

## A new reconstruction of multituberculate endocranial casts and encephalization quotient of *Kryptobaatar*.

Zofia Kielan-Jaworowska and Terry E. Lancaster

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Multituberculate and eutriconodontan endocasts differ from those of primitive therian mammals in their lack of visible midbrain exposure on the dorsal side and in having a vermis-like triangular bulge (recognized herein as the cast of a large sinus-the superior cistern) inserted between the cerebral hemispheres. As the shape and proportions of multituberculate, eutriconodontan, and Cretaceous eutherian endocasts are otherwise similar, one might speculate that the multituberculate and eutriconodontan brains did not differ essentially from those of primitive eutherian and marsupial mammals, in which the midbrain is exposed dorsally. This conclusion might have important phylogenetic implications, as multituberculates and eutriconodontans may lay closer to the therians *sensu stricto*, than hitherto believed. We describe an endocast of the Late Cretaceous multituberculate *Kryptobaatar*, which differs from those of other multituberculates (*Ptilodus*, *Chulsanbaatar*, and *Nemegtbaatar*) in having unusually long olfactory bulbs and the paraflocculi elongated transversely, rather than ball-shaped. We estimate the encephalization quotient (EQ) of *Kryptobaatar*, using: 1) Jerison's classical equation (1) based on estimation of endocranial volume and body mass; 2) McDermott et al. derived body mass estimation equation (2) using upper molar lengths; and 3) estimation of body mass based on new equations (3a, 3b, 3c, and 3d1-9), which we propose, using measurements of the humerus, radius, ulna, femur and tibia. In both Jerison's method and a mean of our series of derived formulae, the EQ varies around 0.71, which is higher than estimated for other multituberculate mammals. It remains an open question whether the evolutionary success of *Kryptobaatar* (which was a dominant mammal during the ?early Campanian on the Gobi Desert and survived until the ?late Campanian) might have been related to its relatively high EQ and well developed sensorimotor adaptations, in particular olfaction and coordinated movements.

**Key words:** Multituberculata, *Kryptobaatar*, brain structure, endocasts, superior cistern, encephalization quotient, body mass, Late Cretaceous, Mongolia.

Zofia Kielan-Jaworowska [[zkielan@twarda.pan.pl](mailto:zkielan@twarda.pan.pl)], Instytut Paleobiologii PAN, ul. Twarda 51/55, PL-00-818 Warszawa, Poland; Terry E. Lancaster [[tlancast@neoucom.edu](mailto:tlancast@neoucom.edu)], Northeastern Ohio Universities College of Medicine, 4209 State Route 44, PO Box 95, Rootstown, Ohio 44272-0095, USA.

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