

記云南罗平的巨犀化石并論 葛氏巨犀的性質

邱 占 祥

(中国科学院古脊椎动物与古人类研究所)

1960 年底古脊椎动物与古人类研究所高等脊椎动物研究室云南工作队在罗平(原师宗)采到了少量巨犀化石。鉴定后,认为这批材料的发现对于我国早第三紀地层分布、巨犀类的系統发育及其分布范围的了解都有一定的意义,因此在这里予以簡短地报导。

在对比罗平和我国其它各地所发现的巨犀化石时,还遇到了对葛氏巨犀, *Indricotherium* (*Baluchitherium*) *grangeri* (Osborn), 性質的認識問題。过去一部分学者认为它的范围很大,包括几乎全部在中国发现的巨犀化石。最近格罗莫娃(Громова В. И.) 认为它并不是一个独立的种,而将它归入了苏联同属的外烏拉尔种 *Indricotherium transuralicum*。但是另一些学者,如德日进、周明鎮等則认为葛氏巨犀可能是由若干种所組成。由于这个問題直接关系到对罗平所采巨犀化石的鉴定与認識,因此在文中对这个問題也提出了一些初步的看法。

本文的写成承蒙周明鎮教授耐心教导,研究室其他諸同志多方予以批評指正,在此謹向他們表示衷心的感谢。

一、罗平巨犀化石的記述

Indricotherium intermedium sp. n.

(图版 I, 2—3, II)

材料: 右上第二臼齿、三枚距骨及一旁掌骨远端(V. 2643, 1—5)。此外尚有周明鎮、徐余瑄于 1959 年所报导过的、采自同一地点的一枚右距骨(V. 2371)。

特征: 一种中等大小的巨犀,介于云南小巨犀和葛氏巨犀之間。距骨窄而高,旁掌骨寬。

描述与比較: 右 M^2 (图版 I, 2)——外脊长 82.5 毫米,原脊处寬 89.4 毫米,后脊处寬 72 毫米。前附尖、前外肋显著,外脊后部向内斜;横脊与外脊交接处有輕微收縮現象;反前刺只在基部略发育;有前、后齿緣;内齿緣于原、次尖处消失。此标本比 *Indricotherium parvum* 者进步: 牙齿較大,齿冠較高,反前刺已发育等,但与 *Indricotherium grangeri* 者相比,則略小而原始。

距骨(图版 II 及表 1)——除一枚略大外,其余三个在大小及构造上都很相近。距骨高仅稍小于其最大寬度;滑車內、外嵴較对称(自前看),外嵴显著地薄于內嵴(前后方向);滑車部分寬度大;与跟骨冠状突相接之关节面(cor.)中部向前凹入,其外下角有一附加小

面(af.),此两面间夹角稍大于 90° ;与跟骨载距突相接之关节面(sus.)较高(见表1);距骨底面与舟骨(os naviculare)相接之关节面(nav.)大致为矩形,其最宽处(前后方向)在其外方;与骰骨(os cuboideum)相接之关节面(cub.)为一长条形(图版II,3)。距骨的外形窄而高,滑车较对称,与跟骨冠状突相接之关节面曲度较大等特点说明它应属于 *Indricotherium* 属。但另一些特点,如滑车部分之宽,与跟骨冠状突相接之关节面与其附加小面所成之角仅稍大于 90° ,与骰骨相接之关节面为长条形等,则又近于格罗莫娃于1959年所修订之 *Paraceratherium* 属的特征。上述矛盾的现象很可能是由于格氏将巨犀两属的特征限得过窄所致。笔者认为,上述距骨总的特点和格氏 *Indricotherium* 属的特征很符合,而后几个较细微的特征可能不应算作属的特征。与 *Indricotherium grangeri* 相比,上述距骨小而相对较高。

表1 距骨 (*Astragalus*) 测量对比表* (单位:毫米)

属	<i>Indricotherium</i>							<i>Paraceratherium</i>
	<i>intermedium</i> sp. n.			<i>transouralicum</i>		<i>grangeri</i>		<i>prohorovi</i>
	云南罗平大同			Целкар-Тениз	Тагал-Гол	蒙古		苏联鹹海北岸
标本号	V. 2643 _a	V. 2643 _b	V. 2371		N. 475-1	N. 21618	N. 26387	
最大垂直高度 (Height)	145	142	152	150—185	135		142.7	95×145
最大宽度 (Breadth)	155	155	166	158—211	157	165	173	139—203
远端最大宽度	118	135	129	147—180	147			103—162
滑车内嵴厚度	94	94	113	108—134	105			74—122
滑车外嵴厚度	66	70	82	120—149	114			82—122
舟骨关节面 (宽×前后长)	91×80	105×73	90×75	90—122×92—117	91×80			86—147×73—112
骰骨关节面宽	25	29	28	40—70	42			19—30
同上,长 (前后)	72		82	83	78			55—90
冠状突关节面 高	56		96	55—79	61			35—57
同上,宽	70		62	70—106	84			66—106
载距突关节面 (高×宽)	68.6×40	64×40	60×45	47,60×55,65	58×46			43—55×29—38
宽与高之比 (B./H.)	106.9	109.1	108.5	104—116.6 平均113.2	116.3		121.2	125.2—150 平均137.6

* 除云南罗平新种,蒙古标本(根据葛兰阶与格里高利1936年图片)外,其余均依格罗莫娃。

旁掌骨远端(图版I,3)——两籽骨关节面不对称,左深右浅(后视),故可确定为掌或跖骨左第四,或右第二。由其粗壮程度判断,可能为第四左掌骨远端。与第一指骨相接之关节面高稍大于宽;籽骨关节面间中嵴较尖锐。旁掌骨远端横切面大致为方形,亦即宽接近于厚(67毫米×71毫米)。根据其籽骨关节面间中嵴之较尖锐判断,可以认为它是属于 *Indricotherium* 属的。与 *Indricotherium grangeri* 相比,其宽度显得很大。而这一点,若按格氏分类的意见(Громова, 1959, стр. 27)甚至不能算作巨犀类的特点。很可能,这也正反映了罗平巨犀较原始的特性。

讨论: 罗平的巨犀化石表现了某些由路南小巨犀 (*Indricotherium parvum*) 到葛氏

巨犀之間的过渡性質。肢骨的发现(虽然太少)使我們对 *Indricotherium* 属較原始种类的骨骼的某些部分有了少許認識, 从而也扩大了格氏对 *Indricotherium* 一属特征描述的范围——格氏仅以一个較特化的种, *Indricotherium transouralicum*, 为基础, 因之其特征就显得过狹, 而不包括某些原始种类的特点。

迄今为止, 在我国作为巨犀而被描述过的只有五个种: *Fostercooperia totadentata* Wood, 1938; *Indricotherium parvum* Chow, 1958; *Indricotherium intermedium* sp. n.; *Indricotherium* (= *Baluchitherium*) *grangeri* (Osborn), 1923; 和 *Baluchitherium* *mongolensis* Osborn, 1924。 *Fostercooperia totadentata* Wood 的真正地位目前还不清楚。至于 *B. mongolensis*, 它并不是巨犀。馬修在奥斯朋对 *B. mongolensis* 原描述文后的附注中就指出它应属于真犀亚科 (Matthew, 1924 对 *B. mongolensis* 的附注)。此后也没有任何人反对过馬修的修正。剩下的三个种, 无论在时代上, 还是在进化程度上都似乎代表了 *Indricotherium* 属在系統发育中三个連續的阶段: *I. parvum* → *I. intermedium* → *I. grangeri*。 *I. parvum* 是目前已知最古老的祖先类型。其牙齿特点与 *I. grangeri* 很相近 (与 *I. intermedium* 只有 M^2 可相比)。在原正型标本中, P^2 , P^3 (Chow, 1958, Pl. I, 3—4) 比較特殊, 难与 *I. grangeri* 相比。观察的結果表明它們可能并非属于巨犀类的。 P^2 臼齿化程度太低, 次尖还处在 P^3 或 P^4 的阶段, 即尚未和后脊相連。在巨犀中 P^2 是前臼齿中臼齿化程度最高的。所以它不可能是巨犀的 P^2 , 若以 P^2 为 P^3 , 則其大小相差太远 (其可复原长度仅約 25—30 毫米)。正型标本中的 P^3 , 其次尖比原尖更向內 (舌) 側, 所以原脊不形成鈎状, 仅为弧形 (这一点与 *Paraceratherium* 属的特征相符, 但其齿寬大于长又說明它不可能属于此属), 后脊內端有“前刺”, 将中谷隔断。外脊內緣基部亦有一相当于小刺之突起。这种构造在巨犀中从未見过, 所以 P^3 也不属于巨犀。 *I. parvum* 的 P^4 相对較寬 (寬长指数約 150), 外脊平滑凸出, 无明显前附尖; 原脊与次尖相連, 形成鈎状; 次尖大, 大部分位于后脊之后; 后脊內端指向次尖前方。这些特点正与 *Indricotherium grangeri* 相近, 而別于 *I. transouralicum*。 M^2 与罗平及葛氏巨犀极相似, 只是更小而原始。下頰齿, 由于在葛氏巨犀中沒有詳細描述, 无法比較。但仍可指出, *I. parvum* 的下前臼齿外壁中部之瘤状物发育很弱。这种构造在苏联外烏拉尔种中发育特強, 而在葛氏巨犀的描述中則未曾提及, 很可能, 也发育較弱。云南小巨犀与葛氏巨犀在构造上极相似, 但又原始, 这說明了它和后者在系統发育上可能相当接近。

I. intermedium 比 *I. parvum* 进步, 这从 M^2 的构造中看得很清楚。但另一方面, 它又比 *I. grangeri* 原始。主要表现在距骨之窄而高, 旁掌骨退化較弱 (其远端还相当寬) 等。因之, 可以初步认为罗平巨犀是属于云南小巨犀和葛氏巨犀这一进化枝系, 而在进化水平上則介于两者之間。

云南小巨犀的生存时代可大致定为漸新世之最初 (周明鎮, 1958), 而葛氏巨犀則为中漸新世或稍晚 (Борисяк А. А. 1948)。由于罗平巨犀, *I. intermedium*, 明显的中間性質使我們可以初步推測, 在罗平可能有中漸新統底部, 或下漸新統頂部的沉积。

Indricotheriinae gen. et sp. indet.

下右第一門齿 (图版 I, 1, V. 2642): 齿尖被磨蝕。齿冠基部上下厚 (亦即普通所指的

齿前后长——因巨犀下門齿向前方伸出)約 33 毫米,左右寬約 42 毫米。齿冠下緣弯曲大,其下緣最高处(即齿冠本身最短处)位于齿上緣,而齿冠本身最高处位于齿冠的外下緣。自齿尖至齿冠基部有上、下两稜,下稜于基部向内歪曲;齿內緣有极发育之瘤状突。齿上緣基部有一与 I_2 (I_2 位于 I_1 之上方)相連之接触面。

門齿之大小及构造特点与格氏 *Paraceratherium* 属之特征很相近。其瘤状突起甚至較 *Paraceratherium* 已知各种更为特化。到目前为止,一般都認为 *Paraceratherium* 在时代上比 *Indricotherium* 更晚些:只限在漸新世最末期至中新世。那么,在同一层位中是否会同时生存着較为原始的 *Indricotherium intermedium* 和門齿如此特化之另一种 *Paraceratherium* 呢? 这一点还值得怀疑。由于我們对 *Indricotherium* 属中較原始种类的下門齿一无所知,而据一般推測 (Грoмoвa B. И. 1959) 它应该由大到小,逐漸退化,所以上述特点也有可能是代表 *Indricotherium* 属一种較原始的特征。

二、关于葛氏巨犀某些問題的討論

問題的提出

葛氏巨犀是奧斯朋于 1923 年所訂立的。这个种曾多次地引起学者們的討論。其中較主要的問題:一为其属的“独立性”問題;另一則为种的范围問題。

在 *Baluchitherium* 属的“独立性”問題上,过去基本上有两种意見:庫派尔(Cooper C. F.)、奧斯朋和帕里夏克等認为 *Baluchitherium* 和 *Indricotherium* 很相近,但又有一定的差別。由于可对比的材料过少,不能作肯定結論,而保留了原訂的属和种。葛兰阶、格里高利 (Granger et Gregory) 和辛普生 (Simpson) 等則認为当时已知三属 *Paraceratherium*, *Indricotherium* 和 *Baluchitherium* 实际上都是一个属——*Paraceratherium*, 而其区别只有亚属 (依 Simpson, 1945, p. 257) 或种的意义 (Granger et Gregory, 1936, p. 55)。

1959 年格罗莫娃提出了新的看法,認为 *Baluchitherium osborni* 应属于 *Paraceratherium*, 而 *B. grangeri* 則应属 *Indricotherium*, 取消了 *Baluchitherium* 这一属名。她将整个巨犀类分为两个明显区别的属: *Paraceratherium* 和 *Indricotherium*。这种分类在目前是比較合理的,它也基本上解决了巨犀类化石中属的混乱状态。

至于葛氏巨犀的范围,則問題較为复杂。一方面,在以前的鉴定中,我国所发现的大部分巨犀化石都以不同形式归入了此种,与此同时,許多学者又对此有所怀疑。德日进于 1926 年将在河套发现的巨犀化石訂为葛氏巨犀大、小两类,并認为其中小种很可能为一独立的种,可称之为 *Baluchitherium minus*。1959 年周明鎮、徐余瑄将新疆哈密所发现的巨犀化石暫归入葛氏巨犀时也有类似的提法。相反,根据格罗莫娃最近的意見, *Indricotherium* 属只有一个种: *I. transouralicum*, 它包括了所有过去描述过的 *I. asiaticum*, *I. transouralicum*, *I. minus* 和 *I. (=B.) grangeri*, 这样,葛氏巨犀这一种名也就被取消了。

葛氏巨犀的范围

我們認为属于葛氏巨犀的材料目前可以初步确定的有: 1923 年奧斯朋所描述的正型标本; 葛兰阶、格里高利于 1936 年所描述材料中的 II—IV 等級 (grade) 和楊鍾健、周明

鎮于 1956 年所报导的甘肃巨犀化石。

1926 年德日进将采自鄂尔多斯三盛公及水洞沟附近的巨犀化石訂为典型的 *B. grangeri* 和小型 (*forme minor*) 两类。实际上, 在构造上它們都更接近于 *Paraceratherium* 属。属于小种的有头骨枕骨部份、橈骨、小多角骨、脛骨、距骨、月骨及指骨等 (Pl. II, Figs. 1, 3—6, 8, 11—12)。其橈骨与脛骨两端急剧变寬; 小多角骨狹长而高, 与月状骨相接之关节面后緣不垂直下切, 有后韧带結节; 距骨扁平, 为标准的 *Paraceratherium* 型距骨; 外(第三)楔骨外側只有一个与骰骨相接之关节面; 掌、跖骨远端分隔籽骨之中嵴較鈍平等, 这些都是 *Paraceratherium* 属的特征。属于典型的 *B. grangeri* 的标本中有一右 M^3 , 脛骨、鈎骨与旁蹠骨 (Pl. I, Fig. 3; Pl. II, Figs. 2, 7, 9)。 M^3 在外形上与 *P. prohorovi* 很相近, 但較大; 脛骨与小型者几无区别; 旁蹠骨两端特寬。上述两类化石大小差别悬殊, 其比为 1:1.6。很可能, 它們并不是 *I. (=B.) grangeri*, 而是代表 *Paraceratherium* 属中两个不同的种。

在 1936 年葛兰阶、格里高利所記述的材料中有一特大等級 (grade I) 的头骨后部 (Am. Mus. 26165) 和中掌骨 (Am. Mus. 26175)。头骨除特大外, 其形态与真正的葛氏巨犀亦有差别: 枕髁与枕大孔寬而低。中掌骨特大, 与 II—IV 等級的大小差别悬殊, 其比大于 1:1.5。相反, 在 II—IV 等級本身中, 大小变化很小。图 44—45 中 (Granger et Gregory, 1936, pp. 66—67) I 和 II—IV 等級中掌骨的递增現象是由于 *I. asiaticum* 中掌骨插入的結果。此外, 奥斯朋曾指出过, 在烏尔丁鄂博(正是最大等級化石的产地)有一更大型的新种, 其时代亦可能較晚 (Osborn, 1929, p. 4)。很可能奥斯朋的意見是对的;

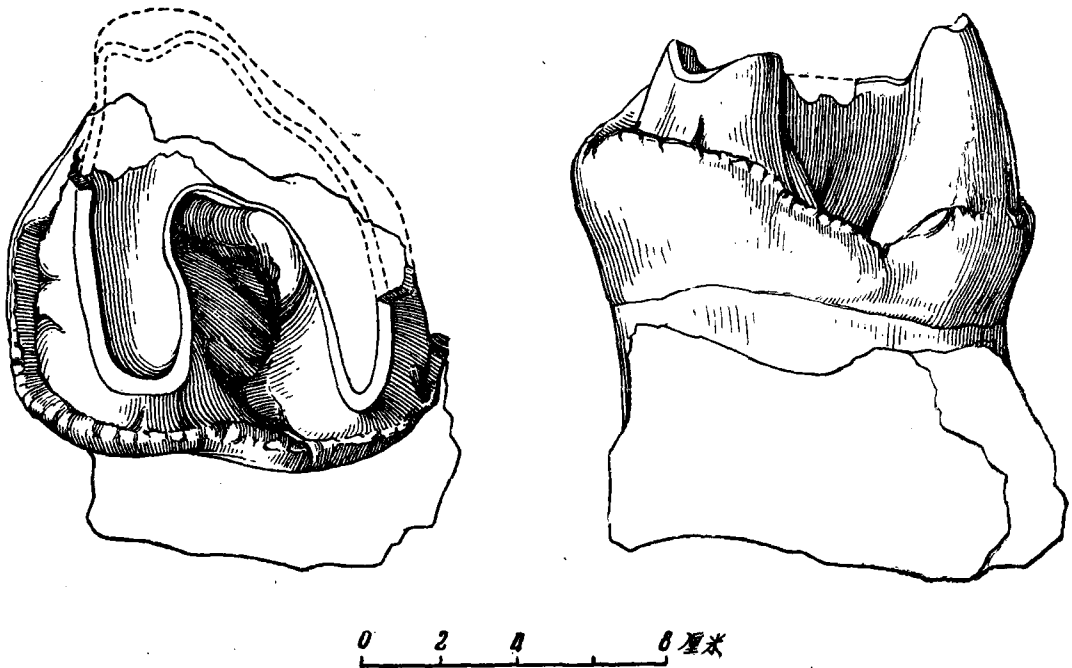


图 1 *Paraceratherium tienshanensis* sp. n.

左 $M^3 \times 1/2$ 原大, V. 2370。左, 頂視; 右, 內側視。

这里的确还有一种比 *I. grangeri* 更特化的 *Indricotherium*。

1959 年周明鎮、徐余瑄所記述的新疆巨犀 (*Indricotherium* cf. *grangeri*)，其中牙齒的很多的特点是 *Paraceratherium* 屬的(見圖 1)。齒冠特別高。M³ 于已相當磨蝕之次尖內緣處高約 80 毫米，比所有巨犀中最高者還高出 1/4，若再加上被磨蝕部分，其高度則相當可觀；原尖內緣鈍平，于基部有一小縱溝，反前刺為一強壯之圓突，其寬占原脊後壁長的一半以上；齒緣特別發達，前齒緣高達 35 毫米，于原脊前之寬約 11 毫米，在內緣一直伸延至中谷後緣。下前臼齒後脊外壁後端無瘤狀突起。這些特點很明顯地與 *Paraceratherium* 屬的特徵相合。此外，牙齒之特長，如 M³ 內緣長 123 毫米，比 *Paraceratherium* 屬中已知最大者還大 1/4，P₄ 比已知最長者長約 1/5，M₁——長 1/3 弱，而 M₂——1/3 強。所有這些，都說明新疆所發現的巨犀是 *Paraceratherium* 屬中一高度特化的新種。所以我們將它訂為 *Paraceratherium tienshanensis* sp. n. (原標本描述見周明鎮、徐余瑄，1959)。

葛氏巨犀種的“獨立性”

葛氏巨犀和蘇聯外烏拉爾巨犀(包括 *I. asiaticum*, *I. minus* 和 *I. transouralicum*——這裡將不涉及蘇聯巨犀的具體分類問題)在形態上確實較為近似。奧斯朋在正型標本的描述中強調了葛氏巨犀前臼齒的鈎形原脊。葛蘭階、格里高利指出了葛氏巨犀前臼齒後脊內端總是指向前，而在 *I. asiaticum* 中則多指向後。帕里夏克提出了兩者間較多的不同之點，如門齒的大小及數目，P² 橫脊的分與連，次尖的大小以及一些肢骨上的特點。但這些特點一部分是相對的，另一部分則是推測性的。格羅莫娃認為整個 *Indricotherium* 屬只有一個外烏拉爾種，而所有上述區別都有其過渡類型，不能算作種的區別。周明鎮、徐余瑄不同意格氏的分類，認為至少在目前應將葛氏巨犀看作單獨的種。筆者同意後者的意見，認為在它們之間仍然存在著相當明顯的區別。

上門齒在 *I. grangeri* 中特別粗壯，正型標本高 100 毫米，基部截面為 58 × 76 平方毫米，亦即其圓周長超過 200 毫米，扁圓錐形，尖端不向後彎曲，整個門齒垂直向下。外烏拉爾巨犀的上門齒在大小及形狀上均有區別：所有已知門齒都較小，帕芙羅娃的標本 (*I. transouralicum* s. *stricto*.) 高 75 毫米，圓周長約 150 毫米 (Pavlov M., 1922, p. 105, Pl. I, Fig. 3; Borissiak A. A., 1924) 另一門齒其基部截面為 47 × 62 平方毫米 (Громова, 1959, стр. 33) 門齒不完全垂直向下，下端較尖，且略向後彎曲。*I. grangeri* 上前臼齒外脊外壁平滑，稍向外凸出；P³, P⁴ 中次尖大，且比原尖更靠外(唇)側，與原脊相連而成彎曲較劇之鈎形，將後小尖自外後方包圍起來，其後脊後之部分大。P⁴ 寬，為其本身長的 150%。外烏拉爾種上前臼齒的前附尖，前、後肋較明顯，前附尖與前肋間之溝亦較深。P³, P⁴ 中次尖較小，原脊與次尖相連，但不組成彎曲明顯之鈎形，所以其後脊後之部分亦小得多。P⁴ 寬只為長的 135% 左右。此外外烏拉爾種在下前臼齒後脊外壁後端有很發育之瘤狀突起，而在 *I. grangeri* 中過去的描述都未曾提及這點，很可能，這種瘤狀突起並不象前者那樣發育。

在肢骨中也有一些區別(見表 2)。肱骨在 *I. grangeri* 中三角肌粗隆 (*tuberositas deltoidea*) 明顯，遠端滑車外髁中嵴不甚顯著，而滑車橫軸接近水平 (Granger et Gregory, 1936, p. 42, fig. 23; Young et Chow, 1956, Pl. I, Fig. A) 外烏拉爾巨犀則相反，三

表2 肢骨长度比較表 (单位: 厘米)

属 种 标本号	<i>Indricotherium</i>		
	<i>grangeri</i>		<i>asiaticum</i>
	N. 26387 grade IV	N. 26166 grade II	
肱骨 (humerus)	90	98.5	93
橈骨 (radius)	112	122	107
尺骨 (ulna)	130	135	120
橈骨 (r)/肱骨 (h)	123	124	115
中掌骨 (McIII)	44	53.5	51.5, 54.5, 60
中掌骨 (McIII)/肱骨 (h)	48.8	54.5	55.4, 58.6, 64.5
股骨 (femur)	128.5	139	123
脛骨 (tibia)	84	92	86
股骨 (f)/脛骨 (t)	153	151	143
中跖骨 (MtIII)	40	50	52, 51
中跖骨 (MtIII)/脛骨 (t)	47.6	54.3	61

(根据葛兰阶与格里高利, 1936)

角肌粗隆几乎沒有, 远端滑車外髁中嵴显著, 滑車橫軸外端剧烈下傾 (Борисяк, 1917; 1923, Таб. 11, 15)。橈骨、尺骨在葛氏巨犀中相对較长, 其与肱骨之比为 124%。外烏拉尔种之比仅为 115% (見表 2)。葛氏巨犀尺骨鷹嘴 (olecranon) 更高些, 后上方为方角形, 而外烏拉尔巨犀則鷹嘴低, 其后上方为圓弧形。腕骨在葛氏巨犀中头状骨自前看与月骨交接少, 与舟骨相接之上緣弯曲較大, 而月骨下端較圓滑; 外烏拉尔巨犀月骨下关节面較尖, 插入头状骨与鈎骨之間。葛氏巨犀的股骨較长, 与脛骨长之比为 153%, 股骨头向内傾斜微弱; 外烏拉尔巨犀股骨較短, 与脛骨比仅为 143% (見表 2), 股骨头亦內斜較劇。葛氏巨犀的跟骨, 正如帕里夏克所指出, 其与骰骨相接之关节面和跟骨前緣成一銳角, 而在外烏拉尔种中則近一直角。葛氏巨犀的距骨更趋扁平, 其寬高指数一般大于 116.6¹⁾, 即外烏拉尔种中之最大指数。掌、跖骨在葛氏巨犀中总是較短, 約为外烏拉尔种的 4/5 左右。关于两种間肢骨比例的差别, 其实早于 1936 年葛兰阶、格里高利即已指出, 从他們的表中亦可看出。但他們将 *I. asiaticum* 的肢骨长度与葛氏巨犀的不同归結为分属不同大小的等級。其实帕里夏克早于 1917 年的描述中即已声明, 这些材料是經過选择的, 而不是不同大小的混杂。所以应该認为其不同确系种間区别。

上述对比表明了葛氏巨犀可以和外烏拉尔巨犀区别开来。这些区别: 更特化的門齿、更笨重、直立的四肢 (股骨头較直、关节面較平等), 都表示葛氏巨犀在进化水平上似乎更前进了一步。

三、中国的巨犀化石及其分布

目前我国已知的巨犀类化石的种、属、地理分布及时代大致如下所述:

1) 葛兰阶与格里高利书中第 32 图的标题 “Tarsal bones of *Baluchitherium grangeri*” 是不正确的, 其中只有 A—C 才是葛氏巨犀的跟骨距骨, 而 D—F 和 G—H (?) 則分別属于 *Indricotherium asiaticum* 和 *Baluchitherium osborni*。

在 *Indricotherium* 属中,除了可以肯定的三个种(云南小巨犀、罗平的巨犀和葛氏巨犀)外,很可能在内蒙古一带还有一种更特化、更大型的 *Indricotherium*。在河套及新疆一带还有 *Paraceratherium* 属巨犀化石的发现。河套地区可能有一小型而较原始的种,而在新疆发现的 *Paraceratherium tienshanensis* 则是迄今为止的巨犀类化石中最大和最进步的一种 *Paraceratherium*。

Indricotherium 属在我国分布较广,北起内蒙地区(北纬 20° 左右),南至云南(北纬 50° 左右)。但在我国中部至今尚未发现。时代自渐新世初期至渐新世晚期(?)。 *Paraceratherium* 目前在我国仅限于河套、新疆一带地区。时代自渐新世中期(?)至中新世初期(?)。

兹将我国目前已知巨犀的种、属依次列下做为本文的结尾。

亚科 *Indricotheriinae* Borissiak, 1923

属 *Indricotherium* Borissiak, 1915

种 *I. parvum* Chow, 1958 渐新世初期,云南东部(路南)

I. intermedium sp. n. 渐新世中期初(或初期末?),云南东部(罗平)

I. (B.) grangeri (Osborn), 1923 渐新世中期,内蒙,鄂尔多斯

(Osborn, 1923, *B. grangeri*; Granger et Gregory, 1936, *B. grangeri* grades II—IV; Young et Chow, 1956, *B. grangeri*)

Indricotherium sp. 渐新世晚期(?)内蒙

(Granger et Gregory, 1936, *B. grangeri* grade I)

属 *Paraceratherium* Cooper, 1911

种 *Paraceratherium* sp. 渐新世中期(?)鄂尔多斯

(T. de Chardin, 1926, *B. Grangeri* forme minor)

P. tienshanensis sp. n. 中新世初期(?)新疆(哈密)

(Chow et Xu, 1959, *I. cf. grangeri*)

参 考 文 献

- Borissiak, A. A. 1916 *L'Indricotherium* n. gen., Rhinocéros gigantesque du Paléogène D'Asie. Comptes Rendus des séances de L'académie des sciences. T. 162, pp. 520—521.
- 1923 *Indricotherium asiaticum* n. gen., n. sp. Mémoires de la société géologique de France Paléontologie. Tome XXV, fasc. 3.
- Chow, M. C. 1958 Some Oligocene Mammals from Lunan, Yunnan. *Vertebrata Palasiatica*. Vol. 2, No. 4, pp. 263—267.
- Chow, M. C. et Xu Y. X. 1959 *Indricotherium* from Hami Basin, Sinkiang. *Vertebrata Palasiatica*. Vol. 3, No. 2, pp. 93—96.
- Cooper, C. F. 1911 *Paraceratherium bugtiense*, a new Genus of Rhinocerotidae from the Bugti Hills of Baluchistan. *Ann. and Mag. of Nat. His.*, ser. 8, N. 43, pp. 711—716.
- 1913a *Thaumastotherium osborni*, a new Genus of Perissodactyles from the upper Oligocene Deposits of the Bugti Hills of Baluchistan. *Ibid.*, ser. 12, N. 67, pp. 376—381.
- 1913b Correction of generic name. *Ibid.*, p. 504.
- 1924a *Baluchitherium osborni*, (syn. *Indricotherium turgaicum*) Borissiak. *Phyl. Trans. Roy. Soc. London*, ser. B, 212, pp. 35—66.
- 1924b On the Skull and Dentition of *Paraceratherium bugtiense*: a Genus of aberrant Rhinoceroses from the lower miocene Deposits of Dera Bugti. *Ibid.* pp. 369—394.
- 1934 The Extinct Rhinoceroses of Baluchistan. *Ibid.* 223, pp. 569—616.
- Granger, W. et Gregory W. 1936 Further notes on the Gigantic extinct Rhinoceros, *Baluchitherium*,

- from the oligocene of Mongolia. Bull. Amer. Mus. Nat. His. LXXII, art. 1.
- Matthew, W. D. et Granger W. 1923 The Fauna of the Houldjin Gravels. Amer. Mus. Nov. N. 97.
- Matthew, W. D. 1924 Notes to the Osborn's art., 1924.
- Osborn, H. F. 1923a *Baluchitherium grangeri*, a giant Hornless Rhinoceros from Mongolia. Amer. Mus. Nov. N. 78.
- 1923b The extinct giant Rhinoceros, *Baluchitherium*, of Western and Central Asia. Nat. His. N. Y., vol. 23.
- 1924 *Serridentinus* and *Baluchitherium*. Loh formation Mongolia. Amer. Mus. Nov. N. 148.
- 1929 *Embolotherium* gen. nov., of the Ulan Gochu, Mongolia. Amer. Mus. Nov. N. 353.
- Pilgrim, G. E. 1910 Preliminary Note on a revised Classification of the Upper Tertiaries of India. Rec. Geol. Surv. Ind. XL.
- 1912 The vertebrate Fauna of the Gaj series in the Bugti Hills and the Punjab. Mem. Geol. Surv. Ind. Palaeontologia Indica, N. S., IV, Mem. 2.
- Simpson, G. G. 1945 The principles of classification and a classification of Mammals. Bull. Amer. Mus. Nat. His., 85.
- Teilhard, de Chardin P. 1926 Description de Mammifères tertiaires de Chine et de Mongolie. Ann. de Paleont., XV.
- Wood, H. E. 1938 *Cooperia totadentata*, a remarkable Rhinoceros from the eocene of Mongolia. Amer. Mus. Nov. N. 1012.
- Young, C. C. & Chow M. C. 1956 Some Oligocene Mammals from Lingwu, N. Kansu. Acta Palaeontologica Sinica, Vol. 4, No. 4, pp. 447—459.
- Борисяк, А. А. 1916 О зубном аппарате индрикотерия. Изв. "АН СССР" 6-я сер. 10, № 5, стр. 343—348.
- 1917 Остеология индрикотерия. Там же 11, № 4, стр. 287—299.
- 1924a *Indricotherium* and *Baluchitherium*. "Докл. АН СССР", июль-сентябрь, стр. 148—149.
- 1924b Новые материалы по подсем. Indricotheriinae Boriss. Изв. РАН, 6-я сер., 18, стр. 127—150.
- 1926 О зубном аппарате *Paraceratherium*. "Ежег. Рус. Палеонт. об-ва" 6, стр. 104—105.
- 1948 Обзор местонахождений третичных млекопитающих СССР. Тр. ПИН, XV, выш. 3.
- Громова, В. И. 1959 Гигантские Носороги. Тр. ПИН, LXXI.
- Павлова, М. 1922 *Indricotherium transouralicum* n. sp. provenant du district de Tourgay. Бюлл. МОИП, отд. геол. новая сер., том XXXI, стр. 95—117.

GIANT RHINOCEROS FROM LOPING, YUNNAN, AND DISCUSSION ON THE TAXONOMIC CHARACTERS OF *INDRICOATHERIUM GRANGERI*

CHIU CHAN-SIANG

(Institute of Vertebrate Palaeontology and Palaeoanthropology, Academia Sinica)

(Summary)

The few fossils of giant rhinoceros described here were found in Loping district, eastern Yunnan, in 1960. Besides a description of the new material, the problems on the specific limit of *Indricotherium grangeri* and its relationship with *I. transouralicum* are also discussed in this paper.

(I) Description of the Loping Fossils

Indricotherium intermedium sp. n.

(Pl. I, 2—3; Pl. II)

Material: Types—A right M^2 , three astragala and a distal end of lateral metacarpal (V2643₁₋₃). Referred specimen—A right astragalus (V2371) from the same locality described by Chow and Xu in 1959.

Specific Characters: *Indricotherium* of moderate size, more progressive than *I. parvum*, but less than all others of known species of the genus.

M^2 (Pl. I, 2)—Evidently more progressive than that of *I. parvum* in being larger in size, with higher crown and more developed antecrochet. It is as a whole smaller and more primitive in structure than *I. grangeri*.

Astragala (Pl. II; Tab. 1)—General outline of the bones is undoubtedly of *Indricotherium* type. It is characterized by its narrowness, the approximate symmetry of both halves of trochlea and the concavity of the coracoid facet (Pl. II cor.), articulating with the process coracoideus of calcaneum. But some more subtle features, such as the nearly obtuse angle, formed by coracoid and a small additional facets (Pl. II cor., af.), the considerable width of the astragalus at the level of trochlea and the ribbon-shaped cuboid facet (Pl. II cub.), show resemblance to those seen in *Paraceratherium*. And, probably, those characters ought not to be considered as diagnostic of *Indricotherium*, as suggested by Prof. Gromova. The specimens from Yunnan are rather smaller, higher and generally more primitive in structure.

Distal end of the lateral metapodial (Pl. I, 3) has two asymmetrical articulating facets for sesamoid bones, the left one being deeper. So it is difficult to determine whether it is the fourth left, or the second right metacarpal, or metatarsal. Judging from its stoutness, it probably belongs to a fourth left metacarpal. The crest, separating two facets for sesamoid bones, is rather sharp. The distal cross-section is nearly square (width—67 mm.; thickness—71 mm.). Its greater thickness may be considered as a primitive

character.

Remarks: In China so far five species have been described as giant rhinoceroses: *Fostercooperia totadentata* Wood, 1939; *Indricotherium parvum* Chow, 1958; *I. intermedium* sp. n.; *I.* (= *Baluchitherium*) *grangeri* (Osborn), 1923 and *B. mongolensis* Osborn, 1924. The systematic position of the first species is still unsettled. As to the *B. mongolensis*, it is certainly not a giant rhinoceros at all (see the Matthew's addendum to Osborn's description). For the other three they seemingly represent different stages of one continuously developed phyletic line, at least morphologically: *I. parvum* → *I. intermedium* → *I. grangeri*.

I. parvum is the most primitive species of the genus. With exception of P² and P³, all the specimens described by Chow are very similar to those of *I. grangeri*. P² (Chow, 1958: Pl. I, Fig. 4), with a considerably low degree of molarization, is opposite to that for genus *Indricotherium*. P³ (Pl. I, Fig. 3), without a hook-like protoloph, but with a special "crista" and a "crochet". They ought to be removed from the types of *I. parvum*. In P⁴ (Pl. I, Fig. 2) the external wall of ectoloph is comparatively flat and rather convexed; protoloph, connected with hypocone, is hook-like; hypocone is larger and the internal end of metaloph is always directed forwards. All these characters show a great similarity between P⁴ of *I. parvum* and that of *I. grangeri*. M² is also very similar to that of *I. grangeri*, but, as in the case of P⁴, it is smaller and more primitive, too. In lower teeth no strong tubercles is developed in the middle of the external wall as in *I. transouralicum*. The great similarity in structure shows that it is phylogenetically more or less closely related to *I. grangeri*.

The above described transitional characters of *I. intermedium* from Loping clearly indicate that this new species probably is a linking form between the two former species. The fossil bearing deposits can also be provisionally considered as Middle Oligocene or uppermost part of Lower Oligocene.

Indricotheriinae gen. et sp. indet.

Another specimen (a lower right incisor) from Loping, markedly distinguished by its truncated top resulted from wearing and the extreme development of tubercles on its inner side, belongs evidently to this group. It is structurally in accord with the diagnosis given by Gromova for *Paraceratherium*. However its affiliating to *Paraceratherium* is not sure, for this genus is apparently later than *Indricotherium* in occurrence (usually latest Oligocene and later).

(II) The Problems of the Morphological Range of *Indricotherium grangeri*

Almost all the fossils of giant rhinoceros discovered in China were formerly included in a single species—*I. grangeri*, though at the same time many palaeontologists had expressed their doubtness (see T. de Chardin, 1926; Chow and Xu, 1959). Actually some of those specimens described can hardly be included in *I. grangeri*.

In 1926 Teilhard de Chardin described a typical form of *I. grangeri* and a smaller one from Ordos. However many of the osteological and odontographical characters show that these two forms, in all probability, belong to the genus *Paraceratherium*, especially

their cuneiform bone and astragalus which show close similarity to those of *Paraceratherium*. Probably they just represent two different species of *Paraceratherium*, but not of *Indricotherium*.

Among fossils described by Granger and Gregory (1936) there are one metapodial and a fragment of posterior part of skull of extreme large size (grade I). There is obvious interruption in size between grade I and grades II—IV (this is *I. grangeri* proper in our sense), if not counting the metapodial of *I. asiaticum*, placed among them (see Granger and Gregory 1936: Figs. 44—45). Probably Osborn was right in pointing out that there was a larger and probably more progressive species in Urdyn-Obo, the very area, where specimens of grade I was obtained. It is not impossible that Osborn's point of view is more reasonable than that of Granger and Gregory who assembled all these forms in a single species, *Baluchitherium grangeri*.

A lower jaw and some upper and lower cheek teeth of giant rhinoceros found from Hami, Sinkiang, described by Chow and Xu (1959), were believed to be a new species, but had been referred to the genus *Indricotherium* (*I. cf. grangeri*). Reexamination of the material indicates that it belongs rather to genus *Paraceratherium*. Because in M^3 , the internal border of protocone is somewhat flat, with a shallow groove at its base; antecrochet is strongly developed; cingulum almost surrounds all the anterior and internal sides of the tooth. In lower premolars there is no trace of tubercles in the middle of the external wall at all. Since no teeth of Indricotheriinae are with such high crown and lengthened to such an extent as in Hami form: P^4 is one fifth longer than the longest in all known indricotheres; M_1 —a little less than one third and M_2 —a little more than one third, therefore we considered it to be a new species of genus *Paraceratherium*, and thus a new specific name, *tienshanensis*, has been given to this most progressive form of the indricotheres.

(III) Validity of *Indricotherium grangeri* as a distinct species

Professor Gromova in her recent monograph (1959) supposed that *Indricotherium grangeri* is a synonym of *I. transouralicum* which is the only known species of the genus *Indricotherium*, but Chow and Xu preferred to consider *I. grangeri* as specifically distinct (1959). The present author personally agrees with the latter opinion.

Upper incisors of *I. grangeri* are stronger (see following Tab.), and with a straight downwards directed tip, while the corresponding teeth in another species are smaller and with the tip directed downwards and somewhat backwards.

Measurements (in mm.)

	Length	Cross section	Circle
<i>I. grangeri</i> (type)	100	58 × 76	200
<i>I. transouralicum</i> (Pavlova, 1922) (Gromova, 1959)	75	47 × 62	150

Upper premolars of *I. grangeri* with flatter and rather convexed external wall of ectoloph. Hypocone of P^3 and P^4 larger, placed more externally (labially) than protocone, therefore the protoloph, is in connection with the hypocone posteriorly, and hook-like.

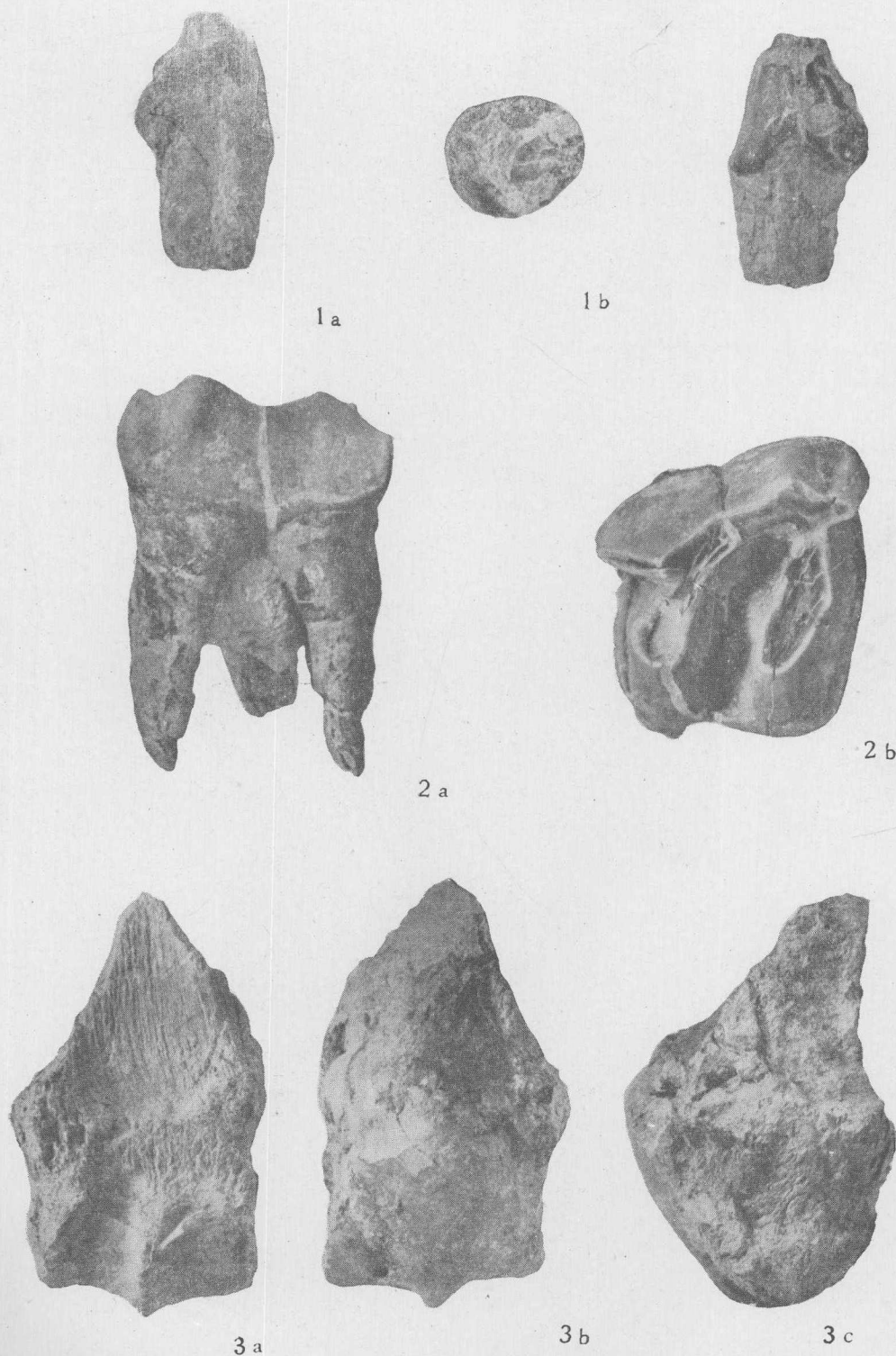


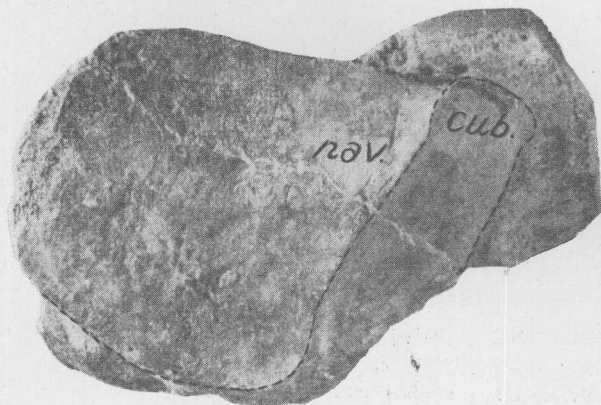
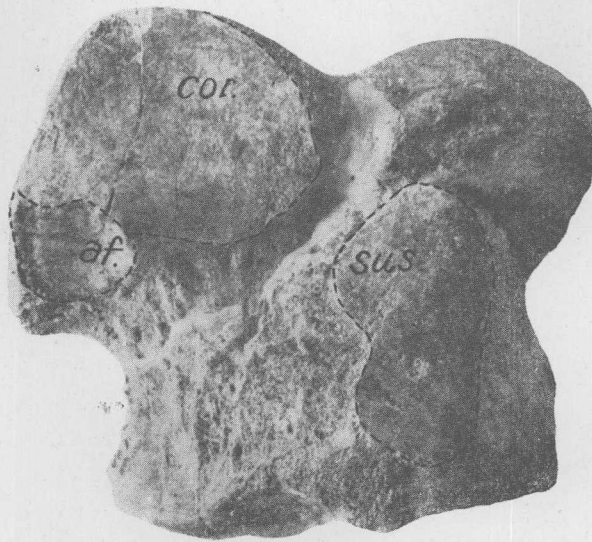
图1. *Indricotheriinae* indet. 右下第一門齿, $\times 1/2$ 原大, V. 2642.

1a, 上視; 1b, 前(頂)視; 1c, 下視。

图2—3. *Indricotherium intermedius* sp. n. $\times 1/2$ 原大

2. 右 M^2 , V. 2643₁. 2a, 外側視; 2b, 頂視。

3. 第四左掌骨远端(?) V. 2643₅. 3a, 后視; 3b, 前視; 3c, 外側視。



Indricotherium intermedium sp. n. $\times 1/2$ 原大 V. 2643₂.
上, 前視; 中, 后視; 下, 底視。

P⁴ is especially wide, having a width index $\left(\frac{\text{width}}{\text{length}}\right)$ of about 150%. Upper premolars of *I. transouralicum*, on the opposite, are with more distinct parastyle-fold and paraconic rib; smaller hypocone, the hook-like form of protoloph, which is connected to hypocone, but is not distinctly shown. P⁴ is comparatively narrower, its width index being only about 135%. In *I. grangeri* there are no markedly developed tubercles in the middle of the external wall of lower premolars, as in *I. transouralicum*.

There are also some differences in the structure of some bones (see Tab. 2). The humerus of *Indricotherium grangeri* has more obvious tuberositas deltoidea; Crista on external half of trochlea less sharp, and the transversal axis of trochlea nearly horizontal. In *I. transouralicum* the same crista is distinctly expressed and the axis turns sharply downwards externally. *I. grangeri* has comparatively long radius and ulna (see Tab. 2). In *I. grangeri* the femur is proportionally long in comparison with its own tibia and fibia (see Tab. 2) and its proximal caput bent less inwards than in *I. transouralicum*. Astragalus of *I. transouralicum* is in general proportionally higher, and its metapodials usually one fifth longer than that in Chinese form.

Some of above mentioned characteristics of the Russian species had already been pointed out by Granger and Gregory (1936), but they considered these distinctions as in correlation with different size grades. We consider the above cited differences are specific distinctions. *I. grangeri* seemingly, with its more specialized upper incisors and heavy and more straightstanding posture of feet, is more progressive.