Osmoregulation and the transition from marine to freshwater and terrestrial life: a comparative study of Jamaican crabs of the genus *Sesarma*

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With 4 figures and 4 tables

Abstract: Osmotic regulation was studied in nine crabs of the genus *Sesarma Say*, 1817 and in *Metopaulias depressus* (Brachyura: Grapsidae: Sesarminae) from Jamaica. All but one of these species are endemic to this island, evolving remarkable life histories that are completely independent from the sea. Despite exclusively relying on fresh water in their natural habitats, endemic species could be acclimated to sea water. Hemolymph osmotic concentrations in fresh water were found to be related to the evolutionary and ecological dependence on this medium. All species showed strong hyperregulatory capacities in fresh water and dilute media. In sea water, the mangrove species *Sesarma curacaoense* hyperegulated while the non-marine species were isosmotic with the external medium. A model proposed by Little (1989, 1990) to discern evolutionary routes taken during the invasion of terrestrial habitats based on osmoregulation, cannot be applied to our results and others obtained for brachyuran crabs. An alternative model is therefore proposed, in which the presence or absence of hyporegulatory capacities is the only possible criterion to discriminate between terrestrial colonization via fresh water or the marine supralittoral in crabs.

Introduction

In his book “The terrestrial invasion”, Little (1990) presents two alternative routes to colonize terrestrial habitats from the marine environment. One is the 'direct' colonization via the marine supralittoral into terrestrial habitats, while the other is 'indirect' via estuaries and rivers. Little (1989, 1990) claims that...