

GENERAL SURVEY OF THE VERTEBRAE.

The *Rhinoceros* vertebrae from Tegelen must have belonged to four individuals: Of the first individual the atlas is preserved in T.M.

Of the second individual M.M. possesses 2 vertebrae cervicales.

In S.M. 18 vertebrae are found, of which 15 belonged to the same individual, while the 3 remaining ones must be ascribed to a fourth individual.

The atlas in T.M. is smaller than the atlas of *Rh. hundsheimensis* and belongs to *Rh. etruscus*. All the other vertebrae are larger than the corresponding vertebrae of *Rh. hundsh.*, possibly with the exception of cerv. VII. The foramen vertebrale in the vertebrae cervicales of S.M. is comparatively higher and less broad than that in *Rh. hundsh.* The proportion between the total breadth and the length of the corpus of thor. II, III, IV, and V is the same in the two *Rhinoceros* species, being 2.3 in thor. II, 2.3 in thor. III, 2.2 in thor. IV, 2.2 in thor. V. In the following vertebrae there is, however, a difference. In thor. VII, VIII, and IX in S.M. the proportion decreases regularly, being 2 in thor. VII, 1.9 in thor. VIII, 1.8 in thor. IX, the proportion being 2.4 in thor. VII from Hundsheim, and 2.3 in thor. VIII. The processus spinosi of the vertebrae thoracales in S.M. are higher than those in *Rh. hundsheimensis*.

The points of difference with the vertebrae cervicales of *Rh. Mercki* from Taubach and particularly from those of *Rh. antiquitatis* are greater. Those in S.M. are much more slenderly built and smaller. In their dimensions and proportions the vertebrae thoracales of *Rh. Mercki* from Heggen resemble, however, those in S.M. much more closely, so much so that merely on the ground of these vertebrae I should not dare to conclude to a difference of species.

The 15 vertebrae in S.M. mentioned belong to the fragments of skull and the dentition in the same museum. From this it follows that they belong to *Rh. Mercki*. There is not sufficient material for comparison to arrive at this conclusion on the ground of a comparison of the vertebrae themselves. The great resemblance of the vertebrae thoracales to those of *Rh. Mercki* from Heggen may be taken as a direct indication that they belong to *Rh. Mercki*, though the vertebrae cervicales present difficulties by their deviation from those of *Rh. Mercki* from Taubach.

FORE LIMB.

SCAPULA.

Scapula sinistra S.M. *Rh. Mercki*. Pl. XI, fig. 2a, 2b and 2c.

Scapula dextra. B.M. *Rh. etruscus*? *Mercki*? Pl. XI, fig. 3.

In S.M. is found the proximal fragment of a scapula sinistra. The whole cranial margin with the tuber scapula is missing. Of the spina scapulae only the ventral base is left. The cavitas glenoïdalis is damaged only in the caudal margin. The articular surface of the cavitas glenoïdalis remains ± 9 mm. distant from the cranial border of the capitulum. The length of the cavitas glenoïdalis is about 81 mm. The breadth 70 mm. These measurements are resp. 80 and 70 in the scapula of *Rh. hundsheimensis*.

Yet it appears from Fig. 1c, Taf. VI of P. 28 that the total length of the capitulum is relatively greater than that of the specimen in S.M. The caudal margin is gently curved as in *Rh. hundsh.*, with this difference that in our specimen the tuberositas infraglenoïdalis projects more outward. The arterial foramen at the dorsal surface in our specimen (Pl. XI, fig. 2a) lies further from the border of the cavitas glenoïdalis and nearer the caudal margin of the scapula than in *Rh. hundsheimensis*.

The B.M. possesses besides a small proximal fragment of a right scapula of a *Rhinoceros* from Tegelen (Pl. XI, fig. 3). It is glued together out of six fragments. The largest dimension of the cavitas glenoïdalis is 83 or 84 mm. against 89 in the preceding specimen. In complete condition the right scapula in B.M. will, therefore, have been smaller than the left in S.M. The cavitas glenoïdalis is for the rest badly damaged, hence the length and the breadth cannot be given. The dorsal surface, too, is almost entirely missing. The small part present of the costal surface is remarkably flat. The same thing can also be seen, as it seems to me, in Fig. 1b, Taf. VI of P. 28, in contrast e.g. with the same part in *Rh. sondaicus*, where it is strongly concave. On the same side the processus coracoideus is still just visible. The tuber scapulae itself is missing.

BRANDT gives (P. 12, Taf. VII, Fig. 13) a figure of the dorsal surface of a left scapula of *Rh. antiquitatis*. The caudal margin in the S.M. specimen, like that of *Rh. hundsh.*, seems to me straighter than that of the scapula of *Rh. antiquitatis*. Besides the border of the cavitas glenoïdalis in the S.M. specimen (Pl. XI, fig. 2a and 2b) seems more concave than in *Rh. antiquitatis*, where the border makes an almost straight impression.

In P. 4 Taf. II, Fig. 2 KAUP gives two reproductions of a left scapula of a *Rh. Mercki*. The caudal margin in this specimen seems straighter to me than that in S.M. The arterial foramen lies nearer the back border in the specimen in S.M. The cavitas glenoïdalis is 98 mm. long in the *Rh. Mercki* mentioned by KAUP, i.e. considerably larger than that of the specimen in S.M. The width is relatively smaller than in the specimen in S.M.

The scapula in S.M. probably belongs to the other parts of the skeleton in S.M., and must, therefore, likewise probably be assigned to *Rh. Mercki*.

HUMERUS.

Humerus sinister T.M. *Rh. etruscus*. Pl. XI, fig. 5a, 5b and 5c.

Humerus sinister T.M. *Rh. etruscus?* *Mercki?*

Humerus dexter B.M. *Rh. etruscus?* *Mercki?*

In T.M. is found the distal end of a humerus sinister (Pl. XI, fig. 5) with a part of the corpus (shaft). The piece is glued together out of three fragments. Above the trochlea the partition wall between the fossa coronoidea and the fossa olecrani is lost for the greater part.

Dimensions (cf. P. 30, p. 227):	<i>Rh. etruscus</i>						<i>Rh. Mercki</i>			<i>Rh. Antiquitatis</i>		
	Tegelen T.M.	P. 25 L.M.	Val d'Arno P. 10	Mosbach B.M.	Val d'Arno B.M.	Hundsheim	Heggen	Taubach	Mosbach B.M.	Wiljui	Krayburg	Nieder-Jöhne
1. Maximum breadth of distal end	127	115.5	132.6	138	121	134	161	155	172	188	180	ca 174
2. Maximum breadth of trochlea	83	78	86.7	92	86	107.6	105	110	116	111	114	114
3. Thickness of condylus externus	55	—	—	81	75	—	75	—	89	73.5	—	91
4. Thickness of condylus internus	80	—	—	88	81	—	105	—	117	101	—	105
5. Thickness of trochlea in groove	42	—	—	47	40	—	57	—	66	57	—	65
6. Thickness of outer side of distal end	83	—	—	95	90	—	120	—	131	120	—	—
7. Thickness of inner side of distal end	98	92	104.5	115	102	101	132	121	138	124	125	139
8. Breadth of fossa olecrani at upper margin	49	—	—	50	44	—	74	—	73	—	—	75
9. Minimum breadth of corpus	53?	57	55.88	—	53?	67.5	73?	71	72?	79	80	86?
10. Thickness of corpus at place of minimum breadth	56?	—	—	—	57?	—	69?	—	80?	79	—	94?
2 : 1	0.56	0.67	0.65	0.66	0.71	0.80	0.65	0.71	0.68	0.60	0.63	0.65
2 : 3	1.50	—	—	1.13	1.14	—	1.40	—	1.30	1.51	—	1.25
2 : 4	1.03	—	—	1.04	1.06	—	1.00	—	0.99	1.10	—	1.09
2 : 5	1.97	—	—	1.96	2.15	—	1.84	—	1.76	1.95	—	1.75
1 : 6	1.53	—	—	1.45	1.34	—	1.34	—	1.31	1.56	—	—
1 : 7	1.30	1.25	1.27	1.20	1.18	1.32	1.22	1.28	1.24	1.51	1.44	1.25
1 : 9	2.39	2.06	2.37	2.46	2.28	1.98	2.20	2.18	2.40	2.40	2.25	2.02

Both in its dimensions and in its proportions the humerus sinister in T.M. resembles the humerus of *Rh. etruscus* in P. 10, p. 366 most closely. The differences are so insignificant that they must undoubtedly be attributed to individual variation or to somewhat different measurement.

In the humerus of *Rh. etruscus* in L.M. the differences of proportion are slightly greater. The humerus in T.M. is somewhat larger and slenderer.

The differences of proportion in the *etruscus* group are not inconsiderable, so that the *Mercki* group falls almost entirely within the range of variation of the *etruscus* group. The humerus from Hundsheim diverges greatly. The humerus of *Rh. Mercki* from Heggen is much larger, but the differences of proportion of the distal extremity are comparatively small.

In T.M. a fragment of the corpus of a humerus sinister from the Teglian Clay is found. The fossa coronoidea and the fossa olecrani are still partially present.

The minimum breadth is 66 mm. against 53 mm. in the former.

The B.M. also possesses a part of a humerus dexter from Tegelen corresponding to the just-mentioned fragment in T.M. It is glued together from many fragments. The minimum breadth is 63 mm.

OS LUNARE.

Os lunare sinistrum.

T.M. *Rh. etruscus?* Pl. XI, fig. 7a and 7b.

The left os lunare in T.M. is almost quite intact.

Dimensions :	
1. Maximum breadth of upper articular surface for radius and ulna	42
2. Length of front side	43
3. Length of upper articular surface	35
4. Maximum dimension (from front to back)	59.7
5. Length of articular surface for os unciforme	37
6. Length of articular surface for os magnum	44

The convex upper articular surface for the radius is prolonged towards the back with a smaller articular surface, as with *Rh. hundsheimensis*. Yet the shape of the articular surface as a whole is somewhat different. In that in T.M. the boundary between the articular surface for the radius and the upper one for the os scaphoideum is about a straight line. In that of *Rh. hundsheimensis* (P. 28, Taf. VIII, Fig. 2) this boundary is formed by two lines which form an obtuse angle.

In *Rh. etruscus* var. *astensis* SACCO the upper articular surface is prolonged in the direction of the os cuneiforme. In the os lunare in T.M., as in that of *Rh. hundsheimensis* (cf. P. 28, p. 50), it is prolonged in the direction of the os scaphoideum, being pointed in the specimen in T.M.

On the medial surface of the os lunare at the upper part two articular surfaces for the os scaphoideum are seen, which unite and have a joint length of 40 mm., and another lower articular surface for the os scaphoideum. The lateral surface has an upper and a lower articular surface for the os cuneiforme.

The distal side has two oblong excavated articular surfaces. The longest is for the os magnum, and the shortest for the os unciforme. Behind the shortest there is a rough surface (Pl. XI, fig. 7b).

The articular surface for the radius passes backward into a prolongation, the broadest part of which (34 mm. broad) bends downward.

An accurate comparison of the dimensions of the os lunare in T.M. with the specimen from Hundsheim is not possible. It only appears from the figures that the specimen in T.M. is considerably smaller.

PORTIS gives a reproduction of a left os lunare of *Rh. Mercki* from Taubach (P. 14). The figure seems too vague to me for an accurate comparison. The differences in form and size seem to be considerable.

Nor do I venture to make an accurate comparison with the os lunare of *Rh. antiquitatis*, figured and briefly described in P. 10, p. 30 and Taf. IX, Fig. 10b.

Metacarpale III sinistrum.

T.M. *Rh. etruscus*. Pl. XI, fig. 4a, 4b and 4c.

T.M. possesses an entirely undamaged metacarpale III sinistrum.

Dimensions (cf. P. 28) :	<i>Rh. etruscus</i> Tegelen T.M.	<i>Rh. hundsh.</i> P. 28	<i>Rh. etruscus</i> P. 32 's Hertogenbosch
1. Maximum length.....	188.5	215	—
2. Maximum breadth of proximal articular surface	56	62	55
3. Maximum thickness of proximal articular surface	49	52	47
4. Maximum breadth of body (middle)	48.5	52.5	—
5. Maximum thickness of body (middle)	19	24	—
6. Maximum breadth of distal articular surface....	44	50.5	—
7. Maximum thickness of distal articular surface..	40	51	—
1 : 4	3.88	4.09	—
4 : 5	2.55	2.19	—
7 : 6	0.99	1.01	—

Metacarpale III in T.M. is somewhat smaller than metacarpale III of *Rh. hundsh.* It appears from the proportions of the dimensions given that the specimen in T.M. is relatively somewhat broader and thinner in the middle. RUTTEN (P. 32, p. 42) gives three dimensions of a metacarpale III of *Rh. etruscus* in the Museum at 's Hertogenbosch. The maximum breadth (55 mm.) and the maximum thickness (47 mm.) are almost the same as those in metac. III in T.M. The minimum breadth in the middle is in the specimen at 's Hertogenbosch 50 mm. as against 54 mm. in that of T.M. The former is, therefore, somewhat slenderer.

RUTTEN says further on p. 42: "Im Vergleich zu demjenigen von *Rh. hundsh.* ist die Gelenkfläche für das Unciforme sehr gross und dasselbe gilt in bezug auf *Rh. Merckii*" (PORTIS, P. 14, Taf. XX, Fig. 15i). In this respect the specimen in T.M. resembles that at 's Hertogenbosch.

The metac. III in T.M. is distinguished from that of *Rh. antiquitatis* by its greater slenderness (BRANDT, P. 12, p. 33, Taf. IX, Fig. 10 h).

In P. 20 (Atlas, Pl. XVIII, fig. 1) a reproduction occurs of a metacarpale III of *Rh. Mercki* KAUP. The specimen strikes us by its shortness.

Measured in the fig. 1. the maximum length would be 175 mm.

- 2. " " breadth of the proximal end 65 mm.
- 3. " " " in the middle 50 mm.
- 4. " " " of the distal end 51.4 mm.

It is, therefore, short and broad, and is not at all in conformity with the dotted outline which PORTIS gives of a middle metacarpale of *Rh. Mercki* from Taubach. According to PORTIS this specimen would, relatively, have been still longer than in *Rh. etruscus* in T.M. At any rate it appears from the two other metacarpalia figured by PORTIS that the missing middle metacarpale cannot possibly have had the form of the French specimen. For this reason I doubt whether this latter (horizon interglaciaire de Villefranche?) may, after all, be ascribed to *Rh. Mercki*. It bears a much greater resemblance to the metac. III of *Rh. antiquitatis* (P. 12, Taf. IX, Fig. 10h). The proportion of the maximum length to the maximum upper breadth is 2.7 in both.

T.M. possesses another fragment which I am also inclined to take for a metacarpale III, though with some hesitation. The distal end is missing. The proximal articular surfaces are worn away. The breadth (middle) is 52.5, the thickness (middle) 20 mm.; hence

the proportion becomes 2.62 as against 2.55 in the first specimen. In complete condition it must have been considerably larger than the first specimen. Whether it should be ascribed to *Rh. etruscus*, I dare not decide.

HIND LIMB.

PELVIS.

Os ischii S.M. *Rh. Mercki*(?). Pl. XII, fig. 1.

Of the pelvis only the right ramus acetabularis of the os ischii with part of the acetabulum has been found. Also the incisura acetabuli and part of the fossa acetabuli is present.

The thickness of the ramus acetabularis measured in the middle is 44 mm. as against 40 mm. in *Rh. sondaicus*. The breadth at that region is 56 mm. against 47 mm. in *Rh. sond.* The description of the pelvis of *Rh. hundsh.* by TOULA does not offer any possibilities of comparison. I think I may conclude from Fig. 1 and Fig. 2 of Taf. IX (P. 28) that the os ischii of the pelvis in S.M. is broader and thicker. From a comparison with the acetabulum of *Rh. sond.* it appears that the maximum diameter of it is more than 90 mm. in the pelvis in S.M. The maximum diameter of the acetabulum is 0.85 mm. in *Rh. Mercki* (SIMONELLI) (cf. P. 23, p. 129).

FEMUR.

Femur sinistrum, T.M. *Rh. etruscus*. Pl. XI, fig. 6a, 6b and 6c.Femur dextrum, T.M. *Rh. etruscus*. Pl. XI, fig. 8a, 8b and 8c.

The femur sinistrum in T.M. consists of several joined fragments. The proximal extremity with the caput and the trochanter maior is wanting.

Besides, T.M. possesses the distal part of a femur dextrum.

Dimensions (cf. P. 28) :	Tegelen fem. sin. T.M.	Tegelen fem. dextr. T.M.	<i>Rh.</i> <i>etruscus</i> P. 25 L.M.	<i>Rh.</i> <i>etruscus</i> P. 10	<i>Rh.</i> <i>hundsh.</i>	<i>Rh.</i> <i>antiqu.</i> Kray- burg	<i>Rh.</i> <i>hemi-</i> <i>toechus</i> BUSK	<i>Rh.</i> <i>Mercki</i> SIMO- NELLI
1. Maximum length	—	—	408	420.7	495	510	—	440
2. Maximum breadth above troch. III	—	—	153	—	184	220	188.7	157
3. Maximum diameter of caput	—	—	72	—	89	96	84.15	74
4. Breadth above troch. III	91	—	90	104.5	91.2	120	109.65	—
5. Minimum breadth of shaft	64	—	ca 62	63.75	74	86	—	—
6. Thickness at that place	54	—	ca 47	—	54	57	—	49?
7. Maximum breadth of distal end	122	120	105	—	142	135	—	117
8. Maximum thickness of distal end inside	148	148	136	153	172	185	—	151
9. Maximum thickness of distal end outside.....	126	126	106	120?	134	147	—	120
10. Distance between lower edge of troch. III and upper edge of troch. maior	—	—	208	—	263.5	275	—	206
5 : 6	1.18	—	1.31?	—	1.37	1.50	—	—
7 : 5	1.90	—	1.69?	—	1.91	1.57	—	—
8 : 7	1.21	1.23	1.29	—	1.21	1.37	—	1.29
8 : 9	1.17	1.17	1.28	1.27?	1.28	1.25	—	1.25
7 : 4	1.34	—	1.16	—	1.55	1.12	—	—

The femur sin. in T.M. is 427 mm. long. It must, therefore, have been much larger in complete condition than that of *Rh. etruscus* in L.M. It is intermediate between that in L.M. and that from Hundsheim.

The femur in T.M. is larger in all its dimensions than that in L.M. Also the proportions are different in several respects. As the dimensions 4 and 5 of the femur in L.M. cannot be given with certainty, little can be concluded from the difference in the proportions 5 : 6 and 7 : 5 given. Taking the maximum breadth of the distal end as the foundation of our comparison, we may say that in the femur in T.M. the thickness below inside is slightly smaller, the thickness outside slightly greater, and that the femur in T.M. is considerably narrower above the troch. III than that in L.M. Accordingly the femur in T.M. is not only larger, but its shape is also slenderer than that in L.M.

The femur in T.M. is probably smaller in complete condition than that from Hundsheim, for it is smaller in all its other dimensions. When the figures of the three femora mentioned are compared, it is at once apparent that the femur in T.M. resembles that from Hundsheim more closely than the Leyden specimen. The proportions of the first two have also greater similarity. The ratio between the maximum breadth of the distal end and the minimum breadth of the shaft is almost the same. The ratio 8 : 7 is exactly the same. The femur in T.M. is relatively somewhat thicker at the place of the minimum breadth. Above the trochanter III the femur in T.M. is broader in comparison with the maximum breadth of the distal end than that from Hundsheim, but it appears from the reproductions, that the femur from Hundsheim is damaged just at this place, and supplemented with plaster. An accurate comparison is, therefore, not possible. The trochanter III of our specimen has a broader base and passes into the corpus only very gradually. The distal condyli diverge more upwards in the Leyden and Hundsheim specimens than in the femur in T.M. (P. 25 and P. 28).

The femur dextrum of *Rh. etruscus* FALC. at Bologna (P. 10, p. 367) is considerably broader above the trochanter III, at least according to measurement 4.1 inch = 104 mm. given by FALCONER. If, however, the figures 19—20, Pl. 49 in CUVIER (P. 1) are compared, to which FALCONER refers, a totally different impression is obtained. By measuring fig. 19 and 20, I arrive at the following dimensions :

	fig. 19	fig. 20
Maximum breadth of distal end	113.2 mm.	120
Minimum breadth of shaft	54.4 „	54
Breadth above troch. III	64 „	73 6
Total length	440 „	440

Though we see from these different results that we do not arrive at reliable results by measuring the figures, we may conclude that according to the reproductions the Bologna specimen both above and below the trochanter tertius, is considerably narrower than our specimen. CUVIER gives as "Plus petite circonférence au dessous du troisième trochanter" 189 mm., the specimen in T.M. measuring 191 mm. in circumference at this place. STROMER VON REICHENBACH says P. 25, p. 84: "Nach der Abbildung in CUVIER und den angegebenen Maassen zu schliessen, ist das etwas grössere Femur von Bologna von dem Leidener recht wenig verschieden; nur scheint der vom trochanter maior zum troch. III gehende, hintere Rand bei dem letzteren weniger gebogen zu sein." The femur in T.M., now, resembles the Bologna specimen also as regards this bent line.

The femur of *Rh. antiquitatis* is considerably larger and clumsier than the femur in T.M.

With regard to the femur of *Rh. Mercki* of SIMONELLI I refer to STROMER V. REICHENBACH's remarks on p. 85 in P. 25.

Femur dextrum I and II.

B.M. *Rh. etruscus* ? *Mercki* ?

There are in B.M. two *Rhinoceros* femora dextra found by Prof. KRAUSE at Tegelen. Of the smaller, which I shall call fem. dextr. I, only the greater part of the corpus is left, the trochanter tertius being broken off at the base.

Dimensions :	fem. dextr. I B.M.	fem. sin. T.M.	fem. dextr. II B.M.
1. Breadth above troch. III	89	91	—
2. Minimum breadth of shaft	59.5	64	—
3. Thickness at that place	52.5	54	55
1 : 2	1.50	1.42	—
2 : 3	1.13	1.18	—

The femur I in B.M. is slightly smaller than that in T.M. It appears from the proportions given that the femur in B.M. above the troch. III is relatively broader, and at the place of minimum breadth somewhat thicker than the femur in T.M. That in Berlin does not increase so rapidly in breadth downwards, and the front side is rounder. The form of the two bones shows a great resemblance; only the rough surfaces and ridges for the attachment of the muscles are more pronounced in that in B.M.

Femur dextrum II in B.M. has been glued together out of several fragments. Missing parts have been supplemented by a brownish substance. Only one accurate measurement is possible, i.e. the thickness at the place of minimum breadth. The femur in B.M. is much larger than that in T.M. In shape it is more similar to femur dextrum I in Berlin. Thus e.g. the front side at the place of the minimum breadth is rounder than in the femur in T.M., the back being flatter.

Caput femoris dextri. S.M. *Rh. Mercki* ? Pl. XII, fig. 2.

Condylus distalis. S.M. *Rh. Mercki* ? Pl. XII, fig. 3 and 4.

There are still in S.M. a condylus lateralis of a femur sinistrum and a condylus lateralis of a femur dextrum. The length of the articular surface measured from the inner-lower to the outer-upper corner is 96 mm. as against 81.5 mm. in femur dextrum (T.M.). The maximum thickness of the condylus lateralis with the epicondylus lateralis is 66.8 mm. in the detached condyli as against 59.2 mm. in the said femur dextrum in T.M. and 59 mm. in the femur sinistrum in T.M. The ratio of the two measurements is resp. 1.43, 1.37, and 1.37.

S.M. also possesses a caput femoris dextri glued together out of two fragments. The maximum thickness of the condylus is 90 mm. against 89 mm. in *Rh. hundsh.*, 78.6 mm. in a detached condylus of *Rh. etruscus* in T.M., 72 mm. in *Rh. etruscus* in L.M., and 74 mm. in *Rh. Mercki* of SIMONELLI.

PATELLA.

Patella dextra and sinistra.

T.M. *Rh. etruscus*. Pl. XII, fig. 5a and 5b.

T.M. possesses a right and a left patella of a *Rhinoceros* from Tegelen. Both are almost entirely intact.

Dimensions (cf. P. 28) :	<i>Rh. etruscus</i> Tegelen		<i>Rh. hunds-</i> <i>heimensis</i>	<i>Rh. Mercki</i> PORTIS : P. 14	<i>Rh. Mercki</i> SIMONELLI
	right	left			
1. Maximum length	95	94	108.2	70	88.5
2. „ breadth	84	84	86	99	70.5
3. „ thickness at the top	48.5	48.5	52	—	—
I : 2	1.13	1.12	1.26	—	1.25
I : 3	1.96	1.94	2.08	—	—

On Taf. X of P. 28 TOULA gives three figures of the patella of the *Rhinoceros* mentioned, which is very similar to the patella in T.M. The reason that the reproduction of the outside of the patella in T.M. (Pl. XII, fig. 5b) differs so greatly from Fig. 3a, Taf. X of TOULA is that the position is not quite the same. But the right patella in T.M. can be placed so that Fig. 3a of TOULA may be imagined to give a reproduction of it. The principal form of both is a rhomb; if, however, Fig. 3c and 3b of TOULA are compared with the original in T.M., it is seen that the lower transverse process of the inner margin of the patella from Tegelen (Pl. XII, fig. 5b) is longer, which also appears from the proportions given. The upper transverse projection (cf. Fig. 36, TOULA with fig. 5a of Pl. XII) is more rounded in that from Tegelen, and its position is more oblique to the vertical elevation of the articular surface than in that of *Rh. hundsh.* In our specimens this vertical elevation itself runs almost parallel to the outer edge (Pl. XII, fig. 5a), whereas in the specimen from Hundsheim the elevation and the edge meet at an obtuse angle. It follows from the second relation that the patella from Tegelen is comparatively thicker. TOULA also states the thickness in the middle and at the distal end, but I see no possibility to give corresponding measurements in the specimen in T.M. which are not open to doubt.

Entirely different is the result of a comparison with the figures given by PORTIS of the patella of *Rh. Mercki* from Taubach in P. 14, Taf. XX, Fig. 17a and b. There, too, the fundamental form is a rhomb. But for the rest the differences are so great that the conclusion of a difference of species may be made without any hesitation. I do not feel myself justified in using the measurements given by PORTIS for a comparison, as I do not know where precisely the measurements were taken.

BRANDT says (P. 12, p. 36) : "CUVIER (Recherch. 4e ed. III p. 158) erwähnt einer bei Abbeville gefundenen Kniescheibe, die vielleicht *Rhinoceros antiquitatis* angehören könnte." CUVIER gives as height 85 mm. and as breadth 95 mm. Hence almost the very reverse of our specimens. The figures 6 and 7 on Pl. 49 given by him, present, however, a striking resemblance to the patella of T.M. held in the same position. The fundamental form is the same. If on Fig. 6 of CUVIER the length and breadth is measured as I have measured them on the specimen in T.M., resp. 26.2 and 23.2 mm. is obtained. The proportion is then 1.13, i.e. exactly the same proportion as in the right patella from Tegelen. If it is taken in consideration that PORTIS (P. 14, p. 154) ascribes all the bones figured by CUVIER on Pl. 49 to *Rh. Mercki* var. *etruscus*, this view finds a strong confirmation here.

TIBIA.

Tibia dextra I. T.M. *Rh. etruscus*. Pl. XII, 6a, 6b, 6c.

Tibia sinistra I. T.M. *Rh. etruscus*. Pl. XII, 9a, 9b.

In T.M. a tibia dextra is found which is glued together out of two fragments, but which is for the rest quite intact. Besides the museum possesses a tibia sinistra corresponding to it, of which the proximal end in front and at the back is damaged.

Dimensions (cf. P. 23 and P. 28) :	Tegelen		<i>Rh. hundsh.</i> P. 28	<i>Rh. etruscus</i> L.M.	<i>Rh. etruscus</i> P. 28	<i>Rh. etruscus</i> BUSK	<i>Rh. antiquitatis</i> Krayburg	<i>Rh. bicornis</i> Amsterdam	<i>Rh. Mercki</i> Heggen	<i>Rh. Mercki</i> Lodesana	<i>Rh. hemiteochus</i> Ilford
	tib. dextra I. T.M.	tibia sin. I. T.M.*									
1. Maximum length	370	369	398	325	357	3.595	380	390	392	—	372.3
2. Maximum breadth of proximal end	115	116	125	102.1	112.2	96.9	135	138	154	107	124.95
3. Maximum thickness of proximal end.	122	—	132	110	122.4	109.6	155	146	—	106	132.6
4. Maximum breadth (middle)	57	59	60	53	58.6	—	77	60	71	—	—
5. Maximum thickness (middle)	57	57	61	47	—	—	63	69	65	—	—
6. Maximum breadth of distal end	94	90?	110	85	—	86.7	115	112	115	85	95.35
7. Maximum thickness of distal end ...	66	66	74	60	71.4	61.2	96	84	78	82	76.5
I : 2	3.21	3.18	3.18	3.18	3.18	3.71	2.81	2.82	2.50	—	2.98
I : 4	6.49	6.25?	6.63	6.13	6.08	—	4.93	6.50	5.50	—	—
3 : 2	1.06	—	1.05	1.08	1.09	1.12	1.14	1.05	—	0.99	1.06
4 : 5	1.00	1.03	0.98	1.13	—	—	1.22	0.87	1.09	—	—
6 : 7	1.42	1.36?	1.48	1.41	—	1.41	1.19	1.33	1.47	1.37	1.23
I : 6	3.93	4.15?	3.61	3.82	—	4.14	3.30	3.48	3.40	—	3.90

*) Tibia sin. I. T.M. is slightly damaged on the outside of the distal end.

Both with regard to their dimensions and to their proportions both tibiae in T.M. fall within the variation range of the *etruscus* group, viz. *Rh. hundsh.*, *Rh. etruscus* at Leyden, *Rh. etruscus* according to TOULA, and *Rh. etruscus* Val d'Arno.

The tibia of *Rh. antiquitatis* is, with about equal length, much broader and thicker, hence clumsier.

SIMONELLI (P. 23, p. 109) gives for the dimensions of the tibia of *Rh. megarhinus* Monte Giogo 3, 4, 6, and 7 resp. 150 about, 60, 107, and 75. This, too, is distinguished by a comparatively and absolutely greater thickness of the proximal end.

The tibia of *Rh. hemiteochus* (Ilford) is at the upper end much broader and thicker, and at the lower end thicker with about equal length.

The tibia of *Rh. Mercki* from Lodesana seems to be slenderer than that in T.M. (cf. P. 23, Taf. XVI, Fig. 7 and 8).

PORTIS mentions in P. 14, p. 153 a proximal extremity from Taubach, which is 140 mm. broad, and a distal fragment, which is 111 mm. broad at the lower part and 75 mm. in the middle. The dimensions greatly exceed the corresponding ones in our specimens, and give fairly different proportions.

In their dimensions the tibiae in T.M. bear the closest resemblance to those of *Rh. hundsh.* There is also great similarity as regards proportions. Those in T.M. are relatively slightly broader in the middle and somewhat narrower at the distal end. When TOULA's Taf. X, Fig. 2 d. is compared with fig. 9b, Pl. XII (the under side of the tibia in T.M.), it at once strikes us that the medial articular surface compared with the lateral one is much narrower in *Rh. hundsh.*

In this latter point the tibia in T.M. and the Leyden specimen resemble each other very closely (cf. P. 28, Taf. X, Fig. 8). The Leyden tibia is smaller in all its dimensions. But in its proportions it is closest to the tibia in T.M. The Leyden specimen is comparatively slightly broader in the middle. Also the articular surfaces for the femur show great resemblance to each other.

The tibia dextra of *Rh. Mercki* from Heggen is larger than the tibiae in T.M. The great breadth of the proximal extremity is striking. "Am oberen Artikular-Ende ist die innere Gelenkfläche hinten auffallend geradlinig abgeschnitten, während diese Partie an der Leidener Tibia zugespitzt oder doch gerundet erscheint, wie an der Hundsheimer Tibia" (SCHROEDER P. 30, p. 237). This peculiarity is also found in the tibiae in T.M.

It follows from what precedes that we may conclude without the slightest doubt that the two tibiae belong to *Rh. etruscus*.

Tibia sinistra II.

T.M. *Rh. etruscus*, Pl. XII, fig. 8a, 8b and 8c.

In the collection from the Clay of Tegelen in T.M. there is still another tibia sinistra, with inscription: "Tibia sinistra *Rhinoceros etruscus* FALC. Clay on the righthand bank of the Meuse at 8.60 ± A.P. (A.P. = sea level), 1 km. S. of Venlo, Sept. 1st 1904." The upper condyli are entirely wanting, the rest is glued together from several fragments and supplemented with plaster.

Dimensions: The total length of the fragment is 353 mm,

	tibia dextra I	tibia sin. I	tibia sin. II
1. Length of tibia to upper end of crista interossea	239	239	267.5
2. Maximum breadth in middle	57	59	59
3. Maximum thickness in middle	57	57	52
4. Maximum breadth of distal end	94	90(?)	95
5. Maximum thickness of distal end	66	66	73
I : 2	4.19	4.05	4.53
I : 4	2.54	2.65(?)	2.81
4 : 5	1.42	1.36(?)	1.30
4 : 2	1.65	1.52(?)	1.61

Tibia dextra I and tibia sinistra I differ rather much as regards the breadth of the lower part, because the sinistra is somewhat damaged at this place on the outside. As the same thing applies to the tibia sinistra II, I prefer to compare the measurements of the two latter.

It appears from the table that the measurements and the proportions are very divergent. Besides the cochleae tibiae differ slightly in form and depth.

The corresponding dimensions of *Rh. antiquitatis* from Krayburg are:

	<i>Rh. ant.</i>	tibia II T.M.
2. Maximum breadth in middle	77	59
3. Maximum thickness in middle	63	52
4. Maximum breadth at distal end	115	95
5. Maximum thickness at distal end	96	73
4 : 5	1.20	1.30
4 : 2	1.49	1.61
2 : 3	1.22	1.13

In this it should be borne in mind that the tibia of *Rh. ant.* from Krayburg is 38 cm. long, whereas the tibia II in T.M. must have been considerably larger. That of *Rh. ant.* from Krayburg is broader and thicker. Tibia II in T.M. cannot have belonged to *Rh. ant.* We have then to consider *Rh. Mercki*. PORTIS says P. 14, p. 153: "Die Tibia (*Rh. Mercki* Taubach Fig. 18) ist vertreten durch eine isoliert gefundene obere Epiphysis von 140 mM. Quersbreite und durch ein einziges Distal-Ende der rechten Seite, dessen grösste Breite unten 111 mM., in der Mitte 75 mM. beträgt. Vergleicht man diese vorhandenen Reste mit den entsprechenden des *Rhin. antiquitatis* und *Rhin. indicus*, so kann man die ganze Länge der Tibia zu 400 mM. annehmen." Through comparative measurements

of tibia I and tibia II in T.M. I arrive at the conclusion that tibia sinistra II must have been at least 400 mm. long. In length it, therefore, corresponds to that of *Rh. Mercki* from Taubach. But the difference in breadth is so great that they cannot have belonged to individuals of the same species. Nor does the reproduction Taf. XX, Fig. 18c (PORTIS) of the concavities for the astragalus resemble that of tibia II in T.M.

PORTIS says further on p. 154: "Ich stehe nicht an, alle von CUVIER (Recherches sur les ossements fossiles, Atlas ±, Pl. 49, fig. 8—9, 10—11, 13—14, 15, 18, 19—21) abgebildeten Knochen als dem *Rhinoceros Merckii*, var. *etruscus* angehörend anzusehen." Following BRANDT (P. 12) PORTIS states as his opinion "dass das *Rhinoceros Merckii* (*Rhin. Kirchbergensis*, *Rhin. hemitoechus*) und *Rhin. etruscus* eine einzige Art bilden, die den grössten Theil Europas bewohnte, wofür er (BRANDT) den Namen *Tichorhinus* (*Rhin. Merckii*) beibehält. Es konnte diese Art gerade wegen der grossen geographischen Verbreitung bei verschiedenen klimatischen . . . und Ernährungs-Verhältnissen sich zu verschiedenen Rassen gestalten. So bezeichnet die ursprüngliche Art *Rhin. etruscus* die südliche Rasse, welche den Süd-Westen Europas bewohnte." Accordingly PORTIS takes Pl. 49, fig. 13 and 14 of CUVIER for a tibia of *Rh. etruscus*. CUVIER gives no measurements, fig. 13—14 have been drawn at 1/4 of the natural size. The figures of CUVIER make an impression of great accuracy. I venture, therefore, to arrive at the dimensions of the tibia itself by measuring the figure.

Dimensions:	tibia (Recherches) CUVIER	tibia II T. M.
1. Maximum breadth at distal end (calculated from fig. 14)	104 mm.	95
2. Maximum thickness at distal end (calculated from fig. 14)	80	73
3. Maximum breadth middle (calculated from fig. 13)	64	59
I : 2	1.30	1.30
I : 3	1.62	1.61

These proportions are, therefore, in good harmony. fig. 14 of CUVIER represents the cochlea tibiae. This departs in a few points from the cochlea of tibia II in T.M. From all this, however, we arrive at the conclusion that tibia sinistra II in T.M. must have belonged to a *Rhinoceros* from the *etruscus* group.

We will now compare tibia sinistra II with tibia sinistra I in T.M. The anterior surface of this latter is distally 90 mm. wide as against 95 mm. in tibia II. The anterior surface of tibia I is 62.5 mm. broad at the top of the distal area of attachment of the interosseous ligament, of tibia II 71 mm. broad. The minimum breadth on the anterior surface of tibia I is 60 mm., of tibia II 57 mm. The anterior surface, therefore, gets much narrower towards the middle. Besides, its proximal part is in tibia II much less concave. This, and the fact that in tibia II the crista does not rise so high proximally, may perhaps be owing to a wrong attachment of some fragments, to which some indications seem to point.

The medial surface of tibia I is 70.5 broad below, that of tibia II 76.5 mm. As fig. 8a, Pl. XII shows, tibia II gets much narrower towards the top, so that tibia II is not only relatively, but also absolutely considerably thinner in the middle. The line bounding the medial surface, is bent quite differently in the two tibiae. In tibia I the medial side is almost flat from below upwards, it being pretty strongly concave in this direction in tibia II.

Also the posterior surface narrows much more proximally in tibia II than in tibia I. Moreover in tibia I it is much more convex across and less concave lengthwise than in tibia II.

These differences may perhaps partly be accounted for by the fact that tibia II has been restored out of a great number of fragments; even the most scrupulous care does not guarantee the exclusion of small inaccuracies in such a difficult operation.

Tibia dextra and sinistra.

S.M. *Rh. Mercki*. Pl. XII, fig. 10a and 10b.

I found in S.M. among the *Rhinoceros* bones also a distal extremity of a left tibia. I have besides succeeded in joining four fragments to a distal extremity of a tibia dextra.

Dimensions (cf. P. 30):	tibia S.M.		tibia dext. I T.M.	tibia sin. II T.M.	<i>Rh. Mercki</i> Heggen
	dext.	sin.			
1. Maximum breadth of distal extremity (front) .	110	104?	94	95	115
2. Maximum thickness of distal extremity	82	82	66	73	78
3. Breadth of distal articular surface (middle)	79	—	70	75	86
4. Maximum dimension of articular surface from front to back (inside)	—	66	58	64	ca 63
1 : 2	1.34		1.42	1.30	1.47
3 : 4	1.20		1.20	1.17	1.36

In complete condition the tibiae in S.M. must have been considerably larger than those in T.M. The breadth of the distal end is only 1 mm. less than in *Rh. Mercki* from Taubach (PORTIS), and 5 mm. less than in *Rh. Mercki* from Heggen (SCHROEDER). The facies articularis for the astragalus is somewhat flatter than in tibia I in T.M. The posterior surface of the tibia in S.M. is rather concave from left to right, that in tibia I in T.M. being more convex. The medial surface and the posterior surface meet at an acute angle, the transition being more gradual in tibia I in T.M.

The proportion 1 : 2 corresponds most closely to that in tibia sin. II in T.M., and diverges greatly from that in tibia dextra I in T.M. I do not attach much value to this. More or less individual development of some muscles may be the cause. Remarkable is the correspondence in the proportion of the dimensions of the articular surface between all three Teglian specimens.

CONCLUSION. We know the tibiae of three *Rhinoceros* individuals from Tegelen of which the first-mentioned specimen in T.M. should be assigned without any doubt to *Rh. etruscus*. The second specimen in T.M. gave me reason for doubt, chiefly on account of the not insignificant differences with the first specimen. The consideration, however, that these differences are possibly partly to be attributed to a not quite accurate joining of the fragments at some places, and that the differences with the tibiae of *Rh. Mercki* from Taubach and from Heggen are still greater, led me to the decision, not to assume difference of species with the first specimen. I was confirmed in my opinion by the striking resemblance with the tibia figured by CUVIER, which was ascribed to *Rh. Mercki* var. *etruscus*, i.e. to *Rh. etruscus*, by the author of *Rh. Mercki* from Taubach himself.

The tibia of the third individual, viz. that in S.M., has only been preserved for a small part, which shows, however, sufficiently that the complete tibia will have been hardly smaller in size than that of *Rh. Mercki* from Taubach and from Heggen, the dimensions of the distal extremity considerably exceeding those in the different *etruscus* specimens. Probably it belongs to the other *Mercki* remains (dentition) in S.M., and should on this ground be ascribed to *Rh. Mercki*.

ASTRAGALUS.

Astragalus dexter I.

T.M. *Rh. etruscus*, Pl. XII, fig. 13a, 13b and 13c.

In T.M. there is found an entirely undamaged astragalus belonging to the already described tibia dextra I of *Rh. etruscus*.

Dimensions (cf. P. 25):	astr. dext. I T.M.	<i>Rh. etruscus</i> L.M.	<i>Rh. Mercki</i> Taubach	<i>Rh. hemioechus</i> (BUSK)	<i>Rh. Mercki</i> (SIMONELLI)	<i>Rh. antiqu</i> Krayburg
1. Maximum length of inner side	69.7	60	83	79.05	66 ?	80
2. Maximum length of outer side	74	66.5	84	63.75	65 ?	82
3. Maximum length of lateral border of trochlea	69	60	76	—	57 ?	70
4. Maximum breadth of outer side	43	35.5	42	40.8	36 ?	39
5. Maximum breadth of inner side	55	46	61	56.55	—	60
6. Breadth of trochlea (back)	74	67	80	79.05?	—	90
7. Length of navicular-cuboid facet	68	64	77	68.85	—	80
8. Breadth of navicular cuboid facet	40	37*	53	40.8	—	58
2 : 4	1.72	1.87	2.00	1.56	1.80 ?	2.10
6 : 3	1.07	1.11	1.05	—	—	1.28
1 : 5	1.27	1.30	1.36	1.40	—	1.33

* STROMER VON REICHENBACH gives 42.

The courteous conservator of the Leyden Geol. Museum, Dr. GERTH, enabled me to compare the astragalus dexter I of T.M. with the Leyden astragalus dexter of *Rh. etruscus* FALC. described by STROMER VON REICHENBACH (P. 25). They resemble each other closely. That in T.M. is, however, larger in every dimension. They diverge from each other only in subordinate points.

The boundary between the trochlea and the facies malleolaris lateralis and the facies articularis calcanea posterior is formed in Teyler's specimen (Pl. XII, fig. 13a) by a somewhat excavated rough triangular surface, which is considerably larger than in the Leyden specimen. In other words: the three articular surfaces which meet in the outer posterior corner, approach each other more closely in the Leyden astragalus than in that in T.M. A consequence of this is that the facies malleolaris lateralis looks shorter and broader in the latter than in the former, and that the facies articularis calcanea posterior has a somewhat different shape.

The facies articularis calcanea media has an oblong rectangular form in the Leyden astragalus; it is rounder and besides flatter in that in T.M. The form of the facies articularis calcanea anterior is the same in the two specimens; only a fusion has taken place with the middle facet in the specimen in T.M., which is not the case with the Leyden astragalus. Owing to this the sulcus is prolonged further downwards in the latter. Nor is the situation of the arterial foramina exactly the same.

The proportion of length and breadth of the navicular cuboid facet is 1.70 in both

specimens. In the astragalus in T.M. the facies articularis navicularis and the medial part of the trochlea meet. This is not the case with that at Leyden, in other words, the collum is shorter in the astragalus in T.M. than in that at Leyden. In this respect that in T.M. is nearer to that of *Rh. Mercki* described and figured by PORTIS (P. 14, Taf. XX, Fig. 19a). The collum under the trochlea is excavated in the Leyden specimen, not in that in T.M.

The outer part of the trochlea is more bent in cross-section in the astragalus in T.M. than in that at Leyden. As appears from the proportions 1 : 5 and 2 : 4, the latter is somewhat slenderer.

The astragalus of *Rh. hundsheimensis* (TOULA P. 28, p. 62—64, Taf. XI, Fig. 1, 3 and 4) is larger in all its dimensions. The facies articularis calcanea media has the shape of a triangle, and is, here too, fused with the facies articularis calcanea anterior. The facies articularis calcanea posterior resembles in form more closely that of the Leyden specimen, with this difference that the before-discussed triangle with its rough surface seems to be entirely absent. (cf. P. 28, Taf. XI, Fig. 4). The astragalus at Leyden as well as that in T.M. show a deep constriction under that facet in contrast with the astragalus of *Rh. hundsheimensis*.

On p. 87 in P. 25 STROMER VON REICHENBACH says: "Von dem Astragalus von Taubach unterscheidet sich also derjenige von Leiden fast nur durch seine Größe." I may add to this that the astragalus in T.M. agrees in its dimensions and proportions still more closely with the Leyden specimen than with that from Taubach. As appears from the table, the dimensions and proportions of the astragalus of *Rh. antiquitatis* from Krayburg, of *Rh. hemitoechus* from Gibraltar depart much more from that in T.M., for which reason an accurate mutual comparison seems unnecessary.

Astragalus dexter II.

T.M. *Rh. etruscus*? *Mercki*? Pl. XII, fig. 14a, 14b and 14c.

There is another right astragalus from the Teglian Clay in T.M. Unfortunately, however, it is badly damaged, particularly at the lower part.

Dimensions :	astr. dext. II T.M.	astr. dext. I. T.M.	<i>Rh. etruscus</i> L.M.	<i>Rh. hundsh.</i> P. 28
1. Maximum length inside	at least 79	68	59	80
2. Maximum length outside	82	74	66.5	—
3. Maximum breadth of trochlea (in front)	78	68	60	75
4. Maximum length of medial border of trochlea	at least 66	65	54	69.6
5. Maximum length of lateral border of trochlea	at least 68	69	60	69.2
6. Maximum breadth of outer side . . .	41.5	43	35.5	—
2 : 1	1.04	1.09	1.127	—
2 : 6	1.97	1.72	1.87	—

For the inner length of astragalus I in T.M. and of the Leyden astragalus I give here resp. 68 and 59, because I have measured them between the points corresponding with the outmost points of the badly damaged inner side of the astragalus II.

The astragalus dexter II is considerably larger than the astragalus dexter I, and almost equals in size that from Hundsheim.

The proportion of outer and inner height is smaller in the second astragalus than in the first, but in this respect astragalus I in T.M. and the Leyden specimen differ just as much inter se. The facies malleolaris lateralis is 60 mm. long in astragalus II as against 57 mm. in the first and 53.5 in that at Leyden. The proportion of this dimension to the maximum breadth of the outer side is in the same succession : 1.44, 1.325, and 1.50. Hence an outside view of astragalus II shows greater similarity to that of the Leyden specimen than to that of the first in T.M.

The groove in the trochlea is flatter in astragalus II, less deep than in astragalus I. The collum is much longer, so that the facies articularis navicularis remains at a distance of 9 mm. from the medial edge of the trochlea. In this respect also the Leyden astragalus is intermediate between the two. The facies articularis navicularis itself is flatter. The facies articularis cuboidea has more the form of that in the Leyden specimen.

On the under surface only the facies articularis calcanea posterior is for the greater part intact (Pl. XII, fig. 14c). It at once strikes the eye that it is only very little excavated, in sharp contrast with what we find in the Leyden astragalus, and especially in the first in T.M. The shape of this articular surface seems to have been a triangle. Only two sides are undamaged. But this is certain that the peculiar triangle which in the first specimen in T.M. lies between the three articular surfaces meeting on the outer posterior corner, is scarcely present, if at all, in the second specimen.

The angle that the facies articularis calcanea anterior forms with the facies articularis cuboidea is much greater in astragalus II than in astragalus I. Also in this respect the astragalus of Leyden lies between them.

It appears from the table given that the first and second dimensions are about the same, as well in the Leyden astragalus as in both in T.M. In this respect the astragalus from Hundsheim is different.

Astragalus sinister.

B.M. *Rh. etruscus*? *Mercki*? Pl. XII, fig. 15a, 15b and 15c.

Also B.M. possesses an astragalus sinister from the Teglian Clay found by Prof. KRAUSE.

Dimensions :	astrag. B. M.	astrag. II T. M.	astrag. I T. M.	astrag. L. M.
1. Maximum length inside	73 (72*)	79	69.7 (68*)	60 (59*)
2. Maximum length outside	74.5	82	74	66.5
3. Maximum length of lateral border of trochlea	66	68	69	60
4. Maximum breadth of outer side . . .	38	41.5	43	35.5
5. Maximum breadth of inner side . . .	52.5	—	55	46
6. Breadth of trochlea (back)	73	—	74	67
7. Length of navicular cuboid facet . .	at least 73.5	—	68	64
8. Breadth of navicular cuboid facet . .	41	—	40	37
9. Maximum breadth of trochlea (middle)	74	82	71	63
2 : 1	1.035	1.038	1.088	1.127
2 : 4	1.986	1.975	1.72	1.87
2 : 9	1.006	1.00	1.04	1.05
1 : 5	1.39	—	1.27	1.30
6 : 3	1.106	—	1.07	1.11
9 : 3	1.12	1.20	1.03	1.05

* dimension in correspondence with astr. II in T.M..

Even at a glance the resemblance to the astragalus dexter II in T.M. is seen. The specimen in B.M. is smaller than astragalus II in T.M., but larger than astragalus I. We see from the proportions given that the Berlin specimen in this respect corresponds closely to the second specimen in T.M., the deviations from the astragalus I in T.M. and that at Leyden being not inconsiderable. As appears from the proportions 2 : 9 and 9 : 3, the total breadth of the trochlea is relatively greater in the astragalus II in T.M. and in the Berlin astragalus than in the two other specimens, the breadth of the outer and inner side being less (2 : 4 and 1 : 5). In the Berlin specimen the collum is well developed, as also in the second specimen in T.M., in contrast with the Leyden, and especially with the first astragalus in T.M. The two latter are, therefore, more thickset in form. The groove of the trochlea is also deeper in them. The difference between the outer and inner length, is greater, as appears from the ratio 2 : 1.

The facies articularis calcanea media is placed higher in the Berlin astragalus (Pl. XII, fig. 15c) than in astragalus I in T.M. (Pl. XII, fig. 13c). Nevertheless there are some points in which the astragalus in B.M. differs from the second in T.M., and is nearer to the first in T.M. and the Leyden one. Thus e.g. in the form of the facies articularis calcanea posterior, which is a consequence of the presence of the peculiar triangle at the posterior outer corner, which is absent in the second specimen in T.M. This articular surface itself is also deeper in the astragalus in B.M. than in the second in T.M., though less deep than in the first in T.M. Unfortunately the astragalus II in T.M. offers no further points of comparison with that in B.M. in consequence of the imperfect state of the lower part.

It appears from the differences in absolute size that the astragalus in B.M. cannot have belonged to the same individual as the second in T.M. Yet they agree almost entirely as regards their proportions, whereas the differences from the Leyden specimen and from the first in T.M. are comparatively great. Accordingly three astragali have been found at Tegelen, the first of which I ascribe to *Rh. etruscus* without any hesitation on account of its many points of resemblance with the Leyden astragalus, the more so as, without any doubt, it fits into the tibia that has already been ascribed to *Rh. etruscus*. As regards the rounding of the trochlea, astragalus II in T.M. fits into the distal end of the tibia in S.M.; for this reason and on account of the deviation from the astragali of *Rh. etruscus* in T.M. and in L.M. one would sooner be inclined to ascribe this second astragalus in T.M. and that in B.M. to *Rh. Mercki* than to *Rh. etruscus*. The variations observed in astragali of *Rh. leptorhinus* OWEN in Br. M. show that the astragali of *Rh. Mercki* vary comparatively much in their proportions, so that I do not hazard a decision with reference to the astragalus II in T.M. nor to the astragalus in B.M.

CALCANEUS.

Calcaneus dexter. T.M. *Rh. etruscus*. Pl. XII, fig. 12.

Calcaneus sinister. T.M. *Rh. etruscus*.

The calcaneus dexter in T.M. fits into the astragalus dexter I already described, as also the Leyden calcaneus dexter fits into the above mentioned astragalus dexter in L.M. The Leyden specimen is quite intact, that in T.M. lacks the posterior lower corner, which is broken off obliquely over the tuber. T.M. possesses also a calcaneus sinister from Tegelen, which is in everything the counterpart of the calcaneus dexter, but the tuber of which is undamaged.

Dimensions (c.f. P. 25) :	T.M.	<i>Rh. etruscus</i> Leyden	<i>Rh. Mercki</i> Taubach	<i>Rh. Antiq.</i> Krayburg	<i>Rh. Megarh.</i> (SIMON.)	<i>Rh. Mercki</i> (SIMON.)
1. Maximum length of outer border	106	100	126	118	143	112
2. Maximum breadth at sustentaculum	77	72	95	91	92	69
3. Thickness at posterior facet for astragalus	63	54	78	70	—	—
4. Maximum diameter of tuber	78	61	73	83	—	—
5. Distance between back edge of tuber and that of sustentaculum (inside, at top)	63	50	75	60	—	—
I : 2	1.376	1.39	1.32	1.29	1.55	1.62
I : 5	1.70	2.	1.68	1.96	—	—

The calcaneus in T.M. is relatively thicker than that in L.M. The ratio of length and thickness is 1.70 in that in T.M., 2 in that in L.M. The proportion of length and breadth is about the same in them (T.M. 1.376, L.M. 1.39).

The facets for the astragalus correspond, of course, to the already described facets of the astragalus for the calcaneus.

The facet on the sustentaculum is rounded in the calcaneus in T.M., oblong with rounded corners in the Leyden specimen. In that in T.M. this facet is connected with the semicircular, small anterior facet. This is not the case with the calcaneus in L.M. The anterior outer corner of the sustentacular facet has, however, a prolongation towards the facet for the cuboid. The strongly bent facets corresponding to the deeply excavated posterior facet of the astragalus resemble each other perfectly in the two specimens, from which appears that the said differences of form of this excavated facet at the astragalus of the two specimens cannot be of any essential consequence. The facet for the cuboid is blunter at the top in the calcaneus in T.M. than in that in L.M., and more excavated.

The calcaneus in T.M., therefore, is larger. The proportion between length and breadth is about the same. That in T.M. is relatively thicker. The form of the facets is not so different on the whole that on this ground it would be justifiable to conclude to another species.

The absolute dimensions and the proportions in *Rh. Mercki* from Taubach, *Rh. antiquitatis* from Krayburg, *Rh. megarhinus* of SIMONELLI, and *Rh. Mercki* of SIMONELLI, on the other hand, diverge much more from those in the calcaneus of T.M.

The calcaneus of *Rh. hundsheimensis* is larger than that in T.M., TOULA states 132.4 mm. as "grösste Höhe, aussen". STROMER VON REICHENBACH has measured from the top (Schnabel), not from the tuber. I have done the same. From the tuber the maximum length in that in T.M. is 115 mm., in the Leyden specimen 105 mm. Consequently the calcaneus in T.M. is in any case considerably smaller than that from Hundsheim. TOULA gives 89 mm. for the maximum breadth. The proportion of length to breadth is then 1.49. If we take 115 mm. for the maximum length of our specimen, the ratio becomes 1.49, and is accordingly quite identical with that in the Hundsheim calcaneus. The proportion of length to breadth in the Leyden specimen would be 1.46 with a length of 105 mm.

The calcaneus of *Rh. hundsheimensis* takes part in the articulation with the tibia ¹⁾ in this way that a small facet on the calcaneus as prolongation continues the lateral border of the trochlea of the astragalus. This is also the case with the Leyden calcaneus, but not with that in T.M. The surface is, indeed, present, but it is rough, not smooth.

For the length and breadth of the calcaneus of *Rh. Mercki* from Taubach STROMER

¹⁾ TOULA writes (P. 28, p. 63) with the fibula, but I suppose that he means with the tibia (cf. TOULA : P. 28, Taf. XI, Fig. 3.).

VON REICHENBACH gives 126 and 95 mm. In his list of literature I find indicated as source A. PORTIS : Über die Osteologie von *Rhin. Merckii* JÄGER, Palaeontogr. 25, p. 141 et seq. On p. 154, however, PORTIS gives as length and breadth 128 and 93. The ratio then becomes 1.376, i.e. exactly the same ratio as that first given by me for the calcaneus in T.M. Taken absolutely, the two dimensions are, however, greater in *Rh. Merckii*. For *Rh. antiquitatis* PORTIS gives 111 and 80. Then the proportion is 1.387. It appears from all this that the calcaneus does not exhibit many specific differences, except as regards the absolute size.

In *Rh. megarhinus* SIMONELLI the collum of the tuber is greatly constricted laterally with much greater thickness from the front backwards, this in comparison with the calcaneus from Hundsheim. This would also be a difference with that in T.M., which does not show such a constriction.

BRANDT gives too few data to enable me to make a comparison that can lay claim to any accuracy.

Cuboideum dextrum.

T.M. *Rh. etruscus* ? *Mercki* ? Pl. XII, fig. 7.

This cuboideum fits into the second astragalus in T.M. It is intact, except that the tip of the tuberosity is lost.

Dimensions (cf. P. 25) :	T.M.	<i>Rh.</i> <i>hundsh.</i>	<i>Rh.</i> <i>sumatr.</i>	<i>Rh.</i> <i>Mercki</i> (SIMON.)
1. Maximum height, outside (without tuberosity)	49	43.4	34.7	35
2. Height on side of os naviculare and os cuneiforme III	37	35	23	—
3. Maximum thickness (with tuberosity)	69	76	51.2	55
4. Breadth of facet for calc. and astrag.	44	45	39.5	—
5. Maximum breadth of distal facet (for metatarsale III and IV.)	40	51	35	—
6. Height of facet divided into three for astragalus, naviculare and cuneiforme III	43	45	34.4	—
1 : 3	0.71	0.57	0.67	0.63
1 : 2	1.32	1.24	1.50	—
1 : 4	1.11	0.96	0.87	—
1 : 5	1.22	0.85	0.99	—

This cuboid is higher than that of *Rh. hundsheimensis*, but not so thick ; besides it would be inferred from dimension 5 that it is much less broad.

The same thing strikes us on a comparison with the cuboid of *Rh. antiqu.* (BRANDT : P. 12, p. 37, Taf. IX, Fig. 12f). The facets on the inner side are comparatively smaller and slightly different in form. The tuberosity is relatively larger. It appears from the four dimensions which SIMONELLI gives of the cuboideum of *Rh. Mercki* (P. 23, p. 133) that the Teglian specimen is considerably larger.

Metatarsale III sinistrum.

T.M. *Rh. etruscus*. Pl. XII, fig. 11a and 11b.

Of the metatarsale III in T.M. the distal end has got lost.

Dimensions (cf. P. 28) :	<i>Rh.</i> <i>etruscus</i> T.M.	<i>Rh.</i> <i>etruscus</i> L.M.	<i>Rh.</i> <i>etruscus</i> (BUSK)	<i>Rh.</i> <i>hundsh.</i> I	<i>Rh.</i> <i>hundsh.</i> II	<i>Rh.</i> <i>Mercki</i> Taub.	<i>Rh.</i> <i>Mercki</i> (SIM.)	<i>Rh.</i> <i>Megarh.</i> (SIM.)	<i>Rh.</i> <i>hemit.</i> (BUSK)	<i>Rh.</i> <i>ant.</i> Kray- burg
1. Maximum length	—	158	174.67	197	188	209	178	208	169.57	ca 165
2. Maximum breadth (proximal end)	47.5	44	51	58	58.5	67	46	59	48.45	65
3. Maximum thickness (proximal end)	39	40	45.9	36	41	54	—	45	40.80	—
4. Maximum breadth (middle)	42.7	38	40.8	45.7	43.6	61	32	56	44.62	55
5. Maximum thickness (middle)	23.3	21	22.95	25.6	25.3	26	21	27	20.4	ca 20
2 : 3	1.21	1.1	1.11	1.61	1.43	1.24	—	1.31	1.18	—
4 : 5	1.83	1.8	1.77	1.78	1.72	2.34	1.52	2.07	2.19	ca 2.75
2 : 4	1.11	1.15	1.25	1.26	1.34	1.09	1.43	1.05	1.08	1.18

As regards the absolute dimensions the specimen in T.M. corresponds most closely to that of *Rh. etruscus* in L.M. and *Rh. hemitoechus* of BUSK and *Rh. etruscus* of BUSK, in its proportions most closely to *Rh. etruscus* in L.M. and *Rh. etruscus* of BUSK. STROMER VON REICHENBACH gives a reproduction of the upper facets of metatarsale III of *Rh. etruscus* in L.M. (P. 25, Pl. II, Fig. 9b). Just as in the specimen in T.M. the front edge is bent, the whole form is triangular. Only the metatarsale in T.M. is somewhat broader. The foremost lateral facet is, like that in the Leyden specimen, about at right angles to the upper surface. The differences with the Leyden metatarsale III are so small, that they can only be taken as individual variations.

This work had already been finished when some new finds were made in the pit owned by Canoy Herfkens & Co. I consider them to be a calcaneus, a naviculare and fragments of a pelvis, probably belonging to *Rh. etruscus*. At present they are in M.M.

should, therefore, be ascribed to *Rh. Mercki*. With the comparatively few bones known of *Rh. etruscus* and *Rh. Mercki*, it is sometimes difficult or impossible to distinguish separate bones of the two species. This is even more true in the case of fragments of bones. It is owing to this fact that I have not succeeded in determining with certainty the fragments of the scapula and the os ischii in S.M., the two vertebrae cervicales in M.M., and the bones in B.M. The fragments of the skull in S.M. present some *Mercki* characters. The vertebrae thoracales bear a close resemblance to those of *Rh. Mercki* from Heggen. The numerous bones, mostly intact, in T.M. are certainly due to *Rh. etruscus*, perhaps with the exception of astragalus II with the cuboideum belonging to it on.

CONCLUSIONS.

1. So far three almost complete upper dentitions of *Rhinoceros* have been found in the Teglian Clay.

The dentition in T.M. undoubtedly belonged to *Rh. etruscus* FALC. As regards development of the inner cingulum it very closely resembles that of *Rh. etruscus* FALC. from Mauer in the Darmstadt Museum (cf. WURM P. 33).

The dentition in M.M. also belonged to *Rh. etruscus* FALC. In the very weak development of the inner cingulum it departs from nearly all *etruscus* dentitions. In this respect it even exceeds several *Mercki* dentitions, which in general are characterized by a feeble development of the inner cingulum.

The dentition in S.M. has been erroneously ascribed to *Rh. etruscus* FALC. by RICHARZ (G. 65). It is a *Mercki* dentition. It bears a striking resemblance in all its characters to the dentition of *Rh. Mercki* from Jerxheim in A.M., but it is considerably smaller.

2. WURM (P. 33) considers the *etruscus* dentition from Mauer in the Darmstadt Museum as a transition form towards the *Mercki* type. With the same right this might be said of the dentition in T.M., and it would be even more applicable to that in M.M. WURM thinks that he can observe signs of a gradual development from the *etruscus* type to the *Mercki* type in several *etruscus* molars from Mauer. In his opinion this transition began in Mauer. This opinion seems to me unfounded. The numerous *etruscus* molars from different localities in the Br. M. do not show a gradual development of the characters, what they show is a comparatively great variation independent of the geological age.

3. Unless we unite brachyodont and hypsodont recent forms in one species, *Rh. Mercki* JÄG and *Rh. etruscus* FALC. must be considered as two different species. The fact that both species vary pretty greatly in some secondary characters of their dentition cannot be an objection. Also the individuals of recent *Rhinoceros* species show variations.

4. T.M. possesses a left horizontal ramus of a lower jaw with the last five molars in situ, belonging to the upper dentition of *Rh. etruscus* mentioned. In S.M. there are numerous fragments and ten molars of a lower jaw belonging to the upper dentition of *Rh. Mercki* in the same museum. The lower molars of the two species perhaps cannot be distinguished at all with any certainty (cf. SCHROEDER P. 29, p. 77).

5. S.M. also possesses a great number of bones of *Rhinoceros*. With the dentition just mentioned they belong to two finds, discovered at a distance of ± 70 meters from each other. According to RICHARZ G. 65 they probably belonged to the same individual. This is not correct. Of the vertebrae thoracales V, VI, and VII there are double specimens present. The fragments of the skull and the other vertebrae belong to the dentition, and

Explanation of Plate I.

- Fig. 1. Pm. 3 (upper antepenultimate premolar), pm. 2 (upper penultimate premolar), mol. 1 and mol. 2 (upper first and second true molar), right side, crown-surface, T.M. $\frac{1}{2}$ nat. size.
2. Series of six upper molars, left side, T.M. $\frac{1}{2}$, *a*: crown-surface, *b*: inner side.

Explanation of Plate II.

- Fig. 1. Series of six upper molars, right side, M.M. $\frac{1}{2}$, *a*: crown-surface, *b*: inner side.
2. Series of six upper molars, left side, crown-surface, M.M. $\frac{1}{2}$.

Explanation of Plate III.

- Fig. 1. Series of six upper molars, right side, S.M. $\frac{1}{2}$, *a*: crown-surface, *b*: inner side.
2. Series of six upper molars, left side, crown-surface, S.M. $\frac{1}{2}$.

Explanation of Plate IV.

- Fig. 1. Last three upper molars (true molars), right side, crown-surface, M.M. $\frac{1}{1}$.
2. Last three upper molars (true molars), right side, crown-surface, S.M. $\frac{1}{1}$.

Explanation of Plate V.

- Fig. 1. Pm. 1 (upper last premolar), left side, outer surface, M.M. $\frac{1}{1}$.
2. Last three upper molars (true molars), left side, crown-surface, T.M. $\frac{1}{1}$.
3. Horizontal ramus of lower jaw, left side, T.M. $\frac{1}{4}$, *a*: crown-surface, *b*: outer surface.
4. Horizontal ramus of lower jaw, right side, S.M. $\frac{1}{4}$, *a*: crown-surface, *b*: outer surface.

Explanation of Plate VI.

- Fig. 1. Horizontal ramus of lower jaw, left side, inner surface, T.M. $\frac{1}{4}$.
2. Horizontal ramus of lower jaw, right side, inner surface, S.M. $\frac{1}{4}$.
3. Pm. 1 (upper last premolar), left side, outer surface, T.M. $\frac{1}{1}$.
4. Ramus of lower jaw, left side, outer surface, S.M. $\frac{1}{4}$.

Explanation of Plate VII.

- Fig. 1. Ossa nasalia, anterior part, S.M. $\frac{1}{2}$, *a*: upper surface, *b*: lower surface, showing a fragment of the septum nasale.
2. Os nasale sinistrum, margin-fragment, upper surface, S.M. $\frac{1}{2}$.
3. Processus zygomaticus ossis temporalis dextri, S.M. $\frac{1}{2}$, *a*: outer surface *b*: lower surface.
4. Ossa frontalia, fragment, upper surface, S.M. $\frac{1}{2}$.
5. Os parietale sinistrum with crista occipitalis, outer surface, S.M. $\frac{1}{2}$.
6. Ossa parietalia, fragment, S.M. $\frac{1}{2}$, *a*: upper surface, *b*: profile-view.
7. Os zygomaticum dextrum, anterior part, outer surface, S.M. $\frac{1}{2}$.
8. Os zygomaticum sinistrum, anterior part, outer surface, S.M. $\frac{1}{2}$.

Explanation of Plate VIII.

- Fig. 1. Os sphenoidum, fragment, S.M. $\frac{1}{2}$.
2. Temporal fragment with meatus auditorius externus sinister S.M. $\frac{1}{2}$.
3. Fragment of the skull-roof S.M. $\frac{1}{2}$.
4. Condyli occipitales S.M. $\frac{1}{2}$.
5. Atlas (vertebra cervicalis I), T.M. $\frac{1}{4}$, *a*: upper surface, *b*: anterior surface, *c*: posterior surface.
6. Atlas (vertebra cervicalis I), S.M. $\frac{1}{4}$, *a*: upper surface, *b*: anterior surface, *c*: posterior surface.

Explanation of Plate IX.

- Fig. 1. Axis (vertebra cervicalis II) fragment, S.M. $\frac{1}{4}$, *a*: upper surface, *b*: anterior surface, *c*: side-view.
2. Vertebra cervicalis III, S.M. $\frac{1}{4}$, *a*: anterior surface, *b*: posterior surface, *c*: side-view.
3. Vertebra cervicalis III, M.M. $\frac{1}{4}$, *a*: anterior surface, *b*: posterior surface, *c*: side-view.
4. Vertebra cervicalis IV, S.M. $\frac{1}{4}$, *a*: anterior surface, *b*: posterior surface, *c*: side-view.
5. Vertebra cervicalis V, M.M. $\frac{1}{4}$, *a*: anterior surface, *b*: posterior surface, *c*: side-view.
6. Vertebra cervicalis VI, S.M. $\frac{1}{4}$, *a*: anterior surface, *b*: posterior surface, *c*: side-view.
7. Vertebra cervicalis VII, S.M. $\frac{1}{4}$, *a*: anterior surface, *b*: posterior surface, *c*: side-view.
8. Vertebra thoracalis I, S.M. $\frac{1}{4}$, *a*: anterior surface, *b*: side-view.

Explanation of Plate X.

- Fig. 1. Vertebra thoracalis II, S.M. $\frac{1}{4}$, *a*: anterior surface, *b*: posterior surface, *c*: side-view.
2. Vertebra thoracalis III, S.M. $\frac{1}{4}$, *a*: anterior surface, *b*: posterior surface, *c*: side-view.
3. Vertebra thoracalis IV, S.M. $\frac{1}{4}$, *a*: anterior surface, *b*: posterior surface, *c*: side-view, *d*: fragment of processus spinosus, posterior surface.
4. Vertebra thoracalis V, S.M. $\frac{1}{4}$, *a*: anterior surface, *b*: posterior surface, *c*: side-view, *d*: fragment of processus spinosus, posterior surface.
5. Vertebra thoracalis VI, S.M. $\frac{1}{4}$, *a*: anterior surface, *b*: posterior surface, *c*: side-view.
6. Vertebra thoracalis VII, S.M. $\frac{1}{4}$, *a*: anterior surface, *b*: posterior surface, *c*: side-view.
7. Vertebra thoracalis IX, S.M. $\frac{1}{4}$, *a*: anterior surface, *b*: posterior surface, *c*: side-view.

Explanation of Plate XI.

- Fig. 1. Vertebra thoracalis VIII, S.M. $\frac{1}{4}$, *a*: anterior surface, *b*: posterior surface, *c*: side-view.
2. Scapula sinistra, proximal fragment, S.M. $\frac{1}{5}$, *a*: dorsal surface, *b*: costal surface, *c*: glenoid cavity.
3. Scapula dextra, proximal fragment, costal surface, B.M. $\frac{1}{5}$.
4. Metacarpale III sin., T.M. $\frac{1}{4}$, *a*: proximal surface, *b*: dorsal surface, *c*: distal surface.

5. Humerus sinister, distal fragment, T.M. $\frac{1}{5}$, *a*: posterior surface, *b*: anterior surface, *c*: distal surface.
6. Femur sinistrum, T.M. $\frac{1}{5}$, *a*: anterior surface, *b*: distal surface, *c*: posterior surface.
7. Os lunare sinistrum, T.M. $\frac{1}{2}$, *a*: dorsal surface, *b*: distal surface.
8. Femur dextrum, distal fragment, T.M. $\frac{1}{5}$, *a*: anterior surface, *b*: posterior surface, *c*: distal surface.

Explanation of Plate XII.

- Fig. 1. Ramus acetabularis dexter ischii, anterior surface, S.M. $\frac{1}{4}$.
2. Caput femoris dextri, S.M. $\frac{1}{5}$.
 3. Condylus lateralis femoris sinistri, S.M. $\frac{1}{5}$.
 4. " " " dextri, S.M. $\frac{1}{5}$.
 5. Patella sinistra, T.M. $\frac{1}{4}$, *a*: articular surface, *b*: outer surface.
 6. Tibia dextra, T.M. $\frac{1}{5}$, *a*: proximal surface, *b*: posterior surface, *c*: anterior surface.
 7. Cuboideum dextrum, medial surface, T.M. $\frac{1}{3}$.
 8. Tibia sinistra II, T.M. $\frac{1}{5}$, *a*: medial surface, *b*: distal surface, *c*: anterior surface.
 9. Tibia sinistra I, T.M. $\frac{1}{5}$, *a*: medial surface, *b*: distal surface.
 10. Tibia sinistra, S.M. $\frac{1}{5}$, *a*: medial surface, *b*: distal surface.
 11. Metatarsale III sin., T.M. $\frac{1}{5}$, proximal fragment, *a*: anterior surface, *b*: proximal surface.
 12. Calcaneus dexter and astragalus dexter I, lateral surface, T.M. $\frac{1}{3}$.
 13. Astragalus dexter I, T.M. $\frac{1}{3}$, *a*: lateral surface, *b*: superior surface, *c*: inferior surface.
 14. Astragalus dexter II, T.M. $\frac{1}{3}$, *a*: lateral surface, *b*: superior surface, *c*: inferior surface.
 15. Astragalus sinister, B.M. $\frac{1}{3}$, *a*: lateral surface, *b*: superior surface, *c*: inferior surface.









