THE TAXONOMIC POSITION OF THE
CHALICOETHERIID PERISSODACTYL
KYZYLKAKHIPPOS ORLOVI FROM THE
OLIGOCENE OF KAZAKHSTAN

by MARGERY C. COOMBS

ABSTRACT: The type of Kyzylkakhippus orlovi, reaffirmed as probably teeth dp2–dp4 from Oligocene deposits at Kyzyl-kak, Kazakhstan, is compared to upper deciduous teeth of Schizotherium priscum. This comparison, and the known presence of S. turtaicum in the Kyzyl-kak fauna, suggest that K. orlovi is a junior synonym of S. turtaicum. Upper teeth of S. turtaicum are otherwise poorly known. Because "K. orlovi" is thereby referable to the Schizotheriidae, there is no definite evidence of the Chalicotheriinae in the Old World prior to the Aquitanian or Burdigalian. Chalicotherium and Nestoritherium alone can at present be included in the Chalicotheriinae.

In 1964 Gabunia and Belyaeva erected a new genus and species, Kyzylkakhippus orlovi, for a deciduous upper dentition from middle Oligocene deposits at Kyzyl-kak, Kazakhstan. They identified the type, from the collection in the Palaeontological Institute of the Academy of Sciences of the U.S.S.R., Moscow (specimen no. PIN 2259-330), as dp2–dp4 of an anchitherine equid. Thenius (1968), however, noted morphological differences between the type dentition and that of known horses, and the zoogeographic difficulties of suggesting that an equid or palaeotherid had existed in Kazakhstan in the middle Oligocene; he correctly referred the genus to the Chalicotheriidae. Thenius also reinterpreted the type dentition as dp2–M3 and suggested especially close affinity to the Chalicotheriinae. Malcolm C. McKenna, who also questioned the referral of Kyzylkakhippus to the Equidae (pers. comm.), made the cast of the type specimen shown in text-fig. 2. My study of this cast and of the drawing of the type figured by Gabunia and Belyaeva (1964, fig. 6) leads me to accept the original identification as dp2–dp4 but also to accept Thenius's placement of Kyzylkakhippus in the Chalicotheriidae. However, I consider that it belongs to the Schizotheriinae rather than to the Chalicotheriinae.

The family Chalicotheriidae is thought to have arisen in the late Eocene or early Oligocene from members of the family Eomoropidae (Radinsky 1964). Two subfamilies, the Chalicotheriinae and Schizotheriinae, are recognized. Generally speaking, the Chalicotheriinae, consisting only of the genera Chalicotherium and Nestoritherium, have undergone quite pronounced changes in foot structure, and on this basis are easily distinguished from all known schizotherines. Chalicotherine dentition is conservative, however, and the upper molars remain low-crowned and quadrate. In the Schizotheriinae (Schizotherium, Borisstakia, Moropus, Phyllostilbon, Ancoytherium) postcranial modifications have occurred much more gradually than in the Chalicotheriinae, and never attain the derived state seen in even the most primitive known representatives of Chalicotherium (C. pilgeri, C. rustingense). Schizotherines modify the dentition more than do chalicotherines, elongating the

molars and increasing the crown height, but they do so gradually. Over a short span of time, changes in schizotherine dentitions are relatively few. *Schizotherium* lacks the derived foot structure of the Chalicotheriinae, but its teeth are less elongated than in most other schizotherines. The exact relationship of *Schizotherium* to chalicotherines and other schizotherines is not clear, but it is probably very near the common ancestry of all schizotherines. It is possible also that ancestry of the Chalicotheriinae is close to *Schizotherium* and perhaps lay within a species which at the present state of knowledge would be placed within *Schizotherium*.

The best-known species of *Schizotherium*, *S. priscum* and *S. turgidum*, are represented by both dental and postcranial remains. Postcranial elements provide the most certain means both for allying and differentiating the two species. Compared to elements of other schizotherine genera, the footbones are of smaller absolute size, metatarsals are longer compared to their width (see, for example, Coombs 1974, table 1), metacarpals and metatarsals are not so closely interarticulated, and fusion between phalanges is unknown. (*Schizotherium* shares the latter three character states with *Borissiakia* but differs from that genus in, among other features, the absence of a cuboid facet on the distal surface of the astragalus.) Among features which differentiate known postcranials of *S. turgidum* from those of *S. priscum* are the loss or strong reduction of a trapezium in the carpus, and the apparent loss of articulation for the ectocuneiform on metatarsal II in the former species (Coombs, manuscript). Loss or reduction of the trapezium occurs more than once within the Schizotheriinae and seems to allow additional flexion of the manus. *S. priscum* is known primarily from Oligocene fissure fillings in France (Phosphorites of Queyray), and *S. turgidum* is an element of the middle Oligocene indricothere fauna well known from Kazakhstan.

Lower teeth have been regularly used to differentiate between species of *Schizotherium* (Matthew and Granger 1923; Gabunia 1951; Belyaeva 1954; Dashzeveg 1974), but upper teeth are poorly known, except in *S. priscum*, and have been little used in interspecific taxonomy. Because of their low crowns and lack of obvious elongation, *Schizotherium* upper molars have on occasion been referred to *Chalicotherium* by workers who did not take postcranial characteristics into sufficient account. Gaudry (1875a), before the association between chalicotheres and postcranials had been recognized, gave the name *Chalicotherium medicus* to some upper cheek teeth from the Phosphorites. Filhol (1894) later suggested that *C. medicus* might be the same animal as *S. priscum* (which he then referred to *Ancylostotherium*), a conclusion with which I fully agree. Similarly, the worn upper molariform tooth of *S. turgidum* figured by Borissiak (1921, pl. 7, fig. 1) led von Koenigswald (1932, p. 22) to classify the species as *C. turgidum*. I believe that the same mistake has been made in the case of *Kyzylikachippus orlovii*, and that this is really a junior synonym of *S. turgidum*. 

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COOMBS: THE CHALICOTHERE KYZYLKAKHIPPUS

SYSTEMATIC PALAEOONTOLOGY

CLAD MAMMALIA

ORDER PERISSODACTYLA

SUBORDER CHALICOTHERIOIDEA Gill, 1872

FAMILY CHALICOTHERIDAE Gill, 1872

SUBFAMILY SCHIZOTHERINAE Holland and Peterson, 1914

GENUS SCHIZOTHERIUM Gervais, 1876

SPECIES SCHIZOTHERIUM TURGATUM Borissiak, 1920

1921 Schizotherium turgatum: Borissiak, p. 43 (English version of Borissiak 1920, above); Matthew 1929, p. 519; Colbert 1935, p. 6; Gabunia 1951, p. 282; Belyaeva 1954, p. 52; Dzosaev 1974, p. 76.

1932 Chalicothereum turgatum: von Koenigswald, p. 22.

1935 Macrotherium turgatum: Colbert, p. 12.

1964 Kyzylkakhippus orlovii Gabunia and Belyaeva, p. 129.


Discussion. PIN 2259-330, a deciduous upper dentition, is the holotype and only specimen referred to 'K. orlovii'. PIN 1442-253, designated as the lectotype of S. turgatum (see Belyaeva 1954), is a lower jaw ramus containing P₂, M₂. The only published upper tooth hitherto referred to S. turgatum is a worn quadratoform tooth figured by Borissiak (1921, pl. 7, fig. 1). Although both Borissiak (1921, p. 43) and Belyaeva (1954, p. 52) identified this tooth as an upper molar (?M₄), it is small (17.5 mm long according to Borissiak 1921, p. 43). The lower teeth of the lectotype of S. turgatum are also smaller than their very few known counterparts in S. priscum. On the other hand, metatarsals of S. turgatum figured by Borissiak (1921) are in general larger than known metatarsals of S. priscum. It is not possible on the basis of limited specimens to reach a conclusion on the relative sizes of feet and teeth in the two species. Size sexual dimorphism in chalicotherids (Coombs 1975) is a further confusing factor in such a determination. The length of the upper molariform tooth figured by Borissiak (1921) may have been reduced by the wear it shows, but the small size suggests that identification as M₄ or even dp₄ or dp₅ is not unreasonable. In any case, though I detect no particular differentiating features between the two specimens, it is so badly worn that it cannot be meaningfully compared with PIN 2259-330. In the absence of any other published upper teeth of S. turgatum, I have compared PIN 2259-330 with upper teeth of S. priscum.

For purposes of comparison with PIN 2259-330, the most useful specimen is a maxilla from the Phosphorites of Quercy; this was given the numbers PQ 359-PQ 362 at the Muséum d’Histoire Naturelle de Lyon, Lyon, France, but was cast as specimen no. AMNH 10494 in the collection of the Department of Vertebrate Palaeontology of the American Museum of Natural History, New York. The teeth in this specimen (text-fig. 1) can be identified as dp₂-M₂ and are probably referable to S. priscum. The posterior two teeth, M₁ and M₂, are generally similar to M₁ and M₂ on left and right uncatalogued maxillae of S. priscum in the Muséum National d’Histoire Naturelle, Paris, figured respectively by Filhol (1877) and Gaudry (1875b). (The specimens figured by Filhol and by Gaudry are very similar to one another and, if from the same locality, might be two sides of the same individual; M₁ is slightly
more symmetrical than M² of AMNH 10494, but both molars are approximately as
quadrate as those of AMNH 10494.) The most posterior tooth of AMNH 10494 is
probably not an M³, because M³ of S. priscum is strongly asymmetrical, with the
posterior part of the ectoloph especially reduced (text-fig. 3). The anterior three teeth
of AMNH 10494 should therefore be regarded dp²–dp⁴. These teeth are of similar
morphology to one another and are all molariform. The molariform structure of
dp², as thus identified, is remarkable in the sense that dp² in Moropus, where several
immature maxillae are known, is closer in morphology to Pᵢ than it is to dp³, dp⁴, or
to the permanent molars. Permanent premolars, including Pᵢ, of S. priscum are
generally similar to those of Moropus. Lower deciduous teeth known in Schizotherium
and other schizotheriines are not helpful in elucidating this question. Tooth dp₂ of
Moropus sp. from Aquitanian deposits of St-Gérard-le-Puy, France, is elongated
compared to its width but is clearly not molariform (Coombs 1974). A dp₃ in an
uncatalogued specimen of S. priscum (Field Lot Bach 1893-11 in the Museum National
d'Histoire Naturelle, Paris) corresponds closely in morphology to dp₃ of Moropus
and thus suggests a possible correspondence of dp₃ as well. Tooth dp₄ of Ancylotherium
(Ancylotherium) pentelicum from Samos (AMNH 23001; see Coombs 1973) is, how-
ever, partly molariform.

Identification of the upper teeth of AMNH 10494 as dp²–M² makes it more likely
that Gabunia and Belyaeva (1964) correctly identified PIN 2259-330, the type of
‘K. orlovii’, as dp²–dp⁴. Further examination and comparison with AMNH 10494
suggest that the size difference between the posterior two teeth of PIN 2259-330 is
approximately the same as that between dp³ and dp⁴ of AMNH 10494 (see Table 1);

<table>
<thead>
<tr>
<th>Tooth</th>
<th>PIN 2259-330</th>
<th>AMNH 10494</th>
</tr>
</thead>
<tbody>
<tr>
<td>dp²</td>
<td>Broken (approx. 14.0)</td>
<td>16.1</td>
</tr>
<tr>
<td>dp³</td>
<td>17.0</td>
<td>18.6</td>
</tr>
<tr>
<td>dp⁴</td>
<td>19.5</td>
<td>19.7</td>
</tr>
<tr>
<td>M₁</td>
<td>—</td>
<td>22.6</td>
</tr>
<tr>
<td>M²</td>
<td>—</td>
<td>22.8</td>
</tr>
</tbody>
</table>

it is also about the same order of magnitude as the size increment from dp² to dp³.
This observation conflicts with Thenius’s view that there is a proportionally large
size difference between the posterior two teeth. In fact, abrupt size increase does not
seem to be a good method of distinguishing dp⁴ from M³ in Schizotherium. In
AMNH 10494 the increase from dp² to M³ is not much more than the size increments
between dp², dp³, and dp⁴. In that little-worn specimen there is also a notably small
size increase from M₁ to M², despite the fact that in many chalicotheriid specimens
M₁ is shorter than M², possibly because of loss of length by wear during life. The teeth
of PIN 2259-330 correspond closely in size to dp²–dp⁴ of AMNH 10494 but, in view
of the difficulties mentioned above in making comparisons between S. priscum and
S. turgenicum in tooth and foot size, one must not put undue emphasis on this similarity.

As thus identified, dp²–dp⁴ of PIN 2259-330 and of AMNH 10494 are very similar.
TEXT-FIG. 1. Right dp², M² referred to *Schizatherium priscum*, AMNH 10494, a cast of PQ 359-PQ 362 of the Muséum d'Histoire Naturelle de Lyon. From the Phosphorites of Quercy, Oligocene, of France.

TEXT-FIG. 2. Cast of PIN 2259-330, left dp², dp³, holotype of *Kyzylkakhippus orlovii*. From Oligocene deposits of Kyzyl-kak, Kazakhstan.

TEXT-FIG. 3. Left M³ of uncatalogued specimen (Lot Number Bach 1903-20 at the Muséum National d'Histoire Naturelle, Paris) referred to *S. priscum* from the Phosphorites of Quercy, Oligocene, of France.

All figures ×1.5.
in morphology. Particularly noticeable in both are the complete molarization of dp² and the presence of a cristite on at least dp⁴. On PIN 2259-330, dp⁴ is less worn than that of AMNH 10494, and therefore the origin of the metaloph from the ectoloph is closer to the mesostyle; such a variation as a result of differential wear is also seen within a single species of *Moropus*. Other minor differences between the two specimens, for example the stronger protocone on dp⁴ of PIN 2259-330, are also attributable to individual variation or differential wear. The small cuspule near the anterobasal base of the mesostyle on dp⁴ and dp⁵ of PIN 2259-330 is of uncertain significance. Clearly M₄ had not yet erupted in PIN 2259-330, for the posterior part of dp⁴ is unworn. This is consistent with the relative lack of wear on the other teeth. In general, few differences occur between AMNH 10494 and the type of *K. orlovi*, and most of the differences that do occur can be interpreted in the light of wear. Even if the two specimens were to be identified respectively (after Thenius) as dp³-M³ and dp⁴-M⁴, the basic similarity between them would not be changed. Certainly the generic identity of *Kyzylkakhippus* cannot be maintained.

Thenius (1968, p. 348) listed the following members of the Oligocene Indricotherium fauna previously described from Kyzyl-kak, the type locality of *K. orlovi*: *Cricetodon deploratus*, *C. caducus*, *Hyaenodon aymardi*, *Tragulidae* indet., *Colodon orientalis*, *Ergilia kazachstania*na, *Indricotherium transouralicum*, *Allaceros* sp., *Schizotherium turgaicum*, and *K. orlovi*. The occurrence of *S. turgaicum* is especially important. The lack of described unworn upper teeth of *S. turgaicum* makes it difficult to make a direct comparison with PIN 2259-330, but probably explains why Gabania and Belyaeva misidentified this specimen as an anchitherine equid. Clearly the presence of *S. turgaicum* in the Kyzyl-kak fauna assemblage increases the likelihood that *K. orlovi* is a junior synonym of *S. turgaicum*. The absence of significant differences from the worn upper tooth of *S. turgaicum* figured by Borissiak (1921) completes the case for synonymy.

Though a full rediscussion of the genus *Schizotherium* would be helpful at the present time, such work is hampered by fragmentary material. In view of Colbert’s (1935) conclusion that *S. turgaicum* is an unusually primitive representative of the genus, it is worth pointing out that his notion was based partly on the worn upper tooth figured by Borissiak (1921), and also that upper molars of all *Schizotherium* species are quadrate relative to those of other schizotherines. *S. turgaicum*, it should be remembered, shows some character states that are clearly not primitive—for example, the loss or reduction of the trapezium in the manus, and the apparent loss of ectocuneiform contact with metatarsal II in the pes. The similarity of PIN 2259-330 to upper deciduous teeth of *S. priscum* adds to the postcranial evidence that *S. turgaicum* clearly belongs to *Schizotherium* and does not represent the separate, primitive genus that Colbert (1935) suggested.

Because *K. orlovi* can be referred to *Schizotherium*, there is still no definite evidence of representatives of the Chalicotheriinae prior to the Aquitanian or Burdigalian of the Old World. Skinner (1968, p. 12) attributed *Oreinootherium bilobatum* (Cope, 1891) from the Cypress Hills Oligocene of Saskatchewan, Canada, to the Brontotherioidea *incertae sedis* as a *nomen inquirendum*. After re-examining the heavy mandibular ramus and separate lower deciduous tooth referred to this species, I fully agree with Skinner’s assessment. *O. bilobatum* had been previously referred to the
Chalicotheriinae (Cope 1891; Russell 1934), but there is no evidence that the Chalicotheriinae were present in the New World during the Oligocene, or indeed at any other time.

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