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Anostracan (Crustacea: Branchiopoda) zoogeography III. Australian bioregions

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Abstract

Anostracan bioregions were identified for Australia. These regions were quantitatively defined using species distributions compared through Jaccard's Coefficient of Community Similarity, and qualitatively defined using regional soils data. Community assemblages are quantified using Fager's Index of Recurring Species Groups. Substrate geochemistry was used to investigate additional relationships, but was limited by the constraints of available data. However, the highly salinized soils directly relate to Australia bearing the highest diversity of halophilic anostracan taxa. Three anostracan biogeographical regions are defined for Australia: Western, Eastern and Southern.

Key words: Fairy shrimp, Monopolisation Hypothesis, wetlands

Introduction

Anostracans are obligate seasonally and episodically astatic wetland species. Anostracan distribution is constrained by limitations to dispersal vectors, habitat suitability, and habitat availability (Rogers 2014a, b, c). New anostracan species likely evolve allopatrically, in geographically isolated, unoccupied habitats, via small, genetically isolated founder populations (Rogers 2014a) because of the strong priority effects created by the habitat monopolisation of a founder population (De Meester *et al.* 2002, Rogers 2014a). In a first comprehensive assessment for the order, anostracan bioregions were developed and defined for North America by Rogers (2014b, c). These bioregions were quantitatively defined using species distributions compared through Jaccard's Coefficient of Community Similarity, and qualitatively defined using climate, substrate and geochemical components. Community assemblages were quantified using Fager's Index of Recurring Species Groups, and it was found that the average Fager's Index for each North American bioregion, as well as the percentage of taxa co-occurring, generally decreased with the length of geological time that region has been available for colonisation.

The strong Fager's Index/colonisation time availability relationship suggests that the Monopolization Hypothesis of De Meester *et al.* (2002) functions at larger landscape scales. The Monopolization Hypothesis (De Meester *et al.* 2002) was proposed to explain the strong priority effects of founder populations, and suggests that founder population rapid adaptation and growth to a given colonised habitat impedes gene flow. As new suitable wetlands become available, founder anostracan populations will monopolise those new habitats via rapid population growth, rapid local adaptation, and a rapidly developed egg bank (De Meester *et al.* 2002, Rogers 2014a). Thus, a founder population in a given pool will develop a tight, coadapted gene pool, resistant to allochthonous congeneric or conspecific genetic input by swamping their genes in the larger established gene pool (Rogers 2014a, b), and resist other invading anostracan species via direct competition (Waters 2011, Rogers 2014a, b). However in older landscapes, taxa may have evolved niche specialisations that allow for co-occurrence, such that competition is limited (Rogers 2014b).

Little work has been done on the bioregionalisation of Australian Anostraca. Daday (1910) treated Australia as a single anostracan bioregion, the "Région Australienne", with only five Australian species known at that time. Dakin (1924) commented that most anostracan species (eight were known) that he had encountered were found on

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