



## Genetic differentiation between sympatric sister species of eucalypts.

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Extensive hybridisation among related species is well-documented in the eucalypts, which raises questions about how speciation occurs and high species diversity is maintained. We explored genetic diversity and differentiation between two sister species of eudesmid eucalypts, *Eucalyptus tetradonta* and *Eucalyptus megasepala*. The two species have overlapping distributions in northern Queensland, where *E. megasepala* is restricted to the Cape Yorke Peninsula, including areas where both species can occur within metres of one another; *E. tetradonta* is widespread from northern Western Australia, through the Northern Territory and into Queensland. Despite their overlapping geographic ranges and apparently limited physical and environmental barriers to gene flow, significant genetic differentiation and population structure were observed with limited evidence of gene flow between the two species. Outlier loci associated with divergent selection were identified, suggesting genetic adaptations underpinning ecological differences. Additionally, flowering time analysis revealed temporal isolation, potentially contributing to reproductive barriers. Over its entire range, *E. tetradonta* genetic diversity follows an isolation by distance pattern with a modestly supported genetic split occurring near the Gulf of Carpentaria. These findings provide valuable insights into the intricate mechanisms driving speciation in *Eucalyptus* species and have broader implications for understanding biodiversity in temperate tree genera.

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