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# 中国湖北、贵州的幻龙*

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近几年来，发见了一些新的保存比较好的幻龙化石。这些化石大大加深了我们对于幻龙的认识。现将这些化石在本文加以记述。

## 化石描述

**亚目 肿肋龙 Pachypleurosauroidea**

**属 贵州龙 *Keichousaurus***

***Keichousaurus yuananensis* 新种**

(图版 I—II)

**正型标本** 一块石灰岩上的印模，保存有体躯的大部分。头、大部分颈和尾缺失。肩胛带和前肢，腰带和后肢的大部分可以鉴定。野外号 F. 19。室内编号 V. 2799。

**层位与地点** 中三迭统下部，嘉陵江石灰岩、湖北远安西北望城岗。(插图 1)

**特征** 比胡氏贵州龙至少大约一倍。背脊椎数约 19—20。坐骨脊椎 (?) 3。肩胛带和腰带很近似胡氏贵州龙。只有坐骨外缘较弯曲。肱骨微有弯曲，远端未加宽，比股骨长。尺骨也似较宽，比桡骨短。

**描述** 此标本由湖北地质调查队第五队第一支队采集，由北京地质学院送交研究。全标本为在深灰色石灰岩上的一印模。保存面为风化面，作黄色。自颈脊椎后部以至尾前部大部保存。这一部分的各部骨骼，可由印模比较清楚地认出，但也有一些部分由于风化，或者界限不太清楚，或者难以十分肯定。这个标本，在被采集前，必长期暴露受风化。

由原石模判断，身躯暴露的为腹侧。

脊椎 保存的脊椎印痕大体为：7 颈脊椎，19—20 背与腰脊椎，3 或 4 荐骨脊椎，4 个尾前脊椎。前四个受节理影响很残破，微向右侧。后三个颈脊椎受风化特烈，不能判别其界限。紧位于两乌喙骨前的两脊椎比较清楚。以后的脊椎由于肋骨与腹肋的掩盖，也不清楚，其大致数目仅可由两边的肋骨肯定。荐骨部分由方解石脉横穿，大受变动，其数目只能由腰带骨长度来判断，极可能只有三个。尾脊椎由坐骨后缘计算。最后一脊椎，只有前部保存。总的说来，脊椎骨的数目，与胡氏贵州龙接近，而比幻龙其他属少。

肋骨与腹肋 颈肋短而尖，不甚明显。右侧各肋骨保存较好，左侧后部几个未保存。肿大现象显著，特别是中段者如此。由模型判断(特别是制的正型)(图版 II)，所有肋骨的近端，只有一头，只有前部的几个，其近端稍宽一些。肋骨末端，未见有加粗现象。

* 1965年8月20日收到。

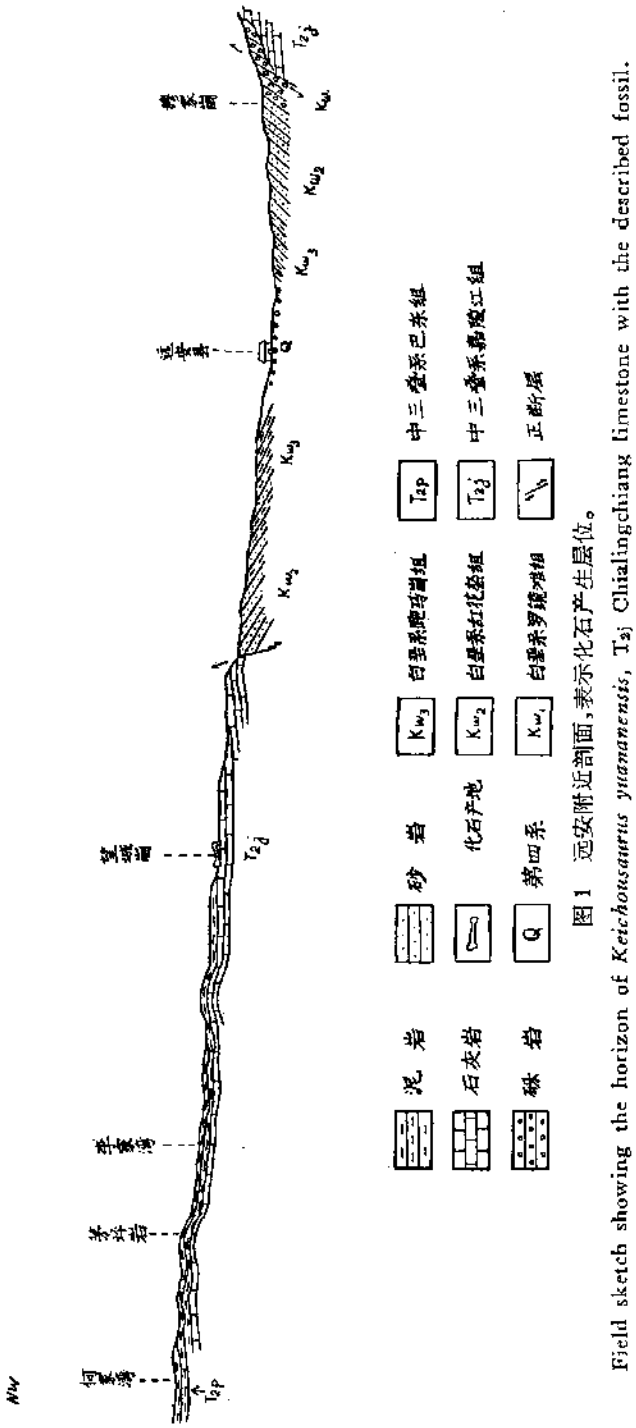


图1 远安附近剖面，表示化石产生层位。

Field sketch showing the horizon of *Ketchousaurus yuananensis*, $T_2j$ Chialingchiang limestone with the described fossil.
(After C. Woo, 1963)

脊椎两侧，腹肋很发育。

在左侧至少有两个荐骨脊椎可见。侧边和肠骨接触处作断切状。

尾脊椎两侧的肋骨也显著可见。

肩胛带与前肢　肩胛带方面，两乌喙骨保存很好，位于原来位置，两骨中间接合很清楚。其轮廓很象贵州龙，无甚特别之处。在两侧的乌喙骨之上，和肱骨近端上部有一深洼（在正模为凸出部分），可能是肩胛骨的近端。在右侧，有长而宽的骨和脊柱成斜角，当为

锁骨。左侧由于岩石破损，不很清楚。未见有清楚的间锁骨。如果上述的锁骨可靠(看来无问题)，我们标本的肩胛带前部有些象其他幻龙，而和胡氏贵州龙不太相同。

肱骨　两肱骨之印模均保存。所示为前腹侧，此骨只微有弯曲，比股骨为长，远端也未见任何加宽现象。长 38 毫米。桡骨在两边隐约可见，而尺骨只有左侧较可辨，也似较宽。两骨比肱骨特短。在两侧有一些掌骨和指骨的痕迹，但已凌乱，原来位置，很难辨清，这些骨都比较纤细。

腰带与后肢　左侧腰带保存较好。紧在左股骨近端，肠骨、耻骨和坐骨部分地可看出。耻骨的远端不很清楚。而肠骨只有近端较明显。坐骨的近端收缩很显著，远端边缘也不太清楚。这三个腰带骨位置少有变动。至少就耻骨和坐骨的形状看，和贵州龙很近似。

股骨　左侧完整，而右侧只有近端可见。很瘦细，比肱骨为短，长 32 毫米，与肱骨之比例很近于贵州龙，但更为明显。

股骨以后的骨全未保存。

表一．重要尺度测量(单位：毫米)

| | |
|---|---|
| 保存长 | 217 |
| 背部长 | 145 |
| 坐骨下之躯体宽 | 48 |
| 肱骨长(左) | 37 |
| 股骨长(左) | 31 |
| 肱骨与股骨比 | 118(84) |

**鉴定与讨论**　虽然这块标本没有头部保存，但由已保存各部分来看，可以归之贵州龙属。在比例上，远安的肱骨比股骨还要长一些，也较宽而直，而远端未加宽。虽然可以说，多数已知胡氏贵州龙为较幼年个体，但是远安的标本还是特大。我们认为远安标本，可列入贵州龙属，但另立一种，名曰远安贵州龙，新种。此新种的特征已见上述。

## 胡氏贵州龙的一些新材料

(图版 III)

当研究本文的材料时，我有机会能看到一些胡氏贵州龙的新材料，这是北京地质学院采集的，由该院李凤林先生代作出以下的观察。这些标本的地点与层位和前记的胡氏贵州龙相同。

一共有十一个正的和负的标本，代表八个个体。只有三个具有头部(一个只有后部保存)。这八个个体，代表不同年龄，其保存状况，完全与前者相同。有些标本还埋于岩石中，但体躯轮廓清楚可见。

首先要讨论的就是由孔施乃德 (Emil Kuhn-Schnyder, 1959) 所提出的关于这一种的颞颥孔大小和形状问题。新材料中以 St. V004 (北京地质学院编号，下同) 那一成年个体的头最能说明问题。这一头骨除了只向右侧微有错动，右边眼眶和眼后部稍损伤了一点外，总的说来，是保存非常完好的(图版 III)。这一头骨的各部的位置和比例和正型标本，完全一样。另外一标本 (St. V0019) 的头骨后部背侧保存很好，颞颥孔也比眼孔略小，而前后拉长。此外还保存有年幼个体 (St. V009) 肩胛带以前的部分，也具有同一性质。

由这些新材料来看，胡氏贵州龙的头的各部分位置和大小大体上和肿肋龙相似，当然也有一些重要的区别。头骨最宽处位于眼眶后部都很明显，而向后逐渐变窄。由新材料的研究，也很清楚的就是所有观察到的胡氏贵州龙大多数标本，包括正型标本都是成长的个体，只有 St. V009 那一个，是真正的幼体。

至于各脊椎的数目，不是那么清楚。在前一文中所指出的为：颈 20；背 20；荐骨 3 或 4；尾 37 以上。在这些新材料中，St. V004 颈部显然较长，有 24 个脊椎。但对照着它的负印模来看，不能完全肯定，是否石板断处结合有无问题。这一标本，背脊椎只有 15，而荐骨可能为 4（尾缺失）。幼体（St. V009）的颈脊椎约为 23—24，St. V0019 的脊椎保存最全，但有些地方不很清楚。其数目是：颈？22；背 19；荐骨 3；尾 35 以上。其他标本，多数保存不好，只有一个，其背脊椎可能为 19，而荐骨为 3 或 4。总而言之，看来也和肿肋龙一样颈脊椎和背脊椎的数目有些出入。其荐骨数目一般不超过 4，少于其他幻龙。

肱骨和股骨的比例，大体上和前述的差不多。只有幼体的 St. V009 的肱骨好象稍比股骨为短，但远端并未加宽。尺骨虽然不如以上标本之显然，但也比较稍为加宽。手骨和脚骨的保存不太好（正型标本的肱骨与股骨比率为 $\frac{11 \times 100}{15.3} = 72$）。

总的说来，北京地质学院的新标本，增加了我们对于胡氏贵州龙的认识，证明以前所述大体正确。

## 贵州龙的系統分类位置

在 1958 年叙述胡氏贵州龙曾基于头骨构造，特别是小的颞颥孔，把它当作属于肿肋龙一科。1959 年孔施乃德把贵州龙归入豆象龙科（Lariosauridae）。他主要和豆象龙相比，主要根据四肢骨一些性质。许耐归之扁鼻龙科（1959），主要根据前后肢的比例等。重新观察了胡氏贵州龙的正型标本（V. 952）可以断定这个标本完全正常，即使有些挤压，颞颥孔的形状也不会改变太大。由此，可得出胡氏贵州龙主要特性之一是颞颥孔小的结论。

我们有了采自同一地点同一层位的同一种龙，进一步证明了上边的说法。三个新的头骨，包括老年的、幼年的，其头骨性质以及各孔的大小等都是一样的。但同样要指出的贵州龙绝不完全同于肿肋龙。后者的颞颥孔还要小一些，鼻孔也不是三角形的，此外还有其他细节不同。显然贵州龙的头骨和上述其他两科的属大不相同。

很明显，只要我们把头骨的性质当作区别幻龙各科的主要性质的话，贵州龙放于任何已知科中都不合适。因此建议把贵州龙当一独立科的代表，叫作贵州龙科，归于肿肋龙亚目。在以后讨论整个肿肋龙亚目和幻龙亚目时，还要再涉及这个问题。

### 扁鼻龙科 Simosauridae

### 兴义龙 *Shingyisaurus*，新属

### 意外兴义龙 *S. unexpectus*，新种

（图版 IV 和 V；插图 2）

**正型标本** 一受了挤压的头骨，带有五个颈前部脊椎。地质博物馆编号 Vm. 1308，

本所模型号码 V. 2800。

**层位与地点**　中三迭统下部（关岭组）。贵州兴义，顶效大寨。与胡氏贵州龙同一产地。

**特征**　见后结论部分。

**描述**　头骨　此标本连同其他一些化石由地质博物馆胡承志送来作鉴定。当送来时只有五个脊椎和头骨的腹侧中部暴露，被认为是属于荐骨部分。张广义采用醋酸将腹侧背侧均修得很好。虽然受了挤压，但这是至今在兴义发见的唯一属于另一类的很好幻龙头骨。化石包于薄层灰黑色石灰岩中。不幸的是没有可靠证据说明原来那一边代表向上的一面。其和胡氏贵州龙的上、下关系也不清楚。只可以说在同一群或组中，比贵州龙也可能稍老一些或新一些。

化石本身纯黑色，为若干（背八腹七）方解石脉横斜切断。当为造成挤压之主要原因。头骨腹侧保存较好，后部几完全无恙。右侧的方骨和下颚骨损破。头骨前部很強烈地向右侧推展（从腹侧看）因而左侧较长，而右侧当近于原来长度。大约离前端约 25 毫米处为方解石脉切断，头骨的这一部分，很受损坏。

头骨背侧的前左部分几乎完好。甚至右边的眼前部分，也保存的较好。头骨后部（在左眼眶后边缘后，和右眼眶前边缘后）受挤压烈。右鼻孔虽有变形，但还可看出轮廓，也与原来位置差不多。右眼孔大大受了变动向后拉长。左颞颥孔的前部几乎和原来一样，但其后部向后向外挤的很利害，也很拉长。右颞颥孔受挤压更甚，其外边几难辨认。头顶孔后部分也受挤很烈。在这些地方，骨与石的界限几混在一起不能辨别。

由头骨上下的变形状况和方解石脉的方向和宽窄看，似乎受变动的力量是从右上侧来的，头的上侧后部也受了挤压，而腹侧后部和附带脊椎几未受变动。骨头完全石化炭化。

因为头骨的相当多部分受挤尚少，因而对于原形认识不太困难。其复原图见插图 2。但由于骨头受了一些变质，而且颜色很深，大多数缝合线无法辨别，其可认出的也见同一图。以下描述主要根据原来保存的样子。另以复原图作参考。

头骨中等大小，具有圆钝的三角形轮廓。前端较宽作断切状，而不是尖的，鼻孔较小，作椭圆形，约位于头骨前边缘和眼孔前边缘之间。左长 10.5 毫米，宽 7 毫米，左眼孔也为椭圆形，比鼻孔大的多。长 26 毫米；中宽 18 毫米，后部比前部略宽。虽然为一方解石脉所贯穿，但未太受影响。右鼻孔和右眼孔都受了变动。前者略向后向外推，而后者显著地拉长。左颞颥孔的前部几乎完好。前缘后宽 16 毫米，比眼孔为窄。不象幻龙其他多数属一样，前部外侧沒有伸出的弯曲部分。虽然后部受变动，但极可能和扁鼻龙一样，并不十分拉长，也比眼孔为窄。

除了额骨和顶骨处的一些缝合线以外，由于深颜色，缝合线不易区分。颞颥孔间的稜很窄，似未太受变动影响。顶骨孔实际上受损伤。但其存在和位置（在一低凹处）可以确定，即在顶骨较后部。

在腹侧，头的两边大部分为保存近于完全的下颚骨所盖。虽然骨间的缝合线不易确定，但大多数各骨，均当存在。右边的颞颥孔近于原来形式，而左边者较拉长。左额骨局部可见。颞颥骨间部分较宽，几全为翼骨所占。腭骨当很大。上颚骨大部分为下颚骨所

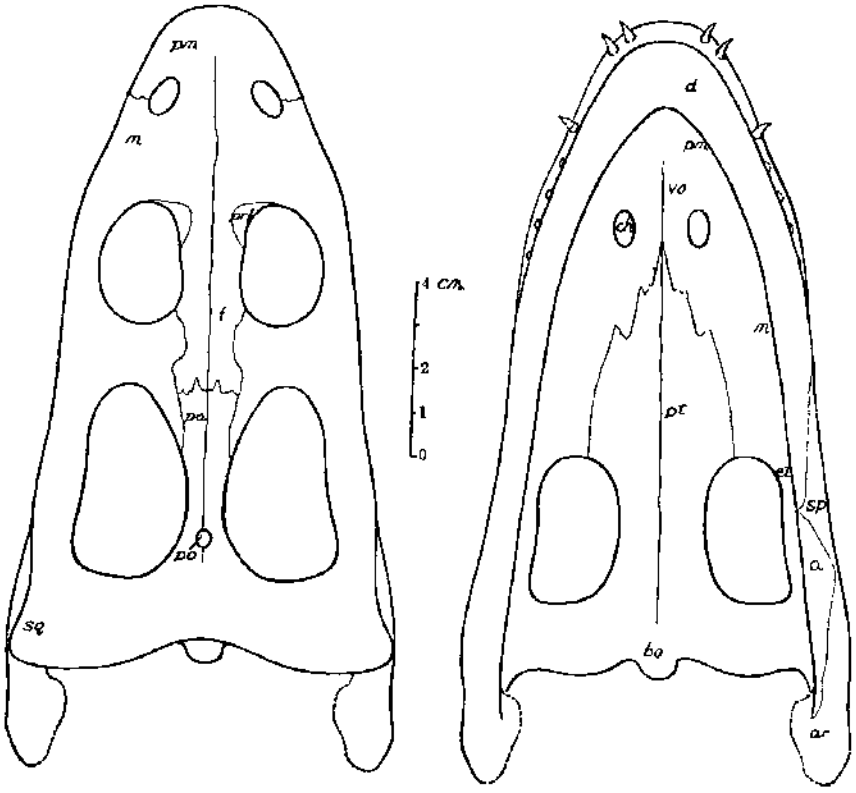


图2 意外兴义龙头骨轮廓，背视与腹视，1/2原大，详看正文 。

A tentative reconstruction of *Shingyisaurus unexpectus*, in dorsal and ventral aspects. For details see text. 1/2 nat. size.

盖。右内鼻孔保存很好，椭圆形，长7宽6毫米。左侧很受损坏向前推移。内鼻孔以前部分受变动较烈，也部分为下颚骨所盖。但就露出部分来说，前颚骨当较短。

头骨总长，149毫米；最宽处，90毫米；眼孔后宽，66毫米。头长与宽比60:40。

下颚　两下颚骨尚紧密地附着于头下部。同头骨一样，左侧移动较轻。右侧后部已破，左边者也不太全。至少在左侧隅骨的缝合线一部分可辨出。以后的关节骨也较清楚。下颚骨前部横的切断，但看来两者间的缝合线当不很长。

牙齿　左侧牙列的后部全被隐盖。但在左鼻孔外侧，有一保存很好的牙，几乎在原来位置。在同一孔之前，另有一移动了的牙，究竟为上牙或下牙，还不能决定。大多数右侧牙列均暴露。一共似乎16—18个牙，由牙孔或部分保存的牙为代表。看来牙的大小不一。唯一保存完好的一牙很细，具有粗的条纹，也很尖，和一般幻龙一样。长7毫米，根部宽4毫米。

颈脊椎　在头骨的枕骨后部，一共有五个脊椎。第一为环椎，其椎体之长为6毫米，宽9毫米。其两侧的小骨，可能为环椎的附属骨。环椎和第二颈脊椎都和肿肋龙的很象，只是较粗大一些。以后的两颈脊椎较长(13.5毫米)。在腹侧中间的有界于两侧直棱的小沟。在侧面和横突和副突接触的面可以看出。特别后一个很清楚。一些颈脊椎的肋骨也在其两侧可见(图版V)。保存的颈脊椎，只有前部保存，但有兴趣的是从后面可以看出神经弧的部分。背棘较低，总高为19毫米。

所有三个保存完整的颈脊椎椎心中部有收缩之象，但未看到清楚的肿骨现象。

**鉴定与讨论**　由以上描述，可以清楚地得出结论，即这个头骨应列入扁鼻龙科。较短的头骨，各孔的位置，特别是颞颥孔的不太长，以及较宽的嘴部，都是这一科显著的性质。所不幸的是头骨的缝合线大半不清楚，特别是头后骨骼，几等于无，也不知道肱骨和股骨的比例等，以证实或修正我们的看法。

另一方面，小的鼻孔及其位置，较窄的顶骨部分（特别是腹侧）和颈脊椎的一些性质都是这一标本所特有的。因此建议成立意外兴义龙（新属新种）一名。这是我国幻龙中这一科的首次发见。

**特征**　中等大小，头前部宽而断切。鼻孔小，位于头前缘和眼孔之间。颞颥孔间顶骨部很窄。牙小而具有粗条纹。颈脊椎腹侧有棱和中间沟，椎体中部收缩。

虽然这个标本产自与胡氏贵州龙同一地区，但和这一种的层位关系还不太清楚。至少两者的岩石性质不太一样。

这一标本的发见是相当出乎意外的，种名即示此意，也说明在兴义，还有其他未知的鳍龙类。

## 亚目　幻龙 Nothosauroidea
## 科　幻龙科 Nothosauridae
## 属　清镇龙 *Chinchenia* 新属
## 宋氏清镇龙 *Chinchenia sungi* 新种

（插图 3—6）

**材料**　一左下颚的前部，有五个牙，11 个颈脊椎，和 6 个腰与荐骨脊椎；肋骨碎块，和两荐骨肋骨；三右和两左乌喙骨；及其一些碎片；两右肩胛骨；四右四左肱骨（三个完全的），和一远端部分；一些前肢下部碎骨；肠骨与坐骨碎片；两右股骨近端，一远端；三左股骨（两个完全的）和四个远端；两后肢下部碎块。由这些骨判断，至少代表四个年龄不同的个体。

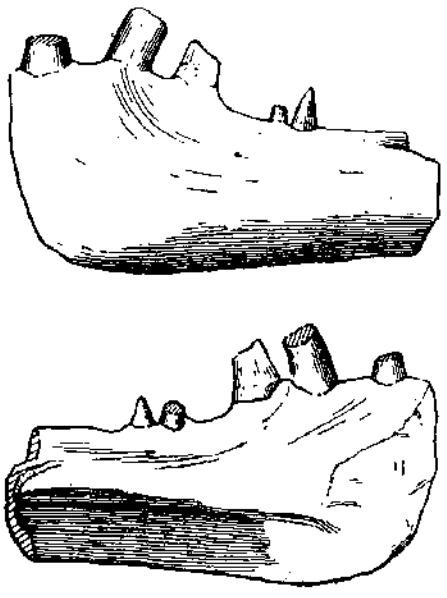


图 3　宋氏清镇龙左下颚。放大一倍。
Left lower jaw in lateral and inner aspects of *Chinchenia sungi*, 2× nat. size.

**层位与地点**　贵州清镇西七公里沧溪桥上铺，由袁振新与宋国珍于 1964 年秋采回。看来为一好地点，多数化石仅为从地面采集，V. 3227。照地方地质工作者的意见含化石的地层年代为中三迭世。

**描述**　由于清镇标本至少代表四个个体，而且多为地面采集，因此不可能分开每一个体的骨骼，只能一起来描述。由保存状况看，应为一富有幻龙的地点。骨的颜色由淡黄到深棕色，石化很强。

下颚骨　属于头骨部分的只有一左下颚的前

端。保存长为 24 毫米。下颚骨的前端，相当加厚，但缝合线并不很长。附有五个牙，但只最后一个完全。牙很尖，有条纹，和一般的幻龙牙相同。下颚的内面有深沟，较凸出。下边相当直。

脊椎骨与肋骨　一共有十七个脊椎骨。均仅有椎心为代表，另有少数神经弧和肋骨的断片。所有归于这一种的脊椎骨在大小上和前述的意外兴义龙差不多，但其腹侧光滑，因之两者肯定不能归于一种。由于侧面沒有副突关节，看来多数脊椎属于背部前部。保存有部分神经弧的那一脊椎，可能是背后部或腰部。其他可能为坐骨脊椎。其确切位置均不能判定。所有脊椎均在中间稍有收缩。为双凹。上部和神经弧接触的面，显示标准的幻龙脊椎十字形的样子。背棘很低。四个附图的脊椎之长为 12；11；12.5；和 11.5 毫米。

肋骨太破无描述必要。有些具有近端较宽的头。有些属于荐骨肋。

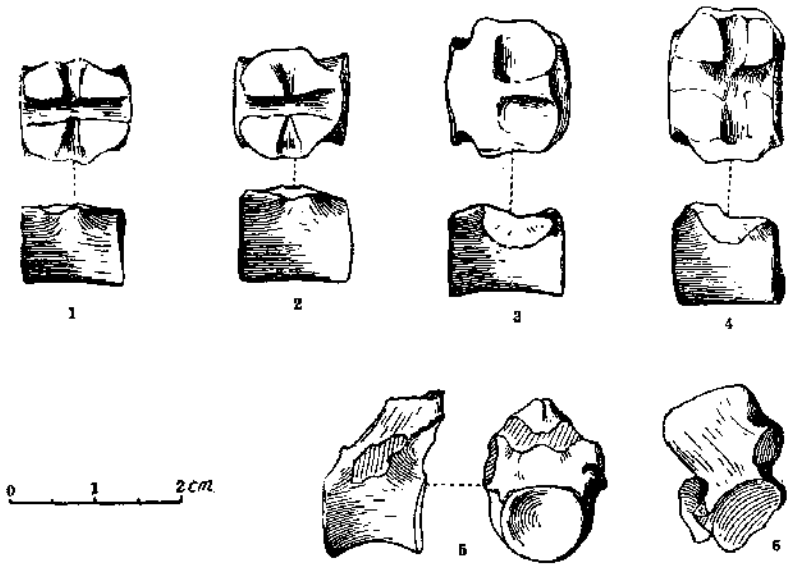


图 4　宋氏清镇龙的脊椎。原大，详看正文。

Various vertebrae of *Chinchenia sungi*. For details see text. Nat. size.

肩胛带与前肢　两右肩胛骨（或还有一破的左边？）保存很好。只有后部伸出的长棘末端残破。小的一个，代表一幼年个体。肩胛骨的样子和幻龙的很象。大的一个其内侧长棘的根部有一显著长沟。和肱骨、乌喙骨关节处之长与宽为 25 × 8.5 和 22 × 8。

共有三个右乌喙骨和一个左乌喙骨的远端（还有二小的未成长的）。保存较好的长 34 毫米，厚 6 毫米。和其他幻龙的乌喙骨一样，其远端有一很清楚的沟。这一种的乌喙骨比起以下要描述的那一种的要小得多。

未见有可归于锁骨或间锁骨的标本。

肱骨　计有左侧三完全的，和一近端与远端头。右侧，三近端，四远端。这些代表不同年龄，大小也稍有差别。稍有弯曲，两端相当扩展。一般形状很象 *Phygosaurus* 的，不必详叙。所有三个完整的肱骨均比以下描述的完整的股骨为短，所以可以肯定，这一种是属于短肱骨一类的。其余的中部只稍有扁平，长 61，58 和 56 毫米。近端宽 19，15 和 14 毫米。远端宽 20，16 和 15 毫米。中间长与宽 7 × 9；9 × 7；9 × 6 毫米。

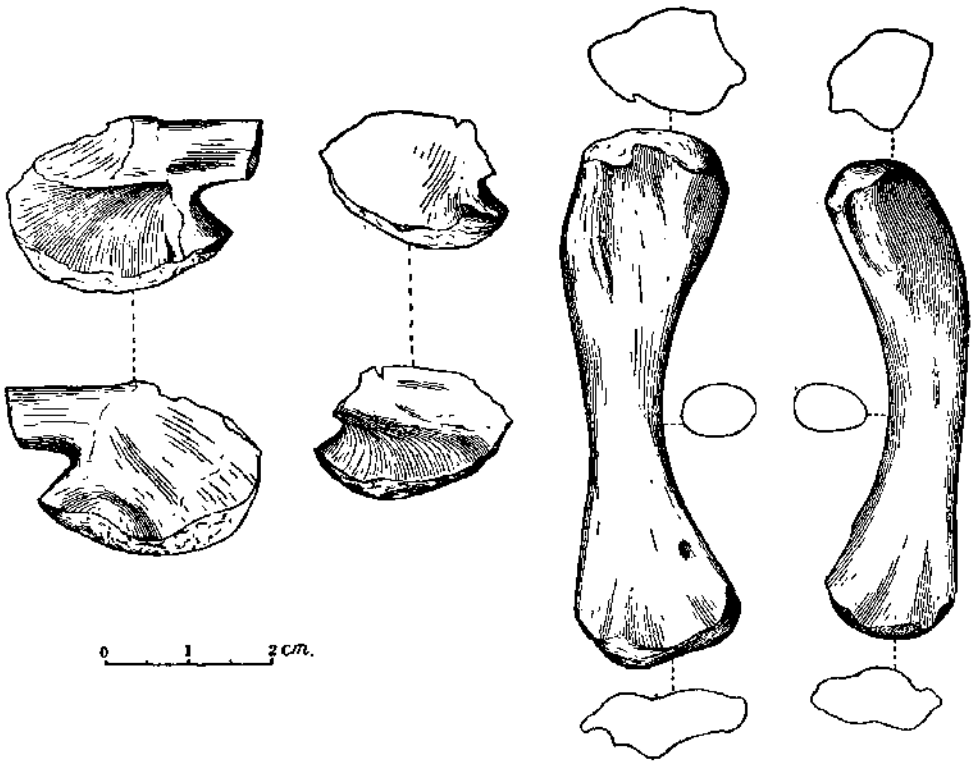


图 5　宋氏清镇龙的肩胛骨和肱骨。原大，详看正文。

Left two scapulae, right two humeri of *Chinchenia sungi*. For details see text. Nat. size.

另有两骨的近端可能为尺骨和桡骨。宽 13 和 14 毫米。后一个的顶端作三角状。

腰带与后肢　腰带部分保存很坏。肠骨只有近端一部保存，坐骨也只有近端和远端残片。所以都不值得记述。

股骨　左边有两完全的，两近端，一远端。右侧，三近端，一远端。有些近端可能为年轻个体，甚至可能当作股骨还有疑问。

两完全的股骨保存很好。长一点的只近远端处稍破。比肱骨细瘦而长。近端后内侧的磨蚀面不特别向下伸。远端只比近端稍窄一些，干部长而微有收缩。与胫骨和腓骨之接连面不甚分开。长 71 和 64；近端宽 15 和 15；远端宽 13.5 和 13.5 毫米。干最窄处，7 和 7.3。肱骨与股骨比：长者 86.9，小者 87.5。

腓骨　只有一远端，长 29 毫米，好象近端只有一小段破去，估计全长约为 40 毫米。当然比股骨为短，但不及其他幻龙如 *Paranothosaurus* 等。

胫骨　只有一近端，和一远端。但连不起来，不属于一个体。近端长与宽 8 及 10 毫米，远端 7 和 11.5 毫米。

**鉴定与讨论**　虽然以上描述的许多骨骼未能构成完整的个体，可是属于一种，实无疑问。此为一中等大小的动物，构造上和前述的几种幻龙以及下边要描述的另一幻龙都不一样。比起其他幻龙来，所有大的以及真的幻龙一属都当首先除外。不幸关于这一种化石未有头骨发见。但就其左下颚和牙齿性质，脊椎骨的性质，以及前后肢的比例等来看，清镇标本显然可属于幻龙科。

由于很难把清镇标本，归于任何已知属，建议名为宋氏清镇龙（新属新种），其特征

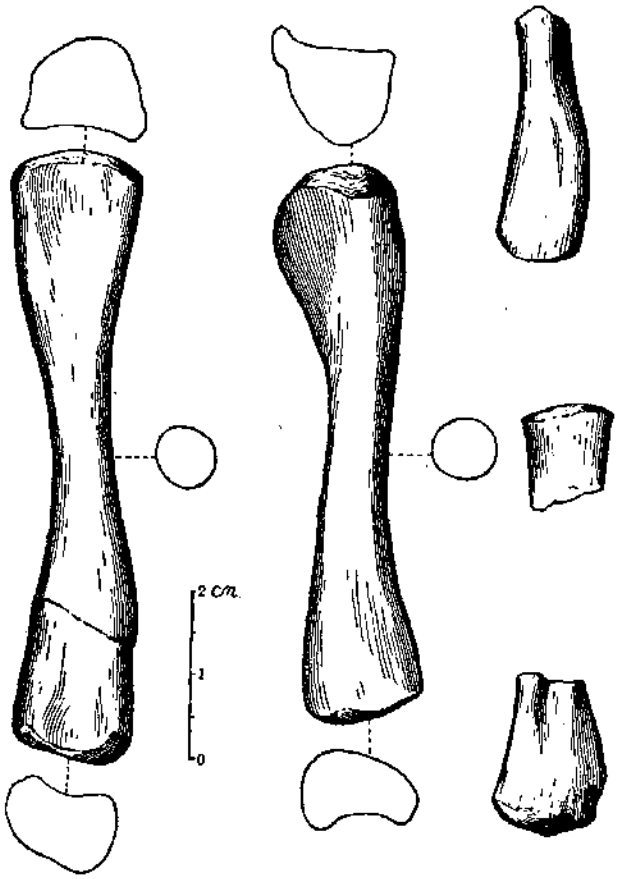


图 6 宋氏清镇龙的后肢骨。原大，详看正文。

Left and middle two femora, right fibula (upper) and tibia (proximal and distal end, lower) of *Chinchenia sungi*. For details see text. Nat. size.

如下：

中等大小，比大多数肿肋龙为大，但比多数幻龙为小。下颚骨前端加厚。缝合处短。牙大小不一，尖而具有微弱的条纹。脊椎骨腹面光滑，椎心不太伸长。肩胛骨为标准幻龙型，具有向后伸长突起。肱骨稍有弯曲，远端加宽，比股骨为短。股骨较细长。近端向下延伸面不大发育，远端面不太分开。

此种命名赠与我们的技工宋国珍。

从系统上说，我们把清镇龙归之于幻龙科，而认为距其他这一亚目的科较远。但由于材料还不够多而好，这个结论，也只能认为是初步的。

清镇含幻龙化石的层位还不太明瞭。地方地质工作者认为是中三迭统，未进一步划分。可能比贵阳三桥者为新。从化石看极有可能因两地化石不但种类不同，保存情况也不相同。

### 三桥龙 *Sanchiaosaurus*，新属
### 邓氏三桥龙 *Sanchiaosaurus dengi*，新种

(图版 VI, VII; 插图 7—12)

以邓氏三桥龙为本属的代表种，特征一致。

**正型标本**　头骨与下颚的腹侧印模，一个单一牙齿，若干头部碎骨和头后骨骼的大部分。V. 3228. 野外号 K64001.

**层位与地点**　中三迭统下部。贵州贵阳三桥金锺桥。

**特征**　见下鉴定与讨论部分。

**描述**　这一幻龙是 1964 年夏贵州地质局工作人员发见的。地点在贵阳城郊三桥附近金锺桥西南约 400 米的朱二桥附近公路旁发见的。据发见人讲，含化石的地层为一种灰色泥质白云岩。显然从风化面上露出。该局邓峯林引起我所对这个地点的注意，在这一年秋天，由我所正在贵州工作的袁振新和宋国珍加以发掘。发掘中邓君和其他人员多所协助。

但这标本在发掘前，已被严重破坏。发掘工作也不很理想。但尽管如此，还是采回来很多的骨骼。保存有头部腹侧的那一块石头，已经到研究室。其他骨骼都是单块采集的，计为：几个头骨碎片，28 个脊椎骨，一些完全的和破碎肋骨，肩胛带与前肢，以及腰带与后肢等。后者是这一动物保存最好的部分。

头骨与下颚　如前所述，头骨与下颚在采集前已被破坏。邓君所抢救的一些碎片，多数不易鉴定。一个可能代表颞颥孔旁之骨。另一个似为下颚骨的后端。第三块更难以确认。因此我们主要根据那块模印来判断。

含有这副模的石块，是头骨与下颚的腹侧。在此平面以上的骨，除那三块外，全被破坏。印模的原型见图版 VI，根据此所造的正模见图版 VII。

头骨的两侧边缘为下颚所盖，而中部颚骨及其周围显然可见。头骨的枕髁部分虽然受损，但其位置可以看出在两下颚间微隆起处。向前翼骨间的收缩部很窄，颞颥孔各骨间之缝合线当然很难看出，但很可能相似于其他幻龙。再向前，内鼻孔看的很清楚。为椭圆形前后伸长，其间的锄骨也很清楚。

整个头骨轮廓是一个很尖的三角形。前端到枕髁长为 182 毫米。前端至下颚后端为 200 毫米。最宽处近枕髁处，为 86 毫米。宽与长之比为 47.25。

下颚也很长。缝合线比较长，约为 31 毫米。总长为 188 毫米。缝合线后宽 37 毫米。通过枕髁处宽 103 毫米。

头骨的形状和 *Ceresiosaurus* 最近，但比这一属大的个体，还要大一些。

牙齿　沿模型的两边和前边有六七个大小不同的圆形轮廓，代表头骨的上牙。有的中间的孔隙尚可见。与三桥标本一起发见的还有单牙，显然属于同一个体。这一牙根部受压扁，但其条纹与尖的形状是标准的幻龙牙齿。

脊椎骨与肋骨　约有 28 个脊椎骨和一些肋骨。多数脊椎，仅为椎心，个别的具较完整的脉弧。有四个为颈中部，八个为颈后部或背前部。12 个大体上保存较好的背脊椎，具有脉弧全部或一部分，另外四个可能为荐骨脊椎。未见有尾脊椎，或仍在野外未采回。脊椎的数目，以及脊椎每一段的数目，未能确定。但由于三桥标本，很近于幻龙，其荐骨前脊椎可能为 45 上下，而荐脊椎为五。所有脊椎均双凹。到了研究室后，这些脊椎是分散的，所以在复原装架上的次序完全是想象的，不一定可靠。

颈脊椎比背脊椎稍小。四个中部颈脊椎较长，而以后的脊椎看来较短，乃由于加粗的缘故。前几个的横突和副突关节，很清楚地分开，少作棘状突出。上面和脉弧的断面，为

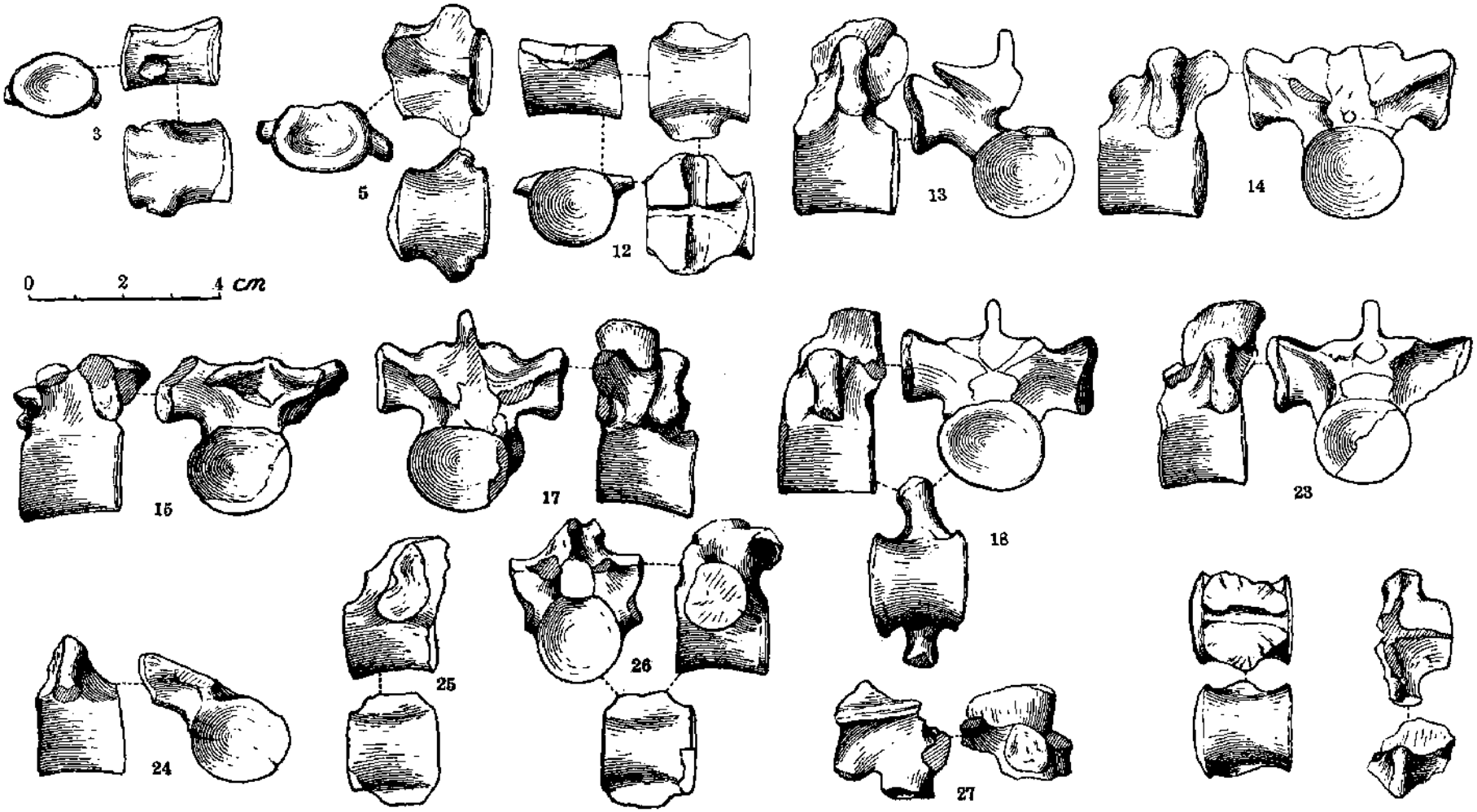


图 7　邓氏三桥龙的脊椎骨。2/3 原大，详看正文。右下角二脊椎为幻龙未定种 A. 4/3 原大。

Various vertebrae of *Sanchiaosaurus dengi*. The numbers marked indicate the serial number of the collected vertebrae and not the actual number of the column. For details see text. 2/3 nat. size. The two vertebrae on the right lower corner are Nothosauridae indet. A, 4/3 nat. size.

标准的幻龙形状。椎心长 20.5；高与宽 9 及 13 毫米。

除最后一节可能为腰后部或荐骨脊椎外，其他脊椎均为背或腰前脊椎。多数保存很好，且有脉弧，但背棘和前后突起均不太完全。多数脊椎具有将近合一的横突和副突关节。背棘特别低。六个附图标本大小如下（均毫米）：一长 21，21，21.5，21，18，及 17。横突间宽 42，41，48，44，41 及 48。后高 38，39，39，—，38 及—。背棘高 9，9，9.5，—，8.5 及—。

估计大约有 17 或更多的荐骨前脊椎缺失。主要约为颈前部，颈中部和腰部。少数背椎也可能不全。

只有两个荐骨脊椎只有椎心和不全脉弧保存，其他两个只以脉弧为代表。所有四个均显著的具有巨大的和荐肋接触的面。由这些面的大小看至少有一或两脊椎缺失。荐骨椎的椎心不大双凹，几近于平。具有大的肋骨面的那一个，可能为第二荐骨，而下一个缺失。具有脉弧的那一个，可能为第四个，脉弧很低，椎心长 17 及 19 毫米；背棘长与高为 19 与 9 毫米。

一共有 25 个大体完整的肋骨。另有许多断节，有的具有头。多数似属右侧，前后次序已很难辨清。装架所示的次序，十分主观，但可以表示其大小安排。自然仍有缺失。那些近端加宽远端变粗的，属于前部，其他远端未加粗，甚或变窄属于后部。两个最完全者（插图 8），直长 98，99 毫米；近端长与宽 16 及 8 毫米，11 及 17 毫米。另一个 10 及 7；10 及 9 毫米。

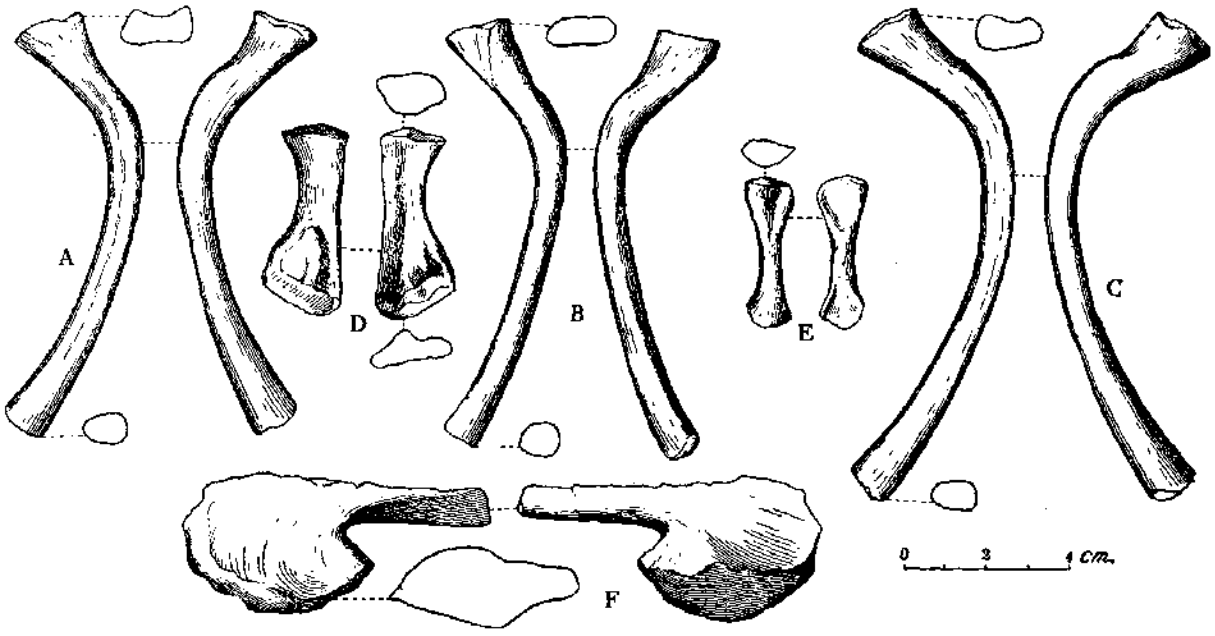


图 8　邓氏三桥龙肋骨（A—C）、荐骨肋骨（D—E）与肩胛骨（F）。皆为 1/2 原大，详看正文。

*Sanchiaosaurus dengi*. A—C, Three ribs in two aspects. D—E, sacral ribs. F, Scapula. All 1/2 nat. size. For details see text.

另外有两个短而宽的骨，可能当作荐肋骨。完全的一个长 43 毫米；近端宽 15 毫米；远端宽 18 毫米。另外一个可能为末一荐肋，但也有可能为手掌骨，长 37 毫米。

肩带与前肢　肩胛骨　右侧者很完整，只有向后伸的突起，尖端缺失。形状很象一般

的幻龙。只有上边稍直一些，内侧较凹入，外侧也稍微凹入。和肱骨接触面很显著。肱骨面长 42 毫米。从肱骨面到上缘，32 毫米。估计全长(从近端到突起末端)为 86 毫米。

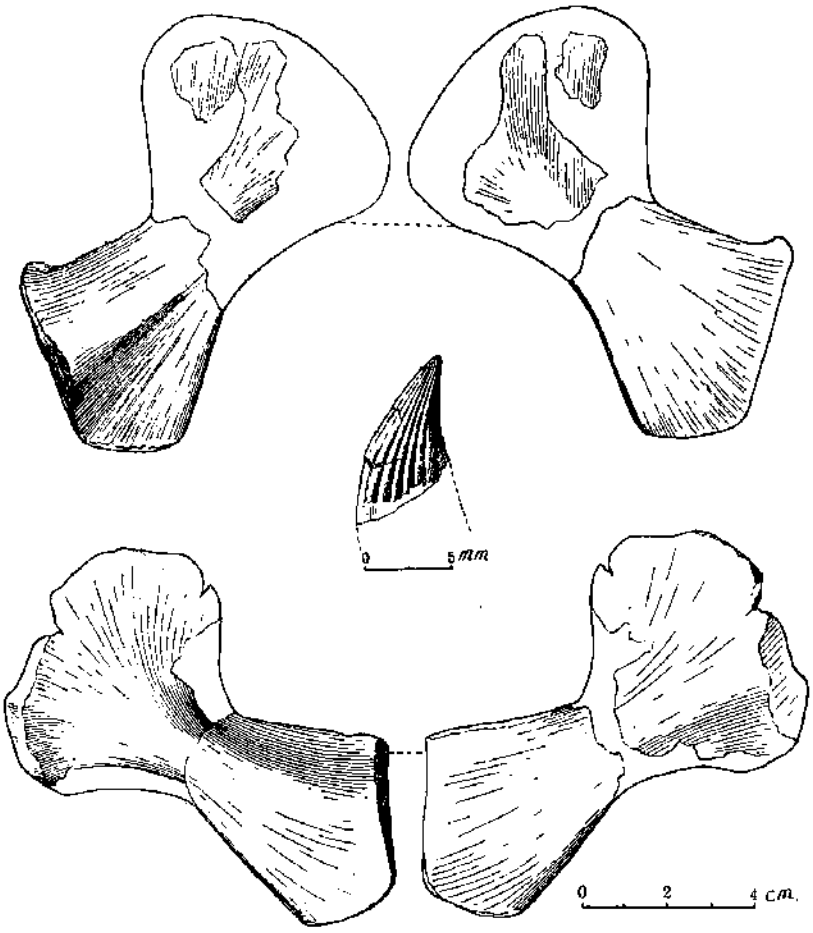


图 9 邓氏三桥龙的一单牙(中)和两乌喙骨。1/2 原大，详看正文。

A single tooth (middle) and two scapulae of *Sanchiaosaurus dengi* in two aspects. For details see text. 1/2 nat. size.

乌喙骨 两个均保存完整。右侧的近端稍损坏，但可由右侧加以整补。构造和幻龙相同。近端，特别和肱骨关节部，相当之薄。远端彼此接触处都十分厚，内侧很平，外侧有一隆起之脊。内侧弯度较深，外侧较浅。稍残缺的乌喙骨孔很小，总长 98 毫米，近端宽 60 毫米。远端宽 45 毫米，中部宽 24 毫米。

肱骨 两肱骨均完全，短而硕壮。中间主干部显得很短，其横切面不太扁。两端相当扩展，向中间逐渐收缩。右肱骨的近端特窄比起远端不很一样，可能不是正常的，受了挤压。两肱骨均只轻度弯曲。近端关节处很大，且有较平顶部。肱骨孔也隐约可见，位于较近远端处。肱骨的长度比股骨显著为短。长 112 毫米；近端宽 34 (左；右为 26)；远端宽 32.5 (左；右为 36)；主干切面，16 × 13 (右侧同，重庆肱骨为 16 × 9 毫米)。

沒有可靠的前肢下端骨头。有两碎骨可能代表尺骨远端和桡骨近端。

腰带和后肢 肠骨 只有右侧的保存较好，这是这一幻龙很有特性的骨骼。总形长而低和其他幻龙的不同。大多数幻龙肠骨的高度和近端耻骨与坐骨边缘差不多或较短一

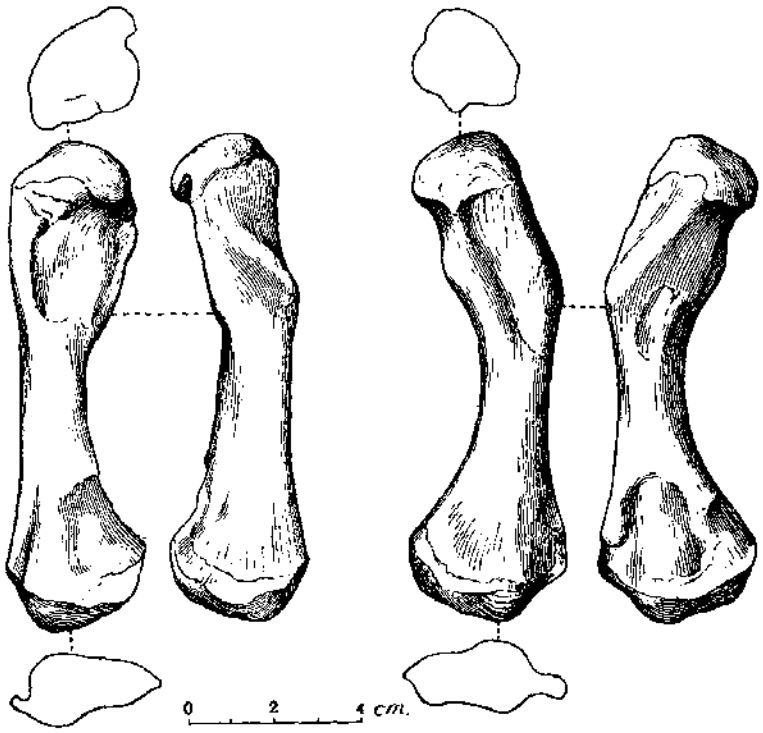


图 10　邓氏三桥龙的肱骨。1/2 原大，详看正文。

Two humeri of *Sanchiaosaurus dengi* in two aspects. For details see text. 1/2 nat. size.

些，而三桥标本则后者显著地比前者为长。此外，它几乎没有前部突起，而代以钝的弯曲。后端突起也短而钝。髋臼可以看出，但它的上边是不清楚的。耻骨和坐骨边很厚，成为很钝的角。在肠骨内面，有一凹入部紧在两边缘之上。更上有三个粗糙部分显然是和肋骨接触地方。从这现象看，其他荐骨肋骨可能和其他幻龙一样不同肠骨接连。下缘宽，39 毫米；高，34 毫米，耻骨边缘的长和厚，25 及 12 毫米，坐骨 21 及 7 毫米。

唯一保存的右耻骨也很特殊。保存很完全。短而宽，中部收缩很轻微。后缘几乎是直的。介于髋臼和肠骨接触面相当清楚。耻骨孔在外面几乎看不见，而在内面很明显，紧靠边缘。远端很薄，没有前后部明显的区别。沿边缘也不象扁鼻龙那样有一缺口，或象副幻龙那样稍有弯曲。长 79 毫米；近端宽，48 毫米；远端宽 51，中部宽，36；近端厚 19；远端厚，5 毫米。

坐骨　为左侧，也很完全。近端下收缩部很弱，其厚度超过了近端。近端的髋臼和肠骨接触面很清楚。远端十分扩展，远端前部和另一坐骨接触处较薄。和扁鼻龙一样，远端长度和高大致相等。但中部收缩不很显著。高 89 毫米；近端长，34 毫米；远端长，82.5 毫米；中部收缩宽 31 毫米。

股骨　两股骨均保存完整。这一骨也具有一些特性。两端很扩展，且宽度差不多。由两端向中部逐渐收缩，因之真正的中干相当的短，也不扁平。两端的关节都很清楚而显著。近端关节几乎作球状，其外侧面向下向外延伸很长。远端的胫骨接触面特别显著。所有这些均表示这一幻龙的后肢，相当的发育。比肱骨为长。两股骨在细节上不很相同。右股骨两端稍受压，而左边者似与原来形状更近。总长左 140，右 138 毫米。近端宽，左

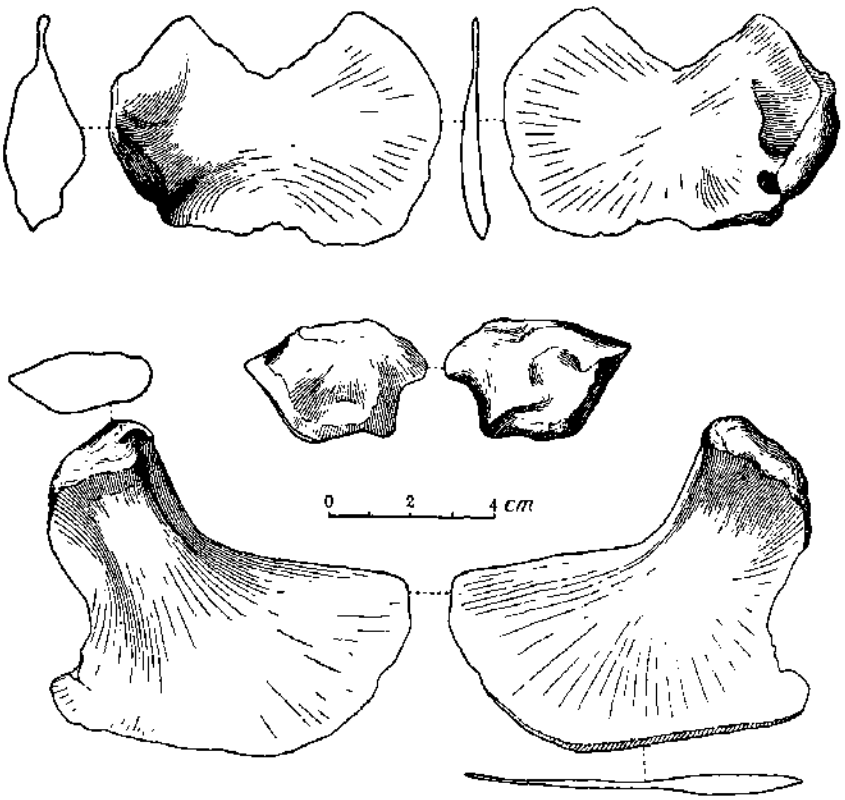


图 11 邓氏三桥龙的腰带骨。1/2 原大，详看正文。
Ilium (middle), pubis (upper) and ischium (lower) of *Sanchiaosaurus dengi* in two aspects. For details see text. 1/2 nat. size.

30，右 31 毫米。远端宽，左 31，右 28 毫米，中间直径，左 15 × 14；右 16 × 14 毫米。肱骨与股骨比，80—81。

胫骨与腓骨 两个在图所示的保存完整的骨，当作胫骨和腓骨，可能都是属于右侧的。很特别是腓骨比胫骨为短（在多数幻龙恰相反）。胫骨干较扁平，两端很硕大。腓骨稍弯也较扁平。两骨比股骨的一半还长一些。胫骨长 81；近端宽 23，远端宽 19.5，中宽 16 毫米。腓骨长 76；近端宽 19，远端宽 16，中宽 10.5（均毫米）。胫骨与股骨比为 57:85。

除了上述的一些骨以外，未见有任何骨表示有另一个体或其他化石的存在。但至少有两块骨很特别，肯定不是属于幻龙的。和三桥幻龙的关系也不明了。

**鉴定与讨论** 虽然在三桥的发掘未能满意的完成，但就已获得的骨骼讲，可以作出较可靠的鉴定。锐而尖的三角形头骨，大小不同的牙齿，脊椎骨不很收缩的椎心，以及头后骨骼的一些特性，都说明为一个幻龙。在描述中也已说明，和这科中的其他主要属有显著的不同。现定名为邓氏三桥龙，新属新种，其特征如下：

头骨三角状，鼻部尖锐。两下颚缝合线长。牙齿大小不一，相距较远，尖而具有条纹。可能有 45 个荐骨前脊椎。椎心轻微收缩，背棘特低。荐骨脊椎多于 4 个，背棘也较低。肩胛骨上缘很直。乌喙骨孔小。肱骨短而粗壮，远端扩展，比股骨短，干部较圆。肠骨无前突起，耻骨短收缩不大，远端无缺口。耻骨孔小，坐骨也不太收缩，股骨两端只微有扩

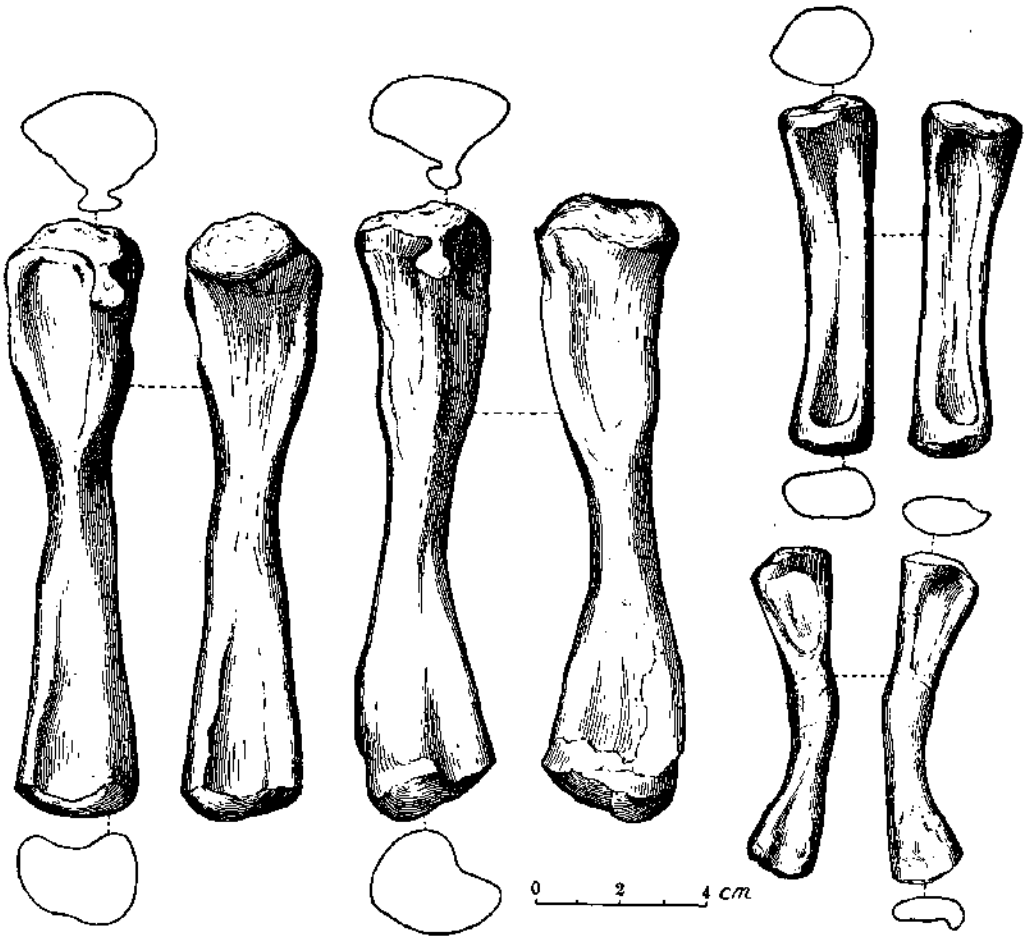


图 12　邓氏三桥龙的后股骨。1/2 原大，详看正文。

Two femora (left and middle) and tibia and fibula (right) of *Sanchiaosaurus dengi* in two aspects. For details see text. 1/2 nat. size.

展，微弯曲。胫骨短而扁平。腓骨比胫骨短。

属名代表产地，种名给予对此标本发见有关的邓峯林先生。

就头骨形状看，三桥龙很象 *Ceresiosaurus* 的。头骨，长与宽的比例为 86×100/182 = 47.25 也很和这一属接近。两者头的宽，均大约等于长的一半。牙齿也很象。但是头后骨骼却很不相同。肱骨两端均较扩展，而比股骨为短。两者比为 80。三桥龙其他骨骼也和欧洲种不同。至于另外其他幻龙属相距更远，不必赘述。

在中国有两其他幻龙，至少在大小上可与贵阳化石相比。

第一是东方广西龙（杨，1959）。虽然广西龙有一部骨骼，但没有头，没有颈节，也没有前肢，因而不能得出任何比例。它比贵阳化石稍大，其股骨远端也较扩展而弯曲，但腓骨比胫骨为长。广西龙的脊椎也较长，它的地质年代比三桥龙为老。由这些情况看，两者显然不一样。

第二个就是重庆附近的那一肱骨（杨，1960）。重庆肱骨大小和三桥的肱骨差不多，但是拿两标本对比，重庆的显然瘦细一些，近端不太硕大，中干也较扁平。因此很难把重庆标本归于这一属。很可能为一真的幻龙，而不是肿肋龙。也很可能为一新种，在目前不

打算给予任何进一步考虑。

根据邓峯林的见解，含三桥龙的地层根据许多可靠的无脊椎动物化石确定为下中三迭统(安尼锡克)。三桥龙的研究符合这个结论。

## 幻龙亚目未定属种

除了以上描述的一些种以外，另外还有些地点具有破碎的骨骼，难作进一步鉴定，可概述如下：

**1. 肿肋龙属种未定** 有三段脊椎骨，一段是六个，其他两段四个脊椎（图版 VIII 及 IX)。地点和兴义龙一样，地质博物馆登记号 Vm. 1308。因为这三段的两头均有损坏，另有些脊椎也不完全，所以只有七个能作可靠观察。所有脊椎的脉弧均未保存。第一段具有六脊椎，可能属于颈部或背前部。因其横突和副突相靠近，位置也较高。其他两段不太能定其部位，可能一为腰部，一为尾部(模型号 V. 2796)。

所有这些脊椎骨的椎心都短而宽，两段间有些肿大。比长度要大一些，作筒状构造，肯定是肿起的。椎心微作横的加宽。腹侧较平，具有浅沟。

这些脊椎是所有标本中最大的。椎心腹侧长 23—26 毫米。中部宽(由一保存最好的标本量) 26 毫米。

就大小讲，这些标本，不可能是上述兴义龙的头后脊椎，许多性质和 *Proneutiscosaurus* 一属相同。我们的标本比起德国这一属来稍大一些。十分可能，我们在兴义有和此属相近的另一幻龙。但现有标本，不足给一个名称。

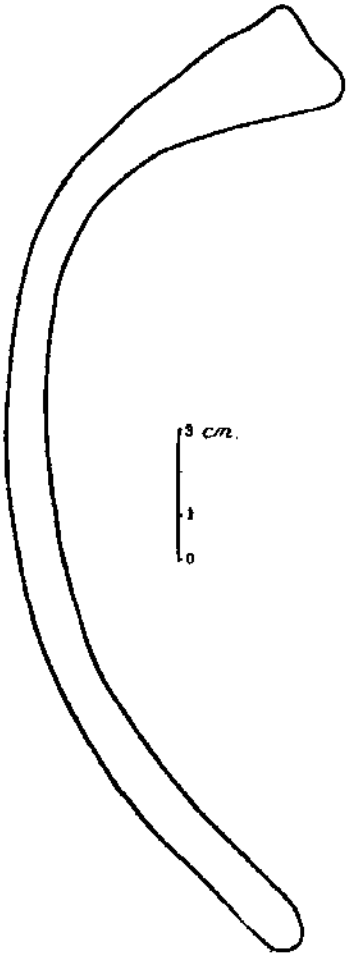


图 13 幻龙科未定种 B，肋骨，1/2 原大。
Nothosauridae indet. B. Rib, in 1/2 nat. size.

**2. 幻龙科属种未定 A** 和上述清镇龙同一地点，还找到了几个脊椎骨和四肢骨碎片。其大小比清镇龙至少大一倍。但却没有其他什么特点可述。这些脊椎等可能是清镇龙的一较大个体，或属于这一属的另一种。另外有一较大的脊椎的脉弧部分和另一破骨，难鉴定，可能不是幻龙的(V. 2797)。

**3. 幻龙科属种未定 B** 根据宋国珍，清镇沧溪桥红枫湖旁，观察到一石块上一大肋骨，乃是修水库时搬出来的石头。因为石头运不回来，将该肋骨拓了一印模，见插图 13。这条肋骨比三桥龙的肋骨大一倍。直长 274 毫米；近端头长 25 毫米。远端未加粗，11 毫米。从这个图上看不出近端处的棱状隆起。因为此图是从后视的，即或有也看不见。此肋骨弯度较强。这个肋骨可能属于背脊椎较后部，代表除了已知的肿肋龙幻龙以外，还有特大的幻龙。这一幻龙的大小与 *Paranothosaurus* 相当。

依照邓峯林和袁振新的观察，另外在两地方也有幻龙化石，一为贵阳以西的安顺县，一为贵阳东北的甕安县。从后一地点已采了一些化石，但至今还未看到。这两个地点

均在图 14 上用虚线表示。

## 結　　論

在过去几年，自从我 1956、1958、1960 几篇关于幻龙文章发表以后，我们对于这一类化石的知识有相当多的增加。不但增加了一些新地点，也有一些种类是前所未见的。在本文中所记述和讨论的肿肋龙和幻龙的总结果，可以归纳为以下几点[1]：

**（1）中国已知的肿肋龙和幻龙**

化石表和地点为：

亚目　肿肋龙亚目
　科　贵州龙新科
　　胡氏贵州龙　　贵州兴义顶效大寨
　　远安贵州龙(新种)　　湖北远安望城岗
　　肿肋龙亚目未定属种　　贵州兴义顶效大寨
　科　扁鼻龙科
　　意外兴义龙　　贵州兴义顶效大寨
亚目　幻龙亚目
　科　幻龙科
　　宋氏清镇龙(新属新种)　　贵州清镇沧溪桥
　　邓氏三桥龙(新属新种)　　贵州贵阳金鍾桥
　　幻龙科未定属种　A　　贵州清镇沧溪桥
　　幻龙科未定属种　B　　贵州清镇红枫湖
　　幻龙科未定属种　C　　四川重庆马家堡(马家堡发现的肱骨从前被认为是肿肋龙的)(杨，1960)
　　东方广西龙　　广西武鸣邓柳伏平屯(杨，1959)

到目前为止不包括脚注中所说的南漳的化石在內，一共有十种不同的鳍龙类(三迭纪蛇颈龙，侏罗纪蛇颈龙不包括在內)分属于两亚目，三科和五个属，六个种，这些属种一般说来都是有代表性的。地理上的分布为湖北、四川、贵州和广西，而以贵州为最多。湖北的产地在长江以北，也很有意义。

**（2）关于分类的意见**

在本文中，如上所表示的，采用了许耐的(1956)关于鳍龙目的三分法，也就是说把肿肋龙和幻龙和蛇颈龙一样列为亚目或至少当作超科。两者的显著的区别，以及所含的属的复杂性，似乎支持这个安排。自然我还不能把这一目的分类作一详细的讨论，因为所掌握的材料不够。但是想把一些初步的想法，概括如下：

自然我们力求把分类的根据，限制在一些主要的性质上，如颞颥孔大小，头骨形状，牙齿，头与颈的比例，以及头颈和躯干的比例等等。

肿肋龙亚目颞颥孔小，或者只中等大小，从不太大或拉长。头骨较长，嘴部比较为宽。牙大小一样，骨骼特别是肋骨有时肿大。荐骨脊椎不多于四。

肿肋龙科。颞颥孔特别小，比鼻孔为小。头骨较长，比颈部二分之一为短。颈较短。这一科包括肱骨远端扩展比股骨短的属，也包括肱骨远端不扩展，而长于或大约相等于股

1) 在研究这些幻龙化石过程中，本所从湖北南漳还采获一个保存很好的水生爬行动物，和另一个非常有趣的海相爬行动物。这些标本正在修理，来不及包括于本文中，俟另有机会，再为发表。

骨的属。我很同意孔施乃德的意见，认为产格尔（Zangerl，1935）所记述的肿肋龙包括的太广了一些。这样解说可以把许耐(1959)的另一相反说法调和起来。

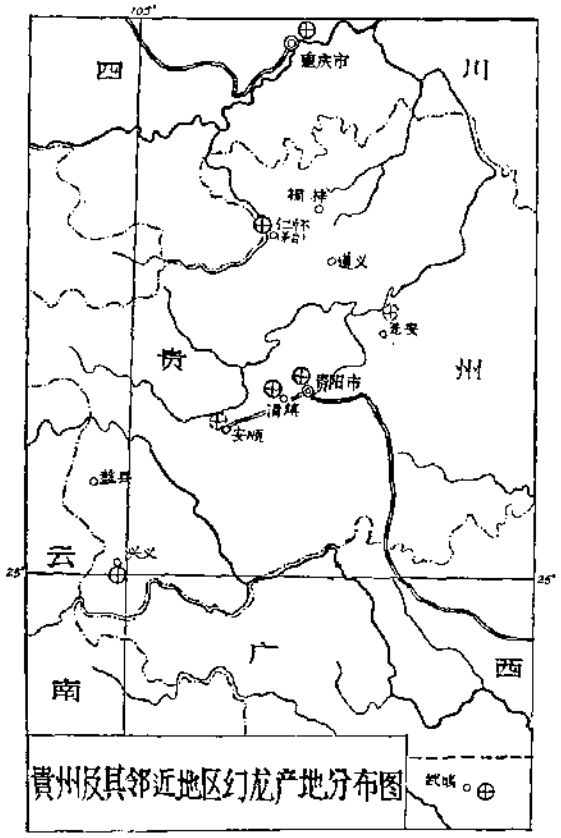


图 14 贵州及附近地区简图表明所记述幻龙化石的地点。虚圈为可能有幻龙的地点。

A sketch map showing distribution of localities with reptiles described in the present paper. Those with only information are indicated by dotted circles.

这一科包括的属有 *Pachypleurosaurus*, *Pachypleura*, 和 *Rhaeticonia* 等。

贵州龙科。颞颥孔小，但比鼻孔稍大一些。头骨较短。颈部较长，约头骨的两倍。肱骨远端不扩展，比股骨为长。包括贵州龙（*Keichousaurus*）。

扁鼻龙科。颞颥孔小或稍大一些，但从不前后向十分拉长。头骨较短，具有宽的嘴部。颈部特长。四肢比例与前科相等。这一科一般的归于幻龙，或当作独立的科。但它和 *Anarosaurus* 一样，颞颥孔小，眼前部分宽，其和肿肋龙关系较近是很明显的。事实上多年以前，努普萨就这样做了（Peyer，1933，p. 117）。

归此科之属：*Shingyisaurus*, *Simosaurus*, *Anarosaurus*, *Elmosaurus* 等。

幻龙亚目，颞颥孔特别大，以至十分拉长。头骨较瘦细，具有嘴部的收缩。牙齿大小不一。头后骨骼无肿涨现象。荐骨脊椎多于四。肱骨远端扩展，比股骨短。

幻龙科。头骨较长，颞颥孔大而长。肱骨比股骨为短。其中间较扁平。归此科之属：*Chinchenia*, *Sanchiaosaurus*, *Kwangsisaurus*, Nothosauridae indet. A, B, C. *Nothosaurus*, *Ceresiosaurus*, *Paranothosaurus* *Metanothosaurus*, 等。

鸥龙科。头骨较短而宽，比颈的一半为短。包括鸥龙（*Lariosaurus*）。

浪龙科。头骨特长，一如幻龙，前颚骨和额骨接连。包括 *Cymatosaurus*, *Germanosaurus*。

？冠龙科。*Corosaurus*。

此外王恭睦还把南漳龙（1959）当作鳍翼龙的一个亚目。南漳龙的小的颞颥孔，可能表示与肿肋龙有关。但是它的头骨其他部分的非常特化现象，似乎排斥了和任何鳍翼龙有关的可能。其年代至多为下三迭世，不是二迭纪。另外一方面南漳龙头骨有些和我们新从南漳采的另一种爬行类相似，因此不打算再作讨论，等以后一并研究。

**（3）地层**

由无脊椎动物化石证明，和在欧洲一样，绝大多数中国已知的幻龙化石都是中三迭世。但就进一步带的分布来说，问题并未完全解决。唯一例外是广西龙，照地方上地质研究者所定含该化石的地层为下三迭统。广西龙骨骼的一些原始现象，支持这个说法。照邓

峯林所述，含三桥龙之地层为中三迭统下部无甚疑问。兴义的含胡氏贵州龙也可能为同一时代。兴义龙和贵州龙的准确地层关系还不清楚。目前我们当作大致同一建造。远安贵州龙也是中三迭世。其他不能进一步鉴定的幻龙年代也如此，清镇龙的层位，可能比三桥龙为新——拉旦尼克？无论如何还没有一个可以当作是晚三迭世的鳍翼龙类。到目前为止在中国已发见的肿肋龙科幻龙列表如下。

表二．中国已知幻龙的地层分布

| | |
|---|---|
| 上　三　迭　统 | |
| 中　三　迭　统 | 上　部　*Chinchenia sungi* |
| | Nothosauridae indet. A |
| | Nothosauridae indet. B |
| | 下　部　*Sanchiaosaurus dengi* |
| | *Keichousaurus hui* |
| | *Keichousaurus yunnanensis* |
| | *Shingyisaurus unexpectus* |
| | Pachypleurosauroidea indet. |
| | Nothosauridae indet. C |
| 下　三　迭　统 | *Kwangsisaurus orientalis* |

和几年前初次报告的一些幻龙化石相比，我们对于这一类的知识，是大大的增加了。但是考虑在我国中三迭世海相地层分布如此之广，离全面的了解还很远。在过去对于我国海相脊椎动物化石的研究工作是做的不够的。为了全面了解地层和生物方面的一些问题有必要在这方面补课，加倍努力。

感谢　对于瑞士孔施乃德教授对本类化石的一些通讯很感谢。对贵州地质局邓峯林和其他有关同志就三桥龙采集工作的协助，非常感谢。北京地质学院李凤林对于远安贵州龙的正型和胡氏贵州龙的新材料给予研究，十分感谢。地质博物馆胡承志及该馆负责同志，借给兴义龙正型标本研究，表示谢意。在研究过程中，本所同志多予协助，一并致谢。

后记：自本文付印后，作者曾于本年八月间观察在天津自然博物馆所收藏的十个胡氏贵州龙（登记号 40117—40126）。标本保存的不太好。就所能观察的推断，未超出本文所记范围以外。

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# ON THE NEW NOTHOSAURS FROM HUPEH AND KWEICHOU, CHINA

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Recently a number of more or less well preserved remains of nothosaurs from new localities have been accumulated. All these fossils increase our knowledge of the sub-order Nothosauria considerably. They are described in the present paper.

## DESCRIPTION

### Sub-Order Pachypleurosauroidea Huene 1956

### Family Keichousauridae Young, new fam.

### Genus *Keichousaurus* Young 1958

### *Keichousaurus yuananensis* sp. nov.

(Pls. 1—2, text-fig. 1)

**Type** A limestone slab with the mold of the trunk part of the skeleton, lacking the head, most part of the neck and the tail. Most of the elements of the pectoral, anterior limbs, pelvic and the posterior limbs are traceable with certainty. Field number F.19, Cat. number of IVPP. V.2799.

**Horizon and locality** Lower part of Middle Triassic ($T_2^1$ of text-fig. 1) from the Chialingchiang limestone. Locality: Wangchenkang, N. W. of Yuananhsien, Hupeh Province.

**Diagnosis** Size more than twice larger than the average size of *Keichousaurus hui*. Dorsal vertebrae probably 19—20. Sacral vertebrae ?3. Pectoral and pelvic girdles are similarly constructed as the named species, only the external border of the ischium is more curved. Humerus slightly curved without distal expansion and is longer than the slender femur. Ulna looks also rather plate-like and apparently shorter than the radius.

**Description** This specimen was collected by the first Subdivision of the Fifth division of General Geological Prospecting, Ministry of Geology and sent to our Institute for study through the kindness of Mr. F. L. Li of the College of Geology at Peking. It is entirely a cast of the middle part of the animal in the dark gray limestone, member of the Chialingchiang Series. The mold is preserved on the weathered surface in yellow colour. The preserved part is from the posterior few neck vertebrae to the anterior part of the caudal region. Most part of the pectoral-pelvic girdles and the anterior- and posterior limbs can be traced besides the main body of the trunk including the vertebrae ribs and gastralia. However, many parts of the mold are rather worn by weathering and thus either less sharp in outline or hard to trace with certainty. The slab must be exposed long before it was catched by geologist.

As judged by the natural mold, the whole body is shown in ventral aspect.

VERTEBRAE Preserved casts of vertebrae probably: Seven posterior neck, 19 to 20 dorsal and lumbar, three sacral and four anterior caudal. The anterior four are badly distorted by the joints of the rock and bent a little to the right side. The part of the other posterior neck vertebrae is mostly worn and hard to make their separation. The two in front of the coracoids are more distinct. The following ones are obscured by the covering of the ribs and the gastralia and their separation can only be made sure by the ribs on both sides. The part of the sacral region is distorted and cut obliquely by a calcite vein so that its number of sacral vertebrae is only estimated by the distance along the pelvic girdle which is most probably three. The caudal vertebrae are counted from the median side of the ischium and the last preserved one is only indicated by part of the anterior end. On the whole it is clear that the number of the detectable part of the vertebrae is very close to that of *Keichousaurus hui* and much less in number as compared with those of most of the other nothosaurs.

RIBS AND GASTRALIA The neck ribs can also be traced faintly which are apparently short and pointed. Nearly all the ribs of the right side are preserved while the posterior few ones of the left side are missing due to the distortion noted in foregoing lines. They are certainly pachyosteological, especially their middle part. As far as can be judged by the mold, especially the positive one produced from the original (Plate II) all of the ribs are single headed, only in those of the anterior ones, the proximal ends are somewhat broader. The distal end of the same shows no clear observable thickening.

The gastralia are extensively developed as can be seen along both sides of the vertebral column.

On the left side, at least two sacral ribs are well shown with truncated lateral end for contact with the ilium.

The ribs of the anterior caudal region can also be observed clearly on both sides.

PECTORAL GIRDLE AND ANTERIOR LIMBS As for the pectoral girdle, the both coracoids are better preserved and in natural position with the median joint clearly seen. The outline of the bone is much the same as that of *Keichousaurus hui* and nothing special. Near the proximal end of the bone and on the top of the humerus of both sides, there is a deep pit (relief in the opposite mold) which indicates the proximal end of the scapula. On the right side faint trace of another long and broad bone lying obliquely towards the vertebral column. It is certainly the clavicle. On the left side it is not so clear by the breakage of the rock. No clear trace of the interclavicle is seen. If the interpretation of the clavicle is true, as it seems, the anterior part of the pectoral girdle must be quite different from *K. hui* and more similar to *Ceresiosaurus* and *Simosaurus*.

The outline of both HUMERI is well preserved. They are shown in ventra-anterior aspect. The humerus is a slightly curved bone much longer than the femur and with the distal end not expanded at all. Length, 38 mm. The radius can be seen on both sides while the ulna is only faintly visible on the left side which looks also rather broad. The both bones are much shorter than the humerus. On both sides there are some traces of the presence of metacarpals or phalanges but in much displaced position and hard to be sure of their relationship. They are all rather slender.

PELVIC GIRDLE AND POSTERIOR LIMBS The pelvic girdle is better shown on the left side. Just at the proximal end of the left femur, part of ilium, pubis and ischium are well indicated. The distal end of the pubis is not clear while the ilium is only indicated by

its proximal part. The ischium is sharply constricted at the middle and its distal border is less clear. The three elements of the pelvic girdle are somewhat displaced. At least judged by the shape of the pubis and ischium they are very similar to those of *Keichousaurus hui*.

The left FEMUR is complete while the right one is only indicated by its proximal end. It is a very slender bone and much shorter than humerus. Length, 32 mm. The proportion of the humerus and the femur is about the same as that of *Keichousaurus hui* but still more expressive.

No clear bone posterior of the femur is recognized.

**Table 1.** Important measurements (in milimeters)

| | |
|---|---|
| Preserved length | 217 |
| Length of the dorsal region | 145 |
| Breadth of the trunk below the ischia | 48 |
| Length of the humerus (left) | 37 |
| Length of the femur (left) | 31 |
| Proportion humerus femur | 118(84) |

**Determination and discussion** Although there is unfortunately no skull preserved, but the number of vertebrae, the pectoral and pelvic girdles and the anterior and posterior limbs are sufficiently clear in referring our specimen to the genus *Keichousaurus*. The humerus is still longer than the femur and it is more broad and straight with the distal end not expanded. The Yuanan form is a much larger individual although the specimens of *Keichousaurus hui* represent mostly young animals. We propose to erect a new species for the Yuanan form for which the name *Keichousaurus yuananensis* is proposed. Its diagnosis is already given in foregoing lines.

## On the new material of *Keichousaurus hui* Young

(Plate III)

During the present study of nothosaurs I have the opportunity to make some observations on the new collection of *Keichousaurus hui* from the same locality as those specimens I have described previously. It was collected by C. C. Chang, then student of the College of Geology at Peking. Through the kindness of F. L. Li of the same College I am able to make the following notes on the new material.

There are eleven positive and negative molds represented by eight individuals of which only three with the skull preserved (one the posterior part only). They represent individuals of various ages and the preservation is exactly the same as described before. Some of the specimens are still embedded in the shale but their outline can be observed clearly.

The first point to be make clear is about the size and the shape of the temporal opening as raised by Kuhn-Schnyder (1959). In the present collection one of the adult skulls of the positive slab marked as St.V004 of the College of Geology at Peking is very expressive. With the exception of slight distortion to the right side and the damagement of the right orbital border and the part behind the parietal foramen the skull is well preserved and intact (Plate III). In this skull the proportion of the nasal, orbital and the temporal opening is the same as the type I have described before. In another

specimen of which the posterior part skull is exposed in dorsal view and in perfect preservation (St.V0019). The small temporal opening is also small and antero-posteriorly elongated as compared with the large orbital opening in front. Besides, there is a very young individual well preserved before the pectoral girdle (St.V009) (Plate III) the same relationship of various openings can be observed.

Based upon the new material it is evident that the various openings of *Keichousaurus hui* are essentially those of the *Pachypleurosaurus* type, although differ in some details. It is also evident that the maximum breadth of the skull lies near the posterior part of the orbits and narrows very gradually posteriorly. It is also clear by the study of the new collection that most of our materials including the type are adult and the one marked as St.V009 is the real youngest one so far known.

Concerning the number of the various parts of the vertebrae it is not so convincing. In my previous paper it was given as neck, 20; dorsal, 20; sacrum, 3 or 4 and the tail, $37^{+}$. In the present new materials St.V004 the neck is conspicuously longer with the number of neck vertebrae ca. 24, but we are not absolutely sure about the connected part as compared with the negative specimen. The number of the dorsal is 15 only and that of the sacrum probably four (the tail is lost). In the young individual St.V009 the neck vertebrae are ca. 23—24. In St.V0019 of which the vertebrae are most completely preserved but some parts are obscure, the numbers of various segments are: neck, (?) 22; dorsal 19; sacrum 3 and tail, 35 and more. In most other new specimens they are not quite satisfactorially preserved except one of them the number of the dorsal of which is most probably 19 and the sacrum 3 or 4. In short, it becomes more sure that the number of the neck and dorsal vertebrae is somewhat variable as in the case of *Pachypleurosaurus* and the number of the sacrum is surely less than all the true nothosaurs.

The proportion of the humerus and the femur is essentially in the condition as those previously described. Only the very young one St.V009 the humerus looks slightly shorter than the femur but the distal end is not expanded. The short and broad ulna is also obviously observed although some of it is less developed in such manner. The hand and foot bones are not quite satisfactorially preserved in all the new specimens (proportion of humerus femur of the type $11 \times 100/15.3 = 72$).

On the whole, the new collection of *Keichousaurus hui* of the college of Geology at Peking increases our knowledge of this species considerably and proves that our previous observation is correct.

## On the systematic position of *Keichousaurus*

In my description on the *Keichousaurus hui* 1958, I considered it as a member of the family Pachypleurosauridae based on the structure of the skull with very small supratemporal opening, smaller than the nasal opening. Subsequently Kuhn-schnyder (1959) grouped it to the family Lariosauridae especially to the genus *Lariosaurus* based on a number of features of the limb bones. In the same year Huene considered it as belonging to Simosauridae based on the proportion of the anterior and posterior limbs. By the re-examination of the type of *Keichousaurus hui* (V952) I am quite sure that the specimen is on the whole intact and free from any deformation. Even a slight deformation of the posterior part of the skull occurred, it will certainly not produce such a radical change of the size of the supratemporal opening. In this case, it must be assumed that

*Keichousaurus hui* is characterized by the small temporal opening.

Fortunately we have got new specimens of the same species from the same locality and same horizon as noted in the foregoing section of this paper. In all the three skulls, adult and young we came to the same conclusion concerning the size and the relative proportion of the various openings of the skull. In any way it must be noted, however, that our form is by no means the same as that of *Pachypleurosaurus*. In the latter genus the temporal opening is much smaller and the nasal opening is not triangular and many other details in difference. Of course, the skull of our form is remarkably different from both the representative genera *Simosaurus* and *Lariosaurus* of the family simosauridae and Lariosauridae respectively.

It is, therefore, clear that it is hard to fit our form in any of the known family properly if we should consider the characters of the skull as the leading features for the family classification. In this regard we like to erect the Keichousauridae as an independent family of the sub-order pachypleurosauroidea. I shall come back to this question latter in the problem of the general classification of the sub-orders Pachypleurosauroidea and Nothosauroidea as a whole.

## Family Simosauridae Romer 1956

### *Shingyisaurus* gen. nov.

### *Shingyisaurus unexpectus* sp. nov.

(Plates IV and V; fig. 2)

**Type** A deformed skull with five anterior neck vertebrae. Collected by the Museum of Geology. Vm.1308 of the Museum and V.2800 of IVPP (Cast).

**Horizon and locality** Lower part of Middle Triassic, Tachai, Tingchiao, Shingyi, Kweichou. Same general district as the remains of *Keichousaurus hui*.

**Diagnosis** See the section of determination and discussion.

**Description** Skull When the specimen was brought to the laboratory by Hu, only five vertebrae and part of median border of ventral side were exposed and supposed by the collector as the part of pelvic girdle. With the help of acetic acid the specimen was carefully prepared by K. Y. Chang. Although deformed in some way, it is a good skull of nothosaurs so far unknown from this district. The specimen is embedded in thin layered dark grey limestone (almost black). Unfortunately there is no indication or data which side of the specimen represents the upper side. Their relationship with the generally thin shales and light coloured thin bedded limestone or concretions with *Keichousaurus hui* is also not clear. The beds in question may thus be derived from the same general formation but may also be somewhat older or younger than the beds containing *Keichousaurus*.

The coloration of the bone is black, still darker than the limestone. It is intersected by a number of calcite veins (dorsal eight and ventral six) apparently responsible for the deformation of the skull. The ventral side of the skull is better preserved. The posterior part of the skull behind the palatine and the pterygoid is almost intact. The posterior end of quadratum and the lower jaw of the right side are broken and those of the left side a little damaged. The anterior part of the skull was pushed strongly towards the right side (looking in ventral aspect) so that the left side is much elongated while the

right side is about the normal length. Some 25 mm behind the anterior end, the skull is broken by the veins of calcite. This part of the skull is seriously damaged.

In the dorsal side, the part of the anterior left corner is almost intact. Even the part of the right side before the orbit is tolerably preserved. The posterior part behind posterior border of the left orbit and the anterior border of the right orbit are strongly deformed. The right nasal opening is effected by deformation but still clearly recognizable and situated at the position nearly in original orientation. The right orbital opening is much pushed backwards and strongly elongated. The anterior part of the left temporal opening is almost intact but the posterior part was pushed laterally and backwards very strongly. The right temporal opening is peculiarly deformed and the bone of its lateral border is much disordered and hard to recognize. The part behind the parietal opening is also much depressed. In this part the boundary of the bone and the rock are almost in confluent state.

Judged by the distortion of the dorsal and ventral side of the specimen and in reference to the direction and breadth of the calcite veins it seems that the force of deformation came from the supra- and right side of the skull. In ventral side the posterior part of the skull together with all the preserved vertebrae are free from any disturbance. The bone is entirely carbonized and mineralized.

Since considerable parts of the skull are not much effected by deformation, it is easy to reconstruct the shape of the skull which is given in figure 2. As the bone is more or less effected by metamorphism and the color of the bone is very dark, only a few sutures of the various elements of the skull can be detected which are indicated in the same figure. The following description of the skull are based on the real preservation of the fossil with the references of the reconstruction.

The skull is moderate in size with rounded triangular outline. The anterior end is distinctly broad and truncated and not pointed. The nasal opening is rather small and oval in outline. It is situated about half way between the terminus of the skull and the anterior border of the orbital opening. Length of the left, 10.5; breadth, 7 mm. The left orbital opening is also oval but much larger than the nasal opening. Length 26; breadth at the middle 18 mm. The posterior part of it is somewhat broader than the anterior portion. Although it is effected by the vein of calcite, it seems not to change noticeably the shape of the opening. Both the right nasal opening and the right orbital opening are deformed. The former pushed a little back and laterally while the latter is considerably elongated. The anterior part of the left temporal opening is almost intact. Breadth short behind the anterior margin, 16 mm. It is narrower than that of the orbital opening. There is also no trace of the lateral narrow extension as observed in other genera such as *Paranothosaurus* and *Lariosaurus*. Although deformed, this opening is most probably a less elongated one and like that of *Simosaurus*, the same of which is less elongated and broader than the orbital opening.

Most of the sutures are obscured by the color of the bone except that between the frontals and parietals. The inter supratemporal crest is very narrow and seems not much effected by deformation. The parietal foramen is actually very much damaged and broken, but its presence and location (marked by a depression) can be seen clearly at the posterior part of the parietals.

In ventral aspect, both sides are covered by the nearly complete lower jaws. Most

of the elements of various bones are exposed although their sutures cannot be traced easily. The basioccipital with the condyle and its surrounding bones is in perfect condition. The temporal opening of the right side represents apparently the true size while the left one is much elongated. The jugal on the left side is partly shown. The intertemporal region is moderately broad which is entirely occupied by the pterogoids. The palatines are rather large. The maxilla of both sides are largely obscured by the covering of the lower jaws. The right internal nare is well preserved. It is oval and 7 mm long and 6 mm broad. The left one is damaged and pushed forwards. The part in front of the internal nares is much deformed and covered by the lower jaws but the remaining part seems to indicate that the premaxilaries are rather short.

Length of the skull from the anterior border to the posterior border of the condyle, 149 mm; maximum breadth, 90 mm; breadth of the snout behind the orbits, 66 mm; proportion of the length and breadth: 60.40.

Lower jaws Both lower jaws are still sticking firmly to the skull. As in the skull the left side is less displaced. The posterior end of the right one is broken and that of the left side is also partly damaged. At least in the left side sutures of the angular are clear. The articular posterior to it is also clear. The anterior parts of both lower jaws are transversally broken. The symphysis is not quite long.

Teeth The posterior part of the left tooth row is completely concealed. But near the lateral side of the left nasal opening, there is a well preserved tooth almost in natural position. In front of the same opening there is a displaced tooth. Whether its position of it should be the upper or the lower one is not certain. Most parts of the right tooth row are visible. It seems that there are altogether 16—18 teeth represented either by alveoles or partly broken teeth. They are probably anisodont. The single well preserved upper tooth shows that it is slender and rather corasely ridged and pointed much the same as that of nothosaurs. Length of it, 7 mm; diameter at the base 4 mm.

Neck vertebrae Behind the condyle of the skull, there are five neck vertebrae preserved. The first one is the atlas. The central piece is the intercentrum of the atlas with length 6 mm and breadth 9 mm. The piece at both sides of the condyle is probably interpreted as the lateral element of the atlas. The epistropheus is 12.5 mm long. The lateral piece at the anterior corner of the right side is intact. Both the atlas and the epistropheus are rather similar to those of *Pachypleurosaurus* (Zangerl, 1935, p. 21, fig. 14) but more robust. The following two neck vertebrae are a little longer (13.5 mm). The median side is marked by a very faint furrow between the rather distinct lateral ridges. At the lateral side, the facets for dispophysis and parapophysis are observable, especially in the last one. The neck ribs are preserved in a few cases as seen clearly in the Plate V. The last preserved neck vertebra shows only its anterior part. But looking from the posterior aspect the neural arch with the dorsal spine is seen. It is rather low. The whole height of the vertebra is ca. 19 mm.

All the three completely vertebrae are distinctly constricted and no pachyosteological phenomena is observed.

**Determination and discussion** By the foregoing descriptions it is obvious that this skull belongs to the family Simosauridae. The relative short skull, the position of various openings and the moderately elongated temporal openings and the short and broad snout are features for this family. Unfortunately most of the sutures are not detectable

and the postcranial skeletons are practically unknown, especially the humerus and the femur, for additional proofs of our determination.

On the other hand, the position and the small size of the nasal openings, the rather narrow and constricted parietal region, especially clear in the ventral side, and the features of the anterior neck vertebrae are distinct for itself. I propose to name it as *Shingyisaurus unexpectus*, gen. et sp. nov. for this interesting specimen. It is the first record of this family of nothosaur in China. Its diagnosis may be given as follows:

Size moderate. Anterior end of the skull broad and truncated. Nasal opening small and half way between the tip of the skull and the orbit. Intertemporal bar narrow. Teeth pointed and striated. Neck vertebrae constricted with the ventral side ridged.

Although the present specimen was derived from the same locality as the *Keichousaurus hui*, but its exact position as regarding to the stratigraphical relationship with the named form is not quite clear. The petrological character of this specimen is not the same as the shales with the numerous small nothosaurs. It may be derived from different horizon, although the general formation may be the same.

The unexpected find of this new form of nothosaurs suggests that we have new hope in getting more forms of sauropterigians.

## Sub-Order Nothosauroidea Huene 1956

## Family Nothosauridae Seeley 1889

### *Chinchenia* gen. nov.

### *Chinchenia sungi* sp. nov.

(Figs. 3—6)

With the diagnosis of the type species *Chinchenia sungi*.

**Material** Anterior part of a left lower jaw with five broken teeth, 11 neck and six lumbar and sacral vertebrae, fragments of ribs and two sacral ribs three right and two left coracoids and some fragments of the same; two right scapulae. Three proximal and four distal right humeri and four left humeri (three complete) and one distal end of the same; three fragments of lower limbs. Fragments of ilia and ischia, two proximal parts of right femora and one distal end of the same and three left femora (two complete) and four distal ends of the same and two fragments of the lower limbs. As judged by the number of the limb bones they represent at least four different individuals of different age.

**Horizon and locality** Shangpu, Tsanchichiao, 7 km west of Chinchenhsien, Kweichou. Brought back to the laboratory by C. S. Yuan and K. C. Sung. It is apparently a very rich place and the present collection was only largely a surface finds. Cat. No. V.3227. According to the local geologists the age of the fossiliferous beds is Middle Triassic.

**Diagnosis** See the section for determination and discussion.

**Description** Since the materials from Chinchen composed of at least four individuals, and were collected mainly from the surface as noted by our collectors, it is impossible to attribute them properly in a natural way, so we shall describe them collectively. The mode of occurrence shows that it must be a very rich locality of nothosaurs. The color of the bone is from pale yellow to brownish red and well mineralized.

THE LOWER JAW There is only one piece of the cranial part which is the anterior end of a left lower jaw with the preserved length 24 mm. The anterior end is distinctly thickened but the symphysis is relatively short. There are five teeth preserved but only the last one is complete. They are sharply pointed and faintly striated of a common nothosaurian nature. On the inner side of the lower jaw there is a deep furrow and the outer side is more convex. The lower border is quite straight.

VERTEBRAE AND RIBS There are fifteen vertebrae, all the centrums only, a few fragments of the neural arches and ribs. All the here referred vertebrae are about the same size as the neck vertebrae of *Shingyisaurus* described before but their ventral side is perfectly, so that it is impossible to be the same species. Most of the vertebrae seem to be the anterior dorsal ones as there is no trace of the parapophysis seen from the lateral side. The one with the neural arch partly preserved may belong to the posterior part of the dorsal region or near the sacral. The other ones are certainly the sacrum. Their exact position cannot be fixed. All the vertebrae are only weakly constricted and amphycoelous. Their detached surface is typical in structure like that of the common nothosaurs. The dorsal spine is very low. Length of the four figured centrums, 12, 11, 12.5 and 11.5 respectively.

The ribs are too fragmentary for detailed description. A few show the elongated facet of the attachment with the neural arch. Some of them belong to the sacral ribs.

PECTORAL GIRDLE AND ANTERIOR LIMBS Two right SCAPULAE (and a broken left one?) are well preserved, except the spine-like posterior process which is broken. The smaller one represents apparently a young individual. They are typical in shape as the other nothosaurids. In the larger specimen the inner side is markedly grooved below the root of the process. Length and breadth of the articular surface, $25 \times 8.5$ and $22 \times 8$ mm$^2$ respectively.

There are three distal parts of right CORACOID and a left one (two fragments of the same, very small, evidently immature). Length of the better preserved one, 34 mm and thickness, 6 mm. Like the other nothosaurian coracoid, the distal end is marked by a distinct groove. It is much smaller than the one to be described below.

There is no trace of the presence of the clavicular and interclavicular.

The HUMERUS is represented by three complete and a proximal parts and distal part of the left side and three proximal parts four distal parts of the right side. They represent the different ages and differ slightly in size. It is only slightly curved, the both ends are moderately expanded. The general features are fit exactly with *Phygosaurus* and need not to repeat here. All the three complete humeri are shorter than the femora described below, so that there is no doubt that our form belongs to the group with short humerus. The shaft at the middle is only slightly depressed. Length, 61, 58, and 56 mm. The maximum breadth of the proximal end, 19, 15 and 14. Distal end, 20, 16 and 15 mm. The length and breadth at the middle 7 and 9; 9 and 7 and 9 and 6 mm.

Two proximal parts may belong to ulna and radius respectively. Breadth 13 and 14 mm. The proximal end of the latter is triangular in outline.

PELVIC GIRDLE AND POSTERIOR LIMBS The pelvic girdle is poorly represented. The ILIUM is indicated by a broken part of the proximal border of the accetabulaum. The ISCHIUM is represented by a broken proximal and distal end. All are too fragmentary for a detailed description.

The FEMUR is represented by two complete ones, two proximal and one distal parts of the left and three proximal and one distal parts of the right side. Some of the proximal one are either of young individuals or only doubtfully referred here as femur.

The two complete femora are intact, only the longer one is somewhat damaged near the distal end. Comparing with the humerus, the femur is slender. It is decidedly longer than former bone. The worn surface on the posterior inner side of the condyle extends not so much downwards. The distal expansion is only slightly narrower than the proximal one. The central shaft is rather long and slightly constricted. The facet of the tibia and the fibular is not quite separated. Length, 71 and 64; proximal breadth 15 and 15 mm; distal breadth, 13.5 mm; and 13.5 mm; minimum breadth of the shaft, 7 and 7.3 mm. Proportion of humerus and femur of the longer ones, 86.9; of the smaller ones, 87.5.

The FIBULA is represented by only one distal part about 29 mm long. It seems that only the proximal expanded part above the constricted shaft is broken so that its total length is estimated about 40 mm. It is certainly shorter than the femur but not so much short as in the case of *Paranothosaurus* and *Lariosaurus*.

The TIBIA is represented by a proximal and a distal end. Both are not belonging to the same individual, as the latter one is much larger. Length and breadth of the proximal end 8 and 10 mm. The same of the distal end 7 and 11.5 mm.

**Determination and discussion** Although it is impossible to attribute the specimens at disposal to certain individuals, it is clear from the foregoing description that they certainly belong to the same species. It is a middle sized animal and quite different from both the forms described in foregoing lines and also from the form to be described below. Comparing the other known nothosaurians, it is clear that all the larger and true nothosaurians have to be discarded. Unfortunately there is no skull preserved but as shown by the anterior part of the lower jaw with anisodont teeth and the features of the vertebrae and the proportion of the humerus and the femur, our form is probably still a member of the family Nothosauridae.

As the present material fits hardly to any of the known form, I propose to name it as *Chinchenia sungi*, gen. et. sp. nov. Its diagnosis may be given as follows:

Size moderate, much larger than most of the Pachypleurosaurians and smaller than most of the nothosaurians. Lower jaw thickened remarkably near the anterior end. Symphysis very short. Teeth anisodont, sharply pointed and with faint striations. Vertebrae with smoothed ventral side and not much elongated centrums. Scapula typical nothosaurid type with long posterior process. Humerus slightly curved with expanded distal end and shorter than the femur. Femur slender with the lateral downwards extension of the proximal end less developed and the condyles of the distal end less separated.

The species name is dedicated to our technician K. C. Sung.

Systematically we regard it as a member of the family Nothosauridae and widely different from the other families of this sub-order. Since, however, the material of this new form is on the whole very fragmentary, such conclusion can only be regarded as a provisionary one.

The exact level of the Triassic beds of Chinchen is not quite clear. It is regarded by the local geologists as $T_2^2$ also the upper part of the Middle Triassic. It is supposed to be younger than the beds as those of Sanchiao near Kweiyang with the form described

below, a form quite different from the present new species.

## *Sanchiaosaurus* gen. nov.

## *Sanchiaosaurus dengi*, sp. nov.

(Pls. VI—VII; figs. 7—12)

With the diagnosis of the type species *Sanchiaosaurus dengi*.

**Type** Negative mold of the ventral side of the skull and lower jaws, one isolated tooth and most part of the postcranial skeleton. V.3228. Field number K64001.

**Horizon and locality** Lower middle Triassic from Chinchungchiao, Sanchiao in the vicinity of Kweiyang, the capital city of Kweichou Province.

**Diagnosis** See the section of the determination and discussion on p. 351.

**Description** The here described interesting form of nothosaurian was discovered in the early summer of 1964 by the members of a field party of the Bureau of Geology of Kweichou. It was found some 400 meters southwest of Chingchungchiao at the road near Chuechrchiao some 6 kilometers west of the Kweiyang city. According to discoverers K. S. Wang and K. H. Fan, the fossiliferous beds are a sort of greyish clayish dolomite, apparently on a weathered surface of the rock. Through the Kindness of Mr. F. L. Deng, a geologist from the same Bureau, it was brought to the attention of IVPP. The fossils were subsequently excavated by C. S. Yuan and K. C. Sung, a field party of IVPP in the autumn of 1964 with the help of Mr. Deng and other authorities of the Bureau.

Owing to some other undesirable difficulties the fossils were unfortunately badly spoiled before the excavation started. The work of excavation was also not quite satisfactory, as the rocks are hard and difficult to get the fossils properly out of the matrix. Nevertheless, much of the bones were saved. They are now at my disposal. The head of the animal is shown in ventral side on the surface of block of dolomite which was brought to the Laboratory. The other free bones are: a few pieces of the skull, some 28 more or less well preserved vertebrae, many complete fragments of ribs, pectoral girdle and anterior limbs and pelvic girdle and posterior limbs are mostly well represented.

Skull and lower jaws As noted in the foregoing lines, the skull and the lower jaws are unfortunately damaged before the excavation. The fragments saved by Deng are indeterminable. The one may represent the part near the supratemporal opening and the other the posterior part of the lower jaw. The third piece is still problematic. Therefore we shall be satisfied with the mold of the skull.

The block containing the negative mold represents the ventral side of the skull and the lower jaws. The real specimen above the level of the mold was destroyed and only the three fragments were saved. The surface of the mold which lies somewhat below the weathered plane of the block supports this explanation. The actual mold is shown in Plate VI and a positive one (Plate VII) showing the real ventral view of the specimen.

The marginal part of the skull is covered by the lower jaws, yet most of the palatinal views of the skull can be detached easily. The basioccipital is damaged but its position can be fixed at the middle of the posterior elevated part between the lower jaws. Anteriorly, the constriction between the pterygoids is distinct which is rather narrow and bordered by the sub-temporal opening. The sutures between the various elements of

bones are of course not easy to trace but most probably in the same relative position as other nothosaurs. Anteriorly the opening of the internal nares are well indicated. It is antero-posteriorly elongated and the vomers are clearly seen between them.

The entire outline of the skull is sharply pointed triangular. Length from the anterior end to the occipital condyle, 182 mm; from the anterior end to the posterior end of the lower jaw ca 200; maximum breadth at the posterior end of the condyle, 86; proportion of breadth and length: 47.25.

The LOWER JAWS are also long stretched. The symphysis is rather long, ca. 31 mm. The total length of the jaw, 188 mm. Breadth across the posterior end of the symphysis, 37 mm; breadth across the occipital condyle, 103 mm.

The general shape of the skull and the lower jaws resembles those of *Ceresiosaurus* and the size is somewhat larger than the bigger individuals of the same genus.

TEETH On the mold, there are some broken circular pits representing the upper teeth. They are of variable size and found on both sides as well as anterior to the snout. The single isolated tooth found together with the skull belongs certainly to the same individual. It is laterally compressed and its root is broken. The striations and sharp point of the tooth are typical for nothosaur, we are not sure whether this tooth is an upper or a lower one.

VERTEBRAE AND RIBS There are 28 vertebrae and many ribs preserved. The vertebrae are mostly represented by centrums, a few with the neural arches in good condition. Four of them may be regarded as the middle neck vertebrae and eight as the posterior of the transitional vertebrae between the neck and the dorsal ones. There are twelve more or less well preserved dorsal vertebrae, mostly with neural arches. The other four are most probably the sacral ones. There is no trace of caudal vertebrae. The number of the whole series of the vertebrae as well as that of each section is unknown. As our form is in close connection with the members of the true nothosaurs we would think that the number of the presacral vertebrae is around 45 and the sacral vertebrae is probably also 5. All the vertebrae are amphycoelous. All the vertebrae were found isolatedly in the laboratory, so that the given position of the vertebrae in the column is purely suggestive.

The NECK VERTEBRAE are smaller than the dorsal ones. The four middle ones are rather elongated while the following ones look shorter due to the increasing of their thickness. In the anterior ones, the parapophysis and the diapophysis are distinct and separated. In the following ones the parapophysis is only indicated by the weak lateral process-like projection. The broken surface of the base of the neual arch is typically formed like that of other nothosaurs. Length of the centrum, 20.5 mm; height and breadth of the centrum anteriorly, 9 and 13 mm.

With the exception of the last one which is probably the posterior lumbar or the lumbar-sacral vertebra, all the others are the dorsal and thoracic vertebrae. Most of them are nearly completely preserved with the neural arch but the dorsal spines and the pre- and postzygapophysis are mostly broken. The elongated facets of the nearly confluent tuberculum and capitulum are preserved in most of them. The dorsal spines are unusually low. The measurements of the six figured specimens: Length of the centrum, 21, 21, 21.5, 21, 18 and 17 mm. Breadth between the diapophyses, 42, 41, 48, 44, 41 and 48 mm. Height of the total vertebrae measured from the posterior end of the centrum,

38, 39, 39, —, 38, — mm. Height of the dorsal spine, 8, 9, 9.5, —, 8.5, — mm.

It is estimated that at least 17 or a little more presacral vertebrae are missing. Those are anterior neck, middle neck and lumbar ones. A few dorsal vertebrae may be also missing.

Only two SACRAL VERTEBRAE with centrums but the neural arches are damaged. The other two are represented only by the neural arches. All of them are indicated by the large facet of the attachment of the sacral rib. Judged by the named facets there are one or two of the sacral vertebrae missing. The centrum of the sacral vertebrae is less amphycoelous or nearly flat. The one with the large rib facet may belong to the second one and the following one is lost. The only one with the dorsal spine preserved probably the fourth one indicates that it is very low. Length of the centrum, 17 and 19 mm. Length and height of the dorsal spine 19 and 9 mm.

RIBS There are some 25 more or less well preserved ribs and a great number of fragments of the same, some with the heads. Most of them seem to be the right side and their natural position is no more certain. Their arrangement showing in the reconstruction mounting is purely theoretical. Nevertheless, it shows the general view of the whole set of the ribs. Of course many of them are missing. Those with the head elongated and distal end expanded are the anterior ones and the others with the distal end not expanded or narrowed are posterior in position. Measurements of the two figured ribs. Straight length, 98 and 99 mm. Length and breadth of the proximal end 16 and 8; distal end, 11 and 7 mm. The same of the other 10 and 7; 10 and 9 mm.

Two of the short and broad bones may be interpreted as the first sacral rib. The complete one: Length 43, proximal breadth, 15 and distal breadth 18 mm. The other bone may indicate the sacral rib of the last sacral but is also possible that it is a metacarpal. Length, 37 mm.

PECTORAL GIRDLE AND ANTERIOR LIMBS SCAPULA The right scapula is nearly complete, only the tip of backward spine being missing. It is very similar to that of *Nothosaurus*, but the upper border is almost straight and inner side is deeply excavated. The outer side is also weakly depressed. The articular surface for the humerus is prominent. Length of the humerus border, 42 mm; height from the humerus border to the upper border, 32 mm; estimated length from the proximal end to the tip of the spine, 86 mm.

CORACOID Both are well preserved. The proximal part of the left one is damaged but reconstructed according to the right one. It is typically formed like that of nothosaurs and simosaurs. The proximal end is rather thin especially the part in articulation with humerus. In contrast, the distal end in contact with the opposite one is especially strong. The inner side is perfectly flat while the outer side marked with a convex ridge along the middle and distal part of the blade. The median circular curvature is rather deep and the lateral side is comparatively weak. The broken foramen coracoideus is rather small. Maximum length, 98 mm; proximal breadth, 60; distal breadth, 45 mm; middle constriction, 24 mm.

HUMERUS Both humeri are complete. It is short and robust. The middle shaft is short and less flat in cross-section. Both ends are considerably expanded and narrow gradually towards the middle. The proximal part of the right one is not broad and with the distal end less subequal and probably not normal and distorted. Both are moderately curved. The proximal condyle is strong with flat end. The entepicondyloid foramen is

weakly indicated and more distally situated. The length of the humerus is distinctly shorter than the femur. Total length, 112; proximal breadth, 34 (left), 26 (right); distal breadth, 32.5 (left), 36 (right); cross-section of the shaft, 16 and 13 (left), same of the right. (Chungking specimen: 16 and 9 mm).

There is no sure presence of the lower arm. Two broken bones may represent the distal end of a ulna and a proximal end of radius.

PELVIC GIRDLE AND POSTERIOR LIMBS ILIUM Only the right one is completely preserved. It is a very characteristic bone of the skeleton. Comparing with the known ilium of other nothosaurs, it is characterized by its long and low general shape. In most of the ilium of nothosaurs the height of the bone is less than or subequal to the length of the pubic and ischian border. In our specimen, the latter is distinctly longer than the former. Furthermore, the anterior process of the ilium blade is totally absent, forming an obtuse curvature. The posterior process is short and blunt. The acetabulum is well marked but its upper border is not so well defined. The pubic and ischian border is thick and forming a very obtuse angle. In the inner side, there is a depressed area immediately above the pubic and ischian border. Above this, there are at least three rough surfaces evidently for the attachment of the sacral ribs. From this feature, it is very likely that the remaining sacral ribs may not in connection with the ilium as in other nothosaurs. Length of the lower border 39; maximum height, 34; length and thickness of the pubic border, 25 and 12; the same of the ischian border, 21 and 7 mm.

The only preserved right PUBIS is also very characteristic. It is complete. It is a short and broad bone with the middle constriction rather weak. The posterior border is almost straight. The border between the acetabulum and the contact surface of the ilium border is well separated. The pubic foramen is almost vanished in outer side but well indicated in the inner side and is marginal in position. The distal end is thin with a distinct separation between the anterior and posterior parts. There is no notch along the border as in *Simosaurus* and no bay-like curvature as in *Paranothosaurus*. Length, 79; proximal breadth, 48; distal breadth, 51; breadth at the middle constriction, 36; thickness of the proximal end 19, distal, 5 mm.

The ISCHIUM is represented by the left side. It is also complete. The constriction below the proximal part is comparatively weak and its breadth exceeds that of the proximal end of which the contact surface of the ilium and the part forming the acetabulum is distinct. The distal part is strongly expanded. The anterior part of the distal end in contact with its opposite one is rather thin. The length of the distal end is about the same of the maximum height of the bone, similar to that of *Simosaurus gaillardoti* but the middle constriction is much less than the named form. Height of the bone, 89; proximal length, 34; distal length, 82.5; middle constriction, 31 mm.

FEMUR Both femora are well preserved. The femur is also rather peculiar in structure as compared with that of other nothosaurians. The both ends are conspicuously expanded and subequal in breadth. The both ends narrow in a very gradual way towards the middle so that the real shaft is relatively very short. It is not compressed. The condyles of both ends are well differentiated and strong. The proximal condyle is almost ball-like with the lateral articular facet extending very much downwards and laterally; in the distal end the tibiale condyle is especially strong. All these suggest that the posterior limb of our form is more powerful than supposed. It is longer than the humerus. The

two femora are not in exact shape, the both proximal and distal parts of the right one is a little depressed and the left one is more near to the natural shape. Total length, left, 140, right, 138; proximal breadth left, 30, right, 31; distal breadth, left 31, right 28; middle constriction, left, 15 and 14, right 16 and 14 mm. The proportion of the humerus and the femurs 80—81.

TIBIA AND FIBULA Two complete bones figured in fig. 12 are considered as the tibia and fibula respectively. They are probably the right ones. Very strange is that the fibula is shorter than the tibia (in most nothosaurs, it is reversed). The shaft of the tibia is very much flattened. Both ends are very strong. The fibula is curved and flat. The two bones are longer than the half of the femur. Tibia length, 81; proximal breadth, 23; distal breadth, 19.5; middle breadth, 16 mm. Fibula: length 76, proximal breadth 19; distal breadth 16; middle breadth 10.5 mm. Proportion of the tibia and the femur, 57.85.

There are no positive evidences that more than one individual or other form is represented in our collection, as given in the foregoing description. However, there are at least two bones of problematic nature. They are certainly not nothosaurs. Their relationship with our form is obscure.

**Determination and discussion** Although not completely excavated, the saved bones are sufficient for determination. From the acute triangular shape of the skull, the anisodont teeth, the pointed snout, the weakly constriction of the centrums of the vertebrae, the peculiar features of the postcranial bones, there is no doubt that our form represents a true nothosaurid. In the course of the description it has made clear that our form is different from most of the known species of this family. We propose to consider it as a new form for which the name *Sanchiaosaurus dengi* (gen. et sp. nov.) is introduced. Its diagnosis is given as follows.

Skull elongated triangular with the nose pointed. Symphysis of the lower jaw long. Teeth anisodont and widely spaced and striated. Probably about 45 presacral vertebrae. The centrum weakly constricts with the dorsal spine extremely low. Sacral vertebrae more than four, dorsal spine low. Upper border of scapula straight. Coracoid with the foramen coracoideus small. Humerus short and robust with the distal end expanded and shorter than the femur. Shaft of it nearly rounded. Ilium low without anterior process of the ilium blade. Pubis short and with weak middle constriction, no notch in the distal border. Pubis foramen small. Ischium with weak neck-like constriction. Femur with both ends weakly expanded and gently curved. Tibia short and flat. Fibula shorter than the tibia.

The generic name represents the locality of the type and the specific name is dedicated to Mr. F. L. Deng, through whom this valuable specimen was found and saved.

As already made clear in the description the outline of the skull is similar to that of *Ceresiosaurus*. The proportion of the breadth and length of the skull is $86 \times 100/182 = 47.25$ which is also close to this genus. The breadth of the skull is about the half of the length in this genus and our form. The teeth are also similarly formed as those of our new species. The post cranial skeleton, however, differs very much from this European form. The humerus is more expanded in both ends and shorter than the femur. The proportion of the humerus and femur is 80. The other parts of various bones differ also in many points from those of the *Sanchiaosaurus*. The other

known nothosaurians are still widely apart from our form and need not to be discussed any more.

In China two other nothosaurs are close to the Kweiyang form in size.

The first is the *Kwangsisaurus orientalis* (Young, 1959). Although it is represented by part of a skeleton but there are no skull, no neck and no anterior limbs so that no single proportion can be deduced. It is somewhat larger than the Kweiyang form. The distal part of the femur is also expanded and curved but the fibula is longer than the tibia. The vertebrae are very long stretched. The stratigraphical position is lower than the Sanchiao beds. From all these considerations, we decide that there is no close relationship between the two genera.

The second is the single humerus from Chungking (Young, 1960, P. 83). It is about the same size as that of our form, but after a direct comparison between the two specimens, the Chungking humerus is slenderer. The proximal part of it is much less robust and the shaft is more flat. For all these facts we do not think that the Chungking specimen should be referred to our form. It is probably not a humerus of pachypleurosaur but a nothosaur, most probably a new species. We prefer, however, to wait more satisfactory facts for a final decision.

According to Mr. Deng, the geologist of the Bureau of Geology of Kweichou, the bed containing *Sanchiaosaurus dengi* is Anisic, lower Middle Triassic, based upon characteristic invertebrate remains. The find of the new nothosaur supports this conclusion.

## Nothosauroidea indet.

In addition to the foregoing described forms, there are a number of isolated and fragmentary bones from various localities and hard to refer to any of these species. They are shortly described below.

1. Pachypleurosauroidea indet. Three segments of vertebrae, one with six, and the other two with four each (Plate VIII and IX) from Tachai, Tinchiao, Shingyi, same locality as that of *Shingyisaurus*. Cat. number of the Museum of Geology, Vm.1308. Since the both ends of each specimen are damaged and some of the vertebrae are also incomplete, there are only seven of the centrums better in condition for study. All the neural spines are broken. The first one with six vertebrae belongs probably to the neck or anterior dorsal as judged by the rather high position of the closely situated facet of diapophysis and parapophysis. The position of the other two specimens is less clear, probably one is thoracic and the other is caudal. Cat. No. of IVPP V.2796 (cast).

All the vertebrae are characterized by the short and broad feature of the centrums. They are somewhat swollen between both ends, broader than the length and certainly tube-like in structure and pachyosteological. The centrums are somewhat transversally elongated and in the ventral side, it is rather flat with broad and shallow furrow. The size of the vertebrae is largest in our collection, length of the centrums 23—26 mm, breadth at the middle, 26 (one of the best preserved).

In size it is too large for being the postcranial vertebrae of *Shingyisaurus*. Many of the features are found in *Proneutiscosaurus*, (Volz, 1903) and the size of our form is a little larger than the German one. It is highly probable that we have to deal with a new nothosauroid comparable with this form. But the present specimens are not sufficient for giving a name.

2. Nothosauridae indet. A. From the locality Shangpu Tsangchichiao, Chinchen yielding *Chinchenia sungi,* there are some fragments of vertebrae and limb bones which are nearly twice larger than the named form. There are however no special features worth mentioning. They may represent the larger individuals of the same form or a separate species of the same genus. A especially large neural arch and other piece of bone may not be a nothosaur at all and indeterminable. V.2797.

3. Nothosauridae indet. B. According K. C. Sung a rib was observed from a slab during the work for constructing a dam in the vicinity of Hungfenghu near Tsangchichiao, Chinchen. It was not able to be brought back the slab and a drawing of the rib has been made which is shown in fig. 13. It is more than twice larger than that of *Sanchiaosaurus.* End to end length, 274 mm; length of the proximal end, 25 mm. The distal end is not expanded, 11 mm. The ridge near the proximal end cannot be seen from this sketch, as this rib is seen from the behind, it is concealed if it is present. It is strongly curved. It belongs apparently to the posterior dorsal region of the column. This large rib suggests that besides the nothosaurs already described, we have to expect a much larger form of this suborder something like *Paranothosaurus.*

According to Mr. Deng and C. S. Yuan traces of nothosaurs have been observed from Anshun west of Kweiyang and Wongan N. E. of Kweiyang, but no specimens have been collected. These two localities are given in dotted circle in fig. 14.

## CONCLUSION

Since my publications on the Chinese nothosaurs (Young, 1958, 1959 and 1960), our knowledge concerning this group is considerably increased during the last few years. Not only many new localities have become known but also many additional materials are new to science. The main result of the so far known nothosaurs in China studied in the present paper may be given as following[1].

### 1. Known forms of nothosaurs in China

| | |
|---|---|
| Suborder pachypleurosauroidea | |
| Family Keichousauridae fam. nov. | |
| *Keichousaurus hui* Young | Tingchiao, Shingyi, Kweichou |
| *Keichousaurus yuananensis* sp. nov. | Wangchenkang, Yuanan, Hupeh |
| Pachypleurosauroidea indet. | Tingchiao, Shingyi, Kweichou |
| Family Simosauridae | |
| *Shingyisaurus unexpectus* gen. et sp. nov. | Tingchiao, Shingyi, Kweichou |
| Suborder Nothosauroidea | |
| Family Nothosauridae | |
| *Chinchenia sungi* gen. et sp. nov. | Tsangchichiao, Chinchen, Kweichou |
| *Sanchiaosaurus dengi* gen. et sp. nov. | Chinchungchiao, Kweiyang, Kweichou |
| Nothosauridae indet. A | Tsangchichiao, Chinchen, Kweichou |
| Nothosauridae indet. B | Hungfenghu, Chinchen, Kweichou |
| Nothosauridae indet. C | Machiapap Chungking, Szechuan |

1) During the preparation of this paper, new finds of other interesting aquatic reptiles have been obtained from Nanchang, Hupeh. It is too late for being included in the present study and will be described in another occasion later.

(The humerus formerly referred as Pachyplaeurosauridae, Young, 1960[1])

*Kwangsisaurus orientalis* Young — Fupingtun, Dengliu, Wuming, Kwangsi (Young, 1959)

There are altogether ten different species or forms of sauropterigians distributing in two suborders and three families and six better known genera and species. They are distributed in four widely extended provinces, Hupeh, Szechuan, Kweichou and Kwangsi from where the Kweichou is the only province most rich in forms and localities.

## 2. Comments on the classification

In the present paper I have adopted the three division of the order Sauropterygia, that is, to raise both Pachypleurosauridae and Nothosauridae to suborder rank or at least to super-family. The difference in many important features and the complexity of their included members seem to justify such an arrangement. Of course I am not intended to make a thorough and complete review of the classification of the whole order at present but like to point out the general idea concerning this problem.

The ground for classification should be restricted for some leading characteristics such as the temporal opening, shape of the skull, teeth, proportion of the skull with the neck, same of the skull and neck with the trunk and same proportion of the limb bones.

Suborder Pachypleurosauroidea. Temporal small, or moderate in size, never much elongated; skull usually long, with broader snout; teeth isodont. Skeleton usually pachyological. Sacral number less than four.

Family Pachypleurosauridae. Temporal opening very small, smaller than the nasal opening. Skull moderately long, less than one half of the neck. Neck short. This is a family including forms with humerus distally expanded and shorter than femur and forms with no expanded humerus and longer or subequal in length with the femur. I agree with the view of Kuhn-Schnyder (1959) that *Pachypleurosaurus* material was lumped too much by Zangerl (1935). In this connection it is better to reduce the contradictory view raised by v. Huene (1959).

Genera included in this family: *Pachypleurosaurus, Pachypleura, Rhaeticonia* etc.

Keichousauridae. Temporal opening small but a little larger than the nasal opening. Skull a little shorter. Neck long about twice that of the skull. Humerus not expanded in distal end and longer than the femur. *Keichousaurus.*

Family Simosauridae. Temporal small or moderately large but not much elongated. Skull rather short with broad snout. Neck extremely long. Limb proportion same as before. This family is currently grouped under Nothosauridae or as a separated family. In view of the comparatively small temporal opening like *Anarosaurus* and the short and broad preorbital region its close relationship with the other members of *pachypleurosaurus* is obvious. In fact, F. v. Nopcsa did this many years ago (Peyer, 1933. p. 117). *Shingyisaurus, Simosaurus, Anarosaurus, Elmosaurus* etc.

Suborder Nothosauroidea. Temporal opening usually large to much elongated. Skull

1) The other specimen containing numerous bones determined as probable a nothosaur from Jenhui (Young, 1960) is not a nothosaur but a first record of ichthyosaur in China as suggested by Kuhn-Schnyder and the specimen was re-examined during the present study. This will be treated in another occasion later.

long with rather slender and constricted snout. Teeth anisodont. Postcranial skeleton not pachyological. More than four sacral vertebrae, humerus distally broadening and shorter than the femur.

Family Nothosauridae. Skull more elongated. Temporal opening very long. Humerus shorter than femur with cross-section at the middle more or less flat. *Chinchenia, Sanchiaosaurus, Kwangsisaurus,* Nothosauridae indet. A, B, C, *Nothosaurus, Ceresiosaurus, Paranothosaurus, Metanothosaurus* etc.

Family Lariosauridae. Skull relatively short and broad, shorter than half of the neck. *Lariosaurus.*

Family Cymatosauridae. Skull much elongated like nothosaur and premaxillae in contact with the frontal. *Cymatosaurus, Germanosaurus.*

? Family Corosauridae. *Corosaurus.*

Wang considered the *Nanchangosaurus* (1959) as a new suborder of the Sauropterygia and this was accepted by Kuhn (1961). The small supratemporal opening suggests a close relationship with the pachypleurosauroidea but the very much specialized features of the skull seem to exclude any direct connection with all these sauropterians. Its level is at most lower Triassic and not Permian. On the other hand it shows some interesting similarities at least in skull with the new material obtained from Nanchang, so it is superfluous to discuss this problem here in any detail.

## 3. Stratigraphy

Like in Europe, most of the nothosaurs found in China are derived from the Middle Triassic as evidenced by the invertebrate fossils. But in detail it is by no means absolutely settled as concerning the zonal classification. The only exception is perhaps the *Kwangsisaurus* from Wuming the beds which according to the local geologists are Lower Triassic. The primitiveness of some part of the skeleton supports this conclusion. According to Deng the beds with *Sanchiaosaurus* are Lower part of Middle Triassic ($T_2^1$, Anisic). Those from Shingyi with *Keichousaurus hui* is probably of the same age. The relationship of the *Shingyisaurus* with the *Keichousaurus* is not quite clear. Provisionally we regard it as the same general level. The level of *Keichousaurus yuananensis* may also be Middle Triassic. The same is true for those forms not exactly determined. *Chinchenia* and other forms may be younger than those of *Sanchiaosaurus* saying Ladinic. In any way there is no evidence of the presence of Upper Triassic sauropterygians known in China. The stratigraphical distribution of the known Pachypleurosaurians and Nothosaurians in China may be given in following manner.

Comparing with the circumstances of the first record of the fossil nothosaurs made before, our knowledge of this interesting group is considerably increased during the past few years. But take in consideration of the vast wide distribution of the Middle Triassic marine deposition in China we are far from the real understanding of this group of fossils. The discovery and searching for vertebrate life in the marine facies of China were long overlooked and new endeavor should be made for this direction of exploration which is important both biologically and stratigraphically.

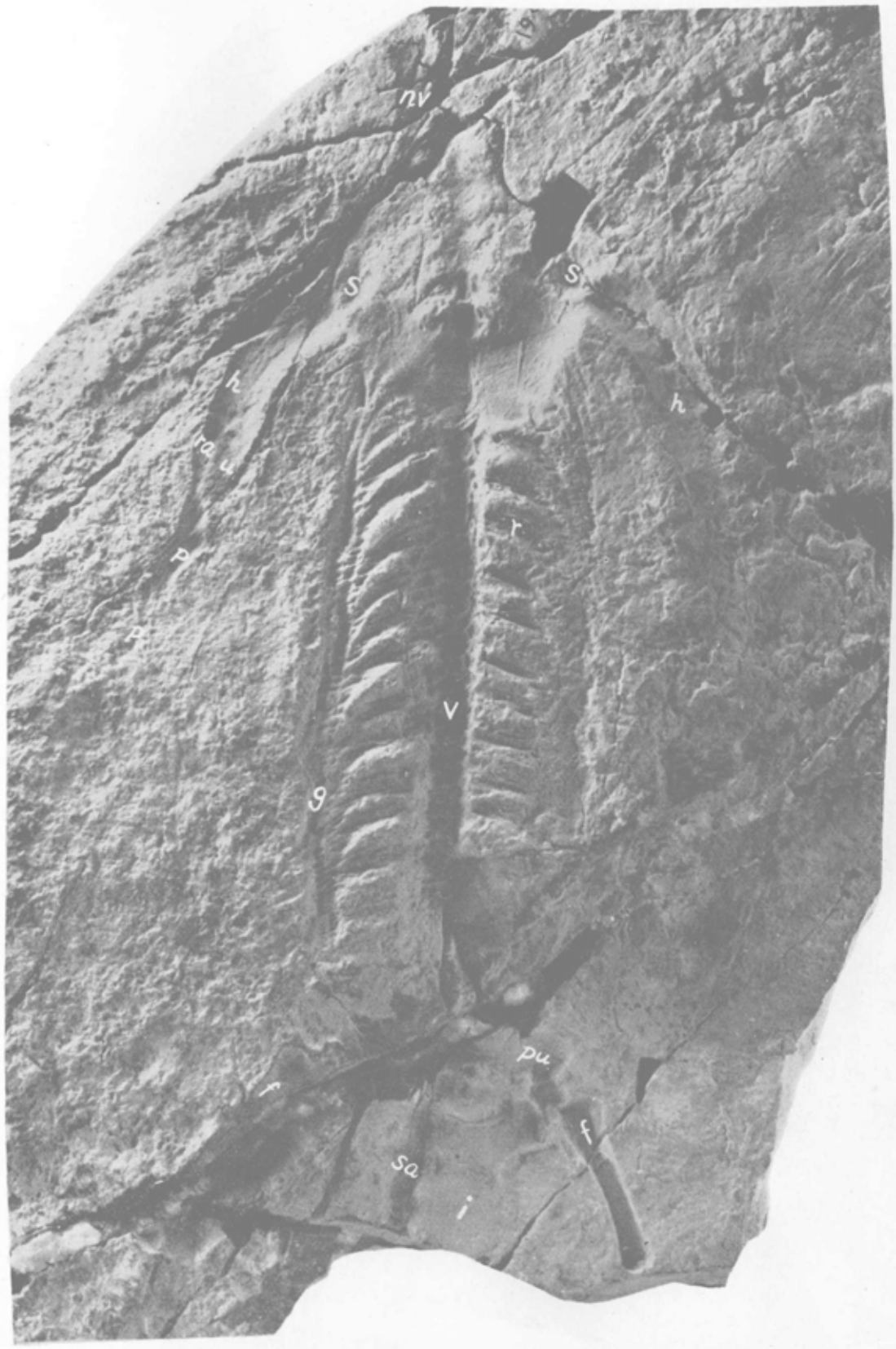
Acknowledgments To Prof. E. Kuhn-Schnyder in Zuerich the writer is deeply indebted for his valuable suggestions of the present group of fossils. To Messrs. F. L. Deng and other authorities of the Geological Bureau in Kweichou I wish to express my sincere

**Table 2.** Stratigraphical distribution of the so far known Nothosaurs in China

| | | |
|---|---|---|
| Upper Triassic | | |
| Middle Triassic | Upper | *Chinchenia sungi* |
| | | Nothosauridae indet. A |
| | | Nothosauridae indet. B |
| | Lower | *Sanchiaosaurus dengi* |
| | | *Keichousaurus hui* |
| | | *Keichousaurus yuananensis* |
| | | *Shingyisaurus unexpectus* |
| | | Pachypleurosauroidea indet. |
| | | Nothosauridae indet. C |
| Lower Triassic | | *Kwangsisaurus orientalis* |

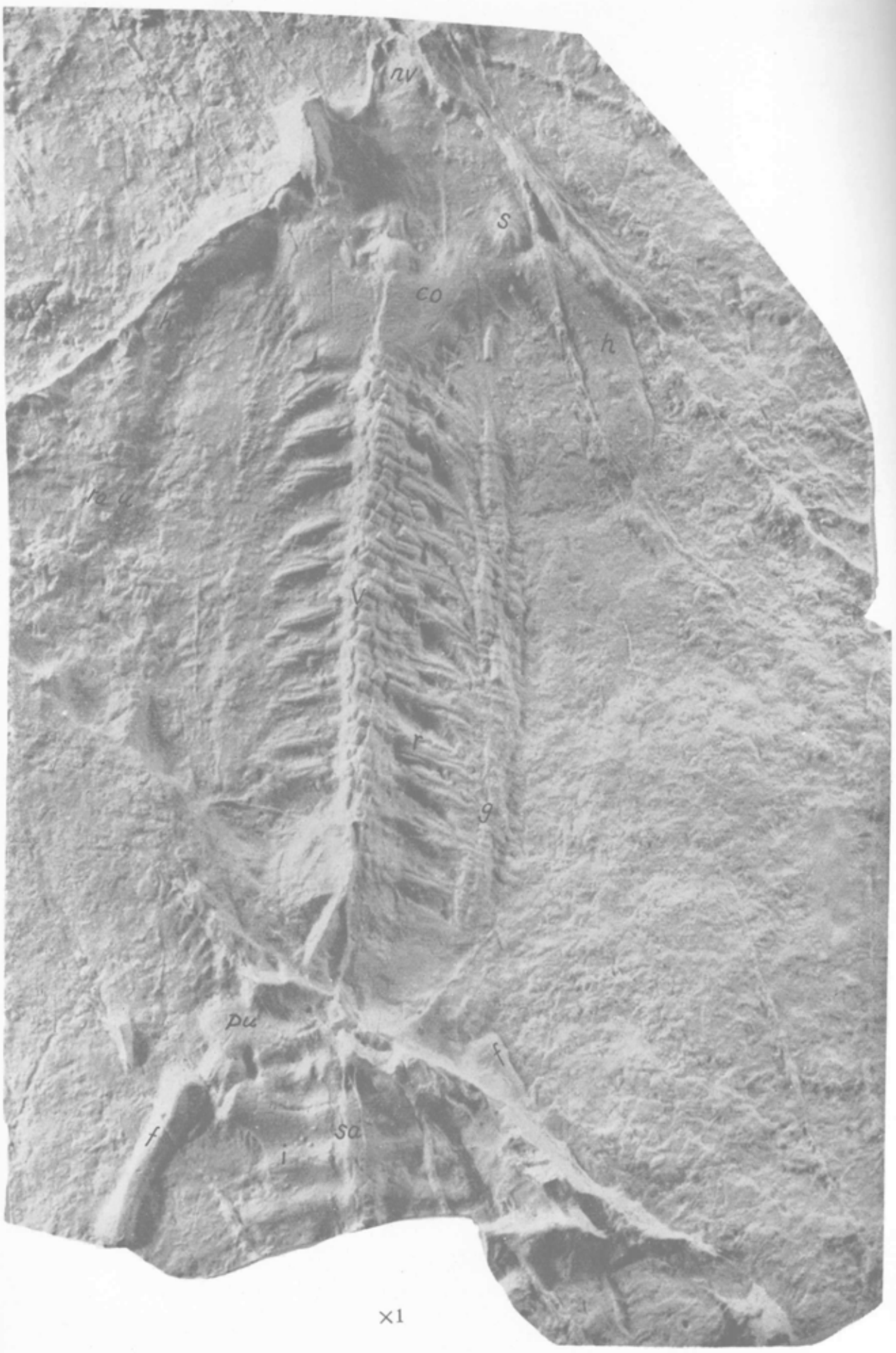
thanks for their kindness in helping us to get the interesting find of *Sanchiaosaurus*. To Mr. F. L. Li of the College of Geology at Peking for transfering to me the type of *Keichousaurus yuananensis* with geological section, and the additional material of *Keichousaurus hui*. I am very thankful to him for his trust in study this valuable fossil. To Mr. C. C. Hu of the Museum of Geology at Peking the author is again indebted for loaning me the type of *Shingyisaurus* and other interesting specimens for study. The same thanks are also due to the authorities of this Museum. During the preparation of this paper I owed much to the following mesdames and gentlemen H. Chang and Y. H. Cao for preparation, mounting and casting of the specimens; C. S. Yuan and K. C. Sung for many valuable field informations of part of the fossils described. C. F. Wang and W. C. Hu for photographs and drawings; Y. Wang for helping me in finding literatures and various way in preparing the manuscript.

P.S. Since the manuscript of the present paper went to press, I got the opportunity in late August 1965 to observe ten specimens of *Keichousaurus hui* kept in the Tientsin Natural History Museum (40117—40126). Most of them are poorly preserved. So far as I can observe they are within the scope of the present description.




远安贵州龙。一块石灰岩上的印模。原大。图上简字的说明与一般采用者同。

*Keichousaurus yuananensis*, (Abbrs. as usually adopted. Original cast.), × 4/5.




×1

远安贵州龙。图版 I 之阳模。原大。简字说明与一般采用者同。

*Keichousaurus yuananensis*, (Abbrs. as usually adopted, mold of Plate I. ), × 1.

胡氏贵州龙。
*Keichousaurus hui*

STV004
×6

STV009
×6

STV004
×1

STV009
×1


**上图**　意外兴义龙。背视，原大。简字说明与一般采用者同。
*Shingyisaurus unexpectus*, (Abbrs. as usually adopted.) Dorsal view, × 1.

**右图**　意外兴义龙。腹视，原大。简字说明与一般采用者同。
*Shingyisaurus unexpectus*, (Abbrs. as usually adopted.) Ventral view, × 1.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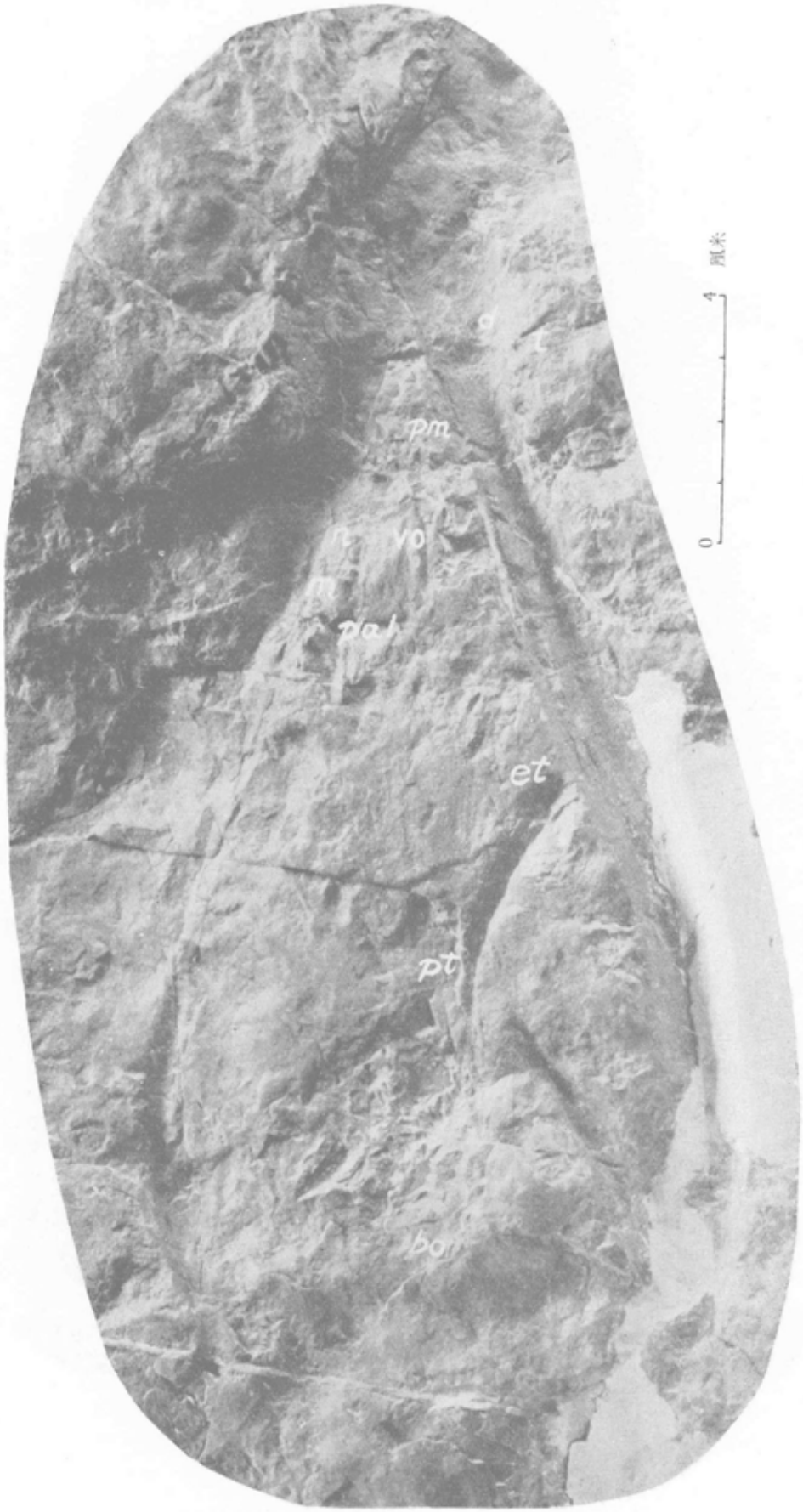
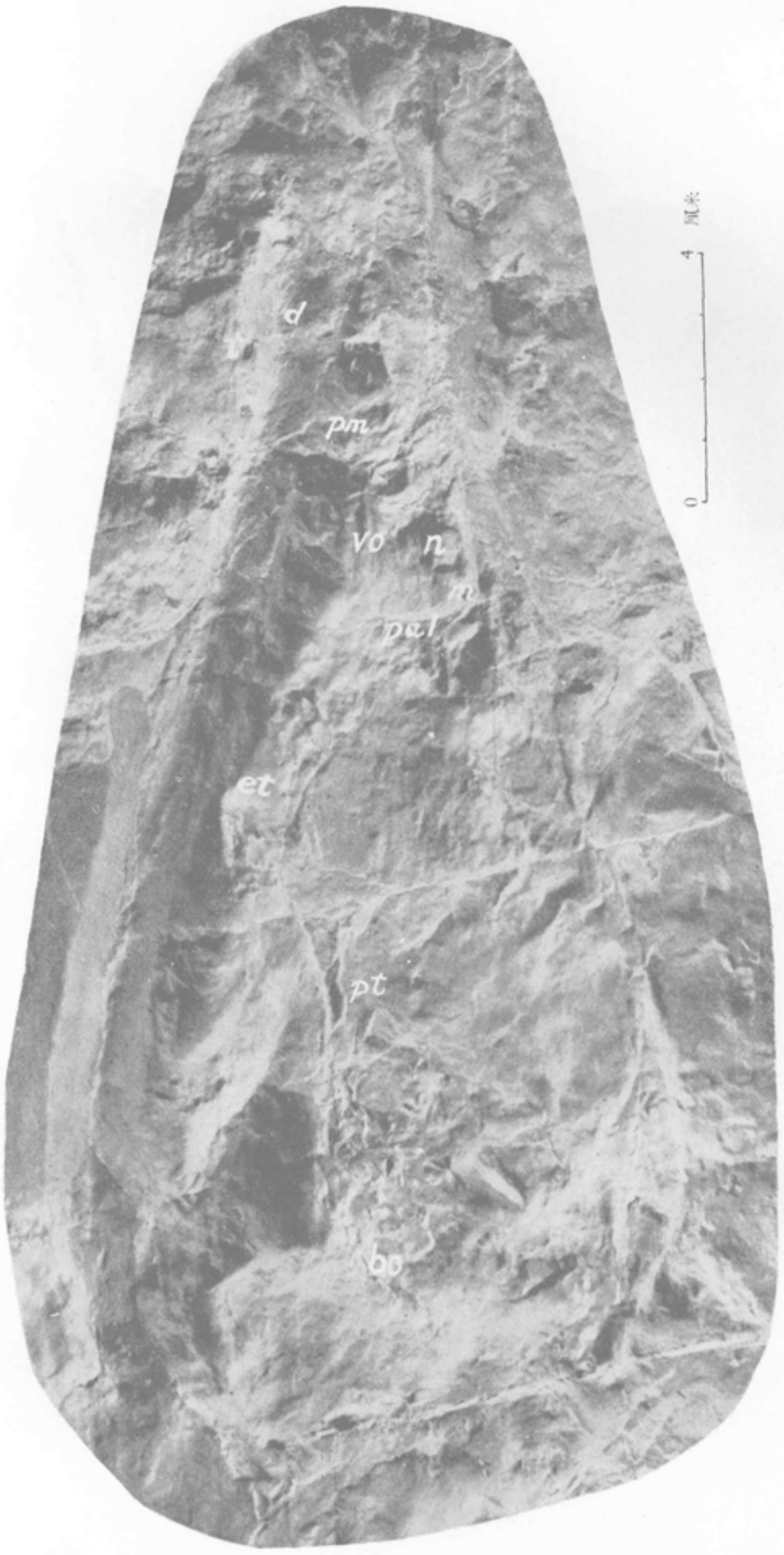
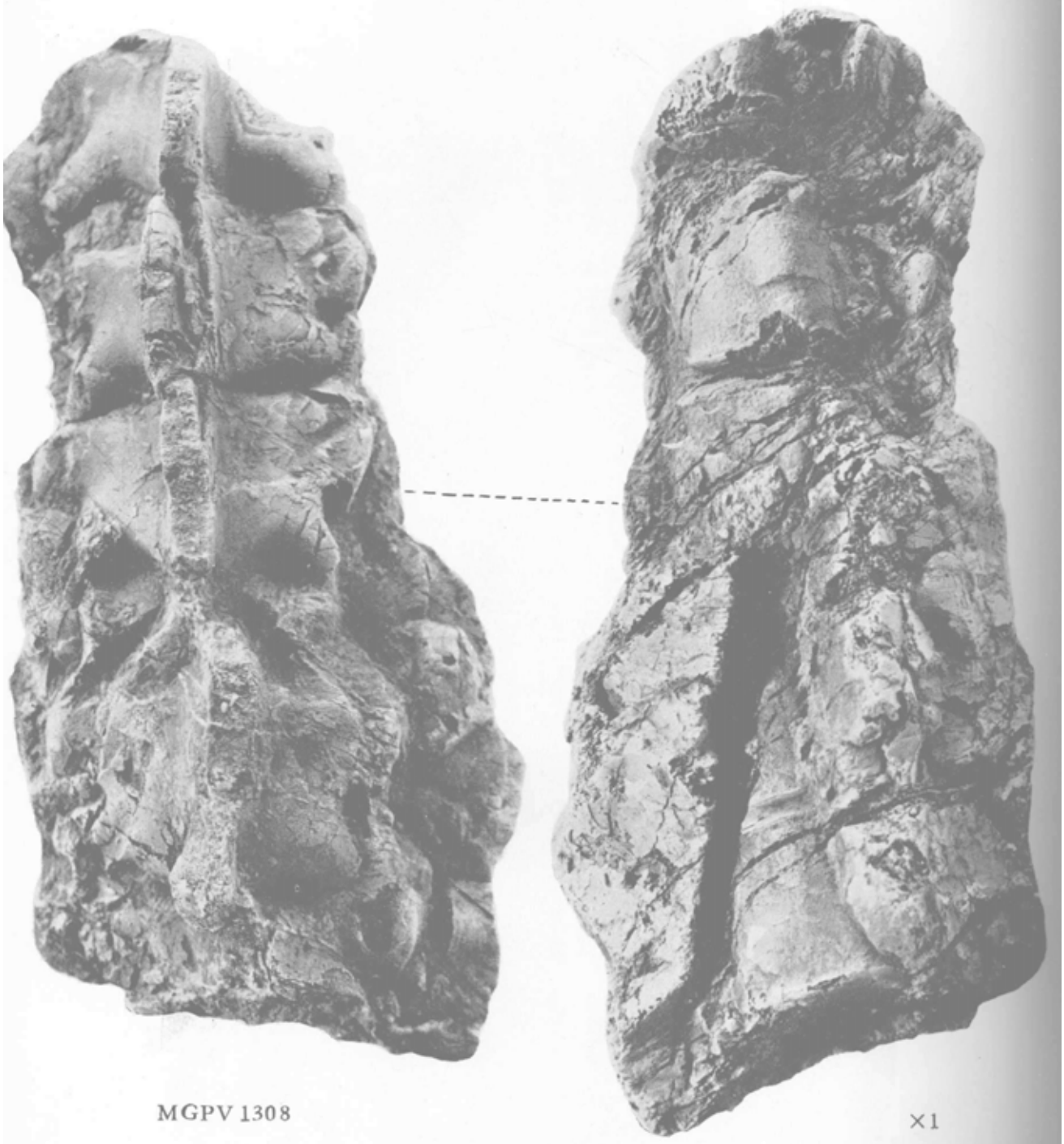



邓氏三桥龙。背视，原大。简字说明与一般采用者同。
*Sanchiaosaurus dengi*, (Abbrs. as usually adopted.) Dorsal view, Ca. × 1.

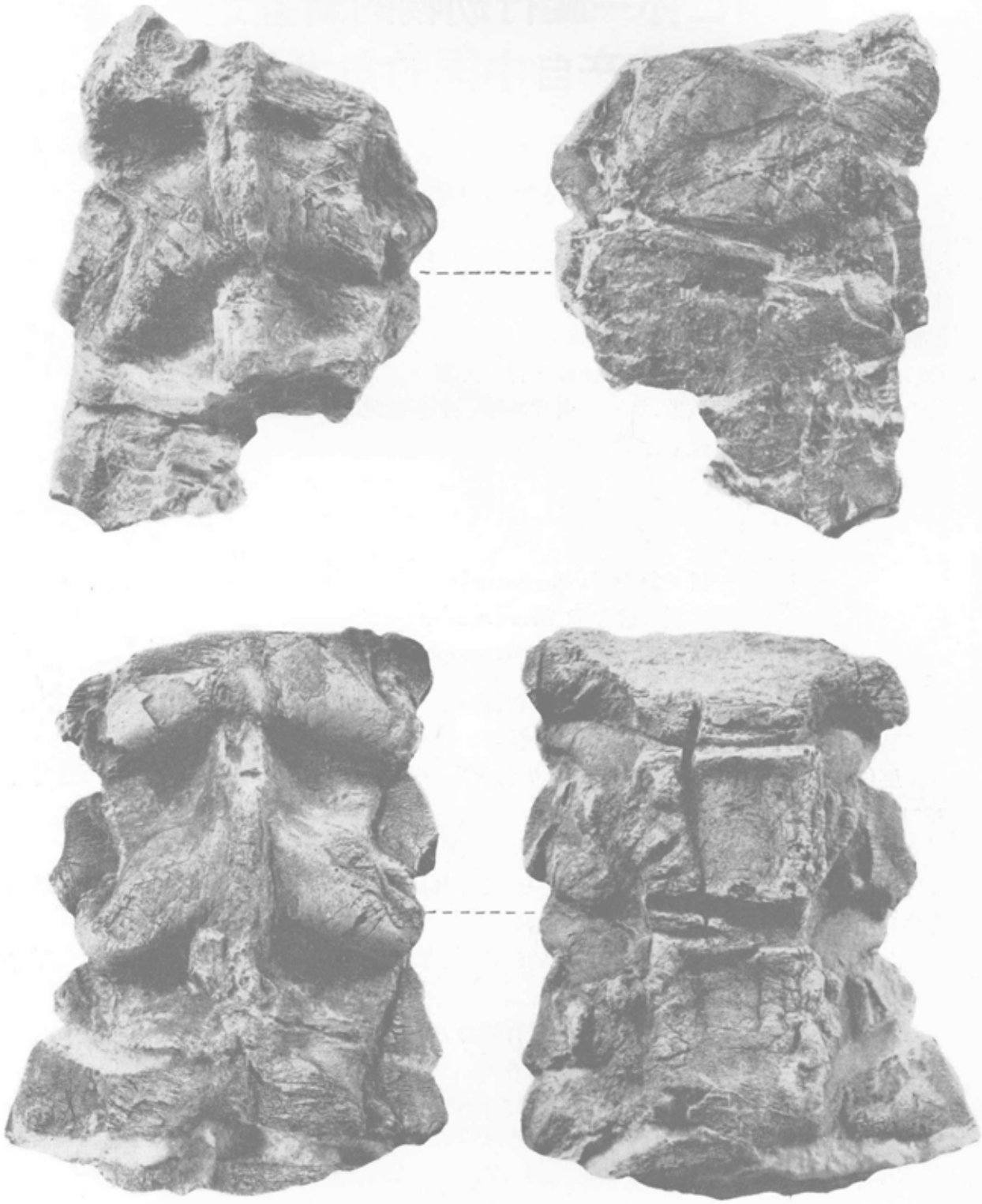



邓氏三桥龙。腹视，原大。简字说明与一般采用者同。

*Sanchiaosaurus dengi*, (Abbrs. as usually adopted.) Ventral view, Ca. × 1.




肿肋龙亚目未定种，原大。
Pachypleurosauroidea indet., × 1.



肿肋龙亚目未定种，原大。

Pachypleurosauroidea indet., × 1.