

安徽淮南大居山早更新世猪化石¹⁾

董 为

(中国科学院古脊椎动物与古人类研究所脊椎动物进化系统学重点实验室 北京 100044)

摘要:继在安徽淮南大居山发现晚中新世老洞哺乳动物群和新洞早更新世哺乳动物群后,1998年在老洞西侧又发现了西裂隙哺乳动物群。记述了西裂隙动物群中的李氏野猪(*Sus lydekkeri*),并对李氏野猪的地理与地层分布进行了综述,对李氏野猪与其近亲之间的关系进行了探讨。李氏野猪主要分布于华北、东北和江南,最早出现在下更新统下部,最晚可延续到上更新统底部。李氏野猪与早更新世分布在长江以南的裴氏猪(*S. peii*)、早更新世和中更新世分布在欧洲和中东的斯氏猪(*S. strozzii*)之间的关系很可能是地理亚种或仅仅是形态种,晚更新世以后分布于欧亚大陆的野猪(*S. scrofa*)是它们的直接后裔。

关键词:安徽淮南大居山,早更新世,猪科

中图法分类号:Q915.876 **文献标识码:**A **文章编号:**1000-3118(2008)03-0233-14

1998年中国科学院古脊椎动物与古人类研究所金昌柱等与安徽省文物考古研究所和安徽省淮南市博物馆等单位的有关同事在实施国家“九五”攀登专项期间在淮南市西北15 km的八公山区大居山(117°01'E,32°35'N)的一处称为新洞的地点及西侧称为西裂隙的地点各发现了一处洞穴堆积。西裂隙堆积含有偶蹄类等动物化石,时代估计为晚上新世(金昌柱,2004)。2004年春在西裂隙中发现了真马化石,因此西裂隙堆积的时代更可能是早更新世早期。在记述了产于西裂隙中的反刍类化石(董为,2006)的基础上,本文对一同发现的李氏野猪做一系统记述和比较,并对李氏野猪的地理和地层分布进行简要的综述,对李氏野猪及其近亲之间的关系进行探讨。

1 系统描述

哺乳动物纲 *Mammalia* Linnaeus, 1758

偶蹄目 *Artiodactyla* Owen, 1848

猪超科 *Suoidae* Cope, 1887

猪科 *Suidae* Gray, 1821

猪亚科 *Suinae* Zittel, 1893

猪属 *Sus* Linnaeus, 1758

李氏野猪 *Sus lydekkeri* Zdansky, 1928

(图1-2;表1)

1) 中国科学院知识创新工程重点项目(编号:KZCX2-YW-106)资助。

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材料 1件保存有左右上颊齿的破碎头骨(IVPP V 14565);1件左侧保留了大部分、右侧保留了小部分的不完整下颌骨(V 14566.1);1件带有 m1 的左下颌骨残段(V 14566.2)。

描述 标本 V 14565 为破碎的头骨,保存部分为带有左右上颊齿的不完整上颌骨及部分鼻骨。头骨在 DP1 以前及 M2 以后的部分缺失。标本的左侧由于受到挤压而变形,但右侧基本上保存了原貌(图 1A)。从保存部分看,鼻骨窄而长,后端比前端稍宽,背侧平坦。上颌骨的形态较复杂,前端在 DP1 的齿根位置可见发育的翼状嵴,为“犬齿盖”向后延伸的部分,与齿槽近于平行,距齿槽缘 7.5 mm;翼状嵴向后逐渐减弱,在 DP2 的后缘位置消失。翼状嵴上方为与它平行的凹槽。在 M1 齿槽缘上方 17 mm 处有一较大的眶下孔,直径约 10.5 mm,它的开口朝向翼状嵴上方的凹槽。眶下孔的前方和上方向内凹陷,在与鼻骨的接缝处较陡。眶下孔的后侧是上颌骨颧突,它在眶下孔的后方、M2 的上方向后外侧偏上的方向伸出,在颧突的中轴可见一道嵴,这道嵴的基部距 M2 的齿槽缘约 22 mm。根据上颌骨颧突的发育状况判断颧弓比较强壮。头骨在鼻吻部的断口上可见发育中的犬齿根,其他形态不清楚。头骨在上颌骨颧突后方的断口可见萌生中的 M2。

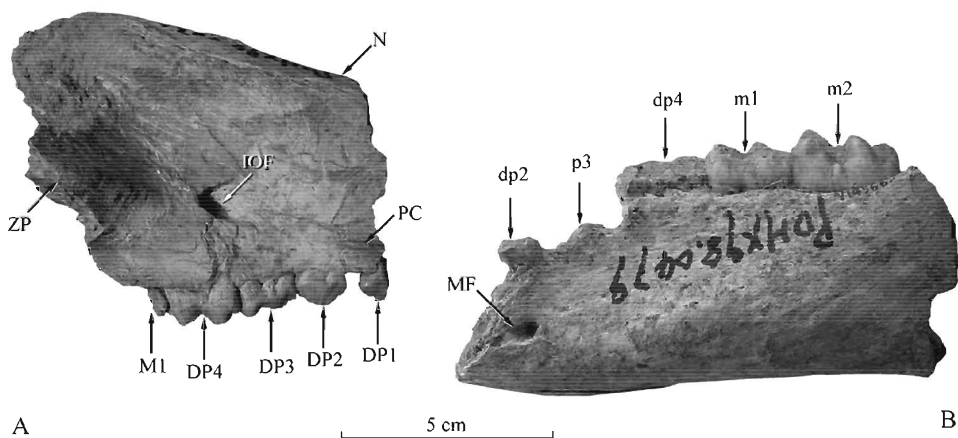


图 1 淮南李氏野猪的上下颌骨侧面视

Fig. 1 Lateral view of incomplete maxilla and mandible of *Sus lydekkeri* from Huainan

A. 不完整的上颌骨 incomplete maxilla (V 14565); B. 不完整的下颌骨 incomplete mandible (V 14566. 1)
IOF. infraorbital foramen 眶下孔; MF. mental foramen 颏孔; N. nasal 鼻骨; PC. pterygoid crest 翼状嵴;
ZP. zygomatic process 颧突

标本 V 14566.1 为不完整的下颌骨,保存有左侧下颌体 m2 以前的部分及 dp2、萌生中的 p3、dp4、m1、m2 和右侧 p3 下颌体腹缘及以前的部分,但下颌联合部的门齿部分缺失(图 1B、2C)。从保存部分看,下颌骨粗壮。下颌体在 m2 后叶处的厚度为 30.5 mm,外齿槽缘至下颌体腹缘的高为 46 mm;在 m1 前叶处的厚度为 29.2 mm,外齿槽缘至下颌体腹缘的高为 42 mm;在 p3 处的厚度为 24.6 mm,外齿槽缘至下颌体腹缘的高约 40 mm。在 dp2 下方 8.5 mm 处有一直径为 5.5 mm 的颏孔。下颌体外侧有一道从 m3 下方向颏孔后下方延伸的隆起,下颌体内侧的相应位置也有这样一道隆起,为下犬齿萌生及容纳齿根的

部分。下颌联合部腹部平坦,向前缓缓弯曲。

上齿系仅见于破碎的头骨标本 V 14565 上,颊齿均为低冠,其测量数据见表 1。

DP1 只有右侧 1 枚,前侧 1/3 缺失。从保存部分看,牙齿由两个主尖组成,前侧的主尖较大。牙齿嚼面视窄长,牙齿舌侧基部有弱的类似于齿带的突起,颊侧也有,但更弱。

DP2 只有右侧 1 枚,保存完整,磨耗轻微。牙齿嚼面视呈狭长的三角形,由 3 个主尖组成。中央的两个主尖较高大,一前一后靠得很近,第三个主尖较矮小,位于后方舌侧。

DP3 左右各 1 枚,保存完整。牙齿嚼面视呈三角形。牙齿由大小相近的 3 个锥形主尖组成,主尖有一定程度的磨耗,前侧只有一个主尖,在它的舌侧有较发育的齿带;牙齿后侧有两个主尖,颊侧和舌侧各一个,在它们的周围没有齿带。

DP4 左右各 1 枚,保存完整。牙齿已经完全臼齿化,嚼面视呈短的长方形,牙齿由 4 个锥形的主尖组成,各主尖有一定程度的磨耗,在牙齿的中央偏后处有一个附属小尖。前齿带发育,颊侧后方的外齿带明显,后齿带发育,但宽度比前齿带小。

M1 只有左侧 1 枚,保存完整,只有非常轻微的磨耗。牙齿呈长方形,长大于宽,前宽后窄。牙齿由 4 个圆锥型的主尖、前、后齿带以及附尖组成。前尖最高,原尖次之,次尖再次之,后尖最低。主尖均有相似的珧琅质纹饰结构,即被若干小沟分割成放射状的几个齿脊,原尖有 5 个脊,次尖 4 个脊,其中舌后侧的最大,前尖和后尖的脊分割得不明显。牙齿的中央偏后方有一个附属小尖。前、后齿缘发育,齿带由一串小瘤组成。颊侧和舌侧没有齿带。

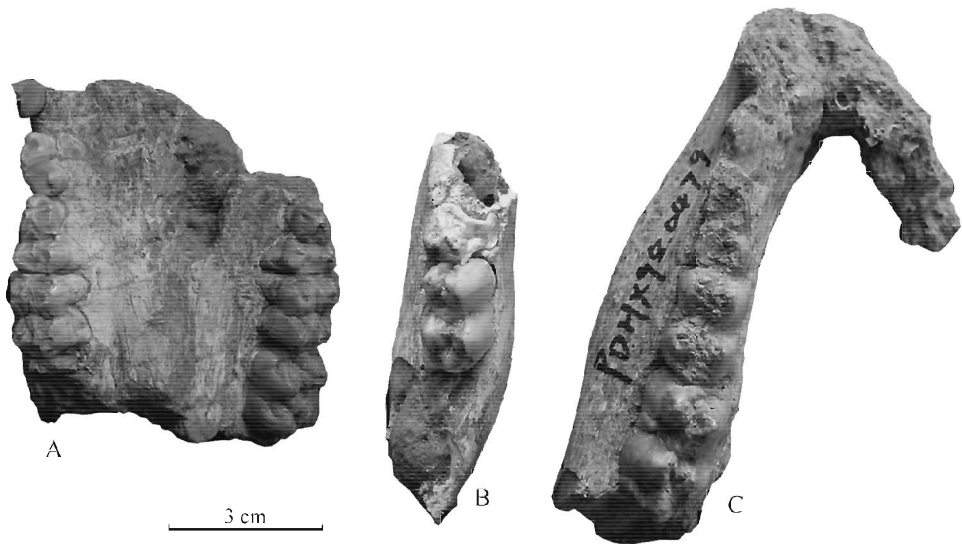


图 2 淮南李氏野猪的上下颌骨嚼面视

Fig. 2 Occlusal view of incomplete maxilla and mandibles of *Sus lydekkeri* from Huainan

A. 不完整的上颌骨 incomplete maxilla(V 14565); B. 左下颌骨残段 left mandibular fragment(V 14566.2);

C. 不完整的下颌骨 incomplete mandible(V 14566.1)

下齿系主要保存在下颌骨标本 V 14566.1 上,下颌骨残段 V 14566.2 上仅有 1 枚 m1。颊齿均为低冠,测量数据见表 1。

dp2 只有左侧 1 枚,有脱落的趋势。齿冠顶部磨耗程度较大,舌侧也有磨耗。牙齿狭长,由前后两个主尖组成,前侧的主尖较大。在前后主尖之间的颊侧和舌侧各有一个小谷。牙齿没有齿带。

p3 只有左侧 1 枚,正在萌生中,位于破裂的牙床中。从出露部分看,牙齿狭长,由前、中、后 3 个主尖组成。前侧的主尖高大。

dp4 只有左侧 1 枚,保存完整,但磨耗程度较大。牙齿窄长,由 3 个叶组成,每个叶均由两个主尖组成;前侧的叶较小,后侧的叶最大。

m1 共有 2 枚,均来自左侧,保存完整,其中 V 14566.1 上的磨耗中等,V 14566.2 上的没有磨耗。它们均呈长方形,前窄后宽。牙齿由 4 个大小相近的丘型主尖和前、后齿带组成。从基本上没有磨耗的标本 V 14566.2 上可见,下后尖最高,下内尖次之,下原尖再次之,下次尖最低。各主尖被若干小沟分割成 3-4 个辐射状的齿脊,形状不一。后齿带比前齿带发育,但前后齿带均不太发育。前齿带尖小,齿谷的中心附锥小而低矮,跟座锥或后齿带锥位于后齿带之前,下内尖和下次尖之后,为附锥中最大的尖。颊侧齿谷谷口有小尖存在或低矮齿缘封闭谷口,舌侧齿谷谷口无任何尖和齿缘。

m2 只有左侧 1 枚,保存完整,没有磨耗。牙齿形状和结构与 m1 相近,嚼面呈长方形,前窄后宽,由 4 个大小接近的丘型主尖和一粗大的跟座锥组成,但体积大得多。下后尖最高,下原尖和下次尖最小和低矮。主尖均被若干小沟分割成辐射状的齿脊。前附锥小,位于下原尖之前内侧,前齿带比它低。齿谷中的中心锥为 2 个,它们几乎等大、呈前后排列。舌侧齿谷的谷口无尖或齿带,颊侧谷入口有一个小锥。根锥较大,在后齿带的前方。

比较与讨论 上述标本中上颌骨上有翼状嵴,颊齿为典型的低冠丘型齿,臼齿有 4 个低矮的圆锥状主尖,它们被若干条小沟分割成若干圆缓的小嵴,臼齿主尖之间有附属小瘤等等,明显为猪属的特征,可以归入猪属。

与产于广西和湖北下更新统与巨猿共生的小猪(*S. xiaozhu*)相比(韩德芬,1987;陈冠芳,2004),两者都有低冠的丘型齿,臼齿的主尖被若干条小沟分割成若干圆而缓的小嵴,主尖之间有附属小瘤,但大居山标本明显大得多。因此大居山标本与小猪标本间的区分很明显。

与我国南方笔架山的 *S. bijiashanensis* 和柳城巨猿洞的 *S. liuchengensis* (韩德芬,1987)相比,尽管牙齿结构相似,但大居山标本明显大一些,因此区分明显。

与产于柳城巨猿洞的 *S. peii* 和“*S. australis*”(韩德芬,1987)、巫山龙骨坡的 *S. peii* (黄万坡、方其仁,1991)及产于建始龙骨洞的 *S. peii* (陈冠芳,2004)相比,大居山标本的牙齿在形态上与这些地点的裴氏猪比较接近,如低冠丘型齿,臼齿主尖被若干小沟分割成放射状的几个齿脊,m2 具有一个发育的跟锥,在尺寸大小上也比较接近等等。但裴氏猪的上犬齿槽的翼状嵴后缘位置比较靠后(韩德芬,1987),而大居山标本翼状嵴后缘位置比较靠前,在 DP2 的位置。另外,大居山牙齿尺寸比巨猿洞、龙骨坡和龙骨洞的标本稍大一些(表 1)。

表 1 淮南大居山的李氏野猪颊齿测量及与其他地点标本的比较

Table 1 Dental measurements of *Sus lydekkeri* from Huainan and comparison with those of other species (mm)

	<i>S. lydekkeri</i>		<i>S. peii</i>			<i>S. strozii</i>		
	V 14565 L	V 14565 R	ZKD ¹⁾	Longgudong ²⁾	Juyuandong ³⁾	Wushan ⁴⁾	Oubeidiyeh ⁵⁾	Europe ⁵⁾
DP1 W		4.82						
DP1 H		7.22						
DP2 L		12.42					11	
DP2 W		7.56					6	
DP2 H		7.86						
DP3 L	14.76	14.94					13	
DP3 W	12.6	11.72					9	
DP3 H	6.7	7.52						
DP4 L	16.1	16.0					14.5 ~ 16.5	
DP4 W	14.72	15.0					11.5 ~ 15	
DP4 H	7.1	7.42						
M1 L	20.46		15.5 ~ 20	16.0 ~ 19.2	16.8 ~ 16.3	20	17 ~ 22	17 ~ 21
M1 W	16.7		15 ~ 17.5	14.8 ~ 17.3	16.5	17	15 ~ 19.5	17 ~ 20
M1 H	11.2							
	V 14566.1	V 14566.2						
dp2 L	9.7		9					
dp2 W	4.9		7					
dp2 H	6.8							
p3 L	15.16		13.5 ~ 15.5	12.3 ~ 14.9	14.3 ~ 15.3	15	15 ~ 15.5	14 ~ 15
p3 W			7.1 ~ 9.5	7.0 ~ 9.4	8.2 ~ 10.0	9.5	8	9 ~ 11
p3 H								
dp4 L	20.72						20.5 ~ 21	23.5 ~ 24
dp4 W	10.4						9 ~ 9.5	11 ~ 12
dp4 H	4.1							
m1 L	21.02	20.4	13.5 ~ 18.5	15.8 ~ 20.5	15.5 ~ 19.0	20	19.5	17.5 ~ 22
m1 W	13.74	13.62	12.5 ~ 14.5	12.0 ~ 13.4	14.0 ~ 15.0	14	12.5 ~ 13	12.5 ~ 15
m1 H	8.22	9.7						
m2 L	26.1		22.0 ~ 27.5	20.9 ~ 25.3	22.0 ~ 26.5	26		
m2 W	17.26		16.0 ~ 18.0	14.8 ~ 17.3	17.3 ~ 19.5	19.2		
m2 H	13.6							

注:L. length 长; W. width 宽; H. height 高;

1) Young, 1932; 2) Chen, 2004; 3) Han, 1987; 4) Huang and Fang, 1991; 5) Geraads et al., 1986.

与周口店第一地点的李氏野猪 *S. lydekkeri* (Zdansky, 1928; Young, 1932) 相比, 大居山标本在牙齿大小和形态上都与周口店标本非常接近(表 1), 大居山标本和周口店标本的翼状嵴后缘位置都比较靠前, 在 DP2 的位置。图 3 是以元谋臼齿猪 (*Molarochoerus yuanmouensis*) (潘悦容等, 2006) 为基准种对大居山标本和产于周口店的李氏野猪 (Young, 1932)、产于龙骨洞(陈冠芳, 2004) 和巨猿洞的裴氏猪(韩德芬, 1987) 及产于欧洲和中东的斯氏猪(Geraads et al., 1986; Faure and Guerin, 1984) 颊齿尺寸对数的辛普森比较图, 用来检验大居山标本与猪属中其他种的相似程度。从图 3 上可见, 大居山标本与周口店标本非常接近, 除了 m1 的长度对数有些差别, 大居山标本的对数曲线线形和周口店标本的基本一致, 而大居山标本和周口店标本的 M1 和 m1 宽、m2 长和 m2 宽的对数值几乎相等, 说明它们的相似性很高。与南京汤山葫芦洞的李氏野猪(董为, 1999; 黄蕴平, 1996) 相比, 大居山标本在形态上与葫芦洞标本非常接近, 在尺寸上葫芦洞标本稍大一点。

与中东以色列 Oubeidiyeh 及法国 Senèze 和意大利 Valdarno 的 *S. strozii* (Geraads et al., 1986; Faure and Guerin, 1984) 相比, 大居山标本在尺寸上与之相近, 只有大居山的 m1

比 Oubeidiyeh 标本稍大, dp4 比法国和意大利的标本略小(表 1)。另外, *S. strozii* 的珐琅质较厚, 前臼齿的形态复杂。

总之, 大居山标本与李氏野猪在形态和大小上最接近, 因此完全可以归入这个种。

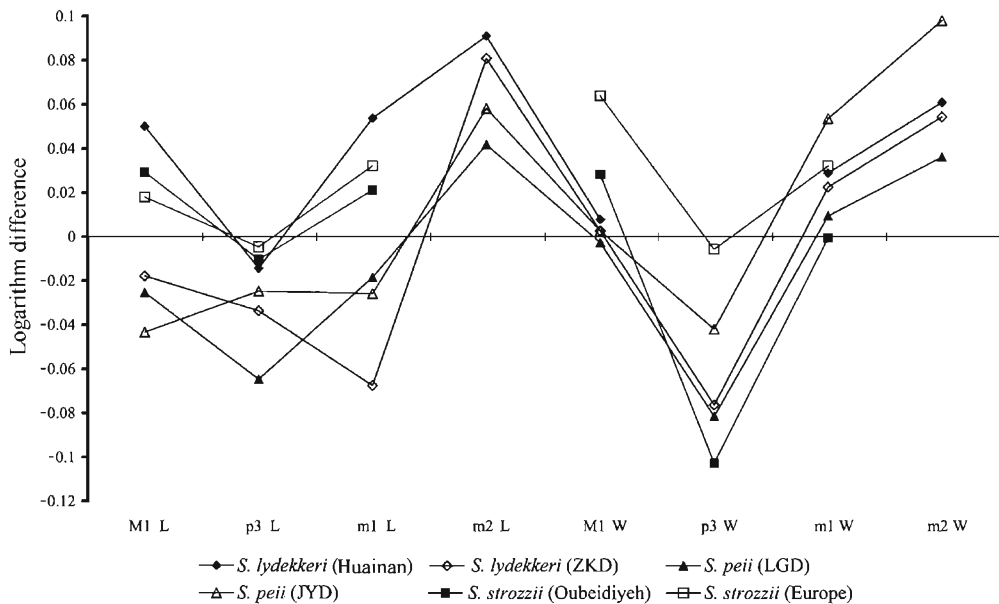


图 3 淮南大居山李氏野猪与其他猪的辛普森比较图

Fig. 3 Simpson diagram of *Sus lydekkeri* from Huainan and comparison with other suid species
 基准种 Reference *O. Molarochoerus yuanmouensis* (Pan et al., 2006); ZKD. Zhoukoudian 周口店; JYD.
 Juyuangong 巨猿洞; LGD. Longgudong 龙骨洞; L. length 长; W. width 宽

2 李氏野猪的地层与地理分布

李氏野猪目前主要发现于我国, 是一种适应能力较强的野猪。李氏野猪是最初由 Zdansky 在研究出土于周口店第 1 地点的哺乳动物化石时订立的新种之一 (Zdansky, 1928)。杨钟健在对出土于周口店第 1 地点的哺乳动物化石进行详细研究时又对李氏野猪做了补充记述 (Young, 1932)。根据李炎贤和计宏祥对周口店第 1 地点各层哺乳动物化石分布状况的研究, 李氏野猪出土的最低层位是在第 11 层, 最高层位是在第 1 层 (李炎贤、计宏祥, 1981)。根据对北京猿人遗址所做的年代学研究, 使用铀系法和电子自旋共振法测定的第 1 层至第 3 层的绝对年龄为 280 ~ 230 ka, 使用电子自旋共振法测定的第 11 层至第 12 层的绝对年龄为 660 ~ 570 ka (吴新智等, 1999), 即李氏野猪在第 1 地点的地层分布完全在中更新统内。在周口店遗址系统发掘期间的 1937 年发现了第 4 地点, 而在 1973 年进行了新发掘后从该地点的新洞出土了人类化石及伴生哺乳动物, 其中包括李氏野猪 (顾玉珉, 1978)。根据对新洞堆积第 3 层至第 7 层的骨化石进行铀系法测定, 包含李氏野猪在内的动物群年代为 175 ~ 135 ka (陈铁梅等, 1984), 为中更新世晚期。德日进等

对收集于河北泥河湾盆地的哺乳动物进行了研究后,也鉴定出一些李氏野猪化石,根据哺乳动物群的性质判断其时代为早更新世(Teilhard de Chardin and Piveteau, 1930)。1961 和 1962 年山西省文物工作者在山西芮城县西侯度村附近进行过两次发掘,出土了旧石器文化遗物及伴生哺乳动物群,其中含有李氏野猪(贾兰坡、王建,1978)。根据动物群对比及古地磁法测定,西侯度遗址的绝对年龄被认为有 1.8 Ma (Jia, 1985)。后来朱日祥等对西侯度遗址进行了高分辨率古地磁采样及测试,取样间隔为 5 ~ 30 cm,测得的绝对年龄为 1.27 Ma (Zhu et al., 2003),比原来的测年数据晚一些,但仍然为早更新世。1963 和 1964 年中国科学院古脊椎动物与古人类研究所的野外工作队在陕西蓝田的陈家窝和公王岭先后发现了人类化石及伴生哺乳动物群,其中有李氏野猪(胡长康、齐陶,1978;祁国琴,1989)。陈家窝地点经古地磁方法测定的绝对年龄为 700 ~ 600 ka (吴新智等,1999),为中更新世;公王岭地点经古地磁法测定的绝对年龄为 1.15 ~ 1.10 Ma (安芷生等,1990;Zhu et al., 2003),为早更新世。1978 年辽宁省的文博工作人员在本溪县山城子乡的山城子村东侧发现了庙后山遗址,在随后的两年里进行了系统发掘,出土了一些石制品、1 枚人牙及伴生哺乳动物化石,其中也有李氏野猪,它主要出土于第 4 层,古地磁年龄约 390 ka,为中更新世(辽宁省博物馆、本溪市博物馆,1986)。根据当地老乡提供的线索,1980 年中国科学院古脊椎动物与古人类研究所及安徽省的有关文博部门对和县龙潭洞南侧堆积进行了野外发掘,出土了和县人化石及伴生哺乳动物群,其中包括李氏野猪(黄万波等,1982)。综合氨基酸法、电子自旋共振法和热释光法等测年结果,和县人动物群的绝对年龄约在 300 ~ 250 ka 之间(陈铁梅等,1987;郑龙亭、黄万波,2001)。1990 年湖北省文物考古研究所及有关部门根据在郧阳地区文物普查中发现了 1 件古人类头骨这一重要线索对湖北郧县曲远河口学堂梁子进行了考古发掘,出土了第 2 件直立人头骨及伴生哺乳动物群,其中包括李氏野猪(李天元、冯小波,2001;计宏祥,1999)。郧县人遗址第 3 层出土郧县人化石及哺乳动物化石的古地磁年龄为 870 ~ 830 ka,即早更新世晚期(李天元、冯小波,2001);电子自旋共振年龄为 581 ± 93 ka,即中更新世早期(陈铁梅等,1996a)。1993 年当地民工在江苏省南京市汤山镇的葫芦洞小洞及巷道堆积中分别挖掘到 1 件直立人头骨化石(吴汝康等,2002),中国科学院南京地质古生物研究所和古脊椎动物与古人类研究所的有关研究人员收集了出土于葫芦洞大洞堆积中的哺乳动物化石,其中包括李氏野猪(董为,1999;2002);1993 至 1994 年南京市博物馆与北京大学考古系对葫芦洞小洞进行了发掘,出土了大量的哺乳动物化石,其中包括李氏野猪(黄蕴平,1996)。根据对哺乳动物牙齿化石所做的电子自旋共振测年,动物群年龄为 350 ka(陈铁梅等,1996b);据²³⁰Th 热电离质谱技术(TIMS)测年,葫芦洞小洞剖面上覆钙板的实测年龄早于 500 ka,而大洞剖面 III 顶部钙板的实测年龄早于 239 ka(汪永进等,2002);根据哺乳动物牙齿化石氨基酸外消旋年代测定,小洞堆积出土的哺乳动物群年龄在 638 ~ 576 ka 之间(刘德明等,2002)。各种测年方法均表明葫芦洞小洞和大洞堆积中出土的哺乳动物群的年代均为中更新世。2000 年南京博物院对葫芦洞西侧约 800 m 的驼子洞堆积进行了野外发掘,2007 年中国科学院古脊椎动物与古人类研究所与南京博物院再次对驼子洞堆积进行了野外发掘,出土了大量的哺乳动物化石,其中包括李氏野猪(董为等,2007)。根据有关种类的地层分布特征,驼子洞堆积的时代为早更新世(董为、房迎三,2005)。2005 和 2006 年河南

省文物考古研究所对河南许昌灵井旧石器遗址进行了考古发掘,出土了很多哺乳动物化石,其中包括李氏野猪(董为、李占扬,2008)。根据动物群的性质和生物地层对比,灵井动物群的时代为晚更新世早期(李占扬、董为,2007)。

从地层分布的角度看,安徽淮南大居山西裂隙堆积和江苏南京汤山驼子洞堆积是目前所知的李氏野猪的最低层位,时代为早更新世早期;河南许昌的灵井遗址是李氏野猪的最高层位,时代为晚更新世早期。大部分李氏野猪都分布在中更新世地层中,即李氏野猪的繁盛期在中更新世。

从地理分布的角度看,辽宁本溪的庙后山遗址是李氏野猪分布的纬度最靠北($40^{\circ}14'49''N$)、经度最靠东($127^{\circ}7'50''E$)的地点,安徽和县龙潭洞是李氏野猪分布纬度最靠南($31^{\circ}45'N$)的地点,陕西蓝田陈家窝遗址($109^{\circ}14'E$)是李氏野猪分布经度最靠西的地点。因此,根据目前的资料,李氏野猪的地理分布范围主要局限于江南地区及华北的大部分地区和东北的南部地区。

3 李氏野猪的近亲及其相互关系探讨

与李氏野猪在形态和大小上最接近的种类有野猪(*Sus scrofa*)、裴氏猪(*Sus peii*)和斯氏猪(*Sus stozzii*),这些猪与笔架山猪、柳城猪等的区别较明显,关系也较远。李氏野猪和野猪的主要区别是前者的个体较大,犬齿也大得多(Colbert and Hooijer, 1953),第三臼齿较复杂, $m3$ 的跟座变化比较大,有时可以变大成第四个小叶(王伴月、吴文裕,1979)。此外,李氏野猪主要分布在中更新统和下更新统,少数可延续到上更新统底部,地理分布局限于我国北方和过渡区;而野猪的地层分布主要在上更新统和全新统,在地理分布上遍及欧亚大陆。

李氏野猪和裴氏猪的区别是两者上颌骨犬齿槽上方的翼状嵴位置在李氏野猪较靠前,在裴氏猪较靠后;李氏野猪 $m3$ 的跟座比较发育,变化较大,有时可形成第四个叶,而裴氏猪 $m3$ 的跟座为一个尖或双尖,没有第四个叶(韩德芬,1987)。此外,李氏野猪的个体大、牙齿粗壮、臼齿更宽,显得比裴氏猪进步(陈冠芳,2004)。裴氏猪最早发现于广西柳城巨猿洞,后来在广西柳州笔架山(韩德芬等,1975)、重庆巫山龙骨坡(黄万波、方其仁,1991)、安徽繁昌人字洞(金昌柱等,2000)、台湾台南县左镇和湖北建始龙骨洞(陈冠芳,2004)也有发现。裴氏猪的地层和地理分布范围比李氏野猪要局限一些,主要分布于长江以南的早更新世地层中,在长江中下游南岸一带与李氏野猪的地理分布有少量的镶嵌。根据目前的资料,在早更新世期间长江以南的较大型的猪属代表是裴氏猪,江南以北地区的猪属代表是李氏野猪。

斯氏猪 *S. stozzii* (Made, 1989; Made and Moya Sola, 1989) 是欧洲早上新世晚期(按欧洲下更新统底界为 1.8 Ma 的定义)至早更新世时期的一种大型猪属成员。它的牙齿比裴氏猪更大而粗壮, $m3$ 的跟座相对简单,仅由一个锥组成(陈冠芳,2004)。斯氏猪和李氏野猪在粗壮程度上比较接近,但李氏野猪的 $m3$ 较发育,尤其是跟座比较发育,而斯氏猪 $m3$ 的跟座较简单。斯氏猪的地理分布范围比较大,除了西欧,在中东的以色列也有发现(Geraads et al., 1986)。

综上所述,在早更新世(按下更新统底界为 2.6 Ma 的定义)期间欧亚大陆有 3 种在大小和形态上接近的猪属成员:斯氏猪、李氏野猪和裴氏猪,它们分别分布于欧洲和中东、中国北方和过渡区、华南和过渡区。到了中更新世以后,在欧洲仍然有斯氏猪,在中国裴氏猪已经消失,李氏野猪继续存在。而到了晚更新世以后,在欧亚大陆的大型猪属成员几乎只有野猪了。因此,李氏野猪、裴氏猪、斯氏猪和野猪之间有什么样的关系就很值得探讨。如果我们承认李氏野猪、裴氏猪和斯氏猪是 3 个曾存在于同时代但又互相独立的种,那么在它们之间不可能存在祖裔关系。而从时间顺序上看,野猪比这 3 个种出现得晚许多。由于在中更新世尚未发现野猪更合适的直接祖先候选者,因此这 3 个种和野猪之间都存在有祖裔关系的可能,但是这 3 个独立的种不可能同时成为野猪的共同祖先,其中只有一个种可能是野猪的真正祖先,而其他两个种在中更新世期间或以后被扩散过来的具备更强生存能力的野猪替代而真正地绝灭了,成为演化中的盲支。这一推论的逻辑类似于人类起源与演化理论中的“替代”说。

如果根据下犬齿的形态分类,斯氏猪属于“verrucose”型,李氏野猪、裴氏猪和野猪属于“scrofa”型(Fistani, 1996),那么就可以排除斯氏猪和野猪之间的祖裔关系。然而,事实上在化石种中,包括斯氏猪、李氏野猪和裴氏猪的雄性下犬齿横切面形状常常处在“verrucose”和“scrofa”两者之间,即其舌面稍长于唇面,唇面变短但仍长于后面(陈冠芳, 2004)。如果根据 m3 的形态分类,裴氏猪和斯氏猪的跟座不如李氏野猪发育,与野猪更接近,那么就可以排除李氏野猪和野猪之间的祖裔关系。但是,被认为是裴氏猪同物异名的南方猪(*S. australis*)的 m3 窄长,具小的第四叶(韩德芬, 1987),即裴氏猪也可有由跟座发育成的第四叶(陈冠芳, 2004)。另外,发现于法国早更新世 Vallonnet 遗址的斯氏猪 m3 也有由跟座发育成的第四叶(Moullé et al., 2006)。根据周口店第一地点的李氏野猪 m3 的形态观察,周口店标本中也有跟座不太发育的 m3(Young, 1932)。因此 m3 的形态在斯氏猪、李氏野猪和裴氏猪之间也存在着过渡类型。

斯氏猪、李氏野猪和裴氏猪的地域性比较明显,而野猪则是欧亚大陆广布的种类,在各地的野猪亚种有很多。如果我们承认野猪在中更新世从欧洲、华北或华南的某一处出现后扩散到欧亚大陆各地,那么比野猪还粗壮一些的斯氏猪、李氏野猪和裴氏猪也有可能早更新世出现后扩散到欧亚大陆各处。笔者认为,从地理分布和形态过渡型的角度看,欧洲、华北和华南的野猪分别由斯氏猪、李氏野猪和裴氏猪演化而来的可能性更大,即斯氏猪、李氏野猪和裴氏猪更可能是形态种或地理亚种,而不是具有生殖隔离的相互独立的种。这一推论的逻辑类似于人类起源与演化理论中的“连续进化附带基因交流”说,即欧洲的斯氏猪、中国北方的李氏野猪和南方的裴氏猪在它们各自的分布边缘处与相邻的种群(形态种或地理亚种)存在基因交流,也可能借助它们的扩散能力深入到另一个相邻种群的分布区域与相邻种群发生基因交流。这样的推论更能解释在斯氏猪、李氏野猪和裴氏猪之间以及它们和野猪之间存在形态上的过渡类型现象。

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EARLY PLEISTOCENE SUID (MAMMAL) FROM THE DAJUSHAN, HUAINAN, ANHUI PROVINCE (CHINA)

DONG Wei

(Laboratory of Evolutionary Systematics of Vertebrates, Institute of Vertebrate Paleontology and
Paleoanthropology, Chinese Academy of Sciences Beijing 100044 dongwei@ivpp.ac.cn)

Key words Dajushan, Huainan, Anhui; Early Pleistocene; suid

Summary

A karstic cave called Laodong with rich Late Miocene mammals was found in 1990 in the Dajushan (117°01'E, 32°35'N) area, 15 km northwest of Huainan City, Anhui Province in eastern China (Jin et al., 2000; Jin, 2004). During the implementation of the State Key Project of the 9th "Five-year-plan", Jin and colleagues found two other fossil localities. One of them is located in a fissure called Xiliexi (it means West Fissure in Chinese) and about 60 m west of the Laodong Cave. Many mammal fossils were unearthed from the fissure deposits. Some specimens of *Sus lydekkeri* were identified as below.

1 Systematic paleontology

Mammalia Linnaeus, 1758

Artiodactyla Owen, 1848

Suoidae Cope, 1887

Suidae Gray, 1821

Suinae Zittel, 1893

***Sus* Linnaeus, 1758**

***Sus lydekkeri* Zdansky, 1928**

(Figs. 1–2; Table 1)

Referred specimens A broken skull with right and left maxillas (IVPP V 14565); a broken mandible with a small part of right branch and large part of left branch (V 14566.1); a left mandibular fragment with m1 (V 14566.2). See Table 1 for dental measurements and metric comparison.

Description Specimen V 14565 is a broken juvenile skull, the preserved parts are incomplete left and right maxillas and nasals. The parts anterior to DP1 and posterior to M2 are lost. The skull is somewhat distorted (Fig. 1A). Judged by the preserved parts, the nasals are long and narrow, the anterior parts are narrower, the dorsal parts are flat. A developed pterygoid crest is located on the root of DP1 in maxilla. It is the posterior extension of "canine lid" and it is almost parallel to the alveolus of upper cheek teeth with a distance of 7.5 mm between the pterygoid crest and the alveolus margin. The pterygoid crest diminishes backward and disappears at the posterior margin of DP2. A large infraorbital foramen with a diameter of 10.5 mm is located about 17 mm above the alveolus margin of M1. Zygomatic process of maxilla is located behind the infraorbital foramen. The developing canine root can be observed from the broken surface of the nostril. The emerging M2 can be seen from the broken surface at the zygomatic process of maxilla.

Specimen V 14566.1 is an incomplete pair of mandibles. The left hemi-mandible is preserved from m2 to its anterior part, with partial dp2, complete dp4, m1 and m2. The p3 can be seen in the corpus mandibulae. The anterior part of the symphysis is also broken. The right

hemi-mandible is just preserved the ventral part of corpus mandibulae before the position of p3 (Figs. 1B, 2C). Judged by the preserved parts, the mandibles are robust. The thickness of corpus mandibulae at the posterior lobe of m2 measures 30.5 mm, and that at p3 measures 24.6 mm. The height from lateral alveolus margin to ventral margin of the corpus mandibulae at the posterior lobe of m2 measures 46 mm and that at p3 measures 40 mm. A mental foramen with a diameter of 5.5 mm is located 8.5 mm below dp2.

The dental morphology is typical of *Sus*, with four bunodont main cusps on the molars and some small accessory cusps in between. The main and accessory cusps are separated by some irregular furrows. The dental measurements are listed in Table 1.

Comparison and determination The specimens are evidently much larger than those of *S. xiaozhu* from Juyuandong, Liucheng, Guangxi and Longgudong, Jianshi, Hubei (Han, 1987; Chen, 2004), and larger than *S. bijiashanensis* from Bijiashan and *S. liuchengensis* from Juyuandong (Han, 1987). Compared with *S. peii* and "*S. australis*" (Han, 1987), a synonymous form of the former (Chen, 2004), the dental morphology is similar to each other, but the pterygoid crest of canine alveolus is much more posteriorly placed in *S. peii* than in V 14565, and the Dajushan dental specimens are larger than those of *S. peii* (see Table 1).

Compared with *S. lydekkeri* from Loc. 1 of Zhoukoudian (Zdansky, 1928; Young, 1932), the Dajushan specimens are very close to those from Loc. 1 of Zhoukoudian. The position of pterygoid crest is in the similar position between the Dajushan specimen and the Zhoukoudian specimens. Dental measurements and Simpson logarithmic comparison show that the Dajushan specimens are closest to those from Loc. 1 of Zhoukoudian.

Compared with *S. strozzi* from Senèze of France, Valdarno of Italy and Oubeidiyeh of Israel (Geraads et al., 1986; Faure and Guerin, 1984), the Dajushan specimens are metrically close to *S. strozzi* (see Table 1), but the enamel of the latter is thicker, premolars are more complicated.

The morphological and metric characters show that the Dajushan specimens can be assigned to *S. lydekkeri*.

2 Discussion

S. lydekkeri is only discovered so far in China. It was firstly named by Zdansky when he studied the mammalian materials unearthed from Zhoukoudian (Zdansky, 1928). It was later systematically studied by Young (1932). Based on the biostratigraphical study, the first appearance of *S. lydekkeri* at Zhoukoudian Site occurs in Layer 11 and its last appearance occurs in Layer 1 (Li and Ji, 1981). The ages of Layers 11 and 1 were dated as 660 ~ 570 ka and 280 ~ 230 ka respectively, i. e. Middle Pleistocene (Wu et al., 1999). Other Middle Pleistocene sites yielding *S. lydekkeri* are Loc. 4 of Zhoukoudian Site (Gu, 1978), Chenjiawo in Shaanxi Province (Wu et al., 1999), Miaohoushan Site in Liaoning Province (Museum of Liaoning Province and Museum of Benxi City, 1986), Hexian Man Site in Anhui Province (Huang et al., 1982), Nanjing Man Site in Jiangsu Province (Dong, 1999; Huang, 1996), etc. The other Early Pleistocene sites yielding *S. lydekkeri* are Nihewan Basin in Hebei Province (Teilhard de Chardin and Piveteau, 1930), Xihoudu Site in Shanxi Province (Jia and Wang, 1978), Gongwangling in Shaanxi Province (Hu and Qi, 1978), Yunxian Man Site in Hubei Province (Ji, 1999), Tuozidong in Jiangsu Province (Dong, in preparation). The Late Pleistocene sites yielding *S. lydekkeri* are few, only Lingjing Site (Dong and Li, 2008) is known. The stratigraphic or chronological distribution of *S. lydekkeri* ranges therefore from the early stage of the Early Pleistocene to early stage of the Late Pleistocene. Dajushan and Tuozidong are the lowest horizon yielding *S. lydekkeri*, Lingjing Site is the highest horizon yielding *S. lydekkeri*. The species is mostly distributed in the Middle Pleistocene.

From the view point of geographic distribution, Miaohoushan Site is the northmost ($40^{\circ}14'49''\text{N}$) and the eastmost ($127^{\circ}7'50''\text{E}$) site yielding *S. lydekkeri*, Hexian Man Site is the southmost ($31^{\circ}45'\text{N}$), and Chenjiawo is the westmost ($109^{\circ}14'\text{E}$). That is to say, the species is mainly distributed within northern, north-eastern China and transitional zone between northern and southern regions.

The species close in morphology and size to *S. lydekkeri* are *Sus scrofa*, *Sus peii*, and *Sus stozzii*. The differences between *S. lydekkeri* and *S. scrofa* are that the former is larger in size and has more robust canines (Colbert and Hooijer, 1953), its third molars are more complicated, the talonid of m3 can be enlarged to a small fourth lobe (Wang and Wu, 1979). In addition, *S. lydekkeri* is distributed mainly in the Lower and Middle Pleistocene within northern region and transitional zone as mentioned above, while *S. scrofa* is distributed mainly in the Upper Pleistocene in Eurasia. The differences between *S. lydekkeri* and *S. peii* are that the position of pterygoid crest is located anteriorly in the former but posteriorly in the latter, the talonid of m3 in the latter does not expand to form the fourth lobe, the former appears larger and more robust; and in addition, the former is geographically distributed in northern China and transitional zone but the latter is geographically restricted in southern China (Han, 1987; Chen, 2004). *S. stozzii* is a European Pleistocene suid (Made, 1989), and it was also found in Middle East (Geraads et al., 1986). Its dentition is larger and more robust than that of *S. peii* (Chen, 2004). It is close in size to *S. lydekkeri* but the talonid of its m3 is simple and without the fourth lobe.

In short, there were three species of *Sus* in Eurasian Lower Pleistocene: *S. peii*, *S. lydekkeri* and *S. stozzii*. If based on the lower canine pattern, *S. stozzii* is “verrucose” type, while *S. peii* and *S. lydekkeri* are “scrofa” type (Fistani, 1996). It can therefore exclude the ancestor-descendant relationship between *S. stozzii* and *S. scrofa*. But actually in fossils, the lower canines of *S. lydekkeri*, *S. peii* and *S. stozzii* are often between “verrucose” and “scrofa” (Chen, 2004). If based on m3, the talonid in *S. peii* and *S. stozzii* is less developed than that in *S. lydekkeri*, but similar to that in *S. scrofa* and it can thus exclude the ancestor-descendant relationship between *S. lydekkeri* and *S. scrofa*. Nevertheless, “*S. australis*”, a synonymous form of *S. peii*, was reported to have a similar fourth lobe in m3 (Han, 1987). That is to say, the talonid of m3 in *S. peii* can also develop into the fourth lobe (Chen, 2004). It was also reported that the m3 in *S. stozzii* from Vallonnet Site, France, bears a developed talonid equivalent to the fourth lobe (Moullé et al., 2006). Even in *S. lydekkeri* from Loc. 1 of Zhoukoudian Site, the talonid of m3 varies individually, the underdeveloped talonid of m3 can be seen in some specimens (Young, 1932). It can be concluded that there are transitional forms of talonid of m3 in *S. peii*, *S. stozzii* and *S. lydekkeri*. So, it is likely that these species are rather geographical subspecies and all of them are ancestor to *S. scrofa* in corresponding areas.

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