HENRYK KUBIAK

MASTODONT REMAINS FROM THE MIOCENE OF BEGGER NOOR, WESTERN MONGOLIA

(SZCZĄTKI MASTODONTÓW Z MIOCENU BEGER NUR, ZACHODNIA MONGOLIA)

(Plates XVII—XVIII)

Abstract. — A description is given of grinding teeth belonging to Miocene mastodonts from the Begger Noor Basin, Western Mongolia. The remains were collected during the Third Polish-Mongolian Palaeontological Expedition in 1965. In the material described two species were distinguished: *Serridentinus gobiensis* OSBORN & GRANGER, 1932 and *Tetralophodon* aff. *sinensis* KOKEN, 1885.

INTRODUCTION

During field work carried out by the Third Polish-Mongolian Palaeontological Expedition in 1965 in Western Mongolia, poorly preserved remains of various mammals like artiodactyls, rhinoceroses and mastodonts, were found in outcrops of the Miocene beds of the Begger Noor Basin (GRADZIŃSKI *et al.*, 1968, Text-figs. 31—32; KIELAN-JAWOROWSKA & DOVCHIN, 1968).

Of the three fragments of mastodont teeth, collected at Begger Noor and described in the present paper, two were regarded as belonging to the genus *Serridentinus* and one to *Tetralophodon*. A fragment of the left ramus of the lower jaw supporting P_4 and M_1, and one single isolated right superior molar tooth M^2, were recognized as *Serridentinus gobiensis*. The type-specimen of this mastodont was described by OSBORN and GRANGER (1932) from the Tung Gur formation (Miocene) of the Tung Gur tableland (Inner Mongolia). Furthermore, fragments of the dentition and portions of the skeleton of this mastodont were described from the Begger Noor beds by ALEKSEYEVA (1959). The occurrence of this species in Begger Noor was also mentioned by DEVYATKIN and LISKUN (1966).

The fragments of the dentition of *Serridentinus gobiensis* described in this paper constitute the third recorded occurrence of remains of this mastodont. In previous work, those skeleton elements of this species were virtually undescribed. Formerly only the following were known: a fragment of the right ramus of a mandible containing M_2 and M_3 and both incisors (OSBORN & GRANGER, 1932), a fragment of the skull with M^2 and M^3, some isolated molar teeth respectively their fragments (roots), a part of the lower jaw and three pieces of bones of the extremities (ALEKSEYEVA, 1959).

The third fragment of mastodont dentition described in the present paper, is a single, considerably damaged, second left inferior molar M_2 regarded as belonging to *Tetralophodon* aff. *sinensis*. This species was known previously only from the Upper Miocene of Yun-nan

province, China (KOKEN, 1885). Thus the tooth from Begger Noor is the second described specimen belonging to this species.

The author employs the terminology used in descriptions of mastodont molars by some authors (e.g. SCHLESINGER, 1917, 1922; ALEKSEYEVA, 1959; HSIEH HSIANG-HSU, 1962; PEI WEN--CHUNG, 1965) in which the inner side of superior molars is termed pretrite, and the outer, post-trite; in inferior grinding teeth, the inner side is post-trite, the outer, pretrite.

The material described in the present paper is housed in the collection of the Palaeozoological Institute, Polish Academy of Sciences, Warsaw, for which the abbreviation *Z. Pal.* is used.

The author wishes to express his gratitude to Prof. Z. KIELAN-JAWOROWSKA, Director of the Palaeozoological Institute, Polish Academy of Sciences, Warsaw, who kindly made the material described available for investigation.

Superfamily **MASTODONTOIDEA** OSBORN, 1921

Family SERRIDENTIDAE OSBORN, 1935, 1936

Subfamily SERRIDENTINAE OSBORN, 1921

Genus **SERRIDENTINUS** OSBORN, 1923

Serridentinus gobiensis OSBORN & GRANGER, 1932

(Pl. XVII, fig. 2; Pl. XVIII)

1932. *Serridentinus gobiensis* n. sp.; H. F. OSBORN & W. GRANGER, Platybelodon grangeri, three growth stages..., pp. 11-13, Fig. 8.

1959. *Serridentinus gobiensis* OSBORN & GRANGER; L. I. ALEKSEYEVA, Mastodont Serridentinus gobiensis..., pp. 117-124, Figs. 1, 2.

Material. — 1) Fragment of a left ramus of the mandible with grinding teeth P_4 and M_1 (Z. Pal. No. MgM-IV/1); 2) isolated second right superior molar M^2 (Z. Pal. No. MgM-IV/3).

Description. — The brachyodont molar tooth, supported by the fragment of the lower jaw (MgM-IV/1), is considerably detached. The grinding surface of P_4 is much worn. Almost half of the post-trite of the tooth is missing. The tooth consists of two lophs. The antero-posterior median valley is distinct. M_1 is less worn than P_4, but also considerably injured. The post-trite of the first crest is almost completely detached; the central part of the second crest is injured, and the almost total pretrite of the third crest and the posterior end of the tooth are lacking too. In spite of the considerable damage of the tooth, three crests and a rudiment of a hind-talon can be distinguished.

The tooth is distinctly divided by the straight antero-posterior median valley into a slightly broader pretrite and narrower post-trite. The first and second crests are slightly worn.The first one exhibits a simple coronal pattern on its pretrite. On the post-trite of the best preserved second loph, two transversely running oval dentine islets are exposed. Between the first and second ridge-crests, a half-worn trefoil conule occurs. In the transverse valleys between the first and second, and the second and third crests on the pretrite, rudiments of a cingulum probably running to the talon are preserved. Besides the above mentioned trefoils, secondary cones or tubercles do not occur. The enamel of the tooth is smooth.

The shape of the transverse section of the ramus of the mandible, which contains the tooth described above, is clearly visible both in the anterior and posterior parts. The maximum width (perpendicular to the vertical axis of the teeth) amounts to 95 mm in the posterior part, and 60 mm anteriorly. The posterior end of the mandible distinctly shows the roots of M_1 (Pl. XVII, fig. 2) (length of the roots 92 mm, length of the roots+height of the crown 132 mm). At the anterior end of the mandible the oval alveolus of the incisor I_2 is preserved, partially filled with calcite crystals. The measurements of the transverse section of the alveolus are following: the maximum diameter (parallel to the vertical axis of the grinding teeth) — 45 mm, the smaller one (perpendicular to the vertical axis of the grinding teeth) — 30 mm.

The isolated, single second right superior molar M^2 (MgM-IV/3) is the best preserved specimen of the three fragments of mastodont dentition, described in the present paper. Only the posterior half of the pretrite of the second crest and a small fragment of the inner side of the first loph are absent.

This three-crested molar tooth of distinct brachyodonty shows the stage of just having come into wear. The tooth is divided along the main axis more or less evenly into pretrite and post-trite. The ridge-crests show the characteristic structure of the genus *Serridentinus*. Both the pretrite and the post-trite are composed of columns, divided into secondary cones (Pl. XVII, fig. 1 — crest II). One anterior and one posterior trefoil is situated in the transverse valleys of the pretrite. The enamel is rather smooth near the summits of the crests, but at the bottoms of the transverse valleys exhibits a clotty structure. Larger tubercles are to be seen at the rudiment of cingulum of the anterior and posterior parts of the tooth. At the anterior part of the crown, a pressure mark is visible.

Well preserved roots exist in the anterior portion of this molar.

The height of the tooth (crown+root) is 130 mm, the length of the roots is 80 mm. The roots are strongly divergent up to an angle of about 40° in the anterior portion of the tooth. The extreme width of the roots is 95 mm, while the breadth of the crown base in this part of the molar measured only 78 mm.

Teeth measurements (in mm) and indices:

Measurements	Z. Pal. No. MgM-IV/1		Z. Pal. No. MgM-IV/3
	P_4	M_1	M^2
Length	62+	111+	138
Maximum breadth	44+ (II crest)	64+ (III crest)	92 (III crest)
Enamel thickness	2—3	4—5	5—6
Number of ridge-crests	2	3	3
Depth of transverse valleys (between unworn crests)	—	32 (II/III)	30
Interval between summits of ridge-crests I/II	±23	38	42
II/III	—	42	45
Breadth-length index	71	58	67
Length of P_4+M_1	173		—

Stratigraphical and geographical range. — The type specimen of this species was discovered in 1930, on the western edge of the Tung Gur tableland (Inner Mongolia), in the Tung Gur formation, *Platybelodon grangeri* OSBORN, 1929 zone, which is regarded as being Upper Miocene in age.

Serridentinus gobiensis was known also from the Upper Miocene beds of Begger Noor, Western Mongolia.

Discussion. — The lower right grinding teeth P_4 and M_1 are elements of the dentition of *Serridentinus gobiensis* not hitherto known. Though one right upper M^2 was at disposal of ALEKSEYEVA (1959), the authoress was not able to give much information about this tooth on account of the well worn grinding surface. The molar M^2 described in the present paper is well preserved and only slightly worn, thus permitting an exact description to be made.

The mastodonts of the genus *Serridentinus* known at present embrace more than 20 species. They occurred from the Middle Miocene to the Upper Pliocene in Asia, Europe and America. About one third of the species mentioned comes from America.

From Mongolia besides *Serridentinus gobiensis*, three other species of this genus are known. These are: *Serridentinus mongolensis* OSBORN, 1924, *Ocalientinus (Serridentinus) florescens* OSBORN, 1929, and *Serridentinus tologojensis* BELAYEVA, 1952. Moreover, from the Tairum Noor Basin of Mongolia, one representative of Serridentinae — *Platybelodon grangeri* OSBORN, 1929, of Upper Miocene age is known.

The first of the species mentioned, *S. mongolensis*, is considered to be the oldest species of this genus. It occurs in the Lower and Middle Miocene. It is known from the Loh formation, Mongolia, in which the smaller form of hornless rhinoceros *Baluchitherium* COOPER, 1913 (OSBORN, 1924, 1936) also occurs.

S. tologojensis, from the Lower (Middle ?) Miocene of Ulan Tologoj, is known only from its deciduous dentition which is difficult to compare with the permanent dentition of other species.

Ocalientinus (Serridentinus) florescens from the Pliocene of Kholobolchi Noor region, Khunuk formation, appears to represent a progressive stage in the evolution of the serrated crests of the ectoconolets, comparable with those of *O. (Serridentinus) floridanus* LEIDY, 1886 (OSBORN, 1936).

European representatives of the genus *Serridentinus* are: *S. lusitanicus* BERGOUNIOUX, ZBYSZEWSKI & CROUZEL, 1951 from the Lower to the Middle Miocene of Portugal, and *S. subtapiroides* SCHLESINGER, 1917 from the Middle Miocene of Eibiswald (Styria), Austria.

Serridentinus gobiensis may be compared with the other serridentines from Central Asia and Europe.

Serridentinus gobiensis is readily distinguishable from *Serridentinus mongolensis* and *Ocalientinus (Serridentinus) florescens* by the simplicity of its molar pattern. The molars of *Serridentinus gobiensis* are of larger size than those of *S. mongolensis*. *S. gobiensis* may be of approximately the same age as *S. mongolensis*, but it is without much doubt older than *Ocalientinus (Serridentinus) florescens*, which is not older than late Pliocene (OSBORN, 1932).

Serridentinus gobiensis is in a stage of evolution closely similar to that of the Miocene *Serridentinus subtapiroides*. In *S. subtapiroides*, M^3 measures 150 mm, while the third inferior molar M_3 of *S. gobiensis* reaches 195 mm. The rudiment of the fifth crest or pentaloph observed in M^3 of *S. subtapiroides* naturally would correspond with the distinct, conical pentalophid talon in M_3 of *S. gobiensis* (OSBORN, 1936). OSBORN suggests also that *S. gobiensis* probably had quite different food-habits, and consequently a different local range from its geologic contemporary, *Platybelodon grangeri*. OSBORN's opinion (1932, 1936) that *S. gobiensis* was a relatively very rare form, was based only on the type jaw, found in the Tung Gur region. Now the

finds from Begger Noor (ALEKSEYEVA, 1959, and the material described in the present paper) indicate that this species was not so very rare and had a greater geographical range than was formerly supposed.

Family BUNOMASTODONTIDAE OSBORN, 1921

Subfamily TETRALOPHODONTINAE VAN DER MAAREL, 1932

Genus **TETRALOPHODON** FALCONER, 1847, 1857

Tetralophodon aff. **sinensis** KOKEN, 1885

(Pl. XVII, fig. 1)

Material. — One single molar tooth, probably the second left inferior M_2 (Z. Pal. No. MgM-IV/2).

Description. — The tooth is considerably detached. Its pretrite is better preserved. The roots of the grinder post-trite are partially covered by a portion of the bone of the jaw. Each of the four crests shows a considerable loss. The fourth crest is fractioned in half. Traces of wearing are visible at the first and second lophs. Each loph,both in its pretrite and post-trite consists of two cones, which are each divided into two conelets. On the posterior side of each loph (at its pretrite?) one trefoil conule occurs, touching the next crest. The antero-posterior median valley is marked and visible. The transverse valleys are narrow and 1/2 to 3/4 filled with cement. The lophs are parallell to the roots, but with respect to the straight line between the base of the crown and the roots, the crests lean forwards considerably. The tooth shows certain features of hypsodonty.

Measurements of the tooth (in mm):

Length		148
Maximum breadth		75 (III crest)
Enamel thickness		5-6
Number of ridge-crests		4+?
Depth of transverse valleys (between unworn crests)		70 (III/IV)
Interval between summits of ridge-crests	I/II	38
	II/III	34
	III/IV	36
Breadth-length index		51

Stratigraphical and geographical range. — The only remains of this species hitherto known is the type specimen of *Mastodon perimensis* var. *sinensis* KOKEN, 1885, described from Yun-nan, China, a province of vast size. Its geologic age is consequently uncertain. Its tetralophodont structure and single median trefoils, however, indicate that it is of Upper Miocene age.

Discussion. — The four-crested tooth of *Tetralophodon* aff. *sinensis*, described in the present paper, differs from the holotype of *T. (Lydekkeria) sinensis* in the presence of abundance of cement and a slightly subhypsodonty. The teeth compared are similar in their tetralophodont structure and in the presence of single median trefoils.

The five-crested type-specimen of *T. (Lydekkeria) sinensis* should be compared with the type specimen of *T. (Lydekkeria) falconeri* LYDEKKER, 1877, Middle Pliocene of India,

from which it differs in the presence of single trefoils, a character which leads the author to regard it as more ancient in dental development than the Lower Pliocene stage of *T. longirostris* KAUP, 1832. In other respects, the fractured type-specimen of *T. (Lydekkeria) sinensis* agrees fairly well with the corresponding teeth, M^3, in the palate of *T. longirostris* (MATTHEW & GRANGER, 1923).

The tooth from Begger Noor seems to indicate also the more primitive type in dental development, owing to the presence of single median trefoils. The latter point, the tetralophodont structure and the occurrence together with *Serridentinus gobiensis* and the rhinoceros *Baluchitherium*, in addition to the opinion of geologists (GRADZIŃSKI *et al.*, 1968), suggests that this specimen is of Upper Miocene age.

On the other hand, however, the abundance of cement and the hypsodonty in this molar tooth seems to indicate a more progressive type of dentition, slightly approaching the final stage of the generic phylum, *Tetralophodon (Morrillia) barbouri* OSBORN, 1921, Middle Pleistocene of Nebraska.

Tetralophodon first appears abundantly in Lower Pliocene time and extends into Middle Pliocene time, surviving to the Middle Pleistocene in the progressively hypsodont *T. (Morrillia) barbouri* (OSBORN, 1936). OSBORN divides *Tetralophodon* into three subgenera: 1) the Eurasiatic Miocene *T. sinensis*, with single trefoils, is referred to the distinct and more primitive subgenus *Lydekkeria* OSBORN, 1924; 2) the Eurasiatic and American Pliocene *T. grandincisivus* SCHLESINGER, 1917, *T. longirostris*, *T. punjabiensis* LYDEKKER, 1886, *T. campester* COPE, 1878 and *T. elegans* HAY, 1917 with incipient double trefoils, are referred to FALCONER'S genus *Tetralophodon*; 3) *T. barbouri* belongs to the final stage *Morrillia* OSBORN, 1936, with hypsodont molars, heavy cement and double trefoils.

The grinding tooth described in this paper is unfortunately much detached and provides poor and inadequate material for the description of a new species.

Institute of Systematic Zoology
of the Polish Academy of Sciences
Kraków, January 1967

REFERENCES

ALEKSEYEVA, L. I. — see АЛЕКСЕЕВА, Л. И.

DEVYATKIN, E. V. & LISKUN, I. G. — see ДЕВЯТКИН, Е. В. & ЛИСКУН, И. Г.

GRADZIŃSKI, R., KAŹMIERCZAK, J. & LEFELD, J. 1968. Geographical and geological data from the Polish-Mongolian Palaeontological Expeditions. Results of the Polish-Mongolian Palaeontological Expeditions, I. — *Palaeont. Pol.*, **19**, 33-82, Warszawa.

HSIEH HSIANG-HOW. 1962. Notes on two new brevirostrine mastodonts from Shensi. — *Vertebr. Palasiat.*, **6**, 2, 178-180, Peking.

KIELAN-JAWOROWSKA, Z. & DOVCHIN, N. 1968. Narrative of the Polish-Mongolian Palaeontological Expeditions 1963—1965. Results of the Polish-Mongolian Palaeontological Expeditions, I. — *Palaeont. Pol.*, **19**, 7-30, Warszawa.

KOKEN, E. 1885. Über fossile Säugethiere aus China. — *Geol. Paläont. Abh.*, **3**, 2, 31-114, Berlin.

MATTHEW, W. D. & GRANGER, W. 1923. New fossil mammals from the Pliocene of Sze-Chuan, China. — *Bull. Amer. Mus. Nat. Hist.*, **48**, 17, 563—598, New York.

OSBORN, H. F. 1924. Serridentinus and Baluchitherium, Loh Formation, Mongolia. — *Amer. Mus. Novit.*, **148**, 1-5, New York.

— 1936. Proboscidea. A monograph of the discovery, evolution, migration and distinction of the mastodonts and elephants of the world. **1**, 1-802, New York.

— & GRANGER, W. 1932. Platybelodon grangeri, three growth stages, and a new serridentine from Mongolia. — *Amer. Mus. Novit.*, **537**, 1-13, New York.

Pei Wen-chung. 1965. On a new trilophodon tooth from Wuffeng of Hupeh Province. — *Vertebr. Palasiat.*, **2**, 213-216, Peking.

Schlesinger, G. 1917. Die Mastodonten des k. k. naturhistorischen Hofmuseums. — *Denkschr. d. k. k. naturh. Hofmus.*, **1**, Geol.-Paläont. Reihe, **1**, 1-230, Wien.

— 1922. Die Mastodonten der Budapester Sammlungen. — *Geol. Hungar., Ser. Geol.*, **2**, 1, 1-284, Budapest.

Алексеева, Л. И. 1959. Мастодонт Serridentinus gobiensis из Бегер-Нура (Монголия). — *Палеонт. Журнал*, **3**, 117—124, Москва.

Девяткин, Е. В. & Лискун, И. Г. 1966. К стратиграфии кайнозойских отложений Западной Монголии. — *Бюлл. Моск. Общ. Испыт. Прир., Отд. геол.*, **5**, 137—138, Москва.

PLATES

PLATE XVII

Page

Tetralophodon aff. *sinensis* KOKEN 147

(Begger Noor, Western Mongolia; Miocene)

Fig. 1. *a* Second left inferior molar M_2, internal view; *b* the same specimen, crown view (Z. Pal. No. MgM-IV/2); ×0.5.

Serridentinus gobiensis OSBORN & GRANGER 144

(Begger Noor, Western Mongolia; Miocene)

Fig. 2. *a* Fragment of the left ramus of mandible with grinding teeth P_4 and M_1, external view; *b* the same specimen posterior view, showing roots of M_1 (Z. Pal. No. MgM-IV/1); ×0.5.

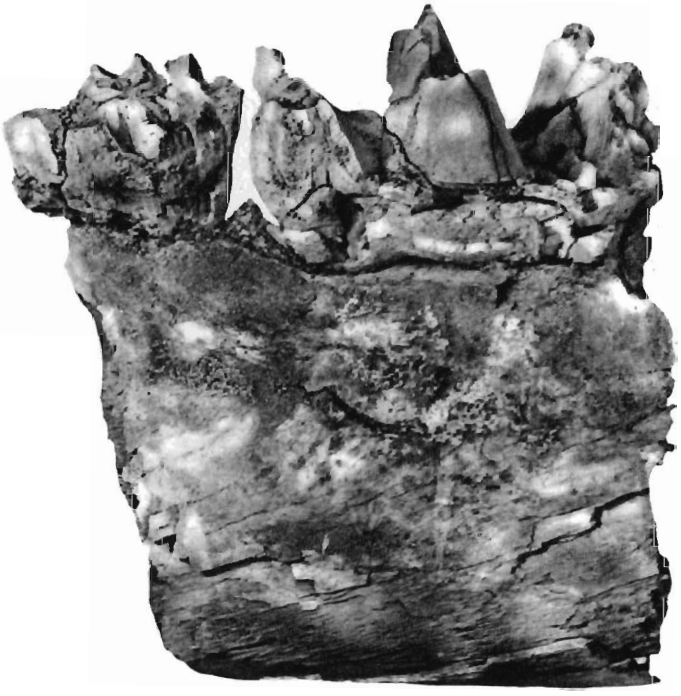
(see also Plate XVIII)

Photo: M. Czarnocka

1a

1b

2b



2a

H. KUBIAK: MASTODONT REMAINS FROM THE MIOCENE

PLATE XVIII

Page

Serridentinus gobiensis OSBORN & GRANGER 144

(Begger Noor, Western Mongolia; Miocene)

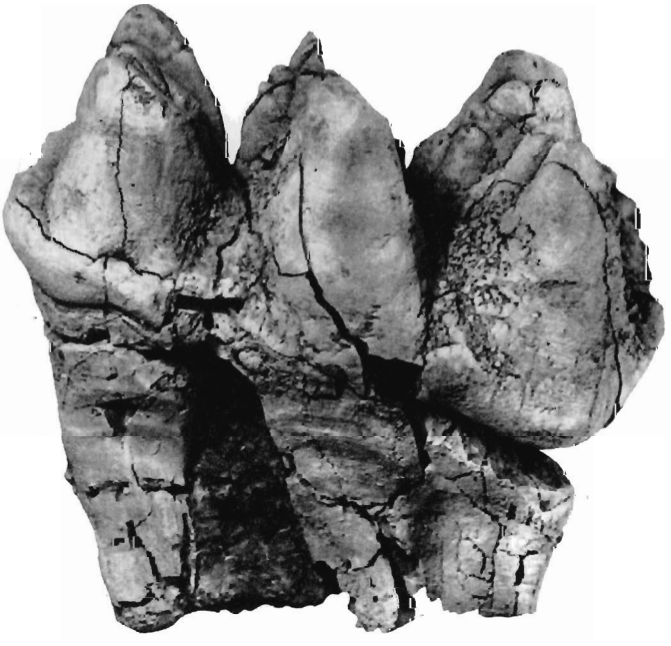
Fig. 1. *a* Second right superior molar M^2, crown view, *b* the same specimen, external view, *c* the same specimen, anterior view (Z. Pal No. MgM-IV/3); ×0.66.

(see also Plate XVII)

Photo: M. Czarnocka

1a

1c



1b