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Deltatheroides-like mammals from the Upper Cretaceous of North America

THE family Deltatheridiidae¹ has been redefined to include primitive therian mammals of tribosphenic grade referable to only two genera *Deltatheridium*¹ and *Deltatheroides*², from the Djadokhta and Barun Goyot Formations, of uncertain age within the Upper Cretaceous of Mongolia². The Deltatheridiidae, long considered Eutheria, although of disputed taxonomic dimensions and phyletic position within the infraclass^{1–5}, seem now best classified as therians of metatherian–eutherian grade, but referable to neither Metatheria nor Eutheria². A combination of apparent marsupial-like and placental-like features in the known parts of the dentition and skull of members of the Deltatheridiidae insures that the family will be of continuing interest.

I here record the first recognition of the Deltatheridiidae *sensu* Butler and Kielan-Jaworowska² from territories outside of Asia, an occurrence documented by fossils collected at Upper Cretaceous horizons in the Western Interior of North America. The new deltatheridiids are known only from isolated teeth and tooth fragments, which have been found but rarely in the large samples of North American late Cretaceous mammals in collections. Nevertheless, the detailed resemblances of these fossils to molars of the Asiatic Deltatheridiidae, especially to those of *Deltather-*

*oides cretacicus*¹, make reliable the identifications recorded here. The fossils are: (1) University of Alberta (UA) no. 4085b (see Fig. 1a), a single upper molariform tooth from the late Maestrichtian (Lancian)^{6,7} Upper Edmonton Formation, Alberta, and first described⁸ as a possible deciduous P¹ of the palaeoryctid *Cimolestes magnus*⁹; (2) University of California (Berkeley) Museum of Paleontology no. 46359, a lower molar (see Fig. 1b), and American Museum of Natural History no. 59482, a lower molar trigonid, both from a previously unidentified species occurring in the late Maestrichtian Lance Formation, Wyoming¹⁰; and (3) UA 4248, a previously unidentified lower molar talonid, from the late Campanian (Judithian)^{6,7} Oldman Formation, Alberta. The Lance and Oldman specimens are virtually identical in coronal architecture, other than slightly larger size, to M₂ or M₃ of *Deltatheroides cretacicus* (this species is being redescribed elsewhere by Z. Kielan-Jaworowska). Occlusal relations and comparison with upper molars of the Asiatic deltatheridiids suggest that the tooth from the Upper Edmonton Formation is probably an M¹ from the same or closely related species as are the lower molar specimens.

The close morphological resemblances between the North American and the Asian fossils generate inferences that: (1) the known Asian and North American deltatheridiids diverged relatively recently before their oldest discovered occurrences in the Djadokhta and Oldman Formations; and, as a corollary, (2) migration of the descendant deltatheridiid species from Asia to North America or *vice versa* (and the known evidence does not now permit a choice) took place soon after this divergence. Although these inferences concerning the near contemporaneity of earliest appearances of Asiatic and North American deltatheridiids must remain tentative—at least until more extensive sampling of the local mammalian faunas of North America and East Asia can be completed—they are nevertheless in accord with other evidence that had earlier and independently indicated the improbability of a relatively great Cretaceous age of the Djadokhta mammals¹¹: relict triconodonts and symmetrodonts survived in North America to at least as late as the time of deposition of the early Campanian (Aquilan)^{6,7} Upper Milk River Formation (still before the time of first appearance of North American deltatheridiids), but fossils of neither triconodonts nor symmetrodonts have been found in the deltatheridiid-bearing Djadokhta Formation or in younger Upper Cretaceous rocks in East Asia.

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Fig. 1 Stereophoto pairs of isolated molars of cf. *Deltatheroides* sp., Upper Cretaceous, North America. a, UA 4085b, M¹ (?), Upper Edmonton Formation, Alberta, Canada; b, UCMP 46359, lower molar, Lance Formation, Wyoming (\times about 7.6).