

Host separation syndrome and chemical dependency of four echinoderm obligate symbionts

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Symbiotic relationships, characterized by an intimate and long-lasting association between at least two distinct species, which usually involve a host and a symbiont. Some symbionts have evolved remarkable dependencies on their hosts, manifesting various adaptations. Recent research has introduced a novel dimension of dependency wherein symbionts rely on the chemical environment created by their hosts (Brasseur *et al.*, 2018, Lourtie *et al. In Prep*). This host dependency can lead to a condition called "host separation syndrome" defined as a health alterations, and potential mortality when symbionts are isolated from their hosts. Our investigation focuses on the study of this syndrome. We investigated four symbiotic associations. Firstly, the sea urchins *Echinometra mathaei*, and its symbionts, namely *Arete indicus* and *Tuleariocaris holthuisi*. We extend our inquiry to two other decapod-echinoderm associations: the interaction between the sea star *Culcita novaeguineae* and the sea star shrimp *Zenopontonia soror*, and the crinoid *Phanogenia distincta* and the pistol shrimp *Synalpheus stimpsonii*. Our experimental design incorporated three conditions: (i) symbionts remaining on their hosts (control), (ii) symbionts isolated from their hosts, and (iii) symbionts isolated in water containing semiochemicals produced by their hosts. Results indicate that all symbionts experienced the host separation syndrome, with chemical dependency observed only in *Arete indicus*, *Synalpheus stimpsonii* and *Tuleariocaris holthuisi*. Our study shed light on chemical dependency in symbiotic associations, offering deeper insights into the dynamics of the host separation syndrome and the importance of the nature of the chemicals produced by echinoderms.

Keywords

Crustacean; Ectosymbiont; Coloration; Mimicry; Host Dependency