# Abstract Detail



Systematics

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## Reconstructing floral shape evolution in the Core Goodeniaceae using geometric morphometrics and densely sampled phylogenies.

The predominantly Australian family Goodeniaceae is known for its diverse flower morphologies. These include species with nearly radially symmetric flowers to several forms of zygomorphy, including bilabiate flowers among species of *Goodenia* and the enigmatic fan-flowers exemplified by, but not limited to, *Scaevola*. We aim to reconstruct the evolution of flower shape in the larger clade of this family (Core Goodeniaceae) to address several questions: 1) How many times have fan-flowers evolved? 2) Do some clades exhibit greater floral shape lability? 3) Do the dorsal petals evolve at a higher rate than the lateral or ventral petals? and 4) To what degree, if any, does floral shape influence diversification rate across the Core Goodeniaceae? Our highly resolved, densely sampled phylogenies for the clade provide the necessary historical structure. For the comparative floral data, we have developed a geometric morphometric method to quantitatively characterize flower shape based on our field-collected and crowdsourced images. This floral morphometric method extracts positional information from five homologous petal apex landmarks, and employs PCA to characterize their variance. The resulting principal components can be reconstructed as continuous characters across the phylogeny and used to effectively cluster species into discrete shape groups, permitting the inference of flower shape evolution across more densely sampled phylogenies. Our datasets provide evidence that the majority of floral shape variation is driven by positional shifts among the dorsal petals, which causes the clear distinction between fan-flowers and all other morphologies. Within Core Goodeniaceae, *Scaevola* s.l. (which is composed almost exclusively of fan-flowers) exhibits less variation in floral shape than does *Goodenia* s.l. This is due in large part to the fact that all three major clades of *Goodenia* s.l. contain individual species and clades that have independently evolved fan-flowers. Expanding our phylogenetic and morphometric representation will increase the resolution of our floral evolutionary inferences among this diverse clade of Australian wildflowers.



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