SHORT COMMUNICATION

Association between the pen shell *Atrina tuberculosa* and the shrimp *Pontonia margarita*

A. M. Góngora-Gómez¹ · N. P. Muñoz-Sevilla² · J. A. Hernández-Sepúlveda¹ · M. García-Ulloa II³ · M. García-Ulloa¹

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Abstract This is the first report on the monogamous and gonochoric shrimp *Pontonia margarita* found in the mantle cavity of the pen shell *Atrina tuberculosa*. The mantle cavity of 25 pen shells *A. tuberculosa*, collected from a sand bank revealed the presence of the shrimp *P. margarita* which was found in all the *A. tuberculosa* collected (ranging from 210 to 266 mm in shell height). The shrimp size increased with the size of the host pen shell (r=0.81 for males, and r=0.76 for females, P<0.05). *P. margarita* measurements indicated that male shrimps were smaller than females. Thus, *P. margarita* is a species with reversed sexual dimorphism. The positive relationship between shrimp size and pen shell size, a prevalence of male–female pairs of shrimp (sex-ratio was 50% males and 50% females) and morphological measurements, suggest that a long-term symbiotic association exists between them, and that the mating system of the shrimp involves social monogamy.

Keywords Association · *Pontonia margarita* · Host · Monogamous · *Atrina tuberculosa*

1 Departmento de Acuicultura, Instituto Politécnico Nacional, Centro Interdisciplinario de Investigación para el Desarrollo Integral Regional (IPN-CIIDIR-Sinaloa), Blvd. Juan de Dios Bátiz Paredes 250, AP 280, CP 81101 Guasave, Sinaloa, Mexico
2 Centro Interdisciplinario de Investigaciones y Estudios sobre Medio Ambiente y Desarrollo, Instituto Politécnico Nacional, Mexico D. F., Mexico
3 Instituto de Ecología, Universidad Nacional Autónoma de México, México D. F., Mexico

1 Introduction

As is the case of symbiotic associations involving crabs (Pieró and Mantelatto 2011), pontomid shrimps have evolved a series of adaptations to cope with a symbiotic life style, which makes them an interesting model for studying the evolution of associations between decapods and mollusks. According to De Grave and Fransen (2011), there are more than 600 species of Pontoniinae in tropical and subtropical regions inhabiting the first 100 m depth (Fransen 1995). Many marine bivalves harbor pontoniid shrimps inside their shells (Richardson et al. 1997; Rabaoui et al. 2008), especially those of the family Pinnidae (Kennedy et al. 2001; Aucoin 2008; Aucoin and Himmelman 2010). The first documented account of the shrimp-pen shell association was by Turner and Rosewater (1958) and involved *Pinna carnea* from the Bahamas. The association of Pontoniinae with numerous taxa has led to the evolution of morphological adaptations and adaptive radiation (Paracer and Ahmdjian 2000). The genus *Pontonia* has been reported as a symbiont of various hosts (Courtney and Couch 1981; Fransen 2006; Baeza et al. 2011), but a relationship between *P. margarita* and a pinnid pen shell species has not been documented. The aim of the present paper is to describe this recently discovered association.

2 Methods

Specimens of the pen shell *A. tuberculosa* were collected in January 2004 from a sand bank 8 km from the shoreline near Jitzamuri beach (26°12'53"N, 109°15'52"W), Ahone (Sinaloa, Mexico) while SCUBA diving (depth: 20–25 m) over a 100 m² area. Individual pen shells were placed in separate plastic bags and transported to the Laboratory of Malacology at the Centro Interdisciplinario de Investigación