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Deinotheriidae (Proboscidea, Mammalia) dental remains from the Miocene of Lower Austria and Burgenland

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(With 4 text figures and 4 plates)

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Abstract

The dental remains of the species *Prodeinotherium bavaricum* and *Deinotherium giganteum* can be identified by size and p3 morphology. In Lower Austria *P. bavaricum* is present in localities of Middle Miocene and early Late Miocene age. *D. giganteum* is present in the Late Miocene localities only. The species have a similar distribution in all European countries. *P. bavaricum* is known from the biozones MN4 to MN9, whereas *D. giganteum* is present from MN7/8 to MN13. The supposed presence of both species in the early Late Miocene of Austria is either due to real coexistence of both species or uncertain stratigraphic determinations.

Key words: Deinotherium, Lower Austria, Burgenland, Miocene

Zusammenfassung

Zahnfossilien von *Prodeinotherium bavaricum* und *Deinotherium giganteum* identifiziet man durch Größe und p3 Morphologie. In Niederösterreich ist *P. bavaricum* bekannt aus Mittel- bis früh Spätmiozänen Fundstellen. *D. giganteum* ist bekannt nur aus den spätmiozänen Fundstellen. Die Arten haben eine ähnliche stratigraphische Verteilung europaweit. *P. bavaricum* ist bekannt aus den Biozonen MN4 bis MN9. *D. giganteum* ist bekannt von MN7/8 bis MN13. Das Vorhandensein von beiden Arten in frühen Spätmiozänen Fundstellen in Österreich deutet entweder auf tatsächliche Koexistenz, oder die stratigraphische Bestimmung der Fundstellen ist nicht sicher.

Introduction

Deinotheres are common in the European Miocene, but they appear usually as isolated finds. The finds are mostly teeth, and the information on the variation of the group has remained restricted. The general taxonomic grouping divides the family Deinotheriidae into small- and large-sized species, although the descriptions of the groups, their variation, and their taxonomic names have varied considerably between authors. Practically no recent publication covers the stratigraphic and geographic distribution of the European deinotheres with conclusive thoughts on the variation and taxonomy of the group. Questions concerning the number of species, size, morphology, and sexual dimorphism have thus remained unanswered.

This study concentrates on deinothere remains from Lower Austria and partly on the isolated finds from Burgenland (for the most relevant earlier descriptions, see PIA & SICKENBERG

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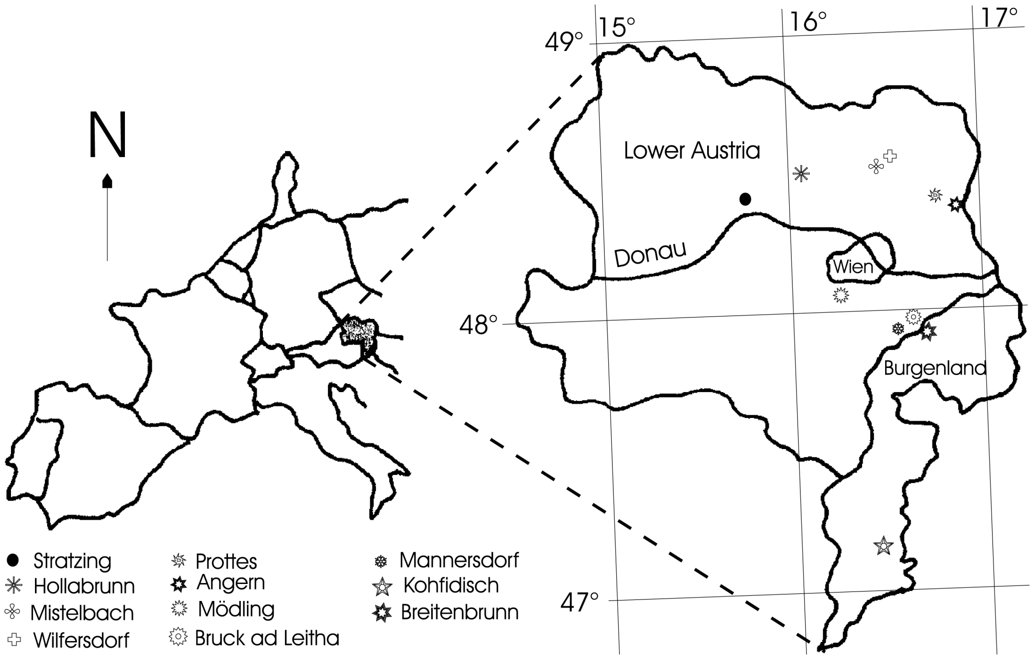

Fig. 1: Lower Austria and Burgenland, East Austria. The most important localities are included. For coordinates of the localities and the Austrian topographic map numbers (ÖK 50: 000), see Appendix 1.

1934, ZAPFE 1948, BACHMAYER & ZAPFE 1972 and 1976). All specimens are of Miocene age, most of the material being from the Pannonian (Central Paratethys Stage, 11.5-7.1 Ma) (see Appendix 1). Great metric and morphological variation of the study material, with nearly each specimen being different, does not allow any clear grouping of the material. Since an earlier, generally accepted, precise morphological framework for Deinotheriidae was not available, the description of these isolated finds had to be done parallel with a large comparative study. The comparisons give a better description of the relationship between other European material and the material of this study. Variations in proportions and morphology are quantified and the importance of the size-morphology changes is discussed. The study does not include a complete revision of all dental elements from Europe, but it is a representative sample of the material available. Therefore, it provides a good basis for a taxonomic assessment of the material and serves as a baseline for further comparisons in Europe. The main issues of this study can be summarized in the following questions:

- Are there any differences in deinotheres from different stratigraphic intervals and different geographic areas?
- What are the diagnostic dental characters separating deinothere genera and species?
- What is the stratigraphic distribution of the family Deinotheriidae in Europe?
- What genera and species are present in the study material, based on size and morphology comparisons?

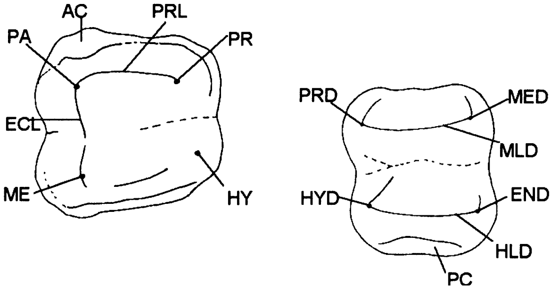

Fig. 2: Dental nomenclature used in the descriptions (after TASSY 1996). Illustration left: upper P4 dext., illustration right: lower m2 sin. Abbreviations: AC - anterior cingulum, ECL - ectoloph, END - entoconid, HY - hypocone, HYD - hypoconid, HYL - hypolophid, ME - metacone, MED - metaconid, MEL - metalophid, PA - paracone, PC - posterior cingulum, PR - protocone, PRD - protoconid, PRL - protoloph.

The descriptions use the dental nomenclature from TASSY (1996, see also Fig. 2 above). The measurements were taken with a caliper INOX in mm. In addition to the measurements, a length index (LI = maximum width/length) and the stage of wear (1 - unworn, 2 - wear facets visible, 3 - dentine visible, 4 - wear facets coalescent) were recorded for each tooth.

Systematics

Order: Proboscidea ILLIGER 1811

Family: DEINOTHERIIDAE BONAPARTE 1845

Species: ***Deinotherium giganteum*** **KAUP 1829**

Description of the study material:

For material list, stratigraphy, measurements and morphology, see Appendix 1.

D3 (Pl. 1. Fig. 1):
Localities Mannersdorf bei Leithagebirge, Hollabrunn

The tooth is bilophodont, with two transverse, parallel lophs. The protoloph has a stronger curvature and is narrower than the metaloph. There is a well pronounced cingulum on the anterior wall, beginning anterior to the paracone. It is less pronounced on the posterior wall and is absent in the other parts of the tooth. There is a slight contact between the paracone and the anterior cingulum. Both lophs have posteriorly extending cristae. Those of the labial side are posteriorly extended, postparacrista ending in the transverse valley and posthypocrista ending in the posterior cingulum. Postprotocrista and postmetacrista are posteromedially extended and they are shorter, ending below the cones. In labial view the anterior loph is anteroposteriorly longer, although in lingual view this is reversed. In anterior and posterior views the lingual cusps are higher than those of the labial side. There are two roots, one under the protoloph, the other under the metaloph.

d2 (Pl. 4, Fig. 2):
Locality Wolfau

The d2 is a triangular, narrow tooth with a pointed protoconid that is connected to the posterior metaconid by an ectolophid. In lateral view, the protoconid is high, exceeding the ectolophid in height. The ectolophid is continuous, but posterior to the protoconid there is a small median valley on the labial and lingual sides of the ectolophid. A curved hypolophid connects the posterior ento- and hypoconids. Lingual, labial, and posterior walls of the tooth are smooth. There are two roots, one distal to the anterior cuspids, the other distal to the posterior cuspids.

d3 (Pl. 1, Fig. 2, Pl. 4, Fig. 2):
Localities Wolfau, Prottes

The d3 is bilophodont. Anteriorly, the protolophid connects the labial protoconid and the lingual metaconid. Posteriorly, the hypolophid connects the labial hypoconid and lingual entoconid. In the Prottes specimen, the wear is considerably stronger on the labial side. The form of the tooth is more elongate than in the bilophodont permanent p4 (slightly lower LI values). The valley is open on both sides, but some remnants of the incipient cingulum are present there. The unworn specimens show that there is a strong anterior protocristid, similar, but longer than that of p4. Posteriorly, the cinglum is worn only slightly at its highest point. The wear is strongest on the labial side and on the anterior lophid. The cristid connecting the anterior and posterior lophids is not worn even in the otherwise well-worn Prottes specimen, which means that it is not a functional ectolophid. There are two roots, one under the protolophid and one under the hypolophid.

d4 (Pl. 4, Fig. 2):
Locality Wolfau

The d4 is trilophodont like its antagonist D4, but elongated and not rounded. The first valley is longer than the second valley, but the lophids are of nearly equal width. Strong anteromedial cristids extend from the labial meta- and entoconids. They end medial to the lophid. The lingual proproto- and prohypocristids are straight, ending anterior to the conids. The anterior cristids of the tritolophid are both somewhat anteromedially extended. Anterior and posterior cingula are present. A singular shelf is also present in the first median valley lingually and labially as an incipient stylid. Two roots are present, one distal to the protolophid, the second distal to the meta- and tritolophids.

P3 (Pl. 1, Fig. 5):
Localities Geiselberg bei Zistersdorf, Enzersdorf bei Mödling, Eichkogel bei Mödling, Josefsberg bei Hollabrunn, Breitenbrunn

The outline of P3 is round to rectangular with a labial ectoflexus of variable strength. The cingulum is strong on the anterior wall and is absent on the labial wall. Its strength varies on the lingual and posterior walls. In labial and lingual views, the anterior cone is larger and higher than the posterior cone. The ectoloph is always in contact with the posterolingual corner of the cingulum through a small, posteriorly extending ridge. The lingual cusps are always separated completely or partially by the median valley. Three roots are present; one covering the anterolabial corner, one (divided in two) covering the lingual side and one covering the posterolabial corner. The individual teeth were variable, having a sublophodont character, because the contacts between the para- and protocones and meta- and hypocones vary. The differences are in the completeness of the contact. It can be a complete loph, an incomplete "half-loph", or only an accessory transverse ridge (see Appendix 1). The height of the lophs is not measurable. Additional structures such as styles are potentially present in the median valley (see Pl. 1, Fig. 5).

P4 (Pl. 1, Fig. 6, 7, 8):
Localities Bruck an der Leitha, Hof am Leithagebirge, Gaiselberg bei Zistersdorf, Mistelbach, Mannersdorf bei Angern, Breitenbrunn, Kohfidisch

The tooth is nearly rectangular in outline, slightly wider than long (LI≥1). The labial cusps are interconnected by an ectoloph. The cingulum is pronounced on the anterior and posterior walls. With wear the para- and hypocones are connected to the anterior and posterior cingula. The labial wall often bears an ectoflexus. In labial view, the protoloph is longer than the metaloph, but in lingual view they are of approximately the same length. In anterior and posterior views the labial cones are higher than the lingual cones. There are two roots present, one under the protoloph and one under the metaloph. Contacts between the para- and protocones and meta- and hypocones vary. The differences are in the completeness of the contact. It can be a complete loph, an incomplete "half-loph", or only an accessory structure between the cones (see Appendix 1). The height of the loph is not measurable. The metaloph might also be divided in two. Styles were recorded in only one specimen (from Gaiselberg bei Zistersdorf).

M1 (Pl. 2, Fig. 1):
Localities Mannersdorf bei Angern, Ebendorf bei Mistelbach, Bergau, Pitten, Josefsberg bei Hollabrunn, Wiesen, Kohfidisch

The first molars are the only permanent trilophodont teeth. General characters are merely modified by slight individual variation in cingulum strength and presence of styles. The occlusal outline is wide, with the lingual wall extended by the cingulum, so that the outline is more rounded than elongate. In general, the second loph is the widest and the third loph the narrowest because the lingual cingulum is often strongest on the lingual wall of the second loph. The cingulum is developed as rugosity of the surface on the posterior tritoloph wall. The labial wall is open in transverse valleys. On the labial side, the cristae extend posteriorly, ending on the next posterior cusp. On the lingual side, they extend posteromedially, ending in the posterior valley. The cristae of the tritoloph may touch the posterior cingulum. In some cases a small incipient cuspid is present on the posterior wall of the tritoloph. It is also worn in contact against the anterior m2. There is one anterior root, one lingual root, and one posterior root. The anterior root is positioned in the anterolabial corner. The lingual root covers the anterolingual portion of the tooth. The posterior root covers the portion of the meta- and tritolophs.

M2:
Localities Marxer Linie (Wien 3), Leithagebirge, Gaiselberg bei Zistersdorf, Mannersdorf bei Angern, Paasdorf bei Mistelbach, Hohenwart bei Mühlbach, Wilfersdorf, Bruck an der Leitha, Kohfidisch, Mistelbach, Breitenbrunn, Wolkersdorf

The form of the bilophodont M2 is close to rectangular (LI~1) as the proto- and metaloph are of nearly the same width. Posterior cristae extend from each cusp. The lingual cristae are shorter, ending distal to the cusps. The labial cristae are oriented posteriorly and extending to the median valley. There are anterior and posterior cingulae. The labial valleys are open. Three roots are present. One covers the anterolingual corner, the second root extends over the anterolabial corner, and the third root covers mostly a portion of the metaloph. The postmetaloph cristae are variable; either they are completely absent or hardly visible, or they are strong and connected, or they are short and end in a depression bearing a small tubercle. The morphology of the individual teeth is summarized in Appendix 1.

M3 (Pl. 2, Fig. 4):
Localities Wien 12, Angern, Stratzing bei Krems, Mannersdorf bei Angern, Breitenbrunn, Paasdorf bei Mistelbach

The general form is nearly rectangular, the metaloph being usually narrower than the protoloph. Posterior cristae extend from each cusp. The lingual cristae are shorter, ending shortly below the cusps. The labial cristae are posteromedially oriented and extend to the median valley. The cingulum begins on the anterolabial corner and covers the anterior side. It is slightly pronounced on the lingual side and it is again visible on the posterior wall. The roots are similarly placed as those of the M2. The postmetaloph cristae are variable; they are either connected or they are short and end in a depression bearing a small tubercle. The cingulum is pronounced anteriorly and lingually ending on the posterolabial wall. The morphology of the individual teeth is summarized in Appendix 1.

Incisors (Pl. 4, Fig. 3):
Localities Paasdorf bei Mistelbach, Prottes, Brunn am Steinfeld, Hernals bei Wien, Türkenschanze (Wien 18), Mauer bei Wien, Hetzendorf (Wien 12), Kettlasbrunn

The deinothere tusks consist of massive dentine. Their form in transverse section is oval rather than round, the longest axis being in anteroposterior direction. Often the tusk is also flattened on the medial side. The tusks are curved distally and caudally and often also laterally. The thickness diminishes from proximal to distal. In transverse section, the dentine has large, concentric rings. No criss-cross-like SCHREGER pattern (also called "engine-turning" or "guillochage", see SHOSHANI 1996: 15) of the dentine tubules has been described in European deinotheres. The lack of this pattern, which should be visible to the naked eye, can be used to identify the deinothere tusks. The only exception to this rule may be *D. bozasi* because the pattern has been reported once in the African *D. bozasi* (HARRIS 1983). The problem of the tusk variability is that it is hardly measurable. First, the inner side is not always flattened. Second, the curvature is almost impossible to measure. (One approach is GRÄF's [1957] "Krummungslänge", the relation between length (a) and sagittal diameter (b) [a x 100/b]). Third, a lateral curvature is not always present; the tusks can also be only distally-posteriorly aligned. Fourth, the presence of wear facets on three possible sides (medial, posterior, or at the tips) and their absence in some specimens points to a still unknown and perhaps variable function.

Many incisor fragments are available from the Lower Austria and Burgenland area. As fragments they yield little information on the total length, width and curvature, but even fragments can serve as evidence of approximate size (diameter). The tusk pair from Türkenschanze (Wien 18, Sarmatian) is special for two reasons. First, being complete, the small size (length 200 and 220 mm) is surprising. Second, the wear has been extremely strong. Facets have been formed on the tips so that there is a flat distal facet on both of the tusks. They are oriented laterally. There is slight lateral curvature and the diameter of the tusks is fairly constant.

The tusk pair of the lower jaw of the Kettlasbrunn mandible (Pannonian) is completely different both in size and wear facets. The tusks are very long (length 740 and 1010 mm) and they are both caudally and laterally curved. The diameter diminishes distally. The left tusk is ca. 270 mm shorter than the right tusk. Also, a long wear facet has been formed on the posterior side of the left tusk. The left tusk was probably favored by the individual since the left toothrow is also more heavily worn. The tip and the posterior side of the tip of the right tusk is smooth. An isolated tusk of differential size stems from Hetzendorf (Pannonian, length 380 mm). It has the characteristic, slight lateral curvature of a deinothere tusk, but the diameter and development of wear facets is variable. Since only a small number of specimens is available and each specimen is different, no indication of generic or specific characters is present. The Türkenschanze specimens from the Sarmatian are much smaller than the Pannonian specimens.

p3 (Pl. 2, Fig. 4, 5, 6, Pl. 3, Fig. 1, 2):
Localities Altmannsdorf (Wien 12), Bruck an der Leitha, Leithagebirge, Türkenschanze (Wien 18)

The tooth is triangular in outline. The main structures are the anteriorly positioned proto- and metaconids and the posteriorly positioned hypo- and entoconids. In the Türkenschanze and Altmannsdorf specimens the anterior conids are fused by wear to form one protoconid. In the Leithagebirge specimen the anterior conids are parallel. In the specimens from Bruck an der Leitha the metaconid is slightly posteriorly displaced in relation to the protoconid. The protoconid continues posteriorly towards the hypoconid and together they form a labial ectolophid. The protoconid often touches the anterior cingulum, this is a cristid extending from the protoconid to a small anterior extension formed by the anterior cingulum. The contacts between the anterior conids and the posterior conids vary. The cingulum is most pronounced on the posterior edge, but appears also on the labial side. Two roots are present, one under the anterior cupids and one under the posterior cuspids. The study specimens are of similar size and they are therefore identified as *D. giganteum*. The morphology of the specimens is summarized in Appendix 1.

p4 (Pl. 3, Fig. 3):
Localities Belvedere (Wien 3), Oswaldgasse (Wien 12), Hollabrunn

The p4 is bilophodont. The general form of the tooth is elongate; it is always longer than wide. An ectolophid connects the meta- and hypolophids. The metalophid is anteriorly concave, the hypolophid is straight and shallow. The anterior cristid extending from the metalophid is strong and curved and it forms a depression. The hypoconid touches the posterior cingulum. The cingulum is strongest anteriorly, but is often well pronounced also on the labial and posterior walls. Variation in p4 includes characters that provide accessory wear facets. The anterior cingulum strength varies from a slight anterior extension to a strong C-formed extension. A cingulum appears occasionally on the labial side, labial to the ectolophid. Expression of the posterior cingulum also varies. The morphology of the study specimens is summarized in Appendix 1.

m1:
Localities Leithagebirge, Belvedere (Wien 3), Laaerberg, Eibestal bei Mistelbach, Mannersdorf bei Angern

The tooth is trilophodont and elongate in form. Its morphology is similar to that of the deciduous d4. Each lophid has slightly pronounced, anteriorly extending cristae. On the labial side, however, the cristae continue medially, reaching the median valley, and are thus always in contact with the anterior transverse lophid. The cingulum is little developed on the anterior edge, but is well pronounced posteriorly. The median valleys are open on both sides, although some cingulum may be present on the labial side. Four roots are present: two larger ones under the anterior lophids and two smaller ones under the posterior lophid.

m2 (Pl. 3, Fig. 4):
Localities Altmannsdorf (Wien 12), Eichkogel bei Mödling, Wilfersdorf

The second lower molar is bilophodont and nearly rectangular (LI slightly below 1). The anterior cingulum is almost unobservable; it is usually visible as a rugosity of the anterior surface. The median valleys are open on both sides. The posterior cingulum is almost as wide as the hypolophid. Each cuspid has an anteriorly extending cristid. The cristids are only slightly developed; especially on the lingual side they are short and end slightly below the cuspids. The labial cristids extend anteromedially, continuing almost at the same level as the transverse lophid. Four roots are present. There are two anterior roots covering the whole anterior portion of the tooth. The posterior roots are of about equal size and are situated in the posterior portion of the tooth.

m3 (Pl. 3, Fig. 5, 6, 7):
Localities Bruck an der Leitha, Altmannsdorf (Wien 12), Wilfersdorf, Weikendorf bei Gänserndorf, Josefsberg bei Hollabrunn

The third molar is bilophodont and is in general view similar to m2. The character that distinguishes it from m2 is that the metalophid is slightly wider than the hypolophid and that the posterior cingulum extends farther posteriorly. Hardly any anterior cingulum is present. The median valleys are open on both sides. The posterior cingulum has different geometries, but it is characteristic that the cingulum is always somewhat labially displaced. The anterior cristids from each cuspid are similarly oriented as in m2. Three roots are present. The two anterior roots are under the metalophid. The third root has a shape that follows that of the posterior lophid and the posterior cingulum, making it triangular. The morphological differences of the study specimens are summarized in Appendix 1.

Toothrows (Pl. 4, Fig. 1):
Localities Laaerberg, Türkenschanze (Wien 18), Altmannsdorf Wilfersdorf, Breitenbrunn, Brunn am Steinfeld, Mistelbach, Schwechat, Kettlasbrunn

HARRIS (1975: 345) described the individual teeth in a deinothere toothrows divided into two functional batteries, the anterior battery being a "crushing" battery and the posterior being a "shearing" battery. The two batteries can be identified by their position in a toothrow: the anterior battery, p3-m1, is oriented in one straight row. The posterior battery, m2-m3, is separated from the anterior row by a slight angle. When a straight line is drawn from the posterior battery, it ends lingual to the anterior battery, and the opposite happens when a line is drawn from the anterior battery. In addition, the posterior dentition is lingually inclined ca. 15 degrees. In lateral view, the profile of the lower toothrow is convex dorsally. With advancing wear the angle is changed so that the anterior battery is ca. 10 degrees separate from the posterior battery. Wear in deinothere toothrows

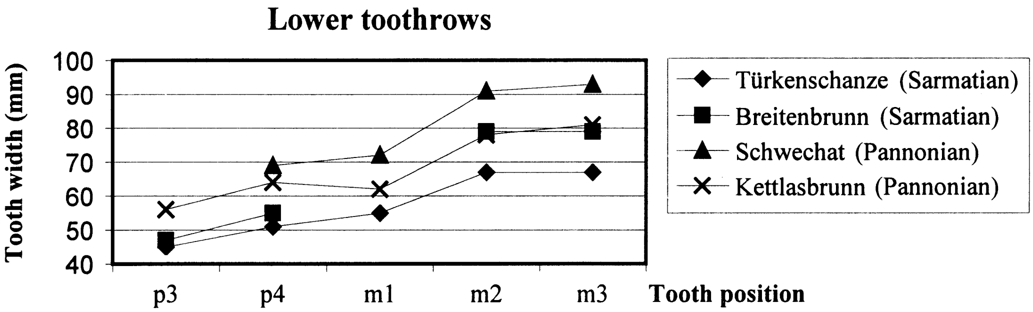

Fig. 3: Measurements for selected lower toothrows of *D. giganteum* from Lower Austria.

follows a virtually constant pattern after the eruption pattern: m1-p3-p4-m2-m3. The first molar (m1) is the first permanent tooth to erupt and HARRIS (1975) has suggested that its function changed with age. Hence, after eruption it acts as a posterior "shearing" tooth, but changes to an anterior "crushing" tooth after eruption of the posterior battery.

The study material has the general characters described by HARRIS (1975). Differences are in toothrow length and in the dimensions and morphology of the individual teeth. Toothrow length and the width of the individual teeth are listed in the Appendix 1. For the diagram below (Fig. 3), the included dimensions are those of the Kettlasbrunn, Türkenschanze, Breitenbrunn (Leithagebirge) and Schwechat specimens. Excluded are the specimens that consisted of only two to three teeth. As Fig. 3 shows, width of the individual teeth increases from anterior to posterior direction: p3 is the narrowest tooth, p4-m1 are of almost equal width and m2-m3 are of almost equal width. The toothrow from Türkenschanze is known to be Sarmatian and it is also the smallest one. All specimens are allocated to *Deinotherium*.

Due to different states of preservation and wear, the morphology of the individual teeth could be studied only in the following cases:

The Laaerberg toothrow has p3 with almost fused anterior cuspids, anteriorly only a short and shallow vertical depression is present. There is a C-shaped lophid from the hypoconid to entoconid. From the protoconid, a cristid runs to the anterior cingulum. The p4 has a strong anterior cingulum, a long valley and a labial cingulum. The m1-m2 do not have any distinctive structures. The toothrow gives additional information on the eruption pattern of the permanent teeth. The p3-p4 are still in the eruption phase in a nearly vertical position. The m1 bears wear facets and the m2 behind is fully erupted but unworn. This probaly means that the deciduous d2-d3 persisted longer than usual, the resorption of the deciduous roots was delayed and the eruption of the permanent premolars took place after the eruption of m2.

In the Kettlasbrunn toothrows (see also BACHMAYER & ZAPFE 1976), the preserved p3 has an ectolophid that has been worn down to expose dentine, but no vertical depression of the anterior wall is present and therefore the anterior conids are probably fused. The m2 on both sides is peculiar because of possible traces of cavities. In the median valley there is a deep circular depression. Their placement in the same tooth position and in the same place is unusual.

The Türkenschanze specimen has p3 with a separated, posteriorly displaced metaconid. The anterior cuspid is reduced and the entoconid inside the posterior cingulum.

The toothrows described here are very similar to each other and differ mainly in their dimensions. The variability in tooth width is similar to that of the isolated teeth. The p3 morphology in the study material points to a coexistence of the two morphologies in the Sarmatian to Pannonian. These toothrows belong among the large toothrows of *Deinotherium*.

Species: ***Prodeinotherium bavaricum*** **(von Meyer 1831)**

Description of the study material:

For material list, stratigraphy, measurements and morphology, see Appendix 1.

d4 (Pl. 1, Fig. 3):
Locality Grund

The tooth is trilophodont and its morphology is identical to a d4 of *Deinotherium*. It is distinguished by its small size.

P3 (Pl. 1, Fig. 4):
Locality Thallern

This tooth is distinguished from P3 of *Deinotherium* by its size. It is a nearly lophodont tooth with a complete proto- and metaloph. The tooth can be recognized as P3 and not as P4 because of the wear facet on the protoloph. In a P3, there is an individual wear facet caused by shearing action of the p3 ectolophid.

M1:
Locality Hollabrunn

This tooth is trilophodont and the morphology is identical to that of *Deinotherium*. The size of these specimens is, however, much smaller than that of *Deinotherium.*

M2 (Pl. 2, Fig. 2):
Localities Wilfersdorf, Mistelbach-Hollabrunner Schotterkegel

This tooth is bilophodont and morphologically identical to that of *Deinotherium*. The size of these specimens is, however, much smaller than that of *Deinotherium.*

M3:
Locality Wilfersdorf

This tooth is bilophodont and morphologically identical to *Deinotherium*. The size of the specimen is, however, smaller than that of *Deinotherium*.

p4 (Pl. 3, Fig. 3):
Locality Wilfersdorf

The specimen is recognized as a *Prodeinotherium* p4 because of its size. It has a straight anterior protocristid that is not curved and does not form a deep depression. Otherwise, the morphology is identical to that of *Deinotherium.*

Comparisons and discussion

The comparative material comes mainly from localities with known age (MN reference localities) and from some Late Miocene localities of Hungary and Bulgaria (for a locality list, see Appendix 2). Additional *Deinotherium* measurements from Africa and Turkey and the original measurements of "*D. gigantissimum*" (STEFANESCU 1894) are included in the discussions. As the size of the deinothere dentition is often used as a diagnostic character (GRÄF 1957, HARRIS 1973, 1978), the following comparisons attempt to demonstrate how the tooth size varies within and between localities (or MN Zones). Since only little material from each locality (or MN Zone) is available, the resulting morphological and metric estimates for definition of taxa are not based on sound statistical analysis. In any case, the summary statistics (Appendix 2) provides the first comparative dental metrics of deinotheres to have stratigraphic precision. The morphological comparisons (with quantitative analysis) were described in detail in HUTTUNEN (2000).

D3: The D3 morphology in the comparative material is conservative; only individual variation in the formation of the posterior cingulum is present. In the Bulgarian (Rogosen) specimen, the posterior cingulum has an asymmetric anterior extention. Otherwise the specimens all share the same bilophodont morphology. The length index increases slightly with tooth size, which means that width increases proportionately more than length. The MN9 (Deinotheriensande) and MN7/8 measurements confuse the pattern of the size increase as the measurements include both small and large specimens. It is therefore probable that both genera are present in these Zones. The teeth from Hollabrunn and Mannersdorf are among the large-sized specimens. The same tooth position from the MN10 of Turkey has dimensions of L57.6 and W57.5 (SANDERS, in press). Since no material from MN10 (Montredon) is present, this cannot be compared to the European material. Nevertheless, these measurements are intermediate between the measurements of this study and the Bulgarian and Hungarian (Polgardi) specimens. The Bulgarian specimen is separate from the MN4-MN9 sequence and reflects a strong metric differentiation from the other study material.

D4: No morphological characters separate the specimens from different stratigraphic zones. A nonmeasurable variation is in the cingulum strength on the anterior, lingual and posterior walls that contributes to the maximum length and width measurements. The metric comparisons show a continuous, proportionately constant size increase, where the specimens from Deinotheriensande include both small and large specimens. GRÄF (1957) pointed out that the lingual cingulum is often stronger than the labial cingulum and that the anterior cingulum is stronger than the posterior cingulum. In most teeth in this study, though, no lingual cingulum is present. WEINSHEIMER (1883) and ROGER (1887) have different opinions on the organization of the roots in D4 (illustrated in detail by GRÄF 1957), but no variation was recorded here. The MN10 specimen from the Sinap Formation of Turkey (SANDERS, in press) is incomplete, but is of similar dimensions as the largest specimen of this range. The small number of specimens does not allow a good estimation of a generic size limit, although it is assumed here that Deinotheriensande contains both *Prodeinotherium* and *Deinotherium*.

d2: The diagnostic characters of this tooth have not been described well earlier. GRÄF (1957) recorded two anterior cuspids that can be connected by a lophid and that a posterior hypolophid can be present. The comparative material from the European Miocene confirm that the morphology remained strikingly similar for both genera and that the characters given by GRÄF are in reality characters for the small-sized permanent p3. The only variation that can be recorded for the d2 is in size and in the occasional appearance of an accessory incipient cuspid between ento- and hypoconids. Metric comparisons show a continuous increase in size, with a slight length index increase with increasing size. Two d2 specimens of African *D. bozasi* from the Pliocene site of Laetoli, Tanzania, have maximum dimensions L33.3, W22.7 and L34.3, W31.3 (HARRIS 1987: 295); these are close to the maximum measurement of the Montredon (MN10) material. The morphology of the African specimens is also identical to the European material (HARRIS 1987: pl. 8.6). This shows that the deciduous material from the Pliocene of Africa and Late Miocene of Europe are very similar in morphology and dimensions. Based on these comparisons, the estimated maximum size for *Prodeinotherium* d2 is L28, W20 and the minimum size for *Deinotherium* d2 is L30, W22.

d3: This tooth has nearly always the same morphology, the same strong cristid that covers the anterior wall, and a long median valley. The morphology does not change other than in cingulum strength. The metric comparisons do not include many specimens, but a general size increase is observable. The Prottes specimen is nearly the same size as the large Hungarian (Baltavar) specimen and even larger than the MN10 (Montredon) specimen. The MN5 specimens are the smallest and MN7/8-MN9 specimens are of approximately the same size. A d3 specimen of *D. bozasi* from Laetoli has dimensions of L55.6, W41.2 (HARRIS: 1987: 295), which is comparable to the Prottes specimen and falls into the range of the Late Miocene material of Europe. The morphology is also similar to that of the European materials. A cautious size limit estimation is maximum L44, W32 for *Prodeinotherium* and minimum L54, W37 for *Deinotherium*.

d4: There is virtually no morphological variation in the trilophodont fourth deciduous tooth. The Grund specimen (*Prodeinotherium,* MN5) is within the range of measurements from Deinotheriensande. These specimens are in turn smaller than the MN10 and younger specimens. A generic size limit is difficult to give because material from one Hungarian locality (Baltavar) is even smaller than the MN10 specimen. MN9 sites generally contains small- and large-sized teeth and probably both genera. The d4 from Laetoli, Tanzania, has dimensions of L72.2, W41.2 and L73.8 and W50.5 (HARRIS 1987: 295). These measurements exceed the dimensions of the Montredon material of Europe, but are smaller than the Late Miocene specimen from Baltavar. The morphology of the African and European material does not differ. No size estimates are given, but the morphological and dimensional similarity of African Pleistocene *Deinotherium* and the European Late Miocene material strongly suggest that *Deinotherium* had a minimum length of at least 72.2.

Deciduous lower toothrow: The toothrow morphology is strikingly similar for all specimens. The tooth size (length of the toothrow and width of individual teeth) is variable, and the MN7/8 (La Grive, France) specimen is the smallest. If these measurements are compared to those of the isolated teeth the toothrows clearly exhibit tremendous size differences. The Montredon specimens are nearly similar in size whereas the Pannonian specimen from Wolfau is slightly larger. The Late Miocene locality Nessebar bears the largest individual teeth of a deciduous lower toothrow known so far.

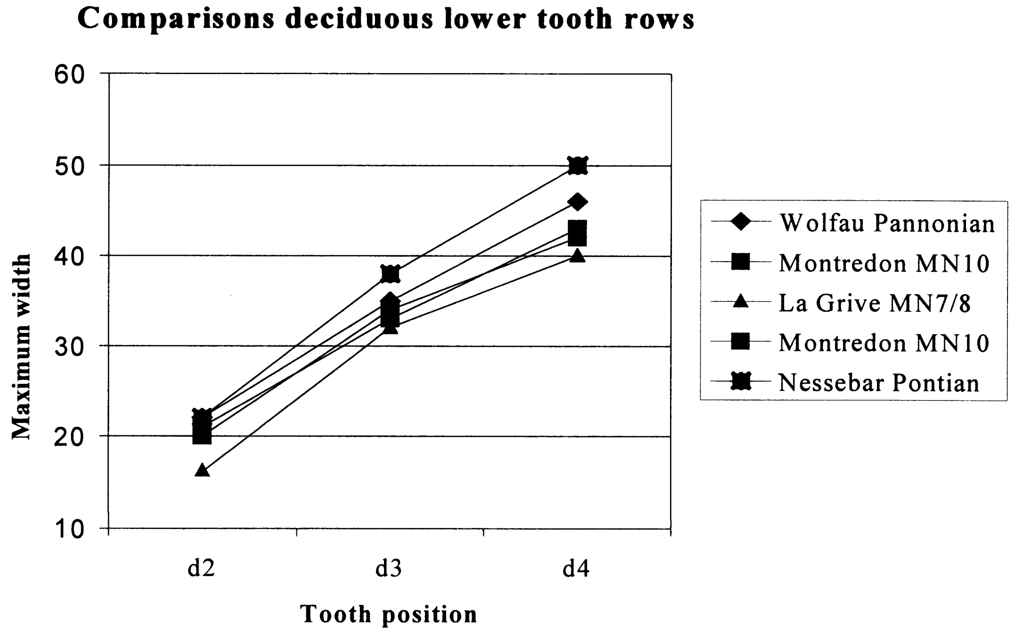

Fig. 4: Comparison diagram for the deciduous lower toothrows from Burgenland, France and Bulgaria (for toothrow descriptions, see DEPÉRET 1887, BAKALOV & NIKOLOV 1962, TOBIEN 1988).

P3: The morphological comparisons evaluated different morphological components. The morphological varieties were not restricted to any size classes, so that no evolutionary tendencies with size could be detected. Incomplete transverse lophs were more common than formation of complete lophs. Other characters such as styles were less common. The outer shape also varied from round to rectangular. Montredon (MN10) material, being from one locality, is currently best suited for a variation study (N=20). Here, a highly variabl e P3 morphology could be recorded (protoloph always present, metaloph variable) and this strengthens the idea that no morphological characters separate the genera. HARRIS (1978 [see diagnosis]) recorded that P3 tends to have accessory styles in *Deinotherium*. The presence of this character apparently did not vary between small- and large-sized teeth. The morphology of the study material is thus fairly usual for the European Miocene and the great variation is in conformity with the natural variation of both genera. Metric comparisons show a continuous increase, whereby the measurements from MN5, MN6 and MN7/8 are separate from MN10. The Late Miocene teeth from Bulgaria (Meschtitza, Noevici) are very large and outside the range of Montredon. The Deinotheriensande measurements are spread over both the large and small specimens. The Pannonian material from Lower Austria is within the range of MN9-MN10 except one specimen that is among the Middle Miocene material (*Prodeinotherium,* Thallern). The conclusion is that *Deinotherium* and *Prodeinotherium* P3 differ in stratigraphic distribution and size, but that both genera are present in MN7/8 and MN9. Morphological varieties occur, but the morph with incomplete loph is more common than the complete loph morphology.

P4: For this tooth, the morphological comparisons were done as for P3. Great variability was present, but the comparisons suggest that the protoloph and metaloph are nearly always complete. Other characters are less common. In the Montredon sample (N=19) the incomplete metaloph is more usual than the complete metaloph. There is no character variation with size increase. The presence of styles did not increase with size. The Lower Austrian material therefore shows great morphological variability in relation to the overall variation of the comparative material. Metric comparisons show that the material from Lower Austria and Burgenland is placed among teeth from several MN Zones. An overall pattern of size increase is present. The largest size is that of "*D. gigantissimum*". Overlapping metric variation are from the Zones MN7/8 and MN9 (Deinotheriensande), suggesting that both small- and large-sized individuals are found in MN7/8 localities in Deinotheriensande. The estimated generic size limit for the two genera (maximum for *Prodeinotherium* and minimum for *Deinotherium*) that is used for taxonomic determination of the Austrian material is thus circa L62, W65.

M1: This tooth has retained the same tritoloph morphology in all specimens. The maximum width of the tooth is either at the first or the second loph. The main morphological characters of interest were styles, posttritoloph ornamentation, or presence of accessory crista(e). Styles were rare, being present only in the large-sized teeth. Slight ornamentation of the posttritoloph surface is present both in large and small teeth. In metric comparisons, the Pannonian material of this study was placed among several MN Zones, and one specimen from Hollabrunn falls metrically among the small-sized *Prodeinotherium*. A closer study of the dimensions shows that the Early Miocene and MN5 material are separate from MN10 and younger zones, but that MN7/8 and MN9 (Deinotheriensande) overlap. "*D. gigantissimum*" has the largest dimensions for this tooth position. The material from Montredon shows great variability even within one locality.

M2: The term convolute was introduced by WEINSHEIMER (1883). Convolute refers to a depression situated in the contact point of the two posteriorly extending convolute (=coiled, twisted) cristae. However, according to WEINSHEIMER (1883) himself, the postmetaloph ornamentation lacks taxonomic significance. According to GRÄF (1957), though, the different postmetaloph characters can be used to distinguish species. Later, HARRIS (1973) considered the presence of the postmetaloph ornamentation to be an important character separating the two deinothere genera because he felt it is well pronounced in *Prodeinotherium* and reduced in *Deinotherium.* The diagnostic significance of postmetaloph ornamentation in M2 and M3 has not been studied before. Such ornamentation has functional significance because it enhances the durability against wear in contact with the anterior wall of the lower m3. In order to determine whether there was an evolutionary tendency in this feature (reduction of postmetaloph ornamentation with increasing size), the ranges of tooth length for five morphologies (no postmetaloph ornamentation, a tubercle or a small horizontal accessory crest present, the postmeta- and posthypocristae form a convolute, postmetaloph ornamentation, but hardly visible) were recorded. There is hardly any difference in the size ranges of the different postmetaloph morphologies, so any taxonomic differentiation based on this character is misleading. Size of the study material is spread over several MN Zones and the presence of two genera can be detected. Closer scrutiny shows that MN4 and MN5 material is separate in size from MN10, whereas the Middle MN7/8 and MN9 (Deinotheriensande) contain both small and large morphs. In addition, the Late Miocene specimens from Bulgaria (Noevci, Lujbovischte, Temelkovo) and the "*D. gigantissimum*" measurements are even larger than the material from MN10.

M3: The morphological comparisons correspond with those of M2. As in M2, no separate size groups could be recorded to accommodate the different forms of postmetaloph ornamentation. According to GRÄF (1957), postmetaloph ornamentation separates deinothere species: a so-called third transverse loph that runs almost parallel to the hypocone and ends at or above the lingual side of the convolute. This is also a diagnostic character of *D. giganteum* according to HARRIS (1973). The present study does not support any of these diagnoses as no evolutionary tendency of the postmetaloph ornamentation is present. The MN5 dimensions are smaller than those of MN7/8, MN10, and younger at circa L72, W75. The MN9 (localities of Deinotheriensande included) dimensions include both size morphs. The East European Late Miocene measurements are the largest ("*D. gigantissimum*" and localities Bötefa, Noevci). The study material contains both genera. Based on these comparisons, one specimen from Wilfersdorf belongs to *Prodeinotherium*.

Incisors: Unfortunately, not many complete tusks were available for comparisons and no clear trends can be demonstrated for the family. Nonetheless, the tusks were clearly variable and assigning them to a genus without knowing the lower dentition or other generic characters is not always possible. In general, the tusks of Proboscidea exhibit great dimorphism. The variable mandible morphology is also dependent on the tusk size, so that strongest tusks are found in large mandibles. It it likely that tusks grew throughout the lifetime of the individual.

The earliest interpretation of the functional importance of deinothere tusks is that of BUCKLAND (1835), who believed that this ("amphibian") animal needed the tusks to anchor itself on the riverbanks while sleeping in water. Not many other theories on the use of the tusks have been published since BUCKLAND's interpretation (see HARRIS 1975). Development of wear facets on different sides of the tusks and their variable form and strength suggest that there was no single mechanical purpose for which the tusks were used. The presence of wear facets on the medial and posterior sides and even at the tips of the tusks reflect a long-lasting, preferred wear mechanism. The wear was therefore potentially produced following an individual pattern or was dependent on the harshness of the local environment and vegetation. The smoothness of the wear facets also supports the interpretation that the tusks were not used for digging hard ground but rather for sorting vegetation.

p3: In the comparative material, the combination of parallel anterior conids with parallel posterior conids was common. The slightly fused anterior conids, where the metaconid is posteriorly displaced, was common with the a C-shaped posterior cingulum while the morphology with parallel anterior conids and C-shaped posterior cingulum was less common. A morphology with parallel anterior conids is found mainly in Early to Middle Miocene localities, whereas the slightly fused to fused morphology dominates the Middle to Late Miocene. After MN9, parallel conids disappear. This is the only deinothere tooth position that exhibits nearly consistent morphological change in different size classes and different MN Zones. The size comparisons show that the MN5 and MN7/8 materials are smaller than in MN10 and younger at circa L54, W32. The MN9

(Deinotheriensande) material include both small and large morphs. The large size of the Austrian specimens indicates that they all belong to *Deinotherium*, although their morphology (metaconid posteriorly displaced) is intermediate between *Prodeinotherium* and *Deinotherium*.

p4: The studied characters include those that were varialbe in the study material, such as protocristid strength or the depth of the depression formed by the anterior cingulum. (Although estimating strength of a structure is subjective, it was included in the characters studied.) No morphological change was recorded. A strong anterior cingulum and a labial cingulum are more common than the presence of a strong posterior cingulum. The ranges for the morphologies overlap and are also continuous, and no morphological tendencies could be detected. Five specimens of different size had an additional style in the median valley. In size comparisons, the MN5 and MN6 dimensions are smaller than those from MN10. Both MN7/8 and MN9 (Deinotheriensande) include small and large morphs. The comparisons show that one *Prodeinotherium* specimen was included in the study (locality Wilfersdorf); its identification was based solely on size.

m1: The morphology of this tooth also remained conservative. Any additional structure can be considered individual variation. In some teeth, the anterior proprotocristid and prometacristids are connected and form an "anterior convolute" with a small depression in the middle. In metric comparisons, the material from MN5 is smaller than that of MN 7/8, MN10 and younger, whereas MN7/8 and MN9 (Deinotheriensande) include both morphs. There are only two specimens from Montredon (MN10) and no variation within the locality can be detected. The relatively few specimens may also explain the minute gap between the dimensions, which leads to some separation of the taxa, although the material from both MN7/8 and MN9 follow this gap. A careful estimation of L71, W54 is given for metric separation of *Prodeinotherium* and *Deinotherium*.

m2: No meaningful morphological variation is present in m2. The Montredon material consists of five specimens only, which is too few to study the variation of one locality. The largest specimens of Hungary (Martonvasar-Tarnok) and Bulgaria (Mihajlovo) are clearly larger than the main comparative material. No clear metric limit between *Prodeinotherium* and *Deinotherium* is detected, but the study material is assigned to *Deinotherium* because of dimensional similarity with most Late Miocene material.

m3: The form of the posterior cingulum has been used as a diagnostic character by some authors (GRÄF 1957). The size of the posterior cingulum does have functional importance because a large posterior cingulum may serve as an additional wear surface in occlusion with M3 metaloph. The characters mentioned above were recorded in comparative material to test whether the differential geometries occur in different size classes. The size ranges for the characters show that the occurrence of a certain posterior cingulum type is not related to size. In metric comparisons, the MN5 and MN7/8 materials are found in one group. The MN9 (Deinotheriensande) material includes both size morphs. Montredon (MN10) yielded only three specimens. The largest measurements are those of the "*D. gigantissimum*" of Romania. The study material is placed among the smaller and larger specimens, but all specimens are identified as *Deinotherium*. The smallest specimen from Bruck a.d. Leitha is from the Pannonian/Sarmatian while the rest of the material is Pannonian. The comparisons are very unclear and no clear size limits for the two genera can be given in this study.

Conclusions

The dental comparisons of the European sample suggest that deinotherium tooth morphology is conservative and that only minor morphological differences exist. The metric comparisons show a continuous tooth size increase, although dimensions from the late Middle and early Late Miocene greatly overlap. The best dental character to identify species is in the lower p3. In *P. bavaricum* p3 the anterior proto- and metaconids are separate and parallel, whereas in *D. giganteum* p3 they are completely fused. There are also few large p3 specimens in which the fusion of the anterior conids is not complete. They were identified as *D. giganteum* in this study. The minor dental differences mentioned in the generic diagnoses of HARRIS (1973) do not apply for European Deinotheriidae.

The Austrian deinotherium finds of this study are of Middle and Late Miocene age or their age cannot be stated exactly. As a rule the Middle Miocene faunas (MN5-7/8) yielded small-sized *P. bavaricum* teeth while most of the large-sized *D. giganteum* fossils were Late Miocene (MN9-MN10). However, some late Middle Miocene (MN7/8) and early Late Miocene (MN9) sites yielded both small- and larger-sized deinotherium molars along with different morphs of p3.

Consequently the smaller-sized teeth and p3 morphs with parallel anterior conids from the Middle Miocene of Austria were identified as *P. bavaricum*, and the large-sized teeth and the p3 morphs with fused anterior conids from Late Miocene faunas were identified as *D. giganteum*. The large p3 specimens with two anterior conids from Burgenland were also identified as *D. giganteum*. The presence of small- and large-sized specimens from the late Middle Miocene to early Late Miocene localities may be interpreted in two ways. First, the species *P. bavaricum* and *D. giganteum* could have coexisted in the same area from the late Middle Miocene to early Late Miocene. The second possibility is that the stratigraphic position of the specimens (partly from old NHMW collections) was not determined correctly.

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D3	NHMW Number	Author	Stage	Locality (ÖK map no.; long.; lat.)	Side	Wear	L	W1	W2 W3 or Morphology	GENUS	LI
D3	1883/LXXXII/9		Sarm./Pann.	Mannersdorf b Leithagebirge (ÖK 78; 16°36'; 47°58')	d	1	42	39		*Deinoth.*	0,93
	2000z0003/0000		Pannonian	Hollabrunn (ÖK22; 16°04'; 48°33')	d	3	48	41		*Deinoth.*	0,85
d3	2000z0007/0000		Pannonian	Prottes (ÖK42; 16°44'; 48°,23')	d	4	55	42		*Deinoth.*	0,76
d4	2000z0004/0000		Badenian	Grund (ÖK22; 16°03'; 48°37')	s	2	58	32	33 34	*Prodeinoth.*	0,59
P3	1954/1948	ZAPFE 1948	Pannonian	Gaiselberg b Zistersdorf (ÖK25; 16°43'; 48°32')	d	4	69	69	No morphology recorded (worn)	*Deinoth.*	1,00
	2000z0005/0000	sk2585	Pannonian	Thallern (ÖK58; 16°17'; 48°03')	d	2	56	57	Protoloph present, metaloph is a half-loph	*Prodeinoth.*	1,02
	2000z0006/0000	sk2583	Pannonian	Enzersdorf b Mödling (ÖK59; 16°17'; 48°06')	s	1	72	72	Protoloph is absent, metaloph is absent	*Deinoth.*	1,00
	2000z0008/0000	sk2584	Pannonian	Eichkogel b Mödling (ÖK58; 16°17'; 48°03')	d	3	72	72	Protoloph is absent, metaloph is a half-loph	*Deinoth.*	1,00
	2000z0009/0000	sk2586	Pannonian	Josefsberg b Hollabrunn	s	3	74	69	Protoloph present, metaloph absent	*Deinoth.*	0,93
	1868/I/41	sk2601	Sarm./Pann.	Breitenbrunn, Bgld (ÖK78; 16°44'; 47°56')	s	3	65	67	Protoloph present, metaloph absent	*Deinoth.*	1,03
	1868/I/40	sk2602	Sarm./Pann.	Breitenbrunn, Bgld (ÖK78; 16°44'; 47°56')	d	3	69	69	Protoloph present, metaloph is a half-loph	*Deinoth.*	1,00
P4	2000z0011/0000	sk2600	Pann./Sarm.	Bruck ad Leitha (ÖK60; 16°46';48°01')	d	1	78	77	No morphology recorded (worn)	*Deinoth.*	0,99
	1887/VI/2	sk2604	Sarm./Pann.	Hof a Leithagebirge (ÖK77; 16°34';47°56')	s	3	66	*67	Metaloph is complete, protoloph is a half-loph	*Deinoth.*	1,02
	1977/1948	ZAPFE 1948	Pannonian	Gaiselberg b Zistersdorf (ÖK25; 16°43'; 48°32')	d	2	66	69	Metaloph is incomplete, protoloph is a half-loph	*Deinoth.*	1,05
	2000z0012/0000	sk2756	Pannonian	Mistelbach (ÖK24; 16°34'; 48°34')	d	2	74	77	Metaloph is incomplete, protoloph is complete	*Deinoth.*	1,04
	2000z0013/0000	sk2605	Pannonian	Mannesdorf b Angern (ÖK43; 15°50'; 48°23')	d	3	75	70	Metaloph is incomplete, protoloph is complete	*Deinoth.*	0,93
	1887/VI/31	sk2609	Sarm./Pann.	Breitenbrunn, Bgld (ÖK78; 16°44'; 47°56')	s	0	76	72	Metaloph absent, protoloph is incomplete, style present	*Deinoth.*	0,95
	1868/I/44	sk2603	Sarm./Pann.	Breitenbrunn, Bgld (ÖK78; 16°44'; 47°56')	s	3	60	67	Metaloph present, protoloph incomplete	*Deinoth.*	1,12
	1973/1597/1	BACHMAYER & ZAPFE 1972	Pannonian	Kohfidisch, Bgld (ÖK168; 16°21'; 47°10')	d	4	80	97	Metaloph is incomplete, protoloph is a half-loph	*Deinoth.*	1,21

	NHMW Number	Author	Stage	Locality (ÖK map no.; long.; lat.)	Side	Wear	L	W1	W2	W3 or Morphology	GENUS	LI
M1	2000z0014/0000	sk2619	Pannonian	Mannesdorf b Angern (ÖK43; 15°50'; 48°23')	d	4	97	89	87	71	*Deinoth.*	0,92
	2000z0016/0000	sk2621	Pannonian	Hollabrunn (ÖK22; 16°04'; 48°33')	s	3	77	62	64	52	*Prodeinoth.*	0,83
	2000z0017/0000	sk3661	?Pannonian	Ebendorf b Mistelbach (ÖK25; 16°35'; 48°33')	d	2	98	71	77	62	*Deinoth.*	0,79
	2000z0015/0000	sk2620	Pannonian	Mannesdorf b Angern (ÖK43; 15°50'; 48°23')	s	3	93	77	78	61	*Deinoth.*	0,84
	2000z0018/0000	sk2622	Pannonian	Bergau, Hollabrunn (ÖK23; 16°09'; 48°30')	d	2	85	72	73	62	*Deinoth.*	0,86
	2000z0019/0000	sk2623	?Karpatian	Pitten (ÖK106; 16°11'; 47°43')	s	3	85	71	71	54	*Deinoth.*	0,84
	2000z0022/0000		Pannonian	Josefsberg b Hollabrunn	d	2	86	72	74	67	*Deinoth.*	0,86
	1954/75		Sarmatian	Wiesen, Bgld (ÖK107; 16°20'; 47°44')	d	3	78	65	64	55	*Deinoth.*	0,82
	1973/1597/2		Pannonian	Kohfidisch, Bgld (ÖK168; 16°21'; 47°10')	s	4	106	*89	*89	*79	*Deinoth.*	0,84
M2	1848/XXI/22	sk2752	Pannonian	Sdgr Schmatz, Marxer Linie, Wien 3 (ÖK59; 16°22'; 48°12')	d	3	83	91	84	No postmetaloph ornamentation	*Deinoth.*	1,10
	1848/XIII/6	sk2631	Sarm./Pann.	Leithagebirge (ÖK78; 16°36'; 47°55')	s	2	81	87	84	A tubercle or a small horizontal ridge is present	*Deinoth.*	1,07
	1866/I/17	sk2595	Pannonian	Wienerbecken	d	2	81	84	78	Postmeta- and post-hypocristae form a circle	*Deinoth.*	1,04
	1977/1948		Pannonian	Gaiselberg b Zistersdorf (ÖK25; 16°43'; 48°32')	d	3	81	81	76	A tubercle or a small horizontal ridge is present	*Deinoth.*	1,00
	1957/318		Pannonian	Wilfersdorf (ÖK25; 16°38'; 48°35')	s	3	68	64	64	No postmetaloph ornamentation	*Prodeinoth.*	0,94
	2000z0020/0000	sk2634	Pannonian	Mannesdorf b Angern (ÖK43; 15°50'; 48°23')	s	2	92	0	0	No postmetaloph ornamentation	*Deinoth.*	0,00
	2000z0021/0000	sk2757	Pannonian	Paasdorf b Mistelbach (ÖK24; 16°32'; 48°32')	d	3	88	90	81	A style is present	*Deinoth.*	1,02
	1846.X.10	sk2642	Pannonian	Hohenwart b Mühlbach (ÖK21; 15°49'; 48°30')	s	1	0	0	105	No postmetaloph ornamentation	*Deinoth.*	0,00
	1841/X/5	sk2761	Pannonian	Wilfersdorf (ÖK25; 16°38'; 48°35')	s	4	96	100	90	No postmetaloph ornamentation, style present	*Deinoth.*	1,04
	2000z0023/0000		Pannonian	Wilfersdorf (ÖK25; 16°38'; 48°35')	d	2	72	76	71	A tubercle or a small horizontal ridge is present	*Deinoth.*	1,06

	NHMW Number	Author	Stage	Locality (ÖK map no.; long.; lat.)	Side	Wear	L	W1	W2	W3 or Morphology	GENUS	LI
	1908/VI/14	sk2758	Pannonian	Paasdorf b Mistelbach (ÖK24; 16°32'; 48°32')	d	3	81	83	89	No postmetaloph ornamentation, style present	*Deinoth.*	1,10
	1987/2		Pannonian	Mistelbach-Hollabrunner Schotterkegel	s	2	70	70	62	A tubercle or a small horizontal ridge is present	*Prodeinoth.*	1,00
	2000z0024/0000		Pann./Sarm.	Bruck ad Leitha (ÖK60; 16°46'; 48°01')	d	2	*83	77	78	No postmetaloph ornamentation	*Deinoth.*	0,94
	1973/1597/3		Pannonian	Kohfidisch, Bgld (ÖK168; 16°21'; 47°10')	s	3	*	*101	99	The postmetaloph ornamentation is hardly visible	*Deinoth.*	0,00
	2000z0025/0000		Pannonian	Mistelbach (ÖK24; 16°34'; 48°34')	d	1	81	90	79	A tubercle or a small horizontal ridge is present	*Deinoth.*	1,11
	2000z0026/0000		Pannonian	Mistelbach (ÖK24; 16°34'; 48°34')	s	2	0	0	81	The postmetaloph ornamentation is hardly visible	*Deinoth.*	0,00
	1887/VI/30		Sarm./Pann.	Breitenbrunn, Bgld (ÖK78; 16°44'; 47°56')	d	1	*74	85	76	No postmetaloph ornamentation	*Deinoth.*	1,15
	1878/SO/2	sk2576	Pannonian	Wolkersdorf (ÖK41; 16°31'; 48°23')	d	3	81	85	77	No postmetaloph ornamentation	*Deinoth.*	1,05
M3	2000z0028/0000	sk2753	Pannonian	Wienerbecken Wien 12	s	3	80	86	79	No postmetaloph ornamentation	*Deinoth.*	1,08
	2000z0029/0000		Pannonian	Angern (ÖK42; 16°49'; 48°22')	s	1	91	94	80	A tubercle or a small horihorizontal ridge is present	*Deinoth.*	1,03
	2000z0030/0000		Pannonian	Stratzing b Krems (ÖK38; 15°36'; 48°27')	d	2	79	*80	*65	No postmetaloph ornamentation	*Deinoth.*	1,01
	1859/I/4	sk2648	Pannonian	Wilfersdorf (ÖK25; 16°38'; 48°35')	s	3	76	74	64	A tubercle or a small horizontal ridge is present	*Prodeinoth.*	0,97
	2000z0031/0000	sk2715	Pannonian	Mannesdorf b Angern (ÖK43; 15°50'; 48°23')	d	2	92	109	0	A tubercle or a small horizontal ridge is present	*Deinoth.*	1,18
	1868/I/43		Sarm./Pann.	Breitenbrunn, Bgld (ÖK78; 16°44'; 47°56')	d	3	66	76	61	No postmetaloph ornamentation	*Deinoth.*	1,15
	1908/VI/14		Pannonian	Paasdorf b Mistelbach (ÖK24; 16°32'; 48°32')	s	2	78	0	0	Postmeta- and posthypocristae form a circle	*Deinoth.*	0,00
p3	1874/XXXIV/9	sk2697	Pannonian	Altmannsdorf, Wien 12	d	4	58	44		Anterior conids fused, no hypolophid	*Deinoth.*	0,76
	a)1818.XI.VVI.1	sk2691	Pann./Sarm.	Bruck ad Leitha (ÖK60; 16°46'; 48°01')	s	2	54	39		Anterior conids slightly fused, c-formed post. cinglum	*Deinoth.*	0,72

	NHMW Number	Author	Stage	Locality (ÖK map no.; long.; lat.)	Side	Wear	L	W1	W2	W3 or Morphology	GENUS	LI
	b)1818/XXXII/4	sk2692	Pann./Sarm.	Bruck ad Leitha (ÖK60; 16°46'; 48°01')	s	3	61	42		Anterior conids slightly fused, c-formed post. cinglum	*Deinoth.*	0,69
	1844/XXI/10	sk2693	Sarm./Pann.	Leithagebirge (ÖK78; 16°36'; 47°55')	d	2	65	*		Anterior conids parallel, anterior depression	*Deinoth.*	0,00
	D1884/3132		Sarmatian	Türkenschanze, Wien 18 (16°20'; 48°14')	d	4	59	39		Anterior conids fused, no hypolophid	*Deinoth.*	0,66
p4	1866/IX/13	sk2764	Pannonian	Belvedere Wien 3	s	3	77	57	55	Anterior cingulum short, anteromedially extended	*Deinoth.*	0,74
	2000z0032/0000	sk2754	Pannonian	Oswaldgasse, Wien 12	s	4	63	55	54	Anterior cingulum short, anteromedially extended	*Deinoth.*	0,87
	570/1963		Pannonian	Hollabrunn (ÖK22; 16°04'; 48°33')	d	2	67	*48	*48	Anterior cingulum and protocristid strong with an anterior depression	*Deinoth.*	0,72
	1859/I/1	sk2702	Pannonian	Wilfersdorf (ÖK25; 16°38'; 48°35')	d	3	58	47	48	Anterior cingulum short, anteromedially extended	*Prodeinoth.*	0,83
m1	1841/XIII/8	sk2730	Sarm./Pann.	Leithagebirge (ÖK78; 16°36'; 47°55')	d	3	*75	53	56	*56	*Deinoth.*	0,75
	1828/XXXVII/10	sk2710	Pannonian	Belvedere Wien 3 (ÖK ; 16°19'; 48°10')	d	3	88	*57	*58	*54	*Deinoth.*	0,66
	1828/XXXVII/11		Pannonian	Belvedere Wien 3 (ÖK ; 16°19'; 48°10')	d	2	84	56	58	54	*Deinoth.*	0,69
	1594/X/32		Pannonian	Laaerberg, Congeriensand (ÖK59; 16°23'; 48°09')	s	2	*	0	60	50	*Deinoth.*	0,00
	2000z0033/0000		Pannonian	Eibestal b Mistelbach (ÖK25; 16°36'; 48°35')	d	2	0	0	54	51	*Deinoth.*	0,00
	2000z0034/0000	sk2715	Pannonian	Mannesdorf b Angern (ÖK43; 15°50'; 48°23')	s	4	99	68	70	64	*Deinoth.*	0,00
m2	1874/XXXIV/8	sk2697	Pannonian	Altmannsdorf, Wien 12	d	3	71	64	64	33	*Deinoth.*	0,91
	1954/74		Pannonian	Steinbruch Wiess, Eichkogel b Mödling	d	3	76	66	65	45	*Deinoth.*	0,87
	I.a.8.b.46	sk2724	Pannonian	Wilfersdorf (ÖK25; 16°38'; 48°35')	s	3	79	72	70	42	*Deinoth.*	0,89
m3	2000z0035/0000		Pann./Sarm.	Bruck ad Leitha (ÖK60; 16°46'; 48°01')	d	2	74	65	60	An even posterior cirgulum with rugose surface	*Deinoth.*	0,88
	1874/XXXIV/7	sk2697	Pannonian	Altmannsdorf, Wien 12	d	2	80	67	60	Triangular posterior cirgulum with a small cupid	*Deinoth.*	0,84

NHMW Number	Author	Stage	Locality (ÖK map no.; long.; lat.)	Side	Wear	L	W1	W2	W3 or Morphology	GENUS	LI
1841/XIII/7	sk2725	Pann../Sarm.	Bruck ad Leitha (ÖK60; 16°46'; 48°01')	s	2	82	72	67	An even posterior cingulum with rugose surface	*Deinoth.*	0,88
I.a.8.b.46	sk2724	Pannonian	Wilfersdorf (ÖK25; 16°38'; 48°35')	s	3	90	76	66	Triangular posterior cingulum with a small cuspid	*Deinoth.*	0,84
2000z0036/0000	sk2723	Pannonian	Wilfersdorf (ÖK25; 16°38'; 48°35')	s	3	109	96	0	A posteriorly extended round-triangular cingulum	*Deinoth.*	0,88
2000z0037/0000		Pannonian	Weikendorf b Gänserndorf (ÖK42; 16°45'; 48°20')	s	2	114	100	97	An even posterior cingulum with rugose surface	*Deinoth.*	0,88
1925/IX/24	sk2726	Pannonian	Josefsberg b Hollabrunn	d	2	88	75	65	Triangular posterior cingulum with a small cuspid	*Deinoth.*	0,85

Lower tooth rows

NHMW Number	Author	Stage	Locality (ÖK map no.; long.; lat.)	Side	p3 W	p4 W	m1 W	m2 W	m3 W	L TR	GENUS
2000z0038/0000			Laaerberg, Belverere Sand (ÖK59; 16°23'; 48°09')	d	*	*	61	73	0	317	*Deinoth.*
2000z0039/0000	sk2564	Sarmatian	Türkenschanze, Wien 18 (16°20'; 48°14')	s	45	51	55	67	67	335	*Deinoth.*
2000z0040/0000		Sarmatian	Türkenschanze, Wien 18 (16°20'; 48°14')	s	0	0	*	76	79	255	*Deinoth.*
2000z0042/0000	sk2696	Pannonian	Altmannsdorf, Wien		44	0	0	64	77	0	*Deinoth.*
ZAalaJb47	sk2724	Pannonian	Wilfersdorf (ÖK25; 16°38'; 48°35')	s	0	0	0	74	77	190	*Deinoth.*
2000z0043/0000		Sarm./Pann.	Breitenbrunn, Bgld (ÖK78; 16°44'; 47°56')	s	47	55	*	79	79	305	*Deinoth.*
2000z0043/0000		Sarm./Pann.	Breitenbrunn, Bgld (ÖK78; 16°44'; 47°56')	d	47	55	0	0	0	104	*Deinoth.*
1883/C/4180	sk2567		Brunn am Steinfeld	d	0	0	*59	*73	*	265	*Deinoth.*
1883/C/4180	sk2567		Brunn am Steinfeld	d	0	*60	*	*	0	200	*Deinoth.*
2000z0044/0000	sk2574	Pannonian	Mistelbach (ÖK24; 16°34'; 48°34')	s	0	0	0	79	79	0	*Deinoth.*
2000z0045/0000		Pannonian	Schwechat (ÖK59; 16°28'; 48°08')	d	0	69	72	91	93	390	*Deinoth.*
1973/1620	Bachmayer & Zapfe 1976	Pannonian	Kettlasbrunn (ÖK25; 16°39'; 48°33')	d	56	64	62	78	81	391	*Deinoth.*
1973/1620	Bachmayer & Zapfe 1976	Pannonian	Kettlasbrunn (ÖK25; 16°39'; 48°33')	s	56	64	62	78	81	*	*Deinoth.*

Upper tooth rows (L=length, W=width, L TR= length tooth row)

NHMW Number		Stage	Locality (ÖK map no.; long.; lat.)	Side	W P3	W P4	W M1	W M2	W M3	L TR	GENUS
2000z0046/0000		Pannonian	Brunn-Vösendorf (ÖK59; 16°17'; 48°06')	s	0	77	78	0	0	156	*Deinoth.*
2000z0046/0000		Pannonian	Brunn-Vösendorf (ÖK59; 16°17'; 48°06')	d	0	0	77	0	0	0	*Deinoth.*

Lower tooth rows juvenile

NHMW Number	Stage	Locality (ÖK map no.; long.; lat.)	Side	W d2	W d3	W d4	W M1	L TR	GENUS
1897/I/33	Pannonian	Wolfau, Burgenland (ÖK137; 16°05'; 47°14')	d	22	35	46	0	158	*Deinoth.*

Incisors	Author	Stage	Locality (ÖK map no.; long.; lat.)	Side	L1	wspr	wtpr	ws10	wt10	ws20	wt20	ws30	wt30	ws40	wt40
2000z0047/0000	sk2674	Pannonian	Paasdorf b Mistelbach (ÖK24; 16°32'; 48°32')	s	frag	260	104	0							
1961/407		Pannonian	Prottes (ÖK42; 16°44'; 48°23')	frag	*	57	49								
2000z0049/0000	sk2665	Sarmatian	Brunn am Steinfeld	?d	220	129									
1874/XXXIV/11	sk2667	Sarmatian	Hernals b Wien 17	frag	240	87									
1886/XVII/18	sk2667	Sarmatian	Türkenschanze (Wien 18)	d	270	96									
1886.XVII.17	sk2667a-b	Pannonian	Mauer b Wien (ÖK58; 16°16'; 48°09')	frag	*	83									
2000z0050/0000		Pannonian	Hetzendorf (Wien 12) (ÖK58; 16°18'; 48°09')	s	380	83	60	54	70	63	88	75			
2000z0051/0000	sk2658	Sarmatian	Türkenschanze (Wien 18)	s	220			73		72					
2000z0051/0000	sk2658	Sarmatian	Türkenschanze (Wien 18)	d	200			72							
1973/1620		Pannonian	Kettlasbrunn (ÖK25; 16°39'; 48°33')	s	740	156	119	0	0	0	0	109	92	124	99
1973/1620		Pannonian	Kettlasbrunn (ÖK25; 16°39'; 48°33')	d	1010	156	119	74	65	91	80	109	92	124	99

Abbreviations for incisor measurements: wspr = sagittal width proximal, wtpr = transverse width proximal, ws = sagittal width, at = cm from the incisor alveole, wt = transverse width

Appendix 2. Comparisons: summary statistics from other European Deinotheriidae localities (mm).

Element			**MN5**	**MN6**	**MN7/8**	**DS**	**MN10**	**Hungary**	**Bulgaria**	***D. gigantissimum***
D2	**L**	**X**	29		41	37 (3)	41 (2)			
		OR				36-40	40-42			
	W	**X**	25		27	32 (3)	36 (2)			
		OR				32-35	35-37			
D3	**L**	**X**	35		46 (4)	43 (10)			69	
		OR			42-48	38-49				
	W	**X**	29		45 (4)	40 (10)		71	63	
		OR			44-46	34-46				
D4	**L**	**X**	51			61 (8)	71 (3)			
		OR				48-68	70-73			
	W	**X**	35			48 (7)	54 (4)		60	
		OR				45-52	52-58			
P3	**L**	**X**	49 (10)	54	41	70 (34)	78 (20)	91	94 (2)	
		OR	45-53			45-92	71-86		90-94	
	W	**X**	50 (9)	56	37	69 (34)	78 (19)	98 (2)	93 (2)	
		OR	43-59			46-85	72-83	91-104	91-98	
P4	**L**	**X**	51 (10)		61 (2)	64 (37)	71 (17)	75 (3)	83	87
		OR	43-59		59-63	53-78	62-79	67-80		
	W	**X**	55 (10)		72 (2)	71 (36)	81 (17)	85 (3)	97	96
		OR	45-61		67-77	55-86	70-88	74-92		
M1	**L**	**X**	65 (5)		65	80 (20)	95 (9)	99 (4)	69	115
		OR	56-74			68-100	88-105	90-107		
	W1	**X**	52 (6)		45	67 (19)	79 (10)	84 (3)	62	93
		OR	47-56			53-80	69-86	82-86		
	W2		51 (6)	66	49	66 (16)	78 (9)	85 (3)	62	92
		OR	45-58			57-79	70-85	81-93		
	W3		44 (6)	56	44	54 (16)	65 (9)	68 (3)	58	83
		OR	41-46			44-66	46-61	65-70		
M2	**L**	**X**	62 (14)	68		76 (13)	87 (14)	100 (2)	89 (5)	114
		OR	52-75			59-89	76-94	96-104	64-107	
	W1	**X**	62 (14)	70		77 (13)	89 (14)	103 (2)	91 (5)	111
		OR	55-70			60-88	75-102	101-104	58-106	
	W2	**X**	58 (14)	64		73 (12)	85 (14)	99 (2)	87 (5)	114
		OR	50-68			58-85	77-94	97-101	64-105	
M3	**L**	**X**	60 (4)	62		73 (26)	81 (6)	103	97 (3)	115
		OR	54-66			59-95	69-89		91-103	
	W1	**X**	59 (4)			78 (26)	87 (6)	92	105 (3)	114
		OR	55-64			62-103	76-101		97-113	
	W2	**X**	53 (4)	54		67 (24)	77 (6)	82	89 (3)	107
		OR	49-55			54-88	66-84		86-92	
d2	**L**	**X**			27 (3)		32 (6)			
		OR			27-28		30-33			
	W	**X**			19 (3)		23 (6)			
		OR			18-20		22-24			
d3	**L**	**X**	35		45 (3)		54	60		
		OR	35		44-46					
	W	**X**	24		31 (3)		37	43		
		OR	22-25		30-32					
d4	**L**	**X**	49			64 (3)	76 (2)	77 (2)	56	
		OR				62-66	74-78	67-86		
	W	**X**	28 (3)			38 (3)	45 (2)	47 (2)	53	
		OR	26-44			35-40	44-45	40-54		
p3	**L**	**X**	41 (8)	57	44	54 (35)	65 (8)	80 (3)		90
		OR	35-49			38-72	58-74	74-83		
	W	**X**	31 (8)	54	37	42 (35)	52 (8)	65 (3)		63
		OR	20-37			32-56	49-58	62-68		

Element			MN5	MN6	MN7/8	DS	MN10	Hungary	Bulgaria	*D. gigantissimum*
p4	**L**	**X**	51 (9)		64	65 (23)	74 (7)	70 (4)	91 (2)	90
		OR	46-61			49-77	68-79	65-73	87-103	
	W1	**X**	40 (9)		44	51 (23)	57 (8)	63 (4)	69 (2)	72
		OR	35-44			41-65	49-59	55-71	62-76	
	W2	**X**	42 (8)		49	52 (23)	60 (6)	58 (2)	73 (2)	73
		OR	38-48			40-64	56-64	58	67-79	
m1	**L**	**X**	63 (6)		86	83 (15)	92 (2)	79 (3)		
		OR	56-70			68-91	90-94	68-98		
	W1	**X**	41 (6)		54	56 (14)	63 (3)			
		OR	37-43			50-65	58-69			
	W2	**X**	43 (6)		56 (2)	59 (13)	64 (6)	72 (2)		
		OR	39-48		55-57	49-62	60-69	71-72		
	W3	**X**	39 (6)		52 (2)	53 (13)	60 (5)	68 (3)		
		OR	34-46		50-53	45-60	58-64	66-71		
m2	**L**	**X**	65 (12)	78		78 (17)	80 (3)	91 (6)	103	
		OR	56-74			64-104	78-81	58-120		
	W1	**X**	53 (13)	69		68 (16)	72 (3)	82 (4)	81	
		OR	48-62			54-87	69-75	75-90		
	W2	**X**	53 (12)	63		68 (16)	65 (3)	78 (5)	88	
		OR	46-60			49-75	63-68	72-82		
	Wci	**X**	36 (11)	45		48 (12)	47 (3)	59 (5)	64	
		OR	30-41			26-50	43-52	55-61		
m3	**L**	**X**	66 (11)	90 (2)	78	83 (19)	78 (3)	91 (2)	91	120
		OR	61-76	82-97		67-104	84-90	83-98		
	W1	**X**	53 (10)	70 (2)	61	68 (19)	78 (3)	68	97	101
		OR	48-61	68-71		50-87	73-82			
	W2	**X**	49 (10)	64 (2)	57	62 (19)	75 (3)	68 (2)	86	90
		OR	44-51	59-69		49-75	72-79	64-72		
	Wt	**X**	33 (10)	42 (2)	40	41 (18)	53 (3)	47 (2)		59
		OR	29-37	32-52		26-51	48-56	43-50		

Measurements MN5-MN10 and Late Miocene from HUTTUNEN (2000)

MN5 - Pontlevoy, France

MN6 - Sansan, France

MN7/8 - La Grive, France (descriptions in DEPÉRET 1887)

DS (MN9) - Deinotheriensande, Germany (descriptions in GRÄF 1957)

MN10 - Montredon, France (descriptions in TOBIEN 1988)

Hungary - several localities (Baltavar, Bötefa, Kemendollar, Köbanya Hofhauser Brickyard, Martonvasar-Tarnok, Pannonhalma, Polgardi, Sopron Boor Sandpit) all Late Miocene (descriptions in GASPARIK 1993)

Bulgaria - several localities (Archar, Zhabarsko, Ijarebichna, Izgrev, Kutina, Kuschmanci, Lujbovischte, Meschtitza, Mihajlovo, Noevci, Novo Selo, Rogosen, Povelyanovo, Temelkovo) Late Miocene-Pliocene (some descriptions in BAKALOV & NIKOLOV 1962)

D. gigantissimum - Measurements from STEFANESCU (1899: 117-125)

Abbreviations: OR = observed range, X = mean (number in paranthesis indicates the sample size), L = length, W = width, Wci = width posterior cingulum, Wt = width talonid

Plate 1

Deinotherium giganteum

Fig. 1: D3 d., occlusal, Mannersdorf bei Leithagebirge, NHMW 1883/LXXXII/9. – x 0.5.

Fig. 2: d3 s., occlusal, Prottes, NHMW 2000z0007/0000. – x 0.5.

Prodeinotherium bavaricum

Fig. 3: d4 s., occlusal, Grund, NHMW 2000z0004/0000. – x 0.5.

Fig. 4: P3 d., occlusal, Thallern, NHMW 2000z0005/0000. – x 0.5.

Deinotherium giganteum

Fig. 5: P3 s., occlusal, Enzersdorf bei Mödling, NHMW 2000z0006/0000. – x 0.5.

Fig. 6: P4 d., occlusal, Mistelbach, NHMW 2000z0012/0000. – x 0.5.

Fig. 7: P4 d., occlusal, Mannersdorf bei Angern, NHMW 2000z0013/0000. – x 0.5.

Fig. 8: P4 d., occlusal, Bruck an der Leitha, NHMW 2000z0011/0000. – x 0.5.

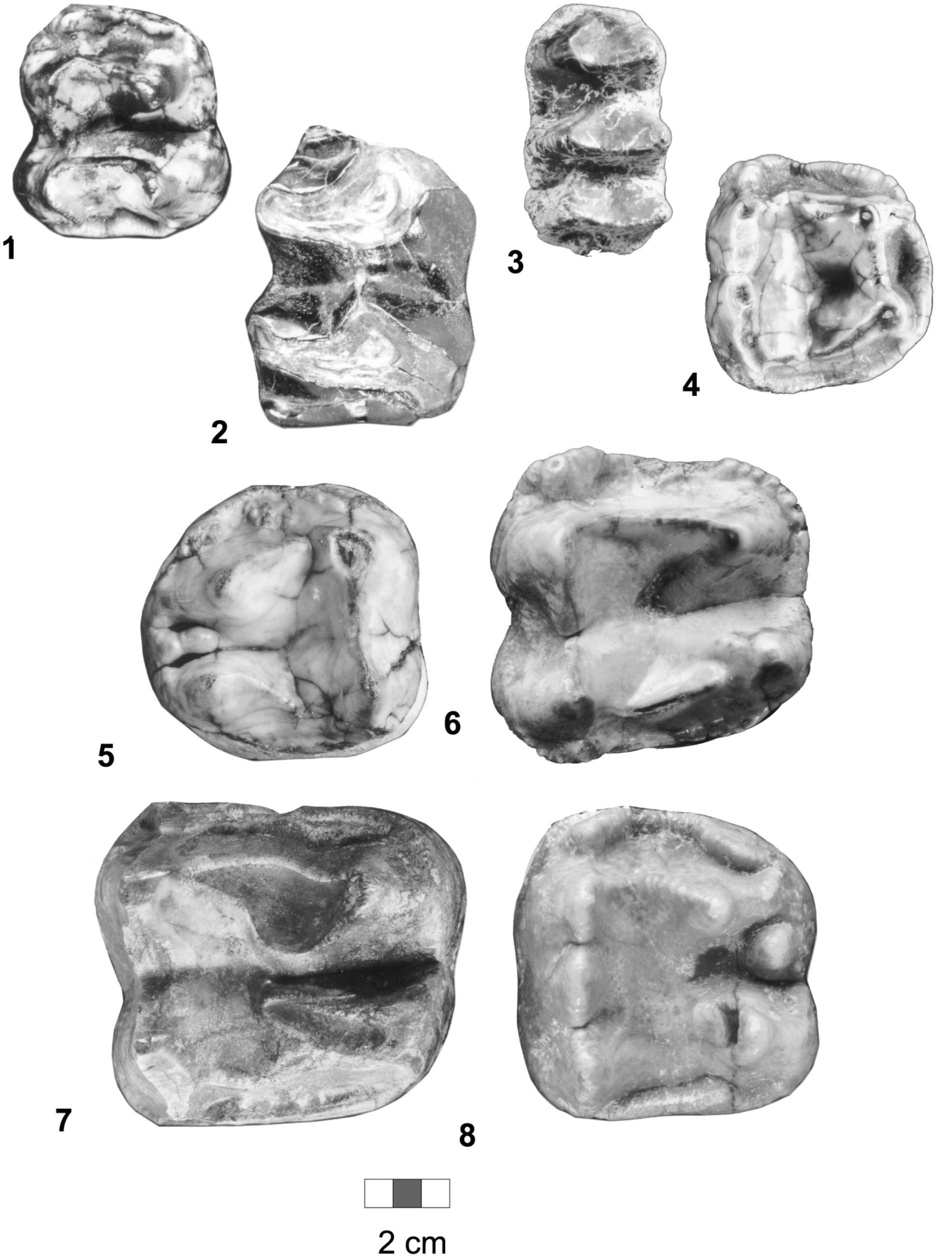

1
2
3
4
5
6
7
8
2 cm

Plate 2

Deinotherium giganteum

Fig. 1: M1 d., occlusal, Ebendorf bei Mistelbach, NHMW 2000z0017/0000. – x 0.75.

Prodeinotherium bavaricum

Fig. 2: M2 s., occlusal, Mistelbach-Hollabrunn, NHMW 1987/2. – x 0.75.

Deinotherium giganteum

Fig. 3: M3 d., occlusal, Mannersdorf bei Angern, NHMW 2000z0031/0000. – x 0.75.

Fig. 4: p3 d., occlusal, Bruck an der Leitha, NHMW 1818/XXXII/4. – x 0.75.

Fig. 5: p3 s., occlusal, Bruck an der Leitha, NHMW 1818/XXXII/1. – x 0.75.

Fig. 6: p3 d., occlusal, Altmannsdorf, NHMW 1874/XXXIV/9. – x 0.75.

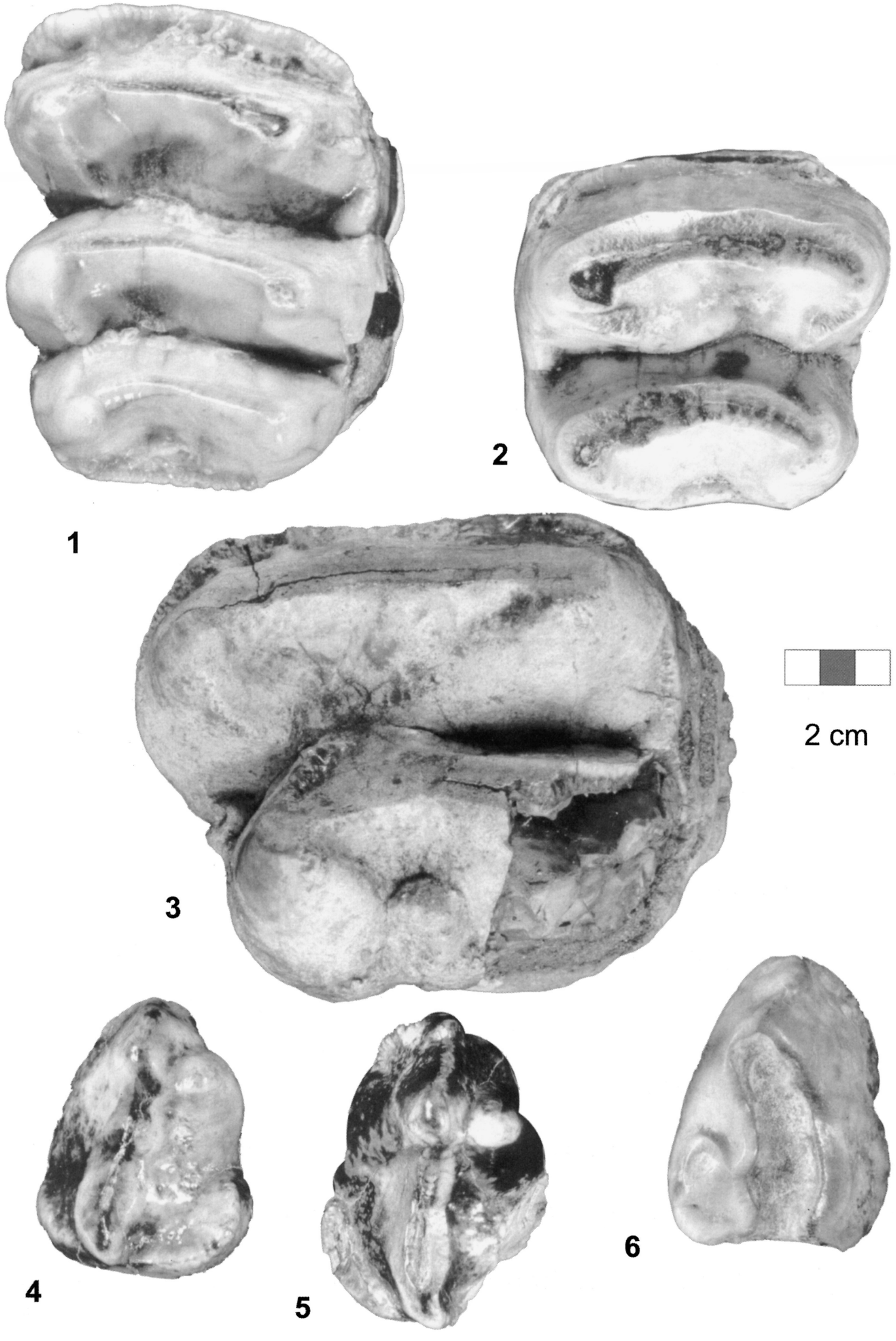

1
2
3
2 cm
4
5
6

Plate 3

Deinotherium giganteum

Fig. 1: p3 d., occlusal, Türkenschanze, NHMW D1884/XXI/10. – x 0.75.

Fig. 2: p3 d., occlusal, Leithagebirge, NHMW 1844/XX/10. – x 0.75.

Prodeinotherium bavaricum

Fig. 3: p4 s., occlusal, Wilfersdorf, NHMW 1859/I/1. – x 0.75.

Deinotherium giganteum

Fig. 4: m2 s., occlusal, Wilfersdorf, NHMW Ia.8.b.46. – x 0.5.

Fig. 5: m3 s., occlusal, Weikendorf bei Gänserndorf, NHMW 2000z0037/0000. – x 0.5.

Fig. 6: m3 d., occlusal, Bruck an der Leitha, NHMW 1841/XIII/7. – x 0.5.

Fig. 7: m3 d., occlusal, Josefsberg bei Hollabrunn, NHMW 1925/IX/24. – x 0.5.

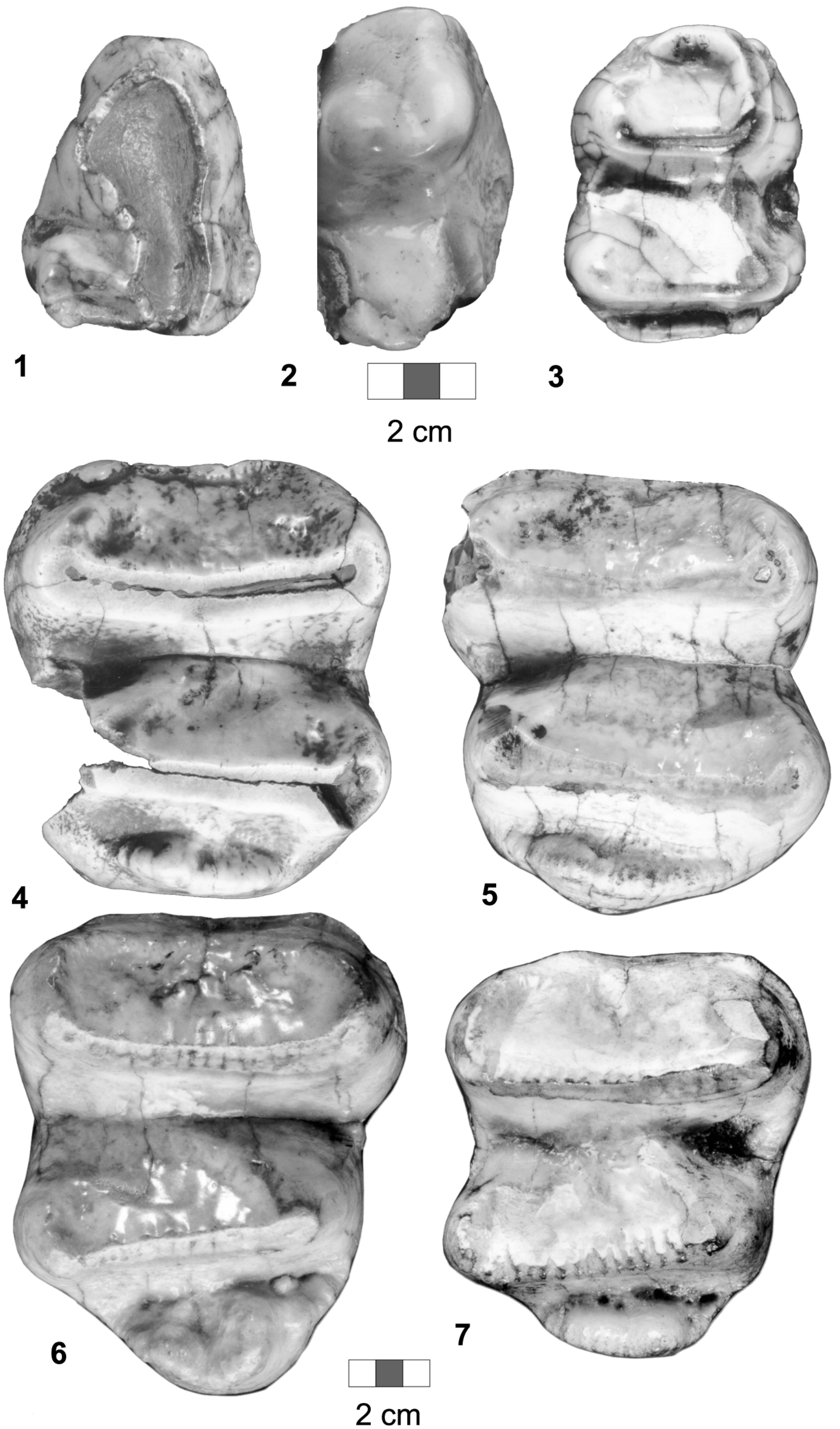

1
2
3
2 cm
4
5
6
7
2 cm

Plate 4

Deinotherium giganteum

Fig. 1: toothrow p3-m2 d., labial, Laaerberg bei Wien, NHMW 2000z0038/0000. – x 0.30.

Fig. 2: toothrow d2-d4 d., occlusal, Wolfau, NHMW 1897/I/42. – x 0.68.

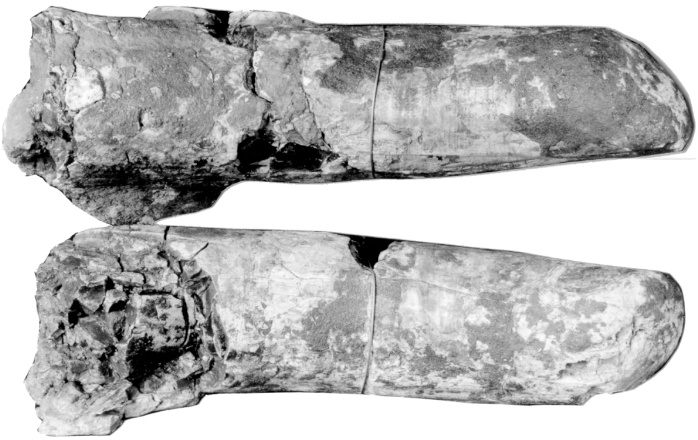
Fig. 3: lower incisors s, d. posterior, Türkenschanze, NHMW 2000z0050/0000. – x 0.26.

10 cm

1

2

10 cm



3

10 cm