NOTES ON SOME REMAINS OF FOSSIL MAMMALS FROM CHINA AND MONGOLIA*

By

Birger Bohlin

Palæontological Institute, Upsala University

1. Chalicotherioide Remains from the Chinese Hipparion Fauna

Chalicotherioidea gen. & sp. indet.

Locality: Province Shansi, Loc. 77. Age: Lower Pliocene.

The only find in the collection on Uppsala is a well preserved astragalus in which the upper part of the trochlea on the outer side is missing. The locality lies in Central Shansi in an area in which the sediments are of fluviatile or lacustrine origin (Licent & Trassaert 1935). The matrix attached to the bone is a friable red sandstone and already Schlosser (1903) noted this difference from the true *Hipparion* clay and stated that the finds indicated a forest fauna. In a paper 1935 I have followed Schlosser and tried to hold that there is a sharp limit between this fauna and the fauna of the *Hipparion* clay proper. In their paper 1935, which reached me when my monograph already was printed, Licent & Trassaert announced finds of *Chilotherium* from Central Shansi (det. Teilhard de Chardin; the only find in the Uppsala Museum from this region is as far as I can see a calcaneum which Ringström has determined as *Chilotherium* sp. [compare Ringström 1928 p. 14 where Loc. 71 is found in the list of new localities for *Chilotherium*] but which shows greater resemblance to a calcaneum of *Diceratherium*). When arranging the collections here I have came upon a fragment of a metatarsus of a *Samotherium* sp. from the Yüshehsien basin and it is thus evident that also this genus occurs, although it might have been rare. This introduction I have thought necessary in

* Received for publication in May 1936.

order to give a true idea of the fauna to which the indetermined species here described belongs.

A P_2 of a *Chalicotherioide* from the *Hipparion* fauna (evidently from the *Hipparion* clay of Shansi) was described by Schlosser 1903 (p. 76) as *Chalicotherium* sp. Several other finds are made in China and Mongolia but these are either younger or older than the *Hipparion* fauna.

DESCRIPTION

The trochlea of the astragalus in the Uppsala collection is low, somewhat oblique and has a broadly rounded inner condyle. The outer condyle is damaged but it must have had about the height indicated in the drawings. Its lower part extends below the outer end of the navicular facet. Distally there is a small outer facet for the calcaneum (C_1; clearly visible also from behind) and a large facet for the articulation with the naviculare. A cuboid facet seems to be absent (see below). From behind one sees in addition to the calcaneal (C_1) facet mentioned above: at the inner side of this a small facet also for the calcaneum (C_2), separated from C_1 by a groove and from the navicular facet, with which it forms a right angle, by an edge. Above these facets there is a broad and deep cavity representing the ectal facet for the calcaneum. The sustentacular facet is complicated, trilobated with an upper and an lateral lobe folded together so that their surfaces form an angle of about 120° and a lower lobe the surface of which is divergent from both the former but is more in accordance with the upper than with the lateral lobe. The lower medial end almost reaches the lower border of the back side of the bone. Finally there is a facet about at the middle of the lower border. This facet is separated from the navicular facet by a sharp edge (the angle between the facets is about 90°). This might be a facet for the cuboid but its surface is not smooth except in a small area medially, the rest is rough with several nutrition holes and the whole facet is more likely a portion of the back side which remains as a facet like rest between the adjoining true facets.

Maximal length (medially).....74 mm
Maximal breadth.....115 mm
Height of the medial portion .....69 mm

From my figures it is at once evident that the Chinese astragalus is quite different from the one of *Moropus cooki*, the only species of which I have material for comparison. The astragalus of *Moropus* is higher, the groove of the trochlea is deeper, the medial condylus is narrower. The sustentacular facet is simple and flat, instead the lower outer facet for the calcaneum is complicated and divided by a groove in an upper and a smaller lower surface which enclose a very obtuse angle. Further this facet is less distinct from the large concave ectal facet for the calcaneum. A small facet (C_3) corresponding to C_3 in the Chinese astragalus is present but more widely separated from the outer lower facet C_1. The navicular facet is flatter and its outline les anguler than in the Chinese specimen.

Forms like *Eomoropus* and *Grangeria* do not need to be taken into consideration, their astragalus being much higher than even in *Moropus* and also in other respects quite different (OSBORN 1913, fig. 4; COLBERT 1934, fig. 6).

The astragalus of *Ancylotherium (Chalicotherium) pentelicum* (ABEL 1920, fig. 10) is higher and reminds, although it is decidedly lower than the one of *Moropus*, rather much of this, having a more deeply grooved trcchlea with a more compressed lateral condylus. Of other differences I may mention the shape of the navicular facet, which in *A. pentelicum* is someway rectangular with a lateral border parallel with the medial border, while in the Chinese specimen the facet runs out in a point laterally. The cuboid facet is evidently missing also in *A. pentelicum* (at least has the facet marked "cub" in Abel's figure nothing to do with the cuboid but is the same facet for the calcaneum as C_1 in my figures; compare Colbert 1935, who places *A. pentelicum* in his tribe *Schizotheriini* in which the cuboid facet is missing).

The astragalus of *Macrotherium magnum* (HOLLAND & PETERSON 1914, fig. 98:3 & 5) shows a certain resemblance in the structure

of the trochlea, this is however lower and the lateral condylus has a much flatter profile. The navicular facet is of a somewhat similar shape as in the Chinese specimen, but it has along its posterior border an elongated facet for the cuboid (I suppose that the darker shaded part in fig. 98:5 is the facet mentioned in the text on the same page although there is no indication of this in the figure; the great extension of the facet medially seems to me to be strange).

In *Metaschizotherium fraasi* the astragalus seems to have about the same height, the medial trochlea is however much more compressed and the neck is evidently lower.

In *Schizotherium turgaicum* the astragalus has a certain resemblance to the one in *Moropus* ("its trochlea is relatively deep, as in primitive Eocene perissodactyls", COLBERT 1935 p. 6). On p. 12 Colbert places the species of Borissiak in the genus *Macrotherium*, which is evidently a lapse (compare p. 6: "a close scrutiny of the figures of *S. turgaicum* leads to the conclusion that this form is not a *Macrotherium*. . . . ").

In its general habitus the astragalus from Shansi resembles *Macrotherium*, but it has some features in common with *Ancylotherium pentelicum* from Pikermi, above all the absence of a cuboid facet (the absence of the facet in the Chinese specimen can however be questioned, see above). The differences from all the astragali which I have had a chance to study either in original or in figures seem to allow the conclusion, that the specimen in the Uppsala museum cannot belong to either of the genera *Macrotherium*, *Moropus*, *Schizotherium*, *Metaschizotherium* or *Ancylotherium*. It may belong to the same genus (or species) as the tooth described by Schlosser or to a species ancestral to the Nihowan *Chalicotherioidea*. We must also have in mind a form *Macrotherium brevirostris*, described by Colbert 1934 from the Tungur formation, the fauna of which has great similarity with the *Hipparion* fauna. I therefore prefer not to give a new name, but I figure the specimen as completely as possible to enable future workers to draw definite conclusions, when more material is available.

I will take this occasion to express my doubts regarding one of Abel's conclusions on the biology of the *Chalicotheriodidea*. Abel seems to be of the opinion that the reduction of the centra of the neck vertebræ and the strong development of the zygapophyses is an adaption to a thrusting function of the neck ("Wie die Reduktion der Wirbelkörper und die enorme Verstärkung der Zygapophysialregion beweist, muss der Hals als Sturmbock benutzt worden sein, wenn das Tier nach den unterirdischen Knollen und Zwiebeln suchte", p. 60). In *Ovibos* for instance, where the neck has to stand the pressure when the animal is butting, the centra are very well developped. I have the impression that the great development of the upper parts of the vertebræ is instead connected with a great development of the upper muscles of the neck, which enable the animal to pull roots and other eatables, which it has uncovered with the aid of its large claws, out of the ground. The strange position of the end surfaces of the centra seems to me to fit well in with such a use of the neck. The wedge shape of the head was quite convenient if the animal wanted to reach the bottom of its pits, which undoubtedly were narrowing downwards.

LITERATURE

Abel, O. Studien über die Lebensweise von *Chalicotherium*. Acta zoologica I. Stockholm 1920.

Bohlin, B. Cavicornier der *Hipparion*-Fauna Nordchinas. Palæontologia sinica, Ser. C, Vol. IX: 4. Peiping 1935.

Borissiak, A. The Remains of Chalicotherioidea from the Oligocene deposits of Turgai. Ann. Soc. Pal. Russ. III. Leningrad 1918.

Colbert, E. H. Chalicotheres from Mongolia and China in the American Museum. Bull. Amer. Mus. Nat. Hist. Vol. LXVII, Art. VIII. New York 1934.

—"— Distributional and phylogenetic studies on Indian fossil mammals III. A Classification of the Chalicotheroidea. Amer. Mus. Nov. No. 798. New York 1935.

Holland, W. J. & Peterson, O. A. The Osteology of the Chalicotheroidea. Mem. Carnegie Mus. III No. 2. Pittsburgh 1914.

Koenigswald, G. H. R. von. *Metaschizotherium fraasi* n. g., n. sp., ein neuer Chalicotheriide aus dem Obermiozän von Steinheim a. Albuch. Palæontographica, Suppl. Bd. VIII, Teil VIII.

Licent, E. & Traessart, M. The Pliocene lacustrine series in Central Shansi. Bull. Geol. Soc. China, Vol. XIV, No. 2. Peiping 1935.

Osborn, H. F. *Eomoropus*, an American Eocene Chalicothere. Bull. Amer. Mus. Nat. Hist, XXXII. New York 1913.

Ringström, T. Über quartäre und jungtertiäre Rhinocerotiden aus China und der Mongolei. Palæontologia sinica, Ser. C, Vol. IV: 3. Peiping 1927.

Schlosser, M. Die fossilen Säugethiere Chinas nebst einer Odontographie der recenten Antilopen. Abh. d. K. Bayer. Akad. d. Wissensch., II. Cl. Bd. XXII, Abth. I München 1930.

2. ?HYÆNARCTOS SP. FROM OLAN CHOREA (MONGOLIA).

Among the very fragmentary remains from Olan chorea are two tooth fragments of a large Carnivore which were put together with tooth fragments of Mastodon and evidently regarded by Schlosser in his paper "Tertiary Vertebrates from Mongolia (Palæontologia sinica, Ser. C, Vol. 1:2) as fragments of milk teeth of this genus: "Among these scarce fragments, however, two must be mentioned specially, for they have very thin enamel and cannot belong therefore to true molars, but only to milk-molars, probably to the second, the D_2" (l.c. p 93). It is difficult to understand how Schlosser could make this mistake, but as there are no other fragments which apply to this description, and the genus *Hyænarctos* or a related genus to which the fragments must be referred is not mentioned by Schlosser, it is probable that he, after having made a hurried first sorting of the material, paid very little attention to the quite uninteresting fragments of *Mastodon* teeth.

M^2. This tooth is represented by the posterior part with the metacone, half of the hypocone and a comparatively small talon. The enamel shows a fine wrinkling in places where this structure is not

deleted by wear. The breadth of the posterior part of the tooth has been about 26 mm. The tooth is much bigger than the M^2 of *Indarctos lagrelii* and has evidently had a less extended talon (fig. 7 & 8). The animal must have had about the same size as *?Hyænarctos* sp. (ZDANSKY, Jungtertiäre Carnivoren Chinas, Palæontologia sinica, Ser. C., Vol. II: 1, Pl. III, fig. 5) and the tooth fragment fits rather well in the outline of the poorly preserved M^2 of the skull of this species. I therefore refer the fragment to the same genus as this skull, rather than to *Indarctos*. There is however an *Indarctos* larger than *I. lagrelii*, *I. sinensis* (ZDANSKY, l.c. Pl. V), of which the upper dentition is unknown.

Left M_1 (fig. 10 a & b). The fragment represents the posterior outer part of the tooth as is evident from a comparison with the M_1 of *Indarctos sinensis*. It is much more worn than the tooth figured by Zdansky but agrees well in all details which are still preserved and the marked wear facet to the left in fig. 10 cannot be anything else than the contact facet with M_2. The enamel is wrinkled in the same way as in the M^2 described above.

The fragments evidently do not belong to the same individual. The colouring of the specimens is different (M^2: enamel olive brown, dentine brown; M_1: enamel orange to yellow, root cream coloured) and the M^2 is much less worn than the M_1.

It cannot be proved of course that these fragments belong even to the same genus, but I do not hesitate to refer also the M_1 to some big *Ursidæ*. The conformity in size, the fact that both fragments come from the same locality and the Ursid character of both are the things which connect them. It is however clear that, except the small *Ursus* sp. described by Schlosser, the Olan chorea fauna comprises also a large representative of the same family.

Explanation of

Plate I

PLATE I.

Fig. 1. *Chalicotherioidea* gen. & sp. indet: Right astragalus. Front view.

Fig. 2. Idem. Inferior view.

Fig. 3. Idem. Medial view.

Fig. 4. *Moropus cooki.* Astragalus. Posterior view. Agate, Sioux county, Nebraska, U.S.A.

Fig. 5. Idem figs. 1-3. Posterior view.

Fig. 6. *Moropus cooki.* Astragalus. Medial view.
Figs. 1-6. 1/2 nat. size. C_1 and C_2 see text. ?cub=possibly cuboid facet.

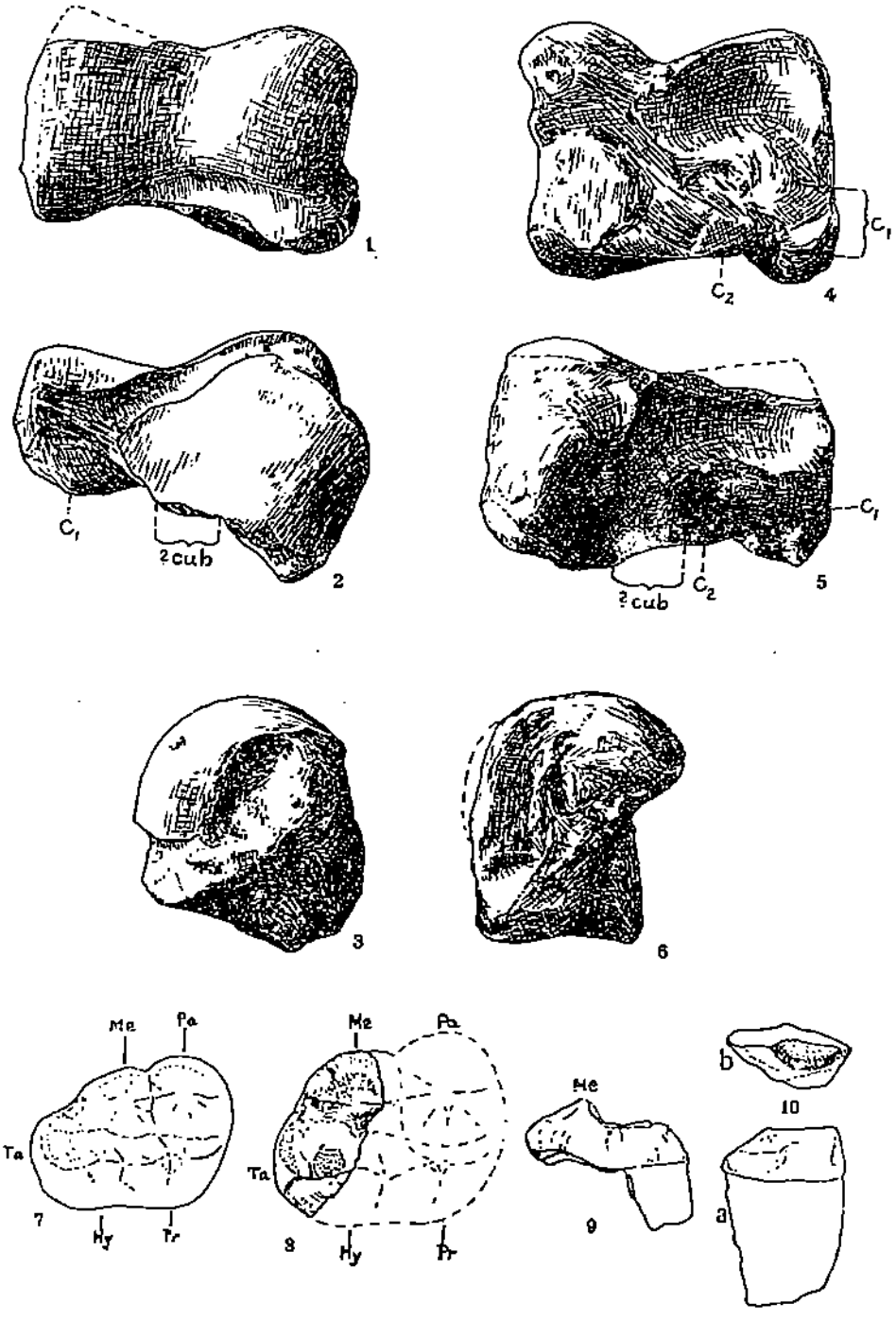
Fig. 7. *Indarctos lagrelii.* Right M^2. Drawn after the original to Zdansky, l.c. Pl. IV, figs. 1 & 2.

Fig. 8. *?Hyænarctos* sp. Fragment of right M^2. Outline of the tooth schematic.

Fig. 9. Idem fig. 8. Posterior view.

Fig. 10. *?Hyænarctos* sp. Fragment of left M_1. a Exterior view; b from above.

Figs. 7-10 nat. size. Hy=Hypocone, Me=Metacone, Pa=Paracone, Pr=Protocone, Ta=Talon. Dotted areas in figs. 8 & 10=wear facets.


1
C_1
C_2
4
C_1
?cub
2
C_1
?cub
C_2
5
3
6
Me
Pa
Ta
Hy
Tr
7
Me
Pa
Ta
Hy
Tr
8
Me
9
b
10
a