

### Fish community structure in rivers located in the Capanema municipality, Pará State, Brazil

<sup>1</sup>Daniel R. Costa, <sup>2</sup>Jean M. Corrêa, and <sup>1</sup>Jefferson M. Penafort

<sup>1</sup>Socioenvironmental Institute and Water Resources, Federal Rural University of Amazon, Belém, Pará, Brazil; <sup>2</sup>Department of Geology, Federal University of Ceará, Fortaleza, Ceará, Brazil. Corresponding author: J. M. Corrêa, [jeanoceano@yahoo.com.br](mailto:jeanoceano@yahoo.com.br)

**Abstract.** Fish fauna species can show spatial and temporal patterns, which can be revealed by species association or species groups as well as by species preference to certain habitats. A study was conducted in 2010 in the Capanema and Caeté rivers located in Bragantina Region. A total of 294 fish were collected, belonging to three orders, seven families, 20 genera and 21 species. The species richness was highest in a Caeté E4 stretch, with 20 species. Simpson's Diversity Index in a Capanema E4 showed the highest species dominance, while Shannon's Diversity Index showed that the Caeté E3 stretch had the greatest diversity. The importance of these findings is not restricted to knowledge of the fish community structure in watersheds, but has its practical and fundamental side to show the possibility of further studies in other areas.

**Key Words:** ichthyofauna, Bragantina Region.

**Resumo.** As espécies da ictiofauna podem se distribuir no espaço e no tempo de maneira organizada, seguindo um padrão que pode ser percebido pela associação ou agrupamento das espécies e pela sua relação com determinados habitats. Nesse contexto, um estudo foi realizado no ano de 2010 em dois rios situados na região Bragantina: Caeté e Capanema. Foram coletados 294 peixes, distribuídos em três ordens, sete famílias, 20 gêneros e 21 espécies. A riqueza de espécies foi maior num trecho do Caeté (E4), com 20 espécies. O Índice de Dominância de Simpson mostrou o valor mais alto no trecho 4 do Rio Capanema, enquanto o Índice de Diversidade de Shannon revelou que o trecho E3 do Rio Caeté possuiu a maior diversidade. A importância destes resultados não se restringe apenas ao conhecimento da estrutura da comunidade de peixes em microbacias sob uso de agricultura familiar, mas possui o seu lado prático e fundamental de mostrar a possibilidade de se realizar mais estudos em outras áreas.

**Key Words:** ictiofauna, Região Bragantina.

**Introduction.** Fish fauna species can show spatial and temporal patterns, which can be revealed by species association or species groups as well as by species preference to certain habitats. These species association or communities can be defined as a set of species interacting each other through spatial, functional or taxonomic association (MacArthur 1965).

Tropical animal communities are typically very diverse, with large number of species and complex interactions, when compared to communities located in temperate regions. The fish fauna follows this general ecological rule, both within families and environments (Lowe-McConnell 1999). The freshwater fish fauna found in the Neotropical region is the richest and most diversified of the planet, with more than 4.475 species described (Reis et al 2003).

The reduced number of studies and the scarce knowledge on the aquatic fauna in the Amazon results on under-estimation, upon fish fauna. This survey intended to characterize the fish community structure in the Caeté and Capanema rivers located in the Capanema municipality.

**Material and Method.** The city of Capanema is located 160 km east far from Belém, capital and most important city of Pará State. Eight sampling sites were selected, being four sites in each of the rivers (Figure 1).



Capanema E1



Capanema E2



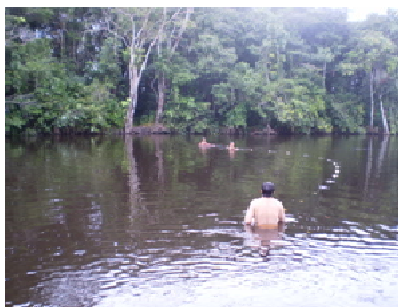
Capanema E3



Capanema E4



Caeté E1



Caeté E2



Caeté E3



Caeté E4

Figure 1. Sampling sites.

Two samples were performed in March and April 2010 and consisted of experimental fishing. In the eight sampling sites were used a cast net of diameter 3 m and trawl net of length 6 m, height 1.2 m and mesh size 5 mm. The experimental procedure result in a total sampling effort of twenty minutes for each experimental unity in each fishery.

Fishes were placed in plastic bags, labeled and packed in styrofoam boxes with ice for identification.

The specimens captured were identified in Coastal Dynamics Laboratory at UFPA. Thus, we used dichotomous identification keys relevant to large groups, such as Britiski et al (1984), identification keys to genera and species contained in Ferreira et al (1998) as well as commercial fish catalogs of Silvano et al (2001) and Santos et al (2004).

The diversity measures aim to emphasize different aspects of community structure examined (Magurran 1988). In order to verify the species dominance in the sampling sites, the Dominance Index (D) was calculated, using Simpson's equation:  $D = \sum (p_i)^2$ , where  $p_i$  is the individual proportion of species "i" in relation to total number of individuals in the sample. This index gives more weighting to abundant species.

The Shannon's Diversity Index ( $H'$ ) is related to species richness, giving greater weighting to rare species. It was calculated for each sampling station using Shannon's equation:  $H' = -\sum (p_i) \times \ln(p_i)$ .

The Shannon's Equitability ( $E_q$ ) reveals a uniform distribution of species, ie, if individuals of the species in the sample are distributed in roughly similar proportions. It was calculated through the following equation:  $E_q = H' / H'_{\max}$ , where  $H'$  is the Shannon's Diversity Index and  $H'_{\max}$  is the maximum Shannon's Diversity, calculated by  $H'_{\max} = \ln S$ , where  $S$  is the number of species in the sample.

Data were organized into a spreadsheet using the following programs: BioDiversity 3.0 and Microsoft Excel for Windows, version 2007.

**Results and Discussion.** Overall 294 fishes were caught in the two river segments, belonging to three orders, seven families, 20 genera and 21 species. The Characiformes was the most predominant group, with 174 individuals. In addition this group also had the highest number of species collected with a total of 10, belonging to four families. The Siluriformes was represented by 83 specimens divided into two families whereas the order Perciformes presented 37 individuals of five species, all of the family Cichlidae. Table 1 shows the contribution of each order for the total individuals captured in the rivers.

Table 1

Contribution of each order in the Capanema and Caeté rivers

<i>Order</i>	<i>N</i>	<i>N(%)</i>
Characiformes	174	59.18
Siluriformes	83	28.23
Perciformes	37	12.59
Total	294	100

N – number of individuals, N(%) – number percent of individuals.

The fish species that were caught in the sampling stations of the Caeté and Capanema rivers did not set up totally in the Neotropical pattern (Characiformes, followed by Siluriformes, Gymnotiformes and Perciformes) (Lowe-McConnell 1999). In our study it was observed that the order Characiformes was the most sampled, followed by the order Siluriformes. However the order Gymnotiformes was not represented. It may have been subsampled, probably due to the intensity that each station was sampled, the amount of fishing gear used, selectivity of each and the day period of sampling.

In our collections, the family Characidae presented the largest number of specimens with a total of 154 while the family Loricariidae contributed with 56 individuals. Table 2 shows the contribution of each family to total individuals captured.

Table 2

Contribution of each family in the Capanema and Caeté rivers

<i>Family</i>	<i>N</i>	<i>N(%)</i>
Characidae	154	52.38
Loricariidae	56	19.05
Cichlidae	37	12.59
Heptapteridae	27	9.18
Curimatidae	12	4.08
Anostomidae	07	2.38
Acestrorhynchidae	01	0.34
Total	294	100

N – number of individuals, N(%) – number percent of individuals.

The Caeté E4 stretch had the highest species richness with 20 species whereas the E3 stretch showed 19. Both the sites E1 and E2 presented 16 species (Figure 2).

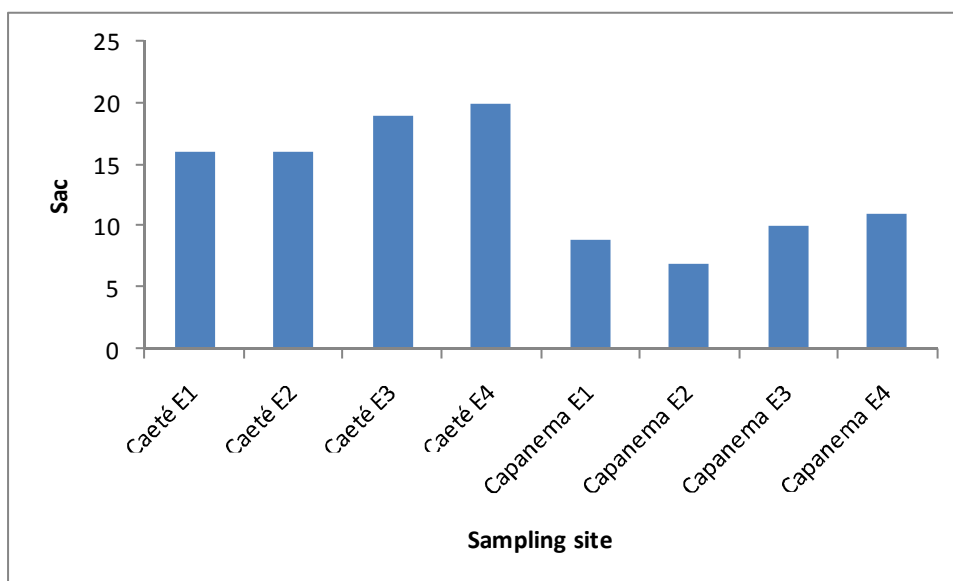


Figure 2. Number of species accumulated (Sac) in each sampling site.

Species richness has been used as an important measure of biodiversity. However, this attribute, typically used to characterize the fish communities structure, are known to be very sensitive to sampling effort (Anjos & Zuanon 2007). This fact can be verified in this study because the species richness were high in the four Caeté reaches.

Among the sampled sites it was verified that the Capanema E4 showed the highest species dominance ( $D = 0.114$ ) while the Caeté E3 stretch had the greatest diversity ( $H' = 3.984$ ). The Capanema E1 showed both the highest equitability ( $Eq = 0.985$ ) and the lowest value of dominance ( $D = 0.022$ ). The values is presented in the Table 3.

Table 3  
Fish community parameters in the sampling sites of Capanema and Caeté rivers

<i>Sampling site</i>	<i>Sac</i>	<i>N</i>	<i>D</i>	<i>H'</i>	<i>Eq</i>
Caeté E1	16	30	0.053	3.787	0.947
Caeté E2	16	39	0.074	3.667	0.917
Caeté E3	19	73	0.063	3.984	0.938
Caeté E4	20	83	0.077	3.858	0.893
Capanema E1	09	10	0.022	3.122	0.985
Capanema E2	07	11	0.091	2.664	0.949
Capanema E3	10	23	0.091	3.116	0.938
Capanema E4	11	26	0.114	3.084	0.892
Total	21	294			

Sac – number of species accumulated, N – number of individuals, D – Simpson's Dominance Index,  $H'$  – Shannon's Diversity Index, Eq – Shannon's Equitability.

The Simpson's Dominance Index and ordination of species abundance had indicated that the Capanema E4 stretch showed greater dominance. Santos & Ferreira (1999) argue that the relatively high dominance of a particular species is due to the shoals presence or areas heavily modified by human activity, such as streams and rivers dammed.

**Conclusions.** The Caeté river stretch, based on diversity indices calculated presented a greater diversity of ichthyofauna species, showing that diversity increases with the habitat size along the rivers.

The importance of these findings is not restricted to knowledge of the fish community structure in watersheds, but has its practical and fundamental side to show the possibility of further studies in other areas.

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Authors:

Daniel Ribeiro Costa, Socioenvironmental Institute and Water Resources, Federal Rural University of Amazon, President Tancredo Neves Avenue, 2501, postal code 66077-901, Belém, Brazil, e-mail: danielpitboy@yahoo.com.br

Jean Michel Corrêa, Department of Geology, Federal University of Ceará, Humberto Monte Avenue, no number, postal code 60455-760, Fortaleza, Brazil, e-mail: jeanoceano@yahoo.com.br

Jefferson Murici Penafort, Socioenvironmental Institute and Water Resources, Federal Rural University of Amazon, President Tancredo Neves Avenue, 2501, postal code 66077-901, Belém, Brazil, e-mail: jm.penafort@bol.com.br

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