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НОВЫЙ *DISCOGOMPHUS* ИЗ СРЕДНЕГО МИОЦЕНА
СЕВЕРНОГО Кавказа

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A NEW DIPSOSAURIDUS FROM THE MIDDLE MIOCENE
OF NORTH CAUCASUS



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PRELIMINARY REMARKS

The *Archiloboceras* fauna from the Choktrak beds (Middle Miocene) of the Belomokhshaya in the Kuban region of North Caucasus (see Borissiak, 1925) includes a comparatively complete skeleton of a rhinoceros that appears to be one of the most primitive representatives of the subfamily Dicerorhininae (see Romanuk, 1932).

DICERORHINUS CAUCASICUS N. SP.

Skull

The skull is quite deformed, its anterior part being the best preserved. Premaxillaries rather well preserved, but still slightly deformed, the left one being pushed forward.

Total length of each bone — about 45 mm; width along outer side — 15; height of the side — 25; symphysis (antero-posterior) — about 25.

The premaxillaries — thin, laterally compressed bones, parallel to each other, their anterior ends converging. Together they form a semi-ellipse distorted by deformation and separated along the front suture.

The outer side of the bone represents a narrow surface, slightly inclined inward in respect of sagittal plane; because of bad state of preservation no signs of incisor alveoli is noticeable on it. The upper side represents a sharp ridge with same curvature as the bone. It is impossible to affirm whether these ridges are united in front, as the anterior ends of both bones are injured. These ridges form the boundaries of the wide and deep groove of the upper part of the symphysis.

Maxillaries are preserved only as fragments. On the left side, only the posterior part of the bone with the base of the zygomatic arch, containing the molars and last premolar, is extant; on the right side a larger fragment of the maxillary is preserved; the lower and anterior parts of the orbit are extant, infra-orbital foramen wanting. Notwithstanding the young age of the animal (see dentition) the sutures are badly distinguishable and mostly quite invisible; thus the suture between the maxillary and the jugal is absent, and the suture between the maxillary and the lacrymal is traceable for only a short distance. The zygomatic arch begins above the insertion between M¹ and M²; its width at the origin is 51—52 mm.

The somewhat deformed *maxilla* are long and narrow bones, slightly expanding towards proximal end; no clear lateral notches are distinguishable at the distal (anterior) end. This end is slightly deformed, its right side being obliquely compressed (this deformation, possibly, destroyed the notch) and consequently neither its correct shape nor the presence of rugosity on it can be established. There is certainly a roughness on the left side, at some distance from the front end, but from the right side it is absent.

Distance from the anterior end to the projected frontal suture—over 200 mm; width above the nasal notch — 85; distance from the anterior end to the nasal notch — over 170; distance from the nasal notch to orbit — over 100.

Nasal bones, when united together, form a slightly convex surface; there is no groove along the median suture in the anterior part, but it exists some distance farther back, i. e. each bone represents a convex surface, thus forming a groove along the median suture where they adjoin; still farther back, on approaching the frontal suture the nasals form a dome-like swelling covered with granular roughness.

Nasal notch (lateral) is above P^1 ; possibly this is not its original position.

Behind the above mentioned swelling of the nasals there are slight traces of the frontal suture, which appears to have been S-shaped: its parts situated near the median suture are directed with their concavities forward, while nearer to the orbits the frontal suture has its concavities directed forward. The last part of the right side is broken off and shifted considerably sideward.

Of the other cranial bones there remains a small part of the right temporal bone with the upper part of the auditory meatus, part of the articular surface, the bases of the post-glenoid and post-tympanic processes; a fragment of the zygomatic arch and a fragment of the occipital with the right condyle, the latter being elongated and compressed from above downwards, its length along convex surface being 65 mm.

Mandible not complete: of the right ramus we have the incomplete posterior part and the middle part containing P_1-M_2 ; of the left ramus — the posterior, also incomplete half containing M_1-M_2 , the front part (symphysis) with incisors (cf. II, fig. 1) and an isolated left P_1 .

Height of coronoid process above the base—about 200 mm; length — over 100; width of ascending branch — 105; height under M_1-M_2 , under P_1-M_2 at posterior end of symphysis — 20, thickness of incisor—20; width of symphysis in the middle part—75, at the incisors — 75, antero-posterior length of symphysis — 105; thickness of symphysis at the posterior end — 20.

The ascending branch is flat and high, has a flat, hook-like, recurved backward coronoid process and is perpendicular to the horizontal branch. On the outer (lateral) side it has a strong ridge extending from the articular process, which is not preserved, downward and forward, and bordering the

deep depression for *m. temporalis* which occupies all the anterior part of this side of the base. The depression for the masseter along the posterior and lower border of the mandible is expressed much weaker and is in a worse state of preservation. The lower side is concave on a level with the upper border of the horizontal branch and at a distance equal to one quarter of its width from the anterior border it has large for. alveolus posteriora.

The horizontal branch is rather massive, not high, gradually narrowing forward. Its slightly convex lower border rises upward towards the anterior end; it appears to form a small angle at the anterior end of the tooth row (but it is difficult to establish definitely owing to its being in isolated pieces), thus exhibiting in a smaller degree the feature characteristic of the mandible of *Stenocranius schidmoecheri* (H. F. Lill & I, 1891, p. 165).

The symphysis is long and flat, slightly narrowing in the middle of the space between the premolars and incisors, and again widening forward. Its upper side forms a wide groove bordered by the cutting edges of the upper margins of the lateral branches. The underside is convex behind and has in front two depressions separated by a wide median ridge; in each of these depressions there are two symmetrically situated mental foramina. The front border at the alveoli is almost straight, with rounded edges, slightly swollen and, possibly, rugose. Posterior alveolar foramina are present on the lateral sides of the mandible, nearer to the posterior end of the symphysis; the one on the right side is double; the upper one, possibly, must be considered as the mental foramen.

Dentition of the upper jaw (pl. I, fig. 1, 2; text-figs 1, 2) is characterized by the molars having high, complex crowns possessing crotchet, antecrotchet and crista, and by the premolars showing but slight inclination.

	length	width	height
P^1 —right	23 mm	16.5 mm	20 mm
left	26 +	17 +	22.5 +
P^2 —right	26 +	20 +	26 +
left	28 +	21 +	28 +
P^3 —right	30 +	17.5 +	30 +
left	34 +	19.5 +	32 +
P^4 —right	26 +	23 +	27 +
left	24 +	27 +	27 +
M^1 —right	47 +	47 +	31 +
left	47 +	51 +	33 +
M^2 —right	— +	48 +	27 +
left	58 +	48 +	36 +
M^3 —right	— +	— +	— +
left	52 +	— +	45 +

P^1 are preserved on both sides of the jaw, the left one being in better condition than the right one. It has an almost right angled triangular crown, with strongly developed outer wall and a posterior transverse crest.

The outer wall, notwithstanding the teeth being considerably worn, still clearly tapers upwards. It consists of two massive main cusps — protocone and tritocone — and a thin and long parastyle. The outer side shows an undulating surface with a well marked ridge (protocone), a convex posterior part (tritocone), and a concave front part (parastyle). The inner side of the outer wall bears the inner ridge of the protocone, which is more developed than the outer one and is well defined through the entire height of the crown. By analogy with the next tooth, this ridge (probably) lies behind the anterior crest, which, consequently, is lacking in this tooth.

The only existing crest is the rudimentary posterior crest (metalloph), which fuses with the only lingual cusp situated on the inner end of the crown and slightly slanted backward. It ought to be the deuterocone, though by



Fig. 1.

The position is rather corresponds to the tetartocone, as moreover the inner (lingual) end of the posterior crest fuses with the anterior margin of this cusp.

Behind the crest there is a well marked posterior valley opening backward. The stipulum is little developed: it exists along the anterior side of the crown (from the parastyle to the tetartocone) feebly expressed at the base of the crown, and further connects the tetartocone with the mesostyle along the posterior wall, at the level of the grinding surface, closing the posterior valley.

Part of the inner cusp of the right tooth is broken off.

P² are well preserved on both sides. These teeth are in the initial stage of abrasion, the right one being somewhat more worn than the left one; in the right tooth the anterior crest has completely fused with the outer wall, in the left — incompletely.

The crown is almost symmetrically trapezoidal in shape, narrowing towards the lingual side. The outer wall (acrotoph) is completely elaborated. It consists of a long parastyle, slightly swollen in the middle part, spindle-shaped in section; a well marked protocone: an outer ridge corresponds to it on the outer side of the wall and a similar ridge (a peculiar rounded crest?) — on the inner side; further follows a large tritocone with a convex-

possessing large swelling on the outer side of the wall; it terminates in a pointed metastyle. The lingual side has a deuterocone and a tertiocone, the latter occupying the middle part of the inner side and projecting lingually somewhat more than the deuterocone, which lies in front of it and is somewhat shifted inside the crown; they lie alongside each other and have a common grinding surface, bicusp-like in shape. The third confluent part of the inner side of the crown is the lingual end of the hypostyle (see below), separated from the tertiocone by a wide valley.

The anterior crest (metastyle), directly confluent at its lingual end with the deuterocone, extends, gradually narrowing, in a straight line towards the middle part of the parastyle and touches the latter with its pointed labial end, being connected with it only by means of a narrow strip of enamel. The anterior crest has no lateral folds (modified primary cusp). The posterior crest (metastyle) has a wider labial end, by means of which it fuses with the anterior part of the inner side of the tritocone, while its narrowed lingual end is connected with the bridge between the deuterocone and tertiocone, a little nearer to the latter (compare the position of the crest and inner cusp in *P*²); the transverse crests thus converge in their inner ends. There are two swellings along the posterior crest: the larger of them (metastyle) lies nearer to the labial end, and forms a narrow crenel on the anterior side of the posterior crest and a wide rounded protuberance on its posterior side; the second, smaller one, lies nearer to the lingual end, and is more developed in the right tooth.

A well developed cingulum-hypostyle (?) extends along the posterior border of the crown in the form of a straight plate; it begins at the end of the metastyle as a thin strip of enamel and ends towards the lingual end, forming an abrasion a narrow spindle-shaped platform. The anterior valley between the meta-, proto- and metastyle is triangular, closed, with crenellated outer and posterior sides. The posterior valley between the metastyle and hypostyle, with crenellated anterior and smooth posterior sides, extends along the posterior wall of the crown and opens to the lingual side, between the tertiocone and hypostyle. Both valleys are filled up with enamel.

The cingulum is absent, except the above described hypostyle. The right tooth is distinguished by a somewhat greater degree of abrasion. It has better developed second swelling on the metastyle. The hypostyle does not attain the metastyle, but descends with its labial end downward.

*P*² are well preserved on both sides; from *P*¹ they differ rather considerably in the structure of the lingual part of the crown. On the whole the shape of the crown is trapezoidal, but with a wider inner side than in the preceding tooth, i. e. it approaches the quadrate form. While the crown of *P*¹ narrows forward (the tertiocone and hypostyle project lingually), that of *P*² narrows backward (the deuterocone shows the greatest projection lingually). The subvertical ectostyle resembles in its general structure the preceding tooth: narrow parastyle, well marked protocone (especially on

the outer side; external ridge more developed than in P^1 , while the rounded crotas is less developed; tritacosa smaller than in P^1 , metaclyle longer.

The anterior crest (protoclype) attains with its pointed labial end the middle of the paraclyle; it has a considerable swelling (protocoma) in its middle part, and terminates in a small deuterocone, still more markedly modelled than in P^1 . The metaclype in its middle part runs parallel with the protoclype, and in its lingual part curves arc-like forward, joining by means of a wide bridge with the lingual end of the protoclype. P^2 has therefore an distinctly modelled tetracoma: the above mentioned lingual arch on the right tooth has an entirely smooth outside, on the left it has a small swelling, possibly corresponding to the tetracoma; this swelling forms an outer ridge on the lingual side of the inner walls of the tooth, approaching the deuterocone at the grinding surface closer than in P^1 , and deviating from it towards the base of the crown — in P^2 the ridges of the deuterocone and tetracoma lie parallel. The metaclype bears on its anterior side two narrow folds: a narrow and long archlet, and nearer to the lingual side — a second shorter fold (more developed in the right tooth and drawn downward); these folds are thus more developed than those in P^1 . The posterior face of the metaclype represents a single wide convexity (it has not two overlappings at P^1).

The transverse crest, therefore, present greater differentiation than in P^1 , while the tetracoma is less developed.

The hypostyle of the right tooth represented by a flat dent, isolated both at the lingual and labial ends. On the left tooth it is connected with the metaclyle, its lingual end at the same time being connected with the lingual end of the metaclype, by means of a small bridge. The posterior valley of the right tooth has therefore two outlets at the extremities of the hypostyle, while that of the left one is closed, its shape being rounded triangular. The anterior valley is elongated, has a complicated posterior side and is likewise closed. Both valleys are filled up with cement.

The cingulum, with the exception of the hypostyle, is absent.

P^2 has not yet fully emerged from the jaw; the right side of the skull is deformed just at the boundary of $P^2 - M^1$, and therefore P^2 is partly broken and not well visible; on the left side it is almost wholly visible.

The crown, as in the preceding tooth, is trapezoidal in section; the anterior inner angle is shifted still more lingually than in the preceding tooth, owing to the predominant development of the deuterocone. The crown is quite narrow, and therefore its elements are exceptionally distinct. The structure of the ectoclype is the same as in the preceding tooth; the tooth being uniserial, the paraclyle appears less developed. It is more developed nearer to the base of the crown and tapers towards the summit of the protocoma. The anterior crest (protoclype) is rather massive, curved arc-like, its highest part being the deuterocone, which is distinctly modelled on the outer side of the crest. The crest extends lingually for a certain distance beyond the

dentiform without, however, forming a definite tetrahedron; it grows lower in the labial direction, without becoming confluent, at the given stage of wear, with the parastyle of the outer wall, and being with it only at a later stage. The posterior crest (metastyle) exhibits quite another view; it has the form of a narrow plate, springing from the middle of the tritacoon, curving S-like, and extending towards the lingual end of the anterior crest without touching it; it bears a similar plate-like, very long arched, almost equal in length to the lingual and labial halves of the crest: the latter therefore represents together with the arched a three-sided figure, with almost equal angles between the rays. Contrary to the preceding teeth, the hypostyle exists only at the very base of the crown. There is a very feeble cingulum along the anterior border of the tooth, situated much higher than that on the posterior one (hypostyle).

M. The moderately worn crown is well preserved on both sides. The general outline of the crown is irregularly quadrate; it narrows both lingually and posteriorly, as in *P.* Its outer wall is massive, with a well developed parastyle, small but well modified paracoons on its outer (labial) and inner (lingual) sides, as elongated metacoons, and a large metastyle; on the anterior part of the outer side of the metacoons, besides the usual wide fold, there is also a rudimentary ridge, smaller in size than that on the paracoons, to which corresponds a fold on the inner side; the metacoons thus appear d a p l i c a t e d. The outer wall is covered to a considerable height from its base, and symmetrically on both teeth, with a thick layer of cement forming a distinct ledge on the outer side of the tooth; the lower part of the crown therefore loses its relief, owing to the ridge and the posterior fold being indistinctly expressed and irregular in shape.

Of the transverse crests the anterior one (protostyle) is more developed, connected by a narrow strip with the parastyle and ending lingually in a small well modified protocon; a small anterocheil is present. At the given stage of wear the posterior crest (metastyle) is much shorter; the hypocoons also retreats labially at the base of the crown, as compared with the protocon; the hypocoons is considerably smaller than the protocon and on the abraded surface of the crown appears very miniature; the strong arched rima almost parallel with the outer wall, but slightly deviates lingually at its anterior end. The median valley is widely opened lingually; on the outer side of this valley the lower part of the paracoons bends in form of a rounded ridge and posteriorly of it the anterior end of the metacoons forms a small narrow fold directed forward. This valley is distinctly filled up with cement, projecting at the lingual margin as a small tongue, outside the extremities of the transverse crests. The posterior valley is triangular, widely opening posteriorly; possibly it is also filled up with cement. There is no cingulum.

MP. Only the anterior half of the right crown preserved; left crown preserved complete. Tooth has practically no signs of wear.

The crown narrows posteriorly, as in the preceding tooth. Its outer wall (ectoloph), owing to slight abrasion, still retains the tapering form; besides the terminal ridge of the parastyle it bears on its outer side, like *M*¹, two more ridges — one of the paracone and the anterior part of the metacone, and a very weakly expressed wide fold of the metacone; the contact on the outer side does not form a ledge, and only fills in its anterior part the space between the ridges (parastyle — paracone — metacone), as an irregular tubercular mass. The inner side of the ectoloph is lobed in wide folds corresponding to the para- and metacones.

The anterior crest (protoloph) is curved arc-like, small in its middle part and tapers both towards the labial end, which is connected by a very narrow bridge with the place of contact of the parastyle and paracone, and in a lesser degree towards the lingual end, which terminates in a small,



Fig. 3.

round grinding slope of the protocone; the latter thickens towards the base of the crown and is better modified. The anterochet is not developed at the given stage of wear.

The metaloph is less developed than the protoloph, and much less abraded; its lingual end curves back almost at right angle; forward from the curvature extends a thin and long crochet, which together with the posterior (lingual) part of the metaloph forms an almost straight thin plate, parallel to the ectoloph and connected with it by the more massive labial part of the metaloph, perpendicular to the above mentioned thin plate and widening towards the ectoloph (anterior to the protoloph). The hypocone is not modified. Anterior and posterior valleys widely open; both filled up with cement. There are no traces of diastema.

*M*² has not yet emerged from the jaw, and is preserved (and disclosed in its anterior part) only on the left side. The anterior part of the ectoloph, as well as the protoloph, are here stable in form of two crests, curved arc-like and united at their anterior ends, absolutely untouched by wear, with finely serrate upper border. On the ectoloph the paracone appears as a distinct swelling, and the parastyle — as a sharp ridge; while on the protoloph

there are no signs of the protocone; evidently it is modelled nearer to the base of the crown. The protoleph striae and taper towards the scitoleph.

On the basis of the above, the following general characteristics of the dentition described may be given. The premolars are distinguished by a series of characters, which can be explained only as evidence of comparatively high differentiation of the dentition: high crowns, its trapezoidal shape, well developed crotchet. But on the other hand, another series of characters points to the contrary. Such are: the structure of the outer wall (paleoleph), whereas the primary cusps are still well modelled; the protocone, represented by a well modelled outer ridge of the outer wall, with a similar cross or less developed ridge (rounded scitoleph) corresponding to it on the inner face; strongly developed parastyle; massive tritocoon — more massive than the protocone, — ending in a well developed metaeryte.

Of the main cusps of the lingual side, the deuterocone is distinctly modelled on the outer side of the anterior crest of all the teeth (P^1 — P^3); as to the tritocoon, it is distinctly developed — only on P^1 , is but very slightly designated (not always) on P^2 and apparently does not exist on P^3 at all.¹ The anterior crest is more strongly developed than the posterior one, but even it is not fully elaborated: the lateral end hardly reaches — and at early stages of wear does not attain — the parastyle; in this respect P^2 evidently is linked both P^1 and P^3 . The posterior crest is thinner than the anterior one; in P^1 it is directed forward, i. e. the crests converge in their lateral ends; the lingual halves of P^1 and P^2 are curved backward (the crest consequently obtains a sigmoid shape); this relation to the tritocoon has already been mentioned above. In addition to these primitive characters, the posterior crest distinguishes by well developed secondary folds — not only the crotchet, but also a second smaller fold, which however is absent from P^1 . A peculiar character in the structure of the crown of the premolars represents the development of the dihypostyle: while in general the cingulum is feebly developed, the posterior side of the tooth has a high, flat plate-like prominence, sometimes isolated; being considerably developed in P^2 , where it appears to be a third crest or posterior wall of the crown, it is weaker in P^1 , and in P^3 is already rudimentary.

The molars are characterized by the crowns with well modelled primary cusps (whereof the metacone is duplicated), strongly developed crotchet and feebly developed criata (in form of a double fold); strong development of cement covering the outer wall of the crowns and filling up its valleys must be noted.

Dentition of the mandible (pl. I, fig. 3; pl. I, fig. 4) is well preserved. It differs from that of the upper jaw by still having a strong

¹ It ought to be noted, perhaps, that the lingual cusp of P^1 is probably the tritocoon; this would correspond to the above indicated tendency of this cusp to increase in size in the series of premolars from the posterior teeth to the anterior ones.

ly worn D_2 , M_2 just appearing from its alveolus. All the molars P_3 — M_3 are present on the right side; on the left side the last two premolars are absent. Teeth are hypsodont, badly worn. Both pairs of incisors (I_1 , I_2) preserved, the second just emerging from alveoli.

	Length	Width	Height
I_1 —right	14 mm ¹	10 mm ²	8 mm
left	15 "	10 "	8.5 "
I_2 —right	17 "	12.0 "	10 "
left	17 "	12 "	10 "
P_3 —right	24 "	15 "	17 "
left	24 "	17 "	16 "
P_2 —right	20 "	16.5 "	24 "
left	missing		
P_1 —right	20 "	17 "	17 "
left	missing		
M_3 —right	30 "	22 "	26 "
left	28 "	22 "	27 "
M_2 —right	40 "	24 "	37 "
left	40 "	24 "	35 "

INCISORS—two pairs; first pair hardly emerged from alveoli (right one, however, falling out); only the summits of the second pair of incisors (quads) have emerged.

I_1 . Crown flat, elongated from right to left, obliquely set on a cylindrical root. Anterior (lower) side of the crown convex, with a depression in the middle; it forms an acute angle with the flat posterior (upper) side, which has a convexity not corresponding, however, to the depression on the anterior wall, but lying nearer to the median border. The anterior border represents a flat curve, with a small indentation corresponding to the depression on the anterior side. Abrasion has affected the anterior border only, as a narrow band lying on a plane parallel to the posterior (upper) side of the crown. The root is cylindrical in shape, laterally flattened. The crown sets on the root a little obliquely, with its median end forward (upward); this end itself projects so, that the root does not lie in the middle, but is nearer to the lateral end.

I_2 . Crown has the form of a three-sided point, with the lateral and anterior (lower) sides slightly convex and meeting at an acute angle, thus forming a rounded convex ridge; both these sides are covered with enamel. The posterior (upper) side, forming a right angle with the lateral side and a very acute angle with the anterior (lower) one, has a symmetrical lancet-like outline, it is concave, but with a wide longitudinal ridge, lying nearer to the lateral border; this side is not covered with enamel. Abrasion has affected only the anterior end of the tooth in the form of triangular platform,

¹ From front to back.

² From right to left.

lying at a very oblique angle to the posterior (upper) surface of the tooth. Only the front part of the tooth has emerged from the alveolus, so that its general form remains unknown.

P₂. Both teeth extant, slightly abraded. Crowns pointed towards anterior end, forming a rounded ridge (parastylid). The primary cusps on the anterior crescent (protostylid), bent at right angle, are well modelled, the protoconid being the largest of them; the parastylid is extended forward, forming the anterior ridge of the crown (see above). The protoconid and metaconid rapidly thicken towards the base, filling up the anterior valley; in correspondence with the modelling of the cusps the valley bears two depressions near the grinding surface, like the outer side which has one depression. The posterior crescent (hypostylid) does not show any modelling of the cusps and forms a regular curve; the grinding surface of the hypostylid merges with the protostylid; the posterior valley is partly filled up with tubercular cement (?). There is shagreen-like enamel. Cingulum absent.

Roots broken; judging by their bases it may be assumed that the anterior one was massive and cylindrical; the two posterior ones — of lesser size, fused together into one transverse plate under the posterior part of the crown.

Crowns of both teeth almost identical; the right one slightly less worn, its parastylid therefore showing a narrower grinding surface.

P₃. Only right tooth preserved. Crown tapers considerably towards its anterior end. Anterior crescent forms an angle, slightly less than a right angle; the parastylid forms a keel reaching the inner side of the crown; primary cusps well modelled. Owing to such a structure of the parastylid, the anterior valley is deeper than that in P₂; the outer wall is flat, without any depression. The grinding surface of the posterior crescent is not confluent with that of the anterior one, because of a longer stage of wear than in P₂; it represents an arch, forming, however, a small angle. The posterior valley is partly filled up with tubercular cement. Cingulum absent. Roots not distinct.

B₂. Only right tooth preserved. Its crown is worn down almost to the base; the grinding surfaces of the crescents occupy almost the entire width of the crown; the posterior crescent embedded with its anterior pointed end into the posterior wall of the anterior crescent; no traces of cement found in either of the small remnants of both valleys. The posterior outer angle of the posterior crescent is modelled on the outer and posterior sides by small depressions; the enamel is smooth (worn?). A rudimentary cingulum is present on the outer side, and opposite to the valleys — on the inner side.

Roots well developed — both the anterior and posterior ones; the summit of P₂ is situated between them.

M₂. Both teeth extant, considerably worn. Crowns taper but slightly toward its anterior end. The anterior crescent doubly bent; the posterior limb is wide, constricted in the middle (modelling the proto- and metaconid),

obliquely set; at right angles to it and obliquely to the outer side in the outer limb and the third thin limb goes from the parastylid, curving towards the ligular end and without tubular wall at the place of contact with D_1 . The posterior crescent is similar to the anterior one, it is somewhat spaced from the latter at the anterior end, and is twice bent, the outer angle forming a hypocoel (η), modified on its outer and inner side. The bottoms of both valleys are covered with cement; cement fills up the space between the anterior and of the posterior crest and the anterior crest, as well as the upper part of the constriction between the crests on the outer side. No traces of diaphragm. Roots not disclosed.

M_2 . Both teeth extant. The crown has uniform width along its whole length, is much less wide than that of the preceding tooth. The anterior crescent has also three limbs, but here the middle one forms with the posterior one an obtuse angle, i. e. lies almost parallel to the outer side; the posterior outer angle is modified (protocoel) by two vertical furrows. The posterior crescent lies still further from the anterior one than in M_1 ; it is developed much less than the anterior crescent and represents a slightly curved arch, on the outer side of which the hypocoel (η) is modified by two vertical furrows. Both valleys are filled to a considerable height with cement; cement fills up the space between the crests and as a tubercular mass — the collum — between the crescents on the outer side, forming a tubercular cavity on the posterior wall of the tooth. There are no traces of diaphragm. Roots not disclosed.

M_3 — just appearing in the alveolus.

Vertebral column

Very few vertebrae preserved. Only two of the last cervical vertebrae and a 2-13 vertebra preserved, all incomplete.

	No. 4733	No. 4734
Length of body	—	28 (without anterior epiphysis)
Anterior articular surface . .	50 x 28.5 mm	45 x 35 mm
Posterior	5	30 x 20 "
Spinal cord	32 x 27 "	32 x 25 "

In the better preserved vertebra (No. 4734) (pl. II, fig. 1) the body is incomplete (anterior epiphysis lacking); almost all the processes are also lacking.

Body elongated, laterally compressed, with a sharp keel along the outer side, not reaching, however, the posterior epiphysis, with obliquely set articular surfaces; the anterior one (without the epiphysis) greatly elongated vertically, convex, pentagonal owing to the lower side being bent at right angle; posterior articular surface strongly concave, almost circular. The arch is preserved, but all its processes are broken off, only the massive

right process (alliform) with a large postzygapophysis is extant; its surface is flat, with raised outer and inner borders; it is rounded pentagonal. Spinal canal large, semi-oval in shape. Large for. transversalis elongated oval in section; their upper border being on a level with the upper surface of the body.

Second cervical vertebra (No. 47/52) more deformed; it lacks the posterior epiphysis; anterior epiphysis very convex, elongated vertically, pentagonal, with level lower border. The body of this vertebra is badly preserved (crushed). Arch extant, but without processes; spinal canal semi-circular (deformed); left for. transversalis preserved, oval, wider than in the preceding vertebra and placed somewhat lower. Part of the interspinous process is extant as a broad plate or lobe directed disteward and downward.

Seventh cervical vertebra (No. 47/53) has a similar high body, but the position of the articular surface is normal and not inclined to the axis of the body. The under part of the body bears a markedly developed keel, lowering backwards. The for. transversalis are absent.

Total length (without the epiphysis) (in mm) 54
 Anterior articular surface (in mm) 51 x 26

The anterior articular surface is of the same shape—high, pentagonal; very convex. The posterior articular surface (posterior epiphysis not extant) was, evidently, broad, strongly concave; the posterior articular surface for the head of the ribs are not preserved. The arch is extant, but without processes. The spinal canal is large and semi-elliptical in outline. The postzygapophysis is not preserved; only the lower part of the right postzygapophysis remained directed disteward, disteward and slightly backward. The base of the spinous process shows that this process had the shape of a rather broad but flat plate. The transverse processes wanting; at the base of the left one, at the level of half the height of the anterior articular surface, there is a small platform directed forward, downward and outward; it is not clear whether this is the result of deformation, or it is a part of the anterior articular area for the head of the rib—in this case it would be the first thoracic vertebra. The spinous process is, however, not massive enough for a thoracic vertebra; the high and narrow anterior articular surface rather points to the vertebra being a cervical one.

Affinities. This exceptionally fragmental material does not permit any detailed comparisons. In any case these vertebrae resemble the vertebrae of typical rhinoscerans by the high bodies of the cervical vertebrae (articular surface greatly elongated vertically) and by the well developed lower branches of the transverse processes.

One of the anterior thoracic vertebrae (second or third?) (No. 47/54).

Total length of body (in mm) 52
 Anterior articular surface (in mm) . . . 45 (height) x 50 (width)
 Posterior " " (in mm) . . . 42 " x 40 "

The body is compressed from above downward (contrary to the cervical vertebrae). The articular surfaces are but slightly inclined to the axis of the body. The anterior one is very convex, broad-based, pentagonal in outline. The posterior one is similar in shape, strongly concave. At the sides of the anterior articular surface, at the base of the transverse processes (both broken), which are still rather massive and shifted downward, and at a level with the lower part of the anterior articular surface of the vertebra, there lie directed forward and sideward anterior articular surfaces for the head of the rib. At the sides of the posterior articular surface, on the extension of its lateral (vertical) base and a little below the upper border of the body of the vertebra there lie directed backward and but insignificantly sideward large semicircular posterior articular surfaces for the head of the rib. The articular surfaces for the tubercle of the rib are not preserved. There is a median line on the under surface of the body of the vertebra; this line has a depression on its sides and gradually disappears toward the posterior border of the body. The arch is incompletely preserved, rather massive, with rounded sagittal spinal canal. The left prozygapophysis is extant (incomplete), inclined to the middle and slightly concave.

One of the posterior thoracic vertebrae (No. 47/50). Only the body of this vertebra remained.

Total length	50 mm
Anterior articular surface	(height) 41 x 45 + (width)
Posterior	41 x 50 + "

The body of the vertebra is rounded triangular in transverse section; the anterior articular surface is slightly convex, heart-like in outline, tapering towards its lower pointed angle; the posterior one is similar in shape, butly concave. The anterior articular surfaces for the head of the rib lie at the upper base of the articular surface and are directed forward and sideward; the posterior ones are similarly arranged, and cut off the upper corners of the posterior articular surface of the body of the vertebra. There is a distinct line along the under side. The arch and processes are not extant.

Affinity. The described vertebra, one of the foremost of the thoracic vertebrae, is characterized by low placed transverse processes (in living rhinoceros they are placed higher) and by the comparatively wide anterior articular surface. It is significant that these same vertebrae in *Epiamastodon* are similar in character; only these the articular surfaces for the head and tubercle of the rib appear to be set closer to each other.

As for the second described vertebra, it is possible only to state that its body tapers comparatively strongly downwards, while in the living rhinoceros the head is not so markedly expressed.

Fore limb

FIGURE 11. Only the lower (distal) parts of both bones extant; the left one (No. 47111) (anti-fig. 3a) being more complete than the right one (No. 47108) (anti-fig. 3b).

	Left	Right
Height (incomplete) . . .	over 200 mm	—
Width of neck	36 ×	32 × mm
Articular surface	75 × 55 ×	71 × 50 ×

The general form of the bone seems to be relatively narrow and high. The anterior and posterior borders diverge from the neck toward the proximal and almost symmetrically. The anterior border is thin and sharp-edged, becoming thick and round in the region of the neck; its sharp border crossing over in the narrow part of the neck on to the inner side of the bone and merging with the border of the supragnathid tuberosity. The posterior border is thickened, and to a greater degree in the proximal part than in the distal, where it forms a sharp ridge which descends to the articular surface; in the proximal direction this ridge crosses on to the outer side and grows over higher, forming a sharp ridge parallel to the crista scapulae. The latter begins a little above the supragnathid tuberosity as a comparatively massive ridge, and then passes into a high and sharp ridge; it is however destroyed along its entire length and therefore its shape (and that of its process) can not be reestablished. The fossae infra- and supra-apleurae appear to be equal (at least in their lower part, as far as it can be judged from the fragment). The inner (costal) side represents a longitudinal depression in the middle, a convex posterior border and a lower and wider concavity in the anterior part, corresponding to the fossa supra-apleurae. The pleural cavity, moderately concave on the spherical surface, has a rounded-triangular, or oblique pear-like shape, tapering forward. The lateral side is almost straight, as well as the posterior one (they form the catheti of a triangle); the lateral border is slightly bent outward, forming a saddle-like surface. The supragnathid tuberosity is low placed and massive, but does not project forward, the bone widening but slightly from the neck to the distal end; the coracoid process is small, better preserved on the right bone.

FIGURE 12. It can be stated, that in general this bone, distinguished by the lightness of its structure and the relatively insignificant vertical elongation, wholly preserves the character of a rhinocerotid bone; such is its distal end with a low set tuberosity and small coracoid process, as well as the character of the body: structure of the posterior border, etc. The incomplete preservation of our specimens makes the accurate comparative difficult; in any case it must be noted that the scapula of *Rhinoceros tigris*

* The difference in the values is due to different deformations (the left one being compressed in the vertical direction, the right one in the lateral direction).

(Holt et al., 1934, p. 76) differs from ours in the following: its glenoid cavity is rounded, the crista extends to the glenoid cavity, and it is small in size (total length about 200 mm).



Fig. 3. Scapula.

a—lateral view, b—dorsal view, c—anterior surface (process a—acromion, d—glenoid cavity, e—crista, f—processus transverse).

***The scapula of *St. hirsuticornis* (Tonn et al., 1962, p. 26, pl. VI, Fig. 1) is in general quite of the same type, the posterior border of our specimen

however does not show such a widening (owing to deformation?), and its glenoid cavity is somewhat wider.

HUMERUS. A fragment (lateral side) of the left bone and the distal end of the right one (Nos. 47/95, 47/100).

Total length about 400 mm; greatest width of the distal end — 150; width of its articular joint — 75; diameter of the proximal end of the joint — 75; diameter of its lateral end — 55.

The bone is moderately massive, curved, with hook-shaped deltoid tuberosity, flat tuberculum majus anterior limiting the deep sulcus intertubercularis, and with large and median tuberculum majus posterior. The head is not preserved.

On the distal end the asymmetrical articular joint, obliquely placed, consists of converging cones — whereof the medial one is much larger than the lateral; the outer part of the latter is flattened (the cone passes into a cylinder). The concoidal fossa is not deep; the ulcrans fossa is bordered by a small epicondyle on the median side, and by a larger one — on the lateral; the epicondylar crest is massive but not high.

Affinity. The described humerus is distinguished by the relative lightness of structure, by the low placed deltoid tuberosity, and by the low epicondylar crest. The asymmetrical structure of the lower articular joint of the described bone is already markedly expressed. This bone is *Sh. lagotis* is of still lighter structure, the deltoid crest is less developed, the distal joint is not so asymmetrical. In *Sh. humboldtensis* it is distinguished by a higher placed deltoid crest, and a less developed epicondylar crest; in the rest the distal end is very similar to the described one.

Remarks. A left bone (last-fig. 4) together with the distal (No. 50/2) is preserved completely; a complete right bone (No. 47/58) is also preserved with its broken left pair (No. 47/50), and an isolated distal end of a left bone (No. 47/90).

	No. 50/2	No. 47/90
Total length	300 mm	300 mm
Greatest width of proximal end	80 "	90 "
Proximal articular surface	42 × 52 "	37 × 50 "
Greatest width of distal end	75 "	70 "
Distal articular surface	43 × 41 "	68 × 41 "
Distance of shaft to the middle	41 × 50 "	44 × 37 "

Owing to deformation these values are not accurate, as well as the proportions of length and width expressed by them.

The bone is thin, straight, slightly compressed antero-posteriorly; it expands towards the ends, and more towards the distal than towards the proximal one. On the proximal end (head) the articular surface for the humerus is pear-shaped, composed by two spherical depressions — the medial

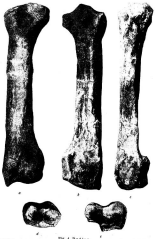


Fig. 4. Radius.

1—Anterior view, 2—Lateral view, 3—Medial view, 4—Distal epiphyseal surface, 5—Proximal articular surface.
 Note: Interosseous lig.—ligamentum, 1—capitulum, 2—tuberositas, 3—epiphysis, 4—epiphysis, 5—epiphysis, 6—epiphysis, 7—epiphysis, 8—epiphysis, 9—epiphysis, 10—epiphysis, 11—epiphysis, 12—epiphysis, 13—epiphysis, 14—epiphysis, 15—epiphysis, 16—epiphysis, 17—epiphysis, 18—epiphysis, 19—epiphysis, 20—epiphysis, 21—epiphysis, 22—epiphysis, 23—epiphysis, 24—epiphysis, 25—epiphysis, 26—epiphysis, 27—epiphysis, 28—epiphysis, 29—epiphysis, 30—epiphysis, 31—epiphysis, 32—epiphysis, 33—epiphysis, 34—epiphysis, 35—epiphysis, 36—epiphysis, 37—epiphysis, 38—epiphysis, 39—epiphysis, 40—epiphysis, 41—epiphysis, 42—epiphysis, 43—epiphysis, 44—epiphysis, 45—epiphysis, 46—epiphysis, 47—epiphysis, 48—epiphysis, 49—epiphysis, 50—epiphysis, 51—epiphysis, 52—epiphysis, 53—epiphysis, 54—epiphysis, 55—epiphysis, 56—epiphysis, 57—epiphysis, 58—epiphysis, 59—epiphysis, 60—epiphysis, 61—epiphysis, 62—epiphysis, 63—epiphysis, 64—epiphysis, 65—epiphysis, 66—epiphysis, 67—epiphysis, 68—epiphysis, 69—epiphysis, 70—epiphysis, 71—epiphysis, 72—epiphysis, 73—epiphysis, 74—epiphysis, 75—epiphysis, 76—epiphysis, 77—epiphysis, 78—epiphysis, 79—epiphysis, 80—epiphysis, 81—epiphysis, 82—epiphysis, 83—epiphysis, 84—epiphysis, 85—epiphysis, 86—epiphysis, 87—epiphysis, 88—epiphysis, 89—epiphysis, 90—epiphysis, 91—epiphysis, 92—epiphysis, 93—epiphysis, 94—epiphysis, 95—epiphysis, 96—epiphysis, 97—epiphysis, 98—epiphysis, 99—epiphysis, 100—epiphysis.

one being the larger) — and a saddle-shaped surface connecting them; the latter bears in front a small coronoid process, its hind margin rises considerably higher. The anterior side of the proximal end has a rugose surface with a deep depression; the lateral epicondyle is much larger than the medial one; the posterior side of the proximal end bears in the middle a high prominence and bears two articular surfaces for the ulna: one — a large trapezoidal lateral facet, occupying the lateral side of the above mentioned prominence and the greater part of the posterior side of the lateral end of the head; the other — a narrow concave medial facet; the rest of the surface of the posterior side of the head is coarsely rugose.

The shaft of the bone in its upper part is oval (rounded quadrate) in section, and in its lower part — triangular (median side flat, lateral one — narrow, ridge-shaped). Anterior side bears in its upper half a long rugosity along the medial border; the posterior one, slightly concave along its entire length, has a rugose surface of contact with the ulna.

Distal end slightly enlarged, especially in the lateral direction. Medial epicondyle small; lateral epicondyle — in form of a large rugose surface with a depression for the ulna; under the latter there is, at the distal end, a small crescentic articular surface for the ulna. On the anterior side of the distal end there is a large rugosity in the lateral half and a small one — in the medial half. On the posterior side there is a rugosity in the shape of a transverse ridge, separated from the distal border by a depression. The articular surface of the distal end, which is concave along its anterior border and convex along the posterior one, consists anteriorly of two depressions, a deeper and smaller medial one for the scaphoid, and a more shallow and large lateral one for the lunate, separated by a small saddle-shaped surface; the posterior convex part slightly curves and widens towards the medial end, entering the medial depression for the scaphoid, and narrows towards the lateral end, extending onto the posterior side of the distal end.

Affinities. This bone in the recent rhombones is more massive, with broader ends; the rugosities being, however, developed partly even less than in bone described. The structure of the articular surfaces is the same; in the bone described both the proximal and especially the distal ones present, however, greater arch of curvature (more concave).

The radius of *Rh. lagotis* (R a m e s s, 1934, p. 37, pl. IV, fig. 3) is still less massive (while its length is 240 mm, the width of the proximal end is 45 mm), with still more markedly expressed difference in the broadness of the ends; the distal end being broader than the proximal one. This bone in *Rh. karstianensis* (T o u l a s, 1952, p. 44, pl. VII, fig. 1) has the same habitus (a broader distal part) but is more massive; the proximal end widens more forward and has no depression on its anterior side; the articular surface of the distal end is of the same structure. The radius of *Rh. schirmeri*, cited by G o u d r y (1962, p. 304, pl. XXXIII, fig. 4) and previously referred by him to this species approaches the bone under description

by the relative lightness of its structure; nevertheless it is thicker and its broader ends; the latter being, however, expanded more or less equally

while in our bone the distal end is larger than the proximal end; the dimensions in its general shape is those of our bone.

U 1 a. The entire left bone (No. 55/1) (text, fig. 5), below to the above described radius (No. 55/2) is extant and two fragments (No. 47/50 and 47/10) also of a left bone; the fragment No. 47/50 is possibly a part of the middle of the shaft of this bone.

General length—more than 100 mm; greatest width of proximal part—50; width of shaft in its middle—25.

The shaft of the bone is three-sided, with an arc-like curvature directed with its convexity towards the radius, thickening evenly from the distal to the proximal end.

The olecranon is wide and high, directed upward and considerably backward. The olecranon process is broken off; the general shape of the bone is therefore unknown, as well as its total length. The semi-lunar articular surface is asymmetrical: the coronoid process is wide and high and considerably bent backward laterally, its end being broken off; the lesser radius end of the semi-lunar surface is incomplete; its lateral end is wide and semi-oval in outline; this articular surface passes over, at a wide contact, also onto



Fig. 5. U 1 a.

a—Distal end, b—side view proximal end; c—distal end, d—shaft.

the semi-lunar surface is incomplete; its lateral end is wide and semi-oval in outline; this articular surface passes over, at a wide contact, also onto

the lateral side of the coracoid process. Only the wide and saddle-like lateral facet for the radius has been preserved. At the proximal end the bone has in section three equal sides; farther in the distal direction the lateral side grows narrower, and the median one — wider, so that in section the bone obtains the shape of a narrow and high triangle, and at the distal end becomes flat. The anterior side along its median border bears an irregular rugosity — the place of contact with the radius; along the lateral border there is also a rugosity. The distal end bears a saddle-like articular surface for the ulniform and an adjoining small facet for the lacinæ; these facets form a curved ridge along their junction. Behind, along the lateral border there lies an elongated facet (nearly completely preserved) for the platform. At the lower border, on the median side, adjoining the articular surface for the lacinæ, there is the wide and flat articular surface for the distal end of the radius; above it the median border forms a deep depression corresponding to the epistyle of the radius.

Affinities. The described bone is characterized by its being relatively less massive; in recent rhinoceros this bone is not only much more massive, but also a little thinner than the radius; the distal end is particularly strongly developed; besides, along its entire length the described bone touches the radius (nearly this is also a constant character, and in some specimens the touching is incomplete), while in the recent rhinoceros only the ends touch one another. By the lightness of structure, by its curvature, and by its touching the radius our bone approaches the bone of such ancient forms as the *Epiacanthium*, which is however still less massive. This bone in *Rh. togian* (F o r m a n, 1824, p. 27, pl. IV, fig. 3) appears to be rather close to our bone; it also tapers toward the distal end and, judging by the figure, touches the radius along its whole length. This bone in the larger form *Rh. hundsheimense* (F o r m a n, 1822, p. 44, pl. VII, fig. 1) is similar in character but more massive. Lastly, the bone referred to *Rh. sublineare* (F o r m a n, 1822, p. 204, pl. XXXII, fig. 3) (judging from the figure, as both description and dimensions are already) is considerably more massive, its clearance being very massive, and straight.

Carpus. The carpus (No. 4756) of the left limb are complete (pl. II, fig. 2); besides there is a number of isolated bones of the left limb of another specimen. The carpus is high and completely displaced, the basis lying wholly on the anterior side of the ulniform. The magnum is high. The articulation with the metacarpals is stopped. The carpus of *Rh. togian* is very similar to the one described, its height being slightly less than its width. The carpus of *Rh. hundsheimense* is of an identical character, differing only in details such as outlines of the anterior sides of different bones, and measurements; how much this form is greater than the one under description can be judged from the size of the upper (proximal) row of the carpal, being 131 mm., while in our specimen it attains only 92 mm.

Cuneiforms (No. 47(55 and 47(52) has the shape of an irregular triangular prism, rather massive, with raised front end (text-fig. 5).

Greatest height — 45 mm; greatest width (along outer wall) — 42; greatest thickness (post-medially) — 25.

The proximal articular facet (a), for the ulna, is triangular, deep saddle-shaped, sloping backward (laterally); on the inner side it adjoins the fan-shaped facet for the pisiform, forming with it a ridge at an angle greater than a right one, directed inward-backward-upward. On the distal side (b) the facet for the scaphiform is triangular and concave. On the medial side (c) there are two facets for the lunar, narrow, crescent, adjoining the upper and lower concave borders.

Affinities. This bone in the living rhinoceros is quite identical, the posterior (lateral) part being however less developed as compared with the high anterior one; the articular surface for the ulna descends lower backward. This bone in *Rh. sondaense*, judging after the figure, is relatively not so high and has a less elevated front part (TATE, 1902, pl. VIII, fig. 4).

Lunatum (No. 47(55 and 47(52) has a trapezoidal anterior side and a wide hook-shaped posterior process (text-fig. 7).

Greatest height — 42 mm; greatest width of the upper articular surface — 42; greatest thickness — 25.

The anterior side (a) considerably widens upward to the broad articular surface for the radius; in its lower and narrower part it swells into a large rugosity, markedly projecting forward. The anterior wall is therefore not vertical, but directed forward and upward. The proximal side (b) bears in its anterior part a large articular surface for the radius, almost semi-cylindrical, slightly saddle-shaped, of asymmetrical outline, extending tongue-like along the neck of the bone backward, for a certain distance; on the medial side it is cut obliquely by the facet for the scaphoid of the medial face, and on the lateral face, perpendicular to its axis, there lies a small, inclined, crescent facet for the ulna. Behind the articular surface for the radius, the shaft of the bone narrows, and farther back widens again, forming the rugose proximal surface of the posterior process of the bone.

The facets of the distal side (c): the one for the scaphiform adjoins the anterior border and is inclined laterally; and the one for the magnum is shifted to the posterior end and inclined medially; the posterior end of the former adjoins the anterior end of the latter at right angle, forming a crest. The lateral side (d) bears a small triangular upper facet for the cuneiform adjoining the articular surface for the ulna, and a wide lower facet for the scaphiform, which occupies more than half the lower border and adjoins the facet the scaphiform. On the medial side (e) articulates for the scaphoid: the upper facets — the anterior one cutting the articular surface for the radius (c. supra),

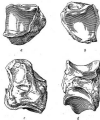


Fig. 6. Coniform.

1—dorsal view, 2—ventral view, 3—lateral view, 4—medial view (not symmetrical, 2 not symmetrical, 3 not symmetrical, 4 not symmetrical except).



Fig. 7. Lenticular.

1—dorsal view, 2—ventral view, 3—lateral view, 4—medial view, 5—dorsal view (not symmetrical), 6—ventral view (not symmetrical, 2 not symmetrical, 3 not symmetrical, 4 not symmetrical except).

elliptical in outline, slightly concave, — and the posterior one, indistinctly modelled, on the posterior process of the bone (its upper prominence). The lower irregular, saddle-shaped, facet for the scaphoid adjoins the anterior half of the medial border of the distal articular surface for the ulniform, its posterior border merging with the anterior border of the facet for the magnum.

Affinities. The described bone is fully of the rhinocerotid type, but in recent rhinoceros it is not so massive, its anterior side is higher, the shaft narrower; the facets differ in details (the two upper facets of the medial side have merged into a single biculi-shaped one). It is impossible from a short description and schematic figure (Pl. orn. n. s., 1914, p. 35) to form a notion of this bone in *Rh. tigris*; it seems that its articular surface for the radius is not so high (more flat), or does not descend so far onto the anterior side, as in the described bone; then there is no articular surface for the ulna. This bone in *Rh. bumbaltruncus* has a less broadened proximal side, and its proximal articular surface descends not so far onto the anterior side; the posterior process is probably broken off (T. v. L. n., 1902, pl. VIII, fig. 5), although in the description, which is most brief, no mention of this fact is made. In other respects they are very similar.

Scaphoidium. The only entire scaphoid (No. 4765) is from a left manus (pl. II, fig. 3).

Length — 34 mm, width — 32, width along the upper articular surface — 42.

The bone is irregular in shape, slightly twisted. The proximal swollen part is triangular in outline; the distal one is flat and twisted to the preceding one at an angle 45—50°. The proximal side bears a deep saddle-shaped, rounded triangular, articular surface for the radius; its narrow anterior part is convex, its wide posterior one concave. On the distal side there are three facets lying consecutively one after another: a flat one for the magnum, a saddle-shaped one for the trapezoid and a small triangular, slightly concave one for the trapezium. The facets for the bases of the metacarpals (lateral side are unknown (the bones of the manus are unprepared).

Affinities. This bone in recent rhinoceros is quite of the same type, only a little more massive, being at the same time considerably larger. This bone in *Rh. tigris* (Pl. orn. n. s., 1914, p. 35, fig. 15) shows a similar triangular proximal articular surface, the details of its structure being however unknown. In *Rh. bumbaltruncus* the character of this bone is the same (T. v. L. n., 1902, pl. VIII, figs. 3, 4 and 5), only it is relatively a little lower and its proximal side is rather trapezoidal than triangular in section. In the short description (T. v. L. n., 1902, p. 45) it is said, that the angle of this surface, facing the lunar, is rounded and that its anterior part is considerably swollen—our bone is also distinguished by both these characters.

U. aciliformis (No. 47, 84) is shown in two specimens: as a part of a complete left ulna and as an isolated, also left, bone (last-fig. 8).

Coronal height—40 mm; greatest width—55; greatest thickness together with the process—25.

This bone consists of an anterior plate, irregularly pentagonal in outline and of a large flat, hook-shaped, posterior process. The proximal side (c) is occupied by two facets for the condyliform and for the lunar, which converge

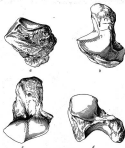


Fig. 8. *U. aciliformis*.

(a) from view of ulna; (b) proximal view; (c) distal view; (d) complete, from a specimen; (e) a specimen, (f) a complete specimen.

in an arc-shaped ridge at a more than right angle. The facet for the lunar is slightly convex anteriorly, and slightly convex posteriorly; the facet for the condyliform is semi-cylindrical, slightly saddle-shaped. The distal side (d) bears a series of facets, forming continuous tapered belt, wide in the middle and tapering toward both ends—for the magnum, Me III, Me IV (the broadest hook), and Me V. The facet for the magnum adjoins the facet for the lunar, forming with it an acute angle; the facet for Me V, consisting of

two parts—an anterior and a posterior ones (the latter already lying on the distal side of the hook-shaped process, almost adjoins to its anterior part the posterior margin of the facet for the radius). The anterior side (top) of the bone, on the medial crest between the facets for the humerus and for the magnum, bears a large callous tuberosity.

ADULTITION. This bone in living rhinoceros is larger, differing only in details of structure; its posterior process is narrower and longer; the rugosity on the anterior side is less pronounced; its outline is somewhat dif-



Fig. 1. Magnified.

a—medial view, b—lateral view, c—anterior view, d—distal view, e—proximal view (see arrangement of foramina), f—distal view (see arrangement of foramina).

ferent, as well as the shape and degree of convexity (concavity) of separate facets. The outline of *Sk. tigris* is figured from below and from the side; it shows a *crater* of a facet for the fifth digit; on the figure from the side, which is very schematic, there is indeed no place for the V and no facet for it (see the figure here below). The general considerably elongated shape of the shaft is similar to that of the described bone in the anterior-medial view being considerably inclined backwards. This bone in *Sk. bantab-*

ovoid. It is generally similar; Mn V is present, which the author calls a second bone (Touss., 1932, p. 48).

M a g n e s. There are two specimens. One in the manus (No. 47/50) and one as an isolated bone (No. 47/56), both are left (text-fig. 9).

Greatest width of anterior side wall — 28 mm; greatest height of anterior side — 20 mm; greatest height of base — 4; greatest thickness antero-posteriorly with the hook-like process — 35.

The bone, rhomboidal in its anterior part, becomes flat and high in its middle part, with the head in its sagittal section regularly rounded into an arch of a circle, and bears posteriorly a hook-like process.

The proximal side (a) on its anterior part is occupied by a flat facet for the scapoid, which narrows backwards into a crescent-like surface extending further along the upper medial border of the middle high crest-like elevated part of the base (d). The proximal part of this crest, rounded regularly into an arch of a circle, is occupied by the facet for the hum., descending anteriorly onto the lateral side and occupying all the lateral side of the anterior part of the base (b). The medial side (c) in the upper half of its anterior part bears a triangular facet for the trapezoid, which adjoins above the facet for the scapoid, and below fuses with the upper border of the facet for Mc II, which has the form of a wide crescent. The distal side (h) is occupied by a deep notch-like articular surface for Mc III. The anterior face (e) is rhomboidal and represents a convex rugosity. The flat posterior hook is inclined laterally.

A r t i c u l a t. In living rhinoceros this bone is quite of the same type, only more wedge-like — widening anteriorly; the anterior side is therefore relatively wider and less regular rhomboidal in outline; the facets show but slight differences in shape. In *Rh. tigris* this bone is higher anteriorly than the one described, its height exceeding the width (Roman, 1934, p. 28, pl. IV, fig. 4).¹ In *Rh. hemphysalensis* the anterior side is wider; the lower articular surface — wider and shorter. As the bone is not figured separately, the details of its structure are unknown (Touss., 1932, pl. VIII, figs 1 and 2). In *Rh. asiatensis* this bone is incomparably flatter, its anterior surface being wide (Dagobert, 1932, p. 21, pl. IV, fig. 1).

T r a p e z o i d e u m. Two specimens are present; one in the manus (No. 47/50), and the other as an isolated bone (No. 47/56), both left (text-fig. 10). The latter has the posterior border of the upper side broken off.

¹ It is stated by Roman, that the magnum is provided with long linear process slightly curving downwards, articulating above with the scapoid and basally touching the base. This description is not comprehensive, for the contact of the magnum with the base seemed to be insignificant, although the anterior side, really, has but small contact with the base. This fact, as well as the relative height of the base, evidently constitutes its most important particularities. The distal articular surface seems to be decreased as compared with that in our form, in which this surface is evidently very much elongated.

Total length — 25; greatest length — 20; greatest thickness — 22 mm.

The bone is parallelepipedal in shape, with a trapezoidal anterior side representing a convex rugosity, passing over onto the medial side. The proximal side (a) is occupied by a deep saddle-like surface for the scaphoid, descending likewise onto the medial side. On the medial side (b) this surface adjoins, as a direct continuation, the facet for the trapezium, which occupies the whole posterior half of the medial side: bounded by the almost straight posterior border, and the acrolike lower and posterior margin of the tongue of the facet for the scaphoid, this facet has a triangular shape. The lateral side (c) is occupied by the facet for the magnum; it is almost flat, slightly and irregularly saddle-shaped, with concave upper and lower margins and im-



Fig. 10. Trapezoidaleum.

1 — front view, 2 — medial view, 3 — lateral view, 4 — distal view, 5 — proximal view.
 1 — front view, 2 — medial view, 3 — lateral view, 4 — distal view, 5 — proximal view.
 1 — front view, 2 — medial view, 3 — lateral view, 4 — distal view, 5 — proximal view.

gularly undulate anterior and posterior ones. The distal side (d) is occupied by a deeply concave, slightly saddle-like articular surface for the II, of oval outline. The articular surfaces extend from two sides onto the posterior side and the irregular, rugose surface of the latter obtains in consequence a concave shape.

Affinities. This bone in living rhinoceros is exactly of the same type; it is but relatively shorter, thicker and higher (the absolute values being considerably greater); hence follow the differences in outline of the articular surfaces, the most essential of which are the following: the facet for the scaphoid does not descend onto the medial face so far as in the form described, the facet for the trapezium being therefore of trapezoidal but not triangular shape; the posterior side is irregularly concave, the facets of the lateral and medial sides of the base extending onto it. This

base is unknown in *Ah. togianus*. In *Ah. dambaldemeyeri* (Tosia, 1952, pl. VIII, figs 1, 2 and 3) this base has the same habitus, so far as it is possible to judge from the figures, the description treating only certain points of difference of this base from that in living *Ah. sumatrensis*.

Trapezium is preserved only in the manus (No. 45/53), which has not been separated.

Greater length — 38 mic; greatest thickness — 26.

This base has the shape of a low tube; it bears two lamellae: one for the scaphoid, slightly inclined medially, on the upper side, and one for the trapezoid on the anterior side. The first is shallow in the unseparated wrist — it is semi-linear in outline and saddle-like in shape; the second is not visible. It appears that they touch one another at an angle.

Affiliation. This base in *Ah. dambaldemeyeri*, judging from the figure (Tosia, 1952), has the same shape.

Metacarpals. An extant all the four metapodials (Mc II — Mc V) of a complete left unseparated manus (No. 47/55); three metapodials of another left limb (No. 47/149, 150, 151); and an isolated Mc III of a right manus (No. 47/52).

Metacarpals II — two entirely complete specimens.

(No. 47/149; total length — 146 mic; width of distal end — 35; thickness of distal end — 32; width/thickness of proximal end — 37:36; width/thickness of the middle of shaft — 15:22).

The base is flat, slightly curved, at its distal end oval in section and compressed antero-posteriorly, near its proximal end—triangular in section and compressed from right to leftward, the proximal end being rectangular in section; the proximal side is occupied by a saddle-shaped articular surface for the trapezoid, slightly descending onto the anterior side of the base, and to a greater degree—onto the posterior one. On the lateral side of the proximal end, at its border, lies the facet for the magnum, wide, flat and curved parallel to the proximal border; along its lower margin it adjoins the narrow facet for Mc III, the latter consisting of two parts — a long triangular anterior one and a short semi-linear posterior one — and lying not in the vertical plane but slightly inclined inward. On the posterior side of the proximal end, the facet for the trapezoid adjoins, along its medial margin, a small triangular facet, probably for the trapezium; but this cannot be definitely determined owing to the absence of a separate specimen of this base.

The shaft of the base is smooth in front; on its lateral side it bears, on its whole length, a rugosity along the line of contact with Mc III; on the posterior side at the proximal end there lies a large asymmetrical rugosity along the lateral margin, and a long (up to half the length of the base) one, along the medial margin; there are two spinose narrow crests along

the margins above the distal articular surface. The medial side—having in the middle the shape of a rounded ridge—expands towards its ends, bearing rugosities. The distal articular surface is asymmetrical, inclined medially corresponding to the curvature of the bone, the medial part of the joint being deeper and steeper, than the lateral one.

Affinities. This bone in living rhinoceros is more massive, more curved, with more markedly expressed rugosities (less slender), but possessing all the typical characters and specialities; the wide facet for *M. III* may be noted (a less mobile bone). This bone in *Rh. agilis* (length 11, thickness 11 mm) is in its slenderness similar to ours. In *Rh. hochstetteri* (T o u r n e r, 1922, p. 51, pl. VIII, fig. 1) this bone is 190 mm long, its section in the middle of the shaft—50 × 26, its proximal end—44 × 46, its distal end—40 × 42; it resembles the bone described.

Metacarpals III—preserved in three specimens.

No. 4120: total length—109 mm; width and thickness of proximal end—40 × 28, distal of distal end—40 × 28, distal in middle of shaft—26 × 22.

A straight flat bone, locally expanding towards its extremities in the lateral direction, and thickening in a much greater degree toward the ends in the antero-posterior direction. The proximal end bears on its lateral side a high prominence in the shape of a thin plate lying along the anterior wall (i. e. not whitening, contrary to the rest of the bone). The proximal surface therefore has the outline of a square with a deep notch in its lateral posterior corner. It is occupied by a large saddle-like facet for the magnum, descending both to the anterior and posterior sides, — and by a triangular facet for the scapiform, of much lesser size; these facets converge in a sharp ridge, forming the summit of the above mentioned lateral prominence. On the medial side, the articular surface for the magnum adjoins along its margin the narrow triangular anterior and the small posterior facets for *M. II*.² On the lateral side, in the above mentioned notch, we have two large rectangular facets for *M. IV*, lying at an angle to each other. The anterior of them adjoins the margin of the facet for the scapiform, and the posterior one adjoins the posterior end of the facet for the magnum.

The shaft of the bone is flat anteriorly, and cut on its sides by oblique rugose areas cutting posteriorly and thus forming a narrower posterior side, slightly concave. The distal joint is almost symmetrical, only slightly inclined towards *M. II*, i. e. medially; its section represents an arch exceeding half a circle.

Affinities. In living rhinoceros this bone is much more massive, wider, with more markedly expressed rugosities, i. e. not so slender; it is

² These facets are not preserved completely on the isolated left *M. III*, but they can be reconstructed after the facets of *M. II*. The posterior one does not appear to be constant as it is absent in the right *M. III* (No. 4762.)

relatively still flatter; the articular surfaces are quite of the same type, only the articular surface for *Mc* II is larger and has a better developed anterior part (possibly, our bone has no posterior facet at all). The distal joint is slightly deflected medially.

Rh. Agabus has a still narrower and thinner (still less massive) median metapodial: the difference in the width of its median and lateral digits being less (*R* = *m* + *s*, 1924, p. 28). Length 125 mm, width and thickness 24 × 3 (in our bone the width is 1:0.4 of length, and here = 1:3) (*R* = *m* + *s*, 1924, pl. IV, fig. 4). The lateral process of the proximal end is less extended. In *Rh. schizomocheri* (*R* = *m* + *s*, 1925, pl. XIII, fig. 13) this bone is still wider, its width being 1:4 of length, with less expanding ends, and more regular in shape, than in living rhinocarids. The bone figured by *G* = *a* + *d* + *r* (1922, pl. XXXII, fig. 6) is still more massive and short, hardly expanding towards the ends. In *Rh. Rauhshelweni* (*T* = *v* + *l*, 1922, p. 54, pl. VIII, fig. 1) this bone is of the same type (width = 1/4 of length) as in the preceding form; the lateral prominence of the proximal end must be noted, being still less extended sideward, although high, influencing the form of *Mc* IV. The lower joint apparently is less obliquely set. Judging by the view from above (*T* = *v* + *l*, 1922, pl. VIII, fig. 2) this bone is relatively flatter than ours. The length is 115 mm, the width and thickness 22.5 × 24.

This bone in *Dicranops orientalis* is exactly of the same type as that in *Rh. schizomocheri* (*R*ingsdorf, 1924, p. 15, text-fig. 7). Its length attains 137 mm.

Metacarpale IV—two specimens.

No. 41 (1): total length = 127 mm; width and thickness in the middle of shaft = 26 × 26; that at the proximal end = 22 × 26, at the distal = 22 × 26.

A curved bone, thickening towards the ends, triangular in section, its medial side being flat, the lateral one forming a rounded ridge. Proximal end not completely preserved. Proximal side is occupied by the facet for the scaphoid, rounded-rhomboidal in section, concave, slightly saddle-shaped. The anterior side of the proximal end represents a highly convex rugosity; on the medial side there remained only the posterior facet for *Mc* III, and the posterior part of the anterior one, all the rest, as well as the lateral side, has not been preserved. The anterior and posterior sides of the shaft are smooth; they unite in the rounded border of the lateral side; the flat medial side is rugose. The distal end bears an asymmetrical joint (the lateral part being narrower and less massive, than the medial one), slightly obliquely set (turned lateradward).

Affinities. This bone in living rhinocarids still more curved and more massive. It has a narrow facet for *Mc* V, which owing to fracture is wanting in our bone. In *Rh. Agabus* this bone is not completely preserved. Mention is only made of it being more curved than the second metapodial

(*Journal*, 1904, p. 35). Mention is also made of there being no facet for Mc V on its proximal side, i. e. that *Rh. lagurus* had only three digits. This bone in *Rh. antilimaculata*, which is figured by Kaup (1833, pl. 13, fig. 12), is more massive and less curved owing to the less developed and bent lateral process of the proximal end of Mc III. The length is 118 mm. This bone in *Rh. hutchinsoni* is 103 mm long its width and thickness — 38 x 23, i. e. it is much flatter than the bone under description, but in general habitus (Touss, 1902, pl. VIII, fig. 1) resembles the latter very much; perhaps its surface at the proximal end is of another outline, as it appears from the valves (Touss, 1902, pl. VIII, fig. 2); but in both these bones the proximal ends are not complete.

This bone in *Dicerthores orientalis* is wider (more massive); its length is 150 mm, width of distal end — 50, i. e. it is relatively much wider than the bone under description (Ringström, 1926, p. 15, text-fig. 7).

METACARPAL V. There are two specimens of this bone: in the complete manus (No. 4755) and as an isolated bone (No. 4756). Length 29 mm; proximal side — 10 x 24.

This bone is of an irregular mammiform shape. The proximal side is occupied by a slightly concave facet for the uniform, descending, at right angle, into the medial side, in the form of a wide tongue. On the anterior side, and likewise adjoining the margin of the proximal facet, there lies the wide articular surface for Mc IV. The remaining surface is, curiously ragged.

ARTICULARS. This bone in living chiroptera is shorter and thumb-like in shape. In *Rh. hutchinsoni* it is relatively narrower, being described as a mammel.

PHALANGES. Complete (1, 2, 3) from all three digits (II, III, IV) of the preserved left manus.

	Phalange 1	II (No. 4756)	III (No. 4757)	IV (No. 4758)
Length	26 mm	26 mm	26 mm	27 mm
Width	20 "	43 "	43 "	32 "
Thickness	10 "	21 "	21 "	28 "
	Phalange 2	(No. 4759)	(No. 4760)	(No. 4761)
Length	22 mm	22 mm	22 mm	22 mm
Width	32 "	45 "	45 "	32 "
Thickness	20 "	24 "	24 "	22 "
	Phalange 3	(No. 4762)	(No. 4763)	(No. 4764)
Length	26 mm	26 mm	26 mm	27 mm
Width	26 "	66 "	66 "	27 "
Thickness	11 "	25 "	25 "	25 "

The **SESAMOID BONES** (all 5 of different sizes).

Length — 31—26; width — 11—15; thickness — 11—13.