

On the Occurrence of a Giant Flying Reptile (Pterosauria) in the Terminal Late Cretaceous of the Lower Volga Region

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Abstract—A fragmentary proximal epiphysis of a humerus from the Campanian of the Polunino 2 locality (Volgograd Region) belongs to a giant pterosaur, Ornithocheiridae gen. et sp. indet. about 5 m in wingspread. Together with a second example from the Campanian of the eastern coast of the United States, the ornithocheirid from the Lower Volga Region is the latest representative of this group in the fossil record.

Key words: Ornithocheiridae, Pterosauria, Campanian, Late Cretaceous, Volgograd Region, Russia.

INTRODUCTION

Pterosaurian remains are rather scarce and fragmentary in the Volga Region and come mostly from Cenomanian deposits (Nessov, 1990; Khozatskii, 1995; Bakhurina and Unwin, 1995; Unwin and Bakhurina, 2000; Averianov, 2004). The post-Cenomanian beds of the Volga Region have yielded the posterior end of a middle cervical vertebra of a medium-sized azhdarchid (3–4 m in wingspread), *Bogolubovia orientalis* (Bogolubov, 1914) (Campanian, village of Malaya Serdoba, Penza Region) (Bogolubov, 1914; Nessov, 1990; Bakhurina and Unwin, 1995), and fragmentary pterosaurian fossils from the vicinity of the village of Polunino (right bank of the Volga River, Volgograd Region). Pterosaurs were discovered in two localities near Polunino: (1) in the Luchiskina gorge (Polunino 1; bones of Maastrichtian vertebrates redeposited in the Paleocene), 7 km southwest of the village; and (2) Gora Lysaya (Polunino 2; Campanian), 3 km northwest of the village. The first locality yielded “the distal region of a humerus tentatively referred to Azhdarchidae” (Nessov and Yarkov, 1989, p. 85) or “the proximal region of the humeral diaphysis of a pterosaur that resembles Azhdarchidae” (Nessov, 1990, p. 9). In Polunino 2, Nessov (1990) recorded tubular bone fragments of pterosaurs, the most complete of which was a fragment of the proximal humeral epiphysis. In the present study, this bone is described, its assignment to a large pterosaur is corroborated, and its taxonomic position is discussed.

DESCRIPTION

The pterosaurian bone fragment (Fig. 1) stored at the Volzhsk Humanitarian Institute, Volzhsk, Volgograd Region (VGI, no. 231/4; collected by A. A. Yarkov in 1990), is part of the proximal epiphysis of the left

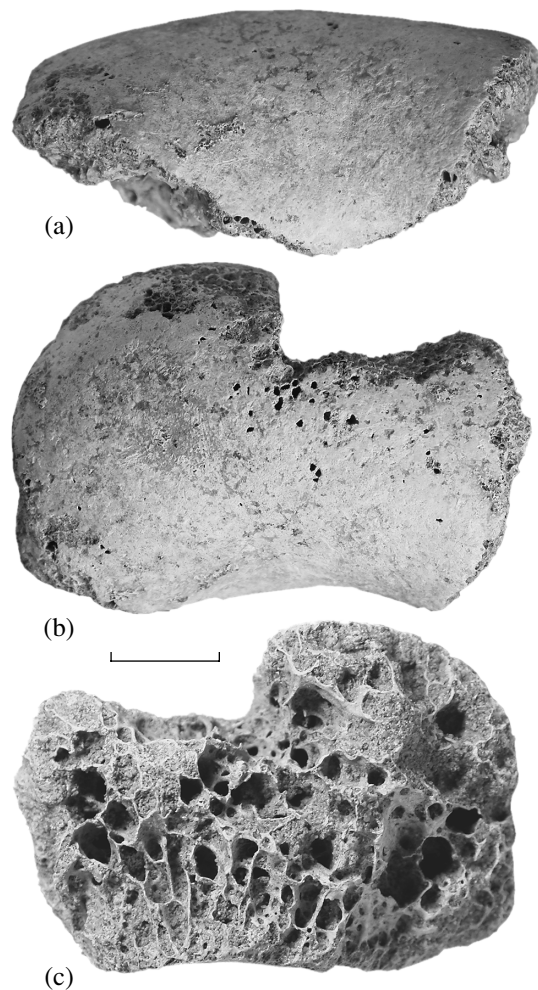


Fig. 1. Fragment of the left humeral head of Ornithocheiridae indet., specimen VGI, no. 231/4: (a) ventral, (b) proximal, and (c) inner views; Gora Lysaya (Polunino 2), Volgograd Region; Campanian, Upper Cretaceous. Scale bar, 1 cm.

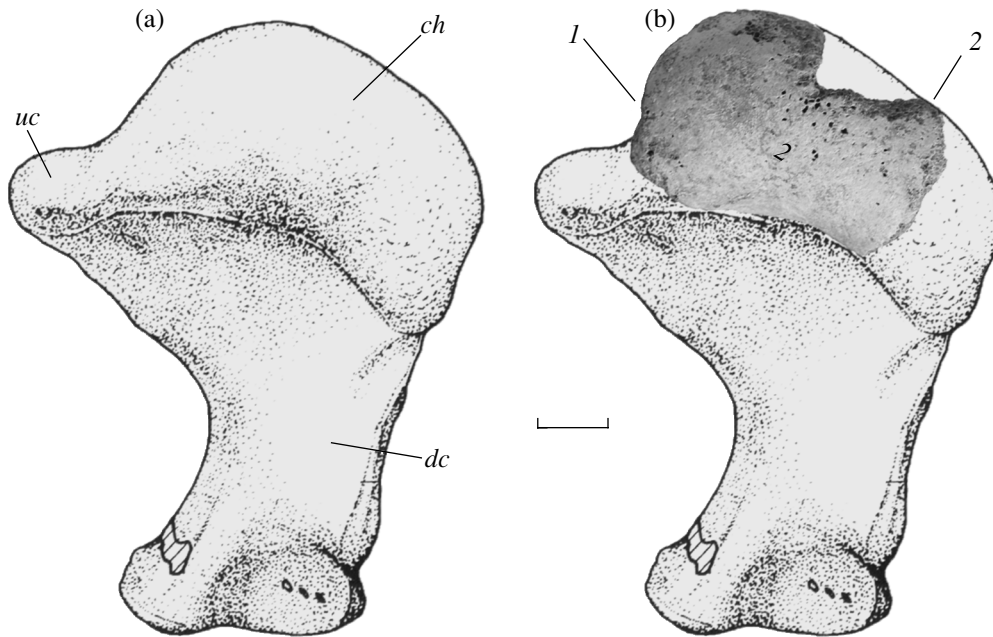


Fig. 2. Left humeri of ornithocheirids, proximal view: (a) *Anhanguera piscator*, Brazil, Lower Cretaceous (after Kellner and Tomida, 2000, text-fig. 32b); (b) reconstructed humerus of Ornithocheiridae indet., specimen VGI, no. 231/4, Gora Lysaya (Polunino 2), Volgograd Region, Campanian, Upper Cretaceous. Designations: (*ch*) humeral head; (*dc*) deltopectoral crest (= processus lateralis); (*uc*) ulnar crest (= processus medialis); (1, 2) distinctive features of specimen VGI, no. 231/4: (1) a more steep rise of the medial wall of the humeral head from the ulnar crest and (2) narrower proximal epiphysis in dorsoventral plane. Scale bar, 1 cm.

humerus (= caput humeri, humeral head). The preserved fragment is most of the humeral head 45.1×30.0 mm in dimensions (Fig. 2). The proximal surface is convex in both ventrodorsal and mediolateral planes. The bone is spongy in inner structure.

The fragment in question cannot be assigned to the family Azhdarchidae, since azhdarchids preserved a primitive structural variant of the proximal humeral epiphysis, i.e., its surface is convex in the ventrodorsal plane and concave in the mediolateral plane (Gilmore, 1928; Lawson, 1975; Murry *et al.*, 1991; Padian and Smith, 1992; collection of the Zoological Institute of the Russian Academy of Sciences). The same structure of the humeral head is characteristic of pteranodontids (Bennett, 2001). Among large flying reptiles, only ornithocheirids have a humeral head that is convex in both planes (Kellner and Tomida, 2000). This character is associated with the prevalence of rotational movements in the humeral joint of ornithocheirids, which provided these giant animals with the retarding force used for maneuvering during the gliding descent (Hazlehurst and Rayner, 1992). Specimen VGI, no. 231/4 is almost identical in size and structure to the humeral head of a young but rather large (5 m in wingspread) individual of the ornithocheirid *Anhanguera piscator* Kellner et Tomida, 2000 from the Early Cretaceous of Brazil and differs from this animal in certain features of minor importance (Fig. 2). Such a similarity enables us to identify with reasonable confidence specimen VGI,

no. 231/4 as a member of the family Ornithocheiridae that was also about 5 m in wingspread.

The ornithocheirid from Polunino 2 is one of the most recent representatives of the family. This group is known since the Early Cretaceous. It flourished in the Albian–Cenomanian, when ornithocheirids had an almost global distribution and, in particular, occurred in the Volga Region (Khozatskii, 1995; Averianov, 2004). In the post–Cenomanian beds, only one ornithocheirid specimen has previously been discovered, i.e., a cervical vertebra and hind limb fragments from the Lower Campanian of the state of Delaware on the eastern coast of the United States (Baird and Galton, 1981). The so-called “*Ornithocheirus*” *bunzeli* Seeley, 1881 from the Campanian of Austria has a concave surface of the humeral head (Wellnhofer, 1980, fig. 1); thus, it most likely belongs to the family Azhdarchidae (Nessov, 1991). A fragmentary ulna and a tooth of a toothed pterosaur were discovered in the Campanian–Maastrichtian of New Zealand; however, it is scarcely likely that they belong to an ornithocheirid (Wiffen and Molnar, 1988).

Thus, it is possible to add the pterosaur Ornithocheiridae indet. to the rich and distinctive assemblage of marine and terrestrial vertebrates from the Polunino 2 locality, which is tentatively dated as the Late Campanian and includes various chondrichthyes and osteichthyes; mosasaurs (members of the genera *Mosasauros*, *Dollosaurus*, *Prognathodon*, *Platecarpus*, and *Hainosaurus* have preliminarily been identified); the plesiosaurs Polycotylidae indet. and Elasmosauridae

indet.; pliosaurs; terrestrial and, probably, marine crocodiles; the specialized marine turtles Chelonioidea indet.; and the dinosaur ?Ankylosauria indet. (Yarkov, 1993, 2000; Nesson, 1995; Averianov and Yarkov, 2000).

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