

PALEONTOLOGY

PHYLLOTILLON (?) BETPAKDALENSIS (FLEROW)

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Excavations in Betpakdala, locality As-Kasansor in Southern Kazakhstan (1936), yielded abundant though scattered paleontological material, found in a thin interbed of gravel, in places cemented into brownish ferruginous sandstone and consisting of small pebbles and bones and teeth. It is but natural that such conditions should not have favoured the preservation not only of entire skeletons, but even of associated parts of them.

The greatest amount of collected remains belong to a representative of Chalicotheres: it may be said to be one of the world's richest localities for these rare mammals. In spite of the fragmentary conditions, some of the essential skeletal parts missing, one may get a fairly clear notion of this form*.

Of the skull a few fragments of the posterior part are preserved as well as fragments of maxillaries with teeth and fragments of the mandible. The occipital wall is of semi-oval shape (like in the tapir), condyles are large, oval; the under side bears the peculiar features of the family (deep pits on each side of the narrow presphenoid, for. ovale lying far in front of f. lacerum medium, etc.). The upper molars are greatly elongated; of the forms known they come nearest to *Phyllotillon naricus* Plgr.; besides details in the structure of cross-crests, they are distinguished by unusually strongly developed cingulum, exhibiting thereby great variability (hypocone now isolated, now fused with metaloph, occasionally with the cingulum). Premolars—with massive ectoloph, complete protoloph and undeveloped metaloph.

Cervical vertebrae as compared to vertebrae of the best known form, *Moropus elatus*, are more elongated and (the centrum just as reduced), possess less massive zygapophyses and neural spines; the posterior for. transversarium lies inside the neural canal. Dorsal vertebrae bear closer resemblance to the vertebrae of *M. e.*, differing but in details and greater length; the lumbar ones—by a greater height of the centrum. Sacrum has a more constricted neural canal (fissuriform) and more inclined spinous processes.

Of the ribs but fragments are preserved; the first complete rib is similar to that in *M. e.*

* More specifically, of two forms, large and diminutive, displaying almost completely identical bones, save for the dimensions. Further is given a description of a large form, previously reported by K. K. Flerow on ground of the first small finds (C. R. Acad. Sci. URSS, XXI, № 1—2, p. 95, 1938).

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Of the scapula the distal end is available with glenoid cavity being oval, and not round (*M. e.*) in shape, posterior border arched (it being straight in *M. e.*), which makes it resemble the scapula in Titanotheres. Of the humerus there is also but the distal end available, not only its trochlea, but the capitulum too being biconical (feature distinguishing it from *M. e.* and Titanotheres).

Radius slender, long, slightly curved (but not twisted) with flat proximal end and thickened distal portion, whose articulating surface is similar to that in *M. e.*, and does not present any sharply modelled elements (great mobility of the wrist). Ulna with a small massive olecranon, directed backwards-upwards and proc. coracoideus slightly projecting forwards; its distal end alone fused with the radius (*M. e.* showing considerable distinctions in the structure of the proximal end).

Carpus united to the metacarpals with a zigzag-shaped articulation and a small os magnum—such being the primitive characters bringing it nearer to Titanotheres*; while os lunatum is already overlapping os magnum. In *Moropus elatus* the primitive features are less pronounced, magnum larger, its head less developed, as well as the palmar hook. Of the remaining carpal bones mention should be made of os lunatum having a cylindrical articulating surface for the radius (in *M. e.* it is hemispherical). Os scaphoidéum is most peculiar on account of the anterior descending process, characteristic also of *M. e.*, and in a lesser degree of Titanotheres.

Metacarpals slender and long (as distinguished from *Moropus* and *Macrotherium* and similar to the more ancient *Schizotherium*, *Grangeria*); Mc_{II} and Mc_{III} having flat and expanded proximal ends, with large tuberosities, however, not articulating with each other (contrary to *M. e.*); Mc_{IV} broader (in proximal half), with smaller tuberosities; its posterior face, below the proximal border, bearing a facet for Mc_V; the latter (the proximal end alone being preserved) a smallish slender bone (*M. e.* exhibits Mc_V of like character; in the earliest forms it is more strongly developed).

For want of a complete forefoot, and most of the bones lacking their distal ends, it is impossible to ascertain whichever of the metacarpals is the longest (apparently, Mc_{III}).

Very few phalanges are preserved. However, it might be stated that in the second digit the 1st and 2nd phalanges had not been co-ossified: there is present unquestionably the 1st phalanx of the 2nd digit, for it shows an articulating surface for Mc_{II} fully displaced onto the dorsal face. Among other phalanges of the first row, evidently belonging to different digits of the fore- and hind-foot deserves attention one (there are 4 specimens of same) which exhibits on the radial side such strongly developed rugosity that it makes the bone appear one and a half times as wide. There are some phalanges of the second row similar to phalanges of various digits in *Moropus*. Ungual phalanges are very few in number; they bear characteristic features of unguis in Chalicotheres; one of them has an unusually strongly developed posterior process (its length exceeding that of the phalanx proper). Should (this being probably the case) it belong to the second digit, the latter is to be considered as the most specialized of all those known.

Of the pelvis merely a few fragments are preserved; it may be suggested that it did not possess such an elongated shaft of the ileum as in *M. e.* Of the femur mostly distal ends are available, characterized by a symmetrical trochlea for patella and symmetrical condyles for tibia—characters relating

* In horses already the most ancient forms exhibit a large os magnum and horizontal carpus—metacarpals articulation.

it to the bone in *Titanotheres* (bone in *M. e.* being generally similar but more massive). Tibia straight, triangular in section; of the fibula only malleus externus is preserved, co-ossified with tibia.

Tarsus is characterized by the stepped tarsus-metatarsals articulation and by astragalus overlapping cuboideum (like in *Macrotherium*, and in distinction from *M. e.*). Astragalus broad with small neck, nearly straight trochlea, not deeply grooved (in *M. e.* the trochlea is shorter and more deeply grooved); on the distal side—a large triangular facet for cuboideum.

Metatarsals are relatively slender and long; Mt_{IV} is somewhat more massive, probably equal in length to Mt_{III}. The latter has a cylindrical distal facet, Mt_{IV}—a hemispherical one. Mt_{III} has a facet for cuboideum; Mt_{II} lacks the facet for cun_I. The bones of *M. e.* are much more massive; the distal facet of Mt_{III} is hemispherical.

The above brief description testifies that the betpakdalian form belonging to the branch *Schizotheriini* (Colbert) cannot belong to the genus *Moropus* from which it differs in many essential features of the skeletal structure, and moreover, by a lighter weight of the skeleton, particularly the limbs; coming close to *Phyllotillon naricus* by the teeth structure, it should, for want of any information on the skeleton of the latter form be referred to this genus so far only provisionally. A number of its skeletal features have a primitive appearance; at the same time all characteristic features of *Chalicotheres* are there, in some cases showing a high degree of specialization, for instance, the structure of the second digit of the fore-limb; the same applies to the new detail in the structure of cervical vertebrae, peculiar as it is: the posterior for. transversarium opens into the neural canal. The primitive characters show at the same time affinities with the skeleton of *Titanotheres*: close genetic relationship exactly with this family of *Perissodactyla* seems to be beyond doubt (contrary to the opinion of W. B. Scott who believes this to be but a case of convergence).

A flat broad superior surface of the cervical vertebrae with reduced centra indicates that the dorsal muscles of the neck were much more developed than the ventral ones; powerful extensors made the neck very strong and mobile, capable to thrust high the small head of the animal, and by a sharp backward pull tear off the leaves and branches seized by the mouth. A raised head—that was the usual attitude of the animal (contrary to Abel). The limbs are not fossorial (Matthew, Osborn), and the teeth too, typical of browsing animals, with a low crown, are not fitted for food mixed with earth (Königswald). Powerful tuberosities on the proximal ends of metacarpals point to the presence of a strong extensor (m. extensor carpi radialis), (since a fossorial limb would have required strong flexors), which would throw up the fore-foot when the animal was clambering with its fore-limbs up the trunk, or clung by them to the side-stems; as a perfect tool for clinging served powerful «hooks» formed by the slightly movable phalanges, particularly strong in the second digit (the principal movement—in the distal joint of the metacarpals and in the carpus—was one for swinging the «hook»). The tendency to elongation of the fore extremities, as observed in *Chalicotheres*, likewise incompatible with the fossorial mode of life, meets the requirement for reaching higher branches. Finally, the picture is rendered complete by the presence of a low, broad, not deeply grooved astragalus overlapping the cuboideum, bearing evidence of a greater strain upon the feet when the animal would be, standing on its hind limbs, clung to the stem with its fore limbs.

Which of the recent animals are in their habits most nearly approaching these remarkable creatures, which had lived from the Eocene till the Quaternary, consequently, had been well adapted to their ecological niche?