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First record of an Early Cretaceous triconodont mammal in Siberia

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Abstract

A lower jaw of a triconodont mammal from the Early Cretaceous Shestakovo locality, belonging to the first Mesozoic mammal ever found in Siberia, is described. It is identified as *Gobiconodon borissiaki* TROFIMOV, 1978, originally described from Khoobur (Mongolia).

The presence of a very similar vertebrate fauna in Western Siberia and in Mongolia suggests that these deposits were approximately coeval and were probably united in one zoogeographical province in Early Cretaceous times.

Key-words: triconodonts - mammals - *Gobiconodon* - Early Cretaceous - Siberia.

Résumé

La mâchoire inférieure d'un mammifère triconodonte du Crétacé inférieur, appartenant au premier mammifère mésozoïque découvert en Sibérie, est décrite. Elle est identifiée comme *Gobiconodon borissiaki* TROFIMOV, 1978, connu de Khobour (Mongolie).

La présence d'une faune de vertébrés très similaire en Sibérie occidentale et en Mongolie permet de supposer que ces dépôts sont plus au moins synchrones et faisaient partie de la même province paléogéographique au Crétacé inférieur.

Mots-clefs: triconodontes - mammifères - *Gobiconodon* - Crétacé inférieur - Sibérie.

Introduction

The dinosaur site at Shestakovo (Chebula District, Kemerovo Province, Western Siberia, Russia) was discovered in 1953 by A. A. Mossakovsky and I. V. Lebedev (ROZHDESTVENSKY, 1960). It is situated on the right bluff of the Kiya River, a right tributary on the Chulym River, 1.5 km downstream from Shestakovo, 55° 54' 12'' N latitude, and 87° 57' 28'' E longitude (Fig. 1).

The Lower Cretaceous fossil bearing deposits of the Ilek Formation were dated as of Neocomian (OSYKO, 1958) or as of Aptian-Albian age (ROZHDESTVENSKY, 1960)

In this locality two partial ceratopsian skeletons of the genus *Psittacosaurus* were found *in situ* (ROZHDESTVENSKY, 1960). In 1994 palaeontological investigations were resumed at Shestakovo, and Maschenko found sauropod bones; in 1995 a lower jaw of a mammal was discovered. Two new sites with psittacosaur bones were discovered near Shestakovo 1. These new sites are known as Shestakovo 2 and 3 (LESCHINSKY *et al.*, 1997).

All Lower Cretaceous deposits in this region are of fluvio-lacustrine origin.

The maximal thickness of the Shestakovo deposits reaches

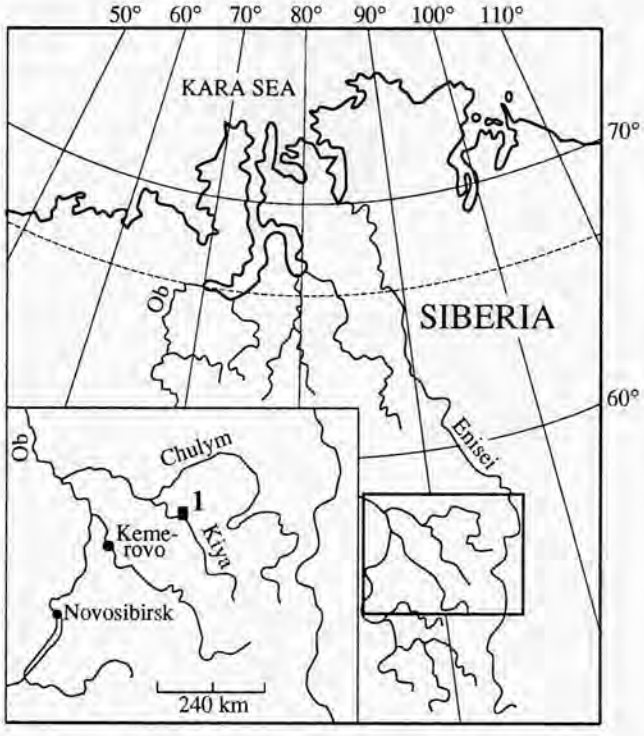


Fig. 1. — Map of west Siberia.
1 indicates the Shestakovo locality. Scale bar is 240 km.

25-28 m with a lateral extension of about 1 km. The sediments exposed in the bluff are composed of gravel, sandstones, loose and hardened sands, and siltstones (upwards).

The total sequence is divided into two members (Fig. 2).

The dinosaur-bearing beds are in the basal red-coloured siltstones of the upper member. The mammalian lower jaw was found at the top of the lower member (greenish-grey sandstones and compact sands).

At present, the tentative list of vertebrates from Shestakovo 1, 2 and 3 includes amiiform fishes, turtles, crocodiles, lizards, a small theropod, a large sauropod, two ceratopsian forms (*Psittacosaurus*), a tritylodontid synapsid and a triconodont mammal *Gobiconodon borissiaki*. The fish and reptilian remains are being identified by Maschenko. A post-Jurassic tritylodont is under study. The triconodont is discussed herein. It is the first Mesozoic mammal ever found in Siberia (Russia).

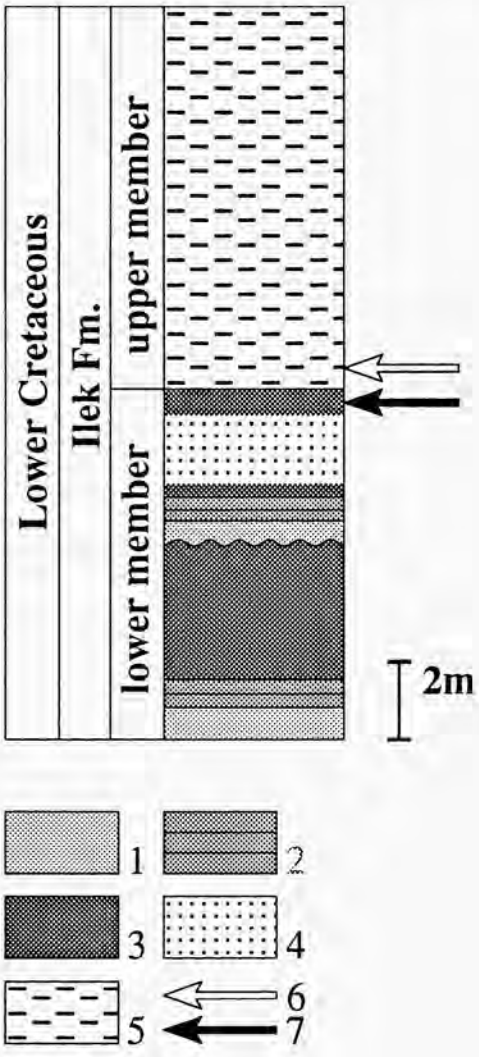


Fig. 2. — Stratigraphic section at Shestakovo 1.
1. gravel; 2. cross-bedding grey sandstones with pebbles; 3. greenish-grey compact sands; 4. loose sands; 5. interbedded green and reddish-brown siltstones; 6. dinosaur-bearing bed; 7. mammalian occurrence.

The teeth nomenclature and dental terminology of the Gobiconodontidae follows JENKINS & SCHAFF, 1988 and SIGOGNEAU-RUSSELL, 1995.

Taxonomy

Class Mammalia LINNAEUS, 1758
Subclass Prototheria GILL, 1872
Infraclass Eotheria KERMACK & MUSSETT, 1958
Order Triconodonta OSBORN, 1888
Gobiconodontidae CHOW & RICH, 1984

Genus *Gobiconodon* TROFIMOV, 1978
Gobiconodon borissiaki TROFIMOV, 1978
Fig. 3, 4.

HOLOTYPE: Partial right mandible with I_1, alveoli for C, P_{1-4}, and nearly complete M_{1-5}. PIN N 3101/09; Lower Cretaceous, Khoobur, Guchin-Us Somon, Arvaykher Aymak, Mongolia.

DESCRIPTION

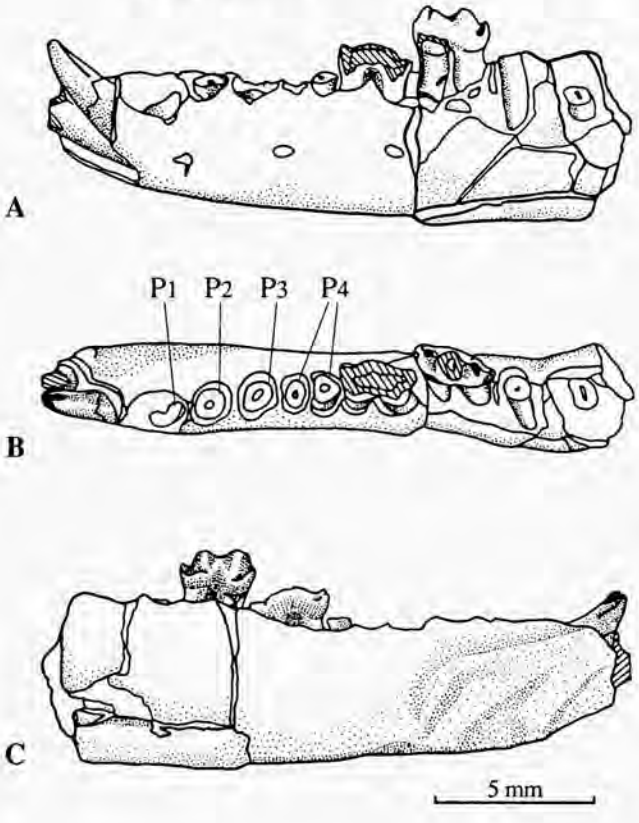
Lower jaw: body size small for the genus (like small musk-rat). Mandible deep and robust, characterised by extensive symphyseal region, which extends posteriorly to the level of the alveolus of P_2 (Fig. 3). Jaw body thickened in symphyseal region. Three mental foramina, situated in the median part of the mandible: (1) below the posterior edge of the alveolus for P_1; (2) under the anterior alveolus for P_4; (3) under the posterior root of the M_1.

A partial incisor, a complete canine, alveoli for premolars, a fragmentary M_1, a nearly complete M_2, and roots of M_3 are preserved.

The incisor was somewhat larger than the canine, judging from its root thickness. The well- preserved canine (Figs. 4 A - B) possesses a spatulate-like crown with rounded and convex mesial side. The labial and especially lingual sides of the crown are flat. The distal surface is convex in the central part, and concave nearer to the labial and lingual edges. The lateral crest is low and weakly developed, the medial crest very distinct, large, and concave anteriorly (Fig. 4A). The wear facet of the canine is mainly apical and in this stage it is rounded-triangular, with descending posterior part (Fig. 4B).

Judging from alveoli and root fragments, P_{1-3} were single-rooted teeth, and P_4 was double-rooted (Fig. 3B). The alveolar size decreases from P_1 to the posterior root of P_4. The alveolus of P_1 is separated from the canine alveolus, and other alveoli are disposed very closely to each other. The alveolus and root of P_1 are very large; the alveolus is stretched antero-labially and the

Fig. 3. — *Gobiconodon borissiaki* TROFIMOV, 1978 from Shestakovo locality; left mandible, PIN N 4463/1. A - labial view; B - occlusal view; C - lingual view. Scale bar is 5 mm.



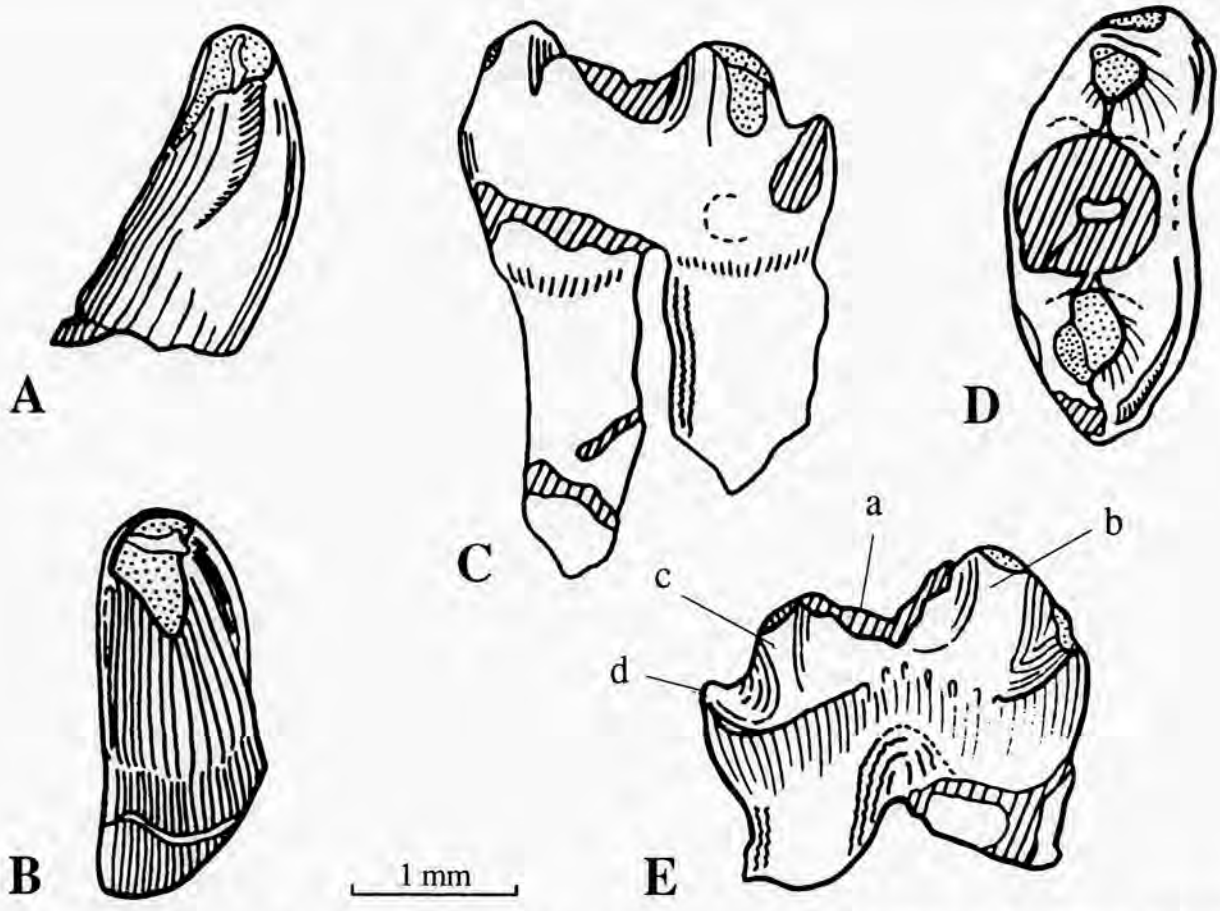


Fig. 4. — *Gobiconodon borissiaki* TROFIMOV, 1978 from Shestakovo locality; teeth, PIN N 4463/1. A, B - canine; C, D, E - M_2. A, E - lingual view; B, D - occlusal view; C - labial view. Scale bar is 1 mm.

long axis of the root's cross section has the same direction. Thus, P_1 is displaced labially relatively to neighbouring teeth.

M_1 was larger than P_4. A preserved fragment of the lingual side of this tooth demonstrates the presence of a distinct antero-lingual cuspule. A lingual cingulum is not developed in the medial part of the M_1.

M_2 is slightly longer than M_1. The crown is convex labially and slightly concave lingually. The anterior side of the crown has a small notch. Primary cusps are disposed in linear order. The central cusp *(a)* is largely destroyed. At the base it is apparently thrice as massive as the anterior cusp *(b)* and posterior cusp *(c)*. Cusp *(b)* is somewhat higher and slightly less massive than cusp *(c)*. Cusp (*a)* is the smallest among the main cusps (Fig. 4C). The posterior part of cusp *(b)* is narrowing and attached to the base of cusp (*a)* by a short crest. The labial surface of the M_2 crown is smooth. The cingulum is present on the anterior, lingual and posterior sides of the crown. It extends from the most anterior point of the base of cusp *(b)*, forming an additional, anterior cingular cuspule *(e)*, and distinctly continues on the antero-lingual side of the crown.

More distally, the cingulum is disconnected, and it has the form of a longitudinal series of scarcely visible enamel tubercles in the medial part of the tooth. Then comes a thin basal cingulum below cusps *(c)* and *(d)* (Fig. 4E).

There are wear facets on anterior and posterior primary cusps, which descend from cusp apices respectively antero-labially and postero-labially. The other facet is situated on the labial side of the anterior cingular cuspule *(e)* (Fig. 4D).

DIMENSIONS (**mm**)

Canine (length x width) are: C – 1.8 x 0.9;

Alveoli (length x width): P_1 – 2.2 x 1.7; P_2 – 1.3 x 1.5; P_3 – 1.2 x 1.5.

P_4 – 1.9 x 1.2 anterior and 1.1 posterior. M_1 (length) - approximately 2.4.

M_2 (length x width) – 2.7 x 1.15. Mandible deep under the anterior part of the M_1 – 4.0.

DISCUSSION AND COMPARISONS

We assign the studied triconodont specimen to the family Gobiconodontidae because its two most mesial lower antemolariform teeth are approximately equally large and caniniform. All other known triconodontans are characterised by a small lower incisor and a large canine (JENKINS & SCHAFF, 1988). The known families of the order Triconodonta differ from each other by the relative size of the main cusps *(a, b, c, d)* of the molariform teeth (JENKINS & SCHAFF, 1988; SIGOGNEAU-RUSSELL, 1995).

The preserved M_2 of PIN N 4463/1 has a distinctly gobiconodontid pattern: a > c ~ b > d.

The family Gobiconodontidae includes two genera founded by TROFIMOV (1978): *Gobiconodon* and *Guchinodon*. We place the triconodont from Shestakovo in *Gobiconodon* because the lower molariform teeth have the same structure for their main cusps and have an incomplete cingulum. Comparison with specimens of the type series demonstrates, that dimensions of the specimen from Shestakovo fall within the known variation interval of *G. borissiaki*. *G. borissiaki* TROFIMOV, 1978 is

smaller (1.75 – 2 x) than *G. ostromi* JENKINS & SCHAFF, 1988 (Early Cretaceous, North America). It differs from *G. ostromi* in a weakly marked size disproportion for the two most anterior antemolariform teeth (the incisor is slightly larger than the canine), in a weaker developed lingual cingulum on M_{2-5}, in a lost lingual cingulum on M_1, and in a more anterior position of the most distal mental foramen.

According to TROFIMOV (1978), *G. borissiaki* is characterised by considerable variation of the teeth and mandible dimensions. The mandible PIN N 4463/1 from Shestakovo possesses two small alveoli for P_4 between a large alveolus for P_3 and a damaged M_1. All specimens of the type series of *G. borissiaki* have a very small single alveolus for this tooth.

The alveolus for P_4 is absent in *G. ostromi* specimens with erupting molariform teeth; there is a small single-rooted P_4 or a small incipiently double-rooted P_4 of the specimen with erupted molariform teeth (JENKINS & SCHAFF, 1988, p. 4, fig. 3). Probably, the number of roots of the gobiconodontids P_4 differs from that of the dp_4. However, we consider this character as an example of individual variation only, because these data are too scant.

G. borissiaki was first described from Khoobur locality (Mongolia, North Gobi, Guchin-Us Somon). The age of this locality is Early Cretaceous, tentatively Aptian - Albian (WIBLE *et al.*, 1995). The rich vertebrate fauna from Khoobur locality contains turtles, lizards, dinosaurs (small carnosaurs, sauropods and psittacosaurs), and mammals, including triconodonts, multituberculates, symmetrodont, eupanthotheres, aegialodont and two eutherian species (BELYAEVA *et al.*, 1974; DASHZEVEG, 1975, 1979, 1994; DASHZEVEG & KIELAN-JAWOROVSKA, 1984; JIELAN-JAWOROWSKA *et al.*, 1987; KIELAN-JAWOROWSKA & DASHZEVEG, 1989; TROFIMOV, 1978, 1980).

A close affinity between the dinosaur faunas from the Khoobur and Shestakovo localities, as well as the presence of the same triconodont species *G. borissiaki* suggest a similar age and, possibly, the zoogeographical unity of the territory from the south Western Siberia to north Mongolia in Early Cretaceous.

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