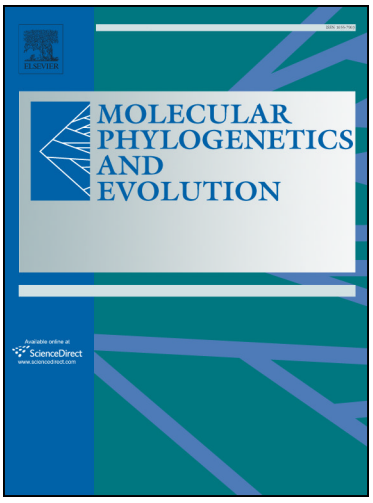

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Multiple origins and strong phenotypic convergence in fish-cleaning palaemonid shrimp lineages

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Abstract

Several species of palaemonid shrimps are known to act as fish-cleaning symbionts, with cleaning interactions ranging from dedicated (obligate) to facultative. We confirmed five evolutionarily independent origins of fish cleaning symbioses within the family Palaemonidae based on a phylogenetic analysis and the ancestral state reconstruction of 68 species, including 13 fish-cleaners from the genera *Ancylomenes*, *Brachycarpus*, *Palaemon*, *Periclimenes*, and *Urocaridella*. We focus in particular on two distantly related lineages of fish cleaning shrimps with allopatric distributions, the Indo-West Pacific *Ancylomenes* and the western Atlantic monophyletic *Ancylomenes*/*Periclimenes* group, which exhibit striking similarities in morphology, colouration and complex behaviour. Specifically, representatives of both lineages are similar in: (1) the general body shape and colour pattern; (2) the utilization of sea anemones as conspicuous cleaning stations; and (3) the use of sideways body swaying to visually promote their bright colour spots in order to attract fish clients. Such morphological, ecological and ethological convergences are apparently due to adaptations to fish cleaning linked to the establishment of similar modes of communication with fish clients in these species.

Keywords

Crustacea; Palaemonidae; cleaner shrimps; behaviour; evolution.

1. Introduction

Cleaning is an ecological and behavioural phenomenon widely occurring among animals in terrestrial as well as aquatic ecosystems (Dickman, 1992). The understanding of