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The biogeographic and evolutionary history of an extraordinary species radiation across an extreme elevational gradient.

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One of the most biologically diverse and geologically complex areas of Earth is located in the Australopacific region. It comprises ancient landmasses that have undergone major climatic modifications, high altitude mountain ranges resulting from geotectonic landscape changes, and young tectonically active archipelagos. To explore how these climatic and landscape changes may have influenced species diversification, we reconstructed the biogeographic and evolutionary history of *Limbodessus* diving beetles (Dytiscidae). This genus is found across the Australopacific region, and shows multiple biome transitions, from underground aquifers in Australia to alpine meadows in New Guinea. Using low-coverage whole-genome sequence data, we estimated an almost complete time-calibrated phylogenetic tree, resolving *Limbodessus* as a mid-late Miocene genus that likely originated in the Sahul continent. We provide evidence for subterranean speciation within isolated underground aquifers, although multiple independent colonizations from surface/interstitial habitats were the most frequent scenario. Alpine biota formed a monophyletic clade, with evidence for one or two independent shifts to high altitudes. Overall, these analyses suggest parallel colonization processes occurred at opposing ends of an altitudinal gradient, led by extreme aridification in Australian lowlands and *in situ* diversification of alpine taxa by passive-uplifting of local biota in New Guinea.

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