

Cladocerans from gut content of fishes from Guaporé River Basin, MT, Brazil

Cladóceros do conteúdo estomacal de peixes da Bacia do Rio Guaporé, MT, Brasil

Lourdes Maria Abdu Elmoor-Loureiro and Carlos Eduardo Aguiar Soares

Laboratório de Zoologia, Universidade Católica de Brasília – UCB,
QS 7 lote 1, Bloco M sala 331, Taguatinga, DF, Brazil
e-mail: lourdes@ucb.br, c.sawabona@gmail.com

Abstract: Aim: the present study aimed to identify the cladoceran species taken from the gut content of fishes sampled from Vila Bela da Santíssima Trindade (Mato Grosso); **Methods:** the gut content of 14 individual fishes were analyzed; from each one, at least 100 individual cladocerans were identified; **Results:** A total of 25 cladoceran species were registered, providing the first species list for Guaporé River Basin, seven of them reported from Mato Grosso State for the first time; **Conclusions:** Besides the information on Cladoceran occurrence, the study point out the importance of this organisms in the aquatic food web of Guaporé Basin.

Keywords: fish gut content, Cladocera, zooplankton, Amazon Basin.

Resumo: Objetivo: o presente estudo buscou identificar os cladóceros observados no conteúdo estomacal de peixes coletados em Vila Bela da Santíssima Trindade (Mato Grosso); **Métodos:** os conteúdos estomacais de 14 peixes foram observados, sendo que para cada um foram identificados um mínimo de 100 exemplares de cladóceros; **Resultados:** Foram identificadas 25 espécies de cladóceros, fornecendo a primeira lista de espécies para a Bacia do Rio Guaporé, sete delas reportadas pela primeira vez para o estado do Mato Grosso; **Conclusões:** Além de informações sobre a ocorrência de cladóceros, o estudo salientou a importância desses organismos na cadeia alimentar aquática da bacia do Rio Guaporé.

Palavras-chave: conteúdo estomacal de peixes, Cladocera, zooplâncton, Bacia Amazônica.

1. Introduction

Cladocera and Copepoda are the biggest organisms in the zooplankton community, so they are usually selected as preferential food by planktivorous fish. However, cladocerans seem to be more consumed than copepods, as observed in a study on *Hyphessobrycon bifasciatus* Ellis, 1911, independently of the fish size class (Coutinho et al., 2000). The fish preference for cladocerans could be related to the prey mobility, as cladocerans move slower and more compassed than copepods, which swim faster and show rapid changes of direction (Carvalho, 1980).

Cladocerans (Branchiopoda) are present in variable proportions in the diet of fishes. Vela (1991) observed that cladocerans were the main component of the *Melaniris sardina* (Meek, 1907) and *Astyanax fasciatus* (Cuvier, 1819) diet in lake Xototlán (Nicaragua). Cladocerans were found in the gut content of several Brazilian fishes such as *Brycon amazonicum* (Spix and Agassiz, 1829) (Leite, 2004), *Bryconomericus stramineus*

Eigenmann 1908 (Crippa et al., 2009), *Geophagus brasiliensis* Quoy and Gaimard, 1824 (Dias et al., 2005), *Hyphessobrycon bifasciatus* (Coutinho et al., 2000), *Hyphessobrycon eques* (Steindachner, 1882) (Crippa et al., 2009), *Metynnis maculatus* (Kner, 1860) (Dias et al., 2005), *Metynnis mola* Eigenmann and Kennedy, 1903 (Resende et al., 1998), *Moenkhausia dichrourea* (Kner, 1858) (Resende et al., 2000; Novakowski et al., 2008), *Moenkhausia sanctaefilomenae* (Steindachner, 1907) (Crippa et al., 2009), *Odontotesthes bonariensis* Cuvier and Valenciennes, 1835 (Casseiro et al., 2003; Piedras and Pouey, 2005), *Rivulus pictus* Costa, 1989 (Shibatta and Bennemann, 2003), *Simpsonichthys boitonei* Carvalho, 1959 (Shibatta and Rocha, 2001), and *Triporthus paranensis* (Günther, 1874) (Galina and Hahn, 2003).

The knowledge on the Cladocera fauna in the Brazilian Center-West region is poor, despite the importance of local hydrographic basins, and there

are wide areas still unstudied (Elmoor-Loureiro, 2000). The use of gut contents can represent a viable alternative to direct sampling and can constitute relevant sources of information for the species occurrence.

This is the case of the present study, which aimed to identify the cladoceran species present in the gut content of fish collected near Vila Bela da Santíssima Trindade, Mato Grosso, in the upper Guaporé River.

2. Material and Methods

The Guaporé River basin, located at the Northwest part of the Mato Grosso State, is part of the Amazon basin, and is tributary of the Madeira River (Figure 1). Along the Guaporé River course, small lakes are observed, locally named as “baías”, which are connected to the main flow when the river water level is high (Fachín-Terán and Vogt, 2004).

The cladoceran specimens analyzed in the present study were found in the gut content of the Characidae fishes *Moenkhausia dichrourea* and *Metynnis mola*.

Fourteen individual fishes were collected in December/06 from Baía Soca-Soca (15° 1' 22" S and 59° 57' 50" W) and Baía do Luiz (14° 59' 16" S and 59° 58' 09" W), both located near Vila Bela da Santíssima Trindade (Figure 1). The fishes were fixed with formalin 10% and their digestive tract was excised. The cladocerans were sorted from gut content under stereomicroscope and transferred to alcohol 70%. For cladoceran identification, the specimens were analyzed in total or until a minimum of 100 specimens. The voucher specimens were deposited at the Zoology Laboratory of the Universidade Católica de Brasília.

3. Results and Discussion

In total, 25 cladoceran species were found in the gut content of fishes from Guaporé River (Table 1), providing the first species list for this basin. Of the species recorded, seven were not reported from Mato Grosso State in previous studies (Green, 1972; Neves et al., 2003).

The occurrence of *Guernella raphaelis* Richard, 1892, *Moina reticulata* (Daday, 1905), and *Moinodaphnia macleayi* (King, 1853) in the Guaporé

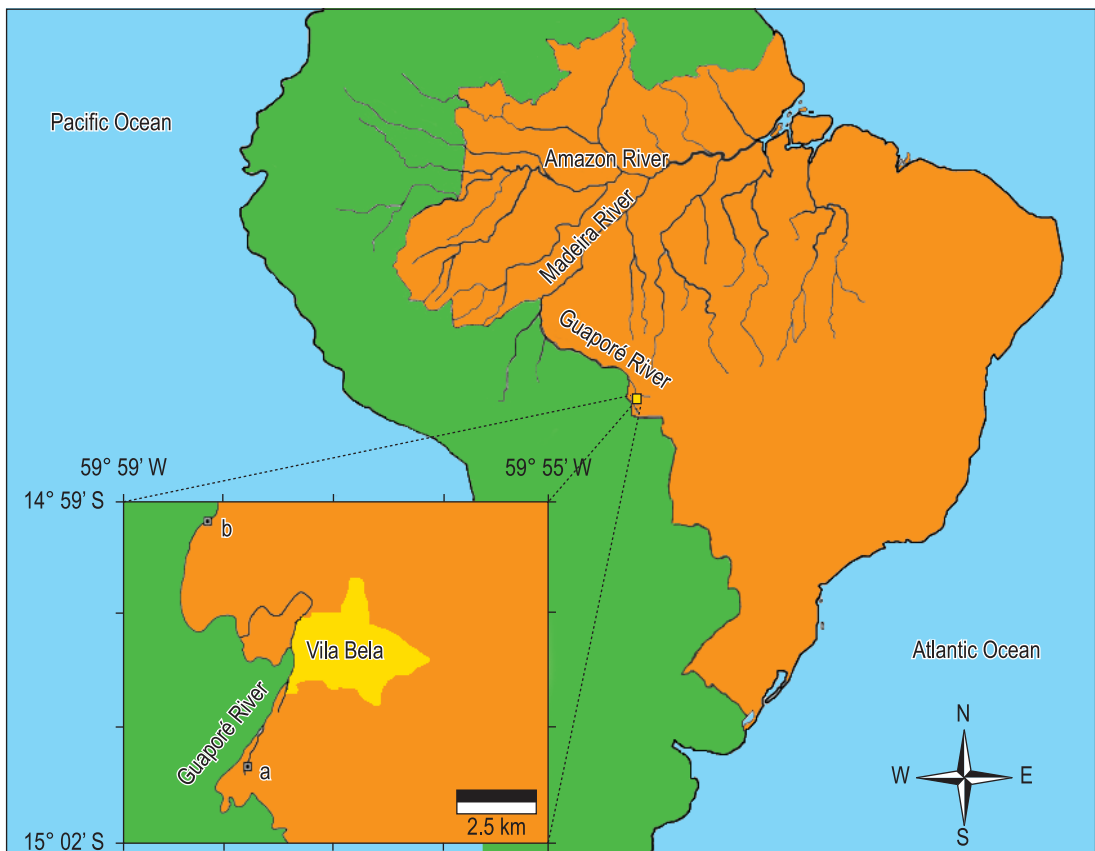


Figure 1. Schematic representation of the Amazon Basin, and location of the sampling sites, near Vila Bela da Santíssima Trindade, Mato Grosso State, Brazil (a: Baía Soca-Soca; b: Baía do Luiz).

Table 1. List of species found in the gut content of *Moenkhausia dichoura* and *Metynnis mola* from Guaporé River basin.

Species
Sididae Baird, 1850
<i>Diaphanosoma birgei</i> Korineck, 1981
<i>Diaphanosoma spinulosum</i> Herbst, 1967
<i>Diaphanosoma brevireme</i> Sars, 1901
<i>Pseudosida ramosa</i> (Daday, 1904)
◆ <i>Sarsilatona behningi</i> Korovchinsky, 1985
Daphniidae Straus, 1820
<i>Ceriodaphnia cornuta</i> Sars 1886
Moinidae Goulden, 1968
<i>Moina minuta</i> (Hansen, 1899)
◆ <i>Moina reticulata</i> (Daday, 1905)
◆ <i>Moinodaphnia macleayi</i> (King, 1853)
Bosminidae Sars, 1865
<i>Bosminopsis deitersi</i> Richard, 1895
Macrothricidae Norman and Brady, 1867
◆ <i>Guemella raphaelis</i> Richard, 1892
◆ <i>Macrothrix brandorffi</i> Kotov and Hollwedel, 2004
<i>Macrothrix elegans</i> Sars, 1901
<i>Macrothrix squamosa</i> Sars, 1901
Ilyocryptidae Smirnov, 1992
<i>Ilyocryptus spinifer</i> Herrick, 1882
Chydoridae Stebbing, 1902
<i>Alona ossiani</i> Sinev, 1998
<i>Alonella dadayi</i> (Birge, 1910)
<i>Chydorus eurynotus</i> Sars, 1901
<i>Chydorus pubescens</i> Sars, 1901
<i>Euryalona orientalis</i> (Daday, 1898)
<i>Graptoleberis occidentalis</i> Sars, 1901
<i>Karualona mülleri</i> (Richard, 1897)
◆ <i>Kurzia polyspina</i> Hudec, 2000
◆ <i>Leydigopsis ornata</i> Daday, 1905
<i>Notoalona sculpta</i> (Sars, 1901)
◆ Indicates the first records from Mato Grosso State.

basin is not surprising, because their presence in the Amazon basin was already known (Stingelin, 1904; Robertson, 1980; Elmoor-Loureiro, 2000).

Although not previously reported from Amazon basin, *Leydigopsis ornata* Daday, 1905 occurs from the Pantanal (Hollwedel et al., 2003) to Venezuela (Rey and Vazquez, 1986). So, this record in Guaporé basin is located within the species known distribution range.

The Brazilian records of *Kurzia polyspina* Hudec, 2000, until now, include only the Distrito Federal (Elmoor-Loureiro, 2002) and Mato Grosso do Sul (Hollwedel et al., 2003). Robertson (1980) reported the occurrence of *Kurzia latissima* (Kurz, 1874) from Pará, but it is possible that it might belong to *K. polyspina*, as previously discussed

(Elmoor-Loureiro, 2002). So, the present record is the first confirmed from the Amazon basin.

Sarsilatona behningi Korovchinsky, 1985 and *Macrothrix brandorffi* Kotov and Hollwedel, 2004 were originally described from Amazonian water bodies: *S. behningi* from Lago Castanho (Amazonas) and *M. brandorffi* from a lagoon near Rio Branco (Roraima). The present records are the first out of type localities and, therefore, they extend the distribution of these species 1000-2000 km to South.

The fish *M. dichrourea* is known to be omnivorous (Wantzen et al., 2002), but sometimes can be planktivorous (Novakowski et al., 2008). Resende et al. (2000) observed that cladocerans were the predominant food item of *M. dichrourea* in Miranda River floodplain (MS). The majority of the observed cladoceran species (73%) collected from the gut contents of the fishes are typical members of the littoral community, which is the case of *Moinodaphnia macleayi*, *Pseudosida ramosa*, *Sarsilatona behningi*, and the species belonging to families Chydoridae, Macrothricidae, and Ilyocryptidae. This fact indicates that, at least partially, *M. dichrourea* eats in the littoral zone.

On the other hand, *Metynnis mola* is mainly herbivorous, but can consume cladocerans when they are abundant (Resende et al., 1998; Wantzen et al., 2002). *M. mola* uses to eat among littoral vegetation, searching for filamentous algae, its main food resource, sometimes cutting aquatic macrophytes to obtain it (Machado, 2003). As many cladoceran species inhabit such environment, it is possible that they would be accidentally consumed.

Besides the information on Cladoceran occurrence, the study point out the importance of this organisms in the aquatic food web of Guaporé Basin.

Acknowledgments

Our sincere thanks to Dr. Eucilene Alves Santana Porto (Brazilian Ministry of Health), for providing the cladoceran samples. We also thank Universidade Católica de Brasília and Conselho Nacional de Desenvolvimento Científico e Tecnológico (grant 555288/2006-4) for the financial support.

References

- CARVALHO, FM., 1980. Alimentação do mapará (*Hypophthalmus edentatus* Spix, 1829) do lago do Castanho, Amazonas (Siluriformes, Hypophthalmidae). *Acta Amazonica*, vol. 10, p. 545-555.
- CASSEMIRO, FAS., HAHN, NS. and RANGEL, TFLVB., 2003. Diet and trophic ecomorphology

- of the silverside, *Odontesthes bonariensis*, of the Salto Caxias reservoir, Rio Iguaçú, Paraná, Brazil. *Neotropical Ichthyology*, vol. 1, no. 2, p. 127-131.
- COUTINHO, AB., AGUIARO, T., BRANCO, CWC., ALBUQUERQUE, EF. and SOUZA FILHO, IF., 2000. Alimentação de *Hyphessobrycon bifasciatus* Ellis, 1991 (Osteichthyes, Characidae) na lagoa Cabiúnas Macaé, RJ. *Acta Limnologica Brasiliensis*, vol. 12, p. 45-54.
- CRIPPA, VEL., HAHN, NS. and FUGI, R., 2009. Food resource used by small-sized fish in macrophyte patches in ponds of the upper Paraná river floodplain. *Acta Scientiarum, Biological Sciences*, vol. 31, no. 2, p. 119-125.
- DIAS, ACMI., BRANCO, CWC. and LOPES, VG., 2005. Estudo da dieta natural de peixes no reservatório de Ribeirão das Lajes, Rio de Janeiro, Brasil. *Acta Scientiarum Biological Sciences*, vol. 27, no. 4, p. 355-364.
- ELMOOR-LOUREIRO, LMA., 2000. Brazilian cladoceran studies: where do we stand? *Náuplius*, vol. 8, no. 1, p. 117-131.
- ELMOOR-LOUREIRO, LMA., 2002. Occurrence of *Kurzia polyspina* Hudec, 2000 (Crustacea, Anomopoda, Chydoridae) in Brazil. *Revista Brasileira de Zoologia*, vol. 19, no. 1, p. 305-307.
- FACHÍN-TERÁN, A. and VOGT, RC., 2004. Estrutura populacional, tamanho e razão sexual *Podocnemis unifilis* (Testudines, Podocnemididae) no rio Guaporé (RO), norte do Brasil. *Phyllomedusa*, vol. 3, no. 1, p. 29-42.
- GALINA, AB. and HAHN, NS., 2003. Comparação da dieta de duas espécies de *Triportheus* (Characidae, Triporthinae), em trechos do reservatório de Manso e lagoas do rio Cuiabá, Estado do Mato Grosso. *Acta Scientiarum Biological Sciences*, vol. 25, no. 2, p. 345-352.
- GREEN, J., 1972. Freshwater ecology in the Mato Grosso, Central Brazil. II. Associations of Cladocera in meander lakes of the Rio Suiá Missú. *Journal of Natural History*, vol. 6, no. 2, p. 215-227.
- HOLLWEDEL, W., KOTOV, AA. and BRANDORFF, GO., 2003. Cladocera (Crustacea: Branchiopoda) from the Pantanal (Brazil). *Arthropoda Selecta*, vol. 12, no. 2, p. 67-93.
- LEITE, RG., 2004. The diet of matrinxã *Brycon amazonicum* (Pisces, Characidae) juveniles, in flooded areas of the Marchantaria Island, Amazonas, Brazil. *Acta Amazonica*, vol. 34, no. 4, p. 661-664.
- MACHADO, FA., 2003. *História natural de peixes do pantanal: com destaque em hábitos alimentares e defesa contra predadores*. Campinas: Universidade Estadual de Campinas. [Tese de Doutorado].
- NEVES, IF., ROCHA, O., ROCHE, KF. and PINTO, AA., 2003. Zooplankton community structure of two marginal lakes of the river Cuiabá (Mato Grosso, Brazil) with analysis of Rotifera and Cladocera diversity. *Brazilian Journal of Biology*, vol. 63, no. 2, p. 329-343.
- NOVAKOWSKI, GC., HAHN, NS. and FUGI, R., 2008. Diet seasonality and food overlap of the fish assemblage in a pantanal pond. *Neotropical Ichthyology*, vol. 6, no. 4, p. 567-576.
- PIEDRAS, SRN. and POUHEY, JLOF., 2005. Alimentação do peixe-rei (*Odontesthes bonariensis*, Atherinopsidae) nas lagoas Mirim e Mangueira, Rio Grande do Sul, Brasil. *Iheringia. Série Zoologia*, vol. 95, no. 2, p. 117-120.
- RESENDE, EK., PEREIRA, RAC. and ALMEIDA, VLL., 1998. *Peixes herbívoros da planície inundável do rio Miranda, Pantanal, Mato Grosso do Sul, Brasil*. Corumbá: EMBRAPA-CPAP. 24 p. Boletim de Pesquisa, 10.
- RESENDE, EK., PEREIRA, RAC., ALMEIDA, VLL. and SILVA, AG., 2000. *Peixes insetívoros e zooplânctófagos da planície inundável do rio Miranda, Pantanal, Mato Grosso do Sul, Brasil*. Corumbá: Embrapa Pantanal. 40 p. Boletim de Pesquisa, 17.
- REY, J. and VASQUEZ, E., 1986. Contribution a la connaissance des cladocères neotropicaux: redescription de *Leydigiopsis ornata* Daday 1905 (Crustacea, Cladocera). *Annales de Limnologie*, vol. 22, no. 2, p. 169-176.
- ROBERTSON, BA., 1980. *Composição, abundância e distribuição de Cladocera (Crustacea) na região de água livre da represa de Curuá-Una, PA*. Manaus: Instituto Nacional de Pesquisas da Amazônia. Dissertação de Mestrado.
- SHIBATTA, OA. and BENNEMANN, ST., 2003. Plasticidade alimentar em *Rivulus pictus* Costa (Osteichthyes, Cyprinodontiformes, Rivulidae) de uma pequena lagoa em Brasília, Distrito Federal, Brasil. *Revista Brasileira de Zoologia*, vol. 20, no. 4, p. 615-618.
- SHIBATTA, OA. and ROCHA, AJA., 2001. Alimentação em machos e fêmeas do pirá-brasília, *Simpsonichthys boitonei* Carvalho (Cyprinodontiformes, Rivulidae). *Revista Brasileira de Zoologia*, vol. 18, no. 2, p. 381-385.
- STINGELIN, T., 1904. Entomotraken gesammelt von Dr. G. Hagmann in Mündungsgebiet des Amazonas. *Zoologische Jahrbucher*, vol. 20, no. 6, p. 575-590.
- VELA, L., 1991. Natural diet of fish from Lake Xolotlán (Managua). *Aquatic Ecology*, vol. 25, no. 2, p. 169-172.
- WANTZEN, KM., MACHADO, FA., VOSS, M., BORISS, H. and JUNK, WJ., 2002. Seasonal isotopic shifts in fish of the Pantanal wetland, Brazil. *Aquatic Sciences*, vol. 64, no. 3, p. 239-251.