



Conference Abstract

Speciation underground in desert aquifers or just another case of hybridisation by blind beetles?

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Abstract

Phylogeographic studies have provided evidence for speciation underground within the confines of a cave environment, questioning the assumption that cave animals evolved from surface ancestors (Juan et al. 2010). However, for many of these studies, it is difficult to rule out the possibility that phylogeographic patterns may have resulted from multiple colonisation events from the same ancestral surface species, introgressive hybridisation among related species, and/or the extinction of surface ancestral lineages. Such is the case for the subterranean diving beetle species (Dytiscidae) of the groundwater calcrete archipelago of central Western Australia, where more than 100 species have been described that appear to have evolved by a combination of ecological/allopatric speciation and in some cases possibly sympatric speciation. We have further explored these speciation theories by phylogeographic analyses of nuclear gene data (WG, TOPO, ARK, Cn) from 86 species in the genera *Limbodessus* and *Paroster*, including analyses of genes involved in photoreception for select *Paroster* taxa. Analyses provide further support for the presence of sympatric sister species, thus, rejecting the hypothesis that previous phylogeographic patterns, based on mitochondrial DNA, resulted from introgressive hybridisation. Our analyses also uncovered deleterious frameshift and stop mutations in a long wavelength opsin gene that mapped to the common ancestor of a sympatric sister triplet of stygobiont species, providing strong evidence that this ancestor was already

adapted to living underground and that the species triplet evolved within the confines of a single groundwater calcrete. Our analyses show that while the majority (~75%) of these stygobiont beetle species evolved from surface ancestors, a significant number diversified underground through a process of either sympatric or parapatric speciation.

Keywords

speciation, subterranean dytiscid beetles, calcrete aquifer, opsin gene evolution

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References

- Juan C, Guzik M, Jaume D, Cooper SB (2010) Evolution in caves: Darwin's 'wrecks of ancient life' in the molecular era. *Molecular Ecology* 19 (18): 3865-3880. <https://doi.org/10.1111/j.1365-294x.2010.04759.x>