

GEOLOGICAL SURVEY OF CHINA

V. K. TING AND W. H. WONG DIRECTORS

Palaeontologia Sinica

EDITORS:

V. K. TING AND W. H. WONG

Series C. Volume 1.

fascicle 1.

TERTIARY VERTEBRATES FROM MONGOLIA

BY

MAX SCHLOSSER

IN MUNICH

PLATES 1-6 AND 5 FIGURES OF TEXT



PEKING 1924.

Perrissodactyla.

***Rhinoceros (Tichorhinus) antiquitatis* Blumenbach.**

Wüst E. Beitr. z. Kenntn. d. diluv. Nashörner Europas. Centralblatt f. Min., Geol. u. Pal. 1922 p. 641—656. 680—688.

The presence of this pleistocene species spread over nearly the whole Europe and North Asia, is indicated by a last molar— M^3 —from the left upper jaw, which was found at Narri 120 li, 72 km., North West from Halong Osso.

The kind of preservation clearly shows, that this molar is of pleistocene and not of pliocene age, it looks nearly as if it could belong to an animal, which has been buried in the historical time, true fossilisation has not taken place.

Unfortunately this tooth is badly worn nearly to its roots, but is notwithstanding fully sufficient for the exact specific determination, for it shows clearly the separation of the ectoloph from the metaloph, characteristic for *Rhinoceros antiquitatis*, while in the other species with few exceptions, for instance *R. mauritanicus* Pomel from Algeria, the ectaloph goes over into the metaloph. By means of the strong usure protoloph and metaloph are fused and enclose, together with the ectoloph, a lake of enamel, a long and little curved prefossette, which is parallel to the ectoloph. Behind the prefossette there is to be seen a minute rudiment of the postfossette. The usure runs obliquely from forward to backward, so that on the posterior border a residue of the enamel is to be seen, the anterior part of the ectoloph, whilst on the posterior margin

the usure has seized even the root. The outline of this root is trapezoidal not triangular as in M^3 of by far the most *Rhinocerotidae*. The shortest side is the posterior, the three others have nearly equal length. One of the three pressed roots is inserted on the posterior side of this M^3 , another on the antero-lateral corner and the third at the antero-internal corner.

The existence of *Rhinoceros antiquitatis* in China was first quoted by GAUDRY,¹ but he had at his disposal only bones and a fragment of the nose, found by ABBÉ DAVID, West of Peking. Among the fossil mammalian remains, presented to the Palæontological Museum of Munich by Prof. HABERER, I² have found a left lower M_2 of this species, which was said to come from Hupe. We cannot be surprised therefore at seeing the *Rhinoceros antiquitatis* also in Mongolia, inasmuch as its presence in Siberia was well known long ago.

Aceratherium Habereri Schlosser sp.

(Pl. VI.)

1903. Abh. bayr. Ak. d. Wiss. II. Cl. Bd. XXXI Taf. V p. 58 fig. 5—10, Taf. VII fig. 1—3. 6. 8. 11.

The remains of *Rhinoceros* seem to belong to a single species, "*Rhinoceros*" *Habereri*, described and figured by me twenty years ago and based on a great many, mostly isolated teeth, which were said to have been found in the red clays of Shansi. By far most of the *Rhinoceros* remains from Mongolia came from the locality Harr Osso. Unfortunately their preservation, especially of the jaw, is not very good, because they are enclosed in a hardened reddish matrix of unequal consistence, so that they can be prepared only at the risk of the teeth breaking into splinters. I have left this material therefore in the same condition as I got it. The best specimens are those, which have been weathered out, but these are mostly isolated teeth so that hardly more than two or three teeth, belonging to the same jaw, could be fixed together. Another unfavourable condition is, that these isolated teeth are much worn mostly, fresh teeth are very scarce. I have at disposal from Harr Osso in a block both rows of superior milk molars and molars, another contains both rows of the superior premolars and the third both rows of the lower premolars and molars. Among the material weathered out the best specimen is a right maxillary with the outer wall of P^3 and the complete P^4 , M^1 and M^2 , but these teeth are worn down to their lower half. Fragments of P^3 , P^4 , M^1 and M^2 of the left side seem to belong to the same individual and so probably do also a number of fragmentary molars of the lower jaw,

¹ Bull. Soc. Géol. de France. 1871/72, T. XXIX p. 178.

² SCHLOSSER. Die fossilen Säugetiere Chinas. Abh. d. bayr. Ak. d. Wiss. XXII 1903, p. 55.

perhaps also some of the present lower tusks, I_2 . Among the complete lower cheek-teeth the left and the right D_4 , a quite fresh left P_4 and the left and the right nearly fresh M_2 and M_3 and a left and a right rather worn M_1 are remarkable. The reddish brown cemented clay from Harr Obo has yielded besides the jaws quoted above some parts of two upper milk dentitions, an outer wall of a left P^4 and the left M^1 and M^2 of a nearly fully grown but still rather young individual, to which may belong also a right P_4 , a quite fresh M_3 of the same jaw and moreover the left and the right outer incisor. I must mention further a much worn M^3 and four inner incisors. Among the lower cheek-teeth the right D_{2-4} are of especial interest as they indicate the presence of a third juvenile animal according to the stage of their usures. The other complete lower cheek-teeth are two right P_2 , a left P_4 , two much worn right and a left M_1 and a right M_2 . On the whole we shall not commit a very great error, if we assume a total number of five or six young and probably as many adult individuals, represented by the teeth from Harr Obo. The individual with the big lower incisors seems to have been a still young but nearly fully grown male.

Another locality, from which numerous, yet very fragmentary teeth come, is Tjagganor-ich, a confluent of the Tjagganor. They seem to represent nearly the whole dentition of a young and an old individual, perhaps the mother of the calf. Among this material only the left and right P^1 and the left P_2 and P_4 are complete.

A third locality, where fragments of teeth of *Rhinoceros* have been found, is Tjel-in-gol, 120 li from Hallong Osso. They are not worth being studied exactly. At Ertemte and Olan Chorea teeth of *Rhinoceros* are rather scarce, especially at the first mentioned locality, and most of them are broken into splinters, among the better preserved specimens, however, some are of great value as they belong to young but fully grown individuals and as from them one can deduce the real height of unworn crowns; an outer wall of a left P^4 and the anterior half of a left M_1 from Ertemte are remarkable in this respect, whilst Olan Chorea has yielded a very old left M^1 . At both these localities fragments of milk-molars of the maxillary have been found.

Notwithstanding the incomplete preservation of by far the most teeth, there are enough to enable us to determine them with full certainty. They show that we have to do with "*Rhinoceros*" *Habereri* as I mentioned just above. Two lower milk-molars only seem to differ on account of their larger size.

Bones of Rhinoceros are very scarce and partly incomplete. Most of them were found at Ertemte, namely a fragmentary lower portion of a left humerus, the proximal end of a right humerus, a complete right unciforme, a very large left and an incomplete right unciforme, a left pisiforme, the tuber of a left calcaneum, a well preserved right astragalus, a very small left cuboid, a trochlea of a lateral metapodial—Mc IV—, two

phalanges of a lateral toe, a sesamoid and besides fragments of vertebræ and of the proximal part of one of the foremost ribs. From Olan Chorea I have at hand a right patella, a trochlea of a median metapodial and a right trapezoid, whilst from Harr Obo only a left patella and the distal parts of a right tibia and of a left radius are at disposal.

Dentition. Two incisors are present in each lower jaw. The inner ones are small and have a conical crown measuring 9 mm. in height and 8 mm. in breadth, whilst their root is about 40 mm. long. The biggest lateral incisors have a crown measuring 80 mm. in length and 32 mm. in breadth. The smallest lateral incisors, belonging probably to females, have a breadth of 23 mm. Incisors of the premaxillaries have not been found, but their presence is ascertained by the strong usures of the lateral lower incisor. Together with the cheek-teeth, which are all represented by specimens, the definitive formula of the dentition can be written with full certainty as

$$\frac{1}{2} I \frac{0}{0} C \frac{4}{3} P \frac{3}{3} M$$

The formula of the milk-dentition is not known exactly, for ID are wanting among the material at hand, but we shall not be making a great mistake if we assume the number

$$\frac{1}{2} ID \frac{0}{0} CD \frac{4}{3} PD$$

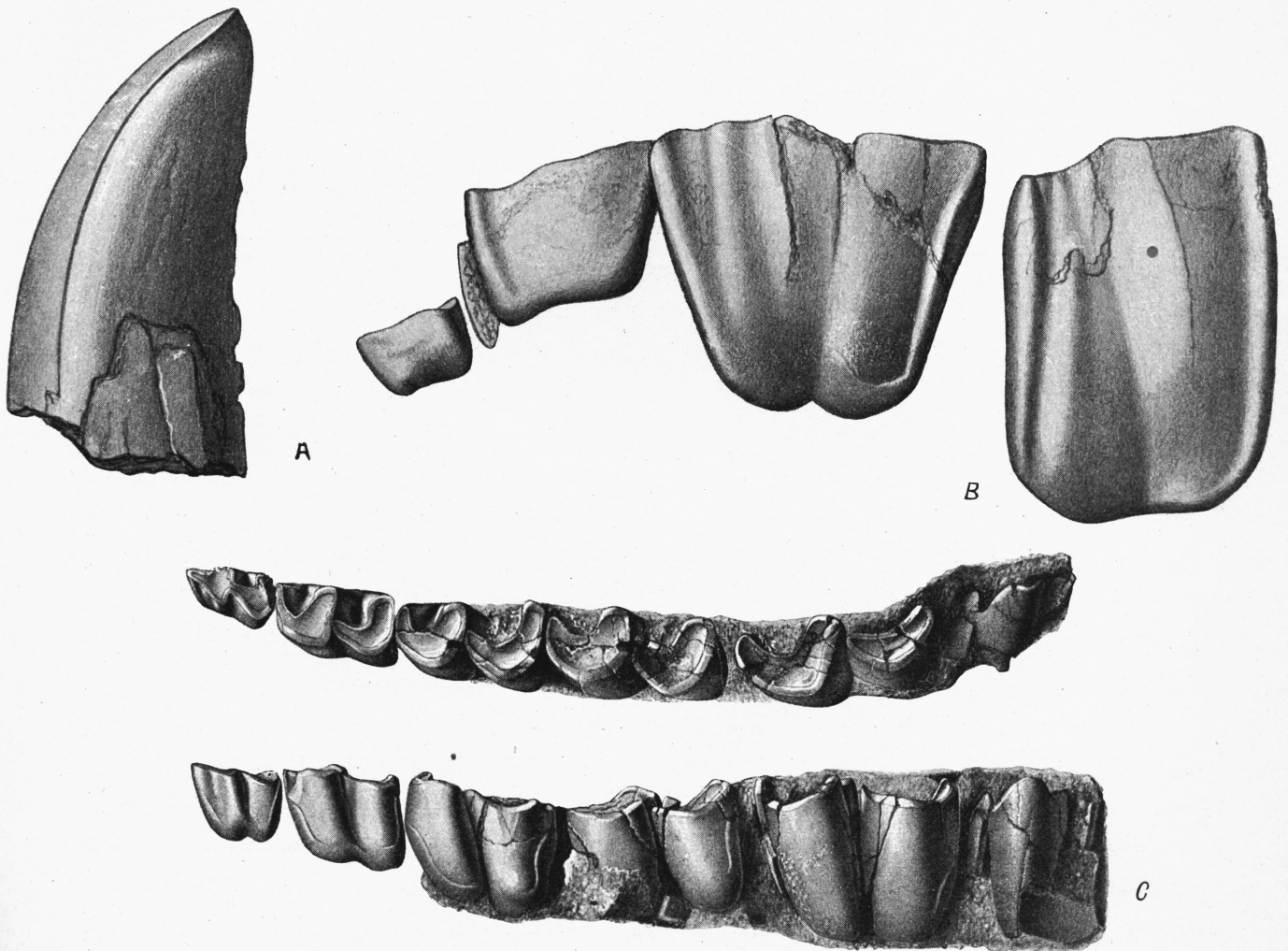
Milk-molars. D¹ is not preserved completely, but a small rudiment of it is sitting on a quite fresh right P⁴ of the specimen with both the series of P from Harr Osso. In the single D² preserved the outer wall is broken off and the lophes do not fit together any more, so that this tooth must also be neglected. D³ and D⁴ show the prominent vertical roll on the outside of the paracon, present in all upper D of *Rhinoceroses*, even of those with a flat outer wall like *Rhinoceros antiquitatis*, an inheritance from the most primitive types of this family. Crochet and antecrochet are well developed, the crista is delicate and the cingulum on the inner side supplied with two small vertical pillars between both lophes. In D⁴ the crista becomes very like that of the molars. Notwithstanding the D cannot be distinguished from those in *Habereri*, except by their lesser dimensions.

Dimensions:

Length of D ¹⁻⁴	115 mm.	Length of D ³	41 mm. maximum,	37 mm. minimum.
Breadth „ D ³	38 mm.	„	35 mm.	„
Length „ D ⁴	47 mm.	„	45 mm.	„
Breadth „ D ⁴	40 mm.	„	38 mm.	„

The lower milk-molars do not differ much in structure from those in the typical *Rhinoceros Habereri*, except by the strong inward inflexion of the anterior and posterior border. D₃ and D₄ are more molarised, D₁ seems to be wanting.

Length of D_{2-4} 106 mm. Length of D_2 32 mm., breadth 16 mm.
 " " D_3 45 mm. maximum, breadth 25 mm.
 " " D_3 39 mm. minimum, " 20 mm.
 " " D_4 40 mm., breadth 25 mm.



Text fig. 1. *Rhinoceros? Aceratherium Habereri* Schl. Harr Obo.

A Right inferior I_2 from above, nat. size.

B Right superior P^{1-2} , D^3 , P^4 from the outside, nat. size.

C Inferior P_2-M_3 combined but from the same individual from above and outside, $\frac{1}{2}$ nat. size.

The P and M of the *upper jaw* do not show marked differences from the corresponding remains in the species just quoted. They have also a nearly flat outer wall provided with a swelling on its anterior and posterior border, and the crown also becomes very high, but the cingulum in the P is weaker and the crochet of the molars more slender and pointed and the foremost P are considerably smaller than in the typical species.

Length of P^{1-4} 120 mm. on the outside, 108 mm. in the median line, fresh teeth of the complete right jaw.

Length of M^{1-3} 143 mm. on the outside, 140 mm. measured in the median line approximately.

Length of P^4-M^2 130 mm., rather worn on the outer wall, of the right maxillary.

" " the same in the median line 126 mm.

" " P^1 maximum 21 mm., breadth of the same 20 mm.

" " P^1 minimum 19 mm., " " " " 15 mm.

" " P^2 30 mm., " " " " 32 mm., height 37 mm.

" " P^3 43 mm., " " " " 44 mm., " 40 mm.

" " P^4 39 mm., " " " " 40 mm., " 59 mm.

" " M^1 44 mm., " " " " 57 mm., " 36 mm.

" " M^2 55 mm., " " " " 55 mm., " 44 mm.

" " M^2 57 mm., " " " " 56 mm., " 65 mm. (fresh).

" " the outer wall of a fresh P^2 from Tjaggan-or-ich 32 mm., height of it 45 mm.

" " " " " " M^1 " Ertemte 46 mm., " " " 62 mm.

" " " " " an old M^1 " Olan Chorea 45 mm., " " " 21 mm.

The numbers given by me in the cited publication are somewhat misleading, the length then being taken in the median line and now at the outer wall. Comparing the originals from Shansi with those from Mongolia the latter are a little smaller, especially the P.

The lower P and M are not very characteristic, especially the worn specimens, but as can be observed there are no remarkable differences between them and those of the typical "*Rhinoceros*" *Habereri*. The fresh teeth are rather high, the M_3 perhaps not to the same degree as in the latter, but the cingulum shows the same development in the anterior and posterior border, the inflection of the inner corners only is a little stronger than in the typical species. It will be sufficient to give the measurements of the individual with P_2-M_3 from Harr Obo, of an isolated M_3 and of the M_3 of an older individual from the same locality.

Length of P_{2-4} 90 mm., length of M_{1-3} 115 mm. approximately, the teeth being rather damaged by pressure.

P_2 length 25 mm., breadth 16 mm., height 21 mm.

P_3 " 31 mm., " 29 mm., " 26 mm.

P_4 " 35 mm., " 25 mm., " 31 mm.

M_1 " 44 mm., " 25 mm., " 33 mm.

M_2 " 52 mm., " 25 mm., " 38 mm.

M_3 fresh 52 mm., " 27 mm., " 57 mm.

M₁ older, length 46 mm., breadth 26 mm., height 31 mm.

M₂ " " 46 mm., " 27 mm., " 34 mm.

M₃ " " 48 mm., " 27 mm., " 37 mm.

The preserved bones not known to me in the typical *Rh. Habereri* indicate a rather slender animal of moderate size as the astragalus and the cuboid prove as well as the unciforme.

Humerus. The height of the trochlea beneath the inner epicondylus is about 70 mm., its breadth may be 83 mm.

Radius. The face for the humerus measures 80 mm., but this bone belongs to a smaller individual than the former. The greatest diameter above the carpal joint is 86 mm., the face for the scaphoid is 38 mm., the length of the radius may be 280 mm.

Pisiforme. Length 54 mm.

Cuneiforme. Height 60 mm., breadth of the distal face 45 mm., probably belonging to a strong male.

Trapezoid. This bone is relatively low but broad, its height being 25 mm. and its breadth 39 mm.

Unciforme. Its height is 30 mm., its breadth 46 mm.

The trochlea of a median metapodial has a breadth of 53 mm., that of a lateral, probably of the M IV, of 46 mm.

The first *phalanx* of a side toe measures 36 mm. in breadth and 23 mm. in height, the corresponding numbers of the present second *phalanx* are 29 mm. and 15 mm.

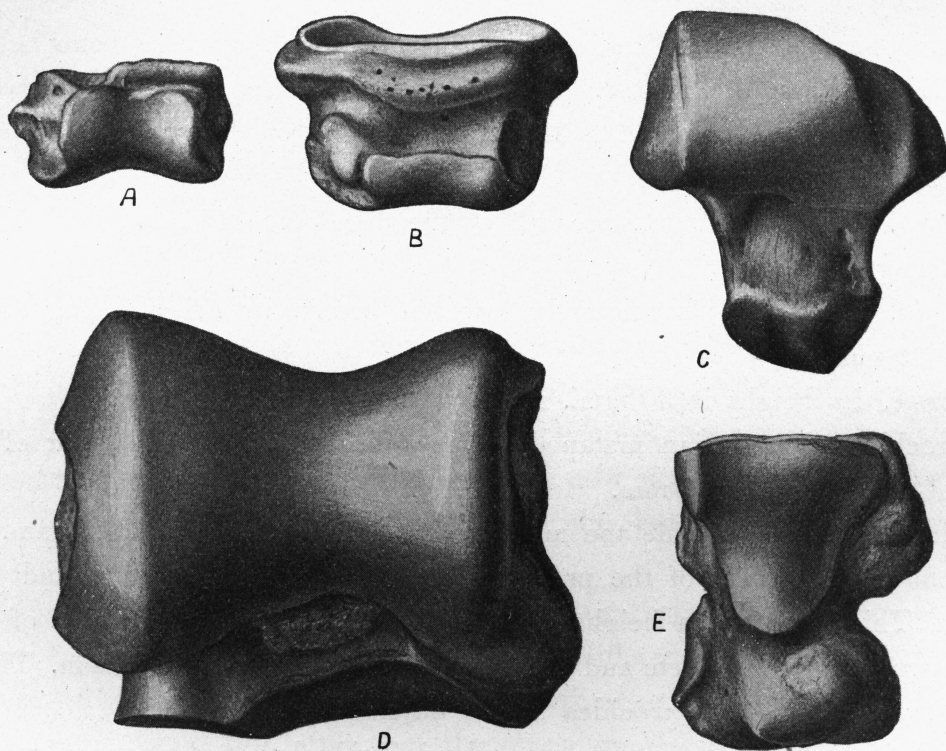
Patella. This bone has a height of 75 mm. and probably a breadth of 75 mm.

The astragalus is complete and therefore very useful for comparison. The breadth is 60 mm., the height of the trochlea at the outer side 46 mm.

The cuboid certainly belongs to a smaller individual than the astragalus does. It is 27 mm. high and 33 mm. broad, the face for the metatarsal IV has a breadth of 24 mm.

Except the biggest of the bones quoted, especially the cuneiforme and the trochlea of the lateral metapodial, all these specimens are smaller than the corresponding bones of the species of *Rhinoceros* and *Aceratherium* from Pikermi, Eppelsheim and Samos and even than those from the miocene of Sansan and Steinheim. Bones from Georgensgmünd only agree in their size with the present specimens from Mongolia. But the cuboid and the unciforme are still smaller than those of *Aceratherium tetradactylum*, they agree in their size with those of *Ceratorhinus Steinheimensis* and the latter, except in its little height, agrees even with *Aceratherium mite* from the White River bed of North America. Notwithstanding the material at hand is rather scarce, yet it is sufficient, to allow the conclusion, that the lateral toes of the foot are weaker than those of the hand and that the animal was somewhat slender. According to its high crowned cheek-teeth

we can assume, that we have to do with a grazer, which lived in steppes and was fitted for quick and enduring marches. This assumption is well in accord with the fact that the remains of this *Rhinocerotid* are by far more abundant at Harr Obo, the locality, which has also yielded the most remains of *Hipparion*, but scarcely any other mammals, while *Hipparion* is also very rare at Ertemte and at Olan Chorea, which contain numerous genera permitting us to conclude that there at least existed some wood and water.



Text fig. 2. nat. size. *Rhinoceros? Aceratherium Habereri* Schl. Ertemte.

- A Second phalanx, lateral toe.
 B First " median "
 C Right unciforme from above.
 D " astragalus " "
 E Left cuboid " below.

It is to be hoped that the collections made in Northern China will complete our knowledge of the structure of the skull and the skeleton of the typical "*Rhinoceros*" *Habereri*. The race from Mongolia can be considered as a variety of it, living in a less favourable environment, which has influenced its organisation and caused its lesser size.

It is a somewhat difficult matter to find out the ancestor of this *Rhinocerotid*. I compared it twenty years ago with *Rhinoceros palaeindicus* from the Siwaliks for like this it has a flat outer wall in the upper grinding teeth. But this character is also to

be seen in *Teleoceras* from North Amerika, which has moreover hypsodont grinding teeth also. But the number of the P is reduced to $\frac{3}{2}$. This genus must therefore be excluded from the nearer relationship, its limb bones besides being quite specialized, short and stout instead of rather long and slender.

The flat outer wall and the hypsodonty is to be seen in different phyla of *Rhinocerotidae* of the later tertiary and the pleistocene, we meet it even in some *Aceratheres*, *A. Persiae* Pohlig from Maragha and *Schlosseri* Weber from Samos, although in a less degree. It is therefore not at all impossible, that "*Rhinoceros*" *Habereri* could belong to the genus *Aceratherium*. I am confirmed in this supposition by the—of course minute—figures of the *Rhinoceros* skulls found by Dr. A. TAFEL¹ in China. The grinding teeth of those skulls agree as well in the number as in the structure exactly with those of *Habereri*, whilst the rather long skull has short, pointed, hornless nasals. But it would be too rash to solve the question concerning the generic position of "*Rhinoceros*" *Habereri* only on the base of those minute photographs, it will be the best to await the description of the complete material from Shansi, brought to Upsala.

¹ TAFEL A. Meine Tibetreise 1914. 1. Bd. Berlin. Tafel XII, Tafel XVI. KILLGUS—Unterpliocene Säuger aus China. Paläont. Zeitschr. V 1922 p. 256—who has studied the fossil mammalian remains collected by Dr. TAFEL, denies the existence of a superior incisor in *Aceratherium Habereri*, which he identifies with *Schlosseri*—KILLGUS writes erroneously *Schlosseri* KIERNIKS instead of WEBER—and derives it from *Aceratherium Blanfordi* of the Siwaliks. I must rectify these statements. Concerning the presence of the superior I it is to be said, that in the lower jaw the presence of two I, a small interior and the large exterior one, is now fully proved. All the Rhinocerotids with two lower I have also a superior I, at least the younger individuals. Concerning *A. Blanfordi*, there is no doubt at all, that we have to do with a still rather primitive and brachyodont type like *incisivum*. Both these species are descendents of *A. lemanense* or a similar species, whilst the contemporaneous *A. Habereri* and *Schlosseri* are highly specialized types, the ancestor of which is still to be discovered, probably in more northern regions of Asia. In return I wholly agree with KILLGUS in respect to the specific identity of *A. angustifrons* and *Wegneri* Andrée from Samos with *Schlosseri* from that locality and from Odessa.