Symbiont acquisition strategies in post-settlement stages of two co-occurring deep-sea *Rimicaris* shrimp.

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Abstract

At deep-sea hydrothermal vents, deprived of light, most living communities are fuelled by chemosynthetic microorganisms. These can form symbiotic associations with metazoan hosts, which are then called holobionts. Among these, two endemic shrimp of the Mid-Atlantic Ridge (MAR), *Rimicaris exoculata* and *Rimicaris chacei* are colonized by dense and diversified chemosynthetic symbiotic communities in their cephalothoracic cavity and their digestive system. Although both shrimp harbor similar communities, they exhibit widely different population densities, distribution patterns at small scale and diet, as well as differences in post-settlement morphological modifications leading to the adult stage. These contrasting biological traits may be linked to their symbiotic development success. Consequently, key questions related to the acquisition of the symbionts and the development of the holobiont are still open. Here we examined symbiotic development in juveniles of *R. exoculata* and *R. chacei* from TAG and Snake Pit using 16S metabarcoding to identify which symbiotic lineages are present at each juvenile stage. In addition, we highlighted the abundance and distribution of microorganisms at each stage using Fluorescence *in situ* Hybridization (FISH) and Scanning Electron Microscopy (SEM). For the first time, *Candidatus* Microvillispirillaceae (midgut tube), *Candidatus* Foregutplasma rimicarensis and *Candidatus* BG2-rimicarensis (foregut) were identified in late juveniles stages. However, these lineages were absent in early juveniles stages, which coincides for the midgut tube with our observations of an immature tissue, devoid of microvilli. Conversely, symbiotic lineages from the cephalothoracic cavity were present from the earliest juvenile stages of both species and their overall diversities were similar to those of adults. These results suggest different symbiont acquisition dynamics between the cephalothoracic cavity and the digestive system, which may also involve distinct transmission mechanisms.

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