

Systematics and biogeography of the Gondwanan Orthocladiinae (Diptera: Chironomidae)

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Restrictions to effective dispersal and gene flow caused by the fragmentation of ancient supercontinents are considered to have driven diversification and speciation on disjunct landmasses globally. Investigating the role these processes have played in the development of diversity within and among taxa is crucial to understanding the origins and evolution of regional biotas. Within the chironomid subfamily Orthocladiinae (Diptera: Chironomidae), a group of genera that are distributed across the austral continents (Australia, New Zealand, South America) have been proposed to represent a relict Gondwanan clade. We used a molecular approach to resolve relationships among taxa and infer the relative roles that vicariance and dispersal may have played in the evolution of this group. Continental biotas did not form monophyletic groups, in accordance with expectations given existing morphological evidence. Patterns of phylogenetic relationships among taxa did not accord with expected patterns based on the geological sequence of break-up of the Gondwanan supercontinent. Likewise, divergence time estimates largely post-dated continental fragmentation and implied instead that several transoceanic dispersal events may have occurred post-vicariance. Passive dispersal of gravid female chironomid adults is the most likely mechanism for transoceanic movement, potentially facilitated by West Wind Drift or anti-cyclone fronts. Taken together, these data suggest that a more complex relationship between both vicariance and dispersal may explain the evolution of this group. The sampling regime we implemented here was the most intensive yet performed for austral members of the Orthocladiinae and unsurprisingly revealed several novel taxa that will require formal description.

