

A new iodactylid pterosaur from western Liaoning 辽宁西部一新的帆翼龙类化石

WANG Li, LI Li, DUAN Ye, CHENG Shao-li

王 丽, 李 莉, 段 冶, 程绍利

Western Liaoning Institute of Mesozoic Paleontology, Shenyang Normal University, Shenyang 110034, Liaoning, China
沈阳师范大学辽西中生代古生物研究所, 辽宁 沈阳 110034

Wang L, Li L, Duan Y, Cheng S L. A new iodactylid pterosaur from western Liaoning, China. *Geological Bulletin of China*, 2006, 25(6):737-740

Abstract: A new istiodactylid pterosaur, *Longchengpterus zhaoi* gen. et sp. nov., is erected, based on an incomplete skeleton with a part of skull from the Jiufotang Formation at Chaoyang, western Liaoning. The skull and tooth morphologies indicate that *Longchengpterus zhaoi* is more closely related to *Istiodactylus latidens* than to other pterosaurs. *Longchengpterus zhaoi* is the only istiodactylid pterosaur from the Jiufotang Formation of western Liaoning. The family Istiodactylid originally had only a genus and species, which was found in the Early Cretaceous strata of Britain. The discovery of the new Early Cretaceous istiodactylid from western Liaoning not only expands its geographical distribution but also proves that western Liaoning is an important region for the istiodactylid radiation and diversity during the Late Jurassic to Early Cretaceous. It has great implications for the study of the origin and evolution of pterosaurs.

Key words: *Longchengpterus*; Istiodactylidae; Jiufotang Formation; Early Cretaceous; western Liaoning

摘要: 根据发现于辽西朝阳九佛堂组一具有部分头骨的不完整骨架,命名一新的帆翼龙——赵氏龙城翼龙(新属新种)。头骨和牙齿形态显示龙城翼龙与宽齿帆翼龙的关系要比与其他翼龙的关系密切,龙城翼龙是目前辽西九佛堂组中发现的唯一的帆翼龙类。帆翼龙科原仅一属种,发现于英国早白垩世地层中,辽西早白垩世新帆翼龙的发现,不但扩大了其地理分布,也证明辽西是晚侏罗世至早白垩世翼龙辐射、分异的重要地区。这对研究翼龙的起源和演化有重要意义。

关键词: 龙城翼龙;帆翼龙科;九佛堂组;早白垩世;辽宁西部

中图分类号:P534.53;Q915.86 文献标识码:A 文章编号:1671-2552(2006)06-0737-04

The Jiufotang Formation from the western part of Liaoning Province is one of the most important fossiliferous continental deposits known so far. At present, seven genera and eight species of pterosaurs have been reported from the Jiufotang Formation. These include two species of *Sinopterus*: *S. dongi*^[1] and *S. gui*^[2]; *Jidapterus edentus*, whose family status is uncertain^[3], an Anhanguerid *Liaoningopterus gui*^[4], *Chaoyangopterus zhangi*, which was

attributed to Nyctosauridae by Wang and Zhou^[4], but its family status is questioned^[5], a ctenochasmatid *Liaoxipterus brachyognathus*^[6], an azhdarchid *Eoazhdarcho*^[7] and *Huaxipterus jii*^[8]. The new specimen is distinguished from the above-mentioned toothless forms such as *Sinopterus*, *Huaxipterus*, *Jidapterus*, *Chaoyangopterus* and *Eoazhdarcho* in having teeth in the upper and lower jaws. It is different from the toothed *Liaoningopterus* and *Liaoxipterus* in that

Received on September 10, 2005; revised on October 14, 2005; accepted on January 18, 2006; published on June 15, 2006.

Author: Wang Li(1961-), female, vice-professor, presently specializes in paleontology. E-mail: wangli7789@hotmail.com

the teeth are different in size in *Liaoningopterus* and *Liaoxipterus*, while the teeth in the new specimen are nearly the same in size. The tooth morphologies of the new specimen indicate that it represents a new istiodactylid pterosaur from the Jiufotang Formation.

Systematic Paleontology

Order Pterosauria Kaup, 1834^[9]

Superfamily Ornithocheiroidea Seeley, 1891^[10]

Family Istiodactylidae Howse, Milner and Martill, 2001^[11]

Genus *Longchengpterus* gen. nov.

Etymology: Longcheng, the ancient name of Chaoyang City; -pterus, Greek, the suffix of pterosaur. The generic name implies that the new pterosaur is found from Chaoyang City, Liaoning Province.

Diagnosis: as for the only species.

Longchengpterus zhaoi sp. nov.

Etymology: The species (Fig.1) is named in honor of President Zhao Dayu of Shenyang Normal University, who sponsored to set up the Western Liaoning Institute of Mesozoic Paleontology.

Holotype: A partial skeleton with an incomplete skull (LPM 00023). Specimen stored in Liaoning Paleontological Museum at Western Liaoning Institute of Mesozoic Paleontology, Shenyang Normal University.

Type locality and horizon: Yuanjiawa village, Dapingfang town, Chaoyang. Upper part of the Jiufotang Formation.

Diagnosis: A new Istiodactylid pterosaur, it differs from *Istiodactylus latidens* in that relatively small size, and the anterior end of the lower jaw is slightly expanded.

There are twelve teeth on each side of the lower jaw. The ratio of mandibular symphysis length to the lower jaw length is approximately 0.32.

Description: Most of the skeletons are preserved, and the measurements of the specimen are in table 1. The lower jaw is almost completely preserved, and the skull is crushed and the detailed structure of the posterior portion of the skull is not clear. The skull is relatively low and elongate. The nasoantorbital opening is triangle in lateral view and occupied much of the snout. The position of quadrate relative to the ventral margin of the skull is inclined backwards. The teeth are displaced and sparsely distributed near the anterior part of the upper jaw, and the exact tooth number of the upper jaw is unclear.

The lower jaw is exposed its dorsal side. The mandibular symphysis is very short. There are twelve teeth on the right dentary. The tooth has sharp tip and tooth root with expanded middle portion. Thus the tooth is spindle-like in lateral view. All teeth are almost the same in size. The tip of the tooth is slightly curved medially.

Four cervical vertebrae are preserved. The short one with a high neural spine behind the posterior end of the skull should be an axis. The remaining three are third, fourth and fifth cervicals. The second cervical vertebra is exposed its right lateral side, the fourth one is exposed in ventral side and the fifth is exposed its dorsal side. There is a pleurocoel in the third cervical vertebra. The ventral surface of the fourth cervical vertebra is smooth and the neural spine is very low in the fifth dorsal vertebra.

The scapula and the coracoid are fused. The coracoid is longer than the scapula. The coracoid is straight with a same diameter along its shaft. The proximal end of the scapula is expanded.

The humerus is almost well-preserved. Both ends are slightly expanded. The deltopectoral crest is short. There is no pneumatic foramen on the humerus.

The ulna and radius; The radius is slightly longer than ulna. The diameter of the radius is less than half that of the ulna.

Carpals and metacarpals; The carpals are strongly displaced. The exact shapes of them are not clear. Metacarpal IV is slightly longer than the wing phalange 1. A short slender bone is located near the proximal end of the wing phalange 1. It is flattened with sharp end. This bone should

Table 1 Measurements of *Longchengpterus zhaoi* (LPM 00023) gen.et sp. nov

Elements	length	mid-shaft width
Skull (from the posterior margin of the squamosal to the anterior tip of the upper jaw)	262	—
Lower jaw (from the end of the retroarticular process to the anterior end of the dentary)	220	—
Scapula	44.7	7.1
Coracoid	58	8.7
Humerus	88	16
Ulna	147	14
Radius	148	6.6
Pteroid	60	3.4
Metacarpal IV	100	14
Wp1/d4	196	13
Wp2/d4	154	8.7
Wp3/d4	119	6.6
Femur	91(est.)	2.3



Fig.1 Photo of *Longchengipterus zhaoui* (LPM 00023) gen. et sp. nov (scale in cm)

be one of the three metacarpals. The metacarpals I–III are not articulated with carpals.

The wing phalange 1 is the longest among the wing phalanges. It is thicker than the remaining wing phalanges although it may slightly exaggerate due to its preservation. The proximal articulation of the first wing phalanx has a fused extensor tendon process. This indicates that this animal is an adult individual. There is pneumatic foramen in the proximal end of the wing phalange 1. Both ends of the wing phalange 2 are slightly eroded. The wing phalange 3 is shorter and slenderer than wing phalanges 1 and 2. The wing phalange 4 is not preserved.

The pelvic girdle and hindlimb: The pelvic girdle is not well-preserved and only a small portion of ilium is preserved, but it is uninformative. The most of the anterior portion of the femur is preserved. It has a clear neck region. The distal end of the femur is covered by the humerus, thus its detailed structure is not clear.

Discussion: *Longchengpterus* is assigned to Istiodactylidae, based on the following characters: Diameter of the radius is less than half that of the ulna^[12], unusually extensive nasoantorbital opening occupies much of the snout, teeth labiolingually compressed with sharply pointed crowns^[11,13,14]. Istiodactylidae includes two genus *Istiodactylus*^[11] and *Longchengpterus* gen. nov. *Istiodactylus* found from England of the Early Cretaceous, it indicated that this pterosaur distributed in Europe–Asia areas. Which has important signification for studying the origin of the pterosaur. More than ten species of others pterosaur of the Late Jurassic to Early Cretaceous of western Liaoning have been reported. These materials identify that western Liaoning area is an evolution center of the pterosaur during Early Cretaceous.

The skull and the tooth morphologies of *Longchengpterus* and *Istiodactylus* are similar and the tooth numbers in the upper and lower jaws of both genera are the same. *Longchengpterus* is different from *Istiodactylus* in that the anterior end of the snout is narrow, while it is round and broad in *Istiodactylus*. *Longchengpterus* is the first Istiodactylid pterosaur found from the Jiufotang Formation.

Acknowledgements: The authors thank Professor Hou Lianhai (IVPP) and President Zhao Dayu of Shenyang Normal University for their help in this research.

References:

[1] Wang Xiaolin, Zhou Zhonghe. A new pterosaur (Pterodactyloidea, Tapejaridae) from the Early Cretaceous Jiufotang Forma-

tion of western Liaoning, China and its implications for biostratigraphy[J]. Chinese Science Bulletin, 2002, 47(20): 1521–1527(in Chinese).

[2] Li Jianjun, Lü Junchang, Zhang Baokun. A new Cretaceous sinopterid pterosaur from the Western Liaoning, China[J]. Acta Paleontologica Sinica, 2003, 42(3): 442–447.

[3] Dong Zhiming, Sun Yuewu, Wu Shaoyuan. On a new pterosaur from the Lower Cretaceous of Chaoyang Basin, western Liaoning, China[J]. Global Geology, 2003, 22(1): 1–7. (in Chinese with English abstract)

[4] Wang Xiaolin, Zhou Zhonghe. Two new pterodactyloid pterosaurs from the Early Cretaceous Jiufotang Formation of western Liaoning, China[J]. Vertebrata Palasiatica, 2003, 41(1): 34–41.

[5] Lü Junchang. A new pterosaur: *Beipiaopterus chenianus*, gen. et sp. nov. (Reptilia: Pterosauria) from western Liaoning Province of China[J]. Memoir of the Fukui Prefectural Dinosaur Museum, 2003, 2: 153–160.

[6] Dong Zhiming, Lü Junchang. A new ctenochasmatid pterosaur from the Early Cretaceous of Liaoning Province[J]. Acta Geologica Sinica, 2005, 79(2): 164–167.

[7] Lü Junchang, Ji Qiang. New azhdarchid pterosaur from the Early Cretaceous of western Liaoning[J]. Acta Geologica Sinica, 2005, 79(3): 301–307.

[8] Lü Junchang, Yuan Chongxi. New tapejarid pterosaur from western Liaoning, China[J]. Acta Geologica Sinica, 2005, 79(4): 453–458.

[9] Kaup J J. Versuch einer Eintheilung der Säugethiere in 6 Stämme und der Amphibien in 6 Ordnungen[M]. Isis, Jena: 1834. 1–315.

[10] Seeley H G. On the shoulder girdle in Cretaceous Ornithosauria[J]. Annals and Magazine of Natural History, 1891, 6(7): 438–445.

[11] Howse S C B, Milner A R, Martill D M. Pterosaurs[A]. In: Martill D M, Naish D, eds. Dinosaurs of the Isle of Wight[M]. Palaeontological Association, London, 2001, 324–355.

[12] Kellner A W A. Pterosaur phylogeny and comments on the evolutionary history of the group[A]. In: Buffetaut E, Mazin J M, eds. Evolution and Palaeobiology of Pterosaurs[C]. Geological Society Special Publication, 2003, 217: 105–137.

[13] Hooley R W. On the Skeleton of *Ornithodesmus latidens*: an Ornithosaur from the Wealden Shales of Atherfield (Isle of Wight)[J]. Quarterly Journal of the Geological Society, 1913, 69: 372–422.

[14] Unwin D M. On the phylogeny and evolutionary history of pterosaurs[A]. In: Buffetaut E, Mazin J M, eds. Evolution and Palaeobiology of Pterosaurs[C]. Geological Society Special Publication, 2003, 217: 139–190.