

# About teeth of *Deinotherium giganteum* Kaup from eastern Paratethys\*



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**ABSTRACT:** Teeth and lower jaws of a partial skeleton of *Deinotherium* from the Lower Don region (south of Russia) are described. The skeleton was discovered in Late Miocene alluvial sands which age was determined as terminal Meotian – Lower Pontian. The sample was attributed to *Deinotherium giganteum* which is typical for Late Miocene basing on dental characteristics and teeth size. It is shown that findings of *D. giganteum* from Eastern Europe are slightly bigger than other known representatives of that species from Western Europe.

**Key-words:** Eastern Paratethys, *Deinotherium giganteum*, Late Miocene, dental characteristics.

**ΠΕΡΙΛΗΨΗ:** Τα δόντια και η κάτω σιαγόνα ενός τμήματος του σκελετού του *Deinotherium* από την περιοχή Lower Don (νότια Ρωσία) περιγράφονται. Ο σκελετός βρέθηκε μέσα σε αλλουβιακές άμμιους του Ανωτέρου Μειοκαινού και χρονολογήθηκε ως Ανώτερο Μαιότιο – Κατώτερο Πόντιο. Το δείγμα αποδόθηκε στο *Deinotherium giganteum* το οποίο είναι τυπικό για το Ανώτερο Μειόκαινο βάσει των οδοντικών χαρακτηριστικών και του μεγέθους των δοντιών. Αποδεικνύεται ότι τα ευρήματα του *D. giganteum* από την Ανατολική Ευρώπη είναι ελαφρώς μεγαλύτερα από άλλους γνωστούς αντιπροσώπους αυτού του είδους από τη υτική Ευρώπη.

**Λέξεις-κλειδιά:** Ανατολική Παρατηθύς, *Deinotherium giganteum*, Ανώτερο Μειόκαινο, οδοντικά χαρακτηριστικά.

## INTRODUCTION

In August of 1982 some bones of large *Deinotherium* were excavated in the Obuhovka sand pit (Fig. 1). That locality is situated on the high terrace of the Paleo-Don in 1.5 km to the west from Yanov khutor (Rostov region, Russia) on the right bank of the Grushevka River (the confluent of the Tuzlov River). The excavations were realized by collaborators of Azov local museum. Most part of bones was laid in anatomical sequence (Fig. 2). Skeleton was destroyed partly during its extracting. This find is important because of well preserved teeth were discovered jointly with the most part of the postcranial elements. There were some short publications about this finding (BAJGUSHEVA & TISHKOV, 1998; BAJGUSHEVA, 1998). Nowadays all remains were restored and the specimen is exhibiting in Azov local museum (Northeast Sea of Azov Region, Russia).

## GEOLOGY AND STRATIGRAPHY OF THE LOCALITY

*Deinotherium*'s remains were discovered in the sand



Fig. 1. The geographical position of *Deinotherium* locality in Obuhovka sand pit in the Lower Don Region.

thickness under the Upper Miocene Lower Pontian limestone on the depth 5.4 – 7.1 m. Those beds were considered to Meotian stage of Eastern Paratethys on the base of their stratigraphic location between Lower Pontian and Sarmatian deposits (ZHIZHCHEKOV *et al.*, 1940). V.V. BOGATCHEV

\* Σχετικά με τα δόντια του *Deinotherium giganteum* KAUP από την Ανατολική Παρατηθύ.

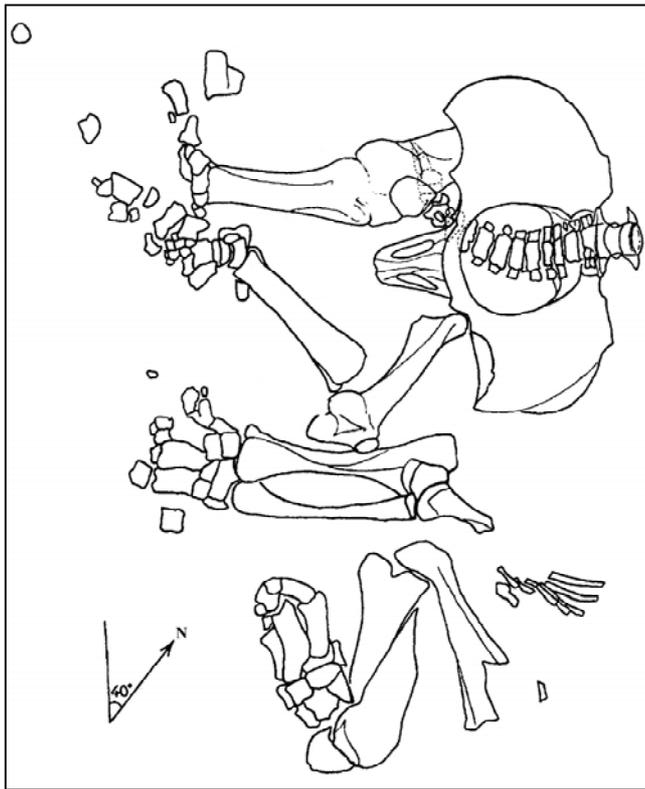


Fig. 2. The scheme of the disposition of *Deinotherium giganteum* remains at the excavated area of Obuhovka sand pit in 1982.

(1941) determined remains of *Mammuth borsoni*, "*Palaeoryx longicephalus*" and *Deinotherium gigantissimum* from those sands and dated them by the same age. These alluvium layers were attributed to the Upper Sarmatian-Meotian Yanov formation of Lower Don Region by G.N. RODZIANKO (1986). Not far from this place near Aksay town (Rostov Region, Russia) in the similar stratigraphic position in arenaceous limestone which are situated between Upper Sarmatian and Lower Pontian limestone the Lower Meotian mollusk's fauna was discovered. V.S. BAJGUSHEVA determined some specimens from these beds which were collected earlier and now they are kept in the collection of Novocherkassk museum of Don Cossacks History (NMDCH). There teeth of *Mammuth borsoni* are prevailed (NMDCH, No. 89, 103, 314, 317, 326). There are remains of *Deinotherium* (NMDCH, No. 310) and *Diceros* cf. *pachignatus* (NMDCH, No. 225).

It seems that the animal association from Yanov sand formation refers to Late Meotian-Pontian Tavrian Faunal Unit of Northern Black Sea Region (by KOROTKEVICH, 1988). In this complex the first appearance of *Mammuth borsoni* is recorded. According to E.L. KOROTKEVICH (1988), in earlier associations remains of *Turicius turicensis* (= *Zygodolophodon turicensis*) and *Tetralophodont longirostris* were typical (in Novoelizavetovskiy and Belkinskiy Faunal subcomplexes of Early and Middle Meotian) or mastodon's finds were rare and unrepresentative

(Cherevichansky mammal subcomplex of Meotian). Unfortunately Tavrian Faunal Unit is insufficiently studied. There are no representative localities of that age in Northern Black Sea Region. Few finds are known from Lower Pontian limestone only.

Based on biostratigraphy data we suppose the age of Yanov formation sands as pre-Pontian or terminal Meotian. According to M.A. PEVZNER *et al.* (2003) these deposits are correlated with the upper part of the Tortonian and with an upper part of Zone MN12.

## PALEONTOLOGY

Order PROBOSCIDEA ILLIGER, 1811

Family Deinotheriidae BONAPARTE, 1845

Genus *Deinotherium* KAUP, 1829

*Deinotherium giganteum* KAUP, 1829

### Material:

Cranium's fragments with 2 upper teeth  $M^2$  and  $M^3$ , lower jaws with teeth without tusks, 4 cervical, 12 tail vertebrae, sacrum, costae fragments, and a part of right scapula, entire pelvis, and almost all bones of extremities. Collection of Azov historical-archeological and paleontological museum (AMZ, No. KP-26579).

### Description

#### Upper jaw:

The left maxilla with  $M^2$  and  $M^3$  and roots of  $M^1$  are preserved. Above roots of destroyed  $M^1$  in the upper jaw there is the significant depression (150.0x130.0 mm). The anterior edge of choana is on the level of the first loph of  $M^3$ . The labial surface of the bone over teeth is relief and repeats root's outlines. The adjoining of  $M^2$  and  $M^3$  is incomplete. The crown of  $M^3$  is situated at the angle to the previous tooth (Plate 1).

The alveolar length of  $M^1$  is about 120.0 mm, width – 90.0 mm. In the crown of  $M^2$  the labial length (94.6 mm) is smaller than lingual one (104.0 mm). The width of the anterior loph (protoloph) is 114.6 mm and posterior one (metaloph) – 113.4 mm. The front cingulum is on the all area of the touching with  $M^1$ . The posterior cingulum is more slender than the anterior one. The roughness of enamel is situated on the inner side between lophes. The same roughness is seen on the posterior part of both lophes. On the caudal part of the crown it is joined with the posterior cingulum. The labial part of the crown is higher than lingual one. The occlusal surface of tooth is grinding off obliquely. The enamel thickness is 5.2 mm.

$M^3$  is less eroded than  $M^2$ . In comparison with  $M^2$  it is narrower caudally. The chewing surface is grinding off obliquely. Lophes are drawn together, more on the external part of the crown. Labial and lingual sides of lophes are turned

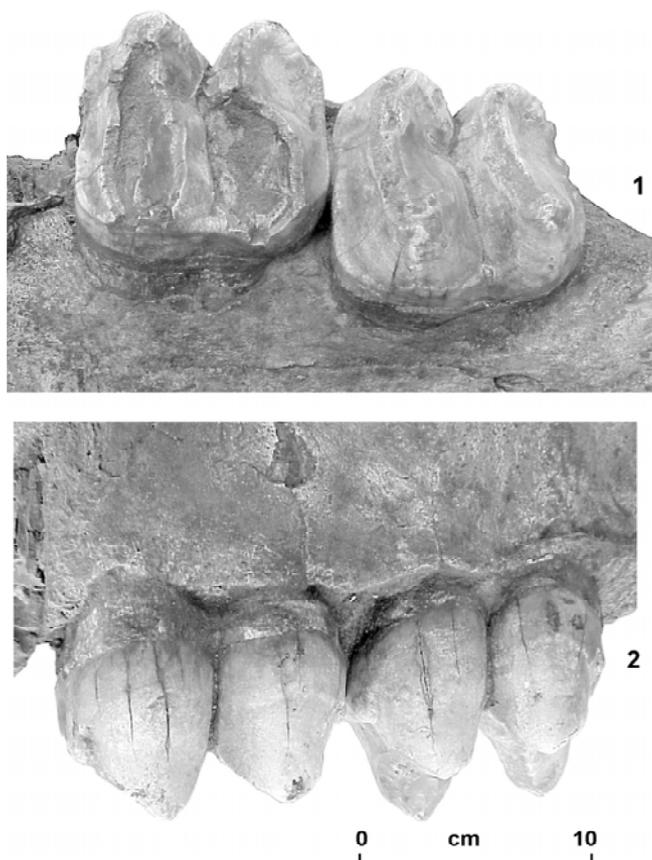


PLATE 1

*Deinotherium giganteum* from Obuhovka sand pit (the Lower Don Region, Russia), AMZ, No. KP-26579. Left upper teeth M<sup>1</sup> and M<sup>2</sup>: 1. occlusal view; 2. labial view.

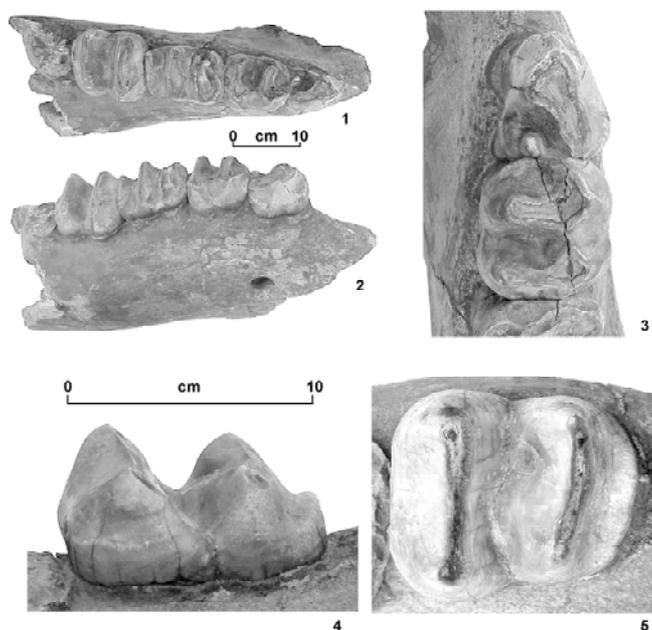


PLATE 2

*Deinotherium giganteum* from Obuhovka sand pit (the Lower Don Region, Russia), AMZ, No. KP-26579. Right mandible with P<sub>1</sub>-M<sub>2</sub>: 1. occlusal view; 2. labial view. P<sub>3</sub>-P<sub>4</sub>: 3. occlusal view. Left M<sub>3</sub>: 4. labial view; 5. occlusal view.

up backward a little. A wide anterior cingulum proceeds to lingual side of the crown. There is the roughness between lophes. On the posterior loph the roughness joins with the cingulum of the back side of the crown. The talon is pronounced weakly.

*Lower jaw:*

Symphysis and processus coronoideus are broken (Plate 2). The right mandible is more informative – it has teeth P<sub>2</sub>-M<sub>2</sub> and roots of M<sub>3</sub>. The left mandible has roots of P<sub>3</sub>, P<sub>4</sub>, M<sub>2</sub> and teeth M<sub>1</sub> and M<sub>3</sub>. The height of right horizontal ramus mandibulae between P<sub>4</sub> and M<sub>1</sub> is 240.0, between M<sub>1</sub> and M<sub>2</sub> – 190.0 mm. Minimal width of the jaw is under M<sub>1</sub> – 142.0 mm. It becomes thicker to M<sub>2</sub>, and under M<sub>3</sub> its width reached 207.0 mm.

The anterior foramen mentale on the right branch of the jaw is damaged. The posterior one is situated on the level of P<sub>3</sub>-P<sub>4</sub> boundary and has dimensions 22.0 x 31.4 mm. On the left branch of lower jaw the anterior foramen mentale is situated under P<sub>3</sub> and the posterior one – between P<sub>3</sub>-P<sub>4</sub>. The exposed canal is very big. The processus coronoideus begins on the level of anterior lophid of M<sub>3</sub>. The length of premolars is 167.8 mm, and the length of the row of molars – 305.0 mm. The ratio of premolar row's length to molar one is 35.7%. On the external upper part of the left branch of the jaw the rugosity is well presented. It stretches from symphysis part to the level of P<sub>3</sub>-P<sub>4</sub>. The degree of teeth obliterating in the tooth row is different. It decreases from P<sub>3</sub> to M<sub>3</sub>, but premolars are erased less than two first lophids of M<sub>1</sub>. Tops of M<sub>3</sub> lophids have narrow fascia of naked dentine only.

P<sub>3</sub> dex: The tooth is triangular in occlusal surface, which is tilted labially. Two anterior conids – proto- and metaconids are erased. Protoconid is connected with the hypoconid by a worn ectolophid that is low in the middle. The entoconid is separated from hypoconid by a deep depression. The cingulum presents on the anterior labial part of the crown. It is less pronounced than the posterior one which is presented on labial and caudal walls. The largest labial height of the crown is 60.0 mm and the lingual one – 46.2 mm. Roots are less bared on the outside than inside. Enamel thickness is changing from 5.0 to 6.2 mm.

P<sub>4</sub> dex: The tooth is bilophodont subquadrate and is narrower anteriorly than posteriorly. The anterior lophid (protolophid) is larger than the posterior one (hypolophid) and is more erased. Lateral conids have anteriorly extending cristids. The anterior protocristid connects with the anterior cingulum. Low hypoconid's cristid joins the protoconid with hypoconid and carries out the function of an ectolophid. The posterior cingulum is well developed and on the back side unites with the hypoconid. Anterior roots are more bared inside (37.0 mm) than outside (15.0 mm). The enamel thickness is 5.0 mm on the posterior lophid.

M<sub>1</sub> dex: The tooth with three transverse lophids and only last one is weakly touched by an abrasion. Protocristids are weakly developed. Cingula feebly marked on the front and back sides of the crown in places of contact with adjacent

teeth. It is better marked on the outside. The tooth is oriented in such way that its anterior part is situated higher and labial conids are lower than lingual ones. Left  $M_1$  has a similar structure but differs from the right one by higher inner wall of the crown (39.0 mm on the first lophid against to 21.2 mm in the  $M_1$  dex). The third lophid is narrower than two others.

$M_2$  dex: The tooth has two transverse lophids which crests are splaying backward. It is wider than previous tooth. The anterior lophid is more erased. The metalophid has two developed protocristids that extend medially and the labial one ends on the anterior cingulum. A cingulum well presented on anterior and posterior walls. The ratio of posterior cingulum's width to the width of hypolophid is 75.5%. The maximal lingual height of the crown is on the posterior lophid – 54.2 mm.

$M_3$  sin: The tooth narrows posteriorly slightly. Transverse lophids are inclined backwards, but not so much as in  $M_2$ . The anterior cingulum is weak and outlines the lingual part of the anterior lophid. Posterior cingulum is well marked and forms a small talonid; its length is 10.0 mm and width – 61.2 mm. Enamel thickness – 2.2 mm.

## COMPARISON AND CONCLUSIONS

There are some similarities and differences of *Deinotherium* from Obuhovka sand pit with *D. giganteum* from Western Europe. On the cast of *D. giganteum* cranium from Eppelsheim (collection of Azov historical-archeological and paleontological museum) the anterior edge of the choana is situated more caudally – on the level of the

posterior lophid of  $M^3$ . On the Obuhovka sample  $M^2$  and  $M^3$  are situated at an angle to each other in contrast to Eppelsheim's cranium, where molars are situated aligned. Upper teeth of *Deinotherium* from the Sea of Azov Region differ from the same from Eppelsheim by wider lophids (Tab. 1). Lengths of upper molars from Obuhovka are larger than the same of *D. giganteum* from Western Europe and are smaller than teeth of *Deinotherium gigantissimum* STEFANESCU (BELOKRY, 1960). The length of  $M^2$  from the skeleton from Kadrianka (Moldova) is 103.0 mm and is similar with AMZ, No. KP-26579. This Moldavian sample was determined as *D. gigantissimum* (DAVID & SHUSHPANOV, 1972).

The length of the toothrow  $P_3$ - $M_3$  of describing finding is similar with *D. giganteum* (Tab. 2).  $P_4$ - $M_3$  length is equal with the same of *D. giganteum* "race major" from Bulgaria (BAKALOV, 1950) and is 420.0 mm.

Teeth measurements of *Deinotherium* from Eastern Europe exceed that from Western Europe (Tab. 3). *D. giganteum* from Eastern Europe have similar or slightly smaller lower teeth in comparison with forms which were described as *D. gigantissimum*. Unfortunately, the limit of variability of *D. gigantissimum* parameters is discovered insufficiently; they are basing on few samples.

B.A. TARABUKIN (1974) who studied remains of *Deinotherium*'s skeletons from museums of Moldova alleged that in the Meotian age *D. levius* and *D. giganteum* existed simultaneously. Later, in the Pontian stage, these two species lived together with *D. gigantissimum*. *D. giganteum* was the ancestor taxon for *D. gigantissimum* according to his opinion. This author established not only body size increasing but morphology changes of teeth, lower jaw

TABLE 1

Measurements of upper teeth of *Deinotherium* from Obuhovka sand pit (Rostov Region, south of Russia) and some other localities of Western Europe. Abbreviations: L - length, W - weight,  $W_{1/2}$  - weight of the first/second loph.

Upper teeth Locality	$M^2$			$M^3$			$M^2$ - $M^3$
	L	$W_1$	$W_2$	L	$W_1$	$W_2$	L
<i>Deinotherium giganteum</i>							
Eppelsheim, cast, mm	104.0	90.4	87.0	102.8	91.2	83.6	210.0
Obuhovka sand pit, mm	104.0	114.6	113.4	104.8	114.0	103.0	206.0
Western Europe (BELOKRY, 1960), mm	81.0-92.0	-	-	78.0-94.0	-	-	-
<i>Deinotherium gigantissimum</i>							
Western Europe (BELOKRY, 1960), mm	108.0-116.0	-	-	107.0-115.0			

TABLE 2

The comparison of the length of lower  $P_3$ - $M_3$  from some European localities.

Length of $P_3$ - $M_3$	Locality	Author	Measurement, mm
<i>Deinotherium giganteum</i>	Obuhovka, Russia	original; sin	470.0
	Krivoy Rog, Ukraine	BELOKRY, 1960	470.0
	Eppelsheim, Switzerland	STEFANESCU, 1899	453.0
<i>Deinotherium levius</i>	Gusiatin, Ukraine	SVISTUN, 1974	409.0
<i>Deinotherium gigantissimum</i>	Manşazi, Rumania	STEFANESCU, 1899	540.0

TABLE 3

Comparisons of lower teeth of *Deinotherium* from some European localities.  
 Abbreviations: L- length, W- weight, W<sub>1/2/3/0</sub> – weight of the first/second/third lophids/maximal;  
 AMZ – collection of Azov historical-archeological and paleontological museum,  
 ROMK – Rostov regional local museum.

Lower tooth, mm	<i>Deinotherium giganteum</i>											<i>Deinotherium gigantissimum</i> Europe by Gräf, 1957			
	Western Europe				Eastern Europe										
	Dinotherium-sande, Germany, MN 9		Montredon, France, MN 10		Obuhovka sand pit, Yanov formation	Popov khutor, Yanov formation	Rostov-on-Don, Upper Miocene	Bulgaria	Tanovka, Stavropol region	Krivoy Rog	Kul'm				
	Hutunnen, Göhlich, 2002				AMZ, KP-26579	Bogatchev, 1941	ROMK-1535, original	Bakalov, Nikolov, 1962	Belokrys, 1960						
	n	min - max	n	min - max	dex	sin					min - max				
P <sub>3</sub>	L	17	55-63-72	8	58-65-74	79.8	-	-	-	80.0	-	-	-	83.0-90.0	
	W <sub>0</sub>	17	48-50-56	8	49-52-58	66.0	-	-	-	68.0	-	-	-	68.0-73.0	
P <sub>4</sub>	L	17	52-68-76	7	68-74-79	82.0	-	-	-	92.0	87.0	-	-	90.0-98.0	
	W <sub>1,0</sub>	17	52-68-76	8	49-57-59	73.8	-	-	-	88.0	90.0	-	-	72.0-78.0	
	W <sub>2</sub>	17	46-55-64	6	56-60-64	76.0	-	-	-	86.0	-	-	-	-	
M <sub>1</sub>	L	12	81-86-91	2	90; 94	103.0	103.4	-	(108.0)	110.0	-	-	-	107.0-111.0	
	W <sub>1,0</sub>	12	62-65	3	58-63-69	(72)	75.4	-	-	83.5	85.0	-	-	70.0-77.0	
	W <sub>2</sub>	12	56-60-65	6	60-64-69	75.2	73.6	-	-	82.0	-	-	-	-	
	W <sub>3</sub>	12	50-54-62	5	58-60-64	70.0	70.0	-	-	68.5	75.0	-	-	-	
M <sub>2</sub>	L	17	64-78-104	3	78-80-81	103.0	-	108.0	-	104.0	-	102.0;	-	108.0-120.0	
	W <sub>1,0</sub>	16	54-68-87	3	69-72-75	97.2	-	105.0	-	103.0	-	-;	86.0	97.0-120.0	
	W <sub>2</sub>	16	49-68-75	3	63-65-68	94.0	-	-	-	95.5	-	105.0;	107.0	-	
M <sub>3</sub>	L	19	67-83-104	3	84-88-90	-	109.0	-	-	110.0	-	93.0;	100.0	105.0	118.0-120.0
	W <sub>1,0</sub>	19	50-68-87	3	73-78-82	-	98.8	-	-	110.0	-	-	-	87.0	90.0-101.0
	W <sub>2</sub>	19	49-62-75	3	72-75-79	-	88.2	-	-	93.0	-	-	-	-	

and skull's distinctions in deinotherium lineage evolution (TARABUKIN, 1974). There is the statement about the coexisting of two *Deinotherium* species in Rumania and Moldova in N.N. MOROȘAN (1935). But there are no real paleontological confirmations for such conclusions.

L.S. BELOKRY'S (1960) considered that *Deinotherium*'s teeth have a wide morphological variability except size variation. So he concluded that there are no serious evidences of species independence of *D. gigantissimum*. It corroborates by the finding of giant forms with mixed morphological features of *D. levius* and *D. giganteum*, which had similar dimensions with *D. gigantissimum* in Upper Sarmatian as in Lower and Middle Sarmatian deposits. Thus *gigantissimum*-like forms are *D. giganteum* (BELOKRY'S, 1960). According to this author, morphology and measures fluctuation of teeth and jaws may be considered as the result of individual, sexual, age and population intraspecific changes. We agree with this opinion and relate the sample from Obuhovka sand pit to *D. giganteum*.

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