New records of association between caridean shrimps (Decapoda) and sponges (Porifera) in Abrolhos Archipelago, northeastern Brazil

Guidomar Oliveira Soledade1
doi.org/10.1590/2358-2936e2017027
George Garcia Santos2
doi.org/0000-0002-0785-9913
Ulisses Pinheiro3
doi.org/0000-0003-3658-1372
Alexandre Oliveira Almeida1
doi.org/0000-0003-0470-8658

1 Laboratório de Biologia de Crustáceos, Programa de Pós-Graduação em Biologia Animal, Departamento de Zoologia, Centro de Biociências, Universidade Federal de Pernambuco. Recife, Pernambuco, Brazil.

2 Instituto de Formação de Educadores, Universidade Federal do Cariri. Brejo Santo, Ceará, Brazil.

3 Laboratório de Porífera (LABPOR), Programa de Pós-Graduação em Biologia Animal, Departamento de Zoologia, Centro de Biociências, Universidade Federal de Pernambuco. Recife, Pernambuco, Brazil.


ABSTRACT

The association of the caridean shrimps Anchistioides antiguensis (Schmitt, 1924) and Typton gnathophylloides Holthuis, 1951 with the sponges Dysidea janiae (Duchassaing & Michelotti, 1864) and Amphimedon viridis Duchassaing & Michelotti, 1864, respectively, is reported for the first time. The material was collected in coral reefs surrounding Santa Barbara Island, Abrolhos Archipelago, Bahia, Brazil. The shrimps occupied different locations inside the sponges. Previous records of associations between these carideans and other hosts were revised and the possible type of association between the shrimps and their hosts is discussed. The occurrence of the sponge A. viridis in the Abrolhos Archipelago is also reported for the first time.

KEY WORDS

Caridea, Anchistioididae, Palaemonidae, Demospongiae, symbiosis.

Despite being less numerous than free-living species, symbiotic decapod crustaceans are quite common and this lifestyle has evolved independently in several taxa within the group (Bauer, 2004; Baeza et al., 2011). Among decapods, caridean shrimps have been commonly reported in association with larger invertebrates and even with fishes (e.g., Castro, 1971; Bruce, 1976; Knowlton and Keller, 1983; Karplus, 1987; Bauer, 2004). However,
the true kind of symbiosis between shrimps and their hosts remains unknown in most cases and, for this reason, the term "association" has been used to describe such interactions (Bauer, 2004).

Caridean shrimps generally use cavities, cracks or even the inside of sessile organisms as shelters, breeding sites or as refuge from predators. Sponges are one of the main hosts of caridean shrimps (e.g., Bruce, 1976; Anker et al., 2008; Pachelle et al., 2015). The type of the associations varies from facultative to obligatory symbiosis (Bruce, 1976). Some snapping shrimps of the genus *Synalpheus* Spence Bate, 1888, for example, are obligatory sponge symbionts (Duffy, 1992; Macdonald et al., 2006; Rios and Duffy, 2007).

During a survey of caridean shrimps carried out in the Abrolhos Archipelago, Bahia, Brazil, Soledade et al. (2015) registered 11 new shrimp records from this region, with some species collected in association with sponges; however, the identity of the host sponges was not elucidated at that time. Recently, the sponges were identified and we verified that some of them were never previously registered in association with two caridean shrimps that occur in the area. Thus, the objective of this study is to report these new associations and to provide a new record of one of the sponge hosts in the Abrolhos Archipelago. To infer about the kind of association between shrimps and sponges we reviewed previous records of associations of species of shrimp with different hosts, and also took into consideration the location of the shrimps inside the sponges.

The material analyzed was obtained in coral reefs surrounding Santa Barbara Island (17°57′49″S 38°41′53″W). The sponges were collected between 22<sup>th</sup> July and 4<sup>th</sup> August 2013. Once collected, the specimens were placed in plastic bags (*in situ*) to prevent escape of associated organisms.

In the laboratory, the sponges were carefully inspected, and the associated fauna was removed, anesthetized on ice, and fixed in ethanol 70%. The associated shrimp were identified and deposited in the Crustacean Collection of the Museu de Oceanografia of Universidade Federal de Pernambuco, Recife, Brazil (MOUFPE). The sponges were deposited in the Coleção de Porifera of Universidade Federal de Pernambuco, Recife, Pernambuco, Brazil [*Amphimedon viridis* Duchassaing & Michelotti, 1864, UFPEPOR 1890, Fig. 1A; *Dysidea janiae* (Duchassaing & Michelotti, 1864), UFPEPOR 1892, Fig. 1B].

**Family Anchistioididae Borradaile, 1915**

*Anchistioides antiquensis* (Schmitt, 1924)

**Material examined.** 4 males, 11 females (1 ovigerous); MOUFPE 18102; Santa Barbara Island (17°57′28″S 38°42′19″W); 3 Nov. 2013; 9 m; in the sponge *Dysidea janiae*; coll. R.M.C. Barbosa and L.M. Fernandes.

![Figure 1](image.png)  
*Figure 1.* External appearance and color pattern of the two species of sponges associated with caridean shrimps from Abrolhos Archipelago, Bahia, northeastern Brazil. (A) *Amphimedon viridis* Duchassaing & Michelotti, 1864; (B) *Dysidea janiae* (Duchassaing & Michelotti, 1864). Scale bars = 1 cm.
Remarks. Specimens of *A. antiquensis* were found inhabiting the host’s osculae. Only one specimen was found inside each sponge tube and none was observed on the surface. This species occurs from Bermuda to Espírito Santo, Brazil (De Grave and Anker, 2017) from the intertidal to 118 m (Williams, 1984). Previous reports of this species on the coast of Brazil did not provide information about its ecological relationships (Chace, 1972; Coelho and Ramos, 1972; Cardoso, 2006; Coelho et al, 2006; Soledade et al, 2015). Specimens of *A. antiquensis* have been observed living inside the sponges *Mycale* (Arenochalina) *laxissima* (Duchassaing & Michelotti, 1864) and *Niphates erecta* (Duchassaing & Michelotti, 1864) in Bocas del Toro, Panama, and it has been considered a facultative sponge associated species (De Grave and Anker, 2017). However, considering that the specimens of *A. antiquensis* were found within the host’s osculae and the fact that each tube contained one organism, *A. antiquensis* and *D. janiae* may have a true relationship. *Anchistioides antiquensis* may use the interior of *D. janiae* as refuge or even site for reproduction, given the presence of individuals of both sexes, as well as one ovigerous female in the examined single host.

**Family Palaemonidae Rafinesque, 1815**

**Typton gnathophylloides Holthuis, 1951**

*Material examined.* 1 male, 1 ovigerous female; (MOUFPE 18104); Santa Barbara Island (17°57′49″S 38°41′53″W); 3 Nov. 2013; shallow tide pool, in the sponge *Amphimedon viridis*; coll. G.O. Soledade.

Remarks. Specimens of *T. gnathophylloides* inhabited the channels of the aquiferous system of *A. viridis*. Sponges of the genus *Amphimedon* Duchassaing & Michelotti, 1864 have a considerable level of toxicity, which can limit the presence of associated organisms within (Albrisio et al., 1995; Berlink et al., 1996). Evidences of toxicity have been verified in *A. viridis* (Campos et al., 2012), which may indicate a natural sponge defense against symbionts. The location of the two specimens of *T. gnathophylloides* inside *A. viridis* suggests that shrimp can tolerate the chemical defense of the sponge. Species of *Typton* Costa, 1844 are commonly recognized as sponge associated (Holthuis, 1951) and evidence of parasitism in these shrimps based on tissue consumption of host sponges by symbiotic shrimp have already been reported in *Typton carneus* Holthuis, 1951, *Typton distinctus* Chace, 1972 and *Typton spongicola* Costa, 1844 (Duris et al., 2011); however, little information is known regarding *T. gnathophylloides*. The species has been reported from the southeastern coast of Brazil (Nalesso et al., 1995; Duarte and Nalesso, 1996). However, this material was recently reanalyzed (in part) and attributed to a new species (*Typton fapespae* Almeida, Anker and Mantelatto, 2014). *Typton gnathophylloides* has been previously reported for the Canary Islands (Pérez Sánchez and Moreno Batet, 1991; González Pérez et al., 1995) but, according to d’Udekem d’Acoz (1999) these records need confirmation. Besides the type material, two specimens from Dry Tortugas, Florida (Holthuis, 1951), the two specimens reported here (previously cited in Soledade et al., 2015) are the only known specimens of *T. gnathophylloides*. It is important to highlight that *A. viridis* is the first host of *T. gnathophylloides* identified to species level. *Amphimedon viridis* has been commonly reported along the Brazilian coast, but this is the first record of the species in the Abrolhos archipelago (Hajdu et al., 2011).

In summary, new records of association between carideans and sponges are provided. It is important to emphasize the taxonomic accuracy of the present reports regarding the identifications of both associated organisms. This reinforces the importance of joint work of taxonomists from different zoological groups, which promotes a greater refinement of results related to the documentation of association records.

**Acknowledgements**

We thank ICMbio (Instituto Chico Mendes de Conservação da Biodiversidade), Conservation International do Brasil and the Brazilian Navy for their support in the field logistics. To Letícia M. Fernandes, Renata M.C. Barbosa, Irlanda S. Matos, Egnio S. Barbosa and Edson Alves for their support in the field. GOS thank the Coordenação de Aperfeiçoamento de Pessoal de Nível Superior (CAPES) for the provision of a PhD scholarship. The species collection for this study complied with current applicable state and federal laws of Brazil (license for collection of Zoological Material No. 39642-1 MMA/ICMBio/SISBIO for
Association between shrimps and sponges


Soledade et al. AOA and USP thank Conselho Nacional de Desenvolvimento Científico e Tecnológico - CNPq for a Research Scholarship (Process Numbers 305939/2015-7 and 454908/2014-8, respectively).

REFERENCES


