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Molecular analysis validates of some informal morphological groups of *Pagurus* (Fabricius, 1775) (Anomura: Paguridae) from South America

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Abstract

The systematics of the hermit crab genus *Pagurus* is complex, with a long history of taxonomic rearrangements. This group, with worldwide distribution, encompasses a large number of morphologically heterogeneous species. A total of 173 currently recognized species have been morphologically organized into 11 informal groups, in attempts to establish internal stability. This arrangement and the relationships among species of each informal group have remained obscure and have never been evaluated from a molecular phylogenetic viewpoint. Attempts to resolve these high-level classification problems have been restricted to morphological studies, with no satisfactory results because of the extensive overlap of the characters used. We evaluated the phylogenetic position of some of these informal groups of species of *Pagurus* occurring along the Pacific and Atlantic coasts of South America, using partial fragments of two molecular markers (16S mtDNA and Histone 3 nDNA). Our results indicated a clear polyphyletic arrangement of *Pagurus*; at the same time, the internal clades fit perfectly with pre-established informal morphological groups from South America, which may warrant a formal taxonomic subdivision of the genus. Additionally, the species belonging to the “provenzano group” clearly fit within a different taxon and should be reviewed. Also, the presence of the genus *Propagurus* in the ingroup could be interpreted by non-exclusive hypotheses: from one point of view, the genus *Propagurus* is nested within *Pagurus*, and therefore *Pagurus* is not valid as currently composed; or possibly, that more than one genus should be recognized among the South American species presently assigned to *Pagurus*. This latter perspective accords with the proposal to restrict *Pagurus* to only a few species.

Key words: Atlantic, Decapoda, Molecular systematics, Mitochondrial and nuclear markers, Pacific

Introduction

The genus *Pagurus* was described more than 200 years ago (Fabricius, 1775), and since then many more species have been assigned to this genus, with continual rearrangements. Some of these species have been shown to belong to other genera, in different reviews of the group (McLaughlin & de Saint Laurent 1998; McLaughlin & Lemaitre 2000; Asakura 2005; Lemaitre & Felder 2011). In some cases, species with an ambiguous taxonomic status have been analyzed by both morphological and genetic approaches (Sandberg & McLaughlin 1993; Mantelatto *et al.* 2009a; Matzen *et al.* 2011). Based on this still-dynamic taxonomy, 173 species are currently recognized in the genus *Pagurus* (McLaughlin *et al.* 2010; Lemaitre & Felder 2011).

The highly diverse and widely distributed genus *Pagurus* presents the same classification problems as other multi-species groups of marine Decapoda, such as *Alpheus* Fabricius (Caridea; Alpheidae) (Coutière 1899; 1905; Anker *et al.* 2006), *Penaeus* Fabricius (Dendrobranchiata; Penaeidae) (Lavery *et al.* 2004), *Pasiphaea* Savigny (Caridea; Pasiphaeidae) (Hayashi 2006), *Munidopsis* Whiteaves (Galatheidae; Munidopsinae) (Ahyong *et al.* 2011) and others. This problem has been addressed using potentially non-natural groupings of species that have morphological similarities, although with no taxonomic status (Coutière 1899; 1905; Forest & de Saint Laurent