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**New records of Monstrilloida Sars, 1901 (Crustacea: Copepoda)
from Rio Grande do Norte (northeastern coast of Brazil)**

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Abstract: During a series of zooplankton surveys carried out during 1984, off the south coast of the state of Rio Grande do Norte, Brazil, several species of monstrilloids were present in the samples. A total of 50 individuals of monstrilloid copepods were collected. These belong to four species (*Monstrilla brasiliensis* Suárez-Morales & Dias, *Cymbasoma* cf. *longispinosum*, *Cymbasoma* cf. *rigidum*, and *Cymbasoma gracilis* Gurney). The taxonomic complexes formed by the species *C. cf. longispinosum* and *C. cf. rigidum* in Brazilian waters are discussed. The lengths of the specimens are provided in order to contribute to studies and revisions of the specimens belonging to these species-complexes. The species *Monstrilla brasiliensis* is recorded for the first time in the Rio Grande do Norte coastal region, thus expanding its geographical range in the Brazilian northeastern coast. The results presented herein increase to four the number of species of Monstrilloida known from off Rio Grande do Norte state.

Keywords: zooplankton, copepods, southwest atlantic, brazilian coast, *Monstrilla*, *Cymbasoma*.

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Resumo: Durante uma série de amostragens de zooplâncton, realizadas durante o ano de 1984, na costa sul do estado do Rio Grande do Norte, Brasil, um total de 50 exemplares de copépodes Monstrilloida foram coletados. Os exemplares pertencem a quatro espécies (*Monstrilla brasiliensis* Suárez-Morales & Dias, *Cymbasoma* cf. *longispinosum*, *Cymbasoma* cf. *rigidum* and *Cymbasoma gracilis* Gurney). Os complexos taxonômicos formados pelas espécies *C. cf. longispinosum* e *C. cf. rigidum* em águas brasileiras são discutidos. Os comprimentos totais dos exemplares são fornecidos com a finalidade de contribuir com futuros estudos e revisões dos espécimes pertencentes a estes complexos de espécies. A espécie *Monstrilla brasiliensis* foi coletada pela primeira vez na região costeira do estado do Rio Grande do Norte, expandindo a sua distribuição geográfica na costa nordeste brasileira. Os resultados apresentados aumentam a quatro o número de espécies de Monstrilloida conhecidas para a costa do estado do Rio Grande do Norte.

Palavras-chave: zooplâncton, copépodes, atlântico sudoeste, costa brasileira, *Monstrilla*, *Cymbasoma*.

Introduction

Out of the eleven orders currently recognized in the subclass Copepoda (Huys & Boxshall 1991, +Thaumatopsylloida see Ho et al. 2003), the Monstrilloidea is one of the least known. Currently, there are four genera recognized as valid: *Monstrilla* Dana, *Monstrillopsis* Sars, *Cymbasoma* Thompson and *Maemonstrilla* Grygier & Ohtsuka (Huys & Boxshall 1991, Grygier 1994a, Suárez-Morales & Gasca, 2004, Grygier & Ohtsuka 2008). Monstrilloids have non-feeding, free-swimming adults that lack appendages between the antennules and swimming legs (Grygier & Ohtsuka 2008). Their endoparasitic larval are known from an increasingly diverse assortment of benthic macroinvertebrates such as polychaetes, mollusks and other invertebrates (Davis 1984, Grygier & Ohtsuka 2008). This order is generally quite scarce, with many species being known from only one or a few specimens (Suárez-Morales et al. 2006). Adults are frequently captured by plankton nets from coastal-neritic systems at all latitudes (Suárez-Morales & Dias 2001a, Suárez-Morales & Ivanenko 2004).

Until now, the majority of the occurrence of the monstrilloid copepod in the northeastern Brazilian coast (Rio Grande do Norte, Paraíba and Pernambuco states) are formed by dissertations (Pekala 1981, Silva 1994, Silva 1999, de Almeida 2006) and theses (Gusmão 2000, Porto Neto 2003) to order and genera levels. Previous surveys of the monstrilloid fauna from northeastern Brazil (Rio Grande do Norte, Pernambuco, Alagoas and Bahia states) yielded records of *Monstrilla grandis* Giesbrecht 1891, *M. rugosa* Davis 1947, *Cymbasoma* cf. *rigidum* Thompson 1888, *C. cf. longispinosum* Bourne 1890, *C. gracilis* Gurney 1927, and *C. quadridens* Davis 1947; also, four new species were described (Suárez-Morales & Dias 2000, Suárez-Morales & Dias 2001b). *Cymbasoma* cf. *longispinosum*, *C. cf. rigidum* and *C. gracilis* were collected also in the coastal region off Rio Grande do Norte (Dias & Bonecker 2007a).

As part of serial surveys of the marine crustacean fauna of the coast of Rio Grande do Norte, zooplankton samples were collected in two coastal areas, from January through June 1984. Among these samples several specimens of monstrilloid copepods were obtained and sorted for identification. The aim of this study was to expand the knowledge of the composition and distribution of the monstrilloid copepods in the region.

Material and Methods

The sampling plan was carried out during 1984, from January through June, along profiles perpendicular to the coast, at eight sites along the South coast of Rio Grande do Norte as far as the 30 m isobath. The two sites positive for Monstrilloidea were Tabatinga (6° 04' 00" S and 35° 06' 00" W) and Tibau do Sul (6° 10' 60" S and 35° 04' 60" W), (Figure 1).

Three sampling stations were located in each profile at the isobaths of 10, 20 and 30 m. In each station, two samples were collected during the day: one by subsurface horizontal and the other by vertical hauls with a conical plankton net (mesh size: 250 µm, mouth diameter: 60 cm). Samples were fixed and preserved in 4% buffered formalin. The monstrilloid copepods were sorted out from the original samples.

All specimens were deposited in the zooplankton collection of the Integrated Zooplankton and Ichthyoplankton Laboratory of the Federal University of Rio de Janeiro (MONSTRILLOIDA DZUF RJ). The individuals were measured from the anterior end of the cephalic somite to the posterior margin of the anal somite.

Results and Discussion

Of a total of the 72 samples collected in Tabatinga and Tibau do

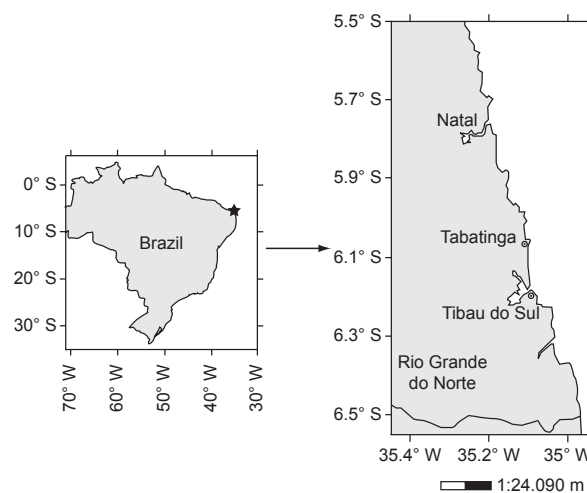


Figure 1. Map of the study area indicating the sampling stations with the occurrence of monstrilloids.

Figura 1. Mapa da área de estudo indicando as estações de amostragem com a ocorrência de Monstrilloidea.

of 50 adult individuals of monstrilloid copepods were obtained; they were found to belong to four species: *Monstrilla brasiliensis* Suárez-Morales & Dias 2000, *Cymbasoma gracilis* Gurney 1927, *Cymbasoma* cf. *longispinosum* Bourne 1890 and *Cymbasoma* cf. *rigidum* Thompson 1888.

A single female of *Monstrilla brasiliensis* (2.02 mm) was collected (MONSTRILLOIDA DZUF RJ 207) (Table 1). This species had a total length similar to that found by Suárez-Morales & Dias (2000) from specimens collected from the northeastern (state of Bahia) and central coasts (states of Espírito Santo and Rio de Janeiro) of Brazil, which ranged from 1.77 to 3.01 mm. This is the second record of the species at the Brazilian northeastern coast, and the first from the Rio Grande do Norte coast. The occurrence of *M. brasiliensis* in the area allows a northwards expansion of its known distributional range.

Twenty-six females of *Cymbasoma gracilis* (0.90-1.97 mm) were collected (MONSTRILLOIDA DZUF RJ 113 to 115) (Table 1). The length of these specimens is within the range found on specimens from the northeastern coast (state of Bahia), but smaller than those found by Dias & Bonecker (2007a, b) off central and south coast of Brazil (1.30-2.60 mm). This species has been recorded from tropical waters of the Atlantic and Indian oceans and in the Mediterranean and Red seas, with a length range of 1.4 to 2.3 mm (Gurney 1927, Isaac 1975). Dias & Bonecker (2007a) marked the local distributional range of this species as from the northeastern (states of Bahia and Rio Grande do Norte) to the southern Brazilian coast (state of Paraná).

Five specimens of *Cymbasoma* cf. *longispinosum* (three females, two males, one damaged) with total body lengths ranging from 1.28 to 2.01 mm (females) and 0.68 mm (male) (Table 1), and eighteen males (two damaged) of *Cymbasoma* cf. *rigidum* (0.52-1.13 mm) (Table 1), were also recorded (*Cymbasoma* cf. *longispinosum* MONSTRILLOIDA DZUF RJ 172 to 173 and *Cymbasoma* cf. *rigidum* MONSTRILLOIDA DZUF RJ 80 to 82). *Cymbasoma* cf. *longispinosum* and *C. cf. rigidum* were found to be distributed from Espírito Santo (state of Rio Grande do Norte) to

Table 1. Total number, total length (mm) and temperature values (°C) of the site with occurrence of monstrilloid copepods from coastal region of the Rio Grande do Norte.

Tabela 1. Número total de organismos, comprimento total (mm) e valores de temperatura (°C) das localidades com ocorrência de copépodes Monstrilloidea coletados na região costeira do Rio Grande do Norte.

Species	Total Number	Total length	Temperature
<i>Monstrilla brasiliensis</i>	1	2.02	27.0
<i>Cymbasoma gracilis</i>	26	0.90-1.97	23.3-25.9
<i>Cymbasoma</i> cf. <i>longispinosum</i> (female)	3	1.28-2.01	22.8-25.5
<i>Cymbasoma</i> cf. <i>longispinosum</i> (male)	2 (1 damage)	0.68	22.8-25.5
<i>Cymbasoma</i> cf. <i>rigidum</i>	18	0.52-1.13	20.5-22.8

southern Brazil (Dias 1996, Johnsson 1998, Duarte 1999, Dias & Bonecker 2007a, b).

There are no morphological differences between the specimens found in the present study and the specimens designated as *C. cf. longispinosum* and the males of *C. cf. rigidum* by Dias (1996), although the lengths differ from values reported by Dias (1996), Dias & Bonecker (2007b) and Duarte (1999) for other Brazilian specimens. The largest specimens of *C. cf. longispinosum* were found off central and south Brazil (females: 3.10 mm, males: 2.00 mm), the same was true for males of *C. cf. rigidum* (up to 1.62 mm). Leite et al. (2007) found males and females of *C. longispinosum* in a tropical Amazon estuary in northern Brazil. This occurrence expands the knowledge of their distributional range. The authors reported that the total length of specimens in northern Brazil was shorter than those observed in studies carried out at the south and southeast of Brazil. The different lengths among the Brazilian specimens can be attributed to the influence of temperature. Hopcroft et al. (2001) related increases of the copepod size with decreasing temperature and with depth into oceanic waters. During the sampling of these species the temperatures registered ranging from 20.5 to 27.0 °C (Table 1). These temperatures are superior to the ones found at the south and southeast of Brazil by Dias & Bonecker (2007a).

Although Isaac (1975) reported the distribution of the species *C. longispinosum* and *C. rigidum* to be worldwide, some authors consider that these are actually species-complexes, and that the strict forms have a more limited distributional range (Grygier 1994b, Suárez-Morales 2006). Dias and Bonecker (2007b) discussed the problem of the taxonomic complexes formed by the species *C. cf. longispinosum* and *C. cf. rigidum* in Brazilian waters. The wide distribution reported for these species could certainly be a result of overlooking closely related species. Because of this problem, in the present report the specimens of *C. cf. longispinosum* and *C. cf. rigidum* are regarded as probable members of taxonomic complexes formed by the nominal species *C. longispinosum* and *C. rigidum*; but they might be undescribed taxa (Dias & Bonecker 2007b). This fact could explain the different lengths found in the Brazilian specimens in relation to figures reported from other localities. Rose (1933) and Sars (1921) reported larger lengths (F: 2.3 to 3.16 mm, M: 1.8 to 2.3 mm) for *C. longispinosum*, and Wilson (1950) and Rose (1933) reported different sizes (1.5 to 1.8 mm) for males of *C. rigidum*. Although the size variation within a species may result from differences in the size of the host and the number of individuals within a host (Sáez & Munk, 2008), the length of the

specimens are provided in order to contribute to future studies and revisions of the specimens belonging to these species-complexes in the Brazilian coastal waters.

The addition of *Monstrilla brasiliensis* in this report increases to four the number of species of Monstrilloidea known from the Rio Grande do Norte region. The occurrence of these species expanded the distribution proposed by Dias & Bonecker (2007a) of the associations of tropical species in Brazilian coast, characterized by the presence of tropical water (temperatures > 18.5 °C and salinities > 36.0). Because of their scarcity in the zooplankton samples, the value of the occurrence of each specimen is high.

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