Fish assemblage composition in three reservoirs in the State of Rio de Janeiro

Composição da assembléia de peixes em três reservatórios do estado do Rio de Janeiro

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Abstract: This study aimed to characterize the fish assemblages of the Ribeirão das Lajes, Vigário and Santana reservoirs located in the state of Rio de Janeiro, formed by transposed rivers and having different morphological and ecological features and human impacts. Twenty-three fish species were collected in the three reservoirs, during both the dry and rainy seasons of 2004. The greatest species variety (20) was found in the Santana reservoir, the most impacted by high nutrient inflow. *Loricariichthys castaneus*, *Hoplias* aff. *malabaricus*, *Metynnis maculatus*, *Astyanax bimaculatus*, *Astyanax parahybae*, *Oligosarcus hepsetus*, *Parauchenipterus striatulus* and *Rhamdia quelen* were present in the three reservoirs, and *L. castaneus* was the most abundant species in the three environments. Biological aspects from constant species, predation and fishing pressures, and fish species introduction were suggested as important factors acting on the fish assemblages in the reservoirs.

Keywords: Ribeirão das Lajes Reservoir, *Loricariichthys castaneus*, *Parauchenipterus striatulus,* Paraíba do Sul River Basin.

Resumo: O presente estudo objetivou caracterizar as comunidades ictíicas dos reservatórios de Ribeirão das Lajes, Vigário e Santana, localizados no Estado do Rio de Janeiro, formados através da transposição de rios e com diferentes características morfológicas e influência antrópica. Foram obtidas vinte e três espécies nos três reservatórios, nas épocas seca e chuvosa de 2004. A maior riqueza de espécies foi encontrada no reservatório de Santana (20), considerado o corpo d'água mais impactado. *Loricariichthys castaneus*, *Hoplias* aff. *malabaricus*, *Metynnis maculatus*, *Astyanax bimaculatus*, *Astyanax parahybae*, *Oligosarcus hepsetus*, *Parauchenipterus striatulus* e *Rhamdia quelen* foram comuns aos três reservatórios, sendo *L. castaneus* mais abundante nos três ambientes. Aspectos biológicos das espécies constantes, pressão de predação e atividades de pesca e a introdução de espécies e foram sugeridos como fatores atuantes sobre as assembléias de peixes nos reservatórios estudados.

Palavras-chave: Reservatório de Ribeirão das Lajes, *Loricariichthys castaneus*, *Parauchenipterus striatulus*, Bacia do Rio Paraíba do Sul

1. Introduction

Increasing demand for energy sources, flood control and water supply have figured among the most common reasons for constructing dams. In the state of Rio de Janeiro, the management of water basins for domestic and industrial purposes has a long history and has resulted in the building of the Ribeirão das Lajes, Santana and Vigário reservoirs, among others. The construction of these three reservoirs involved the transposition of water among basins, changes in the direction of rivers and a series of profound ecological alterations to the region's hydrodynamic network.

Studies of fish assemblages in Brazilian reservoirs have shown that initial colonization takes place mainly through the restructuring of populations already present in the river bed of the forming rivers and are complemented by other species from the drainage basin (Fernando and Holčik, 1991; Agostinho et al., 1999; Luiz et al., 2005). The differences in ichthyic fauna composition between natural systems and reservoirs are generally associated to the distribution of certain species density, influenced by artificial stocking of fish both for recovery of dam-affected ichthyic fauna as well as sport-fishing (O'Brien, 1990; Lowe-McConnell, 1999). According to Straškraba and Tundisi (2000), the spatial reorganization of the system introduces new heterogeneity components capable of increasing the diversity of fish and their biomass.

On the other hand, degradation of aquatic ecosystems, especially in the southeast region of Brazil, has strongly influenced fish diversity. Commercial fishing, organic pollution, river dams, changes in flow patterns, rectification and dredging of channels, silt build up, increased turbidity, destruction of riparian vegetation of lakes and bordering swamps and the proliferation of exotic species are proposed as being the main agents of ichthyic fauna impact (Mazzoni et al., 2000; Bizerril and Primo, 2001).

Despite the strategic importance of the Ribeirão das Lajes, Santana and Vigário reservoirs to the state of Rio de Janeiro, these systems have only recently become the focus of research aimed at its ichthyic fauna. The Ribeirão das Lajes reservoir is the only to have a known ichthyic collection (Oliveira et al., 1986; Araújo and Simoni 1997; Araújo et al., 1998; 1999; 2000; Araújo and Santos, 2001; Santos et al., 2001; Duarte et al., 2002; Duarte and Araújo, 2002; Dias et al., 2005). Within this context, the present study aimed to characterize the fish assemblages of these three reservoirs in terms of species composition, abundance and biomass. Due to different limnological characteristics, our hypothesis was that the three ecosystems also present distinct ichthyic communities.

2. Material and Methods

The reservoirs of Ribeirão das Lajes, Santana and Vigário (Figure 1) present distinct morphometric and hydraulic characteristics and are currently suffering different levels of human impact. The first reservoir in the Rio de Janeiro state, Ribeirão das Lajes, was built in 1908 to produce energy and water supply, using an artificial diversion from the Piraí River - a tributary of the Paraíba do Sul River basin, to the Riberão das Lajes River, which belongs to the Guandu river basin.

In 1945, in order to increase the availability of water and the production of energy for the municipality of Rio de Janeiro, part of the Paraíba do Sul waters were diverted to the Piraí river bed, which had the flow of its waters inverted. The Santana reservoir was thereby formed receiving not only waters pumped from the Paraíba do Sul River, but also the remnant Piraí River tributary. The waters dammed in the Santana reservoir were raised to form another reservoir, the Vigário reservoir, from which exit waters that, along with those of the Ribeirão das Lajes reservoir, are used in the production of energy and supply of domestic water to around 9 million people through the Guandu River system.

The Ribeirão das Lajes reservoir presents oligomesotrophic waters (Guarino et al., 2005), classified as "Special Class", which can be used for domestic supply after simple chlorination. Several formations and fragments of the Atlantic Forest are present in the surroundings of this body of water, which contribute to the high water quality. The reservoir is also used for sport fishing and *Tilapia* aquaculture has recently been developed in one of its arms. Morphometric and limnological characteristics of the reservoir are found in Table 1.

The Santana reservoir was built in 1945, its tributaries cross urban areas and farming and ranching regions, and receives the polluted waters of the Paraíba do Sul River,

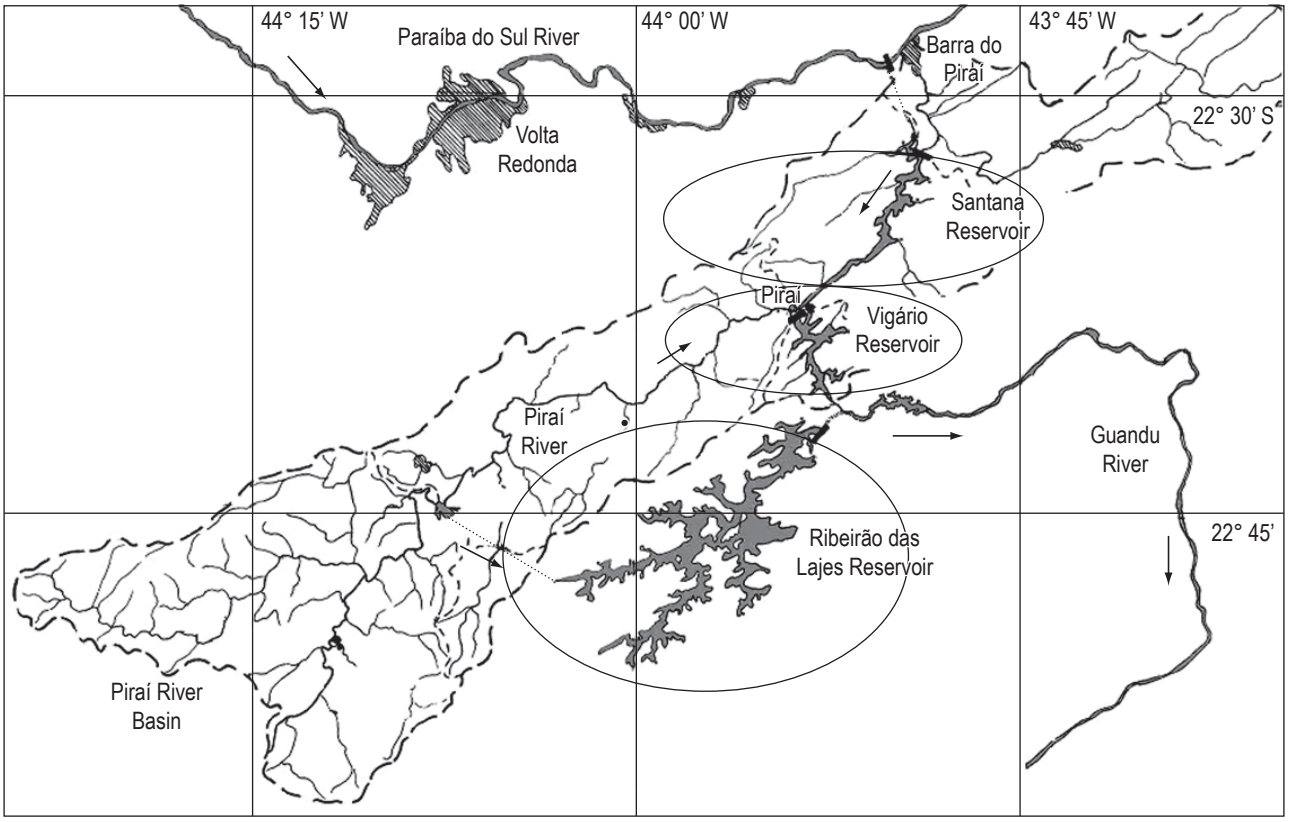

Figure 1. Study area indicating the reservoirs of Santana, Vigário and Ribeirão das Lajes, and the rivers Paraíba do Sul, Piraí and Guandú. The arrows show the direction of the water flow.

having an elevated level of human impact. Such impact leads to high levels of nutrients and organic loads in its waters. These conditions favor an increased proliferation of aquatic plants, so floating barriers were constructed to avoid a greater spread of this vegetation on the surface of the water. Despite the high level of reservoir degradation, water for domestic supply is used after a simplified treatment process. Furthermore, this reservoir is also used by the riverside communities for sport and artisanal fishing.

The Vigário reservoir, also formed in 1945, presents few tributaries and is used for artisanal fishing. Deforested areas used for ranching predominate in the surrounding area. The excess of aquatic plants, which are contained by artificial barriers and periodically removed by mechanical methods, characterizes this reservoir. Fish collections were made in the rainy and dry seasons of 2004 in the three reservoirs.

Table 1. Morphometric and limnological features (average annual values) of the reservoirs Ribeirão das Lajes, Vigário and Santana.

Features /reservoirs	Ribeirão das Lajes	Vigário	Santana
Area (km^2)	30.0-47.8	3.80	5.95
Volume (106 m^3)	450	24.3-37.7	19.9
Mean depth (m)	15	8.6-9.8	3.3
Maximum depth (m)	40	20	12
Altitude (m)	415-430	395-399	361-363
Drainage basin (km^2)	305	2.7	82.5
Retention time (days)	297	30	<1
Water conductivity ($\mu S.cm^{-1}$)	29.0	72.0	97.5
pH	7.2	6.8	7.7
Dissolved oxygen ($mg.L^{-1}$)	8.2	5.4	5.7
Total Phosphorus ($\mu g.L^{-1}$)*	14.7	40.0	32.0
Nitrate (µg.L–1)*	46.8	480.0	530.0

*from Guarino et al. (2005).

The same standardized fishing effort was applied in each reservoir, for 12 hours in the crepuscular time, using 16 gill-nets 3.5 to 55 m long, with heights between 1.15 and 3.8 m and with 1.5, 2, 2.5, 3, 3.5, 4, 4.5, 5 and 5.5 cm knot to knot mesh-sizes. The collections were done in May and November of 2004. All the fish were measured and weighted and voucher specimens were deposited in the Collection of the Museu Nacional (UFRJ), under the code MNRJREG20050418.

The occurrence of the species in the three reservoirs was evaluated using the Index of Constancy of Dajoz (1978) given by the equation: C = (pi x 100)/ P, where C is the constancy value of the species in interest, pi is the number of collections of the species in interest; P is the total number of collections performed. The species with C > 50 were considered constant, with 25 ≥ C ≥ 50, accessory and with C < 25, accidental. The differences between dry and rainy season fish abundance were analyzed using the Wilcoxon Test (Siegel, 1975). Morphometric and limnological data of the reservoirs were obtained from Guarino et al. (2005).

3. Results

A total of 887 specimens belonging to 23 species (Table 2) were collected in the reservoirs under study. The greatest number of species was from the Santana reservoir, with a total of 20 species, followed by Lajes (13) and Vigário (12) (Table 3).

Table 2. Fish species collected in the reservoirs of Ribeirão das Lajes, Vigário and Santana.

Order	Family	Species	Popular name
Characiformes			
	Erythrinidae	*Hoplias* aff. *malabaricus* (Bloch, 1794)	Traíra
	Prochilodontidae	*Prochilodus lineatus* (Valenciennes, 1836)	Curimbatá
	Anostomidae	*Leporinus conirostris* (Steindachner, 1875)	Piau
		Leporinus sp.**	Piau
	Characidae	*Astyanax bimaculatus* (Linnaeus, 1758)	Lambari-de-rabo-amarelo
		Astyanax parahybae (Eigenmann, 1908)	Lambari-de-rabo-vermelho
		Probolodus heterostomus (Eigenmann, 1911)	Lambari
		Oligosarcus hepsetus (Cuvier, 1829)	Peixe-cachorro, bocarra
		Metynnis maculatus (Knerr, 1858)**	Pacu-prata, pacu-cd
Siluriformes			
	Auchenipteridae	*Parauchenipterus striatulus* (Steindachner, 1876)	Cumbaca
	Pimelodidae	*Pimelodus maculatus* (La Cepède, 1803)	Mandi, mandi-amarelo
		Pimelodus sp.	Mandi
	Heptapteridae	*Rhamdia quelen* (Quoy and Gaimard, 1824)	Bagre, jundiá
	Callichthyidae	*Hoplosternum littorale* (Hancock, 1828)	Tamboatá
		Callichthys callichthys (Linnaeus, 1758)	Tamboatá
		Hypostomus affinis (Steindachner, 1877)	Cascudo, caximbau
Gymnotiformes			
	Gymnotidae	*Gymnotus carapo* (Linnaeus, 1758)	Enguia, sarapó, carapó
	Sternopygidae	*Eigenmannia virescens* (Valenciennes, 1836)	Enguia, sarapó, carapó
Perciformes			
	Cichlidae	*Cichla monoculus* (Spix and Agassiz, 1831)**	Tucunaré
		Geophagus brasiliensis (Quoy and Gaimard, 1824)	Acará
		Tilapia rendalli (Boulenger, 1897)**	Tilápia
	Sciaenidae	*Pachyurus adspersus* (Steindachner, 1879)	Corvina

**Introduced species.

Table 3. Constancy index of fish species considering the three reservoirs (Acc-Accidental, Ace-Accessory and Con-Constant), total number, numeric percentual, weight and percentual weight of the fish species collected in the reservoirs of Ribeirão das Lajes (Rib. Lajes), Vigário and Santana.

Reservoir		Ribeirão das Lajes				Vigarlo				Santana			
Fish species	C.I.	N	%	Weight (g)	%	N	%	Weight (g)	%	N	%	Weight (g)	%
Leporinus conirostris	Acc	-	-	-	-	1	0.26	450.0	1.53	-	-	-	-
Leporinus sp.	Acc	-	-	-	-	-	-	-	-	1	0.49	2300.0	11.58
Hoplias aff. malabaricus	Con	3	0.99	1557.45	2.74	2	0.53	615.0	2.09	4	1.94	1475.0	7.42
Metynnis maculatus	Con	31	10.26	2534.11	4.45	4	1.06	256.55	0.87	29	14.08	1811.0	9.11
Prochilodus lineatus	Acc	8	2.65	14605.0	25.67	-	-	-	-	-	-	-	-
Astyanax bimaculatus	Con	20	6.62	437.48	0.77	31	8.18	773.75	2.63	13	6.31	375.0	1.89
Astyanax parahybae	Con	9	2.98	160.90	0.28	82	21.64	1849.94	6.29	32	15.53	944.0	4.75
Probolodus heterostomus	Ace	-	-	-	-	-	-	-	-	5	2.43	93.0	0.47
Oligosarcus hepsetus	Con	3	0.99	268.47	0.47	8	2.11	508.90	1.73	12	5.83	370.50	1.86
Gymnotus carapo	Ace	-	-	-	-	-	-	-	-	8	3.88	1175.0	5.91
Eigenmannia virescens	Acc	-	-	-	-	-	-	-	-	1	0.49	35.0	0.18
Parauchenipterus striatulus	Con	55	18.21	1788.24	3.14	14	3.69	919.20	3.13	26	12.62	2595.0	13.06
Hoplosternum littorale	Ace	-	-	-	-	5	1.32	780.0	2.65	7	3.40	1170.0	5.89
Callichthys callichthys	Acc	-	-	-	-	-	-	-	-	2	0.97	75.0	0.38
Pimelodus sp.	Acc	-	-	-	-	-	-	-	-	1	0.49	185.0	0.93
Pimelodus maculatus	Ace	-	-	-	-	77	20.32	8635.0	29.37	1	0.49	175.0	0.88
Rhamdia quelen	Con	7	2.32	1433.77	2.52	16	4.22	1838.85	6.25	4	1.94	985.0	4.96
Hypostomus affinis	Con	5	1.66	759.55	1.33	-	-	-	-	1	0.49	160.0	0.81
Loricariichthys castaneus	Con	139	46.03	28513.51	50.11	132	34.83	11906.0	40.50	57	27.67	7840.50	39.46
Cichla monoculus	Con	4	1.32	793.90	1.40	-	-	-	-	1	0.49	45.0	0.23
Geophagus brasiliensis	Con	13	4.30	3078.79	5.41	-	-	-	-	1	0.49	85.0	0.43
Tilapia rendalli	Con	5	1.66	974.78	1.71	-	-	-	-	1	0.49	275.0	1.38
Pachyurus adspersus	Ace	-	-	-	-	7	1.85	865.00	2.94	-	-	-	-
Total		302	100	56905.95	100	379	100	29398.19	100	206	100	19869.0	100

The most abundant species in the Ribeirão das Lajes reservoir were: *Loricariichthys castaneus*, *Parauchenipterus striatulus* and *Metynnis maculatus Prochilodus lineatus* was present only in this reservoir. In relation to biomass, *L. castaneus* also predominated, followed by *P. lineatus*. In the Vigário reservoir, the most abundant species were: *L. castaneus, Astyanax parahybae* and *Pimelodus maculatus*. *Pachyurus adspersus* and *Leporinus conirostris* were present only in this reservoir. *Loricariichthys castaneus* also predominated in relation to biomass, followed by *P. maculatus*. In the Santana reservoir, the abundance and biomass of *L. castaneus* stood out. *Astyanax parahybae*, *M. maculatus* and *P. strialulus* comprised the most abundant species. *Parauchenipterus striatulus* also presented the second highest importance in terms of biomass. The species collected exclusively in this reservoir were: *Gymnotus carapo*, *Probolodus heterostomus*, *Callichthys callichthys*, *Eigenmannia virescens*, *Pimelodus* sp. and *Leporinus* sp..

According to the Constancy Index, calculated considering period of the year and different reservoir groupings (Table 3), 12 species were considered constant in the 3 reservoirs. Five species were considered accessories and three, accidental. According to the Wilcoxon Test, no significant differences ($p < 0.05$) were found among abundances of species collected during the rainy and the dry seasons in the three reservoirs.

4. Discussion

4.1 Ribeirão das Lajes reservoir

Even though the Ribeirão das Lajes reservoir has existed for around one century, the aquatic environment has been the aim of few studies, compared to other southeastern reservoirs. However, it is the only of the three studied reservoirs to have former data on the ichthyic community.

The first extensive study of the ichthyic fauna, which took place at the end of the 1970s (Silva et al., 1986), registered twelve fish species and verified the dominance of Cichlidae such as *Tilapia rendalli, Cichla ocellaris* and *Geophagus brasiliensis*, with a relative abundance of, respectively, 50, 18 and 17%. This scene reflected the use of the reservoir for sport fishing, for which exotic species of economic value were introduced, superimposing those residing in the drainage basin.

The distribution of fish species in the drainage basin of the Ribeirão das Lajes reservoir was studied from July to October, 1991, as well as their abundances in the reservoir (IESA 1991). This second study found a total of sixteen species and, in contrast to the previous survey, a numerical predominance of *Astyanax fasciatus* (35%), *Cyphocarax gilberti* (Quoy and Gaimard, 1824) (19.9%), *Loricariichthys spixii* (13.2%) and *Oligosarcus hepsetus* (12.4%). Another extensive ichthyic fauna study, undertaken in the nineties (Araújo and Santos, 2001) found fifteen species and the highest frequency of *Loricariichtys spixii* (currently *L. castaneus*), which represented around 80% of the total fish biomass. The species considered dominant by Silva et al. (1986), *G. brasiliensis, T. rendalli* and *C. monoculus* presented relative abundances of 1.4; 0.2 and 0.6% respectively in this survey. Finally, Dias et al. (2005), working with a smaller sample, in a study on the natural diet of the fish community, collected eleven species with *Trachelyopterus striatulus* (actual *Parauchenipterus striatulus*) and *Metynnis maculatus* being the most frequent with relative abundances of 23.7 and 35%, respectively.

Considering the methodological differences observed among the studies undertaken, such as period of collection and means of fishing, some aspects request our attention. The predominance of *L. castaneus* in the present study corroborated that observed by Araújo and Santos, (2001). The greater abundance of this species, in both collection times of the present study, and the fact of corresponding to 50% of the biomass of fishes collected in the Ribeirão das Lajes reservoir, distinguishes its successful maintenance in the aquatic environment over the last decade.

The prevalence of *L. castaneus* is common to the Paraíba do Sul River basin (Regan, 1904). Bizerril (1999) characterized the genus *Loricariichthys* as having a characteristic distribution in backwaters and parts of the riverbank of this same river. *Loricariichthys castaneus* can present competitive advantages within the ichthyic community due to its morphological and biological characteristics, such as dermic plates that reduce predation on this species, detritivorous/illyophagous habits, and aspects of its reproductive cycle such as the allocation of large quantities of energy in caring for offspring, large ovocytes and a prolonged reproductive period (Araújo et al., 1998; Duarte and Araújo 2001). The silting of reservoirs and drainage basins has been also pointed as favoring *L. castenaus* due to its preference for silted and sandy substrates (Araújo et al., 1998).

The second most abundant species collected in the current study in this reservoir was *Parauchenipterus striatulus*, which presented a constant increase in relative abundance from 1994 to 1997 (Duarte et al., 2002) and was considered dominant by Dias et al. (2005). According to these authors, the elevated abundance of this species could be attributed to its reproductive strategy of internal fecundation, along with thorns on its dorsal fins and pectorals and a mucus-covered body that make it more difficult for predators to catch. *Parauchenipterus strialulus,* like *L. castaneus,* has also been registered in the Paraíba do Sul River (Araújo, 1996; Bizerril, 1999), thereby verifying the importance of autochthonous species in community structuring of the Lajes reservoir, even long after being filled.

The third most abundant species in Ribeirão das Lajes reservoir was *Metynnis maculatus*, a non-native species (Bizerril, 1999). Taking into consideration that the results presented by Araújo and Santos (2001) were developed from monthly collections in 1994, a time in which the presence of *Metynnis* was not registered, the regular appearance of this species in the samples of Dias et al. (2005) and in the present study, show how quickly it adapted after being imported into the Ribeirão das Lajes reservoir. According to ecomorphological attributes of fishes reported by Cunico and Agostinho, (2006) and their relation to reservoir hydrodynamics, *Metynnis* presents an important relative height, represented by its lateral compression, which would be an attribute inversely related to environments with elevated hydrodynamics and directly related to capacity of vertical movement, which facilitates its activities in reservoir environments.

Reservoirs which are close to urban centers and used for recreational fishing receive, often indiscriminately, exotic fish species which contribute as another form of impact on the resident fauna. The consideration of *Metynnis maculatus* as constant should be pointed out since it indicates the vulnerability of the Ribeirão das Lajes reservoir to this type of practice. Two other exotic species collected in the present study and already confirmed in previous studies of the Ribeirão das Lajes reservoir, the cichlids *Cichla monoculus* and *Tilapia rendalli.* According to Silva et al. (1986), *C. monoculus* was introduced in the reservoir in the 1950s for the purposes of sport fishing and control of tilapia abundance. Santos et al. (2001), while studying the diet of *C. monoculus* in the Ribeirão das Lajes reservoir, noted that this species presents a piscivorous habit on its own cichlid family and accentuated cannibalism of the young. It was also noted that this species consumes significantly *Astyanax* spp. and *Oligosarcus hepsetus*, but does not prey on abundant siluriformes (e.g. *L. castaneus* and *P. strialulus*).

In elaborating an ichthyic species list, Araújo and Santos (2001) also reported the presence of *Brycon opalinus*, *Colossoma macropomum*, *Piaractus mesopotamicus*, *Harttia loricariformes* and *Rineloricaria steindachneri* in the Ribeirão das Lajes reservoir. Visual and fortuitous reports of *Colossoma macropomum* and *Piaractus mesopotamicus* took place near the barrage region in this study.

There is some controversy regarding the identification of *Prochilodus lineatus* as an introduced species even though it has frequently been identified as such (Bizerril and Primo, 2001). Therefore, the presence of *P. lineatus* should be observed with caution since the specimens collected in the

Ribeirão das Lajes reservoir, all large, could have come from fishing activities in tributaries near the collection area.

4.2 Vigário and Santana reservoirs

In the two reservoirs, the species both most frequent and of greatest biomass, as reported in the results, was *L. castaneus*. The species *A. parahybae* appeared in second place in terms of abundance.

Species of genus *Astyanax* are ubiquitous in Neotropical lotic systems, having been found in lentic environments of Brazilian reservoirs (Dias et al., 2005). *Astyanax* spp. has been considered among the most resistant to the negative effects of barriers due to high fecundity, small and rapidly developing eggs, wide dietary spectrum and high ecological valence in different environments (Agostinho et al., 1999).

In the Vigário reservoir, the third representative species in terms of abundance was *Pimelodus maculatus,* while in the Santana reservoir it was *Parauchenipterus. strialulus*. Both in the Vigário and Santana reservoirs, the proliferation of aquatic plants must positively influence components of the local ichthyic community. Studies referring to the ichthyic fauna associated to aquatic macrophytes have shown that banks of *Eichhornia* and vegetated aquatic areas serve as a place for the development of larvae and as a refuge for young fishes from predators (Carvalho et al., 2003).

4.3 Aspects relative to the composition of the ichthyic communities in the three reservoirs

There is often a change in the composition of ichthyic communities in the beginning of reservoir formation, leading to an increase of sedentary species populations and a reduction in migrating species (Agostinho et al., 1999). Due to modifications caused by the construction of barriers, fish communities present in reservoirs are the result of restructuring from the species that originally survived in the dammed areas (Araújo-Lima et al., 1995). According to several studies, this process of restructuring is directly influenced by local biota processes and by the reservoir itself, such as primary production, habitat organization, resource limitation, biotic interaction, climate and morphometrics, resulting in a distinct ichthyic fauna for each reservoir (Agostinho et al., 1999; Luiz et al., 2003 Dias et al., 2005).

Despite differences regarding origin, morphometrics and limnological aspects among the three reservoirs under study, the fish communities of the three reservoirs have the dominance of *L. castaneus*, and the constant presence of *P. strialulus, A. bimaculatus, A. parahybae, R. quelen, H.* aff. *malabaricus, O. hepsetus* and *M. maculatus*, thereby not corroborating the initial hypothesis of the present study. It is noteworthy that, except for the latter species, the others were originally part of the Paraíba do Sul River basin (Bizerril and Primo, 2001), reinforcing their importance in the restructuring of the lentic system.

In looking for structuring factors of the ichthyic assemblages in the three reservoirs, the success of *L. castaneus*, which predominated in the present study, stands out both in abundance and biomass in the three reservoirs. *L. castaneus* and *P. strialulus*, both abundant in the three reservoirs, have bionomic aspects, as previously discussed, which could favor these species.

The introduction of *C. monoculus* in Lajes could have increased predatory pressure on native ichthyic fauna. However, in this environment, *C. monoculus* also exercises cannibalism, as well as suffering predation by other species (Araújo et al., 2005). In numeric terms, *C. monoculus* is apparently as common as other piscivores such as *H.* aff. *malabaricus* and *O. hepsetus* and has not become abundant as happened in other reservoirs. Although not confirmed in the present study, *C. monoculus* should be present in the Vigário and Santana reservoirs. Considering the abovementioned, as well as the presence of three piscivorous species in the three reservoirs and the greater abundance of *L. castaneus*, which has morphological aspects that make it more difficult to be caught by predators, we may presume that predation could be an important selection factor in the ichthyic communities in the three reservoirs.

Human impact, especially regarding nutrient contribution, and the introduction of exotic species seem to be important, among other factors. An increase in fish yield in more productive lakes has been observed, as well as a decrease in specialist taxa and an increase in species tolerant to environmental changes caused by eutrophication (Dourado et al., 2005). Even though greater fish biomass was not confirmed in the Vigário and Santana reservoirs, which are of eutrophic characteristics, high species richness was observed in the latter. However, this higher fish variety in the Santana reservoir was related to a larger number of introduced species. On the other hand, the influence of operational aspects in Santana reservoir (current characteristics due to low retention time), and its morphology (lower deep, a greater drainage basin in relation to the size of the water body) can not be ignored as contributing to enhance environmental heterogeneity and favoring species of varying habits.

The fact that the three reservoirs are old (more than sixty years old) and have been formed from different river basins, which in turn receive a large volume of waters transposed from allochthonous basins, portrays the complexity of factors acting on the initial process of fish-population structuring in the three environments. In addition, the lack of data on fish community previous to the reservoirs construction turns difficult to explain what happened in the beginning of the reconstruction of the dammed fish river populations.

Therefore, several local aspects (native fish populations, influence of introduced species, limnological features, habitat characteristics and inter and intraspecific interactions), as well as regional processes (basin differences and the presence of natural barriers), as other authors have already noted (Smith and Petrere-Jr., 2001; Luiz et al., 2003; Oliveira et al., 2003; Sato and Sampaio, 2005), help to stand out the complexity of factors acting on fish assemblages in reservoirs.

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