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Species composition of rotifers in different habitats of an artificial lake, Mato Grosso do Sul State, Brazil

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ABSTRACT. Rotifers are small filter-feeders that are important in food chains and nutrient cycling in aquatic environments. Little is known of the rotifer fauna in the State of Mato Grosso do Sul. We investigated the occurrence and distribution of rotifers in different habitats of an artificial lake near the city of Dourados, from May through November 1997. We recorded 36 taxa belonging to 15 families, mainly Brachionidae. In the different environments sampled, the presence of vegetation was an important factor determining the occurrence of the taxa.

Key words: rotifers, composition, State of Mato Grosso do Sul, Brazil.

RESUMO. Composição de rotíferos em diferentes habitats de um lago artificial, estado do Mato Grosso do Sul, Brasil. Os rotíferos são pequenos filtradores importantes para as cadeias tróficas dos ambientes aquáticos, bem como na ciclagem dos nutrientes. No Estado do Mato Grosso Sul pouco se conhece sobre a fauna desses invertebrados. Dessa forma, procurou-se, neste estudo, investigar a ocorrência e distribuição do grupo nessa região. As coletas foram realizadas em diferentes habitats de um lago artificial, próximo à cidade de Dourados, no período de maio a novembro/97. Foi registrada a ocorrência de 36 táxons, pertencentes a 15 famílias, destacando-se Brachionidae. Em relação aos diferentes ambientes amostrados, verificou-se que a presença da vegetação foi um fator importante para determinação da ocorrência dos táxons.

Palavras-chave: rotíferos, composição, Estado do Mato Grosso do Sul, Brasil.

The ecological importance of rotifers derives from the fact that they are small filter-feeders that play a relevant role in energy transfer and nutrient cycling of continental aquatic environments. Generalists, they participate in herbivore as well as detritus food chains. In part because they are r-strategists with a high rate of population growth, they are also rapid colonizers.

Studies of the composition and distribution of rotifers in South America are few. Those of Koste (1972), Green (1972), Hardy (1980), Bozelli (1992) in the Amazon basin, and of José de Paggi (1989, 1996), Turner and da Silva (1992), Campos *et al*. (1996), Espíndola *et al*. (1996), Bonecker *et al*. (1997, 1998), Lansac-Tôha *et al*. (1997), Heckman (1998), and Koste (1999) in the Paraná-Paraguay basin are prominent.

The purpose of this study is to assess the occurrence and spatial distribution of rotifers in different habitats of an artificial lake located at Dourados city, Mato Grosso do Sul State. There are no information on this group in that location. Another interesting aspect of the area it is situated that is in the boundary area of two basins (Paraná and Paraguay).

Material and methods

The study was carried out in an artificial lake and its terrestrial area (22° 12'S; 54 54'W) belonging to the company Sementes Guerra S.A., at Dourados city, Mato Grosso do Sul (Fig. 1). The lake was constructed in 1981. Its area is about 140,000 m^2, volume about 424,000 m^3, mean depth 2 meters, and maximum depth 5 meters.

Banks of aquatic macrophytes, *Eichhornia crassipes* (Mart.) Solms., occur along part of the shore, and grassland surrounds the lake. This grassy area becomes part of the lake during the rainy season, it is a seasonally flooded wetland adjacent to the lake.

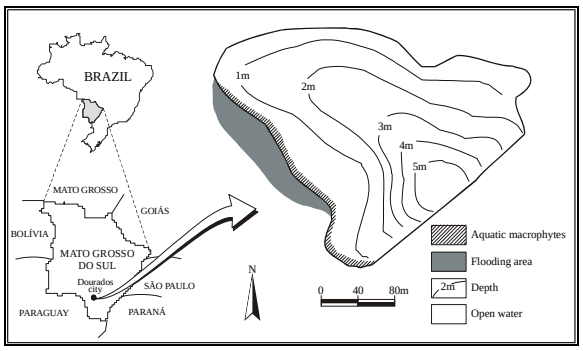

Figure 1. Location of the Dourados city and charactherization of the artificial lake and each habitat sampled (modified by Martinez, 1998)

Collections were made from May through November 1997, in different habitats of the lake, i.e. the pelagic zone (plankton), the littoral zone (macrophyte roots), and the benthos (bottom sediment); and in the grassy areas near the shore (wetland). The objective of this sampling arrangement was to reach the most possible microhabitats in the study area, in order to include as many rotifer taxa as possible in the sampling. Collections were made at different intervals in each microhabitat, that is, 7 monthly collections were made in both the pelagic area and the macrophyte roots, 4 in the flooding area, and 3 in the bottom sediment.

The plankton samples were obtained by horizontal tows at the water surface, using a plankton net with 45μm mesh. Bottom sediment was collected at different depths (0.25 - 4.50 m), using a 600 ml plastic bottle. In greater depths, the sediment was vacuum-aspirated, using the same type of bottle fitted with a plastic tube and weighed at its lower end. A hose connected at the other end was closed while the bottle was lowered; as soon as the tube touched the sediments, the hose was opened and the sediment was drawn into the bottle.

To sample the macrophyte roots, the plant was collected and kept in a plastic bag containing water, and later the roots were washed with distilled water to remove the adherent organisms. In the flooding area, collections were made by resting a 100 ml glass flask on the substrate and waiting for the water to flow into the container.

In the laboratory, the samples were preliminarily inspected live and then fixed with 4% formaldehyde buffered with calcium carbonate. Taxonomic determinations were made according to Koste (1978), Segers (1995), and José de Paggi (1996).

Results and discussion

A total of 36 infrageneric taxa belonging to 15 families were identified. Brachionidae were most prominent with 7 taxa, with their greatest richness in the pelagic area (Table 1 and Fig. 2). With regard to species richness, the family Notommatidae was prominent in the macrophyte roots and benthos; Lecanidae and Colurellidae in the flooded area; Philodinidae in the bottom sediment; and Testudinellidae and Synchaetidae in the pelagic area (Fig. 2).

Table 1. Occurrence and dominance of rotifer taxa registred in the different habitats of an artificial lake, during May to November 1997, at Dourados city, State of Mato Grosso do Sul (pe = pelagic; bs = bottom sediment; rm = roots of macrophytes; fa = flooding area. xxx = abundant; xx = common; x = rare.)

Taxa/habitat	pe	bs	rm	fa
Philodinidae				
Rotaria tardigrada (Ehrenberg)		x		
R. neptunia (Ehrenberg)				x
Philodinidae sp1	x	xxx	xxx	xxx
Brachionidae				
Brachionus dolabratus Harring	xxx			
B. falcatus Zacharias	xxx			
B. calyciflorus Pallas	xx			
Plationus macrachantus (Daday)				x
Keratella americana Carlin	xxx			
K. cochlearis (Gosse)	xxx		x	
K. tropica (Apstein)	xx			
Notommatidae				
Cephalodella sp1			xxx	xx
Cephalodella sp2		xxx	xx	
Cephalodella sp3		x	xxx	
Euchlanidae				
Euchlanis incisa Carlin			x	x
E. dilatata (Ehrenberg)	x			
Manfredium eudactylota De Beauchamp			x	xxx
Colurellidae				
Colurella cf *uncinata* (O.F.Muller)			xxx	xxx
Lepadella ovalis (O.F.Muller)			xxx	x
Squatinella sp.				x
Lecanidae				
Lecane curvicornis (Murray)				xx
L. quadridentata (Ehrenberg)				xx
L. hamata (Stokes)			xx	xxx
Mytilinidae				
Mytilinia ventralis (Ehrenberg)			x	x
Lophocaris sp.			x	
Testudinellidae				
Testudinella patina (Hermann)	x		xx	x
Pompholyx cf *sulcata* (Hudson)	xxx			
Synchaetidae				
Polyarthra vulgaris Carlin	xxx		x	xx
P. dolicoptera Idelson	xx			
Proalidae				
Proales sp.			x	
Proalinopsis sp.			x	xx
Dicranophoridae				
Dicranophorus sp.			xx	xx
Encentrum felis (O.F.Muller)		xx		x
Trichocercidae				
Trichocerca cf *brachyura* (Gosse)			x	
Hexartriidae				
Hexarthra intermedia (Hauer)	xx			
Conochilidae				
Conochilus coenobasis Skorikov	x			
Epiphanidae				
Epiphanes macrourus (Barrois & Daday)	x			

The importance of the family Brachionidae in the composition of rotifers observed in this study,

has been previously noted in different tropical environments (Bozelli, 1992; Segers *et al*., 1993; Dabés, 1995; López and Ochoa, 1995; Lansac-Tôha *et al*., 1997).

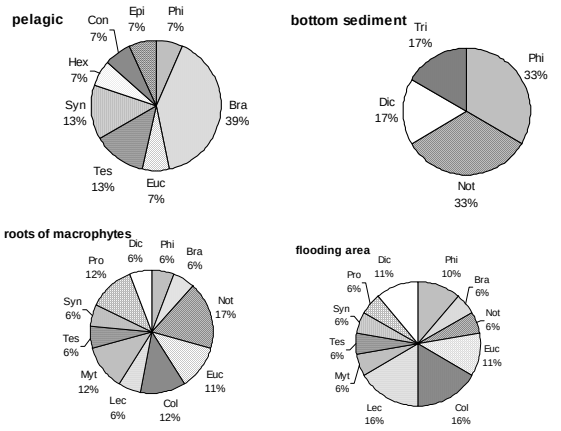

Figure 2. Number of taxa per family (%) registered in each habitat sampled from an artificial lake, in Dourados city, State of Mato Grosso do Sul, May through November 1997 (Phi = Philodinidae; Bra = Brachionidae; Not = Notommatidae; Euc = Euchlanidae; Col = Colurellidae; Lec = Lecanidae; Myt = Mytilinidae; Tes = Testudinellidae; Syn = Synchaetidae; Pro = Proalidae; Dic = Dicranophoridae; Tri = Trichocercidae; Hex = Hexarthriidae; Con = Conochilidae; Epi = Epiphanidae)

In the different habitats sampled, the presence of vegetation was an important factor determining the occurrence of taxa. Where vegetation was present, there were high numbers of taxa, even comparing habitats with different numbers of collections. For example, 18 taxa appeared in 7 samples from macrophyte roots, and 18 taxa also appeared in 4 samples from the flooded area. On the other hand, 15 taxa appeared in 7 plankton samples.

According to Nogrady (1993), a greater richness of rotifers in aquatic environments is generally found in areas where vegetation predominates, either aquatic or in the transition zone between aquatic and terrestrial environments, because aquatic macrophytes favour a greater diversification of habitats for shelter and food (Green, 1972). The importance of vegetation in contributing to the richness of rotifers in aquatic environments has been touched upon in many studies (e.g., Brandorff *et al*., 1982; Paggi and José de Paggi, 1990; José de Paggi, 1996; Junk and Robertson, 1997), sometimes independent of environment (river, pond, and/or water storage tank) (Bonecker *et al*., 1997). Sharma and Naik (1996) added that rotifer composition may vary spatially as a function of the presence of littoral and sublittoral aquatic macrophytes, among other factors. Other studies also compared samples from the open water and the littoral region in a lake and showed a greater richness of rotifer in the littoral due to the presence of extensive banks of aquatic macrophytes (e.g. Bonecker *et al*., 1994, 1997; Lansac-Tôha *et al*., 1997).

The abundant taxa differed between the various habitats sampled (Table 1). *Brachionus dolabratus, B. falcatus, Keratella cochlearis, K. americana, Pompholyx* cf. *sulcata, Polyarthra vulgaris,* and *P. dolicoptera* were more abundant in the pelagic area. *Lecane curvicornis, L. quadridentata, L. hamata, Colurella* cf *uncinata,* and *Lepadella ovalis* were abundant among macrophyte roots and in the flooded area. Philodinidae sp. 1 and *Cephalodella* sp. 2 were abundant in the bottom sediment.

The predominance of the different taxa in each habitat is probably related to the biology of each one. All species of the genus *Lecane*, for example, are substratum-dwellers, that are not able to swim freely over longer distances and live chiefly in littoral habitats (Segers, 1995). *Brachionus falcatus, Keratella cochlearis, K. americana, Pompholyx* cf *sulcata*, and *Polyarthra vulgaris* are typically planktonic (Koste, 1978; Bonecker *et al*., 1998). Most planktonic rotifers are often termed filter or suspension feeding (Nogrady, 1993). In these rotifers the size of the ingested particles is closely related to that of the mouth opening: small species, like *K. cochlearis* and *P. sulcata*, can only ingest minute particles (10-12μm), such as detritus and bacteria; and other large planktonic species, like *Brachionus* species and *Polyarthra dolicoptera-vulgaris*, are able to ingest entire cells (17-18μm) and are exclusively algae-eating (Pourriot, 1977). Most of Philodinidae species are inhabitants of mosses, soils and sands of lakes and rivers branches, and, in general, *Rotaria* species has the end segment of the foot with two to four toes (Koste and Shiel, 1986) and feeding mainly yeasts and bacteria (Ricci, 1984), found chiefly in sediments.

Studies by Espíndola *et al*. (1996) in a lake in the Pantanal, Mato Grosso do Sul, also demonstrated the predominance of *K. americana, K. cochlearis*, and *P. vulgaris* in the pelagic zone. Bonecker and Lansac-Tôha (1996) observed an association of the latter two species near the shore of a lake that had extensive banks of aquatic macrophytes, on the Upper Paraná River floodplain. According to Bonecker and Lansac-Tôha (1996), although these species are considered planktonic they can occur in low densities in the littoral zone of aquatic environments as a function of the supply of food from the macrophytes, and of faunal movement between the pelagic and littoral habitats in shallow and/or spatially limited environments.

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