</sup> is roughly square in outline. M<sup>2</sup> is decidedly amynodont, elongate anteroposteriorly, very broad anteriorly and with strong parastyle and paracone rib, and much narrower posterior side. The external wall is broadly convex, inclining inward posteriorly and slightly everted at the rear end. The transverse lophs are not quite oblique. The protoloph forming an angle of about 50 degrees with the ectoloph. M<sup>3</sup> slightly smaller and shorter than that of M<sup>2</sup> and with concave external wall. The metaloph is longer and more oblique than in M<sup>2</sup> and tends to align or be confluent with the ectoloph, the posterior end of which forms a sharp crested, strongly everted ridge.

The here described genus and species is in many respects rather unspecialized for an amynodont. It has P<sup>4</sup> with prominent metacone rib as well as a strong paracone rib, long metaloph, and molars with relatively less hypsodont crown and less specialized M<sup>3</sup>. Stratigraphically this, as well as another new species (*Sianodon honanensis*) described below, is the oldest known forms of the Asiatic amynodonts.

### *Lushiamynodon obesus* sp. nov.

(Pl. II; figs. 1, 2)

**Type:** Posterior of a skull and fragmentary palate with most of the posterior two molars on both sides and part of left M<sup>1</sup> (V.3023; field no. 53022). Other specimens that might belong to this species include an incomplete M<sup>3</sup> described by Young (1937, p. 424, fig. 8, a) as *Amynodon mongoliensis*, and a M<sup>2</sup> of *Amynodon* sp. described by Zdansky (1930, pp. 49—50; Taf. III, figs. 7, 8), both from Mienchih, Honan.

**Horizon and locality:** The type species is from the Upper Eocene red sandstone beds of Tungchang, a village in Chiyuan County, northern Honan. The Upper Eocene beds there are most probably a correlative of Yuanchü Formation of Yuanchü, Shansi and Mienchih, Honan.

**Diagnosis:** An amynodont of large size (length of ectoloph of  $M^2$  61 mm) with molar similar to those of *Lushiamynodon menchiapuensis* in structure.

**Comparison:** The present species is quite near the above described one from the Lushi Eocene in having broadly convex external wall on  $M^2$ , more oblique metaloph and concave external wall in  $M^3$  and other dental characters. In size it is close to *Sianodon bahoensis* Xu (1965), but differs from the latter in the structure of the skull in having rather well developed and more prominent sagittal crest, expanded cranium, greater distance between posttympanic process and postglenoid process; and the molars have comparatively weak antecrochet and broad median valley. Its third upper molar differs from the one described by Gromova (1958) as *Amynodon giganteus* in having more oblique transverse lophs, and larger and more everted posterior buttress. An above mentioned  $M^3$  (Young, 1937) referred to the present species, differs slightly from the corresponding tooth of the type in being somewhat smaller and with shorter ectoloph.

In his 1937 paper Young described two large-sized amynodonts from Yuanchü Eocene, respectively, as *Cadurcodon ardynensis* and *Amynodon mongoliensis*. The former is certainly not a *Cadurcodon* (=“*Cadurcotherium*”) as Gromova pointed out (1954). It may belong to the present species as judged by its size and degree of inclination of the transverse lophs.

### Genus *Sianodon* Xu (1965)

**Type species:** *S. bahoensis* Xu, 1965 (Vert. PalAsiatica, 9(1), p. 83).

#### *Sianodon mienchiensis* sp. nov.

(Pl. IV; figs. 2—4)

**Types:** A right  $M^3$  (V.3021.2, “holotype”; field no. 5312.15); an incomplete lower jaw of an immature individual with  $P_4$ — $M_2$  and parts of  $P_3$  and  $M_3$  (V.3021; field no. 5314.2).

**Other material:** A broken lower jaw with  $P_4$  and  $M_2$  (V.3021.1; field no. 5312.3). (In here and all the IVPP specimens the first two figures of field number designate the year of collection, such as 53 (in 5310) standing for the year 1953).

**Locality and Horizon:** Near Jentsun in Mienchi County, Honan, on the right side of the Huangho and on the opposite side of Yuanchü; upper part of Upper Eocene, Yuanchü Formation, corresponding to Shara Murun Formation of Ula Usu in Inner Mongolia.

**Diagnosis:** An amynodont of very small size, relatively brachyodont and smaller than any known species of the family.  $M^3$  identical in all points with that in *S. bahoensis* Xu, a much larger species of this genus. Lower molars with external wall of carrying a distinct longitudinal groove between the anterior and posterior lophids.

**Description:** The type last molar is slightly elongated, the inner side of the metaloph slanting slightly backward, making the posterior of the tooth somewhat narrower. The external wall of the tooth is rather flat, but with the rear end slightly everted. The protoloph is not much oblique, forming an angle of about  $65^\circ$  with the ectoloph. Cingula well developed except on the labial side.

The lower jaw (V.3021) is rather high and with comparatively short symphysis, having its posterior border at the front of  $P^3$ . May be only two premolars present. In

this specimen the length of premolar series is about one half that of the molar series (25:50 mm). All the cheek teeth are anteriorly wider, more pronounced in the premolars. The whole cheek teeth series become progressively narrower toward the rear, and all bear a distinct longitudinal groove separating the two lophids. Lower molars narrow and with transverse lophids not quite slanting, forming an angle of about  $65^\circ$  with ectoloph in  $M_2$ . Dimension of  $M_2=9.5 \times 16.6$  mm.

This new species is evidently a small form of rather primitive amynodont closely related to the large *Sianodon bahoensis*. The age of the latter species is still uncertain. It may either be Late Eocene or Early Oligocene.

### *Sianodon honanensis* sp. nov.

(Pl. I; figs. 2, 3)

**Type:** A right maxilla with complete  $P^4-M^3$  (V.3020) and a left maxilla with upper molars series belonging to the same skull (V.3020.1).

**Other material:** An upper jaw fragment with  $M^1$  and  $M^2$  (V.3020.2), and an isolated left  $M^2$  (V.3020.3).

**Locality and Horizon:** As the type of *Lushiamynodon menchiapuensis* (*vide supra*), collected together in 1957.

**Diagnosis:** A small amynodont, close in size to *Sianodon sinensis* (Zdansky) (new combination).  $P^4$  molariform and similar to that in *Lushiamynodon menchiapuensis* described above.  $M^1$  and  $M^2$  rather elongate;  $M^3$  with short posterior loph; so that the outline of the tooth becomes narrow posteriorly; molars with relatively flat labial wall, with slender ridge-like parastyle and paracone folds, close together and to the anterior end of the ectoloph; molar crown relatively higher (for instance, with reference to *Lushiamynodon menchiapuensis*); transverse lophids of molars slanting, forming smaller angles with the ectolophs, being  $45^\circ$  and  $50^\circ$  in  $M^2$  and  $M^3$ , respectively, median valleys widely open.

**Remarks:** This species, though of smaller size, is distinctly more specialized than *L. menchiapuensis* in cheek teeth construction. It has more hypsodont and more elongated molars. In comparison with *S. sinensis*, the two are nearly of same size; but *S. honanensis* has more molariform  $P^4$  with longer metaloph (as in *Lushiamynodon*), molars with more oblique transverse lophids, more prominent lingual cingula, and shorter posterior loph on  $M^3$  (also more similar to that in *Lushiamynodon*). This, as well as *L. menchiapuensis*, is the earliest amynodont now known in Asia.

### *Sianodon sinensis* (Zdansky), 1930, new combination

(Pl. III, figs. 1-5; Pl. IV, fig. 5)

**Type and Hypodigm:** In addition to a cast of the type described by Zdansky (1930) and the specimens described by Young (1937), the material available for investigation includes the following:

(1) A right maxilla with  $P^4-M^3$  and seven isolated upper cheek teeth (V.3018); one lower jaw fragment with  $M_2, M_3$  (V.3018.1), from Jentsun, Mienchih, Honan. The same locality as Zdansky's type.

(2) An upper jaw fragment with  $P^4-M^3$  (V.3019) from Yuanchü, Shansi at or near the River Section locality of Zdansky.

(3) An upper jaw fragment with  $M^1-M^3$  (V.3024) of Tungchan, Chiyuan, Honan, from the same horizon and locality as *Lushiamynodon obesus* described above and *Sianodon chiyuanensis* (*vide infra*).

**Revised Diagnosis:** Dentition  $\frac{? \cdot 1 \cdot (?4-3) \cdot 3}{? \cdot 1 \cdot 3 \cdot 3}$ . Size small, molars moderately hypsodont, upper canines inclining forward, length of premolar series about half as long as that of molar series;  $P^3$  and  $P^4$  rather primitive; upper molars with two strong folds (paracone fold and metacone fold), flat external wall and reduced internal cingulum;  $M^2$  elongate and with transverse lophs not very slanting,  $M^3$  short antero-posteriorly and with strong everted posterior extension of ectoloph. Lower canines curve strongly upward, diastema moderately long;  $P_2$  very small, single-rooted;  $P_3, P_4$  molariform; lower molars with talonid crescent longer than the anterior crescent and separated labially from the latter by a deep groove.

**Remarks:** This is the most abundantly represented form of this family known from the Eocene of northern China. The specimens referred to it listed above show considerable variations in dental characters and, to some extent, in size. The characters of  $P^4$  and the molars are basically similar to those of *S. honanensis* (*vide supra*) and *Sianodon bahoensis* (Xu, 1965), the generic characters of which are to a larger extent based on the structure of skull. We have tentatively grouped the present species with this genus. The allotting of the many specimens to this single species is certainly provisional, not only because they are from three different localities representing at least two late Eocene faunal zones and show wider morphological range in cheek teeth construction, but because at least two different types of lower teeth are found in association with the upper teeth, which differ from one another in no essential respects. In one type the lower molars have flat external wall without a longitudinal groove separating the anterior crescent from the posterior one (as in V.3018). In the other the external wall of lower molars has a distinct longitudinal groove as in Zdansky's type. As these teeth of different characters occur together, it is impossible to separate them at present.

### *Sianodon chiyuanensis* sp. nov.

(Pl. IV; fig. 1)

**Type:** A maxilla with incomplete  $P^4-M^2$  and anterior of  $M^3$  (V.3022).

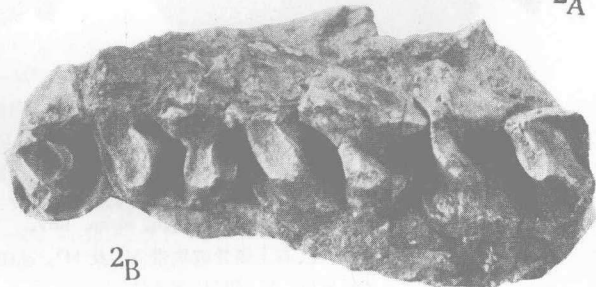
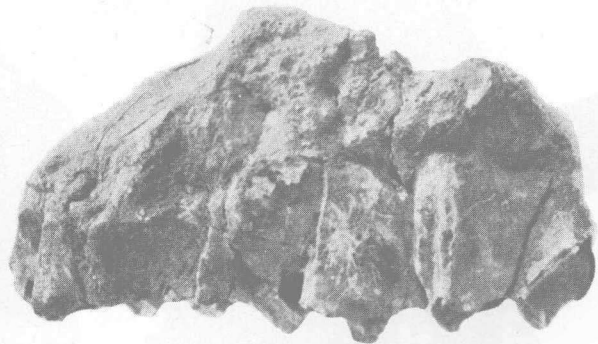
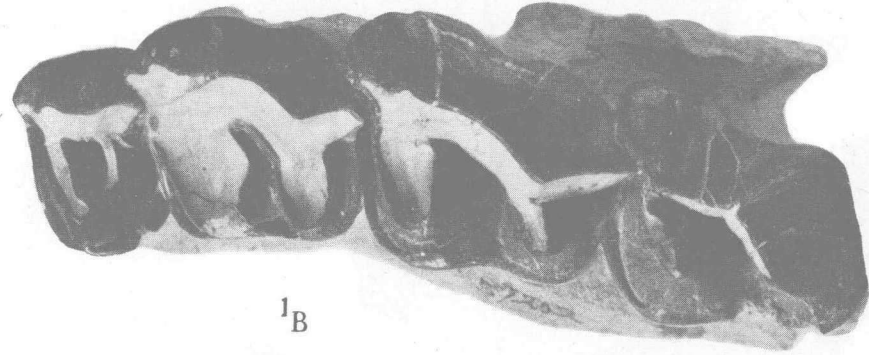
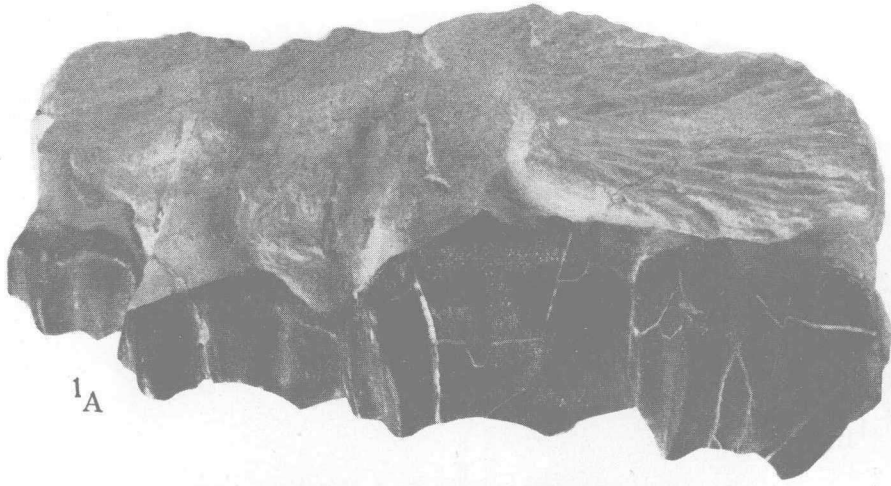
**Horizon and Locality:** Same as the type of *Lushiamynodon obesus* described above.

**Diagnosis:** Similar to *Sianodon sinensis*, but of larger size (length of  $P^4-M^2$  about 78 mm, equal or greater than length of  $P^4-M^3$  for *S. sinensis*);  $P^4$  somewhat less reduced and with long metaloph, and molars with flatter external wall, less hypsodont and more open transverse valley.

This species though represented by very incomplete material, is decidedly distinct from all the other forms. Its larger size and other details render the reference of it to the above described species impossible, in spite of its apparent similarity to *Sianodon sinensis*. The length of  $M^1$  and  $M^2$  is proportionally narrower than any known species of Eocene amynodonts and approaches the condition seen in the Oligocene genus *Cadurcodon*. The specific name is referred to the type locality, which is in the county of Chiyuan, Honan.

## 图版 I 说明

1. *Lushiamynodon menchiapuensis* gen. et sp. nov.  
左上颌骨带 P<sup>4</sup>—M<sup>9</sup>, V. 3016, × 1。  
1A 外侧视; 1B 冠面视。
2. *Sianodon honanensis* sp. nov.  
右上颌骨带 P<sup>4</sup>—M<sup>9</sup>, V. 3020, × 1。  
2A 外侧视; 2B 冠面视。
3. *Sianodon honanensis* sp. nov.  
右上颌骨破块带 M<sup>1</sup> 及 M<sup>9</sup>, V. 3020.2, × 1。  
3A 外侧视; 3B 冠面视。





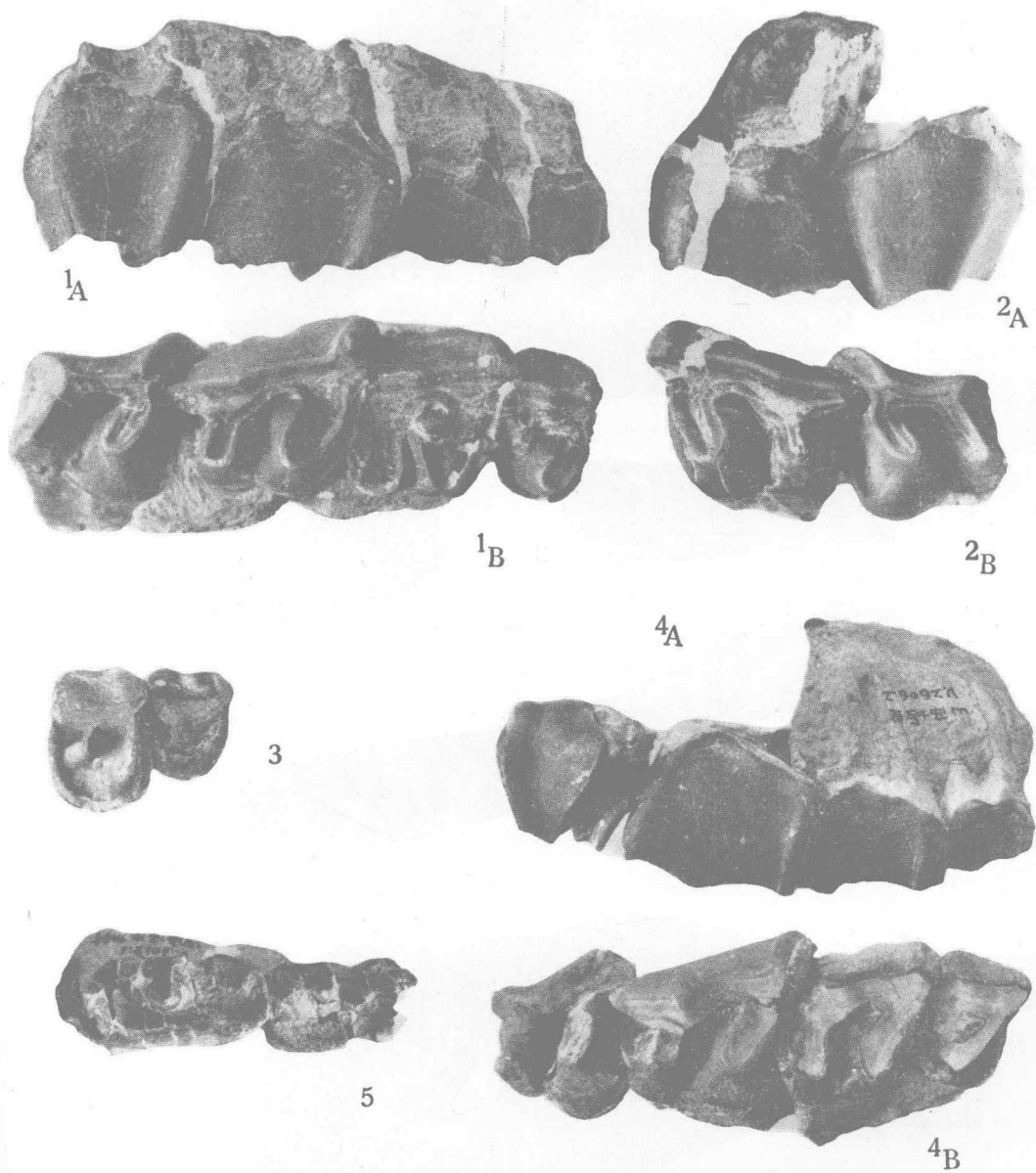


1—2. *Lushiamynodon obesus* gen. et sp. nov.

1A—1B. 左、右上頷骨破塊帶  $M^2$  及  $M^3$ , 冠面視, V. 3023,  $\times 2/3$ 。

2. 頭骨後部, V. 3023,  $\times 1/3$ 。

2A. 腹面視; 2B. 背面視。



1—5. *Sianodon sinensis* (Zdansky),  $\times 1$ .

1A—1B. 右上頷骨帶 P<sup>4</sup>—M<sup>3</sup>, V. 3018,  $\times 1$ 。

1A. 外側視； 1B. 冠面視。

2A—2B. 左 M<sup>2</sup> 及 M<sup>3</sup>, V. 3018,  $\times 1$ 。

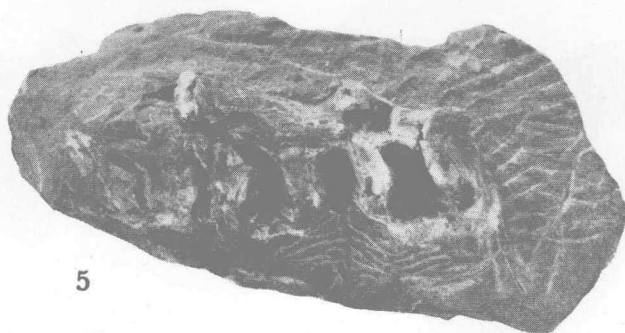
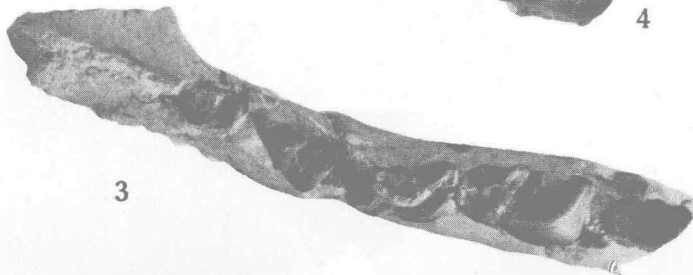
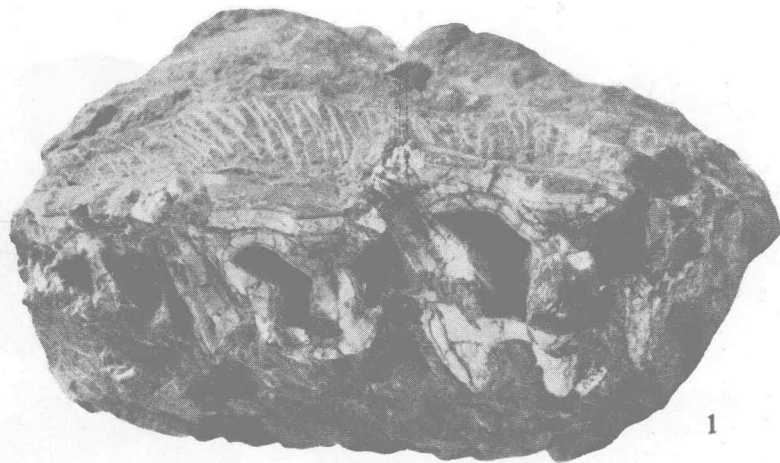
2A. 外側視； 2B. 冠面視。

3. 右 P<sup>2</sup> 及 P<sup>3</sup>, 冠面視, V. 3018,  $\times 1$ 。

4A—4B. 右上頷骨帶 P<sup>4</sup>—M<sup>3</sup>, V. 3019,  $\times 1$ 。

4A. 外側視； 4B. 冠面視。

5. 右下頷骨破塊帶 M<sub>1</sub> 及 M<sub>2</sub>, 冠面視, V. 3018.1,  $\times 1$ 。



1. *Sianodon chiuyanensis* sp. nov.  
左上頷骨破块带  $M^1$ 、 $M^2$  及部分  $P^4$ 、 $M^3$ ，冠面视，V. 3022， $\times 1$ 。
- 2—4. *Sianodon mienchiensis* sp. nov.  
2. 左下頷骨破块，带  $M_1$  及  $M_2$ ，冠面视，V. 3021.1， $\times 1$ 。  
3. 左下頷骨带  $P_4$ — $M_2$  及部分  $P_3$ 、 $M_3$ ，冠面视，V. 3021， $\times 1$ 。  
4. 右第三上白齿，冠面视，V. 3021.2， $\times 1$ 。
5. *Sianodon sinensis* (Zdansky).  
左上頷骨破块带  $M^1$ — $M^3$ ，冠面视，V. 3024， $\times 1$ 。