



ZOOPLANKTON FEEDING SELECTIVE BY FISHES

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INTRODUCTION

Main Brazilian Rivers have already been regulated by construction of dams. The transition from a lotic to lentic system results in a major impact in the upstream fish assemblages, causing changes in the community structure.

In this context, the floodplains associated to reservoirs, previously existent (river phase) or newly created, play an important ecological role, because they permit that innumerable species of fish execute strategies and tactics of their life (e.g. feeding, reproduction, growth, shelter and residence).

As the floodplains are extremely important to the ichthyofauna life cycles, studies about the diet and feeding activity of fish are fundamental. The knowledge about the fish sources of feeding could provide data about habitat, feed availability in the environmental, besides to offer an ecological and behavior understanding of fish species.

Studies of diet of the freshwater neotropical ichthyofauna, differently from temperate regions (Carpenter & Kitchell, 1993), show that the plankton organisms seems not to contribute significantly in the energy and matter transference for the formation and maintenance of fish biomass (Piana et al., 2005). However, the potential role of the plankton community for the small fish is still unknown (Zavala-Camin, 1996) and new information can change the initial hypothesis (Russo & Hahn, 2006).

The aim of this study was assess the zooplankton feeding selective by small fish assemblages.

MATERIAL AND METHODS

Study area

Fieldwork was carried out in Rosana Reservoir, the last one in a cascade along the Paranapanema River (SP/PR, Brazil). Its dam is located at 22° 36'S

e 52° 52'W, with a drainage area of 11,000 km², flooding a shallow area of 276 km² and with water residence time about 21 days.

The samples were collected in a floodplain area located in the right margin of the reservoir upper stretch (22° 36' 56.5"S / 52° 09' 47.3"W).

The maximum depth was 3.1m and the main aquatic macrophytes were *Egeria* sp., *Sagittaria* sp., *Salvinia* sp., *Pontederia chordata*, *Eichhornia crassipes* and *E. azurea*.

Sampling and analyses

Physical and chemical data were obtained in the floodplain pelagic zone (every 0.5m) using a Horiba model U-22 probe. Transparency was measured by Secchi disk.

Fishes were sampled at midday during the dry season (June of 2006) through five manual tow net (1.5 x 5m, 3mm mesh) near the aquatic macrophytes stands.

The obtained organisms were preserved in 10% formalin and latter transferred to ethanol 70% for permanent storage in the collection of the Department of Zoology, State University of São Paulo, Botucatu.

Fishes were identified, counted by taxon, and calculated the diversity (Shannon) and dominance (Simpson). Stomach contents of fishes were analyzed under stereoscopy microscopy. Percentage composition (Hynes, 1950) and frequency of occurrence (Bowen, 1992) were calculated for each item.

Simultaneously to the fish sampling, zooplankton was collected in order to assess the feeding selective. The samples were obtained by vertical hauls (3 times) with a conical plankton net (50mm mesh) and fixed in 4% formalin. The organisms were identified, counted and calculated the diversity

(Shannon).

RESULTS AND DISCUSSION

Physical and chemical characteristics

Transparency of water was of 1.5m. The conductivity was homogeneous in the water column (70 mS cm⁻¹). Values of pH were basic (7.4) in the superficies tending to the neutrality in the bottom (6.9). The values of temperature showed a thermal stratification (23°C on surface and 19°C on the bottom). High values of dissolved oxygen were obtained (about 9mg L⁻¹).

The euphotic zone reaching the whole water column, the high oxygen saturation (107%) and relatively low values of conductivity indicate good water quality condition. In part this is a consequence of the regional environmental preservation proportioned by the Parque Estadual Morro do Diabo, the largest native forest the inland of São Paulo State.

Ichthyofauna

The ichthyofauna was represented by 13 species: *Astyanax altiparanae*, *Hemigrammus marginatus*, *Hyphessobrycon eques*, *Leporinus friderici*, *Metynnis maculatus*, *Roeboides paranensis*, *Serrapinnus notomelas*, *Steindachnerina brevipinna* (Characiformes Ordem), *Hypostomus* sp. (Siluriformes Ordem), *Cichla monoculus*, *Cichlasoma paranaense*, *Crenicichla britskii* e *Satanoperca pappaterra* (Perciformes Ordem). A total of 135 individuals was collected. The order Characiformes had higher richness (8) and abundance (96), followed by Perciformes (4 species and 29 individuals) and Siluriformes (1 species and 10 individuals). All collected individuals were of small-sized Characiformes species or juveniles of the species that achieve large body sizes as adults. The main taxon in terms of frequency of occurrence was *H. eques* with (62 individuals). The Shannon diversity was high (3.14) and the Simpson dominance low (0.14).

Zooplankton assemblages

The zooplankton community was composed by 25 species, with 11 of Cladocera Order, 10 of Copepod Subclass and 4 of Rotifer Phylum. Absolute abundance was of 2,628 ind. m⁻³. There was the predominance of Rotifers with 50% of the individuals, followed by Copepods, 41%, and Cladocera, 9%. The Shannon diversity, 2.1, reflected the dominance of *Polyarthra vulgaris*, with 32% of the total individuals.

Stomach contents

The diet was composed by 51 items, considering the 13 fish species. Microcrustaceans were the most diversified group (17 species), followed by algae (14 species) and aquatic insects (9 species). Vegetable matter, terrestrial insects, fishes, fish scales, detritus and other invertebrates (e.g. Gastropods, Acaridae) were also observed. In terms of frequency of occurrence, Diptera predominated, occurring in 65% of the stomach contents. 21 different items were found for *H. eques*, 20 for *S. pappaterra* and only 1 for *C. monoculus*.

Aquatic insects had a major contribution in the diet of the sampled small fishes, with 55% in volume, followed by vegetable fragments, 28%. The zooplankton species was the third more consumed item (8%). Only eight of thirteen of fish species feed on zooplankton. These results show that zooplankton community suffered low predation pressure by small fish as seen by other authors (Meschiatti & Arcifa, 2002).

However the data demonstrated that there is a zooplankton feeding selective (species and organism size) by fishes.

In spite of Rotifers being the dominant group in the zooplankton assemblage, none of them was predated by fishes. Conversely, even cladocerans being the lowest abundant group in the assemblage, they were the zooplankton most representative item in the fish stomach contents.

Among the copepods, there was a low density of adults and high density of nauplii in the environment, but the adults were the predominant copepods in the stomach contents, evidencing feeding selective to body size by fishes.

CONCLUSION

In the studied floodplain area, the small fish had a low predation pressure on the zooplankton community. Nevertheless, they data show that do exist feeding selective for these organisms.

BIBLIOGRAPHIC REFERENCES

- Bowen, S.H. 1992.** Quantitative description of the diet. In: Nielsen, L.A. & Johnson, D.L. (eds.): Fisheries techniques. American Fisheries Society. Bethesda. p. 325-336.
- Carpenter, S.R. & Kitchell, J.K. 1993.** The trophic cascade in lakes. Cambridge. Cambridge University Press. 380 p.

Hynes, H.B.N. 1950. The food of fresh-water sticklebacks (*Gasterosteus aculeatus* and *Pygosteus pungitius*), with a review of methods used in studies of the food of fishes. *J. Anim. Ecol.*, 19: 36-57.

Meschiatti A.J. & Arcifa M.S. 2002. Early life stages of fish and the relationship with zooplankton in a tropical Brazilian reservoir: Lake Monte Alegre. *Braz. J. Biol.*, 62: 1-8.

Piana, P.A.; da Luz, K.D.G.; Pelicice, F.M.; Costa, R.S.; Gomes, L.C. & Agostinho, A.A. 2005. Predição e mecanismos reguladores da biomassa de peixes em reservatórios. In: Rodrigues, L.; Thomaz, S.M.; Agostinho, A.A. & Gomes, L.C. (eds.): *Biocenoses em reservatórios: Padrões espaciais e temporais*. RiMa. São Carlos. p. 303-310.

Russo, M.R. & Hahn, N.S. 2006. Importance of zooplankton in the diet of a small fish in lagoons of the upper Paraná River floodplain, Brazil. *Acta Limnol. Bras.*, 18(4):357-366.

Zavala-Camin, L.A. 1996. Introdução aos estudos sobre alimentação natural em peixes. EDUEM/Nupélia. Maringá. 129p.