

山东山旺发现中新世大型猛禽化石¹⁾

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摘要 记述了山东山旺地区发现的首件大型猛禽类化石。一新属种, *Qiluornis taishanensis* gen. et sp. nov.。新鸟较我国以前发现的中新世唯一一件大型猛禽类化石, 江苏泗洪的顾氏中新鹭(*Mioaegyptius gui* Hou 1984) 稍小, 但保存更加完整并较进步。这一大型猛禽的发现, 为研究早期猛禽的演化, 以及山旺组地层与相关地层时代对比提供了重要的资料。

关键词 山东山旺, 中新世, 鹰科

中图法分类号 Q915.865

1999年夏, 山旺中新世国家化石自然保护区赠送给中国科学院古脊椎动物与古人类研究所一批具有较高科研价值的脊椎动物化石, 其中一块属大型猛禽类。以下是对这一材料的初步记述。

隼形目 Falconiformes Seebohm 1890

鹰科 Accipitridae Maynard 1880

齐鲁鸟属(新属) *Qiluornis* gen. nov.

词源 Qi(齐)古代山东的简称, Lu(鲁)为现山东省的简称, ornis, 希腊词, 意为“鸟”, 故中文名为齐鲁鸟。

属型种 泰山齐鲁鸟 *Qiluornis taishanensis*。

特征 大型鸟类。颈椎和背椎的腹下突不发育。背椎神经棘长。最后一枚荐椎的横突特别粗壮。跗蹠骨与股骨接近等长, 股骨之长约为胫跗骨长的 2/3。胫跗骨强壮, 腓骨约为胫跗骨长的 3/4。跗蹠骨第 2 趾滑车具滑车翼。第 1、2 脚爪发育, 第 4 爪小。

泰山齐鲁鸟(新种) *Qiluornis taishanensis* gen. et sp. nov.

(图 1; 图版 I)

正型标本 保存不全的脊柱、腰带和完整的右后肢。中国科学院古脊椎动物与古人类研究所标本编号 V 12351。

产地及层位 山东临朐山旺; 山旺组, 中新世。

词源 Taishan(泰山)为山名, 是五岳之首的泰山, 系山东省最著名的旅游胜地。

特征 同属的特征。

1) 中国科学院资源与生态环境研究“九五”重大项目(编号: KZ951-B1-410)和中国科学院创新工程重大项目(编号: KZCX3-J-03)资助。

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标本测量 (mm) 脊柱保存长 350, 愈合荐骨 107, 腰带保存长 140, 腰带保存最宽 73; 股骨长 123, 股骨体横宽 22, 胫跗骨全长 183, 近端最宽 30; 跗蹠骨长 120; 第 1 趾长 60。

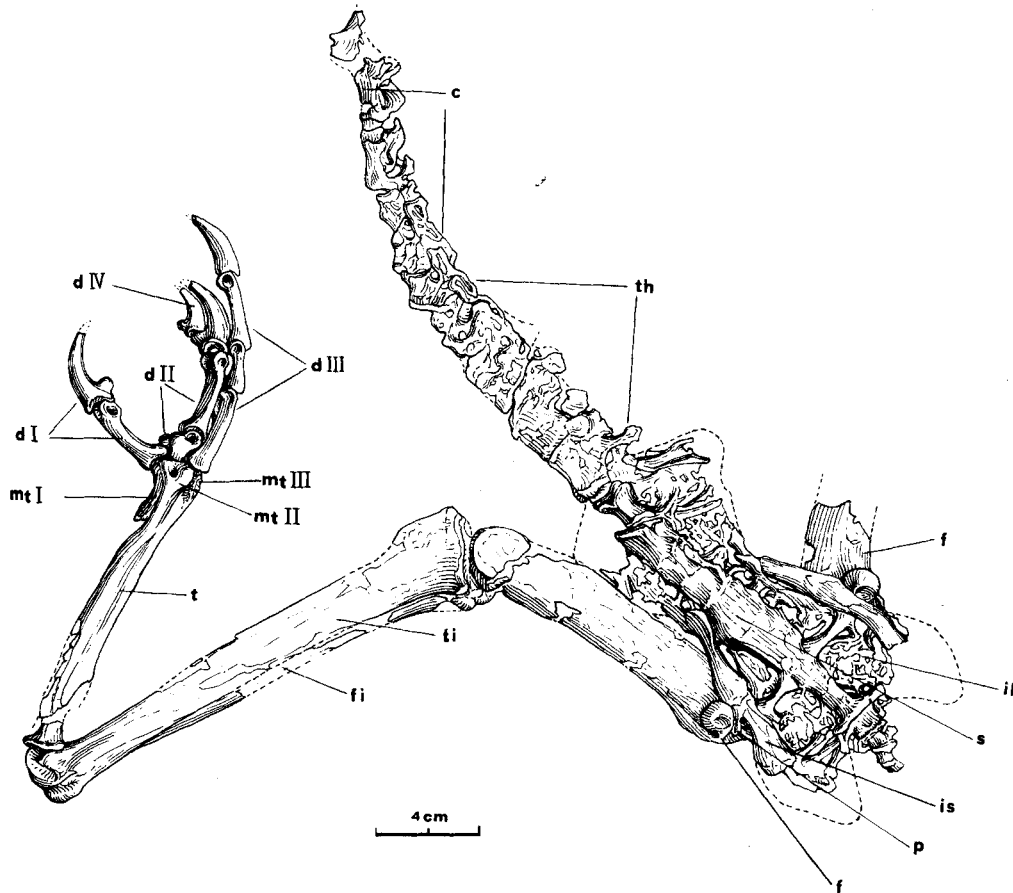


图 1 泰山齐鲁鸟(新属种)的正型标本(IVPP V 12351), 腹、侧视

Fig. 1 Holotype of *Qiluornis taishanensis* gen. et sp. nov., in ventral and lateral view

简字说明 Abbreviations: c, 颈椎(cervical vertebrae); d, I-IV 第 1~4 趾骨 Pedal digits I-IV); f, 股骨(femur); fi, 腓骨(fibula); il, 髌骨(ilium); is, 坐骨(ischium); mt I-III, 第 1~3 趾骨滑车(trochleae of metatarsals I-III); p, 耻骨(pubis); s, 愈合荐骨(synsacrum); t, 跗蹠骨(tarsometatarsus); th, 胸椎(thoracic vertebrae); ti, 胫跗骨(tibiotarsus)

标本描述 颈椎至后部的游离尾椎基本呈连续关节。颈椎和胸椎侧向保存, 但愈合荐骨、尾椎及腰带为腹侧保存。脊柱和腰带部分骨片破损, 腰带后部不全。尾综骨没有保存。股骨, 右侧者基本完整, 左侧者仅存近端; 右胫跗骨和跗蹠骨基本完整; 第 1~3 趾骨保存完好, 仅爪尖稍破损。

在所保存的脊椎中仅有最后两枚胸椎的椎体完整, 最前面的一枚颈椎有部分椎体。在愈合荐骨之前约有 13 或 14 枚椎体保存, 其中约有 5~6 枚颈椎, 颈椎向前变小。胸椎神经棘比较高, 关节突也长。后部胸椎神经棘更高, 还可看出蜂窝状构造。从颈椎到胸椎其腹面没有任何象现生猛禽类具有的腹下突(Proc. ventralis), 而是平凹型的。

愈合荐骨大部横突缺失,其腹面保存完好,在愈合荐骨之前有两个愈合腰椎和两枚愈合胸椎。愈合腰椎的椎体短,但比较宽,有一腹沟;愈合胸椎的椎体长,但无腹沟,而是中央有一条低的嵴,最前端的一枚愈合胸椎与后者断裂开来,并有些错位。现生猛禽愈合胸椎一般都是3枚,而齐鲁鸟仅为2枚。愈合荐椎包括5~6枚荐椎,它们已愈合相当好,椎体界限已难辨认,其椎体腹面增宽,基本为一平面,而没有现生猛禽类的腹沟。最后一枚荐椎的横突很强壮,两侧者都保存很好,这是该鸟的一大特征,现生猛禽类者没有如此明显的构造。在荐椎之后尚有3或4枚较小的尾椎与愈合荐骨联合在一起,最后一枚愈合尾椎末端向后两侧扩展,其横突也相当长,之后尚保存4枚游离的更小的尾椎。

腰带:髌骨(肠骨)髌臼前翼破损,仅能观察其轮廓。其间的骨片多半不全,但近髌臼处,骨骼边缘稍厚,腹面观髌斜嵴(*Crista iliaca obliqua*)非常大,髌骨髌臼后翼(*Ala postacetabularis ilii*)比前翼宽,但骨片亦不全。因为腹面挤压,髌臼孔(*Foramen acetabuli*)看不到,耻骨仅存前部分,与髌、坐骨比较,相当细弱,近端尚未与髌、坐骨完全愈合,因此其最前端即耻骨突(*Pectineal process*)尚能清晰可见,位于髌臼的后侧,不向前伸,耻骨后伸的耻骨尖断裂开来。耻骨内侧即是坐骨的部分骨骼,它保存得较耻骨多。坐骨翼(*Alaischii*)边缘亦比较粗厚,右侧者保存得较多,其边缘与髌骨紧相贴近,但并不愈合,这又是原始性之表现。

股骨:齐鲁鸟的股骨保存了内侧面,比较圆扁,显得特别粗壮。近端最突出的是股骨头,大而圆,内上侧已有明显的股骨头韧带凹(*Fovea lig. capitis*),从覆压的状况看它已有较发育的转子嵴(*Crista trochanteris*)。近端仅较骨体稍扩展,但其他构造不明显,骨体表面光滑,分布于骨体前后的肌间线(*Intermuscular line*)都不明显。股骨远端关节髌观察不全,外髌虽较发育,但构造简单。

胫跗骨呈内侧覆压,故近端的胫内嵴(*Inner cnemial crest*)清晰可见,前缘较直,并明显突出于骨体之外。由于胫嵴的出现,胫跗骨近端显得比较扩展,上段的骨体也比较粗壮。胫跗骨体较宽,但远端较细,有些呈后侧覆压,所以内、外两个关节髌都能观察到,关节髌都较小,保存尚好。远端内关节髌的内侧面有一突出的内韧带突(*Internal ligamental prominence*),髌间窝比较浅和宽。腓骨细长,近端较圆,远端逐渐尖灭,约为胫跗骨长的3/4。

跗蹠骨也保存内侧面,近端与骨体断开,但顶面内侧还紧紧地与胫跗骨远端内髌相关节,还可以观察到一个比较大而圆的内侧杯状窝(*Cotyla lateralis*),近端的其他构造缺失。从内侧仍可观察到骨体自上而下有一较大的凹面延伸,这是由于猛禽跗蹠骨片前后较薄而致。接近远端,内侧一长而较深的第1蹠骨窝(*Fossa metatarsi I*)发育特别清楚。第1蹠骨长,并呈关节状态保留在此窝内。第2蹠骨滑车(*Trochlea metatarsi II*)就在第1蹠骨窝的内下侧,并已有了较发育的滑车翼(*Wing of trochlea*),在滑车翼的中央有一较大的副韧带窝(*Fovea lig. collateralis*);第3蹠骨滑车仅保存一部分;第4蹠骨滑车未保存。已保留的滑车间切迹(*Incisura intertrochlearis*)比较浅。跗蹠骨骨体,就保存的部分可以看出是相当宽的,而且侧向压扁,内侧边特别薄,中段至第1蹠骨窝的上缘,骨体内边缘向后折转,这是大、中型猛禽的共同特征。跗蹠骨的蹠骨滑车末端基本处于同一水平线上,这是猛禽类区别于其他鸟类的共同特征之一。

趾骨和趾爪是齐鲁鸟保存最好的部分,但第 4 趾仅有一趾爪保存。从保留的趾骨看,第 1 趾最大最粗壮,近端扩展,远端的滑车左右两侧收缩变窄,滑车韧带窝发育,证明它已具有比较强的抓握能力。第 1 趾爪大而钩曲,第 1 趾与其他 3 趾相对,从而形成猛禽类强大而有力的捕捉动物的脚趾构造。第 2 趾粗壮,第 1 趾节较短,只有第 2 趾节的一半长,趾爪也较大,与第 1 趾爪相似。第 3 趾的 4 个趾节骨保存都很好,与第 2 趾比较,要细而长,为最长的趾,但趾爪没有第 1、2 趾爪强大弯曲;第 1 趾节最长,第 3 节次之,第 2 节最短。第 4 趾爪是最小的一个,其长约为第 2 趾爪的一半。第 1、2、4 节趾爪都保留很发育的屈肌结节。

比较和讨论 自 1984 年我国江苏泗洪中新世下草湾组发现大型猛禽顾氏中新鸢(*Mioaegyptus gui* Hou 1984)以来,旧大陆再没有新的猛禽材料报道。在新大陆,Emslie(1988)报道一发现于北美中新世似秃鸢的一种 *Hadrogyps aigialeus*; Alvarenga(1985)报道一发现于巴西早渐新世的 *Brasilogyps taustoi*。这两属种均属美洲秃鸢科(Cathartidae)。该科最基本的特征是:中趾之长与跗蹠骨近于相等,第 1 趾位置较高,趾骨也小,不适于抓握或紧抓等。而山旺齐鲁鸟的第 2 趾短于跗蹠骨,第 1 趾特别长而粗壮,趾爪大而钩曲,抓握能力很强,因此齐鲁鸟与美洲秃鸢类相差甚远。

齐鲁鸟个体大,腰带窄长,跗蹠骨骨体前后压扁,有一很薄的内侧缘等,应属鸢亚科。齐鲁鸟没有中新鸢大,中新鸢的跗蹠骨长达 140mm,而齐鲁鸟只有 120mm 长。但就跗蹠骨的形态比较,很显然齐鲁鸟较进步。主要表现在:跗蹠骨顶面的关节凹,齐鲁鸟大而且较深;骨体内侧面齐鲁鸟显得更向内侧扩展和变薄;远端滑车,齐鲁鸟者已具明显的第 2 蹠骨滑车翼和比较深的副韧带窝,而中新鸢尚没有这些构造。齐鲁鸟的进步性,反映出山旺组的地质时代较下草湾组要晚。当然齐鲁鸟还不具有现生鸢类的 3 枚愈合荐骨的愈合胸椎,而仅有 2 枚;腰带虽然已形成现生猛禽类的轮廓,但腰带的 3 块骨在髌臼处尚未完全愈合。这些保守性状的存在说明,鸢类虽然早在始新世就已出现,但它们的进化历程是曲折复杂的。单就个体大小而论,最早发现的是个体很小的 *Diatropornis* (Mourer-Chauviré, 1982)。迄今为止,在中新世之前尚未发现较中新鸢和齐鲁鸟更大的猛禽类化石。当然,始新世时在欧亚大陆生活过一类巨型鸟类——不飞鸟(Diatrymiformes),我国始新世也有中原鸟(*Zhongyuanus* Hou 1980),但它们都是地栖不会飞行的鸟类,在形态特征上与猛禽类等具有很强飞行能力的大型鸟类相差较远。

猛禽类,尤其大型猛禽类化石,不仅在我国第三纪只限于江苏泗洪中新世的中新鸢的跗蹠骨,而且在世界其他地区发现得也比较少,因此可与本文报道的齐鲁鸟对比讨论的材料很少,对于这一类鸟的演化历史知道得也十分有限。世界现生两大鸢类类群:美洲秃鸢类(Cathartidae)和旧大陆的鸢类(Gypaetinae 或 Aegyptinae),它们分别起源于何地? 又是何时分离的? 这些重要问题,目前因化石的贫乏,还很难进行深入探讨。从化石记录看,欧洲最早,始新世中期就已出现(Lambrecht, 1933),在美洲渐新世才有发现(Feduccia, 1999)。我国的中新鸢既具有欧洲早期鸢类的特征,也与新域鸢类(New World vultures)有一定相似之处(Hou, 1984),但较中新鸢约晚 150 万年的齐鲁鸟已与新域鸢类有明显的分异。旧大陆的鸢类在早中新世已分别发现于新、旧大陆(Feduccia, 1999)。到了中中新世,旧大陆鸢类已出现了更多的分异和辐射。然而,因此认为新大陆的鸢类起源于旧大陆,显然还缺

少足够的证据。

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A NEW VULTURE FROM THE MIOCENE OF SHANDONG, EASTERN CHINA

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Key words Shanwang, Shandong Province, Shanwang Formation, Miocene, Accipitridae

Summary

This paper describes the first large vulture discovered from the Miocene Shanwang Formation of Shanwang, Shandong Province, China. The new genus and species *Qiluornis taishanensis* gen. et sp. nov. is proposed and referred to the family Accipitridae. The characters of *Qiluornis* include: the cervical and thoracic vertebrae lack Proc. ventralis; the last sacral vertebra has robust transverse processes; the fibula is nearly three-quarters of the length of the tibiotarsus; the unguals of the first and second pedal digits are large and hooked; and the unguis of the fourth pedal digit is small. The new material is slightly smaller than another Miocene vulture *Mioaegyptius gui* Hou 1984 from Sihong, Jiangsu Province, China, but is more advanced in having a well-developed wing of trochlea of the second digit. The discovery provides new evidence for the study of Old World vultures and the correlation of the Shanwang Formation with other Miocene deposits in China.

Falconiformes Seebohm 1890

Accipitridae Maynard 1880

***Qiluornis taishanensis* gen. et sp. nov.**

(fig. 1; pl. I)

Etymology “Qi” (Chinese Pinyin) is an ancient abbreviation for Shandong where the fossil was collected, “Lu” (Chinese Pinyin) is the present abbreviated name of Shandong; “Ornis” means bird; the species name is derived from “Taishan”, the most famous mountain in Shandong.

Holotype an incomplete individual including partial vertebral column, pelvis and

complete right hindlimb, Institute of Vertebrate Paleontology and Paleoanthropology Collection Number V 12351.

Locality and horizon Shanwang, Shandong Province; Shanwang Formation (Miocene).

Diagnosis Large-sized bird. Proc. ventralis absent on cervical and thoracic vertebrae. Dorsal vertebrae with high neural spine. Sinsacrum robust, last sacral vertebra with strong transverse process. Tarsometatarsus nearly as long as femur. Fibula nearly three quarters of the length of the tibiotarsus. Second trochlea of tarsometatarsus with well-developed wing. Ungual of fourth pedal digit small; unguis of first and second pedal digits large and hooked with well-developed extensor tubercles.

Description The preserved vertebral column is 350 mm long; the sinsacrum is 107 mm long; the preserved length of the pelvis is 140 mm; the preserved width of the pelvis is 73 mm; the femur is 123 mm long; the total length of the tibiotarsus is 183 mm, its proximal maximum width is 30 mm; the tarsometatarsus is 120 mm long; the first pedal digit including the claw is 60 mm long.

The thoracic vertebrae have long zygapophyses and high neural spines. The Proc. ventralis is absent in the cervical and thoracic vertebrae. There are two sinsacral lumbar vertebrae and two sinsacral thoracic vertebrae. The last sacral has strong transverse processes. There are 3 or 4 small caudals fused with the sacrals and form the sinsacrum. Four free caudals are preserved.

The pelvis has a large Crista iliaca obliqua, its Ala postacetabularis is wider than its Ala preacetabularis. The pubis is much slender compared with the ilium and the ischium, and is not completely fused with the latter two elements at the proximal end.

The femur is robust. Its head is large, with a deep Fovea lig. capitis. The Crista trochanteris is also well-developed. The inner cnemial crest of the tibiotarsus is well-developed and has a straight medial margin. Distally the tibiotarsus has a prominent internal ligamental prominence. The intercondylar fossa of the femur is shallow. The fibula is slender, with a thickened proximal end; it tapers and extends distally to about one fourth from the distal end of the tibiotarsus.

The tarsometatarsus has a large Cotyla lateralis and a well-developed Fossa metatarsalis. The first metatarsal is long and in touch with the posterior side of the distal second metatarsal. The second metatarsal has a well-developed wing of trochlea; there is a large Fovea lig. collateralis in the wing of trochlea. The trochleae of the three major metatarsals are nearly on the same level.

The first digit is strong, with a large and curved unguis; it is opposable to the other digits. The second digit is also strong, its first phalanx is short and only about half the length of the second phalanx, and its unguis is large and hooked. The third

digit is nearly complete; it is slender compared to the first and second digits; the first phalanx is long and the second is short; the ungual is less robust and curved than those of the first two digits. The fourth pedal digit has only the ungual preserved, it is the smallest ungual in the foot and is only about half the length of the second.

Remarks Few fossil vultures have been found from the Old World since the discovery of the Miocene *Mioaegypius gui* from Jiangsu Province, China (Hou, 1984). In the New World, *Hadrogyps aigialeus* was reported from the Miocene of North America (Emslie, 1988) and *Brasilogyps taustoi* from the early Oligocene of Brazil (Alvarenga, 1985). Both belong to the family Cathartidae. *Qiluornis* is a large-sized bird. Its pedal unguals are hooked with well-developed extensor tubercles. The tarsometatarsus is medio-laterally compressed with a thin medial margin. The trochleae of its three major metatarsals are nearly on the same level. The first metatarsal articulates with the second metatarsal at the distal end. The hallux is opposable to the rest of the pedal digits. These characters indicate that *Qiluornis* is an accipitrid.

Qiluornis is more advanced than the Miocene *Mioaegypius gui* from Jiangsu Province, China. The tarsometatarsus has large and deep proximal articulating facets, its medial side is more expanded and thinner; the second metatarsal has a well-developed wing of trochlea and deeper Fovea lig. collateralis. Therefore the *Qiluornis*-bearing Shanwang Formation is probably younger than the *Mioaegypius*-bearing Xiacaowan Formation.

Mioaegypius shares characters with both the New World and Old World vultures; however, *Qiluornis* is already a typical Old World vulture. The discovery of this new Miocene Old World vulture indicates that this group of vultures might have already been widely distributed and much diversified by that time after its separation from the New World vultures before the Miocene.

References

- Alvarenga H M F, 1985. Notas sobre os Cathartidae (Aves) e descricao de um Nov genero do cenozoico brasileiro. Anis Academia Brasileira de cieneas, **57**: 349~357
- Emslie S D, 1988. An early condor-like vulture from North America. Auk, **105**: 529~535
- Feduccia A, 1999. The Origin and Evolution of Birds. New Haven: Yale University Press. 298~311
- Hou L H(侯连海), 1984. The Aragonian vertebrate Fauna of Xiacaowan, Jiangsu 2. Aegypinae (Ealcaniformes, Aves). Vert PalAsiat (古脊椎动物学报), **22**(1): 14~20
- Lambrecht K, 1933. Handbuch der Palaeornithologie. Berlin: Gebrüder Bornträger. 393~424
- Mourer-Chauviré C, 1982. Les oiseaux fossiles des Phosphorites du Quercy (éocène supérieur à oligocène supérieur): implications Paléobiogéographiques. Géobios, Mém Spé, **6**: 413~426

图版 I 说明 (Explanations of Plate I)

泰山齐鲁鸟(新属新种)的正型标本(IVPP V 12351), 腹、侧视

Holotype of *Qiluornis taishanensis* gen. et sp. nov. (IVPP V 12351), in ventral and lateral view, ×0.5

