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Camaenid Land Snails in North-western Australia: A Model Case for the Study of Speciation and Radiation

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Camaenidae arguably are Australia's most diverse land snail group encompassing 454 currently recognised species. A survey of coastal regions of the Kimberley, a 430,000 km^2 sub-humid region in tropical north-western Australia, has led to the identification of 170 camaenid species through analyses of key morphological characters and mitochondrial sequences from 300 samples. While at least 120 of these species represent new discoveries, the present study almost quadruples the number of known species in the study area. Extrapolating this increase to the scale of NW Australia prompts estimates that arrive at a magnitude of 600 to 800 camaenid species, a figure that was earlier proposed for the whole continent.

This study seeks to understand the mechanisms that produced and maintained the high levels of diversity and endemism of land snails in the Kimberley. Most camaenid snails are usually confined to specific habitats, such as rainforest patches, vine thickets and woodlands, occupying very restricted ranges. The phylogeographic patterns imply that speciation was essentially driven by allopatric separation while consistent levels of genetic differentiation suggest that species have diversified more or less simultaneously. The fragmentation of formerly widespread rainforests, caused by more arid climatic conditions since the Miocene, has been identified as probable trigger of the camaenid radiation by mediating isolation and parallel patterns of allopatric differentiation. Unable to travel the distances between isolated rainforest patches, new species evolved within each patch. With the same evolutionary processes occurring within each of these patches in a number of land locked species, the end result has been a suite of species assemblages that are unique to each single forest patch.

Thus, the NW Australian Camaenidae are a prime example for the significance of climate change induced habitat fragmentation and ecological niche conservatism as drivers of a so-called non-adaptive radiation, which is a process capable of producing taxonomically and ecologically diverse species flocks over relatively short periods of time.

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