

Discovery of primitive Jurassic mammal *Megaconus*

Under a research grant funded by the National Natural Science Foundation of China, Profs. Zhou Changfu and Wu Shaoyuan of Shenyang Normal University, Luo Zhexi from the University of Chicago (USA), and Thomas Martin from Universität Bonn (Germany) discovered a new primitive mammal from the Jurassic, named *Megaconus mammaliaformis*. The finding and the evolutionary analysis of this fossil were published in an article entitled “A Jurassic mammaliaform and the earliest mammalian evolutionary adaptations” in *Nature* (2013, 500(7461): 163—167).

Mammals are very distinctive from other non-mammalian vertebrates by their novel evolutionary adaptations. The earliest evolution of the mammalian features can be traced to the mammaliaforms of the Triassic and Jurassic periods that are fossil relatives to living mammals. The newly discovered *Megaconus* is such a fossil.

Megaconus mammaliaformis is a new species that belongs to the order Haramiyida, a group with widespread fossil record but previously poorly known from isolated teeth. *M. mammaliaformis* is represented by a complete skeleton with fossilized furs. It has primitive skull structures including the mandibular middle ear, a gradational thoraco-lumbar transition in vertebral column, and primitive ankle (tarsal) bones. However, its teeth have fused roots with mammal-like tooth replacement, and multi-cusped rows that have alternating occlusion between the upper and lower teeth, for omnivorous or herbivorous feeding. Phylogenetic analysis has placed *Megaconus* (and also its order Haramiyida) in a basal position on the mammaliaform evolutionary tree, thus providing new information on the ancestral condition for many mammalian characteristics. The new fossil suggests that mammalian furs evolved before the rise of modern mammals and the mammal-like tooth replacement evolved in fossil haramiyids.

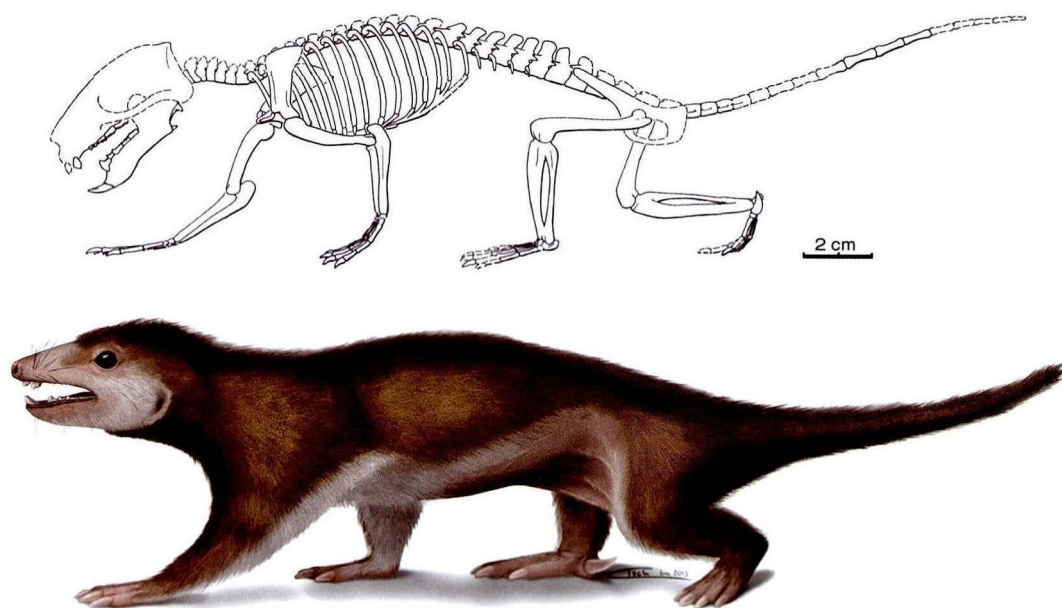


Figure Skeleton and furred reconstruction of *Megaconus mammaliaformis*, from the Jurassic deposits of Tiaojishan Formation of Daohugou, Chifeng, Inner Mongolia (ca. 165–164 million years).