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Henryk KUBIAK

*Gomphotherium angustidens* (Cuvier, 1806) (*Proboscidea, Mammalia*) from the  
Miocene of Przeworno (Silesia, Poland)

[Pp. 469—480, pls. XXXIV—XXXVIII, 2 text figs.]

*Gomphotherium angustidens* (CUVIER, 1806) (*Proboscidea, Mammalia*)  
z miocenu Przeworna na Śląsku\*

*Gomphotherium angustidens* (CUVIER, 1806) (*Proboscidea, Mammalia*)  
из миоцена Преворно на Шлѣнске

Abstract. Molar teeth, tusks and several bones of the postcranial skeleton belonging to the mastodont *Gomphotherium angustidens* from the fossil fauna of Upper Vindobonian age from Przeworno in Silesia are described. The mastodont remains from Przeworno, along with the earlier find from Opole, situated in the vicinity of the present locality, are so far the only finds of Miocene mastodonts in Poland, although this species occurs relatively often in Europe.

INTRODUCTION

*Gomphotherium angustidens* is one of the most frequently found mastodont species in the Tertiary faunae of Europe; nevertheless in Poland the only finds of this species were the remains from the Miocene fauna of Opole (WEGNER, 1913). In 1969 remains of Miocene vertebrates were found at Przeworno (17°10'40"E, 50°41'21"N) in the foreland of the Sudetes Mts. The results of a preliminary geologico-palaeontological investigation (GŁAZEK, OBERC and SULIMSKI, 1971) showed the presence of two sites of Miocene vertebrates in the quarry at Przeworno, which sites, according to the authors mentioned, differed somewhat in age. The lower-lying site, Przeworno I, including the filling of

\* Praca wykonana w ramach problemu resortowego PAN 27.

a horizontal karst channel, contained a fauna referred to the Upper Burdigalian i.e. to the second brown-coal measure (Ścinawa measure = 3 Lausitzer Flöz) (GŁAZEK, OBERC and SULIMSKI, 1971, GALEWSKI and GŁAZEK, 1973). In the lower site Przeworno I following vertebrate remains, described by SULIMSKI (GŁAZEK et al., op. cit.), have been found: *Mustelidae* gen. et sp. indet., *Pseudailurus* cf. *quadridentatus* (BLAINVILLE), *Aceratherium silesiacum* SULIMSKI, *Hyotherium* aff. *soemeringi* v. MEYER, *Dorcatherium* cf. *crassum* (LARTET), and, so far undescribed, *Castoridae* and tortoises.

The higher site, Przeworno II, was a karst crevice filled with a deposit dating from the Younger Vindobonian.

Moreover, in remnants of a cave with siliceous flowstone (locality Przeworno III) some beetles were found. They were determined by GALEWSKI (GALEWSKI and GŁAZEK, 1973) as *Hydaticus laevipennis* THOMSON and as *Acilius* sp. LEACH, *Hydroporus* sp. CLAIRV., *Canthydrus* sp. SHARP and another *Hydaticus* species. The age of these fossil beetles has been determined by the authors mentioned above as Upper Miocene.

In 1971 the Institute of Systematic and Experimental Zoology of the Polish Academy of Sciences in Cracow took over the task of palaeontological exploration of the sites at Przeworno. The investigation, which is still under way, has provided much new material. In the course of the exploration of the site Przeworno II remains of mastodons were found too (Fig. 1). The material under

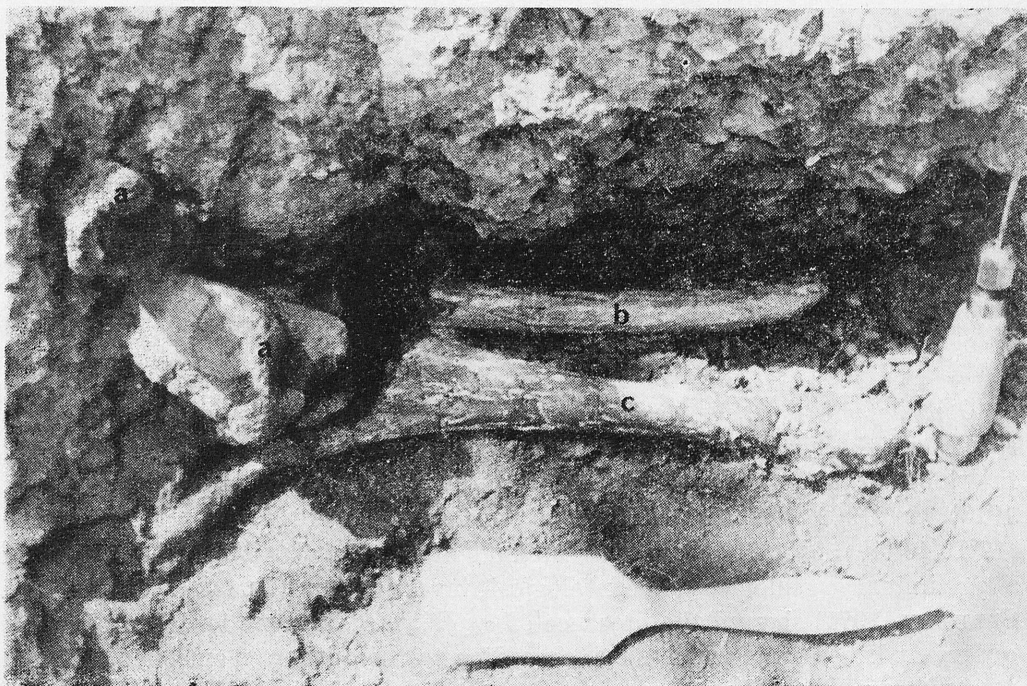


Fig. 1. Mastodont remains excavated at Przeworno: a — fragmentary limb bones, b — lower tusk, c — neural spine of a thoracic vertebra. About one-fourth natural size

description is kept in the collection of the Institute of Systematic and Experimental Zoology in Cracow.

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#### LOCALITY PRZEWORNO II AND ITS STRATIGRAPHICAL POSITION

Przeworno is situated about 50 km S of Wrocław and about 45 km W of Opole. Its geological description is given in the papers by GLAZEK, OBERC and SULIMSKI (1971, 1972). Karst hollows developed here in marbles presumably of proterozoic age. According to those authors, the site Przeworno II contained remains of *Pseudailurus lorteti* GAILLARD, *Hyotherium simorreense* (LARTET) and *Euprox furcatus* (HENSEL). A few Primate teeth defined as *Pliopithecus* (*Pliopithecus*) *antiquus* cf. *antiquus* (BLAINVILLE) were described by KOWALSKI and ZAPFE (1974). Remains of frogs, snakes, turtles, birds, rodents, equids, suids and rhinoceroses were collected during later excavations, but these have not, as yet, been worked out in detail.

GLAZEK, OBERC and SULIMSKI (1971) refer the site Przeworno II to the Younger Vindobonian and therefore to the Middle Miocene, and they are of the opinion that in age it approximates the localities at La Grive-Saint-Alban, Simorre/Tournan, Sansan, Göriach, Steinheim, Vieux-Collonges and others, being somewhat older than the locality at Opole, which according to WEGNER (1913) is of Sarmatian age. This has been confirmed by the results of a study made on the rodents by KOWALSKI (1967). The stratigraphic position of Przeworno II in the upper part of the Middle Miocene (Badenian in Paratethys stratigraphy) seems to be highly probable (KOWALSKI and ZAPFE, 1974; comp. CÍCHA, FAHLBUSCH and FEJFAR, 1972).

#### DESCRIPTION OF MATERIAL

The remains of mastodons found during the excavation carried out by the Institute of Systematic and Experimental Zoology show a relatively good state of preservation. Partly crumbled molar teeth and tusks had to be glued together laboriously.

The material consists of following mastodont teeth:  $i_2$ ,  $D_3$  and  $D_4$  inferior dextra in situ in a mandible fragment; isolated  $P_3$  inferior dextra,  $D_4$  inf. sinistra,  $P^4$  superior sinistra, fragment of  $M_1$  inf. dext., two molars  $M_2$  inf. dext. — in different condition; fragment of  $M_2$  inf. dext.?, fragment of a right upper inciseve tusk, fragment of  $I_2$  inferior sinistra.

The terminology used in the morphological descriptions of the teeth was introduced by SCHLESINGER (1917, 1922), OSBORN (1936) and accepted by LERMANN (1950), TOBIEN (1973) and others, as well as by the author in previous papers (KUBIAK, 1968, 1972).

Mandible with  $i_2$ ,  $D_3$ ,  $D_4$  dextra (Inventory No. MF/1411/74)

The portion of the right body of a mandible (Plate XXXIV, figs. 1, 2) supporting the milk incisor  $i_2$  and the milk teeth  $D_3$  and  $D_4$  probably belongs to an advanced foetus on account of the teeth not yet having come into wear. The milk incisor implanted in the elongated bony symphysis, about 60 mm. in length preserved, is of peg-like form and has an oval "pyriform" transverse section (Fig. 2A). The distal part of the symphysis is damaged and broken off around the tip of the milk incisor, so the tusk was probably completely imbedded in the symphysis. It seems that the right part of the symphysis, in a sense of transverse section, (approximately 30 mm. wide), is preserved; therefore, the whole width ought to be about 60 mm. The well preserved proximal part of the symphysis begins about 30 mm. in front of the anterior wall of the  $D_3$ . The crown of this tooth is 22 mm. in length, 15 mm. in width. The approximately 15 mm. high first loph, consisting of two main cusps of similar size is much larger than the second loph. At the anterior wall of the tooth a small accessory tubercle is visible.

The fourth right milk tooth  $D_4$ , measuring 45 mm. and respectively 31 mm. (second loph), consists of three transverse lophs and an anterior talon. The lophs are divided by an antero-posterior median sulcus into two half-ridges. Each half-ridge, especially of the second loph, shows a main cusp and a lower accessory one. On the pretrites (on the buccal side of the lower "intermediate" teeth and on the lingual side of the upper dentition respectively) separating rims (Sperrleisten) run from the main cusp of each loph to the bottom of the syncline, where they join the opposite rims. The two halflophs are almost symmetrical. There is no cement in the synclines.

$P_3$  inferior dextra (No. MF/1412/74) (Plate XXXV, figs. 3, 4)

The well-preserved unworn crown of the third right inferior premolar consists of two lophs and a posterior talon. At the anterior part of the tooth, in front of the first loph, a small tubercle occurs. The first loph is narrower and higher in comparison with the broader and lower second one. The syncline between the lophs is not deep, and accessory joint tubercles on the pretrite are present. The tooth under description is in its shape similar to that of the corresponding one implanted in situ in the jaw described above. However, it is more developed and larger. Its measurements are: length 32 mm., width (II loph) 26 mm., and height (I loph) 22 mm.

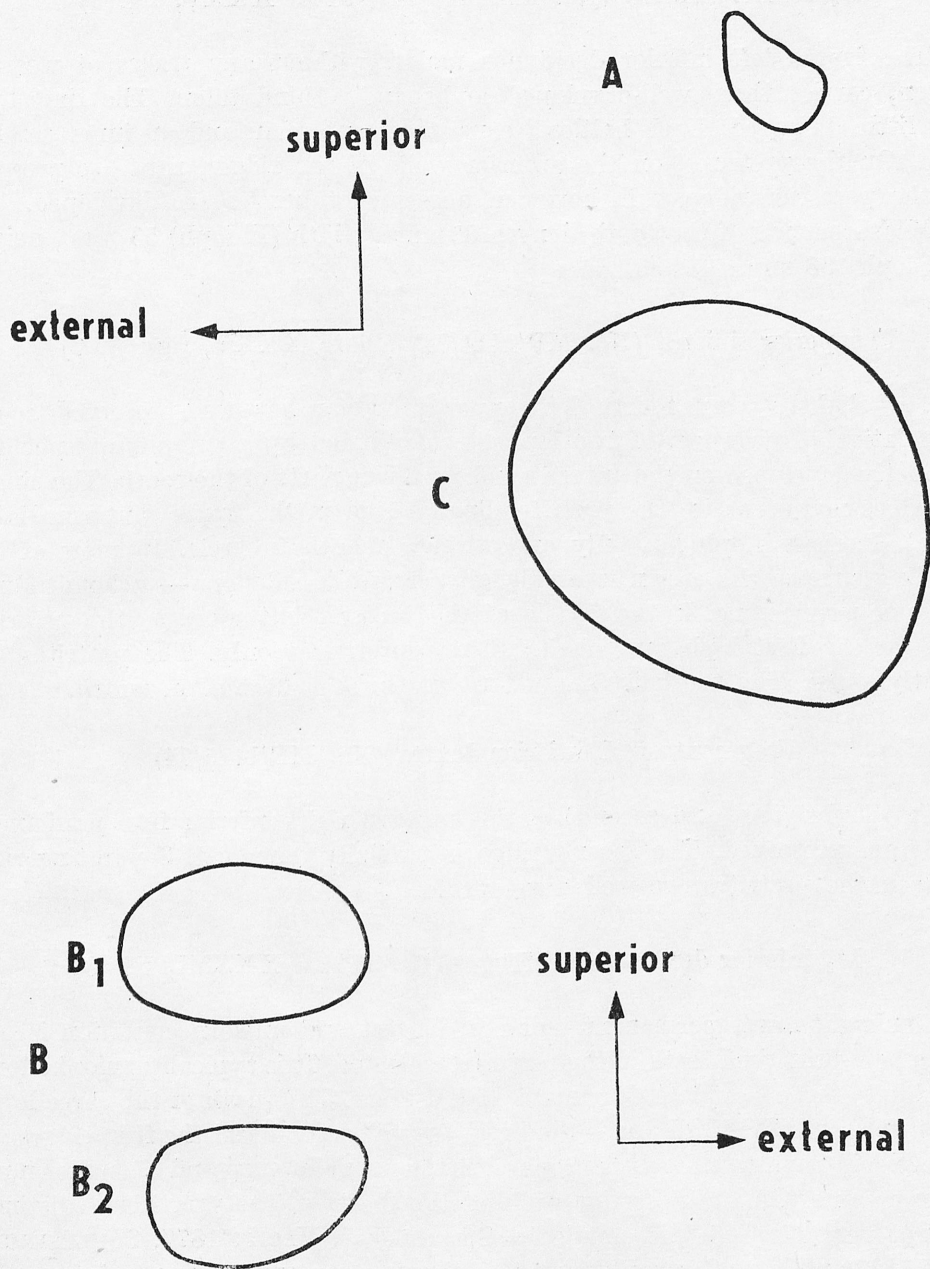


Fig. 2. Transverse section of inferior and superior incisors of *Gomphotherium angustidens* from Przeworno. Natural size. A — right inferior deciduous incisor (in situ) of the mandible (p. 475, Plate XXXIV, figs. 1, 2); transverse section taken about 1 cm. behind the tip of the incisor. B — left lower tusk (p. 475, Plate XXXVII, figs. 10, 11) B<sub>1</sub> — transverse section taken about 20 cm. behind the tip of the tusk, B<sub>2</sub> — transverse section taken about 4 cm. behind the tip of the tusk, C — right upper tusk (p. 475, Plate XXXVII, fig. 12)

D<sub>4</sub> inferior sinistra (No. MF/1413/74) (Plate XXXV, fig. 5)

The fourth left inferior deciduous molar, without any traces of wearing action, carries three well-developed lophs and a hind talon. The first loph is a little damaged. Each halfloph consists of one main and an inner smaller cusp. On the pretrites, on the anterior walls of the ridges, rims are present, on the posterior ridge wall, however, accessory tubercles are developed.

Measurements of the tooth: length 85 mm., width (II loph) 53 mm., height (III loph) 36 mm.

P<sup>4</sup> superior sinistra (No. MF/1414/74) (Plate XXXV, figs. 6, 7)

The slightly worn fourth left upper premolar has well-preserved roots. Its relatively low crown of two lophs is surrounded by a cingulum, especially distinctly developed on the anterior and posterior parts of the tooth. The cingulum does not occur on the pretrite (lingual side in the upper "intermediate" teeth). Each halfloph has only one strong, smooth tubercle. In view of the grinding surface the crown is divided by cross-like sulcuses — a longitudinal and a transverse one. In the middle of the "cross", but more to the pretrite, close to the first loph one small tubercle protrudes only. The pretrites are slightly worn. The tooth is 52 mm. in length, and 48 mm. in width.

Fragment of M<sub>1</sub> inferior dextra (No. MF/1415/74)

Two lophs (first and second) of this unworn right inferior first permanent molar are preserved. The second ridge is partially damaged. Separating rims between the pretrites are well developed.

M<sub>2</sub> inferior dextra (No. MF/1416/74) (Plate XXXVI, fig. 8)

This right lower permanent molar in perfect and unworn condition is one of the best-preserved teeth in the material collected. It is typically trilophodont. It exhibits three complete ridges and a hind talon. The width of the three lophs is not uniform. The third one is the broadest, the second and the first ridges are respectively narrower. Each halfloph consist of a main cusp and a smaller inner accessory one. On the posterior walls of the crests of the pretrites a distinct, but not very large simple conule (= Sperrhöcker, VACEK 1877, SCHLESINGER 1917, 1922 and later German language authors) is present tending to form a trefoil. On the bottom of the valley the central conule joins the rim occurring on the anterior wall of each pretrite-halfloph. The V-shaped transverse valleys are deep and broad, the walls of the lophs rather smooth. The median sulcus is relatively deep and distinctly developed.

The measurements of the molar are: length 130 mm, width (III loph) 71 mm., height (II loph) 60 mm.

**M<sub>2</sub> inferior dextra (No. MF/1417/74) (Plate XXXVI, fig. 9)**

This considerably worn right lower molar tooth is similar in shape and size to that M<sub>2</sub> described above. Its length measures 127 mm., its width 75 mm. Its pretrites exhibit typical trefoils.

**Fragment of M<sub>2</sub> inferior dextra (No. MF/1418/74)**

Only the second and third lophs and the hind talon of this heavily worn right lower molar are partially preserved. The anterior portion of it is broken off. The width of the third loph measures 68 mm.

**Fragment of J<sup>2</sup> superior dextra (No. MF/1419/74) (Plate XXXVII, fig. 12)**

This partially preserved superior incisive tusk, strongly damaged, in very bad condition, is practically undeterminable. Its length is 260 mm. and its maximum diameter is 62 mm. and 50 mm. respectively at the proximal end. The transverse section of the tusk is oval (comp. Fig. 2C, p. 473).

**Fragment of I<sub>2</sub> inferior sinistra (No. MF/1420/74) (Plate XXXVII, figs. 10, 11)**

This 215 mm. long fragment of the distal portion of the left lower tusk, well preserved, shows a thin enamel cap at its tip at the external and ventral sides. The tusk becomes slightly thicker towards its proximal end, where its diameters of the regular oval transverse section are 35 mm. and 25 mm. respectively. The dorso-ventrally flattened tusk is slightly turned upwards at its distal end (comp. Fig. 2B, p. 473).

**Fragments of the postcranial skeleton**

Moreover, some fragments of the postcranial skeleton have been found: a portion of a skull with the posterior part of the left zygomatic arch (No. MF/1421/74); left fragment of an atlas vertebra with preserved: anterior and posterior articular facets, partially the transverse process and foramen transversum, and the left wall of the vertebral foramen (No. MF/1422/74); partially preserved condyles of a right (?) femur (No. MF/1423/74); left astragalus (talus), which measures anterior-posteriorly 126 mm., and medial-laterally 147 mm. (No. MF/1424/74, Plate XXXVIII, figs. 15, 16); phalanx 2 of digit II of the left forelimb, 69 mm. in width (No. MF/1425/74, Plate XXXVIII figs. 13, 14).

Several isolated fragments of molar teeth, tusks and crumbled bones, i.e. ribs, vertebrae etc. among the material collected at Przeworno, probably belonging to mastodons, are indeterminable.

SYSTEMATIC POSITION OF *GOMPHOTHERIUM ANGUSTIDENS*

The generic name *Gomphotherium* BURMEISTER (1837) has been proposed by SIMPSON (1945) for *Mastodon angustidens* CUVIER, which is in all probability the earliest name for this taxon, and has priority over *Trilophodon* FALCONER (1857). The name *Gomphotherium*, however, remained practically unused up to 1945, i.e. over more than 100 years. But since 1945 it has been taken into use, especially by American investigators. By this practise the revised name might be validated (TOBIEN, 1973). Remains of *Gomphotherium angustidens* were formerly described as *Mastodon angustidens* as well as *Trilophodon angustidens*. Now these two names ought to be treated as synonyms of *Gomphotherium angustidens*. Moreover, the generic name *Mastodon* CUVIER, 1817 is one of the synonyms of *Mammot* BLUMENBACH, 1799, and therefore it can be used nowhere in mastodont systematics as a generic name in the formal, taxonomic sense (TOBIEN, op. cit.).

GINSBURG and TELLES ANTUNES (1966) stated that the species *Gomphotherium angustidens* has a polymorphic character. The structural, dimensional and sexual variation of the dental elements, incisors and molars, is extraordinary in a given population, and overlays and obscures real taxonomic differences on the species or subspecies level. The cited authors expressed the view that several mastodont species described from the Portuguese and French Miocene (*Trilophodon depereti* (OSBORN, 1936) = *Trilophodon olisipensis* ZBYSZEWSKI, 1949, *Serridentinus lusitanicus* BERGOUNIOUX, ZBYSZEWSKI and CROUZEL, 1953, *Serridanancus estremadurensis* (BERGOUNIOUX, ZBYSZEWSKI and CROUZEL, 1953) and *Zygolophodon pyrenaicus* (MAYET, 1908)) are nothing else than morphological variations of the very polymorphic species *Gomphotherium angustidens*.

The detailed characteristics of the teeth described above in this paper are typical to those in the dentition of *Gomphotherium angustidens*. The relatively large dimensions of the teeth also demonstrate that the material is distributed within the variation field of *Gomphotherium angustidens*.

On account of the occurrence of one mastodont species only till now at the locality of Przeworno, the remains of the postcranial skeleton should be also determined as belonging to *Gomphotherium angustidens*.

## STRATIGRAPHIC AND GEOGRAPHIC DISTRIBUTION

In Europe trilophodont mastodonts appear for the first time during the Burdigalian. Numerous materials from the late Burdigalian have been found in France, Portugal and Germany.

As SCHLESINGER (1917), LEHMANN (1950), TOBIEN (1973) and many others pointed out, the stratigraphic and geographic distribution of *Gomphotherium angustidens* in Europe is of wide range: from the Upper Burdigalian to the

Tortonian/Sarmatian, locally (Eppelsheim) to Pontian, and from many parts of Southern, Western, Central and Eastern Europe remains referable to *Gomphotherium angustidens* have been described for many years.

It should be mentioned that in Europe the *Gomphotherium angustidens* population consisted of smaller specimens at the Lower Miocene and larger individuals at the Upper Miocene, and at the timeboundary Miocene/Pliocene this species made a transition to bunodont tetralophodont forms with a tendency towards the reduction of the lower incisors. Probably the same transition happened in Asia.

In Asia members of the *Gomphotherium angustidens* group appeared as immigrants in the early Miocene (Burdigalian).

The earliest remains of representatives of the *Gomphotherium angustidens* group recorded from Africa are of the same age.

However, the first mastodonts — closely related to the European *Gomphotherium angustidens* — reached North America as immigrants, apparently via the Bering land bridge, not earlier than at the Miocene/Pliocene timeboundary (comp. TOBIEN, 1973).

#### MASTODONTS OF POLAND

So far remains of mastodonts from the territory of Poland are known from four localities only, i.e. the surroundings of Toruń, Oborniki, Opole (KOWALSKI, 1959) and Przeworno.

One mastodont tooth was found near Toruń in 1834, and described by JENTZSCH (1882) as a new species *Mastodon zaddachi*. Nothing, however, is known about the stratigraphical conditions of that find. According to JENTZSCH (op. cit.) the dimensions of the tooth vary slightly from the larger teeth of *Mastodon borsoni*. That author also states that it is a specimen very closely resembling *Mastodon borsoni*. In a previous paper (KUBIAK, 1972) I classed this find among the synonyms of *Mammot praetypicum* (SCHLESINGER, 1919), of Pliocene age.

The tooth belonging in CHŁAPOWSKI's view (1905) to *Tetralophodon longirostris* KAUP has been discovered in a gravel-pit at Oborniki (Poznań Province) in a young Pleistocene fauna, probably on a secondary rockbed.

The mastodont remains from Opole described by WEGNER (1913) belong certainly to *Gomphotherium angustidens*, i.e. the same species as the material from Przeworno, studied and published in the present paper. The locality of Opole was assigned to the younger Miocene (Sarmatian) by WEGNER (1913), RYZIEWICZ (1961) and KOWALSKI (1967).

However, earlier papers (e.g. PUSCH, 1836) mention fairly abundant remains of mastodonts, among them of "*Mastodon ohioticum* CUV." occurring in Poland. But this must be a misidentification of remains possibly referable to *Elephantidae*.

Thus, it should be stated, that mastodont remains, beside the mentioned two Pliocene species and the Miocene one (from two localities), are extremely rare in Poland to date.

Institute of Systematic and Experimental  
Zoology  
Polish Academy of Sciences,  
Ślawkowska 17, 31-016 Kraków, Poland

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\* — References of the Przeworno locality

## STRESZCZENIE

Opis szczątków mastodontów z wypełnienia krasowej szczeliny w Przewornie II na Śląsku obejmuje fragmenty uzębienia i szkieletu postkranialnego jednego gatunku mastodonta: *Gomphotherium angustidens*. Fauna tego stanowiska, opracowana częściowo przez SULIMSKIEGO (GŁĄZEK, OBERC i SULIMSKI, 1971) oraz KOWALSKIEGO i ZAPFEGO (1974), pochodzi z okresu górnego Vindobonian. Opisane zęby morfologicznie i wielkością odpowiadają analogicznym cechom uzębienia przedstawicieli tego gatunku z innych, wcześniej opisanych stanowisk europejskich.

Na tej podstawie oznaczono szczątki z Przeworna jako *Gomphotherium angustidens* (CUVIER, 1806).

Obok dawniejszego znaleziska w Opolu, skąd WEGNER (1913) opisał szczątki tego samego gatunku mastodonta, odkrycie w Przewornie jest drugim w Polsce znaleziskiem mioceńskich mastodontów (poza dwoma gatunkami plioceńskimi).

В работе приводится описание остатков мастодонтов из отложений карстовой полости (щели) местонахождения Пшеворно II на Шлёнске. Обнаруженный материал содержит фрагменты зубов и посткраниального скелета, относящиеся к одному виду мастодонта: *Gomphotherium angustidens*. Фауна указанного местонахождения, частично обработанная Сулимским ((GLAZEK, OBERC, SULIMSKI, 1971) и Ковальским и Цапфе (KOWALSKI, ZAPFE, 1974), относится к верхнему отрезку виндобона. По морфологическим и размерным показателям описываемый материал аналогичен представителям этого вида из других описанных ранее европейских местонахождений. На этом основании остатки из Пшеворно определяются, как *Gomphotherium angustidens* (CUVIER, 1806).

Пшеворно является вторым в Польше местонахождением миоценовых мастодонтов. Ранее этот вид был обнаружен в Ополе (WEGNER, 1913). Для территории Польши известны также два плиоценовых вида.

## PLATES

Plate XXXIV

*Gomphotherium angustidens*

1. Mandible with  $i_2$ ,  $D_3$  and  $D_4$  dextra. Occlusal view
  2. The same. Lateral (buccal) view
- Both figures natural size



Plate XXXV

*Gomphotherium angustidens*

3. P<sub>3</sub> inferior dextra. Occlusal view
  4. The same specimen. Buccal view
  5. D<sub>1</sub> inferior sinistra. Occlusal view
  6. P<sup>4</sup> superior sinistra. Buccal view
  7. The same specimen. Occlusal view
- a — anterior, p — posterior. All figures natural size

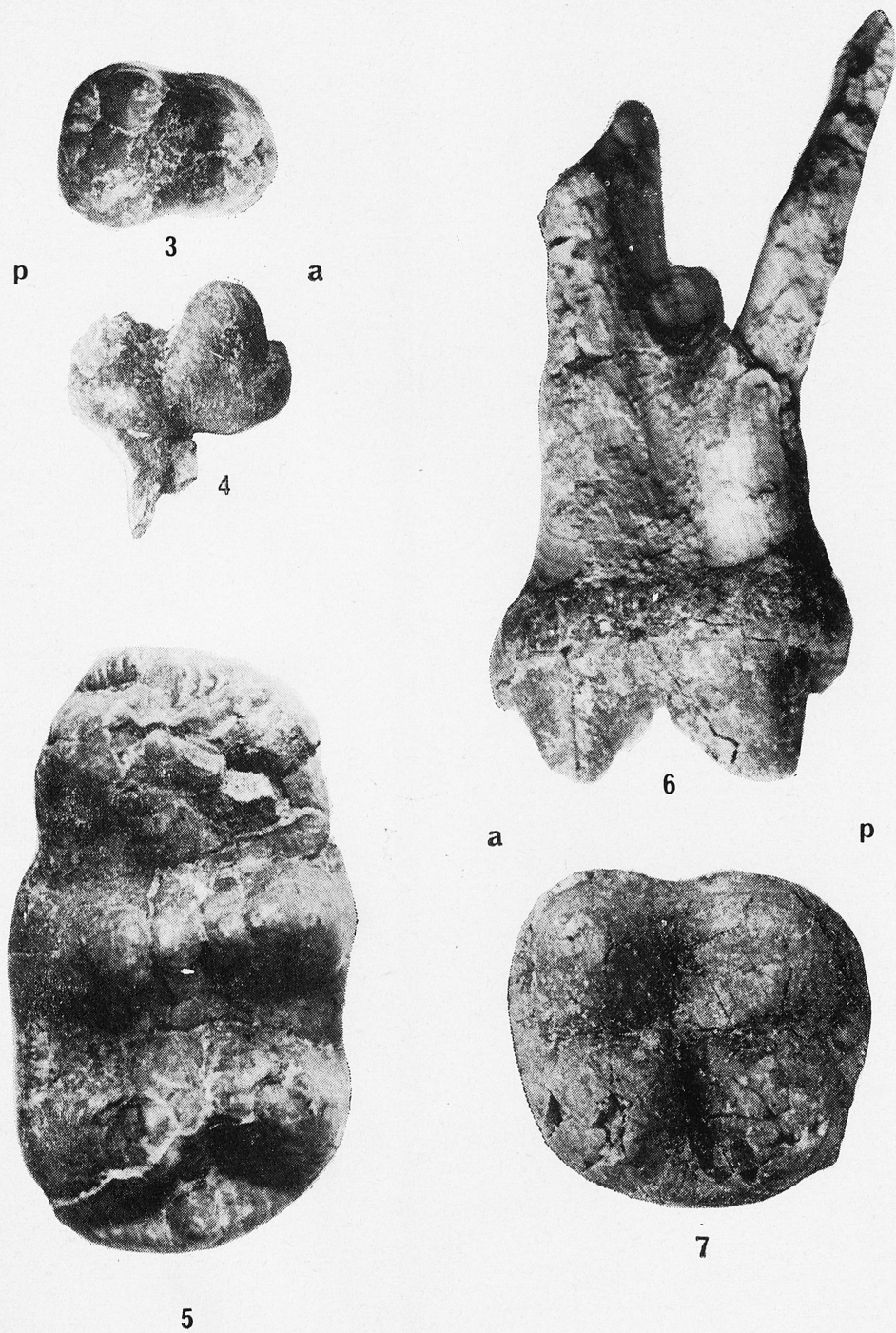


Plate XXXVI

*Gomphotherium angustidens*

8. M<sub>2</sub> inferior dextra. Occlusal view. (No. MF/1416/74)

9. M<sub>2</sub> inferior dextra. Occlusal view. (No. MF/1417/74)

Both figures natural size



9



8

Plate XXXVII

*Gomphotherium angustidens*

10. Fragment of I<sub>2</sub> inferior sinistra. External aspect. Darker part at the tip shows the probably enamel cap.
  11. The same, superior aspect
  12. Fragment of I<sup>2</sup> superior dextra. Superior aspect
- ← — transverse section presented in Fig. 2, p. 473
- All figures two-third natural size



10



11



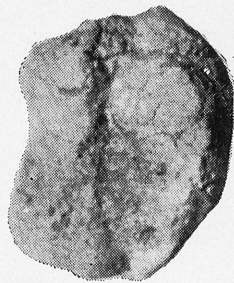
12



Plate XXXVIII

*Gomphotherium angustidens*

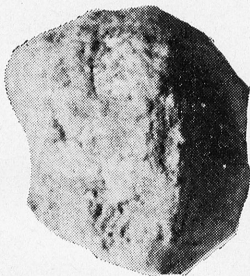
13. Phalanx 2, digit II of the left forelimb. Superior aspect
  14. The same, inferior aspect
  15. Left astragalus, superior aspect
  16. The same, inferior aspect
- All figures one-half natural size



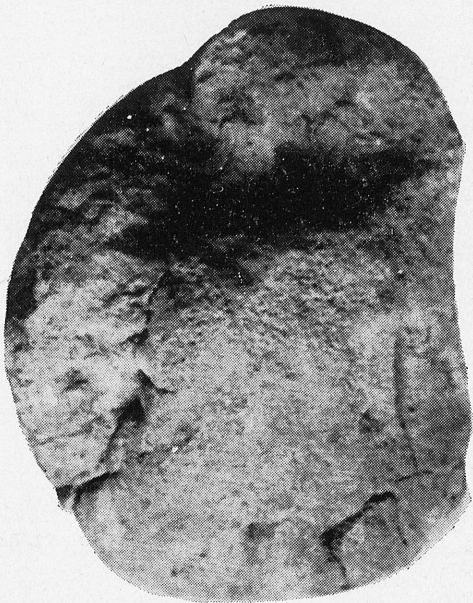
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