

## 甘肃临夏盆地晚中新世豪猪一新种<sup>1)</sup>

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**摘要** 在甘肃临夏盆地发现豪猪化石一新种,甘肃豪猪(*Hystrix gansuensis*)。其主要特征是:个体大;鼻骨较宽大,后缘圆凸,达 M3 的后上方;门齿与 P4 间齿缺长,腭面较宽,两齿列彼此近于平行;后鼻孔前缘弧形;颊齿为中度单面高冠;P4 的前边脊短,褶 I 向颊侧开口,具低小的前附尖;上臼齿褶 I 不向颊侧开口;M3 较少退化。根据共生的哺乳动物群判断,其时代为晚中新世。

**关键词** 甘肃临夏盆地,晚中新世,豪猪科

**中图法分类号** Q915.873

豪猪科(Hystricidae)的成员是旧大陆个体最大的啮齿动物之一。它们最独特的性状是其背部和尾部长有尖锐的刺(或棘)。现生的豪猪主要分布在亚洲南部、非洲和南欧(仅限于意大利)。在欧洲,尽管现生的豪猪仅有一种(*Hystrix cristata*),然而豪猪化石发现得却比较多,分布得也比较广,几乎遍布除北欧以外的整个欧洲。最早的豪猪化石也出现在欧洲晚中新世的 Vallesian 期(Sen, 1999)。在亚洲,从第四纪到现在豪猪的分异很大,化石也很丰富。在我国,现生的豪猪有 2 属 4 种,分布于西藏和长江流域及其以南的地区,最北者不达北纬 35°(黄文几等, 1995)。我国第四纪的豪猪化石也很丰富,其分布比现生者广得多,往北达到北纬 41°的本溪地区(辽宁省博物馆等, 1986; 郑绍华, 1993)。但新近纪的豪猪化石在亚洲发现得很少。在我国以外的亚洲其他地区,仅在印度、土耳其和阿富汗的晚中新世,以及塔吉克斯坦上新世地层中发现了少量化石(Lydekker, 1884; Sen, 1996, 待刊 a, b; Shevryeva, 1986)。我国新近纪的豪猪化石目前仅知 2 种:云南禄丰晚中新世的 *Hystrix* sp. (邱铸鼎等, 1985) 和四川巫山龙骨坡和广西柳城巨猿洞晚上新世的 *Hystrix zhengi* (Weers and Zhang, 1999)。甘肃省过去从未有发现豪猪化石的报道。甘肃临夏盆地中新统中发现的豪猪化石是这类动物在甘肃省的首次发现。这不但扩大了豪猪在我国分布范围,也为亚洲新近纪豪猪的演化提供了重要信息。

关于颊齿高度的测量,笔者赞同 Sen(1999)的意见,即以釉质层的高度计算。文中所用缩写:HZM,甘肃省和政化石博物馆化石编号;IVPP,中国科学院古脊椎动物与古人类研究所;IVPP Loc.,中国科学院古脊椎动物与古人类研究所化石地点编号;IVPP V 中国科学院古脊椎动物与古人类研究所脊椎动物化石编号;LX,临夏地区。

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**豪猪科 Hystricidae Fischer de Waldheim, 1817****豪猪属 *Hystrix* Linnaeus, 1758****甘肃豪猪(新种) *Hystrix gansuensis* sp. nov.**

(图 1, 2, 4)

**正型标本** 头骨的前部, 背侧向受压稍变形, 具左、右 P4 ~ M3 (IVPP V 13052)。

**正型标本产地和层位** 甘肃省广河县庄禾集小杂村 IVPP Loc. LX 200019; 上中新统。

**归入标本** 头骨的前部, 垂向压扁, 具左、右 dP4 (均破损) 和 M1 ~ 2 (HZM 0401); 可能为同一个体的吻部具一对门齿和左 P4 及部分 M1 (IVPP V 12715-1), 左 M3 (IVPP V 12715-2) 和右 P4 ~ M2 (IVPP V 12715-3); 一段右上颌骨具 M1 ~ 2 (IVPP V 12716)。

**归入标本产地和层位** 甘肃省和政县吊滩乡禾托 IVPP Loc. LX 200023 (HZM 0401), 和政县关滩沟乡黑岭顶 IVPP Loc. LX 200035 (V 12715) 和甘肃省广河县城关乡十里墩 IVPP Loc. LX 200014 (V 12716); 上中新统。

**特征** 一种个体很大的 *Hystrix*; 鼻骨增大, 后缘向后圆凸, 达 M3 的后上方; 门齿与 P4 间齿缺长; 两齿列彼此近于平行, 腭面较宽; 后鼻孔前缘弧形, 位于 M2 和 M3 交界处舌侧; 颊齿为中等高冠齿, 单面高冠, 具 3 个齿根; dP4 的舌侧沟仅与褶 I 连; P4 前边脊短, 前尖大而向颊方突出, 褶 I 颊侧开口, 具低小的前附尖; 上臼齿褶 I 不向颊侧开口; M3 较少退化。

**描述** 依 Weers (1990) 对豪猪年龄所分的阶段, V 13052 和 V 12715 可能代表第 V 年龄段。V 12716 可能代表第 IV 年龄段。HZM 0401 为一幼年个体, M2 刚萌出, 大约相当第 III 年龄段。V 12715 标本虽包括了分开的 3 部分, 但它们产于同一地点, 而且牙齿尺寸大小、齿冠高低和磨蚀程度都相当, 可能为同一个体。

因 V 13052 和 HZM 0401 均只保存了头骨前部, 而且受压, 头骨或多或少变形, 很难判断整个头骨形态。从保存部分看, 吻部高, 眶下孔很大, 周缘由上颌骨组成。其后缘达 M1 前部外上方。眶下孔下缘 (即上颌骨颧突下根) 很细小, 位于 P4 (或 dP4) 的前外侧。其腹面供咬肌附着面呈圆弧形, 前缘和侧缘以圆弧形的弱嵴为界。眼眶大, 前缘达 M2 的外方, 具明显的眶后突。眶下孔与眼眶间的骨桥 (即颧弓前上根) 较宽扁。泪骨小, 位于眼眶的前背缘, 具明显的泪结节和切迹。前齿槽孔很小, 位于上颌骨颧突下根的后上方。蝶腭孔很大, 位于 M1 ~ 2 的上方。视神经孔小, 位于眶蝶骨内, 蝶裂的前上方。蝶裂大, 大的圆孔位于蝶裂内, 视神经孔后下方。

门齿与 P4 间齿缺长 (58mm; 57.9mm)。门齿孔小, 约位于齿缺的前 2/5 处。前颌骨-上颌骨缝在头骨腹面横过门齿孔后端。门齿相对较短, 其齿槽后端达前颌骨-上颌骨缝稍后, 突出成卵圆形隆起, 与 P4 的间距较大。颊肌附着面大, 向后达 P4 前缘。其后部凹入。左、右颊肌附着面的内侧嵴彼此近于平行地向前伸达前颌骨-上颌骨缝。两颊齿列彼此近于平行。腭后孔的位置靠前, 位于 P4 之前。后上颌孔小, 位于 M3 的后方。后鼻孔前缘为弧形。成年的 V 13052 的腭面较宽, 左右 M1 间宽度为 16mm。上颌骨-腭骨缝前缘与 M2 的前部相对, 后鼻孔前缘达 M2 和 M3 交界处内侧, 其中央有明显的向后的尖突。而 HZM 0401 的左右 M1 间的宽度为 10mm, 上颌骨-腭骨缝前缘与 M1 后部相对, 后鼻孔前缘达 M2 内侧, 其中央无向后的尖突。

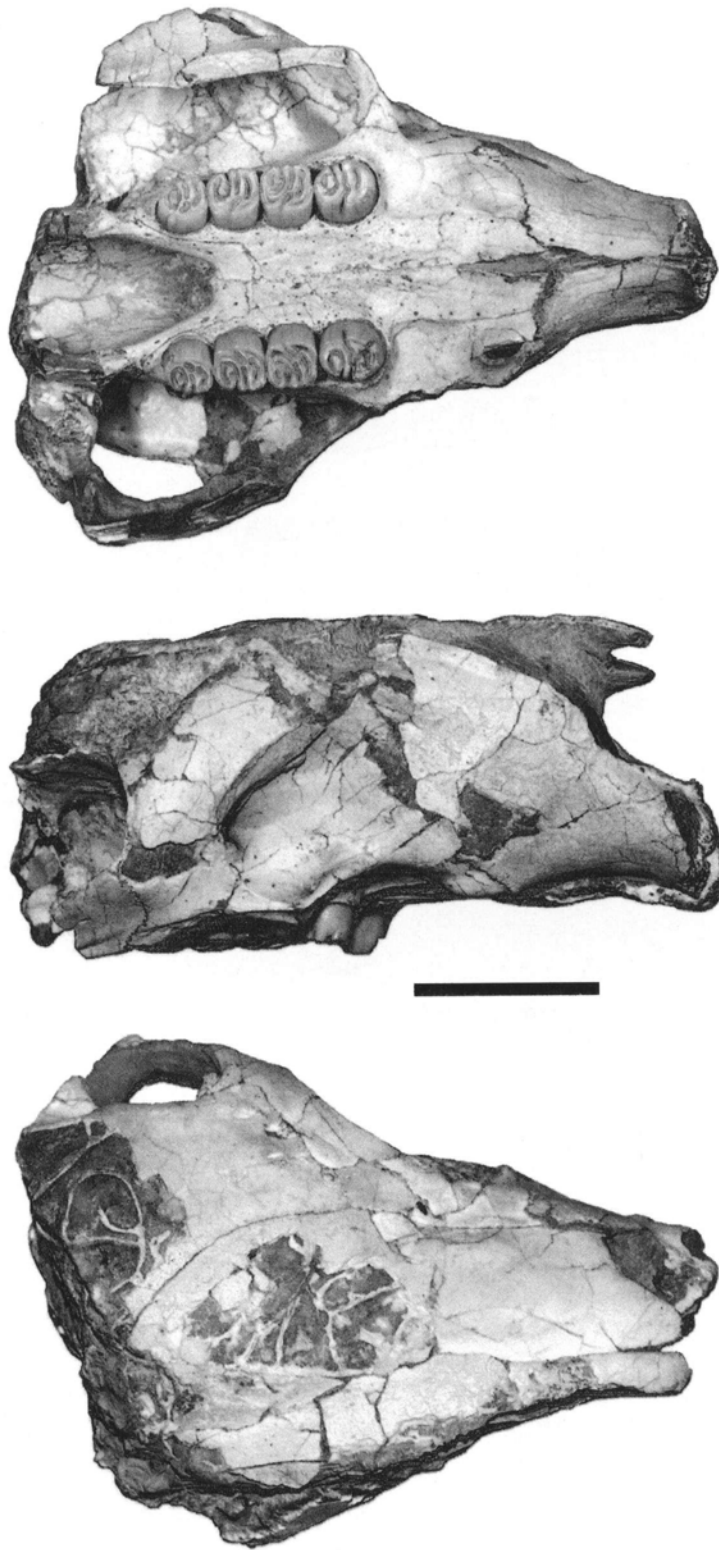


图1 甘肃豪猪(新种)头骨前部(V 13052, 正型标本)

Fig.1 Anterior part of skull (V 13052, holotype) of *Hystrix gansuensis* sp. nov.

上(upper):腹面观(ventral view);中(middle):右侧观(right lateral view);

下(lower):背面观(dorsal view),标尺(scale) = 3cm

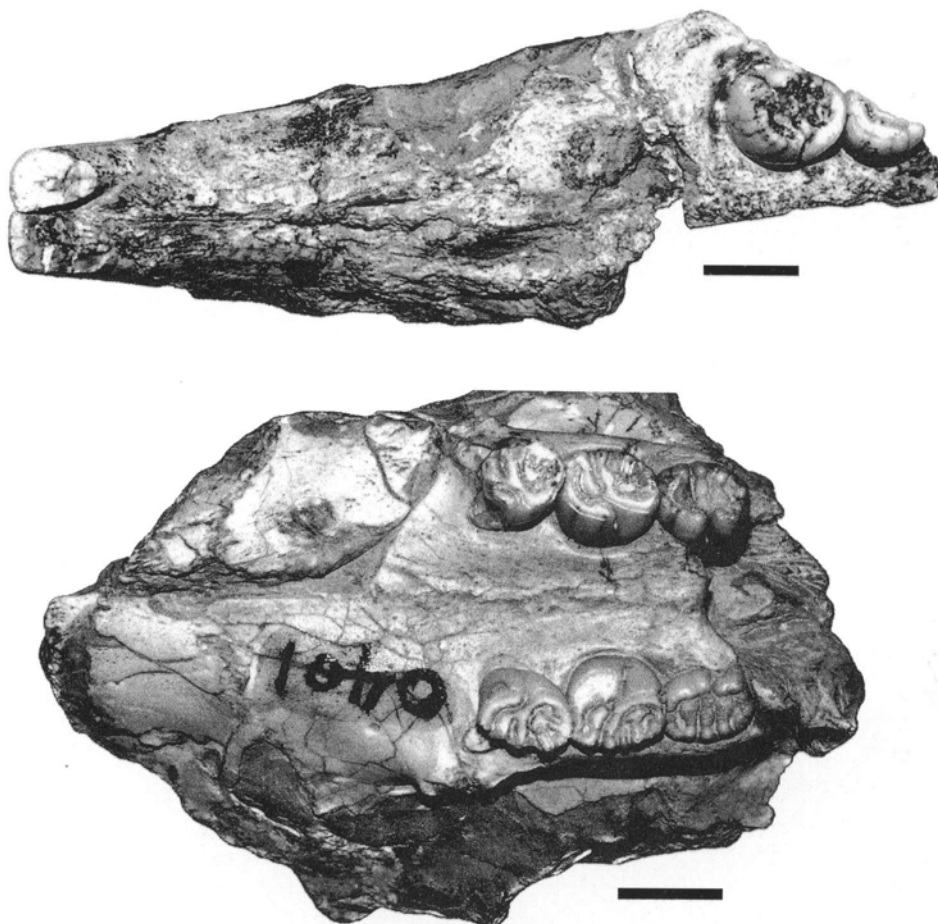


图2 甘肃豪猪(新种)部分头骨腹面

Fig.2 Ventral view of part of skull of *Hystrix gansuensis* sp. nov.

上(upper):头骨吻部具一对门齿,左P4和破的M1(rostral part of skull with a pair of incisors and left P4 and broken M1) (V 12715-1);下(lower):头骨前部具左、右dp4

和M1~2[anterior part of skull with left and right dp4 (broken) and M1~2]

(HZM 0401),标尺(scale) = 1cm

鼻骨较宽大而长,前端外侧稍凹,与前颌骨一起形成明显的鼻颌切迹。前端内侧近中缝处向前圆凸,其前端比前颌骨前端后缩。鼻骨往后稍变宽。V 13052 左鼻骨长 97.1mm,最大宽为 33.4mm,宽/长比为 0.34;在 HZM 0401 左侧鼻骨宽为 21.1mm,右侧的宽为 21.2mm,鼻骨后缘向后圆凸,在 V 13052 达 M3 的后方;在 HZM 0401 约位于 M1 后上方。前颌骨鼻突后端较宽,约在 P4 和 M1 交接处的上方。前颌骨-额骨缝较长,与上颌骨-额骨缝在同一直线上。在 V 13052 的背侧,在鼻骨和额骨破损的地方可见发育的鼻窦和额窦。

上门齿横切面约为卵圆形,唇侧宽于舌侧,前后径大于横宽。釉质层伸达外侧的 1/3 和内侧的 1/4 处,其唇面有 2 条微弱的纵棱。

颊齿为中等高冠齿。上颊齿舌侧明显高于颊侧,约为颊侧的 2 倍。齿冠舌侧面垂向(从冠面到齿根方向)圆凸,颊侧面平直。具 3 齿根,颊侧 2 齿根小,舌侧单齿根大。颊齿冠面结构术语见图 3。

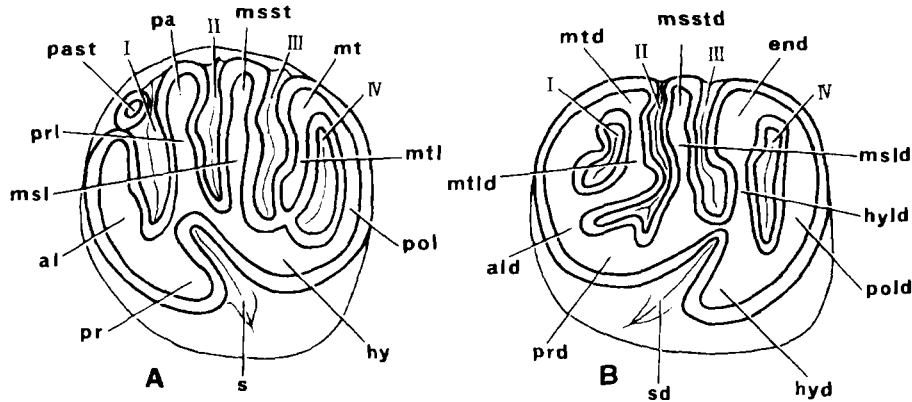


图 3 豪猪类颊齿构造模式图

Fig.3 Nomenclature of the cheek tooth structure of Hystricidae

A. Left P4: al, anteroloph 前边脊; hy, hypocone 次尖; msl, mesoloph 中脊; msst, mesostyle 中附尖; mt, metacone 后尖; mtl, metaloph 后脊; pa, paracone 前尖; past, parastyle 前附尖; pol, posteroloph 后边脊; pr, protocone 原尖; prl, protoloph 原脊; s, sinus 舌侧沟; I ~ IV, fold I ~ IV 颊侧褶 I ~ IV

B. Left p4: ald, anterolophid 下前边脊; end, entoconid 下内尖; hyd, hypoconid 下次尖; hyd, hypolophid 下次脊; mslid, mesolophid 下中脊; msstd, mesostylid 下中附尖; mtd, metaconid 下后尖; mtld, metalophid 下后脊; pold, posterolophid 下后边脊; prd, protoconid 下原尖; sd, sinusid 下颊侧沟; I ~ IV, fold I ~ IV 下舌侧褶 I ~ IV

P4 为颊齿中最大者,冠面约呈卵圆形,长稍大于宽。颊侧褶 I ~ III 向颊侧有浅的开口。褶 I 的开口较大,其沟口底被低小的前附尖封闭。V 13052 的 P4 的褶 IV 是封闭的,而在较少磨蚀的 V 12715 的 P4 上仍开口。舌侧沟在舌面垂向较深(约为舌侧齿冠高的 1/3)。在冠面上, V 13052 的原脊与原尖相连,舌侧沟仅与颊侧褶 II 连,而与褶 I 隔开。而在 V 12715 舌侧沟与颊侧褶 I 和 II 连,使原脊与前边脊和中脊分开。前尖较大,明显向颊侧突出。中脊与后边脊连,形成 U 形。后脊舌端(或后小尖)或游离,或向后弯与后边脊连,或者在次尖处与 U 形的中脊和后边脊连。前边脊较短,其颊端不达前颊角,而是位于前尖的前舌方。在 V 12715 前边脊中部后侧有一小刺伸达或几乎达原脊,将褶 I 分为颊、舌二部分。

M1 在 V 13052 冠面约呈方形,而在较少磨蚀的幼年的 HZM 0401 和 V 12716,冠面约为长大于宽的长方形。前附尖较高,连接前边脊和原脊,封闭褶 I。褶 III 呈向后弯曲的弧形,与褶 IV 连或不连。褶 III 颊端开口较大而深。在该开口处有时有一附加的尖存在(2/6)。后弯的中脊与后边脊连。后脊的舌端变异较大:或膨大,或呈 V 形,其前翼向前颊侧伸,其后翼伸达后边脊(V 13052),或向后弯,与后边脊连或不连。褶 IV 在未磨蚀时,似有极弱的沟向颊侧或颊后侧开口,稍磨蚀后即被封闭。舌侧沟在幼年个体与褶 II 或和褶 I 连,而在 V 13052 与褶 I 和褶 II 均分开。处于第 V 年龄段的 V 12715 的 M1 磨蚀较深,而

且破损。就保存部分看,后脊稍向前弯,与原脊和中脊相连。舌侧沟只与褶 I 舌部连,而与褶 II 分开。

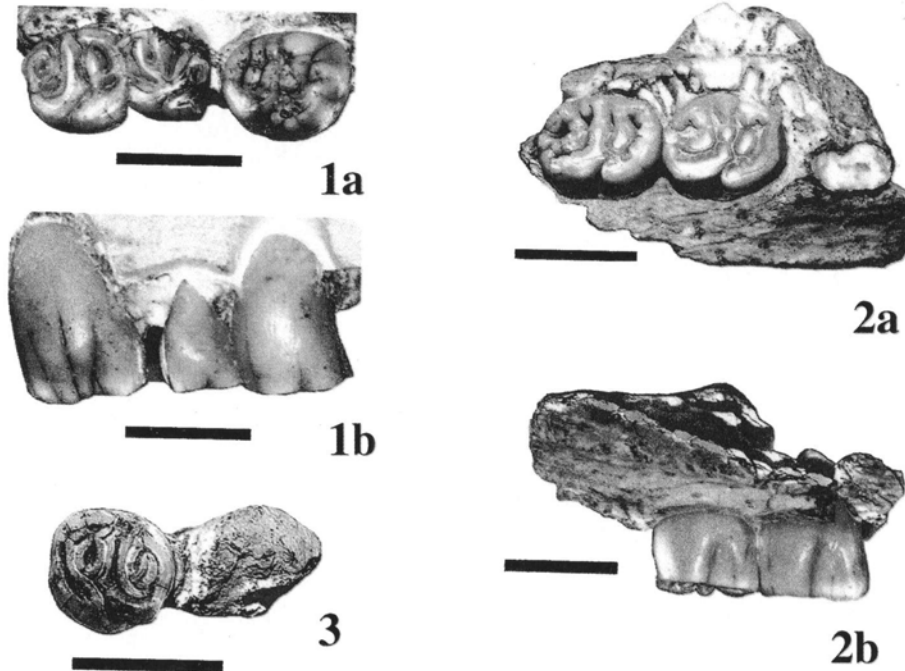


图4 甘肃豪猪(新种)的颊齿

Fig.4 Cheek teeth of *Hystrix gansuensis* sp. nov.

1. 右(Right) P4 ~ M2(V 12715 - 3), 1a, 冠面观(occlusal view), 1b, 舌面观(lingual view);
2. 右上颌骨具 M1 ~ 2[ right upper jaw with M1 ~ 2(V 12716)],  
2a. 冠面观(occlusal view), 2b. 舌面观(lingual view);
3. 左(left) M3(V 12715 - 2), 标尺(scale) = 1cm

M2 冠面的形态结构与 M1 的基本相似。V 12715 和 V 12716 的 M2 的后脊也向后弯, 与后边脊连。但 V 13052 的 M2 的后脊中部向前舌方伸出一刺, 经磨蚀后, 其舌端与后小尖连, 封闭成一小坑。后脊的舌端还未与次尖连。HZM 0401 的 M2 刚萌出, 未受磨蚀。V 12715 的 M2 较特别, 原脊与原尖和前边脊中部连, 将褶 I 分成 2 个封闭的盆。这样舌侧沟仍与褶 II 相通, 而与褶 I 分开了。

V 13052 的 M3 比 P4 和 M1/2 稍小, 冠面为四边形, 后部窄于前部, 长稍大于宽。其冠面结构与 M2 的很相似。比较特别的是它的舌侧沟被封闭成坑, 其舌端开口处被向后舌方突出的结代替。此外, M3 后脊颊端还未与后尖连, 其分叉的前刺也未与后小尖连。后脊舌端与次尖连或不连。V 12715 的 M3 与 V 13052 的不同。它的舌侧沟向舌端开口, 其颊端均与褶 I 和 II 相通。而且后脊也不分叉, 而是后弯与后边脊连。

HZM 0401 保存有 dP4。它们或多或少破损。其冠面结构与 M1 和 M2 的基本相似。只是它的原脊和中脊舌端连。舌侧沟只与褶 I 相通, 而与褶 II 分开。后脊舌端与 V 13052 的 M1 相似, 分叉呈 V 形。

## 测量 (见表 1)

表 1 *Hystrix gansuensis* sp. nov. 颊齿测量Table 1 The measurements of the cheek teeth of *Hystrix gansuensis* (mm)

		V 13052(holotype)		HZM 0401		V 12715		V 12716
		left	right	left	right	left	right	
P4 ~ M3	L	38.0(39.1)	37.7(39.2)					
M1 ~ 3	L	27	27.2					
P4	L	10.8(11.2)	10.2(11.4)			9.3(10.0)	9.5(10.2)	
	W	9.1(9.9)	8.7(10.0)			8.0(9.3)	8.0(9.3)	
	HI						14.5	
	Hb					7.2	7	
	Hs						10.8	
	Ds					4.7	5.3	
	HI/L						1.53(1.42)	
M1	L	9.1	9.5	9.6(9.9)	9.6(10)			9.5(9.5)
	W	9.0(10.0)	8.8(9.8)	7.8(9)	8.2(8.8)			7.7(8.9)
	HI						9.3	
	Hb						5	5
	Hs						8	
	Ds			3	3.6		1.5	4.5
M2	L	9.2	9.3	9.5	9.5		8.3(8.4)	9.8(10.1)
	W	8.7(9.1)	8.7(9.7)	7.7	7.6		8.0(8.8)	7.5(8.7)
	HI			13.2			12.8	14
	Hb			4.8			5.6	4.5
	Hs			8.6			11.6	10.5
	Ds			4.5			1.4	5.2
	HI/L			1.39			1.54(1.52)	1.43(1.39)
M3	L	8.7	8.7			7.8(8.15)		
	W	7.7(8.2)	7.6(8.3)			6.8(7.9)		
	HI					12.8		
	Hb					4.4		
	Hs					9.3		
	Ds					4.6		
	HI/L					1.64(1.57)		
dP4	L				9.6			
	HI				6			
	Hs				4.3			
	Ds				1.7			
	HI/L				0.63			
I	T					6.2	6.4	
	W					5.8	5.8	

注: Abbreviations: L, length 长; W, width 宽; T, thickness 厚; HI, enamel height of lingual side 舌侧釉质层高; Hb, enamel height of buccal side 颊侧釉质层高; Hs, enamel height from base of sinus to base of enamel 内侧沟基部到釉质基部高; Ds, depth of sinus 内侧沟深; The length and width have been taken at the occlusal surface and those in brackets indicate the maximum 齿的长宽(不带括号者)均沿冠面测量,括号内的值为其最大值。

**比较** 由上面的描述和测量可以看出, V 12715 颊齿较其他的标本稍小, 而且其前边脊具后刺, 将褶 I 分成舌、颊二部分。但它的头骨和颊齿的基本特征与正型标本的很相似, 上述的区别暂时作为个体变异考虑。此外, V 13052 的 M3 也很特别, 在目前已知材料很少的情况下, 这些特征在此也暂作个体变异考虑。

临夏的标本在个体较大, 鼻骨增大和齿冠较高等特点上与 *Hystrix* 属的一致, 而与 *Trichys*、*Atherurus* 和 *Thecurus* 有明显区别。与 *Hystrix* 属的已知种比较, 临夏的标本颊齿齿冠显然要比现生的和第四纪的各种都低。它们的尺寸比 *H. brachyura*、*H. subcristata*、*H. indica*、*H. javanica*、*H. lagrelii*、*H. vinogradovi*、*H. kiangsenensis* 等的大, 而小于 *H. crassidens*。此外, 它们与 *H. lagrelii*、*H. sumatrae*、*H. javanica* 和 *H. crassipinis* 等的区别还在于鼻骨增大, 后缘为后凸的圆形, 达 M3 之后。与 *H. magna* 的区别还有腭面较宽, 后鼻孔前缘位置较前等。

新近纪 *Hystrix* 目前已知有 10 种 (*H. parvae*、*H. primigenia*、*H. sivalensis*、*H. leakeyi*、*H. etrusca*、*H. refossa*、*H. zhengi*、*H. depereti* (见 Sen, 待刊 a)、*H. aryanensis* (见 Sen, 待刊 b) 和禄丰的 *Hystrix* sp.)。临夏标本的颊齿齿冠比 *H. parvae*、*H. primigenia*、*H. sivalensis*、*H. aryanensis* 和禄丰的 *Hystrix* sp. 的高, 而较 *H. zhengi*、*H. etrusca*、*H. refossa* 和 *H. leakeyi* 的齿冠低。其尺寸明显大于 *H. parvae* 和 *H. leakeyi*, 而稍小于 *H. primigenia*。此外, 临夏标本与 *H. primigenia* 的区别还在于它们的颊齿列近于平行, 后鼻孔前缘位置较靠前; 与 *H. etrusca* 的区别还包括: 鼻骨较向后伸, 其后缘达 M3 的后上方, 腭面较宽和上门齿齿槽后端位置较靠前等。临夏标本与 *H. aryanensis* 的区别还在于 *H. aryanensis* 的腭部较窄, 两齿列往前分开, 后鼻孔为前凹的 V 形, 上颊齿具 4 个齿根, P4 无前附尖, dP4 的舌侧沟与褶 II 连而与褶 I 分开等。临夏标本与 *H. depereti* 不同在于颊齿尺寸较小, M3 较少退化。临夏标本很可能代表不同于 *Hystrix* 的已知种的新种, 我们称其为甘肃豪猪 (*H. gansuensis*)。

**讨论** Weers 和 Zheng (1998) 曾讨论过 *Hystrix* 属内各种之间的系统关系。因已知的 *Hystrix* 的化石材料还很少, 也不完全, 而甘肃临夏的标本材料也很有限, 目前还很难对 *Hystrix* 属以及 Hystricidae 科的系统关系作进一步的推论。这里只对 *H. gansuensis* 的进化阶段作一些推论。根据现有资料, *Hystrix* 属似乎存在如下一些进化趋势: 头骨前部增高, 鼻骨和额骨增大; 腭面颊齿列由向前分开变为两齿列彼此平行或向前靠近; 颊齿齿冠增高, 颊齿的沟褶由相对较深变为相对较浅, 齿冠面由近方形或长方形变为近圆形, 以及 M3/m3 趋于退化等。如果上面的推论是正确的话, *H. gansuensis* 要比 *H. parvae*、*H. primigenia*、*H. sivalensis* 和禄丰的 *Hystrix* sp. 以及 *H. aryanensis* 进步些, 而比晚上新世及其以后的 *Hystrix* 属的各种原始。它的齿冠高低虽与 *H. depereti* 的相近, 但 M3 较少退化, 很可能 *H. gansuensis* 比 *H. depereti* 要原始些。

如果 *H. gansuensis* 的确比早上新世的 *H. depereti* 原始, 而比晚中新世的 *H. aryanensis* 进步, *H. gansuensis* 的时代有可能为晚中新世和(或)早上新世。LX 200019 地点还产有: *Chilotherium*、*Dicerorhinus*、*Chleuastochoerus*、*Gazella*、*Hyaenotherium* 和鸟类等; LX 200023 还产有: *Acerorhinus hezhengensis*、*Chilotherium*、*Dicerorhinus*、*Hipparion*、*Cervavitus*、*Chleuastochoerus stehlini* 和 *Parataxidea* 等; LX 200035 产有 *Acerorhinus hezhengensis*、*Chilotherium*、*Hipparion*、*Felis* sp.、*Hyaenotherium*、*Ictitherium*、*Machairodus palanderi*、*Melodon*、*Metailurus major*、*Plesiogulo* 和 *Chleuastochoerus* 等。从上述名单中可以看出, 尽管 LX 200019、LX 200023 和 LX



200035 三地点所产的化石种类不完全相同,但总的动物群的面貌是相似的。其中 *Acerorhinus hezhengensis*、*Chleuastochoerus*、*Machairodus palanderi* 和 *Parataxidea* 都是我国中新世晚期的重要成员。因此这三个地点的地质时代很可能是中新世晚期。IVPP Loc. LX 200014 地点目前已知的化石,除了常见的三趾马动物群的成员,如 *Hipparion*、*Palaeotragus*、*Samotherium*、*Protoryx*、*Thalassictis* 等外,还出现了 *Alilepus*。*Alilepus* 在我国的时代分布为晚中新世-早上新世早期。因此,LX 200014 地点的地质时代可能为晚中新世或稍晚。

## A PORCUPINE FROM LATE MIOCENE OF LINXIA BASIN, GANSU, CHINA

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**Key words** Linxia Basin of Gansu, late Miocene, Hystricidae

### Summary

In China the living porcupines are known to be distributed in Tibet and the area south to the Yangtze River, not beyond N 35°. The distribution of Quaternary fossil porcupines is known to be much wider than that of today, reaching Benxi in Northeastern China (north to N 41°). However, our knowledge of the Chinese Neogene porcupines is limited to two species from south China: *H. zhengi* from Pliocene of Sichuan and Guangxi, and *Hystrix* sp. from late Miocene of Lufeng of Yunnan. So far no fossil porcupines have ever been reported from Gansu Province. The discovery of the new porcupine from Linxia, Gansu, not only widened the distribution of the Neogene porcupines in China, but also shed new light on the evolutionary history of the fossil porcupines.

### Hystricidae Fischer de Waldheim, 1817

#### *Hystrix* Linnaeus, 1758

#### *Hystrix gansuensis* sp. nov.

(Figs. 1, 2, 4)

**Holotype** Anterior part of skull with left and right P4 ~ M3 (IVPP V 13052).

**Locality and horizon of holotype** IVPP Loc. LX 200019, Xiaozacun, Zhuangkeji, Guanghe County, Gansu Province; Late Miocene.

**Referred specimens** Anterior part of skull with left and right dP4 (broken) and M1 ~ 3 (HZM 0401); Rostral part of a skull with a pair of incisors, left P4 and part of M1 (IVPP V 12715-1), a left M3 (IVPP V 12715-2), and right P4-M2 (IVPP V 12715-3), which may belong to the same individual; and a right upper jaw with M1-2 (IVPP V 12716).

**Localities and horizons of referred specimens** IVPP Loc. LX 200023, Ketuo, Diaotan Xiang, Hezheng County, Gansu Province (HZM 0401), IVPP Loc. LX 200035, Heilingding, Guantangou Xiang, Hezheng County, Gansu (V 12715), and IVPP Loc. LX 200014, Shilidun, Chengguan Xiang, Guanghe County, Gansu (V 12716); Late Miocene.

**Diagnosis** Very large sized *Hystrix*; nasals enlarged, with convex posterior margin reaching to posterior to M3, diastem between I and P4 long, palate wide, with two parallel dental series, anterior border of choana concave anteriorly, opposite to between M2 and M3; cheek teeth unilaterally sub-

hypsodont, each with three roots; sinus joining only with fold I on dP4; P4 with short anteroloph, large and buccally protruded paracone, tiny and low parastyle and buccally open fold I; upper molars with closed fold I; M3 not much reduced.

**Description and dimensions**(see Chinese text)

**Comparison** The main features of the porcupine from Linxia Basin are almost identical with that of *Hystrix*, differing from *Trichys*, *Atherurus* and *Thecurus* in being large in size and having enlarged nasals and higher-crowned cheek teeth. It seems to represent a new species of *Hystrix*, here named as *H. gansuensis*.

*H. gansuensis* differs from recent and Quaternary species of *Hystrix* in having lower-crowned cheek teeth. Its cheek teeth are larger than those of *H. brachyura*, *H. subcristata*, *H. indica*, *H. javanica*, *H. lagrelii*, *H. vinogradovi*, *H. kiangsenensis*, but smaller than those of *H. crassidens*. In addition, it differs from *H. lagrelii*, *H. sumatrae*, *H. javanica* and *H. crassipinis* in having an enlarged nasals. It is different from *H. magna* in having a wider palatine, more anteriorly located anterior margin of choana.

The Neogene species of *Hystrix* are known include *H. parvae*, *H. primigenia*, *H. sivalensis*, *H. leakeyi*, *H. etrusca*, *H. refossa*, *H. zhengi*, *H. depereti* (see Sen, in press, a), *H. aryanensis* (see Sen, in press, b) and *Hystrix* sp. from Lufeng. The crown of the cheek teeth of *H. gansuensis* are higher than that of *H. parvae*, *H. primigenia*, *H. sivalensis*, *H. aryanensis* and *Hystrix* sp., but lower than that of *H. leakeyi*, *H. etrusca*, *H. refossa* and *H. zhengi*. The cheek teeth of *H. gansuensis* is larger than those of *H. parvae* and *H. leakeyi* but slightly smaller than those of *H. primigenia* in size. Furthermore, *H. gansuensis* differs from *H. primigenia* in having two parallel dental series and more anteriorly positioned choana; from *H. etrusca* in having more posteriorly extending nasals, wider palate and more anteriorly located posterior end of the incisor alveolus. The distinction between *H. gansuensis* and *H. aryanensis* is also obvious. In the former the palate is wider, the two dental series are parallel, the anterior border of the choana is convex, the cheek teeth have three roots, the upper molars have a closed fold I, the P4 has a parastyle, and the sinus joins only with fold I on dP4. *H. gansuensis* differs from *H. depereti* in being smaller in size and having a less reduced M3.

**Discussion** The relationships among the species of *Hystrix* have been discussed by Weers and Zheng (1998). At present it is difficult to discuss the phylogenetic relationships of the Hystricidae in detail because of the paucity of the fossils so far known. We just simply discuss the evolutionary stage of *H. gansuensis* here. Based on the known data some *Hystrix* seems to have the following evolutionary tendencies: the rostrum heightens; the nasals and frontals enlarge; the two dental series changed from divergent forwards to parallel or convergent anteriorly; in the cheek teeth the crown gradually heightens, the fold evolves from relatively deep to shallow, the occlusal surface from rectangular or square to round, and M3/m3 tend to be reduced. If the above assumption is reasonable, *H. gansuensis* seems to be more advanced than *H. parvae*, *H. primigenia*, *H. sivalensis*, *Hystrix* sp. of Lufeng and *H. aryanensis*, but more primitive than late Pliocene and later species of *Hystrix*. *Hystrix gansuensis* seems to be more primitive than *H. depereti* based on having less reduced M3.

The fossil mammals from IVPP Loc. LX 200019 also include *Chilotherium*, *Dicerorhinus*, *Chleuastochoerus*, *Gazella*, *Hyaenotherium*, and bird. Loc. LX 200023 bore *Acerorhinus hezhengensis*, *Chilotherium*, *Dicerorhinus*, *Hipparion*, *Cervavitus*, *Chleuastochoerus stehlini*, and *Parataxidea*. IVPP Loc. LX 200035 yielded *Acerorhinus hezhengensis*, *Chilotherium*, *Hipparion*, *Felis* sp., *Hyaenotherium*, *Ictitherium*, *Machairodus palanderi*, *Melodon*, *Metailurus major*, *Plesiogulo*, and *Chleuastochoerus*, as well. The local faunas from the three localities are similar, although the taxa are not exactly the same. They are known to be important members of the late Miocene *Hipparion* fauna in China. It is more or less certain that the above three localities are all of late Miocene in age. The other taxa from IVPP Loc. LX 200014 include *Hipparion*, *Palaeotragus*,

*Samotherium*, *Protoryx*, *Thalassictis* and *Alilepus*. *Alilepus* is known to range from late Miocene to early Pliocene in China. In any case, the geologic age of *Hystrix gansuensis* is late Miocene, or probably slightly later.

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