



## SPECIES COMPOSITION AND ABUNDANCE OF NON-NATIVE SPECIES IN STREAMS UNDER URBAN INFLUENCE

## COMPOSIÇÃO E ABUNDÂNCIA DE ESPÉCIES NÃO NATIVAS EM FLUXOS SOB INFLUÊNCIA URBANA

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**Resumo:** A introdução de espécies não-nativas em ambientes de água doce é uma das maiores ameaças à biodiversidade. Em ambientes urbanizados, as espécies não-nativas tem se proliferado em detrimento das nativas. O objetivo deste estudo é relatar a composição de espécies e a abundância de espécies não-nativas em riachos urbanos na região de Cascavel. Os peixes foram amostrados por pesca elétrica em quatro riachos. No total foram amostradas 31 espécies de peixes, entre as quais, cinco foram espécies não nativas, destacando-se *Poecilia reticulata* e *Gymnotus sylvius*. Esse estudo contribui para programas de manejo objetivando a sustentabilidade em riachos urbanos.

**Palavras Chave:** Água doce. Impactos. Espécies invasivas. Poeciliidae.

**Abstract:** Introduction of non-native species in freshwater environments is one of the greatest threats to biodiversity. In urbanized environment, non-native species have proliferated to the detriment of native ones. The objective of this study is to report the species composition and abundance of non-native species in streams under urban influence in the region of Cascavel. The fish were sampled by electrofishing in four streams. A total of 31 fish species were sampled, among which five were non-native species, most notably *Poecilia reticulata* and *Gymnotus sylvius*. This study contributes to management programs aimed at sustainability in urban streams.

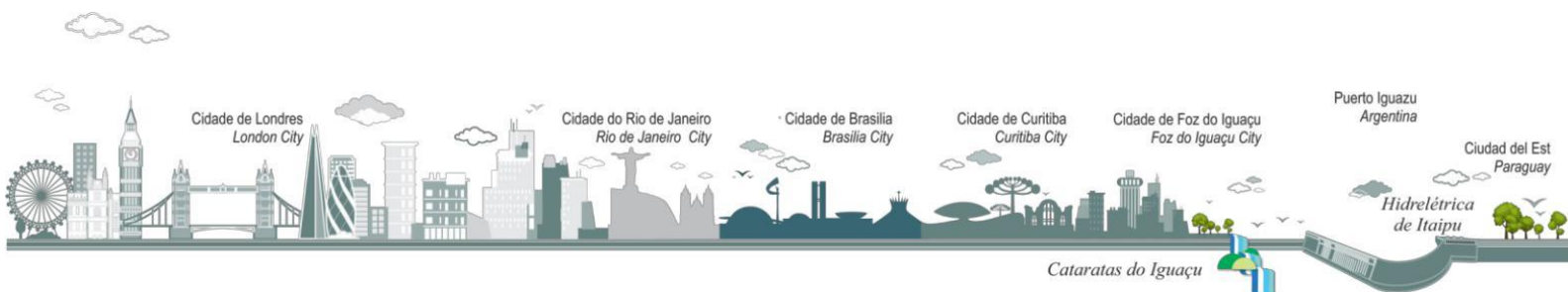
**Key Words:** Freshwater. Impacts. Invasive species. Poeciliidae

## INTRODUCTION

In freshwater ecosystems, the human-assisted species introduction has been accelerating the biodiversity decline (Ding et al., 2017). In Neotropical freshwater

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ecosystems, 192 non-native fish species have already been registered (Gubiani et al., 2018). The introduction and success of non-native species is facilitated by the changes caused by anthropogenic activities such as the habitat modifications by urbanization, being one of the most destructive forms of anthropogenic disturbance. The urbanization effects in streams environment include the soil compaction and waterproofing, reduction or elimination of riparian forest, decrease of habitat availability (Peressin et al., 2018), higher water temperatures, sedimentation, canalization and changes on water quality. These modifications influence direct and indirectly the composition and structure of fish assemblages and the ecosystem functioning (Olden et al., 2010).

Considering the scenario of changes and impacts of urban environments on water resources, as well as the importance of these environments for urban resilience and sustainability, the present work aimed to know the fish fauna of the streams inside the urban area of Cascavel municipality, highlighting the non-native fish species and its traits related to the functional role in the environments.

## MATERIALS AND METHODS

The database contains three samplings (March/2017; July/2017 and December/2017 – January/2018), carried out in four streams of low order (1<sup>st</sup> to 3<sup>rd</sup> orders), in urban area from Cascavel, PR. Fishes were sampled by electrofishing. In the laboratory, all specimens were identified (Ota et al., 2018), and the length (cm) and weight (g) were measured.

## RESULTS AND DISCUSSION

We sampled 28 fish species, totalizing 2,857 individuals, distributed in six





orders: Siluriformes (11 spp), Characiformes (9 spp), Gymnotiformes (3 spp), Cichliformes (2 spp), Cyprinodontiformes (2 spp), and Synbranchiformes (1 spp). Among the sampled species, five were non-native fish species, highlighting *Poecilia reticulata* as the most abundant (1,058 individuals), and *Gymnotus sylvius* with higher biomass (792.45 grams) (Table 1). The functional trait groups related to urban streams were represented by hypoxia tolerant, trophic generalists, independent of the substrate, and they showed elaborate parental care (Tabela 1).

Table 1. Occurrence, abundance and functional traits of the non-native fish species sampled in streams studied. *G. sylvi*= *Gymnotus sylvius*; *G. inaeq*= *Gymnotus inaequilabiatus*; *G. parag*= *Gymnotus paraguayensis*; *P. retic*= *Poecilia reticulata*; *S. marmo*= *Synbranchus marmoratus*. Trophic guilds: Detri/inse: detritivorous/insectivorous, Carn – carnivorous. Tolerance/hypoxia: To – hypoxia tolerant. Parental care: Guar – guarders, IntB – internal bears. Size (total length to *Gymnotus* species; standard length for the others).

Taxon	<i>G. sylvi</i>	<i>G. inaeq.</i>	<i>G. parag.</i>	<i>P. retic</i>	<i>S. marmo</i>
Biomass (g)	792,45	329,85	69,35	490,668	181,53
Numerical abundance	32	16	11	1.058	5
Size (cm)	9.0 - 32	7.2-26.5	9.1-16	0.33-5.7	17.2-50.8
Cascavel stream	x	x	x	x	X
Aroeira stream			x	x	
Quati stream		x		x	X
Afluente Q. stream	x	x		x	
Trophic guilds	Detri/inse	Detri/inse	Detri/inse	Detri/inse	Carn
Tolerance/hypoxia	To	To	To	To	To
Habitat Use	Margin	Margin	Margin	Surface	Margin
Life-history strategy	Periodic	Periodic	Periodic	Opportunistic	Equilibrium
Body size	Large	Large	Large	Small	Large
Spawning type	Multiple	Multiple	Multiple	Multiple	Complete
Sexual Maturity	Late	Late	Late	Early	Late
Clutch size	Large	Large	Large	Small	Small
Offspring survivorship	Low	Low	Low	Low	High
Parental care	Guar	Guar	Guar	IntB	Guar





The degraded environmental conditions in the urban streams favor the tolerant and/or resistant species, specially the non-native ones. *Poecilia reticulata* that presented high abundance in this study occurs in any type of environment owing to its elevated physiological tolerance (Deacon et al., 2011). Historically, the introduction of this species has been directly linked to the control of *Aedes* mosquitoes in urban environments (Shahjahan et al., 2013). Currently, their use as ornamental fish is the main introduction vector of it in natural waters (Magalhães & Jacobi, 2013). It worth emphasizes that their reproductive strategies, as early maturity and viviparity, promote rapid recruitment of new adults.

The origin the *Gymnotus* species in the Iguaçu basin is uncertain and the introduction vector responsible for their presence in these streams is their use as live bait (Baumgartner et al., 2012). The main physical characteristic of the streams where *Gymnotus* occur is the presence of grasses on their banks. When these grasses encounter water, they form good shelters for margin explorer species, also providing food resources for them, as insect's larvae and detritus.

Another species considered as being non-native to the Iguaçu River basin, and introduced by the same vector introduction (live bait), is *S. marmoratus* (Baumgartner et al., 2012). Currently, this species is caught in almost all streams. This species is hypoxia-tolerant, has an air-breathing strategy, and explore any habitat, including those with low environmental quality (McKenzie et al., 2012). *Synbranchus marmoratus* is carnivorous and is considered a pest for aquaculture producers in the region. In streams, this species might impact the native fish assemblages by feeding of juveniles and small size adult fish.

## FINAL CONSIDERATIONS

The presence and abundance of non-native fish was relevant in the studied streams. The non-native fish introduction is common and frequent in our country. Some actions could be practiced to avoid new introductions, as environmental education to





aquarists, fish farming, amateur fishermen, and to the general population. Additionally, the implementation of riparian vegetation management practices and the entry of sediments and pollutants into urban streams are urgent to ensure sustainability of these ecosystems.

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