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The Skull of *Dicerorhinus mercki* (Jäger) from Warsaw

CONTENTS

ABSTRACT. An almost complete skull of the rhinoceros *Dicerorhinus mercki* (Jäger in Kaup, 1841), for the first time found in Poland, discovered in 1970 in the Vistula River bed in Warsaw, is described.

INTRODUCTION*

In August, 1970, the following bones of Pleistocene mammals were found in the Vistula River bed as it was dredged at the 517th kilometer of its course in the Siekierki District of Warsaw: a skull and mandibular fragments of the rhinoceros *Dicerorhinus mercki* (Jäg.), two vertebrae and a fragment of pelvis of the rhinoceros of an unknown species, two damaged skulls of the horse *Equus caballus* L., five horns of the aurochs *Bos primigenius* Boj., including one with a fragment of frontal bone, an antler of the reindeer *Rangifer tarandus* (L.) and two antlers of the deer *Cervus elaphus* L. The species mentioned above are among the most frequent mammals which occur in the Pleistocene deposits of Poland (Kowalski, 1959). The most noteworthy is an almost complete skull of the rhinoceros *Dicerorhinus mercki* (Jäg.), which lacks only the right premolar P^2 and the left zygomatic arch.

Next to *Palaeoloxodon antiquus*, *Dicerorhinus mercki* was one of the most characteristic components of the inter-glacial fauna (Czyżewska, 1962). The remains of the two species were several times found in the environs of Warsaw (Kowalski, 1959; Jakubowski, Krysiak, Roskosz, 1968).

The bones of the rhinoceros under study were found in alluvial deposits at a depth of 6 to 7 m below the present level of the Vistula's bottom. An accurate determination of the age of this find is impossible.

* By G. Jakubowski.

The bone remains mentioned above are now housed in the collections of the Museum of the Earth in Warsaw. The skull of *Dicerorhinus mercki* (Jäg.) has been given an inventory No. MZ VIII Vm — 450. An abbreviation ZIN, meaning the collections of the Zoological Institute of the USSR's Academy of Sciences in Leningrad, is also used in the present paper.

REVIEW OF THE MOST IMPORTANT FINDS IN POLAND

Remains of the hairy rhinoceros *Coelodonta antiquitatis* (Blum.) are known in Poland from more than 100 localities (Kowalski, 1959). Compared with it, *Dicerorhinus mercki* (Jäg.) is considerably rarer and its remains have hitherto been found in 8 localities only (Kowalski, 1959; Czyżewska, 1962). These finds were fragmentary and limited to detached bones or teeth only. The skull under study is the first of this species found thus far in Poland.

The earliest mentions of the occurrence of *Dicerorhinus mercki* (Jäg.) in Poland date back to the 19th century (Pusch, 1836; Brandt, 1877) and concern an almost complete mandible found at Kamieńczyk near Wyszków. In 1880—1882, the following remains were excavated from clay at Szczęśliwice near Warsaw: a fragment of the left maxilla with M^1 and M^2 teeth, two detached molars, part of a mandible with two molars and three fragments of long bones of a rhinoceros, determined by A. Slósarski in 1882 as *Coelodonta antiquitatis* (Blum.). In 1884, this author changed his mind and assigned them to *Dicerorhinus mercki* (Jäg.).

Of other finds, most noteworthy are the mandibles from Imbramowice (Gürich, 1908) and Oborniki near Poznań (Lubicz-Niezabitowski, 1926). The remaining finds represent single teeth mostly discovered in river beds and gravel-pits of northern Poland (Schroeder, 1930; Kowalski, 1959).

A maxillary dentition of *Dicerorhinus mercki* (Jäg.), collected in 1935 by L. Sawicki in a brickyard at Szczęśliwice, was described in 1962 by T. Czyżewska.

DESCRIPTION*

Family **Rhinocerotidae** Owen, 1845
Subfamily **Dicerorhininae** Simpson, 1945
Genus **Dicerorhinus** Gloger, 1841

Dicerorhinus mercki (Jäger, 1841)

(Pls I—V; Figs 1 and 2)

1877. *Rhinoceros Merckii* Jäger; J. F. Brandt, Versuch einer Monographie... t. XXIV, no. 4, p. 1.
1903. *Rhinoceros mercki* Jäger; H. Schroeder, Die Wirbelthier-Fauna ... H. 18, p. 76.
1911. *Rhinoceros merckii* Jäger; E. Wüst, Zwei bemerkenswerte Rhinoceros Schädel ... p. 133.
1930. *Rhinoceros mercki* Jäger; H. Schroeder, Über Rhinoceros mercki ... H. 124, p. 8.
1941. *Dicerorhinus merckii* Jäger; K. Staesche, Nashörner der Gattung Dicerorhinus ... H. 200, p. 9.
1963. *Rhinoceros mercki* Jäger & Kaup; A. Azzaroli, Validitá della specie Rhinoceros ... p. 22.

Note**

* By M. Borsuk-Białynicka.

** The name *Dicerorhinus mercki* (Jäger, 1841) has so far been used in fundamental literature, concerning this species (Schroeder, 1903, 1930; Wüst, 1922; Zeuner, 1934; Azzaroli, 1963) and, therefore, the preservation of this name rather, than *Dicerorhinus kirchbergensis* (Jäger, 1839), having priority, but considerably less frequently used, seems to be better-founded.

Material. An almost completely preserved skull, devoid of the left zygomatic arch only, but having a complete dentition except for the right P^2. The left occipital margin damaged.

Description. Skull strongly elongate, which is particularly marked in the anterior part (anteriorly of maxillary bones) and expressed in a large length of outer nares. Nuchal crest running anteriorly of the foramen magnum (cf. angle x in Plate III). The largest length, occurring between opisthion and rhinion, amounts — in a projection on the plane of palate — to 748 mm, that is, 25 mm more than the acrocranion-rhinion length of the upper surface of the skull. The upper profile of the skull, over the sector from the middle of the base of nasal horn up to halfway the orbito-temporal fossa, is straight and approximatelly parallel to the occlusal surface of teeth. Anteriorly, the profile of skull violently turns downwards at an angle of 55° and posteriorly ascends toward the nuchal crest at an angle of 148° to the plane of horn bases. Despite such a strong bend, the anterior margin of nasal bones is situated much above the upper margin of the premaxillae, which is connected with a considerable height of the anterior part of skull (Pl. I), as well as with a slight downward inclination of the premaxillae together with the anterior part of the maxillae.

The nuchal surface narrows dorsally. The ratio of the largest width of occiput to its width in the upper part amounts to 1.54. The height of nuchal surface approximately equals its width above the external acoustic foramen. Lateral margins of the squamous part of the occipital bone are slightly concave. The nuchal crest strongly concave posteriorly and slightly concave dorsally. Directly under it, there are oval impressions of m. complexus 20 mm high, about 50 mm wide and fused with the impressions of mm. splenii, which occupy dorso-external angles of nuchal surface and reach ventrally halfway its outer margins (Fig. 1). The impressions of mm complexii are spaced at 15 mm.

Above them, there occur smaller (about 30 mm wide and about 13 mm high) oval impressions, probably of m. biventer cervicis, here distinctly separated from m. complexus.

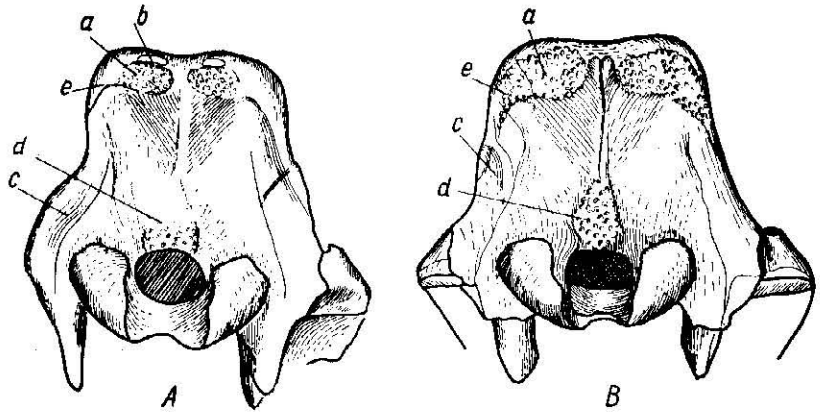

Fig. 1

Dicerorhinus mercki (Jäger) — Occipital view x 1/6; *A*. Specimen MZ VIII Vm-450; *B*. Specimen ZIN 10718; the letters designe presumable muscle insertions of: *a*, m. complexus, *b* m. biventer cervicis, *c*, m. obliquus capitis anterior *d*, m. rectus capitis dorsalis minor, *e*, m. splenius

The external occipital protuberance is developed in the form of a low, but sharp ridge running sagitally in the upper one-third of the nuchal surface; its apex, connected with the attachment of ligamentum nuchae, is situated about 40 mm below the nuchal crest. This ridge separates from each other deep fossae of the rectus capitis dorsalis major muscles which are externally limited by roller-like elevations, running obliquely to foramen magnum. Part of nuchal surface, situated directly above foramen occipitale magnum, forms a robust, rounded protuberance narrowing ventrally. This protuberance is probably connected, much the same as tubercula nuchalia in the pig, with m. rectus capitis dorsalis minor. The fossae for m. obliquus capitis cranialis, situated in lateral parts of the nuchal surface, are shaped like elongate areas about 35 mm wide and stretching along outer margins of the nuchal surface. Irregular ridges, running along the occipito — temporal sutures, make up their medial limits.

Foramen occipitale magnum is oval and 58×45 mm (width/height) in internal diameter. Occipital condyles are oriented with their longitudinal axes running steeply dorsoexternally. An angle between the chord of the ventroexternal curvature of the condyle and the sagittal plane of skull amounts to about 40°. The width of the base of condyles in their upper part amounts to 142 mm. The anteromedial angles of the condyles reach, on the ventral side of skull, fairly far anteriorly (See Table I). Their anterior margins run obliquely posteroexternally.

Table I

Dimensions (in mm) of skull in *D. mercki*

Characteristics measured	Cat. Nos	
	MZ VIII Vm-450	ZIN 10718
Maximum length (akrokranion-rhinion) (over the upper surface of the skull)	723	802
Maximum length parallel to the palate	748	762
Basal length (basion-prostion) (parallel to the palate)	682	741
Length of the external nostril	240	263
Lacrimal process to the nuchal crest	400	442
Lacrimal process to the posterior rim of the nostril	152	148
Length of the horizontal part of the palatine bones	62	ca.53
Length of the palate	368	374
Choanal length to the level of the pterygoid processes of sphenoid bones	121	141
Basion to the posterior alar foramen	141	160
Minimum distance between parietal crests	52	65
Maximum breadth of the occiput	264	272
Breadth of the occiput at the nuchal line	170	178
Maximum breadth of the nasal bones	164	167
Maximum breadth of the frontal bones	255	240
Maximum breadth on the zygomatic arches	390	388
Height of the occiput	239	231
Maximum height in the nasal region of the skull	202	—
Height of the zygomatic arch in its orbital part	85	—
Height of the zygomatic arch by the articular tubercule	68	—
Length of the ventral surface of the occipital condyles	58 left 63 right	61

The paroccipital processes, fused with the retrotympanic ones, form together long (about 75 mm from the lower boundary of the fusion with a postglenoid process), trihedral processes, anteriorly bent in their ventral part. The posterior wall, convex along the longitudinal axis of the process, passes towards the base of condyle, into a depression. The external wall is strongly sculptured for the attachment of m. occipito-mandibularis, the posterior head of m. biventer mandibulae and m. jugulo-styloideus. The anterior surface of the process is slightly concave transversally in its occipital and flat in its retrotympanic part. The convex part is situated in the extension of the external notch of the posterior foramen lacerum. The postglenoid process is very robust, bilaterally flattened and rounded ventrally (Fig. 2*a*). Its ventral end is situated at the same level as the end of the parocipital process. A maximum, anteroposterior diameter of the postglenoid process amounts to 44 mm and its thickness at the same level to 28 mm. The thickness increases towards base to about 45 mm, while the anteroposterior diameter remains more or less the same. The accessory articular surface for the condyle of the temporal bone, 40 mm wide and 55 mm high, situated in the anterior part of process near its base, is facing obliquely anteroexternally. In its upper part, it bends passing onto the ventral surface of skull where it reaches as far as the condyle of the temporal bone. The condyle of the temporal bone is shaped like a long list with a slightly convex

surface, about 120 mm wide, about 25 mm long and slightly inclined anterodorsally at its external end.

The shortest distance between the parietal crests amounts to 52 mm. The surface of parietal bones is flat and that of the temporal fossa convex in the upper and concave in the lower part.

The base of the zygomatic process of temporal bone is turned strongly externally and only slightly anteriorly. The zygomatic arch turns distinctly anteriorly and slightly ventrally at the level of the condyle of the temporal bone, that is, at a distance of about 40 mm (in the projection on the sagittal plane of skull) from the anterior margin of external acoustic foramen. Near the anterior base, it changes its direction from a slightly oblique to horizontal. The upper part of the arch is separated from the temporal crest by a deep notch. The height of the zygomatic arch amounts to about 70 mm increasing only near the anterior base, which takes place in connection with the development of robust tuberosities for m. masseter on its central surface and with raising the wall of arch, forming a lower limit of the orbit, by a dozen or so millimeters in relation to the upper margin of zygomatic arch. This wall, distinctly separated from the upper margin of arch, is situated almost horizontally, slightly convex transversally and slightly concave longitudinally. Anteriorly, it extends to a width of 60 mm.

Of robust protuberances, which surround the orbit, particularly distinct is a tubercle (Fig. 2*a*), 65 × 38 mm in size, situated anteroventrally of it and probably connected with a very strongly developed m. malaris. The lacrimal process is very robust, tubercular and situated directly above the last-named tubercle on the margin of orbit and separated by a deep notch from the third tuberosity which occurs obove the orbit. The supraorbital process proper is not, however, developed.

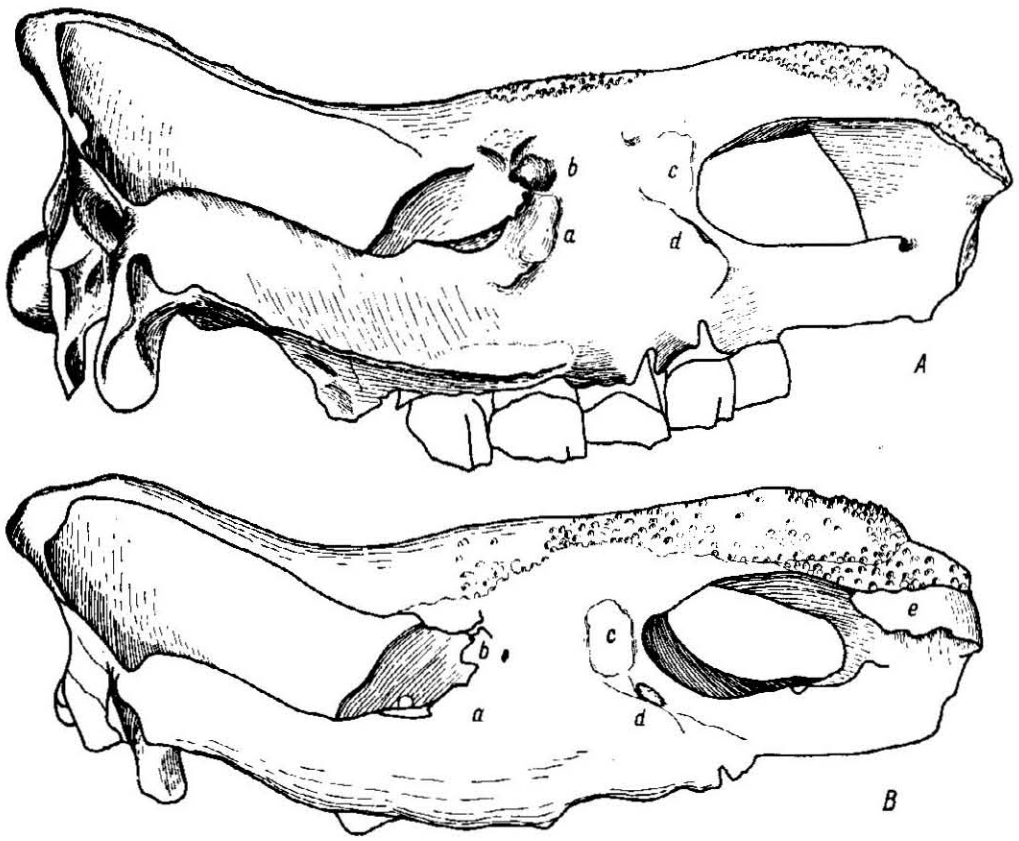

Fig. 2

Dicerorhinus mercki (Jäger); *A*. Specimen MZ VIII Vm-450 — right side view. x 1/9; *B*. Specimen ZIN 10718 — viewed from the left side and somewhat anteriorly, reversed × 1/9; *a*, tuberosity situated at the antero-ventral margin of the orbit- presumable insertion of m. malaris, *b*, lacrimal process, *c*, shallow concavity — presumable insertion of m. dilatator naris lateralis, *d*, infraorbital foramen, *e*, dorso-lateral part of the nasal septum

Two lacrimal foramina, connected with each other very shallowly under the surface, occur behind the lacrimal process. The third lacrimal foramen is situated inside the orbit about 20 mm below the former two.

Creviced foramina, that is the lateral ethmoidal foramen and the optic foramen as well as a common intake of the alar canal and foramen orbitorotundum are situated below the pterygoid crest, which runs obliquely ventrally and strongly posteriorly.

The maxillary bone is shifted posteriorly in relation to the orbit, thus forming an extensive osseous ventral limitation for the pterygopalatine fossa. In connection with this limitation, the anterior margin of the orbit is situated at the level of the medial part of M^2. A sharp crest, directed obliquely posteroventrally, runs on the medial wall of the orbit on the boundary with fossa pterygopalatina.

On the lateral surface of the skull, anteriorly of the orbit, there occur shallow depressions with a rought surface for m. levator labii superioris proprius and, anteriorly of them, behind the posterior margin of nares and above the maxillary foramen, a roundish, smooth depression, 40 mm in diameter, for m. dilatator naris lateralis. A tubercle, small but projecting externally, posteriorly and ventrally, occurs between dorsal margins of these insertions.

The facial crest, provided on the ventroexternal side with strong muscle scars of m. masseter, stretches anteriorly as far as the anterior margin of M^2. A maxillary foramen, 30×20 mm (height/ /width) in size, situated anteriorly in the maxillary bone, occurs directly behind the posteroventral angle of nares at a level between P^2 and P^4.

The base of the frontal horn is shaped like a pentagon, with its apex directed anteriorly. The surface of nasal bones between the bases of horns is not concave in either the axial, or lateral parts of the skull. The base of the nasal horn, more strongly tuberculate than that of the frontal horn is shaped like an anteriorly narrowing oval, provided, in the anterior part, with a notch which separates anterior ends of nasal bones. In the axial part of the base of nasal horn, a very prominent convexity occurs halfway its length. Its posterior slope is situated in the extension of the upper line of skull and anterior one steeply descends towards the surface of the base of horn which gently bends anteroventrally. The presence of this convexity causes a characteristic bend of the upper profile of skull (see above) and a stairlike curve of the anterior part of nasal bones. In lateral parts of nasal bones this curve is invisible and the base of the nasal horn is gently bent over its entire length. Anterior, smooth parts of nasal bones, about 20 mm long and separated from each other by a notch in the axis of skull, project anteriorly of the tuberosity of the base of nasal horn. They fuse with parietal parts of the osseous nasal septum. The space between nasal bones and the premaxillae amounts, in this part of skull, to about 75 mm and is filled by the nasal septum. The septum reaches posteriorly more or less to halway the length of external nares in its dorsal and to a quarter of this length in its ventral part. Its posterior margin is straight and seems to be undamaged except for the lowermost part. The parietal parts of the nasal septum are ossified only in the anterior part of nasal cavity and their length equals about a quarter of that of external nares. An oval, 55 mm high and 25 mm wide, impression with swollen margins, divided in the dorsal part by a prominent keel (Pl. IV; Fig. 1), occurs on the anterior margin of the osseous nasal septum. Its destination is not clear.

The ventral surface of nasal bones displays a strong convexity in the sagittal plane of skull. The palatal process of maxillary bones is bent anteroposteriorly, with its convexity facing the nasal septum. A groove for the cartilaginous nasal septum runs along the ventral axis of this process, with grooves for the vomero-nasal organ (Jacobson's organ), reaching posteriorly not far behind the posterior margin of external nares and anteriorly entering the palatine fissure, running on its both sides. A groove for Stenson's conduit and a groove running outside of it also enter the palatine fissure, forming in their terminal part a deep depression in the medial surface of the premaxilla. Their posterior trace is difficult to observe due to the poor state of preservation.

The palatine fissure is pear-shaped. Its anterior, extended part, confined by concentrically bent anterior parts of premaxillae, forms an aperture of Stenson's conduit and the posterior, con-

tracted part forms an aperture of an osseous groove connected with Jacobson's organ. The posterior angle of the palatine fissure is filled up by two small osseous lamellae fused with each other in the axis of skull. They grow out of the dorsal surface of the maxillary bone, or are fused with it. Palatine processes of the premaxillary bones are absent.

In the ventral view, the skull under study is characterized by a palate which is strongly concave both transversally and longitudinally. This concavity is most strongly expressed at the level and somewhat anteriorly of P^2. Posteriorly it becomes shallower longitudinally and, beginning with the level of the middle part of M^1, the palate is completely flat longitudinally (but concave transversally). The horizontal part of palatal bones is subsquare (anterior width, about 60 mm). The anterior margin of internal nares occurs at the level of the anterior margin of M^2. The length of external nares, measured from the tip of the pterygoid process of the sphenoid bone, amounts to about 120 mm. The posterior margin of this process runs posterodorsally at an angle of 123° to the palate. The width of internal nares between the tips of the pterygoid hamuli anounts to 65 mm. The nares contract anteriorly.

The basilar part of the occipital and the body of the sphenoid in the form of a triangular, transversally convex plate, suddenly contracting at the level of basilar tubercles where it forms a very robust osseous beam. The basilar tubercles are separated from each other by an anteriorly thickening ridge. The body of the sphenoid anteriorly contracts to a width of 19 mm between the bases of pterygoid processes.

The oval notch of the foramen lacerum is separated by a wide osseous plate from the main part of the foramen, thus forming an oval foramen whose shape indicates, however, that this division took place not long ago and that the development of this region may be subject to a considerable individual variability.

Dentition. The dentition in the skull under study is fairly advanced in regard to the wear, but not gerontic. M^3 is abraded to approximately two-thirds of the height of its crown. The state of dentition indicates an individual age of the specimen approaching or somewhat younger than that of the dentition from Jerxheim (Schroeder, 1903) and younger than that of the specimen from Szczęśliwice (Czyżewska, 1962).

The teeth are brown on the occlusal surface and black or lightgray on porcelain-like lateral surfaces of crowns. In the basal parts of crowns, more or less up to halfway the height of the crowns of unabraded teeth, the surface of enamel is slightly rough and displays the traces of a cement coating. In the upper parts of crowns, the enamel is completely smooth.

The teeth are trapezoidal in outline. The parastyle fold is marked on anterior premolars (which may be connected with their stronger wear), becoming more and more distinct posteriorly. The occlusal surface slightly concave transversally to the longer axis of palate. In addition to a transverse bend of the occlusal surface, P^3— M^2 display concavities occurring in the longitudinal axis of teeth, three of them on P^3 and, on further teeth P^4— M^2, two main and one smaller concavity, connected with the parastyle fold. Small humps, separating these depressions, are situated more or less in the extension of the proto- and metaloph and are marked in the form of sharp tips on the external margin of the occlusal surface. External surfaces of the crowns of teeth are slightly convex, which is less distinct on molars. No external swelling is observed near the base of the crown. On the other hand, such swellings occur on the lingual surfaces of crowns.

The external cingulum is reduced down to hardly perceptible lists on anterior and posterior margins of the outer surface of crowns, except for M^1 on which it is very distinct in the anterior half of the tooth. The anterior, well developed cingulum is complete on P^2, worn in its external half on P^3 and M^1, worn in its external quarter on P^4 and M^2 and complete on M^3. The posterior cingulum is somewhat less strongly developed, but distinct. On P^2— M^1 it occurs on the occlusal surface or slightly below and disappears or becomes worn from postfosette outwards.

On M^2, it is situated a dozen or so millimeters below the occlusal surface and in this connection the postfosette is open posteriorly at this level of wear. The inner cingulum is not strongly, but distinctly developed on P^2. On the teeth situated posteriorly of P^2, it is reduced to small tubercles at the outlet of the median valley (somewhat more strongly developed also on M^1).

P^2 — On this tooth, protoloph is separated from ectoloph, with which it fuses probably only below the level of the anterior cingulum. The median valley is still open on the lingual side, but protoloph and metaloph are fused together below the occlusal surface. Crochet is composed of two costae of which the smaller one, more lingual, rapidly disappears ventrally and the larger one, situated in the posteroexternal angle of the median depression, runs throughout the height of this depression. On the anterior and lingual side of the tooth, cingulum is developed to an approximately the same extent. It runs horizontally somewhat below the occlusal surface, limiting anteriorly a small, triangular valley. On the lingual wall of metaloph, cingulum changes its direction, very steeply ascending posteriorly. Enamel 1—2 mm thick.

P^3 — Median valley open lingually, its outlet relatively narrow. A very slightly marked, bipartite crista and a distinct crochet occur on the right P^3. Postfosette closed at the level of occlusal surface.

Median valleys on tooth P^4— M^3 are still open on the lingual side, their outlets narrow on premolars, become, however, wider and wider in the direction from P^3 to M^2 and M^3. Crista poorly developed on P^3, becomes slightly stronger towards M^2. Crochet also becomes more and more robust posteriorly and is always much stronger than crista. On the right P^4, crochet is split in two.

M^3 — triangular, with a fairly strongly vaulted external and very strongly vaulted lingual wall of protoloph. A large, cylindrical tubercle, perhaps a rudimentary metaloph, is situated on the lingual side of the right M^3 near the posterior margin of ectoloph. A small tubercle, which is a vestigial lingual cingulum, occurs at the outlet of median valley on both the left and right M^3. Anterior cingulum very robust. External cingulum forms a small, bipartite tubercle near the posterior margin of the ectoloph of the left M^3 and a thickening of this margin on the right M^3. A robust crochet and two thin lists, of which the external one may correspond to crista and the anterior one has not any counterpart, occur on M^3.

Discussion. Among other things, the following craniological characters indicate that the skull under study should be assigned to the group etruscus-mercki of the genus *Dicerorhinus* Gloger: the elongation of the rostral part of skull, the lack of a direct connection between nasal and premaxillary bones, the form of the osseous nasal septum, the rounded and anteriorly narrowing outline of nasal bones and the development of occiput, in particular its slight hanging out posteriorly, manifested by the size of an angle between the occiput and the parietal plane (o, Table III) and that of an angle between the axis of the occipital opening and the occiput (x, Table III). Relatively large values of angle o and very large ones of angle x (along with certain characters of dentition, including a large width of molars, low degree of the roughness of enamel, etc.) preclude the possibility of this skull belonging to the species *D. hemitoechus* Falconer and this is in conformity with the line of the profile of skull, straight within the range of the bases of horns and bent dorsally from halfway the orbitotemporal fossa (the line of this profile in *D. hemitoechus* being, according to Azzaroli, 1963, bent over the entire stretch between the nasal horn and parietal plane).

An inaccurate determination of some specific characters (e. g., the degree of the bending of the parietal plane in relation to the bases of horns), as well as a lack of data concerning the range of the variability of craniological characters in *D. etruscus* and *D. mercki* precludes the possibility of the specific assignment of the specimen, based on the characters of the skull only.

The question of the assignment of the specimen to *D. mercki* was finally settled by the structure of dentition which is marked by the following characters:

1. Internal cingulum on P^2 relatively poorly developed, on P^3 and P^4 vestigial.
2. On P^2, protoloph separated from ectoloph despite a fairly strong wear of teeth (this also makes up a difference in relation to *D. hemitoechus*).
3. A steep trace of cingulum on the lingual side of metaloph on P^2 indicative of a hypsodont character of dentition.
4. Dimensions of molars exceeding the upper limit of variability for *D. etruscus* (according to Schroeder, 1930, cf. Table II).

Schroeder's extensive studies (1903, 1930) on the species *D. mercki* and *D. etruscus* indicate that precisely these characters (1—3) are typical of the former species in contrast to the latter:

Tabele II

Dimensions of teeth (in mm) of the specimen MZ VIII V m-450 as compared to those in D. *mercki* and D. *etruscus* after Schroeder (1930)

Characteristics measured	MZ VIII Vm-450		*D. mercki*		*D. etruscus*	
	external length*	breadth of protoloph	external length*	breadth of protoloph	external length*	breadth of protoloph
P^3 right	—	—	28—36	31—43	30—35	34—42
left	34	42				
right	38	63				
P^3 left	38	64	36—46	45—70	33—36	49—53
right	42	73				
P^4 left	44	73	37—46	51—74	36—41	55—64
right	49	70				
M^1 left	48	69	47—60	63—70	42—49	53—63
right	56	75				
M^2 left	55	75	52—63	63—73	46—51	57—62
right	65	70				
M^3 left	65	70	61—71	56—69	51—61	50—58

* Measured near the base of the crown.

Compared with a skull of *D. mercki* from Leningrad (ZIN No. 10,718), the skull from Warsaw, described in the present paper, differs in a considerably smaller length, in its upper part of occiput less shifted posteriorly and in its massiveness. Also noteworthy is a very large (with absolute dimensions of skull taken into consideration) difference in the length of sectors between the orbits and nares which is larger on the specimen from Warsaw, as well as certain differences in the development of the nasal septum, discussed below (7).

Regardless of these differences, both specimens display striking similarities in the following craniological characters:

1. Structure of occiput (Fig. 1). In both skulls, indentically developed muscle scars of m. complexus and m. splenius, presumable insertions of m. obliquus capitis cranialis (in the form of longitudinal, narrow, externally arranged depressions) and insertions of m. rectus capitis dorsalis minor (in the form of a convex tubercle over foramen magnum). Identically developed external occipital protuberance in the form of a crest running between oval insertions of m. complexii which are separated from each other. Both skulls have similar proportions of the occiput (a character which undoubtedly is subject to specific variability), expressed in an index of 1.53 for the specimen from Leningrad and of 1.55 for that from Warsaw, in steeply arranged occipital condyles (cf. description), as well as in a ventrally and posteriorly concave muchal crest.

2. Profile of the skull roof (Fig. 2), straight within the range of frontal bones and of a considerable part of nasal bones, distinctly ascends (cf. angle n in Table III) posteriorly. In both skulls, a ventral bend occurs in the anterior part of nasal bones, but in the skull from Leningrad it is less conspicuous and terrace-like in character, while in the skull from Warsaw it is sharper as a result of the presence of a robust tubercle in the median part of the base of nasal horn which makes this skull similar to that of D. etruscus. Nasal bones are separated anteriorly in both skulls by a notch.

3. Zygomatic arch (Pls I and III) high, strongly bilaterally flattened, slightly bent. The condyle of the temporal bone is situated near the external acoustic foramen.

4. Postglenoid process long, robust, bilaterally flattened and rounded, in particular posteriorly.

5. Infraorbital foramen situated just behind the posteroventral margin of nares and characteristically wedged anteriorly in the maxillary bone (Pls II and IV, 1).

6. Anteriorly of P^2, parts of maxillary bones form, together with the premaxillae, osseous beams whose dorsal and ventral margins are parallel to each other.

Table III

Comparison of skull angles* in specimen MZ VIII Vm — 450 to those of other specimens of the species *D. mercki* and *D. hemitoechus*

angle	*D. mercki*							*D. hemitoechus*				
	after Zeuner (1934)					Cat. Nos		after Zeuner (1934)				
	min	med	max	mean	number of species	MZ VIII Vm—450	ZIN 10718	min	med	max	mean	number of species
y	82	95.5	109	95.5	4	109.5	109	110	118	120	116.5	5
m	41	55	66	54	5	41.5	42	28	37	44	37	6
o	70	77.5	83	77	4	76	69	47	53	56	52	7
x	—42	—17.5	—13	—22.5	4	—34.5	—27	—21	—14	—9	—14.6	6
n	147	152	155	151	3	149	153.5	145	154	160	153	6

* The skull angles measured as in Zeuner (1934) are denoted as follows.
y — angle between foramen magnum axis and the palate,
m — angle between foramen magnum axis and parietal surface,
o — angle between nuchal plane and foramen magnum axis,
x — m-o angle between nuchal plane and parietal surface,
n — angle between horn basis surface and parietal surface.

7. The anterior, narrow part of skull is formed by the anterior margin of nasal septum. The specimen from Leningrad is marked by a strong development in this region of the lateral parts of nasal septum, which form a fairly high ledge below the anterior margin of nasal bones and laterally (Fig. 2). In the specimen from Warsaw, these parts are considerably less strongly developed. In addition, the posterior margin of nasal septum is straight in the specimen from Warsaw and concave and reaching dorsally nearly the posterior margin of nares in that from Leningrad.

8. Occipital condyles reach with their median parts far anteriorly, on the ventral side of skull (cf. Table I). Their ventral margins are directed anteriorly and outwards.

9. Alveolar processes are slightly shifted posteriorly in relation to the orbit (an accourate position of M^3 in the skull from Leningrad is difficult to settle).

10. The basiliar part of the occipital and the body of the sphenoid are convex. In the region of the spheno-occipital suture, the base of skull is particularly strongly convex and, at the same time, it contracts abruptly. Robust muscle scars are here separated from each other by a posteriorly running crest.

11. Very wide alveoli of the Leningrad skull indicate a considerable width of teeth also in this specimen.

The lack of data concerning the development of these characters in other known specimens of the genus *Dicerorhinus* prevents the present writers from finding which of these characters are diagnostic features of *Dicerorhinus mercki*. However, a considerable number of characters common to the two skulls is an indubitable proof for their conspecificity and, consequently, some characters which differ these specimens should quite naturally be considered as an expression of an intraspecific variability.

These are such characters as: 1) an abrupt bend of the anterior part of nasal bones, considered by Schroeder (1903) as typical of *D. etruscus* in contrast to *D. mercki;* 2) the length of the orbit-nare sector, considered by Azzaroli (1963) as a character differing *D. hemitoechus* (smaller length) from *D. mercki* (larger length) (variability ranges have not been precisely determined for these species). The dimensions, shape of the posterior margin and degree of the development of lateral parts of the osseous nasal septum also vary intraspecifically.

Of interest is the fact that in regard to the position of the axis of occipital foramen (angles *y* and *m* in Table III), both skulls are on the boundary of variability ranges for *D. hemitoechus* and *D. mercki*, differing from *D. hemitoechus* only in the degree of the projection of occipital crest (angles *x* and *o* in Table III).

After a perfunctory review of literature concerning *D. mercki*, certain doubts are aroused as to the specific position of two specimens assigned to this species.

The skull from Steinheim on the Murr, described by Staesche (1941, p. 116) as *D. mercki* and cited as such by Zeuner (1934), radically differs from the skulls discussed above in profile, in the development of nasal bones, in the lower part of occiput (upper part lacking), in the development of condyles, zygomatic arches, base of skull and probably also in the position of the row of teeth in relation to the orbit.

The skull, described by Simionescu (1940) from Bessarabia under the specific name of *D. mercki*, seems, judging from illustrations in his work, to belong rather to *Coelodonta antiquitatis* (Blum.). This supposition is in conformity with the data on this skull, supplied to the writer by the Chair of Stratigraphy of the Bucharest University's Department of Geography and Geology. Namely, this skull is marked by the presence, in its anterior part, of an osseous bridge with the smallest width of 55 mm which connects the premaxillary and nasal bones, by wide although rounded nasal bones, not divided anteriorly and by a pathological occiput which is, however, typical of the woolly rhinoceros.

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Czaszka *Dicerorhinus mercki* (Jäger) z Warszawy

Streszczenie

W sierpniu 1970 r., w rejonie Siekierek w Warszawie, wydobyto z dna Wisły prawie kompletną czaszkę *Dicerorhinus mercki* wraz z szczątkami fauny plejstoceńskiej (przypuszczalnie na wtórnym złożu), jak: *Equus caballus*, *Bos primigenius*, *Rangifer tarandus*, *Cervus elaphus*, oraz innymi nieoznaczalnymi fragmentami kości nosorożców. Szczątki te, wydobyte w czasie pogłębiania koryta Wisły, znajdowały się na głębokości 6—7 m poniżej obecnego poziomu dna Wisły. Głębokość wody w tym miejscu wynosi około 2 m, co uniemożliwiło wykonanie profilu geologicznego. Materiały te znajdują się obecnie w zbiorach Muzeum Ziemi PAN w Warszawie. Nr inw. czaszki nosorożca MZ VIII Vm-450.

Oznaczenie przynależności gatunkowej okazu MZ VIII Vm-450 oparte zostało na następującym zespole cech czaszki i uzębienia.

1. Wydłużenie przedniej części czaszki.
2. Postać przegrody nosowej skostniałej jedynie w przedniej części jamy nosowej (od 1/2, w górze, do 1/4 w dole, długości nozdrzy zewnętrznych), wklinowanej między kości nosowe i międzyszczękowe i tworzącej przednią krawędź części rostralnej czaszki.
3. Mały stopień wychylenia ku tyłowi potylicy, mierzony kątami o i x (tab. III).
4. Linia profilu grzbietowego czaszki prosta w zasięgu podstaw rogów wygięta ku górze od połowy dołu skroniowo-oczodołowego.
5. Słabo wykształcone cingulum wewnętrzne na P^2, szczątkowe na P^3 i P^4.
6. Protolof P^2 oddzielony od ektolofu mimo dość silnego starcia zębów.
7. Stromy przebieg cingulum na lingualnej stronie matalofa P^2.
8. Rozmiary zębów trzonowych (tab. II).

Porównanie czaszki MZ VIII Vm-450 z czaszką *D. mercki* z Instytutu Zoologicznego AN ZSRR w Leningradzie (ZIN 10718) wykazuje daleko idące podobieństwa w budowie obu czaszek. Podobieństwa te dotyczą budowy potylicy i widocznych na niej odcisków mięśniowych, profilu grzbietowego czaszki, wykształcenia łuku jarzmowego (wysoki, spłaszczony dwubocznie, mało wygięty), kłykci potylicznych, ustawienia otworu podoczodołowego i innych cech. Czaszki te różnią się natomiast wymiarami oraz pewnymi proporcjami (czaszka znaleziona w Warszawie krótsza i bardziej krępa, patrz tab. I).

Porównanie cech czaszki MZ VIII Vm-450 (w szczególności cech wspólnych dla niej i dla czaszki leningradzkiej) z cechami innych czaszek, znanych z literatury, a zaliczanych do tego gatunku, nasuwa wątpliwości co do niektórych oznaczeń gatunkowych. Dotyczy to czaszki ze Steinheim

a. d. Murr, opisanej przez K. Stacschego (1941 str. 116) oraz czaszki z Besarabii, opisanej przez I. Simionescu (1940). Ta ostatnia, znajdująca się w zbiorach Katedry Stratygrafii Bukareszt-ańskiego Uniwersytetu, należy do *Coelodonta antiquitatis* (Blum.), co potwierdzają nadesłane stamtąd informacje na temat jej budowy (obecność połączenia kostnego między kośćmi międzyszczękowymi i nosowymi, budowa potylicy i inne cechy).

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