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Impact of fossils on reconstructing ancestral flowers in Ericales.

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Reconstructing ancestral states is an essential tool for understanding the evolution of traits and lineages, but the impact of including fossils in these reconstruction remains largely unexplored. The asterid order Ericales has both highly diverse flowers and a rich record of well-preserved fossil flowers, making them an ideal group to test the influence of including fossils on ancestral state reconstruction. We used a tip-dating approach with a total-evidence dataset in a Bayesian framework to reconstruct fossil positions in Ericales, taking into account both their morphology and age. We reconstructed ancestral floral characters including and excluding fossil species in a Bayesian framework, using a sample of posterior trees to account for uncertainty. While some fossils appear to be well constrained, most were characterised by high levels of uncertainty. The impact of fossils in the reconstruction varies among traits. We find three general scenarios: (1) no measured impact, (2) increased confidence for one state in otherwise uncertain reconstructions, (3) complete shift from one state to another in reconstruction at deep nodes. The demonstrable impact of fossils on ancestral state reconstructions, especially at deep nodes, shows that future trait evolution studies much to gain from including fossils.

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