

Evaluating rapid evolutionary radiation in *Goniothalamus* (Annonaceae)

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Both intrinsic and environmental factors may result in changes in diversification rate in a lineage. Significant shifts in evolutionary tempo, including rapid evolutionary radiation, are of particular interest as they are key to understanding how factors such as the timing of diversifications, species attributes, environmental conditions and the size and complexity of geographical regions have shaped current patterns of biodiversity. The Annonaceae is a species-rich family of early-divergent angiosperms, has previously been shown to exhibit a low extinction rate. However, a recent study indicated that diversification rates vary across the family: *Goniothalamus* has been highlighted as a genus that is most likely to have undergone rapid evolutionary radiation. This genus is comparatively species-rich (with c. 130 species), however, and has previously been estimated to be relatively young, with a crown age of only 10-3.6 Ma. Phylogenetic reconstructions, and divergence time and diversification rate estimations were used to identify rapid radiation of genera in the family, with particular emphasis on *Goniothalamus*. Possible causes of changes in diversification rate are evaluated to distinguish intrinsic causes (adaptive, including key evolutionary innovations) and environmental causes (non-adaptive, including biogeographical events, palaeoclimatic changes).