

Diet composition and food overlap of *Acestrorhynchus britskii* and *A. lacustris* (Characiformes: Acestrorhynchidae) from Sobradinho reservoir, São Francisco river, Bahia State

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ABSTRACT. Fish diet studies contribute to understanding resource partitioning and community trophic structure. The present paper characterizes the diet of “peixe-cachorro” species *Acestrorhynchus britskii* and *A. lacustris* in Sobradinho reservoir, Bahia State, Brazil. Bimonthly samples (November 2006 to July 2008) were taken in the lotic, transition and lentic stretches of the reservoir, using gillnets overnight. A total of 899 *A. britskii* and 476 *A. lacustris* stomachs were analyzed, 70% of which were empty. Their content indicated the species are predominantly piscivorous, with 18 prey fish species identified. However, each prey occurred in a single month, except for *Anchoviella vaillanti*, recorded in 80% of months for *A. britskii*, and *Tetragonopterus chalcus* in 25% for *A. lacustris*. The species presented high food overlap ($C\lambda = 0.992$), owing to the occurrence of Actinopterygii (bits) and Actinopterygii in all months. Regarding prey fish alone, a differentiated intake and lower food overlap was detected, in the flood ($C\lambda = 0.427$) and drought ($C\lambda = 0.172$) seasons, in the lotic ($C\lambda = 0.434$), transition ($C\lambda = 0.089$) and lentic ($C\lambda = 0$) stretches, and in overall overlap ($C\lambda = 0.236$). The spatial and seasonal differences in the intake of different prey fish by both species suggest an opportunistic feeding habit and a competition reduction mechanism for food resources.

Keywords: natural feeding, peixe-cachorro, piscivory.

RESUMO. Composição da dieta e sobreposição alimentar de *Acestrorhynchus britskii* e *A. lacustris* (Characiformes: Acestrorhynchidae) do reservatório de Sobradinho, rio São Francisco, Estado da Bahia. Estudos sobre a dieta de peixes contribuem para o entendimento da partilha de recursos e da estrutura trófica da comunidade. O presente trabalho caracteriza a dieta dos peixes-cachorro *Acestrorhynchus britskii* e *A. lacustris* no reservatório de Sobradinho, Estado da Bahia. Coletas bimestrais noturnas (Novembro/2006 a Julho/2008) foram efetuadas nos trechos lótico, transição e lêntico do reservatório, empregando redes de espera. Foram analisados 899 estômagos de *A. britskii* e 476 de *A. lacustris*, aproximadamente 70% dos quais se encontravam vazios. Seu conteúdo evidenciou tratar-se de espécies predominantemente piscívoras, com 18 peixes-presa identificados. Entretanto, cada presa ocorreu num único mês, exceto *Anchoviella vaillanti*, registrada em 80% dos meses para *A. britskii* e *Tetragonopterus chalcus* em 25% deles para *A. lacustris*. As espécies apresentaram elevada sobreposição alimentar ($C\lambda = 0,992$), pela ocorrência de Actinopterygii (partes) e Actinopterygii não-identificado em todos os meses. Entretanto, considerando apenas os peixes-presa, foi observado consumo diferenciado e menor sobreposição alimentar, nos períodos de cheia ($C\lambda = 0,427$) e seca ($C\lambda = 0,172$), nos trechos lótico ($C\lambda = 0,434$), de transição ($C\lambda = 0,089$) e lêntico ($C\lambda = 0$), e na sobreposição geral ($C\lambda = 0,236$). A diferença espacial e sazonal no consumo de peixes-presa distintos pelas duas espécies sugere hábito alimentar oportunista e mecanismo de redução da competição pelos recursos alimentares.

Palavras-chave: alimentação natural, peixe-cachorro, piscivoria.

Introduction

Knowledge of the feeding sources used by fish can provide data on habitat, food availability in the environment, as well as some behavioral aspects (HAHN et al., 1997). Given that predators choose several different types of prey, it is observed that a

wide feeding spectrum is adequate and quite common as ontogenetic changes and oscillations in the relative abundance of the feeding resource in use take place (LOWE-McCONNELL, 1999).

The formation of a reservoir modifies the hydrology, physiochemical conditions and resource availability in rivers, to the point of being equivalent to

the creation of a brand new ecosystem (TUNDISI, 1999). These variations lead to a significant change in the biology of all living organisms in the new body of water, with the most distinct impact observed on ichthyofauna (HAHN et al., 1998).

Due to the transitory character of the environmental conditions in impounded rivers, generalist species are the most thriving, as they feature a certain flexibility with regard to their trophic requirements, easily adjusting to environmental changes and alterations in food resource availability. Thus, although fish have morphological adaptations in their digestive tract that are characteristic of their feeding habits, several species show a certain plasticity in their diets, particularly in tropical environments (AGOSTINHO et al., 2007).

Sobradinho reservoir, located in the sub-mid São Francisco river region, is one of the world's largest hydroelectric reservoirs, with 4,214 km² (GODINHO; GODINHO, 2003). Its ichthyofauna consists of at least 44 species, with highlight to those belonging to families Characidae, Curimatidae, Anostomidae and Acestrorhynchidae – the latter possibly representing over 10% of the captured total in the reservoir (FRANCISCO GABRIEL NETO, personal communication). Acestrorhynchidae specimens feature elongated and compressed bodies, and inhabit environment such as lakes, lagoons or river stretches. They feature large mouths with cusped, conical and/or caniniform teeth (BRITSKI et al., 1984, 1999), and are popularly known in the area as “peixe-cachorro”.

Studies on the biology and ecology of fish in the São Francisco basin are still insufficient and restricted

to a few stretches of the basin (e.g. GODINHO; GODINHO, 2003; POMPEU, 1999; SATO; GODINHO, 1999), with few studies on feeding dynamics (GOMES; VERANI, 2003; POMPEU; GODINHO, 2003). Data for the Sobradinho reservoir are even more scarce – and most of all, recent (e.g. MELO; SEVERI, 2010).

The objective of the present work is to characterize the feeding habits of *A. lacustris* and *A. britskii*, analyze the apportionment of feeding resources between these two species, and examine possible diet differences related to individual size and the reservoir's different stretches and water levels.

Material and methods

Study area

Sobradinho reservoir (Figure 1) is the largest hydroelectric reservoir in Brazil, with a surface area of approximately 420,000 ha and a volume of 34 x 10⁹ m³. During the drought season, however, its area may decrease by up to 70%. The reservoir was formed by the impoundment of the São Francisco River, upstream from the city of Sobradinho in the state of Bahia, with the flooded area extending up to the city of Xique-Xique, also in Bahia, located approximately 360 km upstream from the dam. Its catchment basin is supplied mainly by the São Francisco river, along with several intermittent rivers featuring seasonal flow only during the rainy season, whose valleys flooded by the creation of the reservoir formed the recesses along both margins.

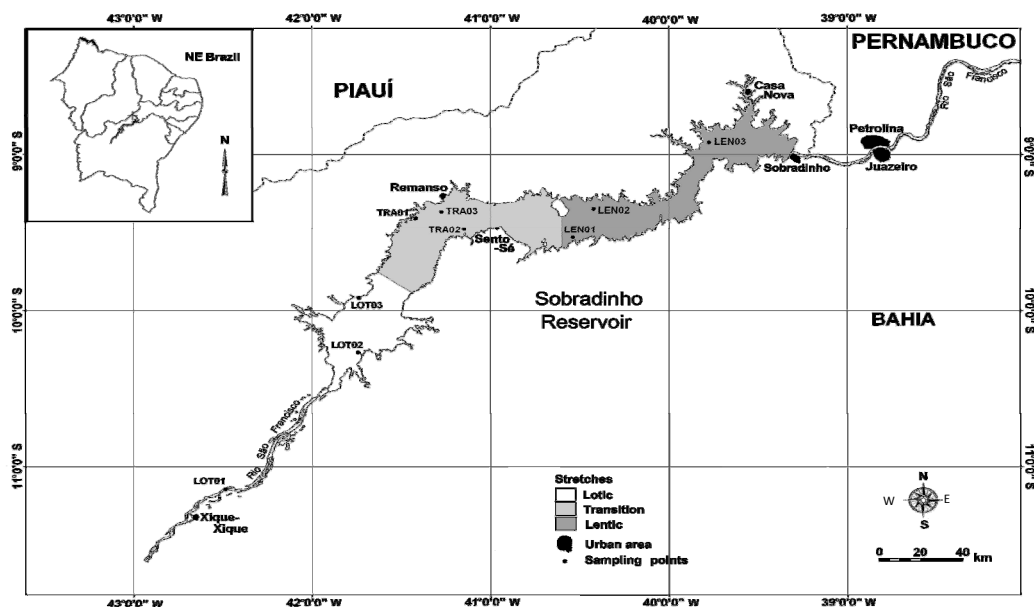


Figure 1. Location of the Sobradinho reservoir in northeastern Brazil, indicating the different stretches of the reservoir and the respective collections' points.

Field procedure

Collections were made every other month, between November 2006 and September 2008, at different points of the reservoir chosen at random in each collection, along lotic, transition and lentic stretches (Figure 1). In each stretch, gillnets were used featuring different mesh sizes (12, 15, 20 and 25 mm between adjacent knots), between 1.5 and 2.5 m high, and 50 m long for each net, set at dusk and removed the following morning. After the nets were removed, the specimens were identified according to Britski et al. (1984), separated by species and preserved in ice until analysis.

Laboratory procedure

In a laboratory setting, the specimens were measured (standard length – SL, 0.1 cm), weighed (total weight – TW, g) and gutted with an abdominal incision for removal of the digestive tract. Stomachs were weighed (0.001 g), fixed in 4% formalin and preserved in 70% ethyl alcohol for later content analysis, and intestine lengths (IL) were measured (0.1 cm). Contents were analyzed under a stereoscope and food items were identified down to the lowest possible taxonomic level, using specialized bibliographic references, identifying prey fish species according to Britski et al. (1984).

Data Treatment

To analyze stomach contents, the item frequency of occurrence (FO) method was used – which expresses the feeding spectrum and frequency of items in the diet – as well as the gravimetric method (Pi) – which provides the direct weight (mg) of each food item in relation to the weight of all food items present in the stomachs (HYSLOP, 1980).

The feeding importance index (IA_i) (KAWAKAMI; VAZZOLER, 1980) was applied on the values for frequency of occurrence and weight, using the following expression:

$$IA_i = \frac{Fi.Pi}{\sum_{i=1}^n (Fi.Pi)}$$

in which:

IA_i = feeding index of item i, i = 1,2,...,n = food items, Fi = frequency of occurrence (%) of each item i, and Pi = weight (%) attributed to each item.

For intestine analysis, the intestinal quotient (IQ) was calculated, with IQ = IL/SL, used as an accessory to characterize the feeding habits of the species.

The diet was also evaluated with regard to the relevance by weight of the categories of prey fish

(Clupeiformes, Characiformes, Gymnotiformes, Perciformes, Actinopterygii (bits) and Actinopterygii), so that a comparison could be made by reservoir stretch (lotic, transition and lentic), by size class (six randomly defined classes) and by hydrological period (drought and flood). The study considered the drought periods (November 2006, September 2007 to March 2008, and September 2008) and flood season (January to July 2007 and May to July 2008), based on water level data of the reservoir provided by the Water Resources Management Division at CHESF. Considering the characteristics of the semi-arid climate in the Sobradinho area, water level data for the reservoir were used instead of pluviometric data, as its variation is directly linked to affluent flow into the reservoir, whose increase does not coincide with the period of highest rainfall in the region.

Food overlap between the two species was calculated using Morisita's Modified Niche Overlap Index (KREBS, 1989), according to the formula:

$$C_{\lambda} = \frac{2 * \sum_{i=1}^S (X_i.Y_i)}{\sum_{i=1}^S X_i^2 + \sum_{i=1}^S Y_i^2}$$

in which:

C_λ = overlap coefficient, S = total number of food items, i = food items, X_i and Y_i = frequency of occurrence of items (i) in the species. This index ranged from 0 to 1, and overlap is considered to be biologically significant when its value is equal to or greater than 0.6 (ZARET; RAND, 1971). The jackknife technique (KREBS, 1989) was applied to evaluate the differences in the values of Morisita's index between stretches of the reservoir and periods, followed by a contrast of means using the t-test (periods) and ANOVA (stretches), considering a 95% significance level, using the Statistica 8.0 application (STATSOFT, 2008).

Results

A total of 899 specimens of *Acestrorhynchus britskii* were analyzed, with SL between 98 and 195 mm, as well as 476 *A. lacustris* individuals, with SL between 100 and 208 mm. Approximately 70% of individuals in each species had empty stomachs. Mean intestinal quotient values were 0.718 (± 0.200) and 0.683 (± 0.180), for *A. britskii* and *A. lacustris*, respectively, differing between them (p = 0.0030).

The analysis of stomach contents for *A. britskii* showed the presence of the following food items (Table 1): *Anchoviella vaillanti* (Clupeiformes), *Astyanax lacustris*, *Hemigrammus gracilis*, *Moenkhausia costae*,

Orthospinus franciscoensis, *Psellogrammus kennedyi*, *Tetragonopterus chalcus*, *Triportheus guentheri* and Serrasalminae (Characiformes), *Cichla* sp. and *Plagioscion squamosissimus* (Perciformes), bits of Actinopterygii (represented by pieces of fins, vertebrae and digested tissues), Actinopterygii (not identified, due to the item's advanced stage of digestion), *Macrobrachium* sp. (shrimp) and vegetal tissue.

Table 1. Feeding important indices (IAi) for each food item ingested by *A. britskii* in Sobradinho reservoir, during the study period.

Items	Year 1					
	Nov. 06	Jan. 07	Mar. 07	May 07	Jul. 07	Sep. 07
	drought	flood	flood	flood	flood	drought
<i>Anchoiella vaillanti</i>	0.0490	0.0005	0.0028		0.0349	0.2239
<i>Moenkhausia costae</i>	0.1663			0.0029		
<i>Orthospinus franciscoensis</i>		0.0013				
<i>Tetragonopterus chalcus</i>					0.0055	
<i>Triportheus guentheri</i>				0.0026		
Serrasalminae		0.0014				
Actinopterygii (NI)	0.5949	0.0299	0.2703	0.3003	0.0722	0.0558
Actinopterygii (bits)	0.1898	0.9641	0.7270	0.6886	0.8873	0.7195
<i>Macrobrachium</i> sp.						0.0007
Vegetal tissue		0.0001				
Items	Year 2					
	Nov. 07	Jan. 08	Mar. 08	May 08	Jul. 08	Sep. 08
	drought	drought	drought	flood	flood	drought
<i>Anchoiella vaillanti</i>				0.0057	0.2540	0.0179
<i>Astyanax lacustris</i>						0.0093
<i>Cichla</i> sp.		0.0346				
<i>Hemigrammus gracilis</i>						0.0040
<i>Moenkhausia costae</i>						0.0248
<i>Plagioscion squamosissimus</i>				0.0006		
<i>Psellogrammus kennedyi</i>				0.0070		
Actinopterygii (NI)		0.1162		0.1538	0.1337	0.0187
Actinopterygii (bits)		0.8491		0.8329	0.6123	0.9253

The stomach contents of *A. lacustris* revealed the presence of the following food items: *A. vaillanti* (Clupeiformes), *A. lacustris*, *Astyanax fasciatus*, *As. lacustris*, *Bryconops cf. affinis*, *Curimatella lepidura*, *Leporinus* sp., *M. costae*, *T. guentheri*, *Pygocentrus piraya* and *T. chalcus* (Characiformes), *Eigenmannia virescens* (Gymnotiformes), bits of Actinopterygii, Actinopterygii and *Macrobrachium* sp. (shrimp). Vegetal tissue and Hexapoda (insects) were also present in the diet, but with reduced participation (Table 2).

The item Actinopterygii (bits) showed the highest IAi values for both studied species, followed by Actinopterygii. Vegetal tissue, *Macrobrachium* sp. and Hexapoda showed extremely low IAi values, which indicates their secondary or even accidental value in the feeding of *A. lacustris* (Tables 1 and 2).

Comparing the intake of food categories by *A. britskii* in the different sampled stretches of the reservoir, Actinopterygii (bits) showed the highest percentage weight value in all environments, although its intake was reduced in the transition stretch. In this same environment, there was an

increase in Characiformes intake. In the lotic section of the reservoir, characterized by stronger water flow, there was low participation by Clupeiformes on a weight basis, represented by *A. vaillanti* (Figure 2A).

Table 2. Feeding important indices (IAi) for each food item ingested by *A. lacustris* in Sobradinho reservoir, during the study period.

Items	Year 1					
	Nov. 06	Jan. 07	Mar. 07	May 07	Jul. 07	Sep. 07
	drought	flood	flood	flood	flood	drought
<i>Acestrorhynchus lacustris</i>				0.0244		
<i>Anchoiella vaillanti</i>			0.0058			
<i>Astyanax lacustris</i>			0.0311			
<i>Bryconops affinis</i>			0.0360			
<i>Eigenmannia virescens</i>					0.0510	
<i>Moenkhausia costae</i>					0.0299	
<i>Tetragonopterus chalcus</i>				0.0217		
<i>Triportheus guentheri</i>					0.0363	
Serrasalminae				0.0066		
Gymnotiformes					0.0551	
Actinopterygii (NI)		0.0119	0.0448	0.1294	0.0417	0.2756
Actinopterygii (bits)		0.9881	0.8814	0.8076	0.6442	0.7244
Hexapoda			0.0009			
<i>Macrobrachium</i> sp.				0.0103	0.1418	
Vegetal tissue			< 0.0009			
Items	Year 2					
	Nov. 07	Jan. 08	Mar. 08	May 08	Jul. 08	Sep. 08
	drought	drought	drought	flood	flood	drought
<i>Acestrorhynchus lacustris</i>						0.0065
<i>Anchoiella vaillanti</i>						0.0016
<i>Astyanax lacustris</i>				0.0273		
<i>Astyanax fasciatus</i>					0.1333	
<i>Curimatella lepidura</i>						0.0207
<i>Leporinus</i> sp.				0.0032		
<i>Pygocentrus piraya</i>				0.0069		
<i>Tetragonopterus chalcus</i>				0.0116		0.0164
<i>Triportheus guentheri</i>				0.0212		
Actinopterygii (NI)				0.2302	0.0555	0.0360
Actinopterygii (bits)				0.6996	0.8112	0.9187

A higher number of ingested categories were observed for *A. lacustris*, although there was higher intake of Actinopterygii in the lentic environment. Clupeiformes were ingested only in the lotic environment, despite its low participation. In the lotic and transition stretches, Actinopterygii (bits) was the category with the highest percentage weight values, followed by Characiformes, present in all environments with an increase in participation from downstream (lentic) to upstream (lotic) (Figure 2B).

Diet analysis by class size revealed an ontogenic differentiation for *A. britskii*, characterized by a reduction in the participation of the category Actinopterygii (bits) and an increase in Actinopterygii in the initial size classes analyzed (up to 155 mm) (Figure 3A). *A. lacustris* showed a diet with a more balanced participation of the different food categories over the different class sizes, without a consistent pattern of variation (Figure 3B).

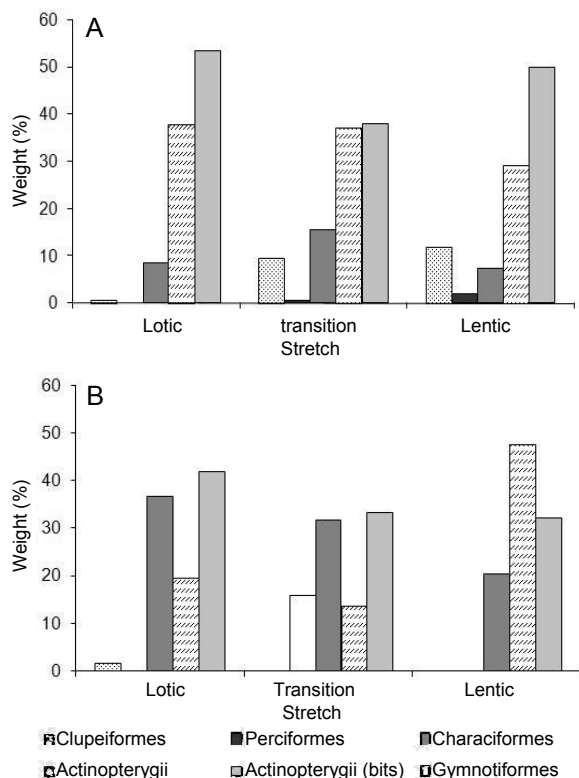


Figure 2. Relative participation, on a weight basis, of food categories ingested by *A. britskii* (A) and *A. lacustris* (B), in the different sampled stretches of Sobradinho reservoir, over the study period.

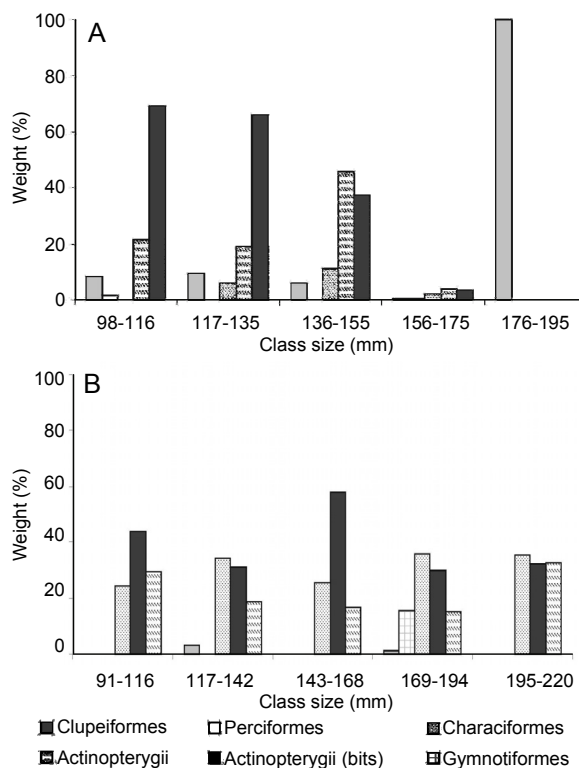


Figure 3. Relative participation, on a weight basis, of food categories ingested by *A. britskii* (A) and *A. lacustris* (B) in Sobradinho reservoir, for the different class sizes.

The analysis of the diet of *A. britskii* by hydrologic period revealed that Actinopterygii (bits) and Actinopterygii were the most abundant categories during both periods, with percentage values of 43.25 and 24.42% for the drought period and 48.65 and 36.80% for the flood season, respectively. A greater participation of Clupeiformes and Characiformes was observed during the low water period (Figure 4A).

For *A. lacustris*, the categories Actinopterygii (bits) and Characiformes were the most abundant, with percentage values of 82 and 78% during the reservoir's drought period and 34 and 32% during the flood season. With the exception of Gymnotiformes, all categories had higher weight percentages during the drought period (Figure 4B).

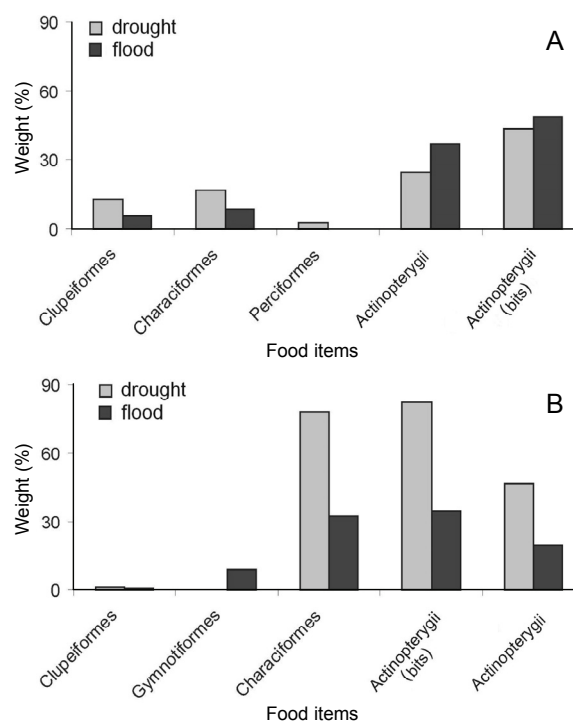


Figure 4. Relative participation, on a weight basis, of food categories ingested by *A. britskii* (A) and *A. lacustris* (B) during the drought and flood periods of Sobradinho reservoir.

Considering all the food items found in the diet of the two species, the food overlap between them was high ($C\lambda = 0.992$). The values found reflect a similarity in the diets regardless of seasonality (drought $C\lambda = 0.976$ and flood $C\lambda = 0.982$, $p = 0.2789$), differing only among the stretches of the reservoir (lentic $C\lambda = 0.988$; transition $C\lambda = 0.948$; lotic $C\lambda = 0.994$; $F(2, 40) = 4.2126$; $p = 0.02187$). This high overlap results from the intense participation of Actinopterygii (bits) and Actinopterygii in the diet of both species in all two-month periods and hydrologic periods, with

differences among stretches only with regard to the prey fish ingested.

However, when considering only the items composed by prey fish, the results express a differentiated participation in the diet of the species with regard to hydrologic period (drought $C\lambda = 0.427$ and flood $C\lambda = 0.172$, $p = 0.00004$) and stretches of the reservoir (lentic $C\lambda = 0$, transition $C\lambda = 0.089$ and lotic $C\lambda = 0.434$; $F(2, 31) = 12.640$; $p = 0.0010$), with overall reduction in food overlap ($C\lambda = 0.236$).

During the drought period, *A. britskii* ingested more prey fish than did *A. lacustris* (six vs. four), whereas during the flood period, the latter species ingested a greater number of prey (13) than the former (eight) (Tables 1 and 2). *A. vaillanti* was the only prey fish species shared by both species during the drought, while five were shared during the flood period (*A. vaillanti*, *M. costae*, Serrasalminae, *T. guentheri* and *T. chalcus*).

Differences in the diet of both species were also observed among the different stretches of the reservoir. In the lotic stretch, they shared two prey fish (*A. vaillanti* and *A. lacustris*) and ingested five (*A. britskii*) and six (*A. lacustris*) other different prey fish species. In the transition stretch, *A. britskii* ingested more prey fish (12) than *A. lacustris* (one). A lesser variety of preys were ingested by both species in the lentic stretch (five by *A. britskii* and two by *A. lacustris*), with no overlap between them.

Discussion

The high incidence of empty stomachs is a characteristic of carnivorous species (GERKING, 1994), especially piscivores. The fact that the ingested species were relatively large, with high nutritional value and easily digestible reduces the time spent until satiation (HAHN et al., 1999), leading the individual to feed less frequently. This trait greatly hinders the study of piscivore diets, due not only to the high incidence of empty stomachs but also by the high level of digestion of prey (PACHECO et al., 2009).

Bennemann et al. (2000) obtained only 23.6% of stomachs containing food in 203 analyzed specimens of *A. lacustris*. In the present study, approximately 30% of *A. britskii* and *A. lacustris* specimens analyzed had food in their stomachs.

The mean intestinal quotient values for both peixe-cachorro species were similar to those recorded by Amaral (1990), 0.70 ± 0.08 for *A. britskii* and 0.66 ± 0.09 for *A. lacustris*; and by Gomes e Verani (2003), 0.73 ± 0.01 and 0.65 ± 0.01 , respectively. Relative intestinal length has been

correlated with the diet feeding habits of fish, with records of values ranging from 0.7 to 0.9 for carnivores, reaching up to 28.7 for herbivores (MOYLE; CECHE, 2004).

With regard to diet, a wide spectrum of food resources was found, most consisting of Actinopterygii and Actinopterygii (bits), evidencing a piscivorous feeding habit for both species in the Sobradinho reservoir. *A. lacustris* was also observed featuring the same feeding preference by Meschiatti (1995) in the Mogi-Guaçu river, São Paulo State, Bennemann et al. (2000) in the Tibagi river, Paraná State, and Hahn et al. (2000) in the Itaipu reservoir, Paraná State. Pompeu e Godinho (2003) characterize both species of peixe-cachorro as exclusively piscivorous, in the Três Marias reservoir, Minas Gerais State.

The presence of items such as vegetal tissue, insects and shrimp in the diet of the studied species can be attributed to accidental ingestion. Bennemann et al. (2000) recorded, on a lower scale, the occurrence of accidental items such as insects, seeds and algae in the diet of *A. lacustris* in the Tibagi river, Paraná State.

Although *Acestrorhynchus* species are recognized as piscivores, *A. pantaneiro* studied by Resende et al. (1996) in the Miranda river floodplain environment, Pantanal, Mato Grosso do Sul State, also had shrimp from the *Macrobrachium* genus in their stomachs, with IAI values between 0.29 and 1.0, regardless of the occurrence of the item fish (0.11 to 0.48). The high participation of shrimp in the diet of that species indicates an opportunist trait (by making use of an abundant food source) in a type of specialized feeding habit (with a diet based on a restricted item type, for which the species has adequate morphological adaptations). This example of trophic plasticity – which is a common feature among freshwater teleosts, especially in tropical river waters, where generalist and opportunist species prevail – makes difficult a generalization of the feeding ecology of ichthyofauna (ABELHA et al., 2001).

Among Characiformes, which comprised the prey of the two species studied in Sobradinho, special mention is due to the importance of *M. costae* on the diet of *A. britskii*, and of *T. chalcus* on the diet of *A. lacustris*, as well as the participation of other foraging Characiformes and engraulid *A. vaillanti*, which are on the bottom of the trophic chain of other piscivores in the reservoir (unpublished data). In an assessment of the ichthyofauna in Sobradinho reservoir, conducted during the same period as the present study, foraging species *A. vaillanti*, *T. chalcus*,

A. fasciatus, *As. lacustris*, *B. cf. affinis*, *M. costae* and *O. franciscoensis* were the most abundant in the different stretches of the reservoir (unpublished data). *M. costae* and *C. lepidura* are prey fish that have also been recorded by Gomes e Verani (2003), in the diet of *A. britskii* and *A. lacustris*, respectively, in the Três Marias reservoir, Minas Gerais State. The authors reinforce the importance of predation on *A. vaillanti* in that ecosystem, attributing it to its greater abundance or vulnerability. In the case of Sobradinho reservoir, it is worth mentioning the higher IAI values for this species in the lentic stretch, especially in the diet of *A. britskii*, which can be attributed to the greater abundance of this prey species in the limnetic zone of the reservoir (unpublished data), as it is an engraulid that feeds on zooplankton and insects (POMPEU; GODINHO, 2003).

The differences observed during the ontogenic analysis of the diet reflect changes in the energy demands of individuals according to increases in size and morphological changes, implying a differentiation in the diet during development (ABELHA et al., 2001). Changes in the spatial distribution of different class sizes can contribute to ontogenic changes to the diet, reducing competition among species that exploit the same resources and/or different sized individuals.

As the fish changes in size, it becomes more agile in predation, and the caniniform teeth, mouth shape, tooth plates and stomach distensibility of the peixe-cachorro facilitate prey retrieval and retention. These traits favor the transit of food on to the esophagus, allowing the deglutition of large-sized whole preys (AMARAL, 1990).

The highest participation on a weight basis in the feeding or both species took place during the drought period, despite the greater richness of ingested items observed during the flood period. A lower relative abundance of certain species and/or greater difficulty in capturing them during the flood period seems to have favored a wider food spectrum for both species during that period. *A. vaillanti* and Characiformes showed greater participation in the diet of *A. britskii* during the low water periods, and *A. lacustris* showed an increase in the participation of almost all items during that period, despite the wider spectrum of items ingested during the flood period. According to Hahn et al. (2000), *A. lacustris* feeds on a wide variety of fish in the Itaipu reservoir, Estado do Paraná, changing its habits according to environmental seasonality. The opportunist character of carnivorous fish species with regard to prey abundance has been recorded by several

authors (ABELHA et al., 2001; HAHN et al., 1997; LOWE-McCONNELL, 1999), in response to its greater seasonal availability in the environment.

In the drought period, due to the greater scarcity of food, food overlap values are higher than during the flood period, when resources are more diversified (LOWE-McCONNELL, 1999; POMPEU, 1999). This characteristic was evidenced through the item participation analysis in the diet of both studied species.

The spatial heterogeneity of habitats, physical disturbances and seasonal changes in quality and quantity affect the population dynamics of predators and preys, as well as the interactions between them. Piscivore fish feed predominantly in the littoral zones of rivers and lakes or submerged aquatic macrophyte beds, which are used as shelter by its potential prey (WINEMILLER; JEPSEN, 1998). Sobradinho reservoir annually undergoes an intense fluctuation in water level, the reflex of which on most of the reservoir's surface - especially its mid-upper portion, due to its smooth terrain - results in characteristics similar to a large floodplain. As such, the spatial-temporal variability of these cyclical disturbances seems to be responsible for the resource use strategy by the studied peixe-cachorro, whose differences result from different morphological and behavioral attributes from one another, favoring an improved partitioning of available resources and reducing overlap in their diets.

Conclusion

The studied species present a similar feeding pattern, with predominance of Actinopterygii (bits) in their diet, although each one exploit different prey fish, depending on the seasonal variation of reservoir level (drought and flood). The use of distinct preys between species, and their spatial and temporal differentiation suggest a mechanism of reduced competition for food, as well as an opportunistic character of food resources' use according to their availability.

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