PARAMETERS OF POPULATION PAREIORHINA ROSAI AND HARTTIA NOVALIMENSIS (PISCES, LORICARIIDAE) IN THE MUTUCA STREAM, MG.

PARÂMETROS POPULACIONAIS DE PAREIORHINA ROSAI E HARTTIA NOVALIMENSIS (PISCES, LORICARIIDAE) NO RIBEIRÃO DA MUTUCA, MG.

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ABSTRACT

The Mutuca stream is the left blank tributary of the Velhas River, located in Nova Lima, Minas Gerais, Brazil. This elevated area is in a protected area by The Sanitation Company of Minas Gerais (COPASA). Its headwaters are in the “Espinhaço” Complex, an area considered by UNESCO as a biosphere heritage reserve. Harttia novalimensis is a catfish species endemic to sub-basin of the “Velhas” River and is considered vulnerable (VU) in the Minas Gerais state list. The specimens were collected bimonthly from October 2008 to August 2009, and to capture the specimens we used screens and mosquito screen drags. We calculated the parameters abundance of population about both species in the higher dry season. The length classes were most abundance among individuals of intermediate size. The length-weight relationship showed that there was negative allometric growth Pareiorhina rosai and isometric in Harttia novalimensis.

Keywords: Pareiorhina rosai; Harttia novalimensis; length class; length-weight relation/proportion.

RESUMO


Palavras Chaves: Pareiorhina rosai; Harttia novalimensis; classe de comprimento; relação peso/comprimento.
1. INTRODUCTION

The Neotropics is one of the world’s most species-rich zoogeographical areas in terms of fish diversity. Although the estimated number of freshwater species varies among authors, it ranges from 2,400 – 4,000 (MCALLISTER et al., 1997) and 8,000 species (SCHAEFER 1998).


Minas Gerais has a watershed system that encompasses most of the main Brazilian watersheds, and for this reason the state has one of the richest ichthyofauna of the country. It is estimated that the state has 354 species of freshwater fish, representing 12% of the total estimated for Brazil (DRUMMOND et al., 2005). Nearly a third of São Francisco watershed is in Minas Gerais (GODINHO & GODINHO 2003).

São Francisco watershed has 36 main tributaries, being the principal right-margin ones the Pará, Paraopeba, Velhas and Verde Grande rivers (PEREIRA et al., 2007). Rio das Velhas is the largest tributary of Rio São Francisco with 761 Km, and the second in water volume with a mean yield of 631 m$^3$. s$^{-1}$ (CETEC, 1983). One some parts, Rio das Velhas is severely degraded and has signs of accentuated pollution and aggradation due to the loss of the riparian forest (LEAL et al., 2010).

Mutuca Stream watershed has its springs in the cities of Belo Horizonte and Nova Lima, in a range known as Serra do Cachimbo, which is an extension of Serra do Curral. The Serra do Cachimbo extends from SW-NE, and its extension is Serra do Espinhaço to the NE (SOUZA, 2002).

Most of the fish species living in headwaters of streams are small-sized species (less than 15 cm long), and many are endemics, with restricted range and no commercial value (CASTO and MENEZES, 1998).

Family Loricariidae is an important component of fish communities living in streams (BUCKUP 1999). Two taxa of loricariid, Pareiorhina rosai and Harttia novalimensis, are found in Mutuca stream. Species of the catfish genus Pareiorhina prefers headwaters at high altitudes, where streams have clear water, are more rocky and fast-flowing (BRAGA et al., 2009). One of the species occurring at the study site, Pareiorhina rudolphi is herbivorous, feeding on periphyton, and has its mouth located ventrally, with filiform teeth and flaplike lips, with allows it to adhere to the rocky substrate.

Pareiorhina rosai was described recently by SILVA et al. (2016). Pareiorhina rosai can be distinguished from almost all congeners by having the dorsal surface of the caudal peduncle strongly concave, 30 vertebrae, a shorter predorsal length, a shorter cleithral width and a shorter caudal peduncle depth (SILVA et al., 2016)

The other catfish species studied here belongs to the genus Harttia, which species are known to inhabit lotic ecosystems and also adhere to the substrate, which include rocks, silt and logs (SILVA, 2009). The genus Harttia has 22 species occurring in Northern and Southeastern Brazil, and associated with fast flowing water courses (RODRIGUES, 2010). Several species of the genus are also associated with headwaters (IBAMA 2006). The species studied here, Harttia novalimensis is endemic to...
Rio das Velhas watershed, and is classified as Vulnerable according to the state of Minas Gerais list of threatened taxa (BIOVERSITAS, 2007). The genus is characterized by a rounded rostrum, large-diameter eyes, and a flattened body (SILVA, 2009).

Mutuca Stream, a left-margin tributary of Rio das Velhas, is located in Nova Lima municipality, and its headwaters is inserted in a protected area managed by the Minas Gerais Sanitation Company (COPASA, 2016). The springs of Mutuca Stream are located at 1,300 meters and is adjacent to the borders of Belo Horizonte city (SOUZA, 2002). It is located in the Espinhaço Complex, an area considered by UNESCO as a natural heritage (DRUMMOND, 2005). This stream has an area of 84 square kilometers and is the first watershed in the northern tip of Nova Lima (SOUZA, 2002). The Mutuca stream watershed historically had extensive riparian forest composed by mesic forest, but it has been greatly diminished due to the mining and urbanization in the region. (SOUZA, 2002).

Considering the usefulness of studying the fish community in streams to characterize the conservation status of these water courses (ANGERMEIER, 1995; ANGERMEIER and WISNTON, 1997), the aim of this study was to investigate population parameters of *Pareiorhina rosai* and *Harttia novalimensis*, from Mutuca stream.

2. MATERIALS AND METHODS

We sampled along a 200-meters stretch of Mutuca stream. The area presented fast-flowing water and small slow-flowing portions, with a mean depth of 30 centimeters (Fig. 2). The bottom is rocky, and serves as substrate for fishes, along the stream there was a riparian forest with medium to high trees, but without significant vegetation on the slopes. Mean water temperature was 18 °C during summer months (December until March) and 11°C during winter (June until September).

Sampling was made once every two months, between october 2008 and august 2009. To capture the fishes, we used a sifter measuring 75 cm long x 35 cm wide with a 0.3 mm mesh (Fig. 3) and a trawl with a 2 mm mesh (Fig. 4). The sifter and trawl were used concomitantly during one hour.

Voucher specimens were fixed in 10% formaldehyde in the field and posteriorly preserved in Ethanol 70%. They are deposited in the Museu de Ciência e Tecnologia da Pontifícia Universidade Católica do Rio Grande do Sul, Porto Alegre, Brazil, under the collection number MCP 46614 (*Pareiorhina rosai*) and MCP 46615 (*Harttia novalimensis*).

Measurements were made with a caliper and a digital weighing scale. For each taxon, we analyzed population parameters of abundance in each period, highlighting the months with more abundance.

Number of length classes was calculated using the equation:

\[2.5 \cdot \sqrt{n}\]

Being \(n\) the number of specimens of each taxon.

For calculating the Class Interval (CI), we used the equation:
The range of lengths is calculated by subtracting the highest total length value by the smallest value. The result is divided by the number of classes desired (SAMPAIO, 2002).

To calculate the relationship between the body mass and length, we used the equation $W = a \cdot T L^b$, where $W$ is the body mass (g), $T L$ the total length (cm) and $a$ and $b$ are constants. The two constants were estimated by the linear regression analysis.

**Figure 1** – Location of Mutuca stream, in Nova Lima, Minas Gerais, Brazil.
3. RESULTS

We captured a total of 487 species, 356 *Pareiorhina rosai* and 131 *Harttia novalimensis*. The absolute frequencies of *Pareiorhina rosai* was 56 specimens in October 2008; 35 in December 2008, 73 in February 2009, 39 in April 2009, 67 in June 2009 and 86 in August 2009 (Fig.3). The sum of *Pareiorhina rosai* abundance was bigger during the dry season (April, June, and August) (Fig. 5). For *H. novalimensis*, the absolute frequency was 20 in October 2008, nine in December 2008, ten in February 2009, 13 in April 2009, 36 in June 2009 and 43 in August 2009. Sum of abundances for *H. novalimensis* followed the same pattern observed in *Pareiorhina rosai* (Fig. 6).

![Figure 2](image-url)  
**Figure 2** – Mutuca Stream, Nova Lima, Minas Gerais, Brazil.

![Figure 3](image-url)  
**Figure 3** – The absolute frequencies of *Pareiorhina rosai* in Mutuca stream.

<table>
<thead>
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<th>Months of the year</th>
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![Figure 4](image-url)  
**Figure 4** – The absolute frequency of *Harttia novalimensis* in Mutuca stream.

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<thead>
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<td>aug/09</td>
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Figure 5 – Relative frequencies of *Pareiorhina rosai* in Mutuca stream.

The number of length classes in *Pareiorhina rosai* was 11 (Fig. 7), and for *H. novalimensis* was 9 (Fig. 8).

The range in each length class for the catfish *Pareiorhina rosai* was 0.29 cm and this taxon was more represented in the length classes 1.95-2.24; 2.24-2.53 e 2.53-2.82 cm (Fig. 7). The other species, *H. novalimensis*, was more abundant in the classes 2.8-3.2; 3.2-3.6; 3.6-4.0 and 4.0-4.4 cm (Fig. 8) and the class interval as 0.4 cm.
In *Pareiorhina rosai*, body weight and length were weakly correlated ($R^2 = 0.65$, $b = 2.76$, $P<0.005$) suggesting negative allometric growth (Figure 9). Correlation between body weight and length was stronger in *Harttia novalimensis* ($R^2 = 0.82$, $b = 3.05$, $P<0.005$), indicating isometric growth in the species (Figure 10).
Figure 9 – Scatter diagram of the correlation between total length and body mass of Pareiorhina rosai.

Figure 10 – Scatter diagram of the correlation between total length and body mass of Harttia novalimensis.

4. DISCUSSION

One of the effects of seasonal rainfall in water bodies is the creation and extinction of micro habitats (ESTEVES & ARANHA, 1999). Some streams in central Brazil have the water flow completely interrupted in the dry season, and only a few puddles along the stream bed (MELO, 1995). Such modifications surely present a challenge to the aquatic species living in these areas (MELO, 1995). In Panama, when the water level lowered 20 cm, the population of filariform fishes tripled, which the author attributed to the alterations in the inter and intraspecific associations (POWER, 1983). As in the mentioned studies, we also detected possible seasonal changes in the population analyzed here, which showed higher abundance in the dry period than in the wet one.

The relative frequencies of each length class are a trait that is sensitive to environmental alterations and may give estimates of mortality/natality rates, population growth and recruiting (GURGEL, 2004). LIZAMA and AMBRÓSIO (1999) reported, studying nine species of Characid, populations with distinct age structures in the same study site with five species presenting predominance of intermediate age classes. Most of the sample of Triportheus angulatus captured by YAMAMOTO et al., (2004) was composed of adult animals. Similar results were found with Astyanax fasciatus (GURGEL, 2004).

However, AGOSTINHO (1985) points out that the age classes sampled might be biased by the sampling method and favor the capture of intermediate-sized fishes. The regression coefficient $b$ is related with the mode of growth of the animal, its nutritional and physiological status, and age (GURGEL and MENDONÇA, 2000). The weight-length relation can also change intraspecifically, within some boundaries, due to several other factors, such as geographical locality, genetic structure, mean population length and age structure (GURGEL, 2004; SOUZA, 2006).

The regression coefficient $b$ can be used as a reliable estimator for the mode of growth within a population (GURGEL, 2004): if $b = 3$ the growth is isometric, if $b > 3$, it is allometrically positive (more mass gain than increase in length), and if $b < 3$ it is allometrically negative (length increases faster than gain of mass). BRAGA and authors (2009) studying Periorhina rudolphi found a $b$ value of 2.07 for males and 1.95 for females. Our results with Paeriorhina rosai also showed a slightly negative allometric growth in the species, suggesting that it changes body shape along its life, with less mass gain relative to increase in length. On the other hand, Harttia novalimensis presented a growth curve close to isometry, suggesting that the species maintains its weight/length ratio along its life.

5. CONCLUSION

During the study period, Pareiorhina rosai was more abundant in February, June and August 2009, while Harttia novalimensis was more abundant in October 2008, June and August 2009. In both species, intermediate size was the most abundant class. Pareiorhina rosai had a weak weight/length correlation ($R^2 = 0.65$), showing a negative allometric growth ($b = 2.7$). Harttia novalimensis had a stronger correlation between weight and length ($R^2 = 0.82$) and presented isometric growth ($b = 3.05$).

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