

## A contribution to the fauna of Cladocera (Branchiopoda) from Ceará state, Brazil

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### Abstract

Until now, few studies on cladoceran fauna from Ceará state were conducted, so only eighth species were recorded for this region. The present paper reports the occurrence of 30 species, being 25 new records for the Ceará state. We analyzed samples from nine water bodies located in Fortaleza, Caucaia, and São Gonçalo do Amarante Counties, collected using plankton net, among marginal vegetation or in the pelagic zone. Highest values of richness were observed in water bodies in which aquatic vegetation was present, with predominance of typically non-planktonic taxa. The Family Chydoridae was the most specious.

Key words: Ceará state, Northeast region, Chydoridae, aquatic vegetation, first record.

### Introduction

Cladocerans are microcrustaceans, predominantly living in freshwater, and they are present in the majority of continental aquatic systems, occurring in an ample spectrum of physical and chemical conditions. Currently, about 600 species are known worldwide, and it is believed that almost 200 species occur in Neotropical Region (Forró *et al.*, 2008). It is estimated that approximately 19% of these species are found in Brazil (Agostinho *et al.*, 2005). However, the knowledge on the occurrence and geographic distribution of cladocerans in Brazil is still incomplete (Elmoor-Loureiro, 2000).

In last decade, new records of occurrence and description of new taxa for the Brazilian fauna have reduced the lacunes of information (*e.g.* Velho *et al.*, 2000; Santos-Wisniewski *et al.*, 2001, 2008; Kotov *et al.*, 2002; Sinev and Howelldel, 2002; Zanata *et al.*, 2003; Elmoor-Loureiro *et al.*, 2004; Guntzel *et al.*, 2004; Sinev *et al.*, 2005; Van Damme *et al.*, 2005; Lopes *et al.*, 2006; Kotov and Elmoor-Loureiro, 2008). Nevertheless, particularly for the Brazilian Northeast region, the knowledge is still very incipient.

The first records for the cladoceran fauna from Ceará state are quite recent (Crispim and Watanabe, 2000; MI, 2004; Leitão *et al.*, 2006), reporting the occurrence of eight species.

This study aimed to investigate the cladoceran fauna of water bodies of the coastal region of Ceará state, contributing to increase of the knowledge about the distribution of species in Brazil.

### Material and Methods

We analyzed samples from nine water bodies located in Fortaleza, Caucaia and São Gonçalo do Amarante Counties, collected in different seasonal periods in 2000 and 2007, among marginal vegetation or in the pelagic zone (Tab. I). A plankton net with mesh size of 80µm was used to sample the cladocerans, which were fixed in 4% formalin.

The samples were analyzed under a stereomicroscope in whole or, in case of high abundance, sub-samples were analyzed until a minimum of 50 individuals was reached.

The voucher specimens are deposited at the Laboratory of Zoology of Universidade Católica de Brasília.

**Table I.** Geografic localization and presence of macrophytes in sampling points in state of Ceará. The samples was taken by Elmoor-Loureiro (LMAE-L) and Gomes e Souza (MBGS).

Sampling points	Coordinates	date	collector	macrophytes
Precabura Lagoon, Fortaleza	3°48'39"S; 38°26'41"W	12.vii.2000	LMAEL	absent
Well marginal to Precabura Lagoon, Fortaleza	3°48'39"S; 38°26'46"W	12.vii.2000	LMAEL	present
Banana Lagoon, Caucaia	3°37'28"S; 38°45'22"W	14.vii.2000	LMAEL	absent
Marginal pond to Banana Lagoon, Caucaia	3°37'28"S; 38°45'22"W	14.vii.2000	LMAEL	present
Cahuípe Stream, Caucaia	3°39'37"S; 38°48'14"W	18.xii.2007	MBGS	present
Lagamar do Cahuípe, Caucaia	3°36'17"S; 38°46'50"W	18.xii.2007	MBGS	present
Guaribas Stream, São Gonçalo do Amarante	3°33'19"S; 38°52'27"W	18.xii.2007	MBGS	present
Lagoon at Pecém, São Gonçalo do Amarante	3°33'22"S; 38°49'26"W	18.xii.2007	MBGS	absent
Swamp at Ypioca Farm, São Gonçalo do Amarante	3°34'39"S; 38°52'31"W	19.xii.2007	MBGS	present

## Results and Discussion

Considering all analyzed samples, seven families and 30 cladocerans species were found; of these, 25 species and two families are reported for the first time to Ceará state (Tab. II).

Until a decade ago, there is no data available on the occurrence of cladocerans in Ceará state (Elmoor-Loureiro, 2000). In recent years, the occurrence of eight species was reported (Crispim and Watanabe, 2000; MI, 2004; Leitão *et al.*, 2006): *Ceriodaphnia cornuta*, *Alona poppei*, *Alonella hamulata*, *Chydorus eurynotus*, *Daphnia gessneri*, *Diaphanosoma spinulosum*, *Latonopsis australis*, *Macrothrix flabeligera* and *Moina micrura*. Three of these species were also found in samples analyzed. Thus, the present study increased to 33 the number of species known for the Ceará.

The species reported here are widely distributed in the Neotropical Region. One exception is the taxon identified as *Alona* sp, which seems to have unique features, and could represents a new species; this issue, however, needs further investigation.

The highest values of richness were observed in the water bodies with presence of aquatic vegetation, regardless whether they are lotic or lentic systems. In lotic systems, the high current velocity, turbidity, turbulence and predation by planktivorous fish negatively affect the establishment of planktonic crustaceans (Viroux, 2002). Nevertheless, the samples of Guaribas Stream and Cahuípe Stream had presented considerably higher richness, which is believed to be a consequence of the presence of aquatic vegetation in this sampling points.

Most freshwater microcrustaceans live associated to the littoral vegetation of aquatic systems

(Walseng *et al.*, 2001), which provide great diversity of habitats, influencing the spatial structure of the micro- and macrofauna (Duggan *et al.*, 2001). Over that 60% of cladocerans species live in association with aquatic vegetation, predominantly the member of the families Macrothricidae and Chydoridae (Kotov, 2006), which have specializations that allow them to the use the resources in the littoral zone, including appendices specialized in scraping and handling food; the chydorids also present great mobility of the post-abdomen (Fryer, 1995).

The family Chydoridae, represented here by 13 species, was the largest contributor to total richness. This pattern has been observed in several continents, in water bodies where aquatic vegetation is present (*e.g.* Hann, 1995; Güher, 2000; Santos-Wisniewski *et al.*, 2002; Lima *et al.*, 2003; Serafim Jr. *et al.*, 2003; Choueri, *et al.*, 2005; Sa-aridrit and Beamish, 2005; Elmoor-Loureiro, 2007; Elmoor-Loureiro and Mendonça-Galvão, 2008; Sousa and Elmoor-Loureiro, 2008).

Besides to the macrothricids and chydorids, other species typically associated with the presence of macrophytes contributed to high richness in these environments: *Latonopsis australis*, *Pseudosida ramosa*, *Moina reticulata*, *Moinodaphnia macleayi*, *Ilyocryptus spinifer* and *Simocephalus acutirostris*.

*Ilyocryptus spinifer* is considered one of the most common cladoceran species in Neotropics and, among Ilyocryptidae, it was the most frequently reported from Brazil (Kotov and Elmoor-Loureiro, 2008). Unlike other members of the genus, that are inhabitants of the mesobenthos, *I. spinifer* is found with high abundance among aquatic vegetation (Kotov and Stifter, 2006).

The species *Diaphanosoma brevireme*, *Diaphanosoma birgei*, *Diaphanosoma spinulosum*, *Bos-*

**Table II.** Cladoceran species from the water bodies sampled in Ceará state, Brazil. PL: Precabura Lagoon; PW: well marginal to Precabura Lagoon; BL: Banana Lagoon; BP: marginal pond to Banana Lagoon; CS: Cahuípe Stream; CL: Cahuípe Lagamar; GS: Guaribas Stream; PE: lagoon at Pecém; SY: swamp at Ypioca Farm. \* indicates species that was previously reported to Ceará state (Crispim and Watanabe, 2000; MI, 2004; Leitão *et al.*, 2006).

Taxa	Sampling points								
	PL	PW	BL	BP	CS	CL	GS	PE	SY
CTENOPODA									
SIDIDAE Bird, 1950									
<i>Diaphanosoma brevireme</i> Sars, 1901			x		x		x		
<i>Diaphanosoma birgei</i> Korineck, 1981			x						
* <i>Diaphanosoma spinulosum</i> Herbst, 1967			x				x		
* <i>Latonopsis australis</i> -group				x	x	x			
<i>Pseudosida ramosa</i> (Dadayi, 1904)				x	x	x			x
ANAMOPODA									
BOSMINIDAE Sars, 1865									
<i>Bosmina freyi</i> Melo and Hebert, 1994			x						
<i>Bosmina tubicen</i> Brehm, 1953			x						
DAPHNIIDAE Straus, 1920									
* <i>Ceriodaphnia cornuta</i> Sars, 1886			x		x	x		x	
<i>Simocephalus acutirostris</i> -group					x				
MOINIDAE Goulden, 1986									
* <i>Moina minuta</i> Hansen, 1899	x								
<i>Moina reticulata</i> (Daday, 1905)				x			x		
<i>Moinodaphnia macleayi</i> (King, 1853)				x			x		
ILYOCRYPTIDAE Smirnov, 1992									
<i>Ilyocryptus spinifer</i> Herrick, 1882		x		x			x		x
MACROTHRICIDAE Norman and Brand, 1867									
<i>Grimaldina brazzai</i> Richard, 1892				x					
<i>Macrothrix elegans</i> Sars, 1901				x			x		x
<i>Macrothrix paulensis</i> (Sars, 1900)				x					
<i>Macrothrix squamosa</i> Sars, 1901							x		
CHYDORIDAE Stebbing, 1902									
<i>Alona</i> sp.									x
<i>Alona monacantha</i> Sars, 1901							x		x
<i>Alona verrucosa</i> Sars, 1901					x	x		x	x
<i>Alonella dadayi</i> Birge, 1910							x		x
* <i>Chydorus eurymotus</i> Sars, 1901				x	x	x	x		x
<i>Chydorus pubescens</i> Sars, 1901					x				
<i>Ephemeroporus hybridus</i> (Dadayi, 1905)				x		x			
<i>Ephemeroporus tridentatus</i> (Bergamin, 1931)				x	x	x			
<i>Karualona mülleri</i> (Richard, 1987)				x	x	x			x
<i>Leberis davidi</i> (Richard, 1895)					x				
<i>Leydigopsis curvirostris</i> Sars, 1901					x	x			
<i>Notoalona sculpta</i> (Sars, 1901)					x	x			
<i>Oxyurella longicaudis</i> (Birge, 1910)				x					x
Number of species	1	1	5	13	13	10	10	2	10

*mina freyi*, *Bosmina tubicen*, *Ceriodaphnia cornuta* and *Moina minuta*, found in samples taken from sites free of aquatic vegetation, are typically planktonic species. However, *D. brevireme* and *C. cornuta* also could inhabit in the littoral zones (Korovchinsky, 1992; Elmoor-Loureiro, 2007), which explains their occurrence also in the samples from areas with macrophytes.

*Bosmina freyi*, reported here from Banana Lagoon, seems to have a wide distribution in Brazil,

although there are little records in the literature. This species has been found in Distrito Federal (Elmoor-Loureiro *et al.*, 2004), Minas Gerais (Santos *et al.*, 2007), São Paulo (Neves, 2008), Pernambuco, Mato Grosso and Rio Grande do Sul (Elmoor-Loureiro, unpublished data). These data support the opinion of Elmoor-Loureiro *et al.* (2004) that the Brazilian records of *Bosmina longirostris* should be reviewed, because its similarity with *B. freyi* in general features.

In increasing, more than four times, the list of species known from Ceará state, the present work beget subsidies for new studies in this region. Cladocerans are important contributors in the flow of energy in continental aquatic ecosystems and may regulate the phytoplanktonic and epiphytic biomass in littoral areas, while are food items for fishes and other invertebrates (Hann and Zrum, 1997; Arcifa, 2000; Cassano *et al.*, 2002). Being sensitive to changes in environmental conditions, could be used as bioindicators (Elmoor-Loureiro, 2004; Zanata *et al.*, 2008).

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