

First report of deep-sea copepod *Megacalanus princeps* Wolfenden, 1904 (Calanoidea: Megacalanidae) from southwestern Atlantic

Flavio de Almeida Alves-Júnior¹, Érika Pinho Correia², Lucas Guedes Pereira Figueirêdo², Aislan Galdino da Cunha², Arnaud Bertrand³ and Sigrid Neumann-Leitão²

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

² Laboratório de Zooplâncton Marinho, Museu de Oceanografia Professor Petrônio Alves Coelho, Universidade Federal de Pernambuco (UFPE). Av. Arquitetura, s/n, Cidade Universitária. Recife, Pernambuco, Brazil.

³ Institut de Recherche pour le Développement (IRD), UMR248 MARBEC IRD/IFEREMER/CNRS/UM2. Av. Jean Monnet, 34203 Sète, France.

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ABSTRACT

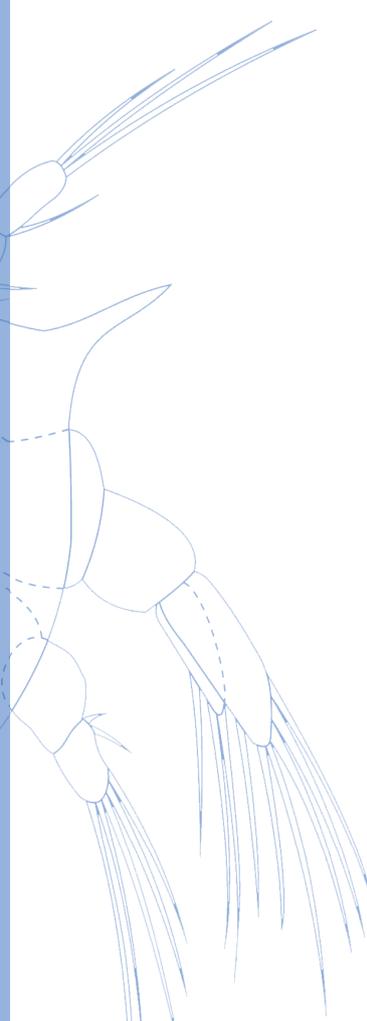
The deep-sea copepod *Megacalanus princeps* Wolfenden, 1904 was previously recorded from the northern and southeastern Atlantic, Indian and Pacific oceans, but not previously observed from southwestern Atlantic. Here we report its first occurrence in Brazilian waters. The current record increases the knowledge on the species distribution and on the deep-sea copepod fauna in the south Atlantic.

KEY WORDS

Geographic distribution, mesopelagic, northeastern Brazil, Calanoida.

The Megacalanidae Sewell, 1947 consists of three genera (*Bathycalanus* Sars, 1905, *Bradycalanus* A. Scott, 1909 and *Megacalanus* Wolfenden, 1904) with 13 species (Razouls *et al.*, 2005–2016). The Megacalanidae are the largest known species of pelagic copepods, reaching 17 mm (Boxshall and Halsey, 2004). The adults of this family are primarily meso-bathypelagic, being widely distributed in deep seas and oceans (Michel, 1994). The genus *Megacalanus* currently consists of only one species: *Megacalanus princeps* Wolfenden, 1904.

This species is absent in the first superficial 300 m depth (Hsiao *et al.*, 2004), and presents the typical vertical migration behavior, leaving the deeper water masses and reaching 300 m, always at night (Gueredrat, 1969).



CORRESPONDING AUTHOR

Flavio de Almeida Alves-Júnior
bioflavio@hotmail.com

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According to Razouls *et al.* (2005–2016), *M. princeps* has been recorded in the northern and southeastern Atlantic, Indian, Pacific oceans, and also in the Mediterranean Sea. However, despite the records for the Atlantic Ocean, this species has never been previously registered in the southwestern Atlantic. This paper reports *M. princeps* for the first time from southwestern Atlantic, off Brazilian northeastern coast.

The zooplankton community was sampled under the framework of the project “ABRACOS” Acoustic along the Brazilian coast, on board of R/V Antea in October 2015, using a Micronekton net (mesh size of 1 mm) through oblique hauls. The samples were collected around the Rocas Atoll (3°51'S 33°49'W), Brazil, simultaneously with the plankton hauls, the sounder TDR: Time Depth Recorders (model: G5, 31 mm length by 8 mm diameter, 3g, CEFAS Technology, UK) was towed, which checked the real depth of each tow.

After collected, the samples were fixed in formalin 4% and the Megacalanidae copepods identified to species level by observing the external morphology according to Miller (2002). All material was deposited in the carcinological collection of the “Museu de Oceanografia Professor Petrônio Alves Coelho (MOUFPE)” of the Federal University of Pernambuco in Recife, Brazil. In the distribution section the new record is in bold.

SYSTEMATICS

Order Calanoida Sars, 1903

Family Megacalanidae Sewell, 1947

Genus *Megacalanus* Wolfenden, 1904

Megacalanus princeps Wolfenden, 1904

(Fig. 1)

Material examined. 1 Male [Total length (TL) 9.9 mm], Rocas Atoll, #ST-14, Leg. 1 water column, 510 m depth, initial coordinate tow: 03°58'S 34°03'W, final coordinate tow: 03°57'S 34°04'W, 6 October 2015, MOUFPE 15581. 1 female (TL 9.21 mm) and 1 male (TL 10.31 mm), Rocas Atoll, #ST-22/Leg. 1 water column, 525 m depth, initial coordinate tow:

04°07'S 33°47'W, final coordinate tow: 4°07'S 33°48'W, 8 October 2015, MOUFPE 15658.

Distribution (Fig. 2). West Atlantic Ocean: Greenland, Iceland (W), Canada (Newfoundland), USA (Woods Hole, New Scotia, Carolinas, Florida), Bermudas (32°10'N 64°30'W), Sargasso Sea, Gulf of Mexico, Dominican Republic, Caribbean Sea, Brazil (Rio Grande do Norte: Rocas Atoll), Antarctic (Drake passage). East Atlantic Ocean: Faroe Island, Ireland (S & W), Spain (Bay of Biscay, Cape Finisterre, Canary Island), Portugal (Azores, Madeira Islands), Mediterranean Sea (Ligurian Sea, Tyrrhenian Sea, Gulf of Gabès, Ionian Sea, Alexandria), Ibero-moroccan Bay, Morocco, Mauritania-NW, Cape Verde Island, São Tomé Island, Angola, Saint Helena Island, South Africa. Indian Ocean: Arabian Sea, Bay of Bengal. Indonesia-Malaysia. West Pacific Ocean: Japan (Hokkaido), China, Taiwan, Philippines, New Caledonia, New Zealand, SubAntarctic (SW & SE Pacific). East Pacific Ocean: USA (Gulf of Alaska, Saint Paul Island, California, Hawaii), Canada (British Columbia), Peru (San Lorenzo Island), Chile (Juan Fernandez Island) (Gueredrat, 1969; Hsiao *et al.*, 2004; Razouls *et al.*, 2005–2016; this study).

Bathymetric distribution. The specimens examined were found at a depth of 525 m, in accordance with Miller (2002) and Hsiao *et al.* (2004), but their occurrence is usually between 300–2000 m.

Remarks. The specimens examined presented the same characteristics than those reported by Wolfenden (1904). Segmentation and setation patterns from swimming legs and maxilla were the same of that observed by Bradford-Grieve (1994). Also, the proportional length of urosomites and furca was different than the one found by Tanaka (1956); which found a proportional length from 41:20:15:7:17, while we found 33:23:13:8:23, indicating a small morphological variation, when compared with specimens collected in the Pacific Ocean. The specimens have long rostral filaments as observed by Sars (1924) and Tanaka (1956). Finally, as observed by Miller (2002), the specimens found here presented a cephalic crest; this characteristic was only found before in specimens collected in deep waters off

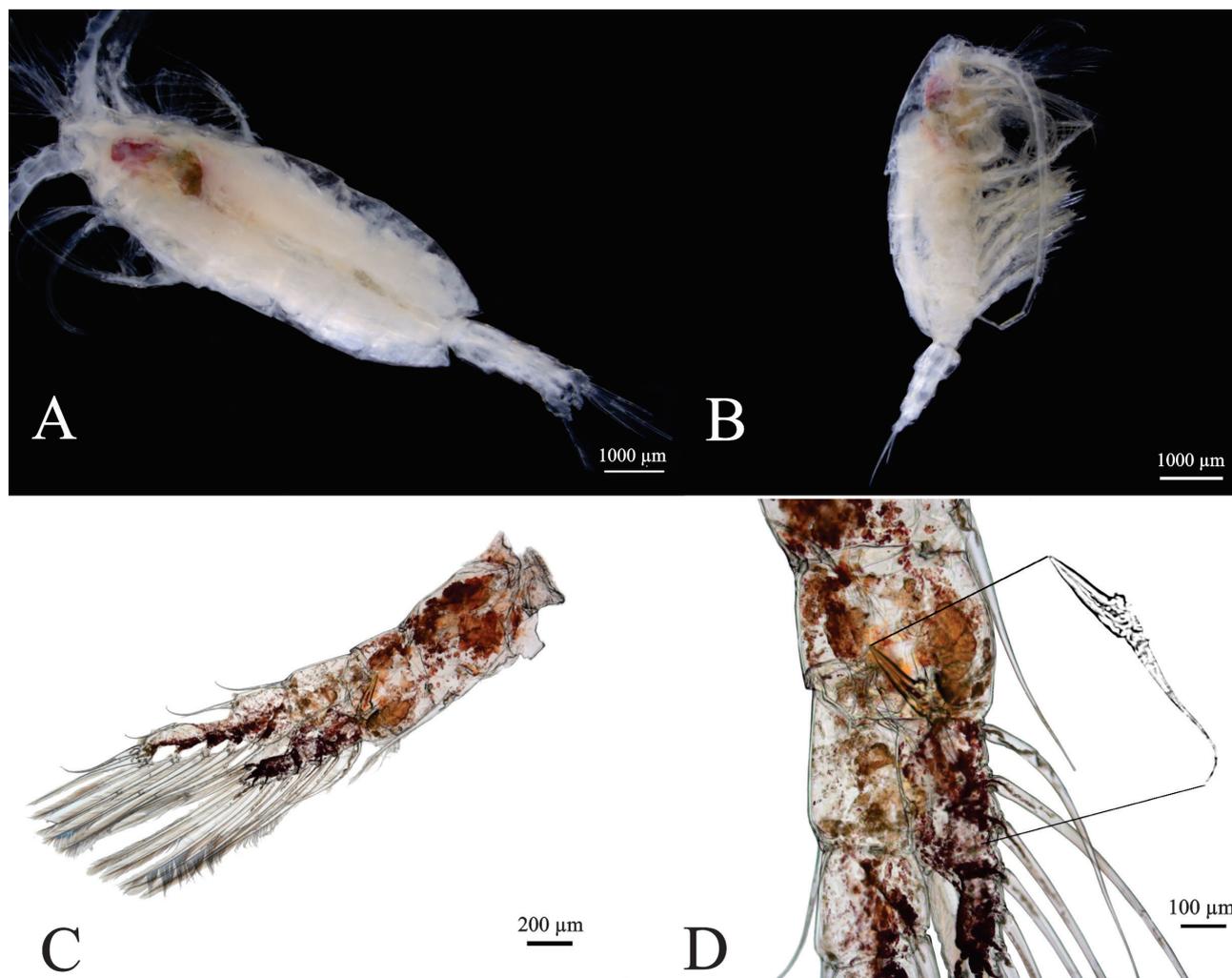


Figure 1. *Megacalanus princeps* Wolfenden, 1904, female (TL: 9.21 mm; MOUFPE: 15658) from northeastern Brazil. (A) Habitus, dorsal view; (B) lateral view; (C) P1 total view; (D) P1 highlighting the hook-like process followed by an inner seta on anterior surface of basis of leg 1.

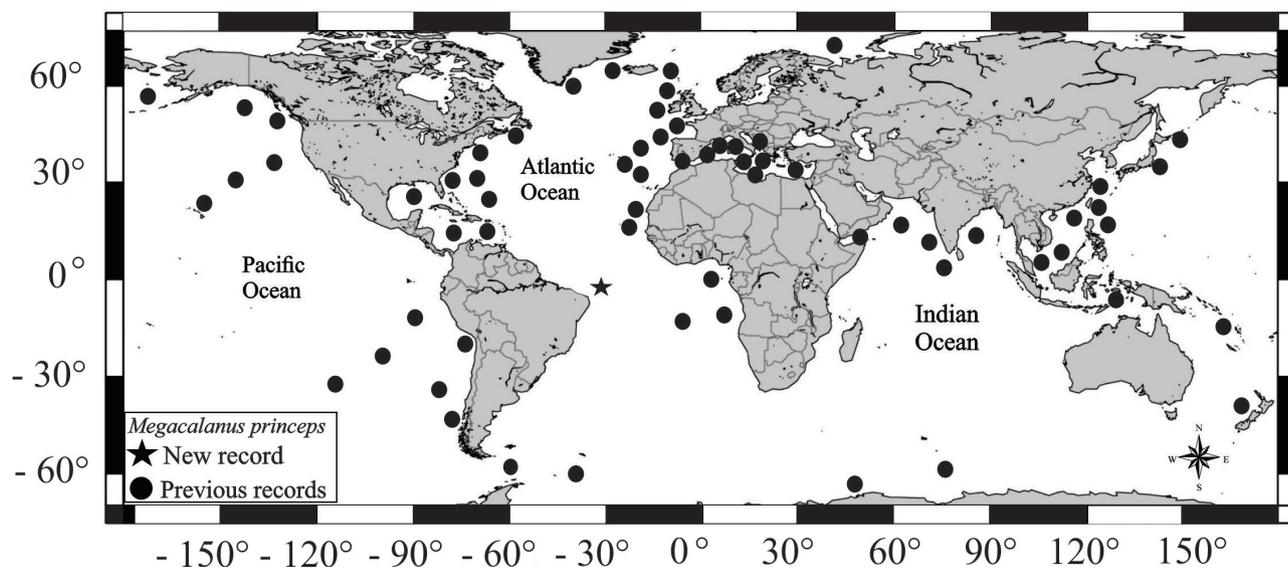


Figure 2. Worldwide geographic distribution of *Megacalanus princeps* Wolfenden, 1904.

Southern California. Probably due to the low sampling effort, scarcity in meso-bathypelagic collections and the increasing of deeper waters studies in Brazil, the spatial distribution of *M. princeps* was not known in this region. The occurrence of *M. princeps* in Brazilian waters expands its world distribution and increases the knowledge about zooplankton species from south Atlantic deep waters.

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