ZOOPLANCTON AS POLLUTION INDICATORS IN THE CASCAVEL STREAM, GOIÂNIA, GOIÁS

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ABSTRACT

Knowledge of different groups of zooplankton has been a powerful tool for assessing changes in aquatic ecosystems caused by various impactful activities such as introduction of exotic species, siltation and contamination by domestic and industrial waste water, deforestation and others. This study aimed to evaluate the water quality and detect the effects of a lotic environment of this community. The samples were collected during the period from April to September 2006. Water samples for qualitative and quantitative analysis of zooplankton were collected by vertical hauls the entire water column, using -If a cylinder-conical net of 35 mm mesh width. Samples were collected in the stream Cascavel in Goiânia, Goiás. The analysis of the zooplankton community stream Cascavel revealed the presence of several groups in the body of water. The study also showed the importance of these living things in water quality and its relationship to the physical and chemical factors.
KEYWORDS: water quality, zooplancton, cascavel stream

ZOOPLANCTON COMO INDICADOR DE POLUIÇÃO NO CORREGO CASCAVEL, GOIÂNIA, GOIÁS

RESUMO

O conhecimento dos diferentes grupos de zooplâncton tem sido um poderoso instrumento para avaliar modificações causadas nos ecossistemas aquáticos por várias atividades impactantes como introdução de espécies exóticas, assoreamento e contaminação por esgotos domésticos e industriais, desmatamento entre outras. O presente estudo teve por objetivo avaliar a qualidade da água e detectar os efeitos de um ambiente lótico sobre esta comunidade. As amostras foram coletadas durante o período de abril a setembro de 2006. As amostras de água para a análise quali-quantitativa do zooplâncton foram coletadas por meio de arrastos verticais

de toda coluna d'água, utilizando -se uma rede cilindro-cônica de 35 mm de abertura de malha. As coletas foram realizadas no córrego Cascavel em Goiânia, Goiás. A análise da comunidade zooplanctônica do córrego Cascavel revelou a presença de vários grupos no corpo d'água. O estudo mostrou também a importância destes seres vivos na qualidade da água e a sua relação com os fatores físico-químicos.
PALAVRAS-CHAVE: zooplancton, córrego cascavel, qualidade da água.

INTRODUCTION

Changes in water quality of a body of water can be determined by physical, chemical and biological, in order to characterize this feature front of different uses and identify the causes of any degradations (SANTOS et al., 2011; PEREIRA et al., 2014). In streams polluted water is gradual transformation of organic compounds in mineral salts and carbon dioxide. The balance are directly related to the body's ability to absorb water releases, not conflicting with their use (COSTA et al., 2003; TSUJII et al., 2014). Basins with natural forest cover, vegetation promotes protection against soil erosion, sedimentation and excessive nutrient leaching (DONADIO et al., 2005; MELO-SILVA et al., 2013; GONÇALVES et al., 2016).

Knowledge of different groups of zooplankton has been a powerful tool for assessing changes in aquatic ecosystems caused by various impactful activities such as introduction of exotic species, siltation and contamination by domestic and industrial wastewater, deforestation and others. Zooplankton, one of the most abundant in freshwater invertebrate groups, had been studied in various environments in Brazil (SANTOS-WISNIEWISKI et al., 2002; SANTOS et al., 2009; NEGREIROS et al., 2009).

Organisms belonging to the zooplankton are distinguished by the enormous wealth of species, have great ecological importance as actively participate in processes responsible for the functioning of ecosystems, such as nutrient cycling and maintenance of trophic chains and are considered as a strategic compartment in energy dissipation of ecosystems water and maintenance and guidance of aquatic food webs (ROCHE & ROCHA, 2005). In addition, zooplankton also has strong links with the higher trophic levels of aquatic trophic web (SORANNO et al., 1985), accounting for an important energy transfer route of primary producers to fish. All these features make the zooplankton community key element for understanding the changes that occur in aquatic ecosystems particularly due to eutrophication.

This is a community of organisms that have different development strategies, related to breeding and feeding, allowing the colonization of environments with different physical and chemical characteristics. The zooplankton community consists mainly of protozoa, rotifers, cladocerans and copepods (WETZEL, 1983). The zooplankton have sizes of a few micrometers to a few millimeters, a fact that contributes to environmental structural diversity (BOZELLI & HUSZAR, 2003).

The rotifers are important in plankton, for their high reproductive rate and conversion of primary production, so that it can be used by secondary consumers, reaching produce up to 30% of the total biomass of plankton (NOGRADY, 1993; ANDREOLI & CARNEIRO, 2005). Cladocerans have large number of species, especially in coastal areas of lakes and reservoirs, living associated with macrophytes, fed algae and periphyton (SIPAÚBA-TAVARES & ROCHA, 2001; SANTOS-WINIEWISKI et al., 2002). On the other hand, the copepods have a high degree of endemism with very restricted geographical distribution to be more

sensitive to changes in environmental variables (MATSUMURA-TUNDISI & TUNDISI, 1986; TUNDISI & MATSUMURA TUNDISI, 2008). The zooplankton community is very important to the functioning of aquatic ecosystems. This study aimed to evaluate the water quality and detect the effects of a lotic environment of this community.

MATERIAL AND METHODS

STUDY AREA

The Cascavel stream born in Vila Rosa sector in Goiânia, Goiás, shows the extent ten kilometers and flows into the Ribeirão Anicuns. This, in turn, flows into the Meia Ponte River, which supplies Goiania and directly influences the quality of life of city residents. The study was based on three collection points, located between Alameda Alliance, Leblon and Copacabana Avenue between sectors Vila Rosa and Atlantic Garden, Goiânia, Goiás (Figure 1). The point 1 is the source of the Cascavel stream to 805,9m altitude and UTM coordinates 0682534E and 8147853N; Point 2 is located in the back of a farm, the 822.0 m of altitude and UTM coordinates 0682429E and 8148147N; Point 3 is next to the bridge Independence Avenue, 804.4 m of altitude and UTM coordinates 0682264E and 8148519N.

COLLECTION OF SAMPLES

The samples were collected during the period from April to September 2006 between 8:09 am and with a depth of at least 15cm. Water samples for qualitative and quantitative analysis of zooplankton were collected by vertical trawls the entire water column, using If one cylinder-conical net of 35 mm mesh width. The volume of water filtered in trawls was calculated according to APHA (1992). After filtration and packaging in polyethylene bottles, samples were stained with the vital dye Rose Bengal and elapsed 15 minutes, they were fixed with 4% formalin.

Qualitative analysis was done by taxonomic identification of organisms, the level of order through the usual and specific techniques of optical microscopy, using taxonomic keys, compared with illustrative boards and referring literature. For quantitative analysis, the sample was allowed to stand for 48 hours for sedimentation. After this period, the supernatant removed and proceeded to count the concentrated volume. The organisms were counted with the aid of a stereoscopic binocular microscope with 7x to 180x increase in diascopy lighting. Subsampling is accomplished by withdrawing 1.0 ml aliquots of the homogenized sample with the aid of a Pasteur pipette.

For physicochemical analyzes the bottles were washed with stream water before collection. The following physic-chemical parameters were analyzed: air and water temperatures, dissolved oxygen and nitrite (MACEDO, 2005). The parameters analyzed in points 1 to 4 were too compared with the parameters set by CONAMA Resolution n°357 - March 17, 2005 (CONAMA , 2005) - to waters Class 2.

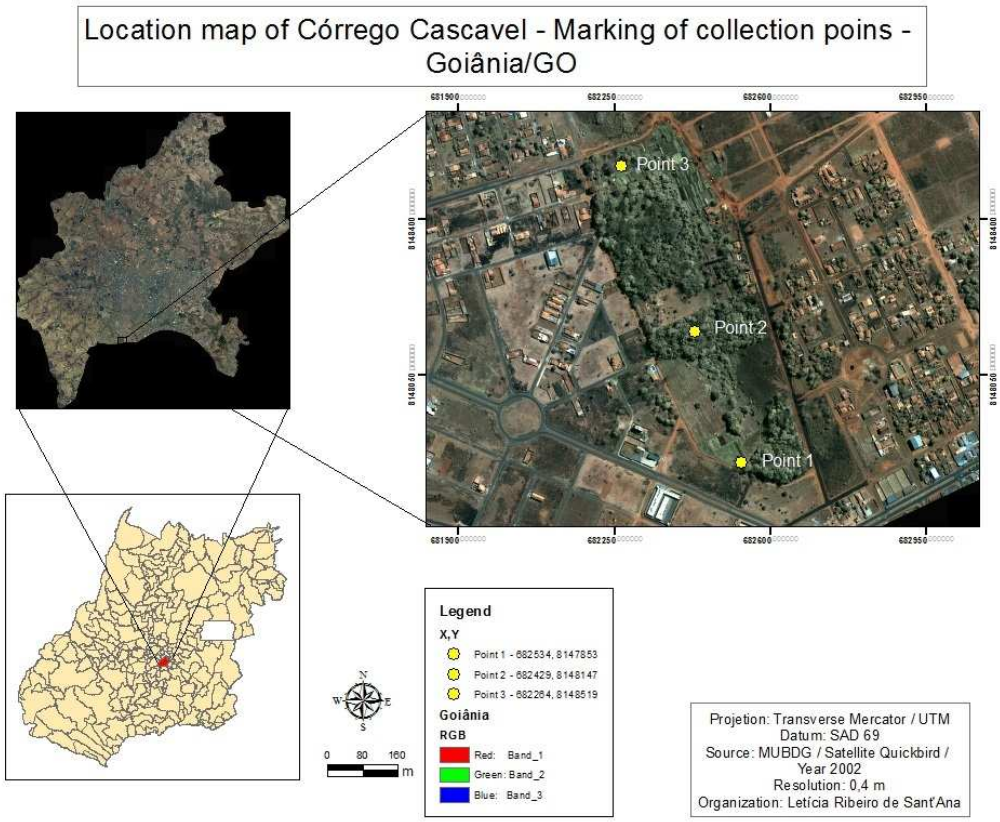

FIGURE 1. Location Map of Cascavel stream with the marking of collection points in the city of Goiânia, Goiás.

RESULTS AND DISCUSSION

The water temperature was relatively high, as expected for the collection period characterized as a rainy season (April) and lower in the dry season (May and July). The concentration of dissolved oxygen is within the range recorded for urban aquatic environments, according to CONAMA resolution 357/05 in point 1, in July and in paragraph 2 in April, May and July and in paragraph 3 in months May and July 2006.

In April and May, in point 1 and point 3, in April 2006, the dissolved oxygen was below the parameters established by Resolution CONAMA 357/05 (Table 1). The values of the physical and chemical characteristics of water in the collection points in the stream Cascavel are presented in Table 1.

TABLE 1. Physical and chemical characteristics of water in the collection points in Cascavel, Goiânia, Goiás.

Chemical parameters	Point 1			Point 2			Point 3			Variables		
	apr/06	may/06	jul/06	apr/06	may/06	jul/06	apr/06	may/06	jul/06	Mean	Max.	Min.
Air temperature (℃)	26,4	25,1	23,6	26,1	24,1	23,6	25,4	25,1	23,6	26,4	26,4	23,6
Water temperature (℃)	24,7	24	23,3	24,4	22,5	21,7	24,7	23,1	22,3	23,41	24,7	21,7
Dissolved oxygen (mg/L)	3,67	3,54	5,02	5,11	5,18	5,99	4,71	5,75	5,72	4,96	5,99	3,67
Phosphate (mg/L)	0,027	0,023	0,025	0.026	0,021	0,026	0,028	0,029	0,027	0,025	0,029	0,021
Nitrite (mg/L)	13,1	12,5	10,3	5,23	4,47	3,25	9,58	8,04	8,02	8,27	13,1	3,25

By CONAMA resolution 357/05 the maximum match value is 0.186 mg / L. In Table 1 the displayed values did not exceed the allowed value. The Nitrite in intermediate state of the nitrogen cycle is formed during the decomposition of organic matter and readily oxidized to nitrate. In shallow waters, the presence of nitrites may indicate partial decomposition of organic matter, arising from excessive discharge water treatment plant or industrial pollution (ESTEVES, 1998). The concentration of nitrite according to CONAMA 357/05 should not exceed 1 mg/L. The results presented in Table 1 show that all points have nitrite higher than the value established by the legislation, thus indicating pollution signals.

In April 2006 the cladocerans group presented in greater quantities in Section 1. Section 1 showed the highest amount of zooplankton groups. In point 2, the amount of cladocerans was superior compared to rotifers and copepods and point 3, the rotifers were presented in greater quantities (Figure 2).

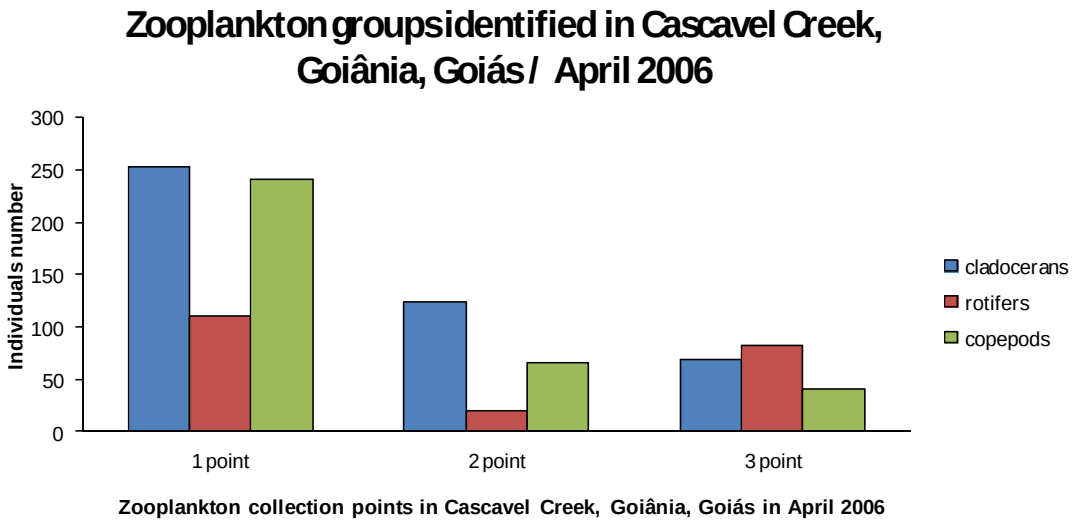

FIGURE 2. Graph showing the zooplankton-identified groups in the three collection points in Cascavel Stream, Goiânia, Goiás in April 2006.

In May 2006 the cladocerans group presented in greater quantities in Section 3. All other groups, rotifers and copepods presented in all studied points. Only in point 1 the copepod group was not identified. The copepod group in April introduced in small quantities in other periods (2:03). Compared to the physicochemical results (Table 1) it is noted that the amount of nitrite is present in greater amounts in 1. Of the groups identified copepods are the animals more sensitive to contamination in the water body. The absence of copepods in point 1 and the small amount identified in paragraphs 2 and 3 show this situation (Figure 3).

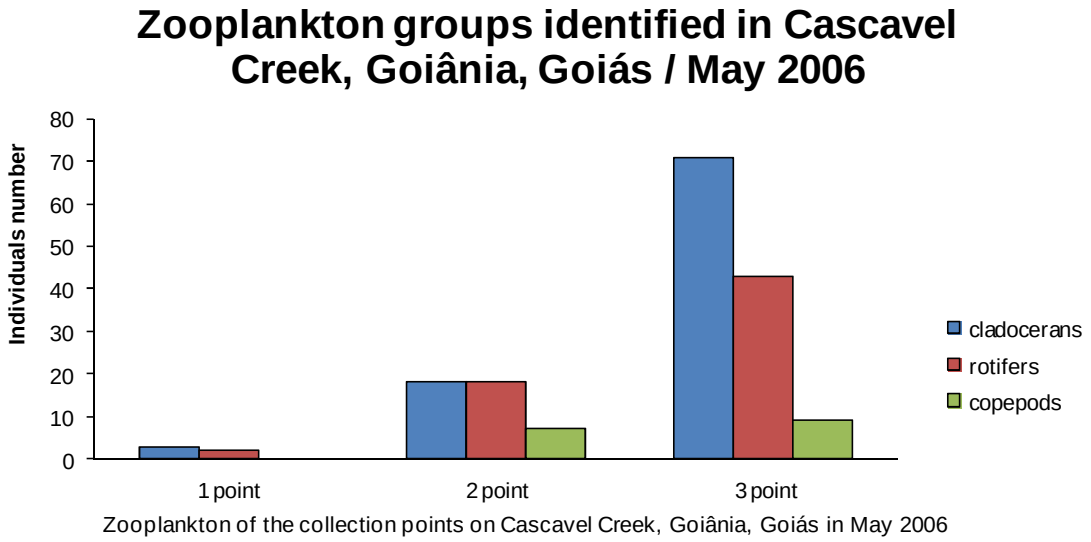

FIGURE 3. Graph showing the zooplankton-identified groups in the three collection points in Cascavel Stream, Goiânia, Goiás in May 2006.

In July the copepods present in small amounts, it probably due to the poor environmental conditions. The rotifers were presented in greater numbers in paragraph 1, then the largest amount was in point 2 and point 3 followed by the cladocerans also had fewer, but much larger than the copepods (Figure 4).

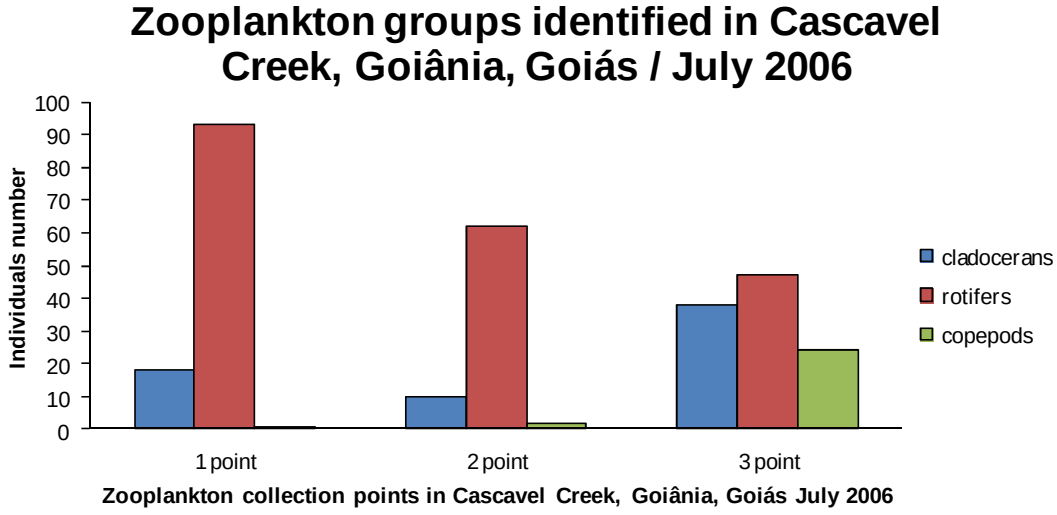

FIGURE 4. Graph showing the zooplankton identified groups in the three collection points in Cascavel Stream, Goiânia, Goiás in July 2006.

Comparing the collections in the months of April, May and July 2006 it was found that the month with the highest amount of zooplankton groups was the month of April, this due to be the rainy season, with more organic matter from the flash floods brought by the rain. The month of May had the lowest amount of zooplankton groups. This result may have been caused due to environmental problems in the water body. The physic-chemical analysis with excess nitrite in the water, not complying with CONAMA Resolution 357/05 and the amount of oxygen dissolved presented showing low perturbations in the environment.

CONCLUSION

The analysis of the zooplankton community Cascavel stream revealed the presence of several groups in the body of water. The study also showed the importance of these living things in water quality and its relationship to the physical and chemical factors.

The copepods presented in smaller quantities in the dry season as was to be expected due to environmental problems, because they are very sensitive to the medium changes. The rotifers were the second group; the most performed and most often were the cladocerans, which are associated macrophytes and periphyton.

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