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First Report of the Ectoparasitic Isopod, *Holophryxus acanthephyrae* Stephensen 1912 (Cymothoidea: Dajidae) in the South Atlantic: Recovered from a New Host, the Deep-Sea Shrimp, *Acanthephyra acanthitelsonis* Spence Bate, 1888

Flavio de Almeida Alves-Júnior¹ · Arnaud Bertrand^{2,3,4} · Marina de á Leitão Câmara de Araújo⁵ · Ricardo José de Carvalho Paiva¹ · Jessor Fidelis de Souza-Filho¹

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Abstract

The crustacean family of isopods, Dajidae, comprises 18 genera containing 54 species with widespread distribution. The species of this family are ectoparasites, especially on euphausiids, mysids and shrimps. The species of *Holophryxus acanthephyrae* has a life cycle involving a first intermediate host (copepod) and a definitive host (shrimp), and adheres particularly on deep-sea shrimps of genus *Acanthephyra*. Here, we make the first report of dajid isopod *Holophryxus acanthephyrae* from Brazilian waters (South Atlantic) and the first occurrence as parasite on deep-sea shrimp *Acanthephyra acanthitelsonis*. The specimen was collected under the framework of the project “ABRACOS 2” (Acoustic along the BRazilian COast), on board of R/V Antea in April 2017, using a Micronekton net (mesh size of 10 mm) in Rocas Atoll. The specimen female of *Holophryxus acanthephyrae* was found in pelagic zone in Rocas Atoll, at 630 m depth. This study increases the knowledge on Dajidae family and their host range.

Keywords Parasitism · Isopods · Deep-sea shrimp · Brazilian waters · Rocas Atoll

Introduction

The family of crustacean isopods, Dajidae Giard and Bonnier 1887 comprises 18 genera containing 54 species (Shields and

Gómez-Gutiérrez 1996; Williams and Boyko 2012; Boyko and Schotte 2013; Ariyama et al. 2016; Shimomura 2017). This family has a widespread distribution, occurring in all oceans, specially, as ectoparasite on euphausiids, mysids and shrimps (Shields and Gómez-Gutiérrez 1996). The genus *Holophryxus* Richardson, 1905, occurs as ectoparasites on natant decapod crustaceans, inhabiting mainly in pelagic zones below 200 m, with records in Indo-Pacific Oceans and in North Atlantic (Schultz 1978; Jones and Smaldon 1986).

The species of *Holophryxus acanthephyrae* Stephensen 1912 has a life cycle involving a first intermediate host (copepod) and a definitive host (shrimp) (Coyle and Mueller 1981; Jones and Smaldon 1986). Here we report the first report of dajid isopod *Holophryxus acanthephyrae* from the South Atlantic Ocean and its first occurrence as parasite on the deep-sea shrimp *Acanthephyra acanthitelsonis* Spence Bate, 1888.

Materials and Methods

The specimen was collected under the framework of the project “ABRACOS 2” (Acoustic along the BRazilian COast) performed on-board of R/V Antea in April 2017 around

✉ Flavio de Almeida Alves-Júnior
bioflavio@hotmail.com

¹ Laboratório de Carcinologia, Museu de Oceanografia Professor Petrônio Alves Coelho, Universidade Federal de Pernambuco (UFPE), Av. Arquitetura, s/n, Cidade Universitária, Recife, PE CEP: 50740-080, Brazil

² Institut de Recherche pour le Développement (IRD), UMR248 MARBEC IRD/IFEREMER/CNRS/UM2, Av. Jean Monnet, 34203 Sète, France

³ Departamento de Oceanografia (DOCEAN), Universidade Federal de Pernambuco (UFPE), Recife CEP: 52.171.900, Brazil

⁴ Departamento de Engenharia de Pesca (Depaq), Universidade Federal Rural de Pernambuco (UFRPE), Recife CEP: 52.171.900, Brazil

⁵ Coleção Didática de Zoologia da UPE, Faculdade de Ciências, Educação e Tecnologia de Garanhuns, Universidade de Pernambuco (UPE), Rua Capitão Pedro Rodrigues, 105, São José, Garanhuns, PE CEP: 55295-110, Brazil

Rocas Atoll (3°51'S, 33°49'W), in Brazilian waters. Samples were collected using a Micronekton net (mesh size, 10 mm), with stations (#ST) between 40 and 1660 m depth. Trawl depth was continuously recorded using a Scanmar depth sensor fitted on the upper part of the trawl mouth. After capture, the specimen of *Holophryxus acanthephyrae* and *Acanthephyra acanthitelsonis* were preserved in 70% alcohol and was deposited in the Carcinological Collection of the "Museu de Oceanografia Prof. Petrônio Alves Coelho (MOUFPE)" at the Federal University of Pernambuco.

Results and Discussion

Only one female of *H. acanthephyrae* was collected (voucher number: 18744) adhered on postero-dorsal margin of the carapace of the deep-sea shrimp *Acanthephyra acanthitelsonis* (voucher number MOUFPE: 18745) (Fig. 1), in bathypelagic zone off Rocas Atoll at 630 m depth (ST#35, 4° 19' 29" S, 35° 29' 51" W), at water mass South Atlantic Central Water (SACW) with temperature of 4.8 °C.

The material analysed of *H. acanthephyrae* fits with all diagnostic characters described by Stephensen (1912), Jones and Smaldon (1986) and Wasmer (1988) with the main characteristics: elongate and symmetrical body, divisible into cephalon, thorax and abdomen, although there is no distinct boundary between the thorax and the abdomen; The cephalon small, weakly notched anteriorly and not bifurcate, has a pronounced ridge visible in all dorsal and lateral views; The specimen presented no eyes, rudimentary antennules and antennae, a pereopods with a strongly curved dactylus and an oostegite at the base and only the first and fifth pairs of oostegites are visible externally, flattened crest with 12–13 spines and the abdomen is triangular with a medial ridge visible in ventral margin (Fig. 2). For the *Acanthephyra acanthitelsonis* the diagnosis comprises: Carapace smooth, rostrum slender with 7–9 small teeth, ventral margin armed



Fig. 1 *Holophryxus acanthephyrae* Stephensen 1912 parasitizing the deep-sea shrimp *Acanthephyra acanthitelsonis* Spence Bate, 1888 (lateral view), collected in Rocas Atoll, Northeastern Brazil. Scale bar = 1 cm

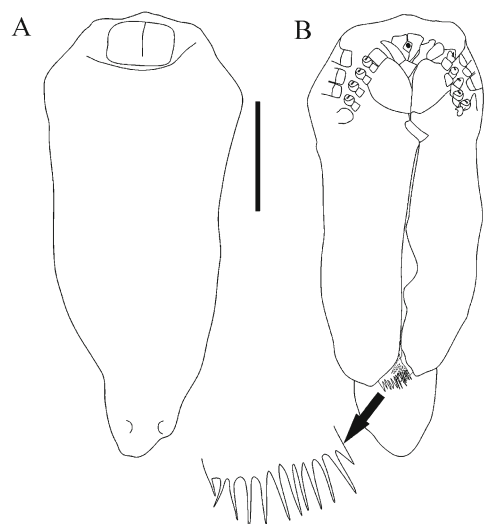


Fig. 2 *Holophryxus acanthephyrae* Stephensen 1912, dorsal view (A) and ventral view (B) with posterior part of pereon and pleon (highlighted) observed in mature female, collected Rocas Atoll, Northeastern Brazil. Scale bar = 0.5 cm

with 4–5 teeth, antennal spine present; Branchiostegal spine present, with distinct carina extending backwards on to carapace for three times the spine length; Telson longer than uropods, slender, armed with 13–19 pairs of dorsolateral spines and 2 pairs of distal spines (see Alves-Júnior et al. 2016).

Holophryxus acanthephyrae analyzed herein presents distribution in North Atlantic (Arctic Oceans, Davis Strait (60°07'N, 48°26'W), West of Greenland to South of England, Bay of Biscay, and Mediterranean); Indo-Pacific Oceans between 32°S and 57°S and Antarctic Ocean (Holthuis 1947; Jones and Smaldon 1986; Wasmer 1986, 1988). According to Jones and Smaldon (1986), this species has a wide distribution only in the North Atlantic Ocean; however, herein we confirm the first report of this species in the South Atlantic (Brazilian waters). The new host *A. acanthitelsonis* has a widespread distribution in Atlantic Ocean, with records in Western Atlantic from United States to Brazil and Eastern Atlantic in Iceland and from Guinea Bissau to Namibia, exclusively in deep waters (meso- and bathypelagic zones) (Alves-Júnior et al. 2016), with distributional aspects in South Atlantic through the currents: Benguela, South Equatorial Current (SEC) and South Atlantic Current (SAC). Thus, the species of *H. acanthephyrae* may have a wider distribution than is documented in South Atlantic. However due the low sampling efforts in meso-bathypelagic zones these records are still scarce.

This species is documented as deep-sea shrimps ectoparasite, especially on the genus *Acanthephyra* A. Milne-Edwards 1881 (Stephensen 1912), with records in hosts as: *Acanthephyra purpurea* A. Milne-Edwards 1881 by Stephensen (1912), *Acanthephyra purpurea* var. *multispina* Coutière 1905 [= *Acanthephyra purpurea* A. Milne-Edwards 1881] by Holthuis (1947) and *Acanthephyra pelagica* (Risso 1816) by

Jones and Smaldon (1986). The first record of *A. acanthitelsonis* was made by Alves-Júnior et al. (2016) from Brazilian waters, indicating that the species of *H. acanthephyrae* may be parasite in other species of the genus *Acanthephyra* occurring in Brazil, but the knowledge about the distribution of this parasite in Atlantic Ocean still far from complete.

Thus, this work updates the record of *H. acanthephyrae* with the first observation in Brazilian waters and expands its Atlantic distribution. Also we provide the first observation of parasitism on *Acanthephyra acanthitelsonis*, raising the knowledge on Dajidae family, their host range, and on deeper waters studies in Brazil.

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Compliance with Ethical Standards

Conflict of Interest The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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