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Article

Oligochaeta (Annelida: Clitellata) in the Juruena River, MT, Brazil: species indicators of substrate types

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Abstract: Oligochaeta assemblages are important components in freshwater environments, where their abundance and composition may indicate aspects related to water quality and sediment. The lack of information about these communities in Brazilian aquatic environments, as well as the application of native species as bioindicators of lotic environmental, stimulated the conception of this paper. Thus, the aim was to study the community of aquatic Oligochaeta in selected stretches of the Juruena River (MT), thereby generating grounds for future environmental monitoring action in lotic ecosystems. For this purpose, samples were analyzed at bimonthly intervals during the period from January to November 2009, in stretches of the Juruena River (Amazon River Basin) located in the State of Mato Grosso (MT). Two methods were used to collect the organisms: a) "D" network in small clusters of fixed macrophytes in the sediment on the river banks; and b) Ekman-Birge dredge in fine sediment. Preliminary results were 584 organisms distributed in 22 taxa. Of these, 22 valid species were identified. This number corresponds to approximately 25% of the aquatic oligochaete species registered in Brazil. Of these species, *Limnodrilus hoffmeisteri*, *Dero nivea* and *Pristina rosea* can be associated with organic enrichment conditions and/or some level of environmental degradation.

Keywords: *Freshwater oligochaetes, bioindicators, lotic environments, freshwater environments.*

Oligochaeta (Annelida: Clitellata) do Rio Juruena, MT, Brasil: espécies indicadoras em diferentes substratos

Resumo: Comunidades de oligoquetos constituem importante componente em ambientes de água doce, onde sua abundância e composição podem indicar aspectos relacionados à qualidade da água e do sedimento. A carência de informações sobre estas comunidades em ambientes aquáticos brasileiros, bem como a aplicação de espécies nativas como bioindicadores de ambientes lóticos estimularam o desenvolvimento do presente trabalho. Assim, o objetivo foi estudar a comunidade de oligoquetos aquáticos em trechos selecionados do Rio Juruena (MT), gerando subsídios para futuras ações de monitoramento ambiental em ecossistemas lóticos. Métodos: Para isso foram analisadas amostras efetuadas em intervalos bimestrais durante o período de janeiro a novembro 2009, em trechos do Rio Juruena (Bacia Hidrográfica do Rio Amazonas) localizado no Estado de Mato Grosso (MT). Para coleta dos organismos foram utilizados dois métodos: a) rede em "D" em pequenos agrupamentos de macrófitas fixas no sedimento nas margens do rio; e b) draga Ekman-Birge em sedimento arenoso. Os resultados preliminares 584 organismos distribuídos em 22 táxons. Dentre estes, foram identificadas 22 espécies válidas. Esse número corresponde aproximadamente 25% das espécies de oligoquetos aquáticos registradas no Brasil. Destas espécies, *Limnodrilus hoffmeisteri*, *Dero nivea* e *Pristina rosea* podem ser associadas à condições de enriquecimento orgânico e/ou algum nível de degradação ambiental.

Palavras-chave: *Oligoquetos aquáticos, bioindicadores, ambientes lóticos, ambientes de água doce.*

Introduction

Oligochaeta are some of the most abundant groups in continental aquatic macrofauna and play an important role in the process of decomposition and cycling of organic matter in freshwater ecosystems (Ragonha & Takeda, 2014, Cesar & Henry 2017). These organisms are found in almost all fresh aquatic environments (Cesar & Henry 2017), living in sediment and water columns (Rodriguez & Reynoldson 2011), and in association with other organisms (Corbi et al. 2004, Alves & Gorni 2007, Gorni & Alves 2007, Gorni & Alves 2008, Oda 2015).

In addition, these worms have limited mobility and are influenced by the habitat characteristics in which they are found (Behrend et al. 2012). Thus, the richness and abundance of Oligochaeta is directly related to environmental variables (Marchese & Drago 1999, Jablonska, 2014), such as availability of food resources (Martins & Silveira, Alves 2011); dissolved oxygen (Dornfeld et al. 2006); type of substrate (Moretto et al. 2013); water temperature (Nascimento & Alves 2009), thus being considered indicators of specific habitats.

However, although common in freshwater environments (Timm et al. 2001), knowledge about Oligochaeta fauna in Brazilian fresh waters is still fragmented and incomplete (Alves et al. 2008, Takeda et al. 2017). This lacuna is mainly due to the concentration of studies related to the spatial distribution of benthic invertebrate fauna, with emphasis on insect larvae (Roque & Trivinho-Strixino 2001, Sanseverino & Nessimian, 2001), the great extent of the still unexplored parts of the Brazilian hydrographic basins (Joly et al. 2011) and the low financial investment in scientific research in the country (Agostinho et al. 2005, Magurran 2011).

However, since the 1980s, taxonomic identification keys developed specifically for South America (Brinkhurst & Marchese 1989) and Brazil (Righi 1984) encouraged new research on the Oligochaeta, addressing aspects of their ecology (Petsch et al. 2015, Rodrigues et al. 2016), their geographic distribution (Gorni & Alves, 2008, Gomes et al. 2017), their composition in anthropologically disturbed environments (Behrend et al. 2012, Rosa et al. 2014) and their use as test organisms in ecotoxicological experiments (Corbi et al. 2015, Lobo & Espindola 2016).

However, the lack of information about these organisms in Brazilian aquatic environments is still evident in many regions (Gomes et al. 2017), as well as the use of native species as bioindicators of the quality of the country's aquatic ecosystems. Thus, the main objective of this paper was to study the aquatic Oligochaeta community in selected stretches of the Juruena River (MT), providing information for future action of environmental monitoring in lotic ecosystems.

Material and Methods

1. *Study area*

For the analysis of the Oligochaeta assemblages, samples were analyzed at bimonthly intervals during the period from January to November 2009. For the regular samplings, five sites were selected from the Juruena River (Amazon River Basin), located in the State of Mato Grosso (MT) (Figure 1).

The region is demarcated by humid tropical climates to contrasting seasons. Regionally the rainy season has its beginning, usually in the month of September until the month of April. From December to March are characterized by a increase in regional rainfall (Tardy, 1986). The basin is mainly sheltered by Ombrophilous Forest (Instituto Brasileiro de Geografia Estatística, 1992). In the upper portion of the basin, close to the Juruena, the vegetation is classified as "Cerrado". The soils in the basin are largely composed of red-yellow Acrisols (29%), red-yellow Oxisols (27%) and Arenosols (18%) (Empresa Brasileira de Pesquisa Agropecuária, 1980).

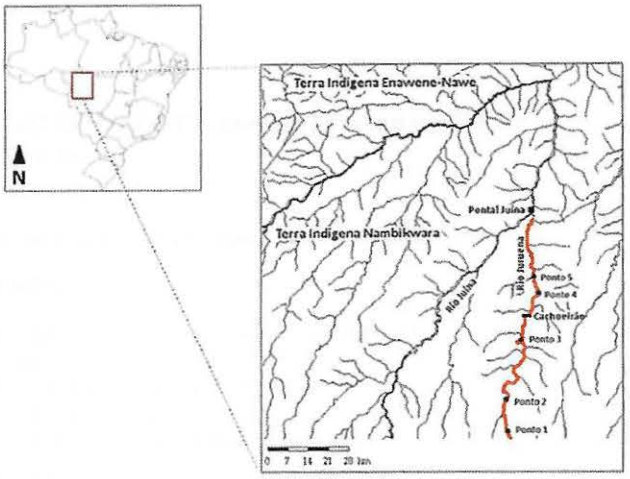

Figure 1. Map showing the location of the study area with highlight of the sampled section.

The headwaters of Rio Juruena are situated at the Parecis Plateau, in a savanna ecosystem ("cerrado"). In this area the water is totally transparent and poor in nutrients (N, P, and Ca). Biochemical oxygen demand (BOD) and fecal coliform bacteria are low, demonstrating that anthropic contributions are insignificant. Macrophytes are not abundant and are distributed in discrete and sparse stands, sometimes covering a sand plateau onshore.

The collection sites were selected considering: i) prevailing habitats, ii) easy access, and iii) adequate sites for the use of benthic fauna samplers (details of the geographical location of the sites are shown in Table 1).

2. *Data collection*

The collection of organisms followed the methodology described by Dowing (1984) and Peckrasky (1984). Thus, two methods of collecting zoobenthos were used: a) the D-net sampler in small groups of fixed macrophytes on the river margin; and b) Ekman-Birge dredge in fine sediment to collected sediment and associated organisms.

The net, with 0.30 m mesh openings, was dragged 1.0 m by the macrophyte roots, making a capture area of 0.3 m^2. The dredge, with an area of 0.0225 m^2, was launched in locations close to the margins in depths of up to 3 m. As an adopted procedure, two samples (replicas) were made with the net and dredge at each sampling site (a total of 50 sample units). Still at the sites, the collected samples were washed in a sieve with a mesh of 0.21 mm opening, fixed in 10% formalin and preserved in 70% alcohol. In the laboratory, the samples were washed again on a 0.021mm mesh granulometric sieve. The organisms were screened in a WILD® stereomicroscope with a maximal increase of 30 times.

Table 1. Relative abundance of aquatic Oligochaeta species in Juruena River, and geographic coordinates of the sampling sites. +: ≤ 10%; ◊: 10 < 50%; ■: ≥ 50%.

Species/Coordinates	Sample site				
	Site 1	Site 2	Site 3	Site 4	Site 5
	13° 22' 01" S	13° 15' 56" S	13° 04' 27" S	12° 54' 13" S	12° 51' 22" S
	59° 00' 45" W	59° 01' 10" W	58° 58' 32" W	58° 54' 47" W	58° 55' 41" W
Allonais chelata		+	+	+	+
Allonais inaequalis	+	+		◊	+
Aulodrilus pigueti	+	+			
Aulophorus costatus	+		+		+
Aulophorus lodeni		+			
Branchiura sowerbyi	+	+	+		
Brinkhurstia americana	■	■	■	■	■
Dero digitata					+
Dero pectinata			+		+
Dero sawayai				+	
Dero nivea				+	
Haplotaxis aedeochaeta	+	+	+		+
Limnodrilus hoffmeisteri	+	+			
Nais communis	+		+	◊	+
Nais elinguis	◊	+	+	+	+
Nais variabilis		+	+	+	+
Narapa bonettoi	+				
Pristina leidyi	+	+		+	+
Pristina rosea	+	+	+	+	+
Pristina menoni		+			+
Slavina evelinae	+	+	+		+

For the identification of Oligochaeta, taxonomic criteria adopted by Brinkhurst & Jamieson (1971), Righi (1984), Brinkhurst & Marchese (1989), Pinder & Brinkhurst (1994) and Timm (2009) were followed. The list of species in synonymy was based on the catalog proposed by Christoffersen (2007).

All biological material identified was deposited in the Laboratory of Ecology and Aquatic Ecotoxicology (LEEA) linked to the Department of Hydraulics and Sanitation, School of Engineering of São Carlos, University of São Paulo.

In order to verify the sensitivity of the species to the different habitats, fixed macrophytes, mainly Podostemacean species on the river margin (collected with a D-net sampler) and fine sediment (Ekman-Birge dredge) we applied Indicator Species Analysis (ISA) (Dufrene & Legendre, 1997) (alpha = 0.05). This analysis combines species relative abundance with their relative frequency of occurrence in the various groups of samplers. This analysis was made using the ''indicspecies'' package (De Caceres & Legendre, 2009) in R software (R Core Team, 2017), with 10,000 permutations.

Results

A total of 584 organisms were identified in 22 valid species comprising 11 genera. This number corresponds to less than 1% of the aquatic species described in the world and approximately 1/4 of the species registered in Brazil (Christoffersen 2007, Martin et al. 2008). The relative abundance of the Oligochaeta species are shown in Table 1. The specie *Brinkhurstia americana* showed a relative abundance greater than 50% of the total fauna in all the points sampled.

The Indicator Species Analysis (ISA) reveals five indicator species of fixed macrophytes (*Aulophorus costatus*, *Dero pectinata*, *Dero digitata*, *Dero sawayai* and *Dero nivea*), and four indicator species from fine sediment (*Aulodrilus pigueti*, *Limnodrilus hoffmeisteri*, *Aulophorus lodeni* and *Narapa bonetoi*) (Table 2).

Discussion

Listed below are the species, according to the nomenclature proposed by Timm (2017) with respective records from the Brazilian territory and ecological considerations.

Allonais chelata

Distribution: **São Paulo:** collected in urban streams by Alves and Lucca (2000) and associated with aquatic macrophytes (Alves & Gorni 2007). **Pernambuco:** Gurjaú reservoir (Marcus 1944). **Pará:** Tapajós river, Trombetas river, São Manuel River, Cuminá river, Salgado lake, Cupari river by Marcus (1942) and by Du Bois-Reymond Marcus (1947,

Table 2. Indicator Species in two collected habitats on the Juruena River (fixed macrophites and fine sediment). IV (%): species indicator value obtained by 10,000 permutations (using the Monte Carlo Method).

Taxa	Habitat	IV (%)
Aulodrilus pigueti	Fine sediment	36.1
Aulophorus costatus	Fixed macrophytes	29.7
Aulophorus lodeni	Fine sediment	20.9
Dero digitata	Fixed macrophytes	20
Dero pectinata	Fixed macrophytes	25.1
Dero sawayai	Fixed macrophytes	20
Dero nivea	Fixed macrophytes	20
Limnodrilus hoffmeisteri	Fine sediment	36.1
Narapa bonettoi	Fine sediment	20.9

1949a, 1949b). **Amazonas:** Grande Curuay lake by Marcus (1944) and Du Bois-Reymond Marcus (1944, 1947). **Rio Grande do Sul:** areas of irrigated rice fields (Sternert et al. 2012).

Allonais inaequalis

Distribution - **São Paulo**: associated with gastropods of the species *Pomacea bridgesii* (Gorni & Alves 2006); associated with aquatic macrophytes (Alves; Gorni, 2007); and sponges of the species *Metania spinata* (Gorni & Alves 2008a). It was also collected in the sediment of urban streams (Alves et al. 2006; Sanches et al. 2016). **Rondônia:** Cuniã lake by Gomes et al. (2017).

Aulodrilus pigueti

Distribution: **Paraná:** Patos Lake and Ivinhema River (Montanholi-Martins & Takeda 2001); in the Paraná River (Montanholi-Martins & Takeda, 1999); in different floodplain habitats of the Paraná River (Ragonha & Takeda, 2014, Petsch et al. 2015), in several reservoirs in the state of Paraná (Moretto et al. 2013); in the Paraná River, in the Ilha Grande National Park, between the states of Mato Grosso do Sul and Paraná (Ragonha et al. 2013); in tributaries of the Paraná River (Ragonha et al. 2014); in Ivinhema River and Baía River (Behrend et al. 2009) and Iguaçu River (Behrend et al. 2012). **São Paulo**: marginal lagoon of the Mogi-Guaçu River (Alves & Strixino 2000, 2003). **Mato Grosso do Sul:** Negro River (Takeda et al. 2000). **Piauí:** collected in the Poti River by Sales et al. (2014). **Rio Grande do Sul:** in areas of irrigated rice fields (Sternert et al. 2012).

Aulophorus costatus

Distribution - **Paraná**: Patos Lake and Ivinhema tributary (Montanholi-Martins & Takeda 2001). **São Paulo:** in the city of São Paulo (Marcus 1942, 1943); associated with the gastropod *Pomaceae bridgesii* (Gorni & Alves 2006); associated with submerged macrophytes (Alves & Gorni 2007); in reservoirs (Pamplin et al. 2005). **Mato Grosso do Sul:** Negro River (Takeda et al. 2000). **Rondônia:** Cuniã Lake by Gomes et al. (2017).

Aulophorus lodeni

Distribution – **São Paulo:** In the Infernão lagoon associated with the rhizosphere of the *Scirpus cubensis* macrophyte (Correia & Trivinho-Strixino 1998), associated with the *Scirpus*, *Eichhornia* and *Salvinia* macrophytes in the Infernão lagoon by Trivinho-Strixino et al. (2000). **Pará:** in the Cupari River (Marcus 1942, Du Bois-Reymond Marcus 1947, 1949a, 1949b).

Branchiura sowerbyi

Distribution - **São Paulo:** Tietê River (Marcus 1942, 1943, Du Bois-Reymond Marcus, 1949a); in the Salto Grande eutrophic Reservoir (Dornfeld et al. 2006); Americana Dam by Pamplin et al. (2006); in the Monjolinho dam in the city of São Carlos (Fusari & Fonseca-Gessner 2006); Tietê River reservoirs by Pamplin et al. (2005) and by Suriani et al. (2007) and in a marginal lagoon of the Mogi-Guaçu River (Alves & Strixino 2000, 2003). **Paraná:** in several reservoirs in the state of Paraná (Moretto et al. 2013) and in the Iguaçu River (Behrend et al. 2012). **Piauí:** Poti River by Sales et al. (2014).

Brinkhurstia americana

Distribution - **São Paulo:** urban streams (Alves & Lucca 2000, Alves et al. 2006; Sanches et al. 2016); in the Ribeirão das Anhumas reservoir (Corbi & Trivinho-Strixino 2002); sediments of the Ponte Nova and Bariri reservoirs (Pamplin et al. 2005). **Paraná:** Ivinhema River and associated with the macrophyte *Eichhornia azurea* in the Patos lake (Montanholi-Martins & Takeda 2001), in the Paraná River (Montanholi-Martins & Takeda 1999); in Ivinhema River and Baía River (Behrend et al. 2009); in Iguaçu River (Behrend et al. 2012) and in several reservoirs in the state of Paraná (Moretto et al. 2013). **Mato Grosso do Sul:** Negro River (Takeda et al. 2000).

Dero digitata

Distribution - **São Paulo:** associated with the gastropod *Pomaceae bridgesii* (Gorni & Alves 2006); associated with aquatic macrophytes (Alves & Gorni,2007); in the Tietê River dam (Pamplin et al. 2005) and urban streams (Alves &, Lucca 2000, Rosa et al. 2014). **Mato Grosso do Sul:** Negro River (Takeda et al. 2000). **Pará:** Tapajós, Cururu, Acará, São Manuel, Cupari and Juruena rivers and in the cities of Fordlandia, Belterra, Santarém and Itaituba (Marcus 1942, 1944, Du Bois-Reymond Marcus 1947, 1949a, 1949b). **Amazonas:** Grande Curuay Lake (Marcus 1944, Du Bois-Reymond Marcus 1944, 1947). **Rondônia:** Cuniã Lake (Gomes et al. 2017). **Paraná:** Iguaçu River (Behrend et al 2012); in different habitats of the Paraná River floodplain (Ragonha & Takeda 2014), in several Paraná state reservoirs (Moretto

et al. 2013) and associated with the macrophytes *Hydrilla verticillata* and *Egeria najas* collected in the Paraná River and Leopoldo Backwater (Behrend et al. 2013). **Rio Grande do Sul:** in areas of irrigated rice fields (Sternert et al. 2012).

Dero pectinata

Distribution – **Paraná:** Patos Lake, in the floodplain of the Paraná River (Montanholi-Martins & Takeda 2001), in different floodplain habitats of the Paraná River (Ragonha & Takeda 2014). **São Paulo:** was collected in reservoirs (Marcus 1943, Pamplin et al. 2005), in sediment of Ribeirão das Anhumas reservoir (Corbi & Trivinho-Strixino, 2002); in an urban stream (Alves & Lucca 2000, Alves et al. 2006) and in Tietê river reservoirs (Suriani et al. 2007). **Mato Grosso do Sul:** Negro River (Takeda et al. 2000).

Dero sawayai

Distribution: **São Paulo**: in streams (City of São Paulo) and Rio Claro by Marcus (1943), associated with gastropods (Gorni & Alves, 2006), associated with submerged macrophytes (Alves & Gorni 2007); associated with the sponge *Metania spinata* (Gorni, Alves, 2008a) and in urban impacted streams (Sanches et al. 2016). **Paraná:** associated with the macrophytes *Hydrilla verticillata* and *Egeria najas* collected in the Paraná River and the Leopoldo Backwater (Behrend et al. 2013), in the Iguaçu River (Behrend et al. 2012) and the Paraná River in the Ilha Grande National Park, between the states of Mato Grosso do Sul and Paraná (Ragonha et al. 2013); in different floodplain habitats of the Paraná River (Ragonha & Takeda, 2014); in tributaries of the Paraná River (Ragonha et al. 2014); in Baía River in artificial substrates (Fujita et al. 2015) and Ivinhema and Baía rivers (Behrend et al., 2009). **Minas Gerais:** associated with decomposing leaves of *Eichhornia azurea* in Manacás Lake (Martins et al. 2011). **Ceará:** was found among individuals of the species *Stolella agilis* f. *iheringi* (Marcus 1942, 1943). **Alagoas:** was found in the city of Satuba, in an artificial tank (Marcus 1943, 1944). **Pernambuco:** São Francisco River (Marcus 1943, 1944). **Rio Grande do Sul:** in areas of irrigated rice fields (Sternert et al. 2012).

Dero nivea

Distribution: **São Paulo**: macrophyte rhizosphere (Correia &Trivinho-Strixino 1998); marginal lagoon of the Mogi-Guaçu River (Alves & Strixino 2000); associated with macrophytes in Infernão Lagoon (Trivinho-Strixinoet al. 2000); in the sediments of the Ribeirão das Anhumas reservoir (Corbi & Trivinho-Strixino 2002), in Tietê river reservoirs (Pamplin et al. 200, Suriani et al. 2007); associated with gastropods (Gorni & Alves 2006), in submerged macrophytes (Alves & Gorni 2007); associated with the sponge *Metania spinata* (Gorni & Alves 2008a) and in urban impacted streams (Sanches et al. 2016). **Rio Grande do Sul**: in areas of irrigated rice fields (Sternert et al. 2012). **Rondônia:** Cuniã Lake (Gomes et al. 2017).

Haplotaxis aedeochaeta

Distribution - **Paraná**: Detected in the Ivinhema River (Montanholi-Martins; Takeda, 2001); Parana River (Montanholi-Martins & Takeda 1999); in floodplain areas of the Parana River (Ragonha & Takeda, 2014, Petsch et al. 2015), in Rio Ivinhema (Behrend et al. 2009), and in tributaries of the Paraná River (Ragonha et al. 2014).

Limnodrilus hoffmeisteri

Distribution: **São Paulo:** in cement tanks of the University of São Paulo, in streams of the Jardim Europa and Rio Tietê (Marcus 1942), in urban streams (Alves & Lucca 2000, Alves et al. 2006, Rosa et al. 2014, Sanches et al. 2016); in marginal lagoon of the Mogi-Guaçu River, by Alves and Strixino (2000, 2003), in the Tietê River reservoir (Pamplin et al. 2005, Suriani et al. 2007), in the Salto Grande eutrophic Reservoir (Dornfeld et al. 2006), in the American Dam (Pampli et al. 2006), in the dam Monjolinho (Fusari & Fonseca-Gessner 2006), in the Monjolinho reservoir (Fusari et al. 2006); in Monte Alegre Lake (Cleto-Filho & Arcifa 2006), in streams of the Intervales State Park (Alves et al. 2008); Galharada and Serrote streams (Gorni & Alves 2008b), in mesohabitats of Galharada stream (Gorni & Alves 2012). **Paraná:** Iguaçu River (Behrend et al. 2012) and Paraná River, in the Ilha Grande National Park, between the states of Mato Grosso do Sul and Paraná (Ragonha et al. 2013); in the Paraná River (Montanholi-Martins & Takeda, 1999); in different floodplain habitats of the Paraná River (Ragonha & Takeda 2014), in several reservoirs in the state of Paraná (Moretto et al. 2013); in the Paraná River tributaries (Ragonha et al. 2014) and Ivinhema and Baía rivers (Behrend et al. 2009). **Rio Grande do Sul:** Quadros lagoon, with muddy sediment and weakly brackish water (Marcus 1944). **Minas Gerais:** occurred in a stream of the Atlantic Forest (Rosa et al. 2015); in the São Pedro stream (Martins et al. 2008) and in an urban stream (Frizzera & Alves 2012). **Piauí:** Poti River by Sales et al. (2014).

Nais communis

Distribution: **São Paulo**: associated with the sponge *Ephydatia crateriformis* (Marcus, 1943), the sponge *Radiospongilla amazonenses* (Corbi et al. 2005) and the sponge *Metania spinata* (Gorni & Alves 2008a); associated with the macrophytes (Trivinho-Strixino et al. 2000, Alves & Gorni 2007); sediment of urban streams (Alves & Lucca 2000); associated with gastropods (Gorni & Alves 2006, Martins & Alves 2008); sediment of the Monjolinho River (Alves et al. 2006); associated with bryophytes of the genus *Fissidens* sp. and *Philonotis* sp. (Gorni & Alves 2007); Campo do Meio and Galharada streams (Gorni; & Alves 2008b, Gorni & Alves 2012), streams of the Intervales Park (Alves et al. 2008); was detected in impacted urban streams (Rosa et al. 2014, Sanches et al. 2016). **Minas Gerais**: detected in first order streams of preserved areas (Rodrigues et al. 2013) and in an urban stream (Frizzera & Alves 2012). **Paraná**: Paraná River, in the Ilha Grande National Park, between the states of Mato Grosso do Sul and Paraná (Ragonha et al. 2013), in the Iguaçu River (Behrend et al. 2012); in different floodplain habitats of the Paraná River (Ragonha & Takeda 2014, Petsch et al. 2015); associated with the macrophytes *Hydrilla verticillata* and *Egeria najas* collected in the Paraná River and Leopoldo Backwater (Behrend et al. 2013); in tributaries of the Paraná River (Ragonha et al.,2014); Baía River, in artificial substrates (Fujita et al. 2015) and Ivinhema and Baía rivers (Behrend et al. 2009). **Alagoas**: was found by Marcus (1944) in the Paulo Afonso waterfall. **Pará:** near Belterra by Marcus (1942) and Du-Bois Reymond Marcus 1947, 1949a, 1949b).

Nais elinguis

Distribution - **São Paulo:** associated with the gastropod *Pomaceae bridgesii* (Gorni & Alves 2006).

Nais variabilis

Distribution - **São Paulo:** associated with Odonata larvae *Elasmothemis cannacrioides* and *Mnesarete* sp. (Corbi et al. 2004); associated with submerged aquatic macrophytes (Alves & Gorni,2007); leaf litter of Galharada stream (Gorni & Alves 2008b, Gorni & Alves 2012) and was detected in impacted urban streams (Sanches et al. 2016). **Minas Gerais**: it was detected in first order streams of preserved areas (Rodrigues et al. 2013). **Mato Grosso do Sul:** Negro River (Takeda et al. 2000).

Narapa bonettoi

Distribution - **Paraná**: Ivinhema River (Montanholi-Martins; Takeda, 2001; Takeda et al. 2001); the Parana River (Montanholi-Martins & Takeda 1999); Ivinhema and Baía River (Behrend et al. 2009); in several reservoirs in the state of Paraná (Moretto et al. 2013), in floodplain areas of the Paraná River (Ragonha & Takeda 2014, Petsch et al. 2015) and in tributaries of the Paraná River (Ragonha et al. 2014) **São Paulo:** Gouveia stream (Alves et al. 2006; Alves et al. 2006). **Mato Grosso do Sul:** Negro River (Takeda et al. 2000).

Pristina leidyi

Distribution - **São Paulo:** associated with colonies of *Ephydatia crateriformis* sponges, in the Araguá River sediment (Marcus 1943); (Alves & Gorni 2007), associated with the *Metania spinata* sponge (Gorni & Alves 2008a), associated with gastropods of the species *Pomacea bridgesii* (Gorni & Alves 2006), associated with submerged macrophytes (Gorni & Alves 2008b), in mesohabitats of the Galharada stream (Gorni & Alves 2012) and was detected in impacted urban streams (Sanches et al. 2016). **Paraná:** in Ivinhema River (Behrend et al. 2009); Iguaçu River (Behrend et al. 2012); in tributaries of Paraná River (Ragonha et al. 2014) and Baía River, in artificial substrates (Fujita et al. 2015). **Minas Gerais:** occurred associated with decomposing leaves of *Eichhornia azurea* in Manacás Lake (Martins et al. 2011); in first order streams of preserved areas (Rodrigues et al. (2013) and associated with bryophytes (Rodrigues et al. 2016). **Alagoas:** in a creek of the city of Garça Torta (Du Bois-Reymond Marcus 1947). **Pernambuco:** São Francisco river (Marcus 1944). **Rio Grande do Sul**: in areas of irrigated rice fields (Stenert et al. 2012). **Amazonas**: near Humaitá by Marcus, (1943) and Du Bois- Reymond Marcus (1947, 1949a, 1949b).

Pristina rosea

Distribution - **São Paulo:** Pinheiros River and the campus of the University of São Paulo associated with bromeliads (Marcus 1943), in the Tietê River associated to the plant of the genus *Calathea* sp. (Marcus 1944); in urban streams and a rural stream (Alves et al. 2006); in the Monjolinho reservoir, organically enriched (Fusari & Fonseca-Gessner 2006); associated with bryophytes of the genus *Fissidens* sp. and *Philonotis* sp. (Gorni & Alves 2007); in streams of low order of the Campos do Jordão State Park, characterized by cold waters, rapids and stony bed (Gorni & Alves 2008b), in mesohabitats of the Galharada stream (Gorni & Alves 2012) and was evidenced in impacted urban streams (Gorni et al., 2017). **Minas Gerais**: occurred in first-order streams of preserved areas (Rodrigues et al. 2013); associated with bryophytes (Rodrigues et al. 2016) and in a stream of the Atlantic Forest (Rosa et al. 2015). **Pernambuco:** city of Recife, in pools of water (Marcus 1944) and in Tegipió (Marcus 1943).

Pristina menoni

Distribution: **São Paulo:** urban streams (Alves et al. 2006, Sanches et al. 2016), associated to bryophytes of the genus *Fissidens* sp. and *Philonotis* sp. collected in the Jacaré Pepira River (Gorni & Alves 2007). **Paraná:** Ivinhema River (Montanholi-Martins & Takeda 2001). **Minas Gerais:** associated with bryophytes (Rodrigues et al. 2016). **Rondônia:** Cuniã Lake (Gomes et al. 2017).

Slavina evelinae

Distribution - **São Paulo:** in cement tanks of the University of São Paulo, associated to *Ficus elastica* (Marcus 1942); Canindé lake (Marcus 1944), macrophyte rhizosphere (Correia &Trivinho-Strixino 1998), in the sediment of the Ribeirão das Anhumas reservoir (Corbi & Trivinho-Strixino 2002), in the Tietê river reservoir sediment (Pamplin et al. 2005, Suriani et al. 2007); in submerged macrophytes (Alves & Gorni 2007) and was evidenced in impacted urban streams (Sanches et al. 2016). **Paraná:** in Ivinhema and Baía rivers (Behrend et al. 2009); Paraná River, between the states of Mato Grosso do Sul and Paraná (Ragonha et al. 2013); in different floodplain habitats of the Paraná River (Ragonha &Takeda 2014); in the Iguaçu River (Behrend et al. 2012); associated with the macrophytes *Hydrilla verticillata* and *Egeria najas* collected in the Paraná River and the Leopoldo Backwater (Behrend et al. 2013); found in floodplain areas of the Paraná River (Petsch et al. 2015) and in the Paraná River tributaries (Ragonha et al. 2014). **Ceará:** associated with bryozoans of the species *Stolella agilis* (Marcus 1942). **Rio Grande do Sul**: in areas of irrigated rice fields (Stenert et al. 2012). **Mato Grosso do Sul:** Negro River (Takeda et al. 2000). **Minas Gerais:** urban streams (Frizzera & Alves 2012). **Pernambuco:** Near São Bartolomeu (Marcus 1942, 1943). **Pará:** in several rivers of the state (Marcus 1942, Du Bois-Reymond Marcus 1947, 1949a, 1949b).

Based on species distribution patterns and habitat preference (ISA) in the Juruena River, we concluded that *Dero* species are associated with marginal regions of aquatic ecosystems, mainly occurring as aquatic macrophytes. This condition demonstrates the susceptibility of this species group to samplers such as D-net. *Limnodrilus hoffmeisteri*, *Aulodrilus pigueti, Narapa bonettoi* and *Aulophorus lodeni* were related with depositional zones, where fine sediments occur. *L. hoffmeisteri* are also registered as being associated to organic enrichment conditions and/or some degree of environmental degradation.

Thus, in order to increase the efficiency of future environmental quality monitoring programs carried out in the region, cautious monitoring of these species in other parts of the Amazon River Basin is advisable.

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Author Contributions

Guilherme Rossi Gorni: Substantial contribution in the concept and design of the study; Contribution to data analysis and interpretation;

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Conflicts of interest

The author(s) declare(s) that they have no conflict of interest related to the publication of this manuscript.

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