

## In quest for a phylogeny of Mesozoic mammals

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We propose a phylogeny of all major groups of Mesozoic mammals based on phylogenetic analyses of 46 taxa and 275 osteological and dental characters, using parsimony methods (Swofford 2000). *Mammalia sensu lato* (Mammaliaformes of some authors) are monophyletic. Within mammals, *Sinoconodon* is the most primitive taxon. *Sinoconodon*, morganucodontids, docodonts, and *Hadrocodium* lie outside the mammalian crown group (crown therians + Monotremata) and are, successively, more closely related to the crown group. Within the mammalian crown group, we recognize a fundamental division into australosphenidan (Gondwana) and boreosphenidan (Laurasia) clades, possibly with vicariant geographic distributions during the Jurassic and Early Cretaceous. We provide additional derived characters supporting these two ancient clades, and we present two evolutionary hypotheses as to how the molars of early monotremes could have evolved. We consider two alternative placements of allotherians (haramiyids + multituberculates). The first, supported by strict consensus of most parsimonious trees, suggests that multituberculates (but not other allotherians) are closely related to a clade including spalacotheriids + crown therians (Trechnotheria as redefined herein). Alternatively, allotherians can be placed outside the mammalian crown group by a constrained search that reflects the traditional emphasis on the uniqueness of the multituberculate dentition. Given our dataset, these alternative topologies differ in tree-length by only ~0.6% of the total tree length; statistical tests show that these positions do not differ significantly from one another. Similarly, there exist two alternative positions of eutriconodonts among Mesozoic mammals, contingent on the placement of other major mammalian clades. Of these, we tentatively favor recognition of a monophyletic Eutriconodonta, nested within the mammalian crown group. We suggest that the "obtuse-angle symmetrodonts" are paraphyletic, and that they lack reliable and unambiguous synapomorphies.

**Key words:** Mammalia, Allotheria, Australosphenida, Boreosphenida, Monotremata, Eutriconodonta, phylogeny, parsimony analysis.

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