

On the Ichthyosaur *Otschevia* from the Volgian Stage of the Volga Region

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Abstract—*Brachypterygius zhuravlevi* (Arkhangelsky) previously described from the Middle Volgian Substage (lower part of the *Dorsoplanites panderi* Zone) is assigned to the genus *Otschevia* Efimov, 1998. New fossils of this species (incomplete postcranial skeleton) from the Samara Region are described. The generic diagnosis is amended.

INTRODUCTION

Arkhangelsky (1998) revised the ichthyosaurs material collected by Zhuravlev (1943) in the Savel'evskii Mine near the village of Gornyi (Volga Region near Saratov) and described a new species of the genus *Brachypterygius* (family Ichthyosauridae), based on an incomplete forelimb from the *Dorsoplanites panderi* Zone of the Middle Volgian Substage of the Upper Jurassic. This genus of latipinnate ichthyosaurs was described by Huene (1923) on the basis of an isolated anterior flipper from the Kimmeridgian of Great Britain; it is characterized by the presence of a contact between the distal epiphysis of the humerus and the intermedium, wedging in between the radius and ulna. In the specimen described from the area of the village of Gornyi, the distal epiphysis of the humerus also bears a facet for the intermedium; however, this bone was reconstructed, since it was not preserved (Arkhangelsky, 1998).

At the same time, more complete skeletal fossils from the same stratigraphic level in Mine no. 3 of the Kashpirskoe Pyroshale Field in the Syzranskii District of the Samara Region (*Geologiya SSSR...*, 1967) prompted me to revise the taxonomic position of the ichthyosaur from the village of Gornyi. The bones were discovered in the Kashpir locality workers by the researchers of the Department of Historical Geology and Paleontology of Saratov State University (SSU) in 1983; to date, they are housed in the Saratov Regional Museum (SRM Hb, no. 30192). This specimen described by Efimov (1998a), includes cranial and postcranial bones of one individual belonging to the longipinnate genus, *Otschevia*, from the upper part of the Lower Substage and the bottom of the Middle Substage of the Volgian Stage of the Ulyanovsk Region (Volga Region) and is characterized by the presence of a contact between the intermedium and the humerus. At the same time, original structural features of the humeri indicate that ichthyosaurs from the Gornyi and Kashpir locali-

ties should be assigned to the same species. These features involve an unusual general shape of the humerus characterized by an extremely wide proximal epiphysis well distinguished from those of other Volgian ichthyosaurs. Thus, these bones are similar in size and proportions, namely, the ratios between the width of the proximal epiphysis and the length of humerus in the individuals from Gornyi and Kashpir are 0.82 and 0.79, respectively; the ratios between the greatest width of the diaphysis and the humerus length are 0.48 and 0.50, respectively; the diaphysis is not visible in the figure in the original study (Arkhangelsky, 1998, fig. 4) because of epiphysis twisting. The second peculiar feature of the two individuals considered is a short but high crest for the attachment of the medial head of the musculus triceps brachii. The specimen from the Kashpir locality includes the intermedium articulated with the humerus; however, the latter has only one ventral facet that makes contact with the basal element of the third main digit; this feature is characteristic of *Otschevia*. The same feature was undoubtedly characteristic of the intermedium of the ichthyosaur from the Gornyi locality (not preserved in the specimen).

The forms compared differ from each other in a number of characteristics; I believe that these differences are attributable to individual variation. In the humerus from the Gornyi locality, the epiphyses are twisted to a greater extent, although this distinction is intensified by postmortem compression of the bone in the ichthyosaur from the Kashpir locality. At the same time, the extent of the twisting of the epiphyses shows individual variation in *Platypterygius (Longirostria) longmanni* from Australia (Wade, 1984, fig. 2). A wider contact between the intermedium and the humerus observed in the individual from the Kashpir locality should be considered as a normal variation in the interrelations between the bones of the epipodium and autopodium, observed in a series of flippers of animals of the same species, for example, in *Ichthyosaurus*

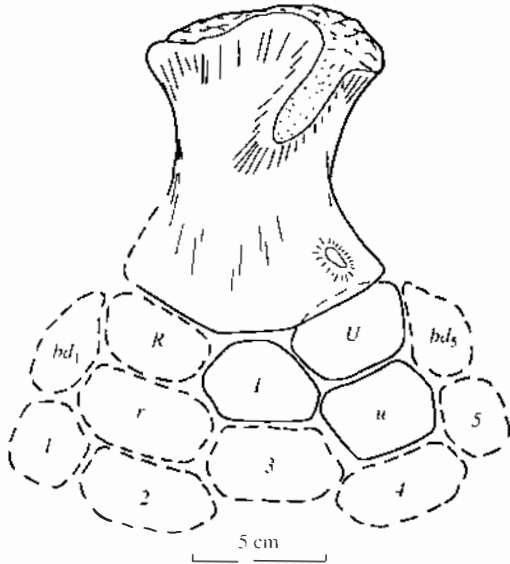


Fig. 1. *Otschevia zhuravlevi* (Arkhangelsky). SRM Hb. no. 30192. left forelimb, dorsal view. Designations: (*bd*₁) basal element of the first digit, basalia distalia; (*bd*₅) basal element of the fifth digit, (*I*) intermedium; (*R*) radius; (*r*) radiale; (*U*) ulna; (*u*) ulnare; and (1–5) main digits.

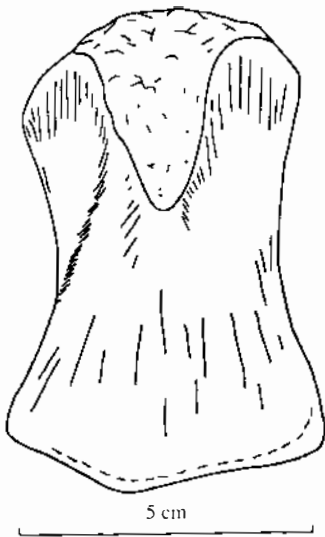


Fig. 2. *Otschevia zhuravlevi* (Arkhangelsky): SRM Hb. no. 30192. right femur, dorsal view.

(McGowan, 1974, fig. 5). In the humerus from the Kashpir locality, the sites for the attachment of the ligaments of the musculus triceps are located closer to each other within the facet for the ulna; however, this character is of low taxonomic value. All the above indicates that ichthyosaurs from the Gornyi and Kashpir localities should be assigned to the same species, *Otschevia zhuravlevi* inhabiting the Saratov Region and the adjacent more northern area of the Samara Region at the beginning of the Middle Volgian.

The genus *Otschevia* was originally referred to as the family Stenopterygiidae (Efimov, 1998). However, the presence of five rays in the forelimbs and dorsal displacement of both the anterior and posterior rays makes this genus similar to the family Undorosauridae (established by Efimov in 1999) rather than to the Stenopterygiidae. Even in the Early Jurassic, members of the latter, in particular, the genus *Stenopterygius*, showed a trend toward the dorsal displacement and subsequent reduction of the posterior digits only (see Mazin, 1982). In this paper, the diagnosis of the genus *Otschevia* is amended.

SYSTEMATIC PALEONTOLOGY

Family Undorosauridae Efimov, 1999

Genus *Otschevia* Efimov, 1998

Otschevia: Efimov, 1998, p. 82.

Type species. *Otschevia pseudoscythica* Efimov, 1998: Upper Jurassic, Volgian Stage, Lower (*Ilowaiskya pseudoscythica* Zone) and Middle (lower part of the *Dorsoplanites panderi* Zone) substages; Volga Region near Ulyanovsk.

Diagnosis. Ichthyosaurs 3.5–5.5 m long. Teeth large and conical. Coracoids rounded with anterior incisure. Interclavicle with spade-shaped posterior ramus. Distal epiphysis of humerus with three facets for radius, ulna, and intermedium wedging in between them. Intermedium with one ventral facet for articulation with basal element of third digit. Forelimb with five main rays, of which first in preaxial position and fifth in postaxial position. Femur with two distal facets.

Composition. In addition to the type species, *O. zhuravlevi* (Arkhangelsky, 1998) and *O. ? volgensis* (Kasansky, 1903).

Otschevia zhuravlevi (Arkhangelsky, 1998)

Brachypterygius zhuravlevi: Arkhangelsky, 1998, p. 91, fig. 4.

Holotype. PIN, nos. 426/60–76, left humerus articulated with the elements of epipodium and autopodium; Saratov Region, Krasnopartizanskii District, village of Gornyi, Savel'evskii Shale Mine; Upper Jurassic, Volgian Stage, Middle Substage, *Dorsoplanites panderi* Zone.

Description (Figs. 1 and 2). The anterior thoracic vertebrae are extended ventrally and pointed in

cross section; they are 58–71 mm high, 27–31 mm long, and characterized by a fusion between the diapophyses and the sites for the attachment of the neural arches. The parapophyses are weakly detached from the anterior edge of the vertebrae. Both facets are relatively large and rounded; in the posterior vertebrae of this region, the facets are suboval. The thoracic vertebrae are 70–82 mm high and 31–33 mm long; compared to the anterior thoracic vertebrae, they are weakly expanded ventrally in cross section. The diapophyses are oval; however, posteriorly they become irregular oval and are displaced to the middle of the vertebrae. The parapophyses are round; in the posterior vertebrae of the thoracic region, each parapophysis resembles a crescent inclined posteriorly and located close to the anterior edge of vertebra. Only one posterior thoracic vertebra is preserved, it is 80 mm high and 33 mm long. This vertebra and anterior caudal vertebrae are pear-shaped in cross section. In the posterior thoracic vertebra, both facets are located below the middle of the height, whereas in the caudal vertebrae, they are fused with each other and form a single suboval articular surface inclined posteroinferiorly. The posterior caudal vertebrae are round in cross section. The caudal vertebrae are 80–60 mm high and 31–18 mm long.

The left humerus (specimen SRM Hb, no. 30192) is relatively well preserved and only slightly damaged in the anterior part; it is 124 mm long and similar to that in the holotype (Arkhangelsky, 1998). The proximal epiphysis is 98 mm wide. The reconstructed distal epiphysis is 93 mm wide, and the diaphysis is 63 mm wide. The epiphyses are twisted to a lesser degree than in the holotype, the angle is 12°; the dorsal crest is relatively more massive. The process for the attachment of the medial head of the musculus triceps brachii is well developed. The facets for the radius, intermedium, and the ulna are approximately 37, 27, and 40 mm long, respectively. Thus, the facet for the intermedium on the humerus from the Kashpir locality is relatively larger than that of the ichthyosaur from the Gornyi locality.

The ulna, intermedium, ulnare, and six bones of the autopodium are polygonal in outline. Dorsally, ventrally, posteriorly, and medially the ulna adjoins the humerus, ulnare, the basal element of posterior additional digit, and the intermedium, respectively. Thus, the basal bone of the posterior additional digit was located close to the distal epiphysis of the humerus and probably had a weak contact with the latter. Ventrally, anteroventrally, and posteroventrally the intermedium adjoined the basal element of the second main digit, radiale, and ulnare, respectively. The surface on the intermedium for articulation with the humerus is convex, the facet for the ulna is larger than the facet for the radius. The ulnare is a hexahedron. It bears two posterior articular surfaces for the elements of the fifth digit, two medial surfaces for the intermedium and the basal element of the third digit, and the ventral surface for the fourth (main) digit. Thus, the forelimb included five

rays, the first and fifth of which were in the ~~proximal and~~ postaxial positions, respectively.

The right femur is 82 mm long. The proximal and distal epiphysis are 48 and 56 mm wide, the diaphysis is 37 mm wide. The distal epiphysis bears two facets. The facet for the tibia is 21 mm long, and the facet for the fibula is 32 mm long. The femur is characterized by the presence of an extremely stout dorsal crest extending medially almost to the middle of the length of the bone and by only slightly twisting epiphyses.

Measurements. The animal was approximately 3.8 m long.

Comparison. *Otschevia zhuravlevi* is distinguished from the type species by more massive and relatively short humeri, stronger twisted humeral epiphyses, and by the presence of a crest for the attachment of the medial head of the musculus triceps brachii. Efimov (1997) assigned *Ichthyosaurus volgensis* Kazansky, 1903 from the same stratigraphic level of the Samara Region to the genus *Otschevia*. This form is represented by an incomplete postcranial skeleton, in which the forelimbs are not preserved. The assignment of this material to the genus *Otschevia* is substantiated by the peculiar rounded coracoids. However, this character is insufficient as an argument for identification of the species; therefore, it can be only tentatively referred to as *Otschevia volgensis* (Kasansky).

Occurrence. Middle Substage (lower part of the *Dorsoplanites panderi* Zone) of the Volgian Stage; Volga Region near Saratov and Samara.

Material. In addition to the holotype, (SRM Hb, no. 30192) occipital condyles, fragmentary lower jaw, incomplete vertebral column, fragmentary ribs, both humeri, elements of epipodium and autopodium, and right femur of one individual; Samara Region, Syzranskii District, Kashpirskoe Pyroshale Field (Mine no. 3); Upper Jurassic, Volgian Stage, Middle Substage, lower part of the *Dorsoplanites panderi* Zone.

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