




First records of non-native species Malaysian prawn *Macrobrachium rosenbergii* (Decapoda: Palaemonidae) in an important South American hydrographic system

Primeiro registro da espécie não nativa camarão da Malásia *Macrobrachium rosenbergii* (Decapoda: Palaemonidae) em um importante sistema hidrográfico sul-americano

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Abstract: Aim: The objective of this work is to record the occurrence of non-native species *Macrobrachium rosenbergii* in water bodies of the Piquiri River basin, State of Paraná, Brazil, an important South American hydrographic system. **Methods:** Samples were obtained from October 2015 to June 2016 and from September 2017 to September 2018, using traps and electric fishing equipment (portable alternating current generator, 2.5 kW, 400 V, 2A) in the Piquiri River and two tributaries. **Results:** 16 *M. rosenbergii* specimens were caught, 11 females and 5 males. **Conclusions:** Our results indicated the introduction of the species *M. rosenbergii* into the Piquiri River basin by aquaculture activity. The constant insertion of new specimens by the productive sector may, in the short term, maintain populations with large number of individuals, causing potential damage to the native biodiversity.

Keywords: aquaculture; biological invasion; crustaceans; propagule pressure; species introduction.

Resumo: Objetivo: Este trabalho tem como objetivo registrar a ocorrência da espécie não nativa *Macrobrachium rosenbergii* na bacia hidrográfica do rio Piquiri, Estado do Paraná, Brasil, um importante sistema hidrográfico Sul-Americano. **Métodos:** As amostras foram coletadas de outubro de 2015 a junho de 2016 e de setembro de 2017 a setembro de 2018, utilizando armadilhas e equipamento elétrico de pesca (gerador de corrente alternada portátil, 2,5 kW, 400 V, 2A) no rio Piquiri e dois afluentes. **Resultados:** 16 espécimes de *M. rosenbergii* foram capturados, 11 fêmeas e 5 machos. **Conclusões:** Nossos resultados indicaram a introdução da espécie *M. rosenbergii* na bacia do rio Piquiri pela atividade de aquicultura. A constante inserção de novos espécimes pela aquicultura pode manter populações com elevado número de indivíduos, ocasionando potenciais danos à biodiversidade nativa.

Palavras-chave: aquicultura; invasão biológica; crustáceos; pressão de propágulos; introdução de espécies.



Originally occurring in South and Southeast Asia, parts of Oceania, and some Pacific islands (New, 2000), the Malaysian prawn, *Macrobrachium rosenbergii* (de Man, 1879), has aroused the interest of aquaculture farmers and currently, it has been introduced in over 40 countries (Iketani et al., 2011). In Brazil, due to the expansion of continental aquaculture, especially the production of Nile tilapia (*Oreochromis niloticus*) (Linnaeus, 1758), and the viability of polyculture production including prawns, there is a warning signal for new species introductions in Brazilian inland waters. In this scenario, the State of Paraná stands out as the main vector of new introductions, given that it is the largest tilapia producer in Brazil (IBGE, 2017) and a precursor in the implementation of systems for farming fish and prawns together in the western region of the state (Dutra et al., 2015). This way, the present study describes the first records of the species *M. rosenbergii* in water bodies of the Piquiri River basin, State of Paraná, Brazil.

Samples were obtained monthly from October 2015 to June 2016 in the Piquiri River and its tributary São Pedro Stream, and quarterly from September 2017 to September 2018 in Pioneiro Stream (Figure 1). The selection of these environments was based on the presence of aquaculture farms (i.e., freshwater prawn farming) with production of the species *M. rosenbergii*.

Due to the environmental characteristics of the sampled sites (great depth and flow), captures were performed using traps with three different funnel sizes to minimise specimen size selectivity. The traps were arranged equidistantly, in sets of three units, in the water outlets of the cultivation ponds, as well as in the water bodies receiving the effluent water. For the samplings performed in Pioneiro Stream, we used electric fishing equipment (portable alternating current generator, 2.5 kW, 400 V, 2A) with three successive captures and constant catch per unit effort (CPUE) in segments of approximately 50 metres delimited by multifilament nets, at three sampling

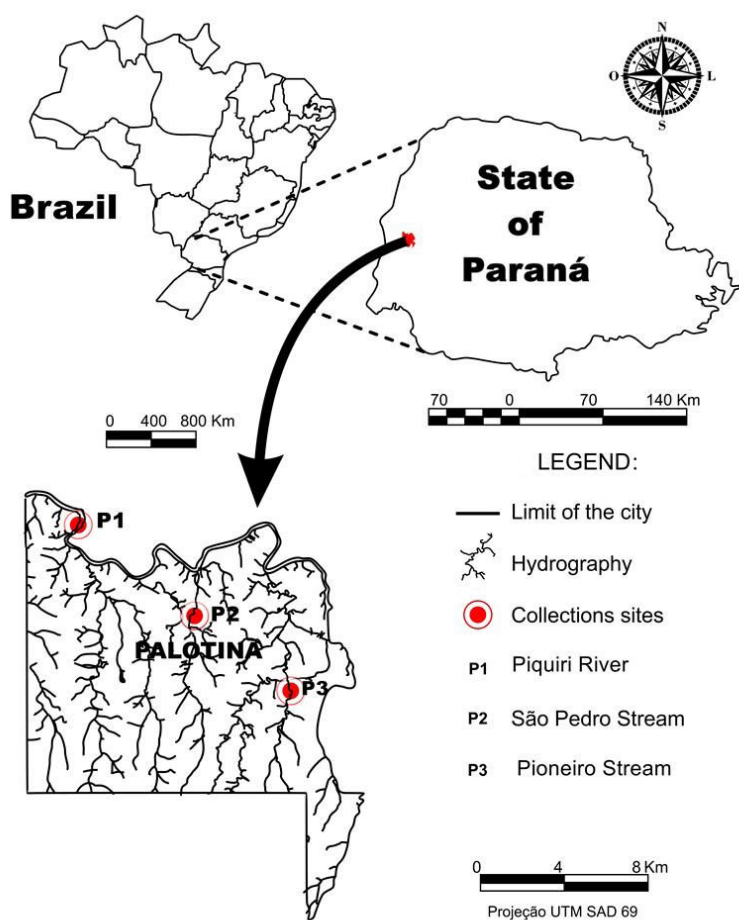


Figure 1. Collection sites of Malaysian prawn *Macrobrachium rosenbergii* along the Piquiri River basin municipality of Palotina, State of Paraná, southern Brazil.

sites (headwaters, middle section, and mouth of the stream).

The collected individuals were taken to the Laboratory of Ecology, Fishing and Ichthyology, Federal University of Paraná, Palotina Sector, for taxonomic identification following specialised identification keys (Dore & Frimodt, 1987; Sampaio et al., 2009). All specimens collected remain deposited in the Crustacean Collection of the Capão da Imbuia Natural History Museum, Curitiba, State of Paraná, Brazil (MHNCI 5556; 5557; 5558; 5561; 8702).

In December 2015, we caught eight female specimens of *M. rosenbergii* in the Piquiri River and one male specimen in São Pedro Stream. In July 2018, we caught seven specimens in Pioneiro Stream, four males and three females (Table 1).

The comparison with the specialised literature (New et al., 2010; Pinheiro & Hebling, 1998), as well as the direct comparison with specimens from cultivated areas, allowed confirming the capture of the species (Figure 2a). The species *M. rosenbergii* differs from the other species of the genus by its long and upwardly curved rostrum, presenting between eight and fifteen dorsal teeth, and six to sixteen ventral teeth (Figure 2b). The chelipedal carpus is distinctly larger than the merus, and the telson tip reaches far beyond the longer posterior spines (Figure 2c).

The introduction of a new cultivated species observed throughout the present study reflects a common situation in developing countries. The demand for rapid economic growth encourages the use of non-native species with globally consolidated technology systems to

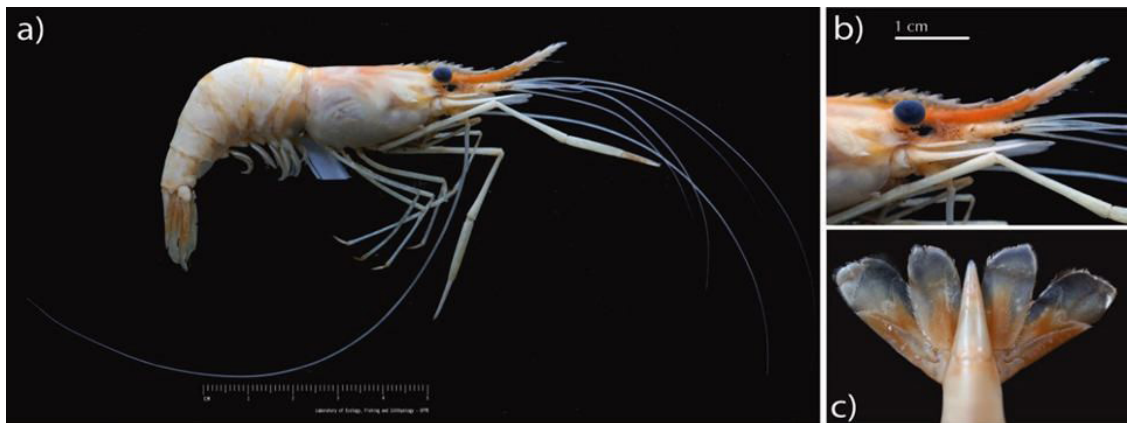


Figure 2. (a) Captured female specimen of Malaysian prawn *Macrobrachium rosenbergii*; (b) Detailing of the long and upwardly curved rostrum; (c) Detailing of the telson reaching far beyond the longer posterior spines.

Table 1. Identification number, deposit record at the Capão da Imbuia Natural History Museum (MHNCI), location, capture date, sex, carapace length (Cl), and weight in grams of Malaysian prawn *Macrobrachium rosenbergii* specimens.

Identification Number	MHNCI	Location	Latitude S	Longitude O	Capture Date	Sex	Cl	Weight (g)
46	5556	Piquiri River	24°08'46.4"	53°54'51.5"	dec/15	Female	2.8	1.7
54	5556	Piquiri River	24°08'46.4"	53°54'51.5"	dec/15	Female	1.7	0.46
56	5556	Piquiri River	24°08'46.4"	53°54'51.5"	dec/15	Female	2.2	0.74
59	5556	Piquiri River	24°08'46.4"	53°54'51.5"	dec/15	Female	2	0.57
68	5556	Piquiri River	24°08'46.4"	53°54'51.5"	dec/15	Female	1.8	0.34
51	5561	Piquiri River	24°08'46.4"	53°54'51.5"	dec/15	Female	1.7	0.57
70	5557	Piquiri River	24°08'46.4"	53°54'51.5"	dec/15	Female	2.3	0.2
72	5557	Piquiri River	24°08'46.4"	53°54'51.5"	dec/15	Female	1.7	0.56
23	5558	São Pedro Stream	24°18'13"	53°43'46"	jun/16	Male	5.2	7.26
2	8702	Pioneiro River	24°18'37"	53°48'53.1"	jun/18	Female	2.6	9.37
3	8702	Pioneiro River	24°18'37"	53°48'53.1"	jun/18	Male	3.1	2.5
17	8702	Pioneiro River	24°18'37"	53°48'53.1"	jun/18	Male	7.2	24.14
18	8702	Pioneiro River	24°18'37"	53°48'53.1"	jun/18	Male	5.4	12.97
19	8702	Pioneiro River	24°18'37"	53°48'53.1"	jun/18	Female	5	10.46
36	8702	Pioneiro River	24°18'37"	53°48'53.1"	jun/18	Female	4.2	4.96
750	8702	Pioneiro River	24°18'37"	53°48'53.1"	jun/18	Male	15.4	29.43

the detriment of native species, thus increasing the risks of biological introductions and invasions (Pelicice et al., 2017). With respect to *M. rosenbergii*, information about its potential negative impact on biodiversity—although concentrated in estuarine regions—has indicated the high risk of invasion (Iketani et al., 2016). It is well known that the species *M. rosenbergii* inhabits tropical rivers, lakes, and reservoirs; however, it needs access to adjacent areas of brackish water, which is essential for achieving complete larval development and reproductive cycle (Pinheiro & Hebling, 1998). However, even though they are unable to naturally complete their reproductive cycle within the Piquiri River basin, due to the lack of connectivity with estuarine regions, the constant insertion of new specimens by the productive sector may (propagule pressure), in the short term, artificially maintain populations with large number of individuals. This fact would result in the recruitment of new specimens, thus causing potential damage to the native biodiversity. In this way, we highlight that some actions are necessary to prevent escapes like education of freshwater prawn farmers to understand the non-native species concept and their environmental risks, adoption of structural measures to minimize the escape of non-native species from aquaculture facilities (e.g. screens, covers, control structures and containment ponds), as well as improvement of inspections and monitoring by Brazilian Environmental Agencies (see Nobile et al., 2019).

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