

ARTÍCULO BREVE

FIRST RECORD OF INVASIVE SNAIL *Melanooides tuberculatus* (MÜLLER)
(GASTROPODA: PROSOBRANCHIA: THIARIDAE) FOR THE IGUAZÚ
RIVER BASIN, ARGENTINA – BRAZIL.

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ABSTRACT

In this work is reported the first record of *Melanooides tuberculatus* in the Iguazú River basin (Argentina-Brazil). This species is native to southern Asia and was anthropogenically introduced to America in the 1960s decade. Sixteen specimens (one adult and 15 juvenile) of *M. tuberculatus* were recorded at only one site, the rapids of Iguazú River at Isla San Martín, Iguazú National Park, Argentina, in June 2005. This finding of *M. tuberculatus* specimens suggests the presence of a stable population that would represent a threat to the native mollusk fauna, given that this species promotes replacement and impoverishment of mollusk diversity.

KEY WORDS: freshwater environment, Iguazú National Park, impact, invasive mollusk.

RESUMEN

Primera mención del caracol invasor *Melanooides tuberculatus* (Müller) (Gastropoda: Prosobranchia: Thiaridae) para la Cuenca del Río Iguazú, Argentina – Brasil. En este trabajo se reporta el primer registro de *Melanooides tuberculatus* en la cuenca del río Iguazú (Argentina-Brasil). Esta especie es nativa del sudeste asiático y fue introducida por el hombre en el continente americano en la década de 1960. Dieciséis ejemplares (un adulto y 15 juveniles) de *M. tuberculatus* fueron colectados en junio de 2005 en un solo sitio del Parque Nacional Iguazú (Argentina), correspondiente a los rápidos de la Isla San Martín. Este hallazgo sugiere la presencia de una población estable que podría representar una amenaza a la fauna de moluscos nativa, dado que esta especie provoca un reemplazo y empobrecimiento de la diversidad de moluscos.

PALABRAS CLAVE: ambientes dulceacuícolas, impacto, moluscos invasores, Parque Nacional Iguazú.

Melanooides tuberculatus (Müller, 1774) was recorded for the first time in Argentina in 1999 (Peso & Quintana, 1999) in Paraná River, at the area of Yacyretá dam (27°23'S 55°54'W), six years after filled. This dam greatly modified the natural habitat, which was transformed from a river with rapids and numerous falls into a lake. Only one year later, the species was widely dominant among the mollusks found in the stomach content of benthofagous fish from the reservoir (Quintana *et al.*, 2001-2002), and currently there exists a stable population of this exotic species in the area (Peso *et al.*, 2004). Previous to the filled of the

reservoir, three native species of genus *Aylacostoma* (Thiaridae) were in this area, namely *A. guaraniticum* (Hylton Scott, 1951), *A. chloroticum* Hylton Scott, 1954 and *A. stigmaticum* Hylton Scott, 1954. According to Quintana & Mercado Laczkó (1997), these species can be considered nowadays extinct in their natural habitat.

Melanooides tuberculatus is native to southern Asia (its typical locality is Coromandel coast, India) and was anthropogenically introduced to America in the 1960s (Texas, USA) (Murray, 1964). It was first recorded in South America at Brazil (Santos, São

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Paulo) in 1967, and since 1984 it has been collected from tributaries of the upper Paraná River in the states of São Paulo and in the Lake Paranoá, Brasília (Vaz *et al.*, 1986), Goiás (Rocha-Miranda & Martins-Silva, 2006) Mato Grosso do Sul and Paraná (Fernandez *et al.*, 2003). The species is presumed to have dispersed southwards from these localities in spontaneous or accidental way, like linked to the aquatic plant trade.

Like other invasive species, *M. tuberculatus* has life history traits characteristic of 'r' strategists: it is euryoic, with early maturity, relatively short life span and extremely high fecundity. The combination of iteroparity, parthenogenetic reproduction and parental care have allowed this prosobranch to successfully compete with pulmonate species (also efficient 'r' strategists) in the colonization and occupation of freshwater and brackish habitats in many parts of the world (Quintana *et al.*, 2001-2002). Despite the lack of genetic recombination entailed by this reproductive mode, parthenogenesis is advantageous in this case because it facilitates rapid exploitation of recently colonized environments: a single isolated individual is able to generate a new colony. This species goes through an early phase of exponential growth when colonising new environments, and reaches maximum density within the first two years (Quintana *et al.*, 2001-2002):

In Asia and Africa, *M. tuberculatus* acts as intermediate host for parasites of man and domestic animals (*Paragonimus* Braun, 1899 and *Clonorchis* Loos, 1907). To date, no specimens infected with *Paragonimus* species have been detected in America.

The goal of this work is to report the first record of *M. tuberculatus* in the Iguazú River basin. This goal is part of a larger project for the inventory of freshwater mollusks of Iguazú National Park (INP), Argentina.

Iguazú National Park was created in 1934 and encompasses ca. 67,620 hectares. In 1984 it was declared Natural World Heritage because of the high biological diversity of the subtropical forest (Paranensean Forest) and the numerous waterfalls that are approximately 75 m high. This INP is located in the extreme NE of the Argentine Republic; the climatic characteristics (1600 mm annual precipitation, 21.1° C mean annual temperature) generate a wide habitat diversity supporting the existence of varied flora and fauna. The waterfalls harbor plants and animals that are specially adapted to the constant moisture and the force of water. Abundant islands covered by a distinct type of forest exist along the upper course of the Iguazú River.

Nine seasonal field surveys were performed from December 2003 to December 2005 at INP, Argentina. Sampling encompassed the main course of Iguazú River, as well as creeks and sloughs within the INP, with a total of 75 different sampling sites. The figure 1 show some of them. Materials determined during these field trips were deposited in the Invertebrate Zoology Collection, Museo de La Plata (MLP), Facultad de Ciencias Naturales y Museo, Universidad Nacional de La Plata.

Sixteen specimens of *Melanoides tuberculatus* were only recorded at one site, the rapids of Iguazú River at Isla San Martín (25°41.314'S 54°26.531'W), in June 2005. This site was sampled on three occasions

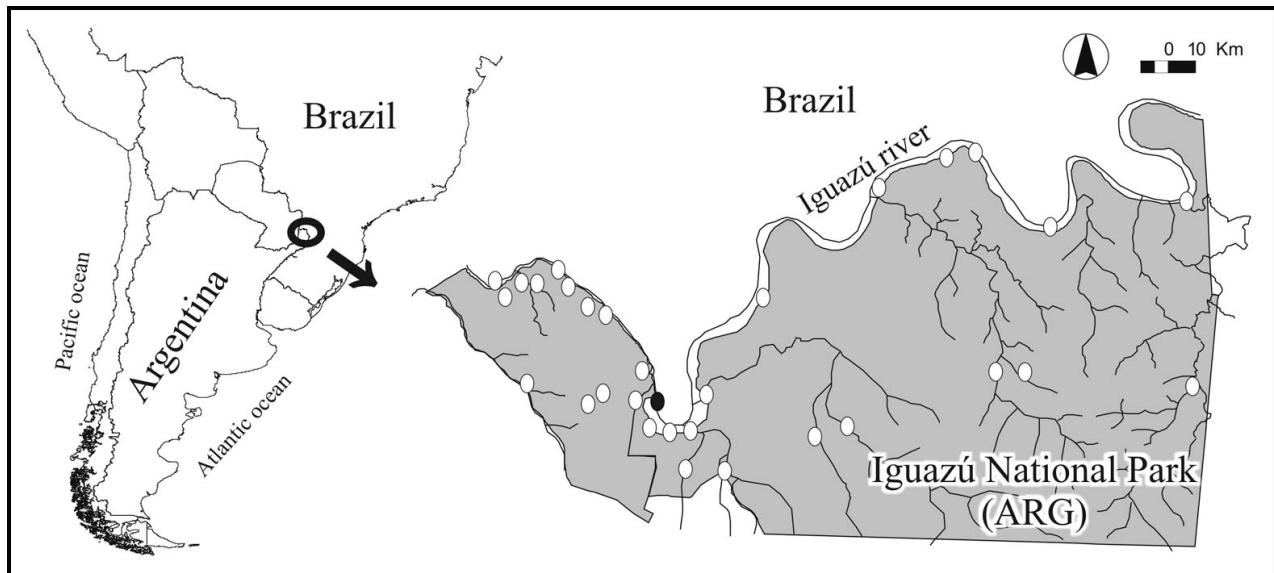


Figure 1. Sampling sites (31) at Iguazú National Park. Empty circles, *M. tuberculatus* absent; full circle, presence of *M. tuberculatus*.

only (June 2004, June and December 2005) because the high level of Iguazú River hindered access to the area at other times. The environment at the sampling site comprises a smooth basaltic substrate with little vegetation and fast water flow that gives origin to the 'Salto Tres Mosqueteros' waterfall.

The material collected (MLP N° 12576) is the shell of an adult specimen (figure 2), 20.5 mm in total length. The coloration is uniformly brownish without evident bands, similar to that of specimens recorded in Rio de Janeiro, Brazil (MLP N° 12574). Fifteen juvenile specimens, $1.33 \text{ mm} \pm 0.41$ in total length (figure 3), were also collected at the same site; these were scattered on the basaltic substrate. Although the determination of juvenile specimens is not easy, in this case their size was much smaller than that of the native thiarid species (*Aylacostoma* spp.), whose minimum size at birth is between 7 and 8 mm (Castellanos, 1981). In contrast, the young *M. tuberculatus* are between 2.4 and 3 mm at birth (Quintana *et al.*, 2001-2002), much more similar to the dimensions recorded for our materials.



Figure 2. *Melanoides tuberculatus* (Müller, 1774) from Iguazú National Park, Argentina: shell of an adult specimen (20.05 mm length).

This new location of *M. tuberculatus* represents the first record of the species within the Iguazú River basin, a tributary of the Paraná River system. Although it is not possible to determine how the species arrived at the INP, the nearest populations of this species recorded within the large Paraná basin are

approximately 300 km away, one of them, upstream, to the NE of the new site, in Paraná state, Brazil (Londrina, Sertajena and Sertanópolis), and the other, downstream, to the SW, in Posadas, Argentina. Some populations have also been recorded in Santa Catarina State, Brazil, in environments that are not part of the Iguazú basin, but are close to the headwaters of this river. However, no specimens of *M. tuberculatus* were recorded in our samplings on the Upper Iguazú River. It is noteworthy that nine hydroelectric dams have been built on the upper course of Iguazú River in Brazilian territory whose reservoirs are exploited for aquaculture and aquarism. These types of artificial environments favour the colonization of opportunistic species, as the case of *M. tuberculatus* in Posadas. Pointier *et al.* (1993) and Rocha Miranda & Martins Silva (2006) mentioned that the populations of *M. tuberculatus* occurred mainly in backwaters and shady areas with fine sediment (organic detritus). However, as it was noted in this work and by Giovanelli *et al.* (2005) this



Figure 3. *Melanoides tuberculatus* (Müller, 1774) from Iguazú National Park, Argentina: shell of a juvenile specimen (2.18 mm length).

species also adapts to lotic environment. Thus, *M. tuberculatus* behaves like a typical invasive species colonizing a wide variety of habitats. It seems clear that this species first colonizes artificial environments and disperses from there.

This finding of *M. tuberculatus* specimens suggests the presence of a stable population that would represent a threat to the native mollusk fauna, given that this species promotes replacement and impoverishment of mollusk diversity (Fernandez *et al.*, 2001, 2003).

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