古脊椎动物与古人类
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新疆的一新翼龙类*

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1963年夏，新疆石油科学研究所勘探室古生物組魏景明采集了一批有重要意义的化石。这批化石随后由古脊椎动物与古人类研究所在新疆的工作队人員孙艾璘、赵喜进带来本所作鉴定。这批材料为第一次在我国发現的翼龙类，归于广义的翼手龙类亚目，在本文加以描述和討論。关于化石的保存情况和地厪情形，除了孙、赵两位一些口头报告外，只有标签所記述的那些。因此本文只拟就古生物部分加以探討。如以后續有标本采获，再考虑补充。

标本描述

翼龙目 Pterosauria Owen, 1840

准噶尔翼龙亚目 Dsungaripteroidea（新亚目）

准噶尔翼龙科 Dsungaripteridae（新科）

特征見代表属准噶尔翼龙

准噶尔翼龙 *Dsungaripterus*, gen. nov.（新属）

特征見代表种魏氏准噶尔翼龙（新种）

魏氏准噶尔翼龙 *Dsungaripterus weii*, sp. nov.（新种）

正型标本 头骨与下顎的前部。两个頸脊椎；十三个連續的脊椎，包括后三个联合背椎，三个后部背椎和七个荐骨脊椎；七个連續的尾脊椎和两个分开的尾末端脊椎；右肱骨近端；可能有一不完全的尺骨；两个有翼的手掌骨；两个第一个有翼指骨，及三个以下的翼指骨；近于完整的荐骨腰带，一对股骨，均仍連接于荐骨脊椎上；一左脛骨的近端。所有以上的标本均属同一个体。另外，还有一些殘破的骨片和由长骨所形成的內模，也当作归于这一个体一部分用于装架上。野外編号960，古脊椎动物与古人类研究所标本登記号V. 2776。

附加标本 肱骨的近端和远端，也可能有一尺骨的近端和远端。一股骨的远端和一对不甚完全的腰带骨，另外一些碎片。野外編号同上。标本登記号 V. 2777。

层位与地点 下白堊統的較上部（野外为 Cr_1^2）。新疆准噶尔盆地西北烏尔禾[江木河（白楊河）入口处]。

特征 一相当大的翼龙类。头骨前部較狭窄而尖銳，微向上弯曲。在鼻孔和眼前孔之前与以上有一中稜。鼻孔前的长可能长于两孔加起來的总长。两孔似相連接，未为

* 5月18日收到。

他骨所隔。下顎前端由縫合綫紧相連接,前端也很尖銳,也向上作显著的弯曲。牙齿微向后弯,除了上顎后部的几个牙外,均彼此相当隔开。上牙約为十二;下牙为十一。下顎的前几个牙特别小,有衰退趋势。联合背椎肯定存在。荐骨脊椎七。第四腕骨特长,第四飞的指骨相当之长。两翼尖到尖的距离約介于三米和三米半之間,約为体长之四倍。荐骨腰带为标准的翼手飞型的。股骨相当之长,长于第一飞指骨的一半,前后作显著弯曲。脛骨也相当长,长于股骨且很直。

头骨与下顎

头骨 只有头骨前边保存。在头骨的两边,鼻孔和眼前孔的边緣都保存了一部分,所以其輪廓是可以看出的,相当之大,后部破损,但可能距断裂处不太远。鼻孔和眼前孔很可能是相連合的,沒有被别的骨分开。在两边均有一淸楚的斜向深沟,代表前顎骨和上顎骨的分界綫。前顎骨的尖端破损,但应当非常的尖銳。这一部分相当狹窄。从側面看,向上弯曲之状很淸楚。約在鼻孔和眼前孔前 45 毫米处,有一发育很好的中稜。其根部明显的凹入,表示此中稜必然先向前伸,然后再向后延伸。因上緣殘破,其高度不得而知。在头骨后端殘破处,看不到顴骨的任何痕迹。在头骨腹側,全为前顎骨和上顎骨所盖,但有可能內鼻孔卽位于后部破裂处或距之不远的地位(現为石膏所塡充)。在腹側有一淸晰的中稜和每边一沿边的浅沟可以几乎通到头骨的很前部分。

头骨上的中稜只見于寇氏翼手龙,因之我們有理由相信,我們标本的头后部构造应接近于这一种。接受这个說法,可以認为头骨的眼前孔后部之长比同一孔前部之长为短。

保存总长 275 毫米;估計长 285 毫米,从尖端到鼻孔和眼前孔前緣 190 毫米;中稜前高度 35 毫米;眼前孔后高 22 毫米,尖端破裂处寬 4 毫米;眼前孔前緣寬 47 毫米;后端破裂处寬 82 毫米。

左側有十二个牙及其牙孔,右側十一。由鼻孔和眼前孔相当靠后,与下牙相比,好象在最后的左側牙以后,已沒有牙,或至多只有一个或两个牙遺失。在这个标本的后部,似其上已为顴骨所迭。如果如此,上牙数应为 12 或至多 14。在头骨的前端約有 130 毫米长沒有牙齿。除了后端五个牙相距較近以外,前边的牙相距較远。相距远的牙大小差不多。相距較远的牙中最后一牙在两边均保存較好。牙冠低,具微向后弯的尖,牙面几乎是平滑的。后边五牙相距較近,但在下牙的最后一牙后可能不起作用。在左边一較新的牙(从后計最后一牙孔之前)表示具有两尖。除非下顎可以前后移动,很难設想这些后边牙有什么用处。

下顎 两下顎由縫合处紧紧相連約长 187 毫米。此处有一长而較弱的直稜。从腹側看,两下顎完全愈合为一。两下顎向前端逐漸相近以成一尖銳的尖,其末尖惜已缺失。从側面看(左側保存較好),在从前端計第七牙以后几乎是直的,但从这一点起向前下顎显著地向上弯,以便与上顎相适应,但更为显明。另外有两殘块,十分可归于这一对下顎,大的一块似属左側,小者属右側。比起前部下顎来高度較低。因此有这一种印象,卽我們的下顎应和无齿翼龙(*Pteranodon* 或 *Ornithodesmus*)的下顎相象。由于两下顎碎片的高度很一致,可能更接近于后者,可能和两属一样,也沒有下顎孔。两下顎骨向后分开漸約成为二十五度角。縫合处之后有一向后的深窝。在牙列以后下顎上稜很显著,尤以两破碎

部分为甚。从腹側看，縫合綫后部有清楚的台梯状，骨面具有不同程度的粗糙面，以腹側縫合綫后部为甚（同一性质在头骨上也有，但很不清楚）。这一性质或者表示这动物的嘴套有角质的鞘状物。

下牙 所露出的牙以个别牙齿和牙孔为代表。但右側有两个缺失，左側十一牙代表眞正的牙的数目。同上牙一样，下牙也是彼此相当隔开的，只有最后两牙相当靠近一些。多数的牙缺失或受損伤，从前端計右側第七牙，左側的第七、第九、第十牙有部分牙冠保存。最后一牙保存最好，只有尖端不完全。这个牙表示牙冠具微弱的条痕，牙尖微向后內側弯。最有兴趣的是前三个牙小而退化，以第一牙为甚。由前端計以第八牙为最大。全牙列长 138 毫米，保存长，左 270 毫米；第六牙旁下顎高 36 毫米，第八牙处高 31 毫米；近破裂处高 31 毫米；左下顎碎片高 21 毫米。

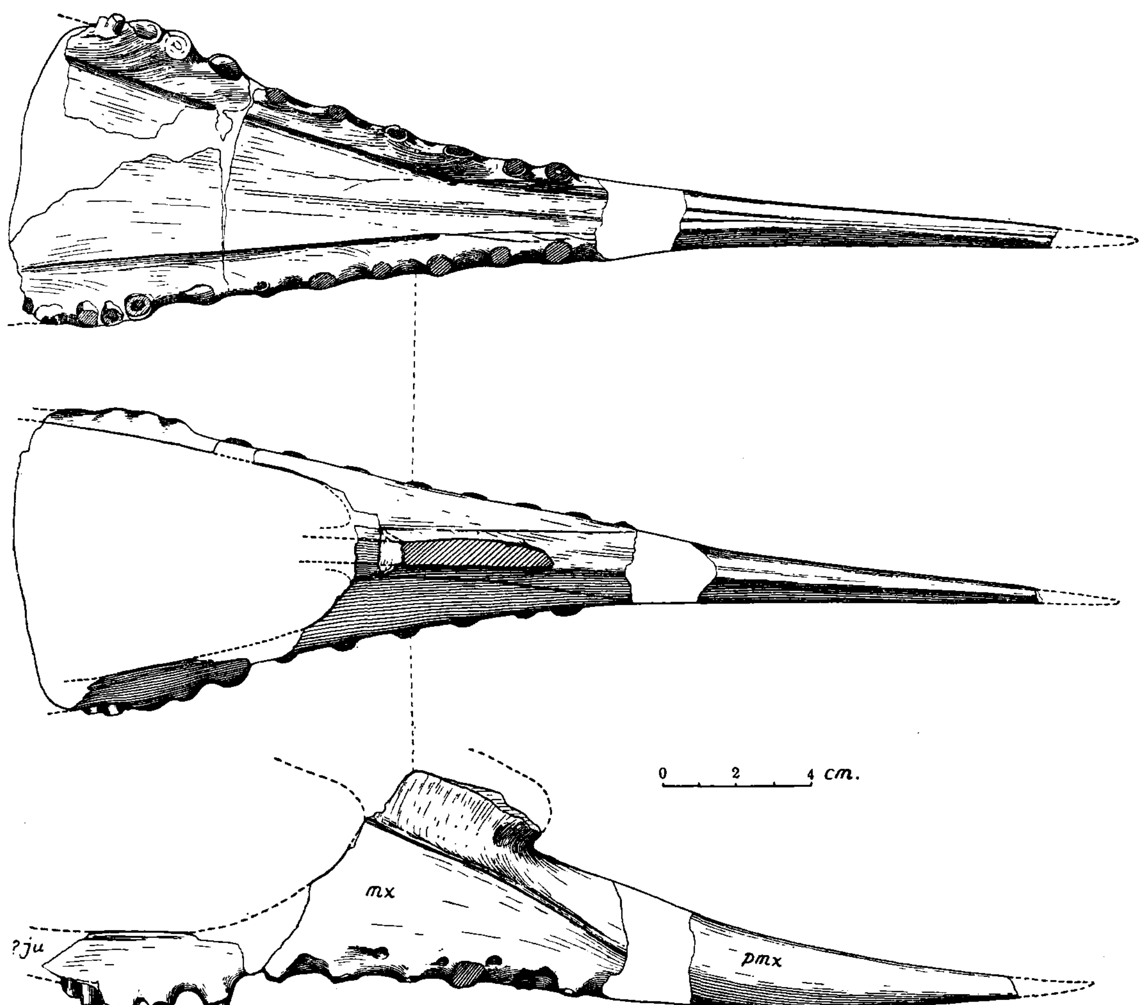

图 1. 魏氏准噶尔翼龙，新属新种。头骨与上顎骨前部，三面观，原大二分之一。

Fig. 1. *Dsungaripterus weii*. gen. et sp. nov. Anterior part of the skull ventral, dorsal and right side views. 1/2 nat. size. Abbreviations: ju. jugal; mx., maxilla; pmx., premaxilla.

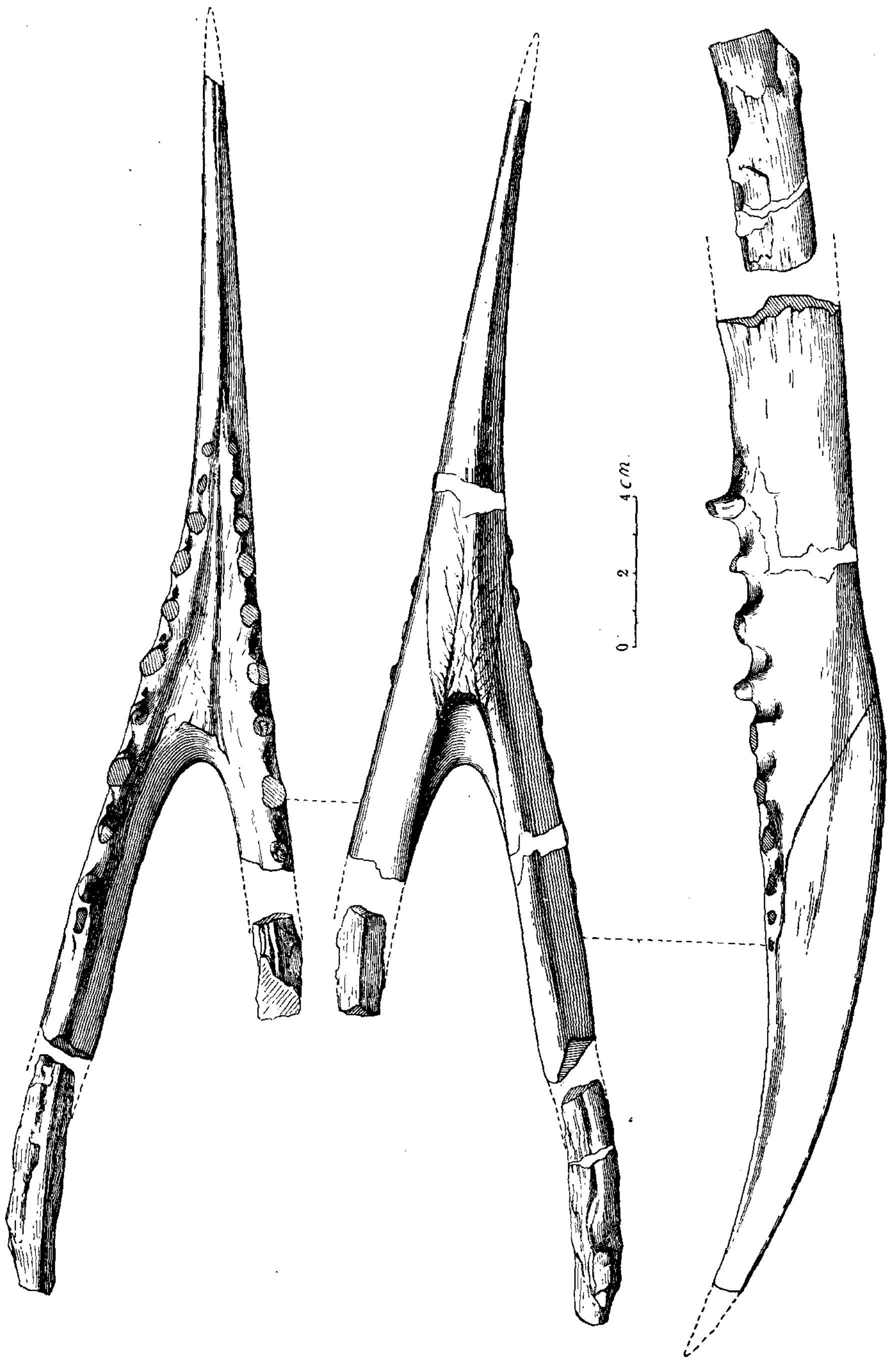

图 2. 魏氏准噶尔翼龙，新属新种。下颚三面观，原大二分之一。

Fig. 2. *Dsungaripterus weii.* gen. et sp. nov. Lower jaw pair in dorsal ventral, and left side views. 1/2 nat size.

除去前两个下牙外，所有上牙下牙的周围，近牙孔处的骨均相当地升高到約 3—6 毫米。此外在上下顎牙列的側旁的每两牙間，有一比較清楚的小窝。在牙列前端和后端，沒有此等現象。这小孔的作用，不很清楚，或者由其相对的牙所挤磨而成，有如一些鳄类一样。下牙列前端也对不上上牙列，似乎已失去功用。

脊　椎　骨

頸脊椎　只有两个頸脊椎。图 3A 所示的可能代表环椎以后的第三或第四脊椎。这一标本，实际上几乎全由內模造成，只有一小部分有眞正的骨，骨皮很薄，不到半毫米厚。脊椎的后部已損坏。腹側也保存不好。背棘已失去，脊椎的整个形状和性质还可看出。此脊椎为前凹式，其前端椎体之上有一弯曲的稜。在此稜上为凹入的三角状部分，神經孔保存很好，几为圓形，直径为 6 毫米。左边的前关节突保存很好，关节面下由一粗大的突起所支持，面几乎向上。在此以后，整个脊椎較为收縮，然后向后再为扩大。从后面看，神經孔以上也有一凹入面。由背棘根部的破裂来判断，几占了上部全椎之长。保存长 37 毫米；

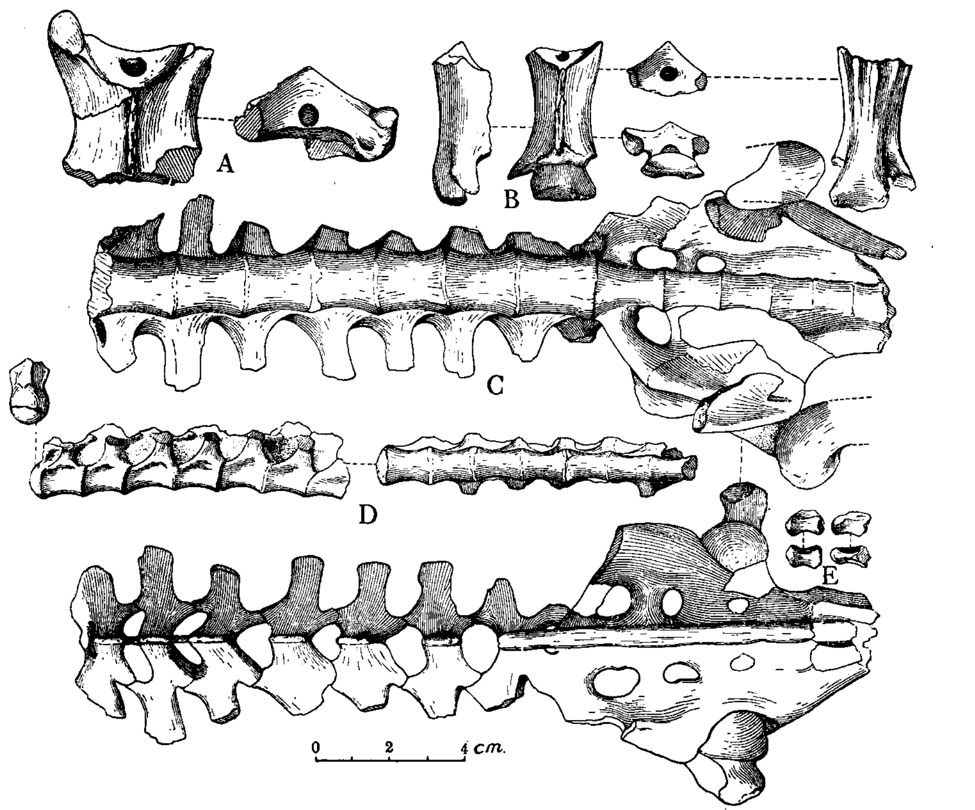

图 3.　魏氏准噶尔翼龙，新属新种。脊椎骨，詳看正文。均原大二分之一。

Fig. 3. *Dsungaripterus weii.* gen. et sp. nov. A. Neck vertebra in dorsal and anterior views; B. Posterior neck vertebra in dorsal, lateral, ventra, anterior and posterior views. C. Sacral vertebrae and the posterior presacral vertebrae in ventral and dorsal views (cf. fig. 6, A). D; Consecutive caudal vertebrae in left side and ventral views with the anterior aspect of the first one; E. Two posterior caudal vertebrae in lateral and ventral views. All 1/2 nat. size.

前寬 46 毫米;当中收縮处寬 31 毫米;背棘根部长 27 毫米。

第二个頸脊椎,可能代表最后一个頸脊椎或者倒数第二个。图 3B 也主要由內模作成。骨皮更薄。这一脊椎較为完整。特别是腹側,前后端和左后关节突。两前关节突,右后关节突和背棘殘破。这一脊椎較前一个小而細。后关节突也很小。椎体主要部分窄而只有微弱的收縮。在一般性质上和上一脊椎完全符合,所以也当为頸脊椎的一个。由腹側看,前部有一显著的稜,而后部有一較寬的沟。我們这一頸脊椎,和何勒所描述的 *Ornithodesmus* 的頸脊椎很象,所不同处就是这英国标本的腹側較寬而平,沒有稜与沟等。总长 42 毫米,收縮处寬 15.5 毫米;同处高 13 毫米;后端靠后关节突寬 20 毫米;前神經孔直径 42 毫米。

"联合背椎"(图 3, C; 图 6, A)　由于还附着于其他后部的脊椎的三个脊椎紧愈合一起,所以我們相信,我們所研究的这动物是具有所謂联合背椎的。这三个联合一起的脊椎,代表联合背椎的后部。在上述的第二个頸脊椎和这三个相連的脊椎間未发現其他背脊椎,所以我們不能断定,到底这个連合背椎由几个脊椎組成。由其他材料参考和在这三个背椎上未看到和肩胛骨接連的痕迹,因而認为为数应当較多,而不是較少,所以假定为八个。

虽然这三个脊椎的椎心和背棘都联合在一起,但和有关的一些属相比,并不怎么坚強。只有椎心与椎心間愈合为一界限,难以分别;背棘也在上部相連,但其間空隙还是很大。至少从保存的部分看,并沒有所謂"神經孔上板"形成的痕迹。这个发育不全的性质,到底应解释为一特性,或者当作这个性质发展的初期阶段,或者为年輕的个体,在目前是难以肯定的。这三个脊椎的长大約相同。总长为 51 毫米,个别长为 16.5, 18, 18 毫米。側突短而向上伸,其末端均少殘破。局部愈合的背棘很低約高出前部神經孔 12 毫米。其末端无显著的加厚。虽然在以下复原图上,我們把肩胛骨和联合背椎的接連处,放在背棘側旁,但还不十分可靠,有待証实。可能同 *Ornithodesmus* 更相近一些。总的說来,我們的联合背椎,和已知各属,都有区别。在数目上可能与 *Pteranodon* 相近,而在构造上可能更近于 *Ornithodesmus*, 但背棘沒有带状連接。

其他荐骨前脊椎　在联合背椎之后,和荐骨脊椎之前,有三个背后部脊椎,还自然地連接在一起。总长 52 毫米;个别长 17; 17 和 19 毫米。側突很短和肋骨相接的关节面很小。背棘和联合背椎完全不同,相隔很开,也較高(最前一个 13.5 毫米)。最后一脊椎的后关节突和第一荐骨脊椎的前部关节突几融合为一起,联合背椎以后,这三个背脊椎在一般性质上和数目上和 *Pteranodon* 很近(图 3, C; 图 6, A)。

荐骨脊椎(图 3, C; 图 6, A)　在这一系列連接的脊椎并和腰带骨和两股骨組成一个整体的标本上,一共有七个荐骨脊椎,代表相連脊椎的最末一段。第一荐骨脊椎最长大也和末一背脊椎愈合一起。背側长 21 毫米,前端总高 46 毫米。背棘和末一背脊椎的背棘清楚地分开,但和以后荐骨脊椎的背棘似乎相連(此处破損)。自第一荐骨脊椎以后,其他脊椎显著愈后愈变小。最后一个少許破損,为最小的一个。长为 18, 16, 13, 13, 12 和 11 毫米(自前至后)。背棘相連接而愈合为一带状体。但彼此还可以辨别出来。荐骨肋骨短而粗,也是愈后愈小。荐骨脊椎的孔很大,也是愈后愈小,最后一个,也可能是穿孔的,隐于腸骨之后。总的說来,荐骨脊椎,也和 *Pteranodon* 相似,但也有些区别。

尾脊椎(图 3, D、E)　共有七个連在一起和两个单一的尾脊椎。因为最后的荐骨脊椎后部残破,未能和这連着的脊椎很合适地接起来。但由大小判断,很可能就是連在一起的或者至多有一个脊椎缺失。最有兴趣的一点是,由这脊椎的前端看是后凹式的。前端很凸出,由前面看有一水平的不太显著的稜。第一个脊椎最大(不計凸出部分),腹侧长为 11 毫米,寛为 11 毫米。向后则逐渐增长而变窄,多数的背棘破損。側突保存較好,斜向上伸。两单一脊椎无疑代表尾末端的脊椎。前后均可能还有一两个缺失。前两个脊椎的前端也突出証明亦为后凹式,长为 9 毫米。

除了荐骨脊椎清楚地为七个以外,其他脊椎部分的数目都不清楚。在复原时,我們假定頸脊椎为 9, 背 11—12, 坐骨 7, 尾 12—14。这样作大致和 *Pteranodon* 相近,而我們的动物的尾可能比較长一些。

前　　肢

关于肩胛带,未有可靠的标本。可能一二內模代表肩胛骨,但极难肯定。

肱骨(图 4, A、E)　一左側的近端为唯一的正型标本的肱骨代表。近端因受磨蝕也不完全,但关节处和其他部分大致可辨。三角稜虽受損伤也还可看出位置較高。向远端,骨干逐渐变窄而較直。末端破裂处可能很接近全骨的收縮处。保存近端寛 31 毫米;破

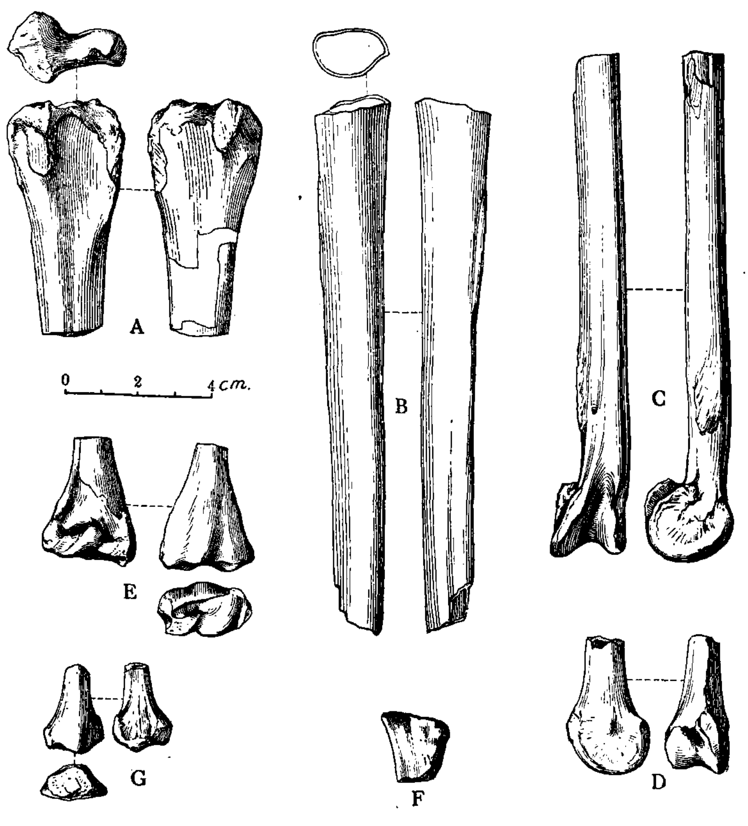

图 4.　魏氏准噶尔翼龙,新属新种。前肢,詳看正文。均原大二分之一。
Fig. 4. *Dsungaripterus weii*. gen. et sp. nov. Anterior limbs (A—B, E—G.) and the wing-metacarpals (C and D) in different views. For details see text. All 1/2 nat. size.

裂处寬 16 毫米；保存长 62 毫米；估計全长 125 毫米。

另外一肱骨的远端保存很好（图 4, E），对正型标本說来显然太小，远端寬 23 毫米。这一肱骨和那一对小的腰带骨为同一个体(V. 2777)，是同正型标本一起发現的所謂副型。保存长 31 毫米，破裂处寬 10 毫米，由远端向上收縮很快，其一切性質和 *Ornithodesmus* 的肱骨很象。

另外有两个較殘破而小的骨可能为肱骨上端，屬 V. 2777，其三角稜还可辨出。

尺骨 有一段骨干（图 4, B），似代表近近端处的一个尺骨，惜近端未保存，保存长为 132 毫米，背側凸起，而腹側較平。可能为左側。近端破裂处相当之寬，表示很近于上端，向远端方向逐漸变窄，未看到接近远端处的加寬現象。这一事实清楚說明这一骨相当之长，至少还有一半未保存。全长估計近 300 毫米。

另外一个尺骨，可能由一內模代表，也是一边凸，一边凹。

还有也可能是尺骨的近端和远端（图 4, F、G），两者均較小，可能为左側。近端的表面，实际未保存，寬 18 毫米，远端保存較好，但也稍有磨蝕，寬 15 毫米(旧 V. 2777)。

未見有可靠的属于手根骨部分的骨。所謂飞骨或者可能有。

翼掌骨[1]（图 4, C、D） 关于这一有兴趣之骨，只有两边的远端部分。关节处保存很全。保存較短的一个(长 35 毫米，远端寬 16 毫米)，当属于左側；而較长的一个(保存长 129 毫米，远端寬 19 毫米)，属于右側。由保存較好的右側可以看出骨干是很直的。近破裂处寬 12 毫米，厚 10.5 毫米。背面和腹面都相当之平，因之骨干的横切面，作近于四方形輪廓。远端同第一翼指骨的关节显著分开，介以深沟。在后側約位于远端 30 毫米以上，有显著的粗糙面。这一粗糙面在左側，未保存，显然就在該处断裂了。这个破裂面是附着翼膜的。因为两个翼掌骨都不完全，其总长不知道，但由保存較好的右側来判断，必然相当之长，估計也近于 300 毫米，卽和尺骨差不多同长。

沒有很清楚的其他掌骨，可能一些棒状的皮未保存的骨属于这些骨。

翼指骨（图 5） 第一翼指的两边均保存完好。第二个也完全，似为左边。第三个只有两端和中部保存，加以修补，也当作左边。由于翼指大部分保存相当之完全，有助于我們了解前肢构造，特别是两翼的长度，左第一翼指长 374 毫米；右 377 毫米。第二翼指，265 毫米。第三翼指长估計为 202 毫米，第四估計为 150 毫米。四个翼指加起来的总长为 991 或 994 毫米，也就是約近一米长。

第一翼指的近端甚为粗大而加寬。肘突状的突起很大，长 13 毫米，近端寬为 37 毫米。关节处由一显著的稜分而为二，成为两关节面。这和翼掌骨远端很为配合。全骨相当之直，远端只稍微加寬，左边者为 28 毫米。右边的远端足状伸出殘缺。远端相当凸出，由其他翼指可知这第一翼指也为中空。骨干相当扁平，中部寬 14 毫米，厚 8 毫米。具有不大发育的直稜的一面当为腹側，由此假定以判其左右之分。

第二翼指完全，近端稍加寬，而有凹入的关节面。远端也有足状的凸出面稍寬的部分。

1) 关于翼龙的翼掌骨和翼指骨，經常有两种不同的解释。一种认为是代表第四指，另一种认为代表第五指。我們在本文中采用前一解释。作为翼龙演化出来的早期初龙类，第四指經常是最长的，而第五指有退化或消灭趋势。尽管可能有些例外，但总的說来多数初龙类是如此。因此作者相信第一个解释可能更接近于眞实一些。当然，这还是一个有待解决的問題。

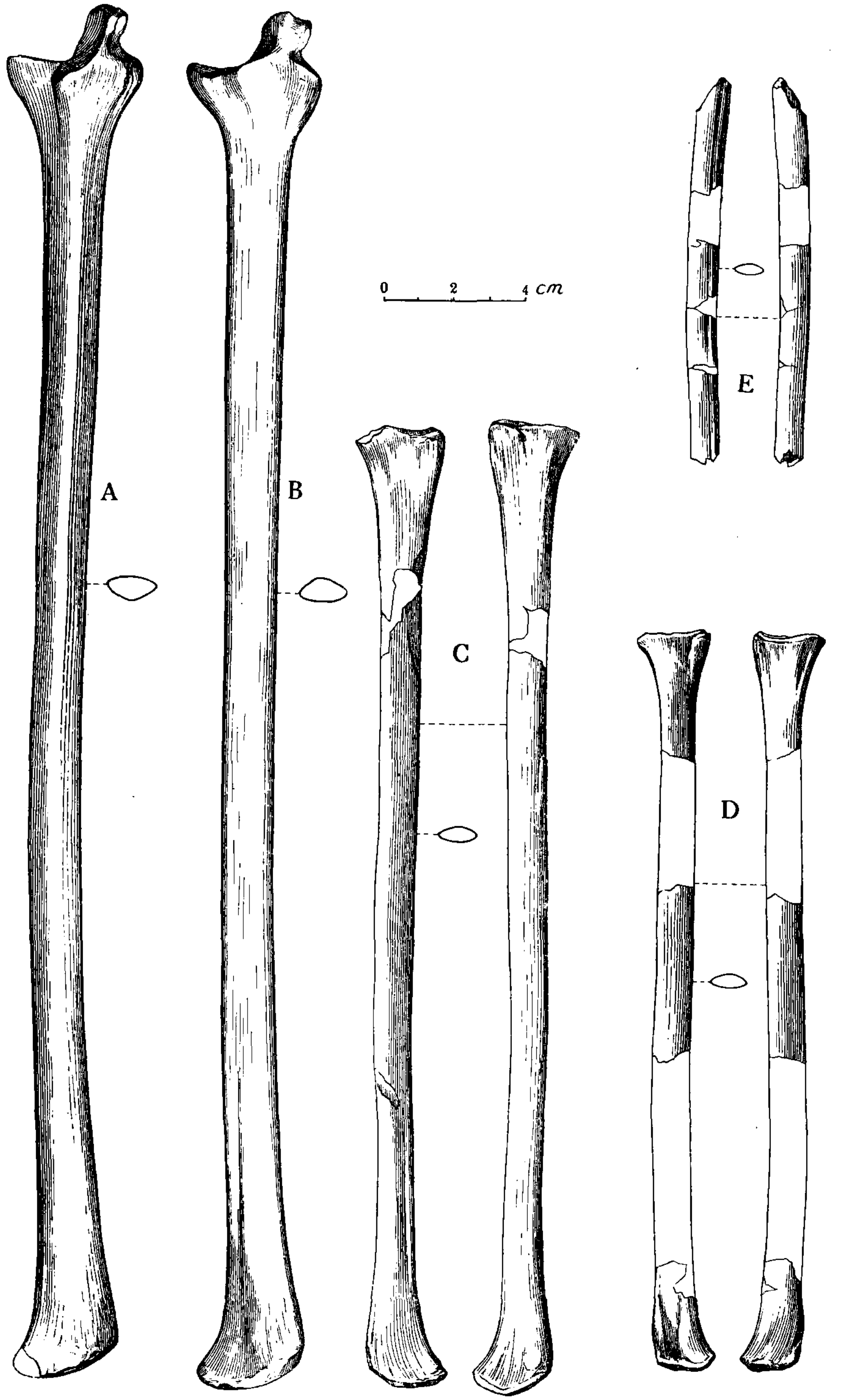

图 5. 魏氏准噶尔翼龙，新属新种。翼指骨，詳看正文，原大二分之一。

Fig. 5. *Dsungaripterus weii.* gen. et sp. nov. A right first wing-finger in ventral view; B. Left first wing-finger in dorsal view; C. left second wing-finger in two views; D. Third left wing-finger in two views; E. fourth left wing-finger in two views. All 1/2 nat. size.

骨干构造同第一翼指相同而較弱。腹的直稜也有。近端寬 25 毫米；远端寬 21 毫米；中部寬 11 毫米；厚 5.5 毫米。

第三翼指虽不完全，但保存部分相当完好。这几段归于同一动物甚至一边，似无疑問，因为在全部材料中，再沒有其他相似的扁的骨骼。两端也相当加寬，近端凹入，而远端凸出，后者的足状輪廓較为微弱。近端寬 20.5 毫米；远端寬 16.5 毫米；中部寬 10.5 毫米；厚 4.5 毫米。在这翼指背側，稍凸起的形状还可看出，但腹側的长稜完全消失。

第四翼指仅有中段。較寬的一端，应为近端。这一段骨比第三个还要瘦小一些，不过大致結构还是一样。骨干沒有清楚的凸面和凹面，两边均作微凸，一边稍显著一些（当为背面）。在这一边，沿后緣有一清楚的沟，近近端显著，向远端变微弱。近近端破裂处寬 9 毫米；近远端破裂处寬 8 毫米。中部寬 9 毫米；厚 4 毫米。

两翼指間凸凹状关节面异常发育，似乎表示各节运动面相当之大，甚至可以折迭起来。

腰带与后肢

两腰带骨均尚附着于荐骨脊椎之上，差不多在原来位置，所差的是許多边緣部分有損伤，但由于两边可以互相补充，再加上 V. 2777 的腰带也可以补充，所以全部样子，还可以看出。所有各腰带部分，相当愈合一起，其縫合綫不易看出。但有的还可以辨認出来。

腸骨 两腸骨的前后端均殘破。左側的保存較好。前突起向前伸出的样子較近于 *Pteranodon* 和 *Nyctosaurus* 而不大象翼指龙。其最前伸出可达到第二荐骨脊椎的前側旁。前緣上部相当之直，向后几乎切割髖臼的上緣。后端有一相当升高部分，且加厚，左右两个紧夹着第六个荐骨脊椎。在此加厚部分以后向后伸出，显然很短，此由 V. 2777 的右腰带这一部分保存几近完全，可以証明。腸骨与恥骨以及和坐骨的分界不很清楚，但极可能腸骨占了至少髖臼的一半。

恥骨与前恥骨 恥骨和腸骨的分界虽不很清，但十分可能恥骨占了一部分髖臼的边緣，在右腰带骨，有一較清晰的綫通过髖臼的下部，似乎代表腸骨和恥骨与坐骨間之界限。此外，荐骨肋骨和恥骨的分界很清楚，不但有縫合綫，而且此处有一較高的隆起。这一部分骨骼代表恥骨的近端部分，是十分可靠的，和其他翼龙不同，因为所有四个标本，其內側均有未穿透的恥骨孔。这个恥骨孔的位置相当之高，很接近于腸骨前突起的根部。这也証明了恥骨的确占有髖臼的一部分。除了正型的右側以外，所有这一骨的末端，均未保存。即在这一标本，恥骨与前恥骨的后边也有損伤。但前端和末端保存很好，末端作断切状。远端这部分，无疑代表前恥骨。在相当于髖臼下的水平部分，有一似縫合綫的綫向前伸到前緣边，如这一綫为眞的縫合綫，而非破裂，那么恥骨和前恥骨的接連是相当愈合，而骨化一起的。

坐骨 坐骨和恥骨愈合向外微凸。坐骨和其他翼龙的区别在于沒有閉孔，但在所有四个标本，其近端內側均有一低凹部分，說明此孔未透到外側。

髖臼 髖臼未穿透，但由 V. 2777 的右側看該处中心，非常之薄，几乎透明。髖臼作圓角四边形，其前后的直径，稍大一些。正型的右側 29 毫米；V. 2777 的右側 17 毫米。正型右前恥骨远端寬 17 毫米。

股骨(图 6, A)　两股骨均仍粘着在髖臼上，但稍有移位。两股骨的比較自然一些的方向，应当稍向外向后一些。股骨細长而向后弯曲。和髖臼的关节头由一长而斜的頸状部分和骨干很分隔。和髖臼的接触面相当凸出而光滑。和那頸状部分由一圓状稜分开，因而使得这頸和那关节部分合起来象一菌状形式。这个頸的部分相当收縮，有 11 毫米长（距外側圓錐）。关节部直径为 21 毫米；頸的直径为 13 毫米，外側圓錐发育很好，其側旁有一深窝。此外，从頸部側后旁，到这圓錐体的外下旁还有較深的沟。从外側圓錐向下，驟然变窄，整个骨干几乎一直保持同一厚度，一直到近远端处，才再为加寬，远端也較寬，內外两关节也相当分开。骨干相当前后弯曲。全长 221 毫米；远端寬 30 毫米；中部寬 14 毫米；前后厚 11 毫米。

另外归于 V. 2777 的一股骨远端（图 7, B）和上述股骨相同，远端寬 19 毫米。

总的說来，这一种的股骨很具一些特性，易于同其他翼龙区别，如 *Pteranodon* 和 *Ornithodesmus* 等。

脛骨（图 7, A）　唯一具有的脛骨为近端部分，保存长为 170 毫米。似为左側，近端部相当加寬，四周突出地伸到骨干外周。近端面浅而微凹，边緣周稍微升起，微有傾斜，寬 27 毫米，前后长 21 毫米。外側突出部分显然代表和脛骨完全愈合的腓骨近端。在近端以下不远即断破，向下伸的細的腓骨部分似乎不很长。腓骨遺痕的存在，当代表一原始性質。脛骨的骨干非常之直，向远端逐渐变窄，其橫切面为圓角三角状。比較起来骨壁較厚，約大于一毫米。脛骨的总长不得而知，但当比股骨为长，估計长度为 270 毫米。

另外一长約 162 毫米，骨模似代表另一边的脛骨。

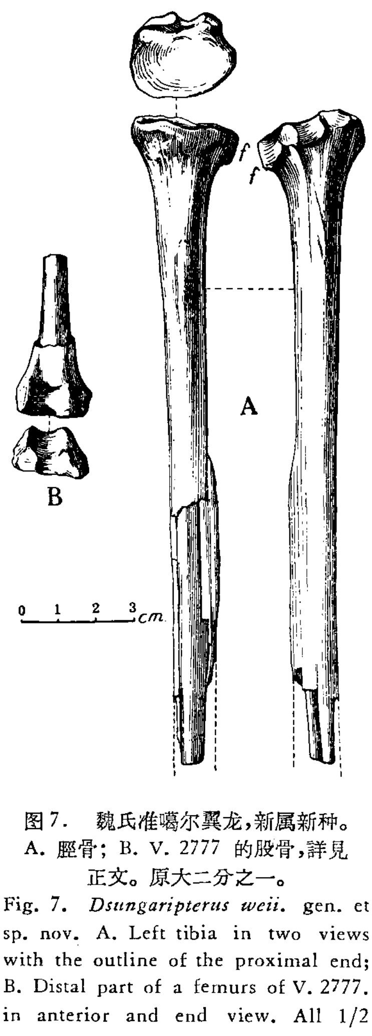

图 7.　魏氏准噶尔翼龙，新属新种。A. 脛骨；B. V. 2777 的股骨，詳見正文。原大二分之一。

Fig. 7. *Dsungaripterus weii*. gen. et sp. nov. A. Left tibia in two views with the outline of the proximal end; B. Distal part of a femurs of V. 2777. in anterior and end view. All 1/2 nat. size.

骨架的装置

这一采集是不能完全令人滿意的，就已知部分看来，本来应当为一較完全的骨架。尽管所缺失的部分还很重要而很多，如头与下顎的后部和許多头后骨骼均不全等，但我們还是可以尝試做一个比較滿意的壁式装架和带肉的复原图。这壁式装架（图版 I）是主要由苏有伶在作者指导下作的，带肉复原图（图版 II）是由沈文龙繪的。以下就此工作作一些說明。不用多說，这些都是試驗性的，可能以后需要加以改动。

关于头骨的复原　头骨与下顎的前部完全保存，无多可以說明之处。鼻孔和眼前孔就保存部分来推断，很可能合而为一，未为骨所隔开，象一些其他翼指类那样。最重要的一个性質是那个孔前和上边的直稜。不幸的是这个稜保存不全，上部破損，向后通了多

远,未能知道。前边底部的缺口,說明此稜必首先向前伸,然后折而向后。这样类似的情形,只有在高氏翼手龙上看到。这一种,嘴部也很尖,上下顎前部,也无牙齿。所不同的就是无牙的部分較短而直。因之,我們有理由相信,我們标本的头的后边构造或許和这一种的差不多,象在再造图上所示的那样。虽然如此,再造时把眼前孔以后部分改得比鼻孔与眼前孔加起来大一些,使得可以和长的嘴部比較相称。我們肯定难以确切知道这个稜向后伸多远,但十分可能象高氏翼手龙一样,沒有向后伸多远,到眼孔上即漸消失。不大可能再向后伸,也很可能,沒有枕骨上的稜。

下顎骨保存較多一些。其缺乏部的补充也主要参考了高氏翼手龙的下顎。两个殘缺的下顎后部,很好帮助我們了解下顎后部的构造。这証明下顎向后变低一些,如 *Ornithodesmus* 那样,也証明沒有下顎孔,因为以后所有地方不多,似不可能还有此孔。

总的說来,头和下顎的复原,如图 8 和图版 I 所示。我們这一头骨几乎象一大大放大了的高氏翼手龙,区别在于嘴部向上的弯曲和其他一些特性。

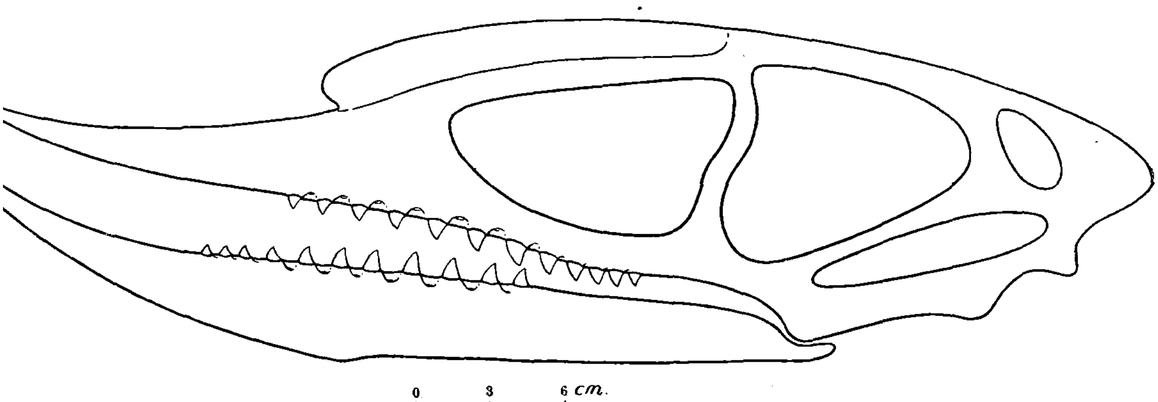

图 8. 魏氏准噶尔龙,新属新种。头骨之再造,左側視,詳看正文。原大三分之一。
Fig. 8. *Dsungaripterus weii*. gen. et sp. nov. Reconstruction of the skull and lower jaw in left side view. For details see text. 1/3 nat. size.

脊椎骨 較易复原,因为后部脊椎保存較全。比較困难的为頸部和背前部脊椎。由仅有的两个頸骨来判断,我們这一动物的頸应接近于广义的 Ornithocheiridae。我們因之主要照 *Pteranodon* 的頸来复原。联合背椎的前部以及数目也不知道,不过可以肯定和已知的几属均有区别。似乎各脊椎的联合較松,为数有八个,否則这动物的身躯太短。大多数联合后的脊椎均保存,只有尾部不太全。毫无疑問,这一动物是短尾的,但比 *Pteranodon* 可能較长一些。整个脊椎的样子,見图版 I 左側所示者。

前肢 除了一些翼指外,保存不好。肩胛带全付缺如,肱骨、下臂和翼掌骨均保存不全。我們对这一部分的复原主要参考各与之有关的前肢。可能有差錯。尽管如此,象在以前描述部分所已交代清楚的,由下臂和翼掌骨所构成的部分应当較长。而两者大約相等长。四个翼指可以說几乎完全保存,对于了解两翼的寬度十分有用。

两腰带骨保存比較好,可互相补充。在图 6A,其缺乏部分用虛綫表示,整个复原見同图 B。

后肢 脛骨远端和以后的骨完全缺失。两股骨在图上所示的是不很自然的,应当

稍向外向后一些。因为不打算把它拆开，也多少影响了后肢部分复原的姿势。 脛骨长度虽然不知，但象图上所示的，比股骨要长一些。第一翼指和股骨是除第二翼指外保存完全的两长骨，其比例为 58.6。

脛骨以下部分的复原，主要参考 *Pteranodon* 和其他近似属，可能不十分正确。

全部复原見图版 I，大体为由左侧看的飞的姿势，右前肢根部未表示出，除了后肢方向外，一般很好。这一动物的横寬估計近于 3.5 米。

图版 II 为一較艺术化的生活复原，表示約在一亿年前这一动物的生活情況，当然更为理想一些，可能有錯。

鉴定与討論

在以上描述中，已經很清楚，此新疆化石为一和翼手龙亚目有关的动物，問題只是归于哪一科。

这一正型当代表一新属新种，其特征已見上述。

关于最近的翼手龙亚目的分类为孔氏（1961）所作，共列了五科。其中三科可立即排除其可能性，或者太小（Pterodactylidae）或者牙太特殊化（Ctenochasmatidae 和 Belenochasmatidae），而后一科的归属还有問題，可能根本不归翼龙。 所以只留下两个全具有联合背椎的两科可以考虑。

在以上描述中，我們曾一再和代表 Ornithodesmidae 一科的代表种 *Ornithodesmus latidens* 相比較。尽管如此，新疆化石和这一种有一系列根本区别，如向上弯而长狹的嘴，前部无牙，以及联合背椎的情况等。所以不可能把我們的化石归于这科。 这一英国动物的头构造很輕巧，鼻孔和眼前孔也为骨所隔开。

同 Ornithocheiridae 比，也似同样不太可能。我們的化石具有一直眼前孔上稜，而沒有枕骨上的稜。而这一科既均有枕骨上的稜，但沒有前一个稜。 此外，新疆标本有牙齿，只前部无牙，和完全无牙的 *Pteranodon* 等属不同；和有牙的 *Ornithocheirus* 也不同。 此外，我們的联合脊椎上沒有那所謂的上伸經板。

因此，十分清楚，中国新发现的化石当代表一新的科。即为准噶尔翼龙科。

前已指出，根据新种头上的稜、牙的性質和尖的嘴等，我們覚得新疆化石和德国晚侏罗世的高氏翼手龙有关。看来后者可能为前者的祖先类型。高氏翼手龙由瓦格来 1836 所創，根据佛令格 1901 年所描述及所附图版，是十分清晰的。这一翼手龙和其他所有翼手龙的区别在于头上那直稜，和嘴前部和下顎前部无牙齿。再加上較大的鼻孔和眼前孔，和那不太尖的牙齿，可以設想，从这个种演化为我們的准噶尔翼龙当无困难。由于同样理由，我們覚得这个种和其他翼手龙区别太大，应当另立一新属，取名为德国翼手龙（*Germanodactylus*），而其代表种应为高氏德国翼手龙（*G. Kochi*）。在 *Rhamphorhynchus* 其嘴与下顎也无牙，但其他性質，距这个种太远了。

新疆的准噶尔翼手龙，具有一系列特性。虽然它的牙齿有退化趋势，但很难相信，它和晚白堊世无牙的一些属（如 *Pteranodon* 等）有何血統关系。我們的化石无有枕上稜，在这一点上，与 *Ornithocheirus* 比較更接近的多。

对于翼龙分类的一个建議 在所有通行的教本和参考书中，关于翼龙，均分作两亚

目，一为长尾的嘴口龙亚目，一为短尾的翼手龙亚目。前者包括三科（Dimorphodontidae, Rhamphorhynchidae 和 Scaphognathidae）。Anurognathidae 还是列入翼手龙亚目比較好，因其尾是短的，还有其他一些特性。

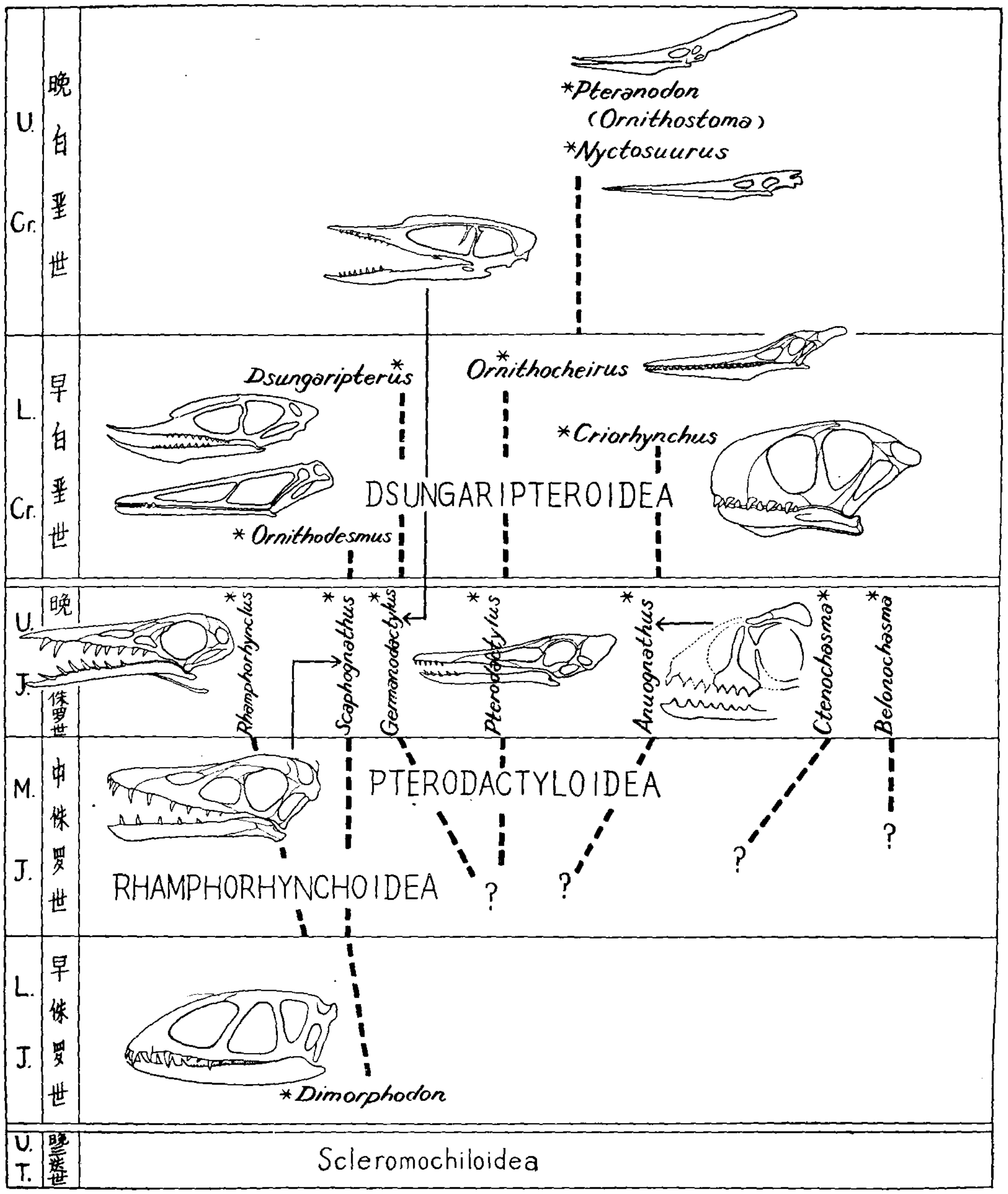

图 9. 翼龙的分类建議。几乎所有属均代表一科或亚科，所附头骨均按比例縮至同一大小，以便于比較。詳看正文，中文名称从簡。

Fig. 9. A suggested classification of the order pterosauria. Nearly of the illustrated genera represents the type genus of a family of sub-family. The skulls of those forms are reduced to approximately the same size and not to scale for an easy comparison of various proportions. For details see text. Chinese names of the fossils ommited. The sketches of the skull of various forms are after Pflienger, Hooley and other current text-books.

在这一研究过程中，感到有必要把翼龙目分为两个亚目。翼手龙亚目本身应只限于那些沒有联合背椎而生存于晚侏罗世的一些种类。这一亚目可包括三个或四个不同的科。具有中稜的高氏德国翼龙应列一新科。平常通称翼手龙科，其牙齿限于口腔前部，一般在鼻孔以前，和 Anurognathidae 科，其头骨短而高。Ctenochasmatidae 牙齿特多，但头骨和翼手龙科有些象，也可能归入此一亚目。这几类在头骨构造上很不相同，說明这一亚目的分化必然早在晚侏罗世以前就开始，可能为中侏罗世，而在这时期，我們关于翼龙类的知識是非常貧乏的。至于和前一亚目嘴口龙的关系还不明了，可能也在中侏罗世已分道揚鑣。至于 Belonochasmatidae 的系統地位还很不明了，也可能根本不属于这一目。

留下其他侏罗紀以后的所有翼龙，一般都是較大，有的很大。所有这一些无不具有联合背椎，无疑表示飞行力量的增长。但是除了有共同的联合背椎外，其他結构，也很多样化，所以有必要把这些归納为另一亚目，或至少当作超科，而再分为若干科或亚科。关于准噶尔翼龙的系統位置，在以上已加以說明，当代表一独特的科，而可能来自晚侏罗世的德国翼龙。它的联合背椎不完全清楚，但肯定有，可能稍松，較为原始一些。

代表 Ornithodesmidae 的 *Ornithodesmus* 这一属，其头骨很輕巧，早在 1913 年，胡勒就指出其与嘴口龙亚目中的 *Dimorphodon* 和較新的 *Scaphognathus* 有关。和翼手龙一样，其牙齿只限于鼻孔以前。Ornithocheiridae 的代表属为 *Ornithocheirus* 很殘破，但清楚地具有枕骨上稜。而牙齿一直到嘴最前端。由于前一性質，它可能和晚白垩世的 *Pteranodon* 等有关系。另一方面其来源可能和晚侏罗世小的翼手龙有关。因为从头骨构造上，如尖的嘴，孔很向后等，但还須要进一步証实。至于头骨短而高的 *Anurognathus* 相当特殊，不能归于嘴口龙亚目，因为是短尾。归于翼手龙亚目也有困难，因为头骨很特殊，以后者的可能性較大一些。高头的后期的 *Criorhynchus* 可能与之有关。这一科的来源可以追溯到早侏罗世。

照以上所述，似乎应当有一亚目或超科一級的名字，以包括所有白垩紀具有联合背椎的种类，建議卽用准噶尔翼龙亚目。和翼手龙亚目的主要区别为有眼前孔上稜或有枕骨上稜和联合背椎。

这些說法另由图 9 表示出来(并可参閱外文頁 252)。

中国所发現的其他翼龙和可疑的鳥化石

萊阳的翼龙

本文所記述的魏氏准噶尔翼龙代表在我国第一次可鉴定的翼龙化石，但并不是在我国第一次的发現。1958 年笔者研究山东萊阳恐龙化石时，有一些保存欠佳的骨，就被当作翼龙加以問号。由于这一次的研究，对萊阳标本，有了更明确的認識。

萊阳城东北一地点的唯一可鉴定的骨极可能为一尺骨，两头均破。V. 755 比新疆标本为小，可能属翼手龙亚目。

萊阳陡山 (T. 1) 的一骨为第二翼指的近端(图 10, 2)，其近端凹入，和新疆同一标本很象，也可能为左側，但至少小三分之一。近端寬 17 毫米。V. 746 (以前說卽 V. 747) 两股骨 (图 10, 3、4) 可能卽为第一骨，均为右側，和新疆的股骨很象。从側面看，也稍有弯

曲。近端关节也与骨干由一頸状分开。但远端不太扩展。比新疆标本可小四分之一。近端宽 24 毫米;远端寛 21 毫米。

这一地点各骨,和新疆的极相似而小,很可能即归此属,而为另一种,但我們目下还不打算給以名称。

图 10, 1 所示为第一翼指(編号 V. 747, 前誤印为 V. 755, 陡 6, T. 6),这一标本在构造上也和新疆标本很象,只是特小。近端寬 17 毫米,由近端寬处,驟然向下縮窄。也可代表另一准噶尔翼龙,另一标本可能代表一尺骨, V. 747。

总之,莱阳的翼龙化石,和准噶尔翼龙很象,也有可能还有翼手龙存在。这些化石均和鸚鵡嘴龙共生,时代为早白垩世。

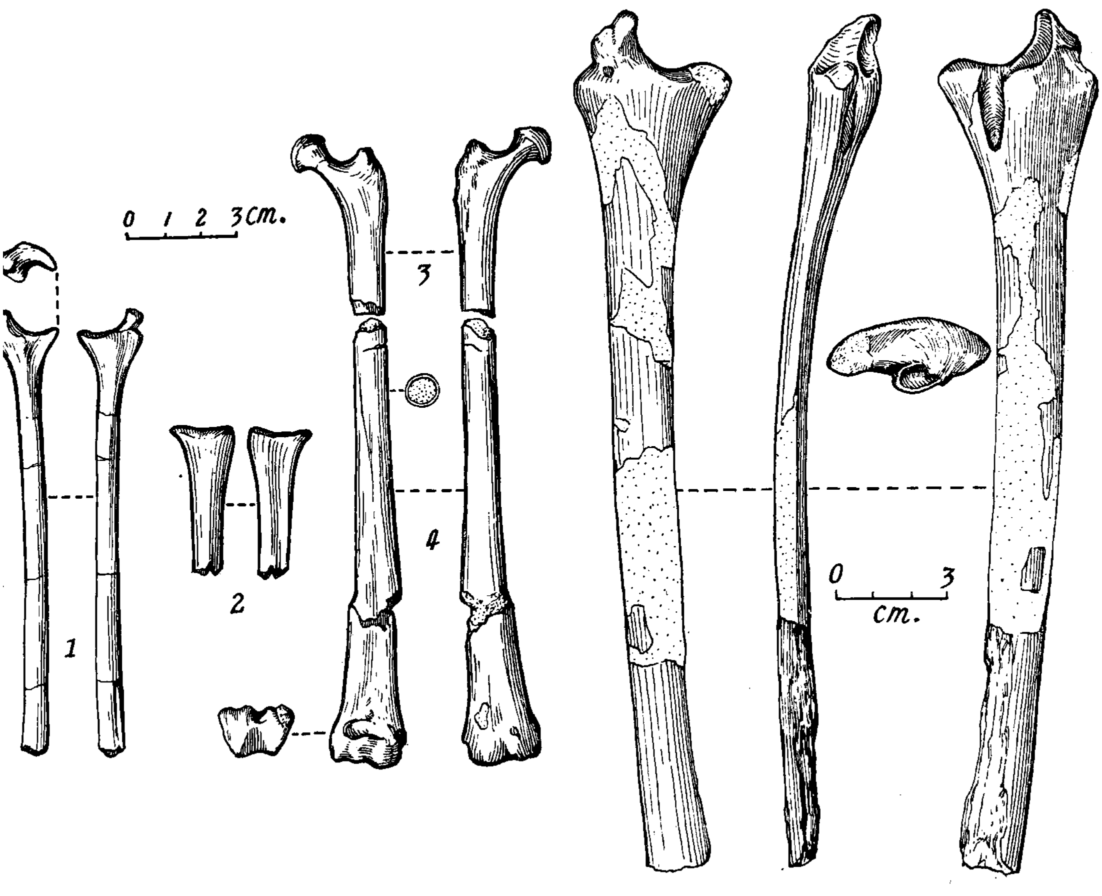

图 10. 左图翼龙,种属未定。改自楊 1958,右图采自楊 1935,詳見正文。均原大二分之一。
Fig. 10. Left figures 1—4 Pterosauria indet. From Laiyang, Shantung modified from Young 1958. Right figures Pterosauria indet. From Mengyin, Shantung after Young, 1935. For details see text. All 1.2 nat. size.

山东蒙阴的翼龙

在 1958 年即已指出,以前当作肉食类恐龙尺骨的一标本。图 10 的右側图也可能为一翼龙。現在看来也当为第一翼指的近端。这一标本,比新疆的同一骨还稍大一些。其

他构造完全一样。所以我們可以説，准噶尔翼龙有可能在山东蒙阴也存在。

这一标本发現于蒙阴西佳佛。在这一地点，还发現了一个很特别的蜥脚类肩胛骨，显然不是盘足龙，和一个相当大的剑龙背刺。所以有可能不与盘足龙同层，因此这一鉴定看来不一定和盘足龙为晚侏罗世的説法有矛盾。如果进一步了解地层和采有更多的化石，説不定蒙阴地区也有早白垩世层位。

內蒙的翼龙遺迹

有尺骨，可能为右側（图 11，A），其近端破損。为一地質队自內蒙所采。标签只注“阿馬加汗”，别无其他，所以确切地点不清楚。按标签所志，产生这化石的岩石为紅砂岩，年代为白垩紀（Cr_5），但骨干所包的岩石为黄砂岩。骨本身为橘黄色。骨壁非常之薄，不及 0.5 毫米，由近端已扩展的情况判断，距近端当很近。室內号 V. 2778。

和 *Ornithodesmus* 的尺骨相比，这标本可能属右側。这个标本的远端和这属相比，非常近似，几乎每一小节都可相比。所以这个标本当作翼龙，是毫无疑問的。保存长 224 毫米；总长大約为 230 毫米，近端破裂处寬 25 毫米；远端寬 43 毫米；中部寬和厚为 17，12 毫米。背面凸而腹面較平。

我們的标本比英国的那一属为小。因为准噶尔翼龙的尺骨，保存欠佳，很难相比。但是一般印象是这內蒙标本比起长而細的新疆标本来短而寬。所以这內蒙标本可能归于另一种，可归于准噶尔翼龙亚目的化石。

在內蒙发現这一翼龙化石有双重意义，第一次在內蒙找到有翼龙化石和这个地点把广大的相距很远的山东和新疆的翼龙地点連系起来。

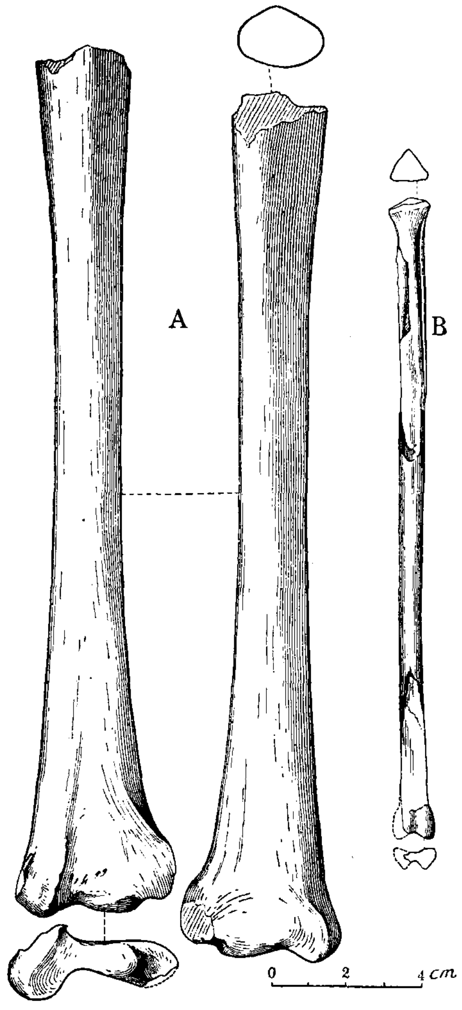

图 11.　准噶尔翼龙，科属未定。詳見正文。原大二分之一。

Fig. 11. Dsungaripteroidea indet. A. An ulna from Inner Mongolia; B. A tibia from Changchi, Sinkiang. All 1/2 nat. size. For details see text.

新疆昌吉的 ?古鳥化石

有一細长的骨骼尚附着于蓝灰色砂岩之上。为石油野外队所采，地点在标签上只写了“昌吉河”别无其他説明，只能理解为烏魯木齐以西的昌吉河流域某地。野外号 880，室內号 V. 2779。时代为早白垩世（Cr_1），采集人刘寬信。

化石本身几乎是全黑的。近端和远端附近有些损伤。但两端形状还可看出。总长165毫米。此骨非常之直而細，两端处显著加粗。近端面作三角状，向內側較斜。寬为11毫米。远端保存較差，但可看出有清楚的分开的关节面，一保存較好，一破碎，当为和跟骨及脚掌骨近端的关节处。寬約为10毫米。在近端下破裂面旁有一細而似針状之骨，自远端下伸約63毫米(尖端已破)，显然为殘余的腓骨。因之此脛骨与腓骨当为右側。

由此骨的一般形状和远端分开的关节面看，和 *Hesperornis* 可能相象，腓骨的存在可以联想到近代的鷹类鳥。大小比前者为小。在目前很难作出进一步鉴定。但可以指出，这一标本如果不是翼龙的話，可能有一天証明为中国的第一个鳥化石記录。

* * *

在研究过程中，蒙德意志联邦共和国明星孔供給了一些有用的通信；本所张弥曼帮助查閱俄文文献；沈文龙、胡惠清繪了插图；再造装置为苏有伶、张广义所制，陈春亭曾作修理；孙艾璘和赵喜进协助了对这批标本的研究工作。作者一并表示感謝。特别应对新疆石油局同志尤其是发現人魏景明同志表示感謝，他不但允許把这些标本让我們研究，还贈送給本所陈列室。

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ON A NEW PTEROSAURIAN FROM SINKIANG, CHINA

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INTRODUCTION

In the summer of 1963 a very interesting collection was made by Mr. C. M. Wei of the Paleontological Division, Institute of Science, Bureau of Petroleum of Sinkiang. The whole collection was sent to the Institute of Vertebrate Paleontology and Paleoanthropology for determination. It represents for the first time the sure presence of Pterosauria in China. All the remains belong certainly to the sub-order Pterodactyloidea (in broad sense) and will be described in the present paper. As the field data on the occurrence of this find are completely not available except the attached etiquette and a few oral informations given by A. L. Sun and H. T. Chao, I prefer to restrict the present paper to the paleontological study only. The geological condition will be given later, if new collection will be made.

DESCRIPTION

Order Pterosauria Owen 1840

Suborder Dsungaripteroidea suborder nov.

Family Dsungaripteridae Fam. nov.

With the diagnosis of the type genus *Dsungaripterus.*

***Dsungaripterus* gen. nov.**

With the diagnosis of the type species *Dsungaripterus weii.*

***Dsungaripterus weii* sp. nov.**

Type Anterior part of the skull and lower jaws; two neck vertebrae, thirteen consecutive vertebrae including three posterior "Notarium", three posterior dorsal vertebrae and seven sacral vertebrae, seven consecutive caudal vertebrae, two isolated distal caudal vertebrae; the proximal end of the left humerus, probably a left ulna, the distal part of both wing-metacarpals, both first digits, of the fourth finger and three following digits of the left side of the same; nearly complete pelvic girdle of both sides and both femora attaching still to the sacrum in almost natural position and proximal part of the left tibia. All these specimens belong certainly to one individual. In addition a few fragmentary and internal molds of some long bones are tentatively mounted to the panel reconstruction of the named specimens and a few unused ones are considered as also belonging to this individual. Field number 96C. Cat. No. of the Institute V.2776.

Referred specimens Proximal and distal ends of humerus and probably ulna, a distal part of a femur and much damaged both pelvic girdles and some fragments. Field number the same as the type. They were found from the same site. Cat. number

V.2777.

Horizon and locality Upper part of Lower Cretaceous (Cr_1^3, according to the label) from Urho, near the mouth of Chiangmuho (Paiyangho), N. W. border of Dsungari Basin, Sinkiang.

Diagnosis Rather large pterodactyloid. Anterior part of the skull laterally compressed, sharply pointed and bending upwards. With well developed median crest above the nasal and preorbital opening. Prenasal opening length of the snout longer than prenasal and preorbital openings. The both are apparently completely confluent. Lower jaws firmly connected by symphysis. Also sharply pointed with the part of the symphysis bending upwards. Teeth with backward bending point. They are well separated except the posterior few ones of the upper teeth. Upper teeth probably twelve and lower ones eleven in number. The anterior teeth of the lower ones small and tend to be reduced. "Notarium" present. Sacrum composed of seven vertebrae. Fourth metacarpal very long. The four flying fingers considerably long. The total width of the wings presumably between three and three and half meters and nearly four times that of the length of the animal. Pelvic girdle of typical pterodactyloid construction. Femur comparatively long, longer than the half of the first flying finger. It is anterio-posteriorly curved. Tibia must be longer than the femur and is straight.

Skull and lower jaws

Skull Only the anterior part of the skull is preserved. In both sides of the skull, part of the border of the nasal and preorbital openings can be clearly traced. The posterior border is broken but may be not very far from the breakage. The two openings are apparently confluent. There is a distinct obliquely oriented furrow on both sides which marks certainly the line between the premaxilla and the maxilla. The tip of the anterior end is a little broken. The premaxillary part is sharply compressed. Looking from the side the pointed part of the skull forms a very weak upwards bending. About 45 mm in front of the nasal and preorbital opening there develops a well and strong crest. The well-marked notch shows that the crest must be first somewhat extending anteriorly and then backwards. Its height remains unknown. At the posterior part of the breakage of both sides there is no trace of the jugal. On the ventral side of the skull the whole part is formed by the premaxilla and the maxilla. But it is possible that the internal nasal opening may be at or very near the broken part now filled by plaster. There is a distinct median ridge and a lateral furrow at each side which can be traced up to the very tip of the skull.

The presence of the supra-preorbital crest is only found in the *Pterodactylus kochi* Wagler described by Plieninger (1901—1902) and we have reasons to assume that the posterior part of the skull of our form may be rather similarly constructed as the named form. In assuming this conception, the length of the skull posterior to the nasal and preorbital opening should be shorter than the part before this opening.

Preserved length, 275 mm; Estimated length 285 mm; length from the tip to the anterior border of the preorbital opening, 190 mm; Height of the skull anterior to the crest, 35 mm; the same at the posterior part of the preorbital opening, 22 mm; Breadth of the skull near the anterior breakage, 4 mm; near the anterior border of the preorbital opening 47 mm; near the posterior breakage 82 mm.

There are twelve teeth or sockets of them in the left side and eleven in the right side preserved. Judging from the posterior extension of the nasal and preorbital opening and comparing with the lower teeth, it seems that there are no more teeth posterior to the last preserved one or at most one or two teeth lost. The preserved posterior part of our specimen seems already overlapped by the jugal. If so, the number of the upper teeth should be 12 or at most 14. There are no teeth (about 130 mm long) in the anterior part of the jaw. With the exception of the last five teeth at the posterior part, all the others are rather widely spaced. The widely spaced teeth are subequal in size. The last one of the spaced teeth of both side are well preserved. They are short crowned and with weakly backward pointed tip and almost smooth surface. The last five teeth are more closely situated and certainly behind the last tooth of the lower tooth row and probably not functional. The fresh one of the left side (the one before the last alveole) shows that those teeth are bi-cusped. It is difficult to assume how they are functioned with the lower teeth, unless the lower jaw can be moved anterio-posteriorly. Length of the whole preserved upper tooth row, ca. 153 mm.

Lower jaw The two lower jaws are firmly connected by the part of the symphysis which is about 187 mm long. It is marked by a longitudinal weak ridge. In the ventral side, the both jaws are fully coossified. The both lower jaws converge anteriorly in order to form a sharp point, the very sharp tip of which is unfortunately broken. Looking from the lateral side (the left side is better preserved) the lower border of the posterior part of the jaw behind the seventh tooth counting from the anterior end is perfectly straight. But from there the lower jaw bends conspicuously upwards in accordance with the same bending of the upper jaw but much stronger. There are two fragments apparently belonging to the posterior part of the lower jaws, one (the larger one) to the left side and the other to the right side. They are much less in height as compared with the anterior part of the lower jaw. So, the general shape of the lower jaw is either like that of *Pteranodon* or like that of *Ornithodesmus* (Hooley, 1913, pl. 37, fig. 5). The latter possibility is more probable as the two fragments show more consistency in height. The dental foramen is apparently absent as in the case of the two genera. The two lower jaws diverge only gradually posteriorly about 25 degrees. At the posterior end of the symphysis there is a weak fossa facing posteriorly. Behind the tooth row the upper edge of the lower jaw is distinctly ridged, especially strong in the two fragments. In ventral view there is a distinct shelf at the median posterior part of the symphysis. The surface is weakly but distinctly marked by rugged ornamentation, especially strong in the ventral side at the posterior part of the symphysis (the same is for the upper jaw but rather faint). Such development suggests strongly that the beak of the animal may be reinforced by a horny sheath.

The lower teeth are completely showing in the left side by alveoli and broken teeth. In the right side the last two are broken. There are eleven teeth in the left side, representing thus the actual number of the dentition. They are also widely separated as in the case of the upper teeth, but the last two are more closely situated. Most of the teeth are lost or damaged. The better preserved ones, such as the seventh, counting from anterior end, of the right side, the seventh, ninth, and tenth of the left side show more or less part of the crown. The last named one is the best one with the tip only a little broken. It shows that the tooth is faintly striated with the tip bending somewhat medially and posteriorly. Very interesting is the fact that the anterior three teeth are decidedly reduced, especially the first one. The eighth tooth of both side represents the largest one of the row. Length of the entire tooth row, 138 mm. Preserved length of the left side 270 mm. Height of the jaw behind the sixth tooth, 36 mm. Height of the same behind the eighth tooth, 31 mm. The same near the posterior breakage, 31 mm. Height of the left broken one 21 mm.

In both of the upper and lower teeth, with the exception of anterior two of the lower ones, the bone of the surroundings of the alveole is considerably elevated in about three to six milimeters above the level of the upper border of the jaw. In addition, along the lateral border of both upper and lower jaws between each two teeth of the middle part of the row, there is a more or less distinct fossa developed. No trace of such feature in the anterior part and posterior part of the row. The function of such development is not clear, probably caused by the opposited tooth as in the case of the crocodiles.

Vertebrae

Neck vertebrae Only two neck vertebrae are preserved. The one illustrated in figure 3. A represents a middle neck vertebra, probably the third or the fourth one after the atlas and epistropheus. It is actually formed by an internal mold, only the part of the anterior left corner being covered by real bone. The bone is extremely thin, scarcely exceeding one milimeter. The posterior part of the centrum and the both post-xygapophises are broken. The ventral side of the centrum is also damaged. The dorsal spine is broken too. Nevertheless the feature of vertebra can be easily recognized. It is typical procoelous. The upper border of the centrum forms a curved sharp ridge. Above it there is an excavated triangular area with the neural canal well preserved. It is almost circular in outline and six milimeters in diameter. The prezygapophysis is well preserved in the left side. Its articular surface is large, supported by strong process, and facing almost direct upwards. Behind this the whole vertebra constricts moderately and then expands again posteriorly. In posterior view the part above the neural canal forms also a weakly excavated surface. The broken part of the dorsal spine shows that the root of the spine takes the whole length of the upper part of the vertebra. Median preserved length, 37 mm; anterior breadth, 46 mm; breadth at the middle constriction, 31 mm; length of the base of the dorsal spine, 27 mm.

The second neck vertebra represents probably the last or the one before the last vertebra (Fig. 3, B). It is also mainly formed by a mold with only a few parts covered by real bone. The bone is still thinner, much less than one milimeter. The vertebra is better preserved, especially the ventral side, both ends and the left postzygapophysis. The both prezygapophyses, the right postzygapophysis as well as the dorsal spine are broken. It is much smaller and slenderer than the preceding vertebra. The postzygapophysis is also weaker. The main part of the centrum is narrow and weakly constricted. All the general features agree, however, with the other vertebra and is undoubtedly belonging to the neck region of the column. In ventral view the anterior part is marked by a prominent anterior longitudinal ridge while the posterior part by a deep and broad furrow. The general characters of this vertebra agree with the neck vertebra of *Ornithodesmus* described by Hooley (1913) but the latter differs from that of ours by a number of distinct features, such as the broader anterior part, evidently flatness of the ventral side, etc. Total length, 42 mm; breadth at the minimum constriction, 15.5 mm; height at the same·point, 13 mm; posterior width at postzygapophysis, 20 mm; diameter of the anterior neural canal, 4.2 mm.

"Notarium" (Fig. 3, C. Fig. 6, A.) That the present form is armed with the fused or co-ossified anterior dorsal vertebrae, the so called "notarium" is proved by the last three vertebrae which are cemented firmly together and still sticking to the'following dorsal ones and the sacrum. They are certainly the posterior part of the notarium. Since there are no vertebrae preserved between the last described neck vertebra and these three ones, we are not sure about the vertebral number of the notarium. Judged by the restoration of *Pteranodon* by Eaton and the wholly absence of the facet for the scapula at the lateral side of the fused dorsal spine, we would assume that there must be at least eight vertebrae of our form as in the case of the named genus and not like that of *Ornithodesmus* with only six vertebrae of the notarium (Hooley, 1913, Pl. 38, Fig. 5).

Although the last three vertebrae of the notarium are starting to fuse together both by the centrums and the neural spines, they look not so firm as in the case of both *Pteranodon* and *Ornithodesmus.* Only part of the centrums are co-ossified and no sharp line can be separated. The upper part of the neural spine is totally fused each other but the space between them is rather large forming a conspicuous hole. There is no actual "supra-neural plate formed in our form, at least in the posterior part of the notarium. Whether this features have to be interpreted as the specific characters or as the incipient stage of their fusion or as a young individual development is not sure. The three vertebrae are subequal in length. Total length measured from the ventral side, 51 mm; Length of each anterio-posteriorly, 16.5; 18; 18 mm. The diapophysis is short and directs more upwards. They are all more or less damaged terminally. The partly fused neural spines are very low only about 12 milimeters above the neural canal anteriorly. There is no distal thickening or slightly so. Certainly there is no supra-neural plate developed in our form. It is also not sure how the distal part of the scapula articulates to the notarium, although the restoration made below is essentially copied from that of *Pteranodon.* It is probable that the articulation may be somewhat like that of *Ornithodesmus.* In any way the notarium of our form seems to differ quite remarkably from the both named genera. In number of the vertebrae it is likely the same as that of *Pteranodon* but no supra-neural plate. In way of articulation it may be the same as that of *Ornithodesmus,* but the number of vertebrae is most probably much less. In addition, as noted above, the notarium of our form seems to be distinguished by its less degree of co-ossification and the absence of the band-like fusion of the dorsal spines.

The other presacral vertebrae (Fig. 3, C, Fig. 6, A.) After the notarium and before the sacrum there are only three vertebrae still connected firmly in natural position. Total length measured ventrally, 52 mm. Length of each anterio-posteriorly, 17, 17 and 19 respectively. The diapophysis is very short with the rather small facet for the articulation with the rib. The dorsal spines are widely separated and comparatively higher (13.5 mm in the anterior one). The postzygapophysis of the last dorsal vertebra is almost in fusion stage with the first sacral vertebra. In all the genral features and the number of the vertebrae post to the notarium are essentially comparable with those of *Pteranodon.*

Sacral vertebrae (Fig. 3, C, Fig. 6, A.) There are seven firmly fused sacral vertebrae representing the last section of the vertebral complex with the both pelvic girdles and both femora in nearly natural position. The first sacral vertebra is also in rather fused state with the last dorsal vertebra, both by the centrums and the pre- and post-zygapophysis. It is the largest one among the sacrals. Ventral length of the centrum 21 mm. Total height anteriorly, 46 mm. The dorsal spine is well separated from the last dorsal vertebra but apparently fused (a little broken there) with the following spines. Then the size of the following vertebrae decreases considerably backwards. The last one is somewhat damaged, being the smallest. Ventral length anterio-posteriorly, 18, 16, 15, 13, 12 and 11 respectively. The dorsal spines are fused together and form a continuous band but the separation of them can still be recognizable. The sacral ribs are short and strong. They decrease also in size posteriorly. The intersacral holes are large and decreasing considerably posteriorly. The last ones are apparently obliterated and concealed behind the ilium. On the whole, the structure of the sacral vertebrae is very similar to that of *Pteranodon*, but differs from the same in some details such as the shape of the holes formed by the transversal prosessus, etc.

Caudal vertebrae (Fig. 3, D and E) There are seven caudal vertebrae still in consecutive series and two isolated ones. The former cannot be fitted well with the last sacral as the posterior part of which is damaged. But judged by the size it is very probably that this series is immediately in connection with the sacrum or nearly so (at most one is missing). It is of special interest to note that the first vertebra is opistho-coelous in nature. It is rather distinctly projecting in the anterior end. Looking from the anterior end there is a weak horizontal ridge. The first vertebra is the strongest with the ventral length 11 mm without the anterior projection and the anterior breadth, 11 mm. Then the following ones increase in length and decrease in breadth backwards in a very slight manner. The spina dorsal is damaged in most of them but the diapo-physes are better preserved and direct upwards. The two isolated vertebrae represent undoubtedly the termial part of the tail (Fig. 3, E.). One or two may be missing be-tween the consecutive series and the two and one or two missing posterior to these two vertebrae. The anterior end of these two vertebrae are also projecting, proving once more that the caudal vertebrae are opistho-coelous. Length, 9 mm.

With the exception of the sacrum which composed of seven, the number of the other parts of the column is not known. In the following reconstruction we assume that the probable number of the vertebral column may be as follows: neck, 9; dorsal 11—12; sacrum, 7 and caudal, 12—14. It is about the same as those of *Pteranodon,* but the tail of our form may be relatively longer.

Anterior limb

No sure scapula and other elements of the pectoral girdle are present, althought some of the internal cores may be the former one.

Humerus (Fig. 4, A, F.) The humerus is only represented by the proximal part of the left one. The proximal end is much worn and damaged so that the exact shape is rather obscure. Nevertheless, the cresta medialis and the condyle for the articulation to the glenoid surface of the scapula are observable and they two are rather closely situated. The deltoid crest is also damaged but it is well formed and not so strony as the spiral curved one of *Ornithodesmus*. It is also more highly situated. Distalwards the shaft narrows gradually towards the distal end and looks rather straight. The preserved end may be quite near to the minimum constriction of the shaft. Preserved proximal breadth 31 mm; breadth near the breakage, 16 mm; preserved length, 62 mm; estimated length, 125 mm.

There is a distal part of a right humerus (V.2777) in rather well state of preservation (Fig. 4, E.). It is too small for the present individual. Distal breadth, 23 mm. It fits with the small pelvic girdles in association with the larger animal. Preserved length, 31 mm. Breadth at the breakage, 10 mm. From the distal end the bone narrows in a rather sudden way upwards, exact like that of *Ornithodesmus*. It agrees almost in every detail with that of the named form, only the anterior border is more straight and the circular foremen into shaft is less distinct. The trochlea for the radius and the valley for the ulnar ridge are clearly observable.

Two other fragments of the upper part of long bone may represent the humerus of the other individual (V.2777) but are too poorly preserved for a detailed description. The shape of the part of the deltoid crest is detectable. They are much smaller than left humerus described above.

The **ulna** is represented by part of the shaft near the proximal end (Fig. 4, B). The proximal end is unfortunately broken. Preserved length 132 mm. It is strongly convex in the dorsal side and nearly flat in the ventral side. It is apparently the left side. The proximal broken end is rather expanded showing that it must be close to the upper end. The bone narrows gradually distally without the distal expansion, showing that at least one half of the remaining part is missing. The total length of the bone should be nearly 300 mm.

The other ulna may be represented by the part of the core with also one side convex and other side flat.

There are two small fragments represent probably the proximal and the distal part of a ulna (Fig. 4, F, G.). They are small and probably belong to the left side (more clear in the proximal one). The real surface of the proximal is broken. Breadth, 18 mm. The distal part is better preserved but also in a worn state. Breadth, 15 mm.

No remains of the carpals are present in our collection. The pteroid bone is doubtfully presented.

Wing-metacarpal* (Fig. 4, C, D.) This interesting one is only represented by the distal part with the articulated end well-preserved. The one with only small part of the beam preserved (Length 35 mm; distal breadth, 16 mm) is considered to belong to the left side and the other (preserved length 129 mm; distal breadth 19 mm) the right side. The better preserved right one shows that the shaft is perfectly straight. Breadth near the breakage, 12 mm and the thickness at the same point, 10.5 mm. Both the dorsal and ventral sides are rather flat, so that the cross section of the shaft looks rather square in outline. The distal condylar part in articulation with the first wing-finger is sharply differentiated. There is a weak prominent and rough surface developed in posterior side about 30 mm above the distal end in the right one. In the left one, this surface is immediately broken above the damagement. This surface is

* There are two ways of interpretation of the Wing-metacarpal and the Wing-phalanges, one as the fourth finger and the other as the fifth one. In the present paper the former interpretation is adopted. In the earlier archosaurians from which the pterosaurian is most probably derived, the fourth finger of the hand is always the longest and the fifth one tends to reduce or disappears. The writer believes, thus, the first case is more likely true.

clearly for the attachment of the wing. Since both the wing-metacarpals are broken the length of this bone is unknown. But I have the impression that this bone must be rather long as judged by the better preserved right one. An estimation of the length may reach 300 mm, about the same length as that of the ulna.

No sure presence of the other metacarpals, but some fragments of the rod-like internal cores may represent those bones.

Wing-phalanges (Fig. 5) The first wing-phalanx of both sides is well preserved. The second one is also complete and is considered to be the left side. The third one is indicated by both ends and the middle part and is reconstructed. It is also considered as belonging to the left side. Both ends of the fourth one are damaged and is probably also the left side. By the well preservation of all those wing-fingers we are able to get a fairly good idea about the structure of the anterior limb, especially the length of the wing. The length of the left first wing-finger 374; the right 377 mm; the same of the second, 265 mm. The estimated length of the third one, 202 mm. The same of the fourth one, 150 mm. The total length of the whole four fingers is 991 to 994 mm or nearly one meter long.

The proximal end of the first wing-phalanx is considerably expanded and strong. The olecranon-like process is very prominent about 13 mm long. The proximal breadth, 37 mm. The articular surface is well separated by a sharp ridge for the division of the ulnar and radius facet. They fit quite nicely with the distal part of the wing-metacarpal. The bone is nearly straight and the distal end is only moderately expanded. Breadth 28 mm of the left. The anterior foot-like extension of the right one is broken. The distal end is moderately convex. As showing by the breadth of the following phalanges the bone must be also very hollow. The shaft is rather flat about 14 mm broad at the middle and 8 mm thick. The longitudinal ridge along shaft represents evidently the ventral side and is only weakly developed.

The second wing-phalanx is complete. The proximal end is comparatively weakly expanded with a well excavated concaved surface and the distal end is also distinctly expanded with foot-like outline and convex end. The shaft is essentially the same structure as that of the first one but weaker. The longitudinal ridge is also well developed in the ventral side. Breadth of proximal end, 25 mm; the same of the distal end, 21 mm. Breadth at the middle of the shaft, 11 mm; and thickness of the same 5.5 mm.

The third wing-phalanx is partly reconstructed, but both the end and the middle part are in good condition of preservation. That those segments are belonging to the same individual and even to the same side seems doubtless, since there is no other flat bones found in the collection. The both ends are also distinctly expanded with the proximal end concave and the distal end convex. The foot-like outline of the latter is only weakly indicated. Breadth of the proximal end, 20.5; That of the distal end, 16.5 mm. Breadth at the middle 10.5 mm and the thickness at the same point, 4.5 mm. The weakly convex nature of the dorsal side is still recognizable but the longitudinal ridge disappears completely.

The fourth wing-phalanx is only represented by the middle part. The broader part is evidently to be oriented as the proximal end. The bone is still slenderer than that of the third one but the general structure is exactly the same. There is no distinct convex and flat side of the shaft but both are weakly convex with one side (apparently the dorsal side) slightly more convex than the other side. Along this side a rather distinct longitudinal groove can be observed along the posterior border of the proximal part and becomes weaker distally. Breadth near the proximal breakage, 9 mm; The same near the distal breakage, 8 mm. Breadth at the middle 9 mm and thickness at the same point, 4 mm.

The well developed articulated surface between each two wing-phalanges suggests a more mobility of the wings in all directions, even in slight folding manner.

Pelvic girdle posterior limb

Both the pelvic girdles (Fig. 6,) are sticking to the sacrum in almost natural position. Unfortunately the anterior and posterior end of the ilium as well as the part of the pubis, the prepubis and the ishium of both sides are damaged, but the real shape of the pelvic girdle can be detected rather satisfactorily. We could get a fairly reliable idea about the construction of the pelvic girdle. All the elements of the pelvic girdle are strongly co-ossified and the suture between them are difficult to detect. However, the suture between the ilium and the pubis, the ilium and ischium and pubis and prepubis may be faintly observed. The other pair of pelvic girdle found in isolated condition (V.2777) supplements much that of the type.

Ilium Both the anterior and the posterior ends of both ilia are broken. The left one is better preserved. The anterior end is long streched with rather blunt end like that of *Pteranodon* and *Nyctosaurus* and not like that of *Pterodactylus*. It ends some part above the anterior part of the second sacral vertebra. This part of the bone is almost straight and cuts posteriorly nearly the upper border of the acetabulum. Directly behind the acetabulum, there is a considerable elevation forming the thick part with an upper smooth facet almost side by side with the dorsal spine of sixth sacral vertebra. The posterior projection behind this elevation is rather short as indicated by nearly complete tip of the right side of the paratype V.2777 (Fig. 6, C.). The separation with the pubis and the ischium is not clear but it is probable that the ilium takes at least one half of the border of acetabulum.

Pubis and prepubis The separation of the pubis with the ilium is not perfectly sure but it is very likely that the pubis takes the part for making the acetabulum too. In the right pelvic girdle, there is a rather clear line across the lower part of the acetabulum which seems to represent the boundary between the ilium and the pubis and the ischium. In addition the separation of the sacral rib and the pubis is rather clear, not only by suture but also by distinct swollen at the very point in connection with the sacral rib. That this part of the pelvic girdle forms the proximal part of the pubis is evindenced by the fact that in all the four specimens, the pubic foramen is clearly seen in the inner side. It is rather high in location quite near to the root of the lower border of the anterioı process of the ilium. This makes quite clear the pubis is also not excluded from the acetabulum. Distally the bone is damaged in all the available specimens, except the right side of the type. In this side the posterior edge of the pubis and prepubis is also damaged, but the anterior border is well preserved and ended distally by a truncated termination. The distal part of the bone represents certainly the prepubis. Short below the level of the acetabulum there is a faint suture-like line running anterior up to the very border of the bone. If it is not a fracture and realy as suture, the pubis and prepubis must be firmly connected or co-ossified.

Ischium The ischium is fused with the pubis and forms an expanded bone, convex moderately externally. It differs from the other pterosaurians by the total absence of the obturator foramen but instead a depression or fossa is developed at the proximal part of the inner side in all the four specimens.

Acetabulum The acetabulum is imperforated but its middle part is extremely thin as shown by the right one of V.2777. It is rather rounded square in outline with the anterio-posterior diameter slightly longer. 25 mm of the left side of the type and 17 mm in the right of V.2777. Breadth of the distal end of the right prepubis, 17 mm.

Femur (Fig. 6, A.) The femur of both sides is well preserved and sticks still to its acetabulum but somewhat displaced. Both femora should direct much more sidewards and posteriorly. The femur is a long and slender bone and distinctly curved posteriorly. The condyle is well separated from the shaft by the long and obliquely directed neck. The articulated surface is moderately convex and smooth. It is differentiated from the neck by a distinct circular ridge, so that the condyle and the neck form a somewhat mush-room-like shape. The latter is well constricted and 11 mm long from the lateral trochanter. The diameter of the condyle is about 21 mm and that of the neck 13 mm. The lateral trochanter is strong with a deep lateral fossa. There is also a deep groove running from the posterior lateral side of the neck to the lower lateral part of the trochanter. The bone narrows from the lateral trochanter suddenly distalwards and keep almost the same degree of thickness short before the distal end where the shaft begin to expand again. The distal end is rather strongly expanded and the medial and lateral condyles are well separated. The shaft curves considerably backwards. Total length, 221 mm; breadth of the distal end, 30 mm; breadth at the middle of the shaft, 14 mm; anterio-posterior thickness, 11 mm.

A much smaller distal part of a femur (V.2777) (Fig. 7, B.) agrees well with that of the type. Distal breadth, 19 mm.

On the whole the femur of the present form is very characteristic and differs very easily from other pterosaurians such as *Ornithodesmus, Pteranodon* etc.

Tibia (Fig. 7, A.) The only tibia is represented by proximal end with the shaft 170 mm long preserved. It is interpreted as the left one. The proximal end is considerably expanded, overhanging much the shaft. The proximal surface is shallow concave and the border is somewhat elevated. It faces obliquely laterally. Breadth 27 mm and anterio-posterior length, 21 mm. The lateral projection of the surface represents the proximal part of the fibula which is completely fused with the tibia. It is broken immediately below the expanded part of the proximal end. The pointed splint of its distal part must not very long. The presence of the vestige of the fibula indicates one of the primitive features of our form. The shaft is perfectly straight and narrows very gradually distalwards. Its cross section is rounded triangular. The bone well is comparatively thick, slightly exceeds one millimeter. The total length of the tibia is unknown, certainly longer than the femur. Estimated length, 270 mm.

An internal core, 162 mm long, seems to represent the tibia of the other side.

Mounting and reconstruction

Although the present collection is not quite satisfactory and many important parts of the skull, lower jaw and postcranial skeleton are missing, it is possible to make a trial of a panel mounting and a fleshy restoration of the animal. The most important part of the bone especially the anterior part of the skull, and lower jaws, the wing-metacarpals and wing-fingers, part of the notarium, complete sacrum with the pelvic girdles and the femora in satisfactory condition of preservation. The mounting is made by Mr. Y. L. Sou under my direction and the restoration picture by W. L. Shen. The following notes may be added as comments of such work. Needless to say that all these are provisional and subjected to change, if necessary.

The recostruction of the skull The anterior part of the skull and the lower jaws are actual. The nasal and preorbital opening are most probably confluent and no bony separation, as the case of most of the advanced pterodactyloids. The most interesting feature of our form is the presence of the sagital ridge in front of and above this opening. Unfortunately its upper border is broken and its posterior extension is unknown. The notch at the base shows that the ridge must start first anteriorly and then bending backwards. Such development is only known in *Pterodactylus kochi*. In this form the premaxilla is also sharply pointed and without teeth in the anterior part of the upper and lower jaws. The only difference is that the edentatous part is shorter with the tip part perfectly straight. We have thus reasons to assume that the posterior part of the skull may be rather similarly constructed as the named form as showing in the present reconstruction. It is, however, so restored that the post preorbital part seems to be somewhat larger than the preorbital and nasal opening in oder to be more balanced with the long snout. It is absolutely not sure about the posterior extension of the sagital crest but most probably not extends much backwards as in the case of *Pterodactylus kochi*. It is almost certain that there is no posterior extension and the supraoccipital crest is absent.

The lower jaw is for the most part preserved. The posterior part is reconstructed mainly according to *Pterodactylus kochi*. The two fragments of the part behind the dental row help much the reconstruction. They suggest that the posterior part of the lower jaw narrows gradually backwards as in the case of *Ornithodesmus* and most probably no dental foramen as the same form, because there is no much space left for such foramen.

On the whole the posterior part of the skull and the lower jaw is reconstructed as given in figure 8 and plate I. The skull of our form is almost like an enlarged skull of *Pterodactylus kochi* but with characteristic upward bending of the anterior part and many other details.

The vertebrate colunm is also easy to reconstruct because every segment of the column is represented and the posterior part of the column is almost complete. According to the two neck vertebrae, we may assume that the neck vertebrae are quite similar to those of Ornithocheiridae in broad sence. Our reconstruction of the neck is essentially made with reference to that of *Pteranodon*. The real shape of the notarium is not sure but we have reasons to believe that it is neither like that of *Pteronodon* nor that of *Ornithodesmus*. It seems that our notarium is more loosely constructed and eight in number otherwise the body is much too short for the animal. The post notarium vertebrae are mostly represented by real specimens except a little of the caudal ones which are missing. No doubt that the tail of our form is rather short. The whole column is shown in side view in plate I.

The anterior limb is less well preserved except the wing-fingers. There are no pectoral elements preserved at all. The humerus and the lower arms as well as the metacarpals are only represented by fragmentary bones. Our reconstruction of this part adopts chiefly the current reconstruction of the Ornithocheirids and is hypothetical. Nevertheless, as shown above in the section of the description, the lower arm, represented by the ulna and the wing-metacarpal are considerably long and both bones may be subequal in length. The four wing-fingers are practically complete and very useful in getting the idea of the maximum width of the wings.

Both the pelvic girdles are nearly complete and supplement each other. They are still fixed with the sacrum in natural position. Their broken parts are shown in dotted line in figure 6, A. and the tentative reconstruction is given in the same Figure 6, B.

Concerning the *posterior limbs,* the lower part of the tibia and the remaining parts are totally missing. The both femora are still sticking to the acetabulum but somewhat displaced. Their direction in the reconstruction of the whole animal is not natural. They should direct more posteriorly. The exact length of the tibia is not known. But as judged by the preserved part of the left side, it must be rather long as shown in the given reconstruction, considerably longer than the femur. The first wing-finger and the femur are the two only long bones which are worthwhile to give their ration, that is 58.6.

There are no bones preserved after the proximal part of the tibia. The restoration of this part is mainly made with the help of *Pteranodon* and other large *Ornithocheirians* and may be not quite correct.

The entire restoration as shown in the panel mounting plate I is on the whole in a good posture of flying except the two femora which should be direct more posteriorly. The total span of the wings is nearly three and half meters.

A more artistic painting is given in plate II for showing the picture of our animal that lived some 100,000,000 years ago.

DETERMINATION AND DISCUSSION

In the course of the foregoing description, it is quite evident that the Sinkiang fossils belong certainly to the suborder Pterodactyloidea. The question is to which family our form belongs to. It is certainly a new genus and species of which the diagnosis is already given before.

In the latest classification of Pterodactyloidea there are five families given by Kuhn (1961). The first three families (Pterodactylidae, Ctenochsmatidae and Belonochasmatidae) can be at once excluded from the present consideration. They are either too small or too specialized in their dentition. The systematic position of the family Belonochasmatidae is still problematic and may not a pterosaurian at all (Kuhn, 1961. 4). Our form can evidently be compared with the last two families (Ornithodesmidae and Ornithocheiridae) with the presence of notarium.

In the course of description made above we have repeatedly used the type genus and species of the family *Ornithodesmus latidens* (Hooley, 1913) for comparison. Nevertheless our form differs from this species fundamentally by many important features such as the long, compressed and upward bending of the snout, the edentatous nature of the anterior part of the premaxillae and the lower jaws, presumably more number of the anterior dorsal vertebrae of the notarium etc. The skull of the English form is much lightly constructed and with the nasal and preorbital opening well separated. It is out of question that our form can not be a member of this family.

It is equally evident that our form is quite different from the members of the family Ornithocheiridae. As noted above we have a conspicuous sagital ridge above the nasal and preorbital opening and presumably no supraoccipital crest as in the case of the genera of this family*. Furthermore the Sinkiang form is toothed, although the anterior part of the mouth is edentatous. There is also no supraneural Plate developed in the notarium of our form.

It is therefore obvious that the Chinese form represents a new family, the Dsungaripteridae, fam. nov. with the type genus and type species as given in preceding pages.

Relationship and origin of Dsungaripterus By the sharply pointed snout without teeth, the presence of the sagital crest and the general construction of the skull we have the impression that *Pterodactylus kochi* Wagler may represent the ancestral type of form. *Pterodactylus kochi* is derived from the lithographieschiefern of Eichstaett, Germany of Upper Jurassic age. According to the description by Plieniger with the well reproduced plate, this form differs from all the other *Perodacylus* species by the presence of well-developed sagital crest above nasal and preorbital opening and the absence of teeth both in the anterior end of the upper and lower jaws. Together with the rather large preorbital opening and blunt teeth, it has almost no difficulty that this form gives rise of our form. By the same reasons we feel that it is necessary to erect a new genus for this perculiar type of "*Pterodactylus*" for which the name *Germanodactylus* (Gen. nov.) is proposed, so the named species should be called *G. kochi* (Wagler). In *Rhamphorhynchus* there is also no anterior teeth of both upper and lower jaws but the other features differ widely from the named form.

The Sinkiang *Dsungaripterus* bears a series of characteristics, notably the upward bending of the snout and the lower jaw. Although the teeth of our form tend to reduce but we do not think that there is any relationship between the toothless *Pteranodon* (and other Upper Retaceous pterosaurians) and the Chinese species. As before-mentioned it is most probable that there is no supraorbital crest developed in our form.

A suggested classification of Pterosaurians In all the current classification, Pterosauria is divided into two suborders, the long tailed Rhamphorhynchoidea and the short tailed Pterodactyloidea. The former suborder should include only the three families, Dimorphodontidae, Rhamphorhynchidae and Scaphognathidae. The Anurognathidae should be better included in the suborder Pterodactyloidea on account of its short tail and other perculiar characters (see below).

During the present study we feel that it is better to divide the Pterodactyloidea into two suborders. The suborder Pterodactyloidea should be restricted only to those forms without notarium of the Upper Jurassic time. It may include three wide different forms, possible also a fourth one. The crested Germanodactyloidae (new family), the anteriorly toothed Pterodactylidae (with the teeth before the nasal opening) and anuroganthidae with high and short skull. The family Ctenochasmatidae with numerous teeth may belong also to this suborder. The widely different types of this suborder suggest that the radiation of this group of Pterosaurians must started rather earlier saying Middle Jurassic time, a period of which we know almost nothing of this order. Its relationship with the Rhamphorhynchoidea is not sure at all. The genus *Belonochasma* is a problematic form possibly to be excluded from this order.

* Even in *Nyctosaurus* the supraoccipital is developed.

All the post Jurassic pterosaurians are much larger in size, some of them even gigantic, all with the development of notarium, certainly in connection with increasingly high power of flying. They are, however, quite variable in structure in spite of the common nature of the notarium. It would be more suggestive to combine them into one Suborder, or at least one superfamily and subdivided into several families or subfamilies. Concerning the systematic position of our *Dsungaripterus* it is already made clear before. It represents a special family and may be derived from the Upper Jurassic *Germanodactylus*. Its development of the notarium is not entirely clear but may be rather loosely constructed and rather primitive in nature.

The representative genus *Ornithodesmus* of the family Ornithodesmidae is very characteristic by the light structure of its skull. Its relationship with the earlier Rhamphorhynchoidea such as *Dimorphodon* and *Scaphognathus* is long suggested by Hooley (1913). Its teeth are entirely restricted before the nasal opening as in the case of *Pterodactylus*. The family Ornithocheiridae represented by *Ornithocheirus* is poorly known but the presence of a supraoccipital crest is evident and the teeth are prolonged anterior

Table 1. A suggestive classification of the Pterosauria

Suborder	Family	Leading characters
Suborder:		
Rhamphorhyncoidea		Long tail
	Dimorphodontidae	Preorbital large
	Rhamphorhynchidae	Preorbital small
	Scaphognathidae	Teeth vertical in position
Suborder:		
Pterodactyloidea		Short tail without notarium.
		All small in size.
	Germanodactylidae	Muzzle sharply pointed with crest above the preorbital opening. Anterior part of the beak toothless.
	Pterodactylidae	Small size. Nasal and preorbital separated. Anterior dorsal vertebrae not fused etc.
	Anurognathidae	Skull short and high.
	Ctenochasmatidae	Teeth numerous
	Belonochasmatidae	Systematic position not certain great increasing number of teeth.
Suborder:		
Dsungaripteroidea		Short tail with notarium.
	Dsungaripteridae	Anterior part of muzzle no teeth nasal and preorbital opening confluent and large, beak bending upwards and moderately long.
	Ornithodesmuidae	All teeth placed before the nasal opening, skull lightly constructed without supraneural plate.
	Ornithocheiridae	Teeth prolonged anterior to muzzle. With supraoccipital crest.
	Pteranodontidae	Beak extremely long. No teeth. Well developed supraoccitital crest. With supraneural plate.
	Criorhynchidae	Skull high and anteriorly truncated.

to the muzzle. By the former character, it is very likely that it may be the ancestral type of the late toothless *Pteranodon* and other related genera. It may be derived from the small *Pterodactylus* of the Upper Jurassic in view of the general archetecture of the skull, especially the pointed muzzle and the backward shiftling of various openings as well as the lengthening of the beak but there lacks still more effective proofs. The high and short skull of *Anuroganthus* is very conspicuous and it is very unnatural to put it under the suborder Rhamphorhyncoider on account of its short tail and to group it with the other Pterodactyloids on account of the special shape of the skull. It is probable that the equally high skull form like *Çriorhynchus* etc. may be the descendant of this form. Its ancestral may be traced to the lower Jurassic *Dimorphodon.*

In doing so it seems necessary to erect a new name of higher rank to cover all the Cretaceous forms for which the name Dsungaripteroidea is proposed. Its sharp separation with the Upper Jurassic Perodactyloidea is evident by the common character of the suprapreorbital crest or supraoccipital crest and the Notarium.

In figure 9 the above statements are given in a more graphic and chronologic way and may be again tabulated in the table. (p. 252) No attempt is made for the detailed diagnosis and classification below the rank of genus.

NOTE ON OTHER REMAINS OF PTEROSAURIANS IN CHINA AND OTHER DOUBTFUL "AVIANS"

Pterosaurians from Laiyang, Shantung

The present described *Dsungaripterus weii* represents the first record of a determinable Pterosaurians in China but by no means for the first time that this interesting order is observed. In 1958, some fragments of limb bones were determined as ? Pterosauria indet. (Young, 1958). With the study of the present form we have, however, better understanding of those fossils from Laiyang.

The only determinable bone of the fragments of the locality N. E. of Laiyang city is more probably a ulna. It is smaller than that of the Sinkiang species. V.755.

The material from Toushan (T. 1) includes the proximal part of the second phalanx (Fig. 10, 2). The end is deeply concave as that of the corresponding one of the Sinkiang form and probably also a left one. It is almost one third smaller than the named form. Proximal breadth, 17 mm (V.746 not V.747). The proximal and distal part of the right femur fit almost in direct connection (Fig. 10, 3d 4). It fits almost exactly with the femur of Sinkiang. Its weak curvature can be observed in side view, although it looks straight dorsally and ventrally. The condyle is well separated by a neck from the shaft, same as the named form. The distal end is however less expanded. It is about one fourth smaller than the Sinkiang form. Proximal breadth 24 mm; distal breadth, 21 mm.

The remains of this locality can be identified at least to the genus Dsungaripterus, but we prefer to wait for further facts for a name of this locality. V.746.

The well preserved proximal part of a bone illustrated in fig. 10, 1 is certainly a first wing-phalanx (Cat. no. V.474 and not V.755.) It fits also in general structure with the Sinkiang form but much smaller proximal breadth 17 mm. The expanded proximal part narrows very aboruptly towards the distal end. It may represent another unknown form of Dsungaripteroids. The other fragment is probably a middle part of a ulna. V.747.

The revision of the previously known remains from Laiyang shows that the *Dsungaripterus*—like forms and possibly other member of this interesting group is present in E. Shantung. The geological age of the Toushan is known as Chingshan Beds of Lower Cretaceous in association with psittacosaurs.

Pterosaurian from Mengyin, Shantung

As I have noted in 1958 the bone described as Theropoda indet. (?ulna) (Young, 1935, p. 531, fig. 8.) represents also a pterosaurian (Fig. 10, right figure). It is the proximal part of the first wing-phalanx. It is about the same size (slightly larger) and structure as the same bone of Sinkiang. We have thus suspect that *Dsungaripterus* may present as far as Shantung.

In view of the peculiarities of the fauna discovered from Hsichuefu, it is probably not in contradictory with the view that the *Helopus*-bearing Beds are Upper Jurassic as it seems. In this locality, besides the pterosaurian, a perculiar sauropod and a large stegosaur have been found. It is quite possible that some Lower Cretaceous Beds may be recognized, if detailed stratigraphy is going to be made.

Pterosaurian from Inner Mongolia (Fig. 11, A.)

An ulna, probably the right side, with the proximal end damaged has been collected by a geological field party from Inner Mongolia. The locality indicates only "A-ma-chia-han" without any other informations. According to the label attached it was derived from a sort of bright red sandstone. And the age is given as Cr5. The filled matrix in the shaft of the bone shows, however, that it is a sort of yellowish grey sandstone. The bone is yellow in coloration and the bone is extremely thin, less than 0.5 milimeter. Judged from the weakly expanded part of the upper breakage it must be quite near to the proximal end. Cat. no. V.2778.

Judged by the ulna of *Ornithodesmus,* this specimen belongs most probably to the right side. Its distal end fits almost exactly with the same of the named form including the circular pit, oval convex condyle and the articular surface etc. It is, therefore, beyond any doubt that we have to deal with a large pterosaurian. Preserved length 224 mm; actual length probably about 230 mm; proximal breadth at the breakage, 25 mm; distal breadth, 43 mm; breadth and thickness at the middle 17 and 12 mm. The dorsal side is moderately convex and ventral side flat.

This bone is smaller than the named English form. Since the ulna of *Dsungaripterus weii* is poorly preserved, it is difficult to compare. But one has the impression that the present specimen is more stout and comparatively broader than the more long stretched and slender ulna of the named form. It is, therefore, probably belonging to another Dsungaripteroidea but not the same genus and species.

The occurrence of the pterosaurian in Inner Mongolia is two-fold interest, not only because the pterosaurian is first recorded in Inner Mongolia but also because its geographical location intermediates the remains of the same order between widely apart areas like Sinkiang and Shantung.

? **Ornithurae indet. from Changchi, Sinkiang** (Fig. 11, B)

A piece of long bone embedded in blueish grey sandstone collected by a field party of Pteroleum Affair from Changchi, west of Urumchi, Sinkiang. The label indicates only "Changchiho" without any further information. Field number 880, matrix, sandstone and age, Cr_1 ; Collector, K. S. Liu. Cat. no. V.2779.

The bone is almost black in color and part of the surface near the proximal and the distal end is damaged with however the both ends still well-preserved. Total length 165 mm. The bone is perfectly straight and slender with the both ends distinctly thickened. The proximal end is triangular in outline and somewhat obliquely oriented. Maximum breadth, 11 mm. The distal end is less well preserved but showing the well divided condyles for the articulation with the tarso-metatarsus II and IV, one is damaged and one is well in good condition. Preserved breadth across the distal end, 10 mm. Along the lateral border of the damaged part below the proximal end there is a splint-like bone extending downwards about 63 mm. It is certainly the degenerated fibula and the whole bone should be considered as the right side.

This bone looks quite similar to the tibia of *Hesperornis* and other hawks-like birds. It is much smaller than the named genus. We refrain from doing further determination but like to point out that the present specimen may some day proved to be the first record of Mesozoic avian find in China.

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图　版　說　明

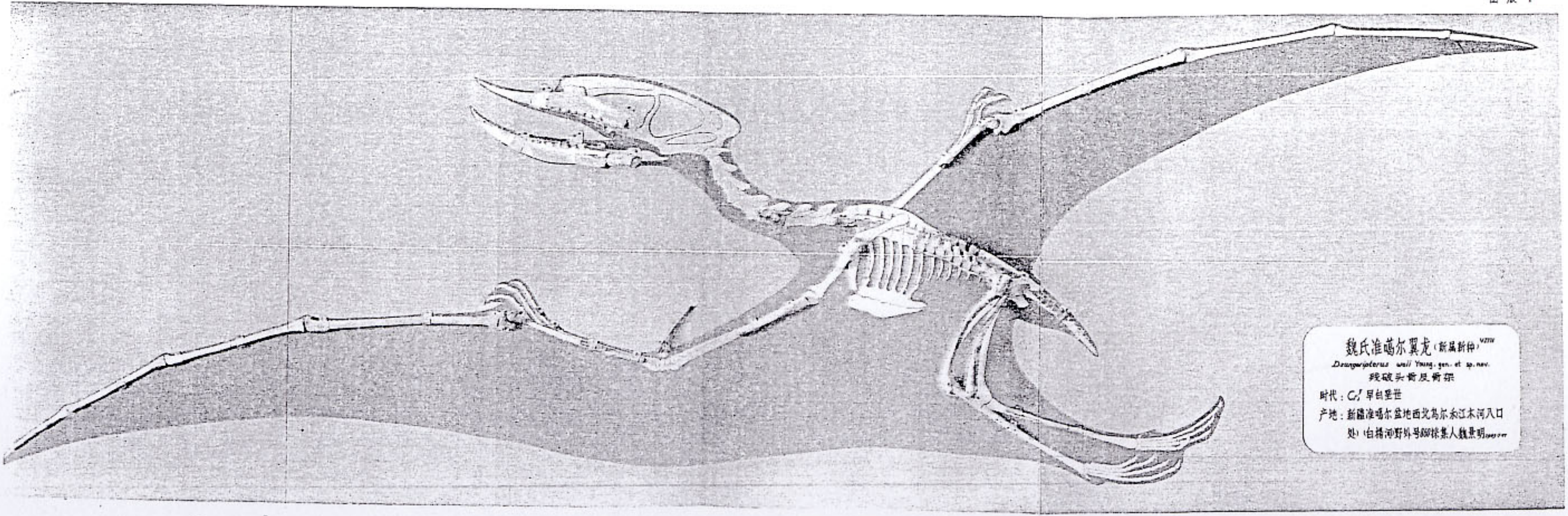
EXPLANATION OF PLATE I—II

图版 I.　魏氏准噶尔翼龙，新属新种，壁式装架的原大 1/6。可以看出眞骨凸出，缺失部分为浅色，而两翼为深色。

Plate I.　*Dsungaripterus weii.* gen. et sp. nov. Panel mounting of the skeleton of the type V. 2776 in about 1/6 natural size. The actual bones are easy to observe in relief and the missing parts by the painting in lighter coloration. The outline of the wings is given in darker color. Photo by C. Tu.

图版 II.　同一动物的生活复原图。

Plate II.　A trial of a fleshy restoration of the same animal by W. L. Shen.


魏氏准噶尔翼龙（新属新种）
Dsungaripterus weii Young, gen. et sp. nov.
残破头骨及骨架
时代：早白垩世
产地：新疆准噶尔盆地西北乌尔禾江木河入口
处）（白杨河野外号 采集人魏景明