THE PHYLOGENY OF PALEOCENE MAMMALS AND THE EVOLUTION OF PLACENTALIA

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Resolving the phylogenetic relationships among Paleocene mammals has been a longstanding goal in paleontology. Constructing an accurate and comprehensive phylogeny for Paleocene mammals is a worthwhile objective in itself, but it also provides a framework on which we can better understand the origin of placental mammals and the evolutionary processes underlying the diversification of mammals before, during, and after the end-Cretaceous mass extinction. More recently, a robust Palaeocene mammal phylogeny has become a much-coveted tool for reconciling discrepancies between morphological and molecular evidence for the phylogeny and diversification of Placentalia. Here, we present a novel phylogenetic dataset to test hypotheses regarding Paleocene mammal phylogeny and the origin and diversification of Placentalia. To date, our matrix combines phenomic data for 36 extant mammal species and 107 fossil species scored for 2540 morphological characters alongside 26 genes sequenced for 47 species. We utilized a reductive morphological scoring strategy in order to minimize assumptions and test hypotheses on homology. Multiple sequence alignments were performed in MEGA-X for each gene. We then analysed the data using Bayesian methods and explored the effects of different approaches.

Relaxed clock analyses using a molecular constraint and an FBD prior are congruent with the diversification of many extant orders prior to the K-Pg boundary. Relaxed clocked total-evidence analyses (morphology and molecules) using an FBD prior resulted in older ages of diversification than those estimated by our relaxed clock molecular constraint model and previous molecular studies. Within Placentalia, our phylogenies provide support for the divergence of Atlantogenata (Afrotheria and Xenarthra) from Boreoeutheria (Euarchontoglires and Laurasiatheria). Among the Paleocene taxa, ‘condylarths’ are distributed along the base of Laurasiatheria with members of ‘Arctocyonidae’ recovered as sister taxa to Artiodactyla; enigmatic groups such as Pantodonta and Taeniodonta are recovered as crown placentals whereas Leptictida is not. Our Paleocene mammal phylogeny is a critical step toward better understanding placental mammal evolution. Ultimately, this work will facilitate the investigation of fundamental questions previously encumbered by the lack of a well-resolved phylogeny.

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