

## Desmostylian phylogenetic relationship revisited

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Desmostylian is an extinct clade of marine mammals. They belong to Tethytheria or possibly Perissodactyla. They lived in North Pacific Rim from earliest Oligocene to earliest Late Miocene and are already extinct at the order level. Traditionally, Desmostylian has been divided into two families, Desmostylidae and Paleoparadoxiidae, based on their teeth morphology, with the former including 4 or 5 genera (*Ashoroa*, *Cornwallius*, *Kronotherium*, "*Vanderhoofius*", and *Desmostylus*) and the latter 4 genera (*Behemotops*, *Archaeoparadoxia*, *Paleoparadoxia*, *Neoparadoxia*). Although the phylogenetic relationships within Desmostylian have been mostly unclear, two hypotheses were proposed: either both Desmostylidae and Paleoparadoxiidae are monophyletic groups, or Paleoparadoxiidae comprise paraphyletic outgroups for Desmostylidae. One factor contributing to such difference in the hypothesis was the lack of well-preserved specimens that can be used as suitable outgroups for phylogenetic analyses. Cooper et al. (2014), however, described a well-preserved skull of *Anthracobne* that is considered as an appropriate outgroup of Desmostylian. In this study, at first, I ran analyses on data matrices on the desmostylian interrelationship published in previous studies to examine reproducibility of the results, i.e., whether or not tree topologies reported in these studies could be recovered. Second, I analyzed the Desmostylian relationship by newly adding *Anthracobne* as an out-group to such data sets after examining the accuracy of their character coding. Phylogenetic analysis was conducted with equally weighted parsimony using TNT v. 1.1 (Goloboff et al. 2008). One thousand replicates of tree bisection reconnection branch swapping were run holding ten trees per replicate with all zero-lengths branches collapsed. For this analysis, published data sets were combined and revised to include 5 species of Desmostylian and 5 species of Paleoparadoxiidae. A whole data matrix including both cranial and postcranial characters and a culled matrix including cranial characters only were separately analyzed. In this analysis, analyses on both the whole and culled data sets resulted in Paleoparadoxiidae forming paraphyletic, successive outgroups for the monophyletic Desmostylidae. This result provides a phylogenetic framework for discussing various aspects of Desmostylian evolution.

### Reference

- Cooper et al. (2014). Anthracobunids from the Middle Eocene of India and Pakistan Are Stem Perissodactyls. PLoS One 9(10): e109232.
- Goloboff et al. (2008). TNT, a free program for phylogenetic analysis. Cladistics 24: 1-13.