

Crabs as indicators of coral phylogeny: phylogeny and cophylogeny of Indo-Pacific symbiotic marine invertebrates

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Coral reef biodiversity is dominated by invertebrates, many of which are involved in symbiotic associations. The study of these relationships has led scientists investigate possible coevolution events among the organisms involved. Despite the increasing interest in coevolution patterns, studies of marine coevolutionary events between invertebrates are relatively scarce. This project focuses on a unique invertebrate-invertebrate association occurring in the Indo-Pacific, involving stony corals (Scleractinia) and coral-dwelling gall crabs (Cryptochiridae). The dataset comprises corals from a monophyletic lineage including the families Psammocoridae, Coscinaraeidae, Fungiidae, and the genus *Leptastrea* and their associated crabs from the genus *Dacryomaia*. Corals and associated crabs were collected at eleven localities in the Indo-Pacific, from the Red Sea to New Caledonia. For each coral, the mitochondrial gene COI and the nuclear ribosomal region ITS2 were amplified and sequenced. For each crab the mitochondrial genes COI and 16S were amplified and sequenced. Morphological and molecular data from both host and symbiont was used to reconstruct the phylogenies, which were combined for cophylogenetic analysis later. Phylogenetic reconstructions have allowed us to revise the latest phylogenies, and to confirm the presence of undescribed crab species and new associations. Coral phylogenetic analysis was combined with morphological analysis. Based on this combined approach, we found that *Coscinaraea exesa* and *Coscinaraea columna* belong to the genus *Psammocora*, a finding that needs to be formalized taxonomically. Coral and crab sequences were used for cophylogenetic analyses. Cophylogeny showed that host-specificity is very high in gall crabs, for example with *Dacryomaia japonica* uniquely inhabiting corals of the genus *Leptastrea*. The coevolutionary event analysis confirmed the presence of coevolution between corals and gall crabs. The relationship between Scleractinia and Cryptochiridae has appeared to be so tight that gall crabs could be used as phylogenetic indicators of scleractinian evolution. This work produced novel discoveries and an innovative data set in the field of marine coevolutionary studies and provides a future research perspectives in the field of the biological interactions among marine invertebrates.

