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Fossil versus molecular datings of major ant subfamilies

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Despite the interest the ants (Formicidae) have long generated, the group's evolutionary history has become more clearly established only recently, and yet our understanding of the diversity and phylogeny of these organisms is far from complete. Substantial advances have been made in the last decade by the discoveries of primitive fossil and extant lineages, and by molecular phylogenetic analyses. Recent molecular divergence dating estimates suggest that crown group ants arose some time between 115 and 168 million years ago, depending on the methodology applied (BEAST, penalized likelihood, etc.) and the assignment of fossils as stem group or crown group calibration points. This time interval is devoid of fossil ants, however, and the earliest known fossils are currently reported from mid-Cretaceous (ca. 100 Mya) ambers from France and Myanmar. These included only members of extinct or uncertain subfamilies thus far, but new discoveries presented here have revealed the presence of three of the 'big four' modern subfamilies in this time frame, i.e. Dolichoderinae, Formicinae, and Ponerinae. These findings and an overview of other known Cretaceous ants show that molecular divergence datings proposed respectively for each three subfamilies, which did not exceed 90 Mya in previous studies, were all underestimated. Meanwhile, this argues for an age of crown group ants within the 139-158 Mya as proposed by the most recent study, thus closer to the Jurassic/Cretaceous boundary than previously thought.