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NOTA

FIRST RECORD OF L*imnoperna fortunei* (DUNKER, 1857) (BIVALVIA: MYTILIDAE) IN CONTINENTAL WATERS OF URUGUAY (RÍO NEGRO AND RÍO YÍ)

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Primer registro de *Limnoperna fortunei* (Dunker 1857) en aguas continentales de Uruguay (Ríos Negro y Yí)

Los impactos ecológicos y económicos causados por moluscos invasores de orígen asiático, son recientes en la cuenca del Plata. *Limnoperna fortunei* (Dunker 1857) ingresó en la región en 1991 y en la actualidad presenta una amplia dispersión en sistemas acuáticos continentales. Los objetivos del presente trabajo son comunicar el primer registro de *L. fortunei* en aguas interiores de Uruguay (Ríos Negro y Yi) y mencionar algunos de los perjuicios que ocasiona.

Palabras clave: *Limnoperna fortunei*, especie invasora, aguas continentales, **Uruguay.**

The invasive Asiatic bivalve *Limnoperna fortunei* (Dunker, 1857), native from rivers and streams of China and southeast Asia (Morton, 1977) invaded both Hong Kong area and Japan in the 1970s (Morton, 1977; Kimura, 1994). In South America was firstly recorded in Argentina, in the littoral zone of the Río de la Plata (Pastorino *et al.*, 1993). According to Darrigran & Pastorino (1995) it was introduced accidentally in 1990s through the ballast waters of interoceanic ships provenient from Asia. Up to date, *L. fortunei* was recorded in de la Plata, Paraná, Paraguay and Uruguay rivers (Darrigran, 2001) and was successfully settled in about 1100 km of water bodies in del Plata Basin where it presented an advanced of 240 km/year (Darrigran, op.cit). More recently *L. fortunei* was founded in Brazil in the Guaiba lake (Dreher-Mansur *et al.* 1999). The aim of this note is to report the first time the presence of *L. fortunei* (Dunker, 1857) in continental water bodies of Uruguay (*i.e.* Río Negro and Río Yí) and to call the attention to the possible impacts that its presence may cause in natural environments and man made structures.

In 1999, carrying out monitoring studies of the environmental quality of Negro and Yí Rivers (Fig. 1), we detected *L. fortunei* specimens in benthic samples and also into the water distribution systems of Palmar hydroelectric power plant (Fig. 2). This type of biological contamination causes an important impact in the human environment. The damage by macrofouling produced by this species was similar to that caused by *Dreissena polymorpha* (Pallas) in Canada and United States (Morton 1996). Losses about 2 thousand million dollars were generated in the companies affected by *D. polymorpha* (zebra mussel) for programs of prevention and eradication (Darrigran, 2001). For example, the biofouling in the cooling water systems of aquatic power stations, poses a serious operational problem to electricity generating stations (Fisher *et al.*, 1984; Jenner *et al.*, 1998). It results in the blockage of water flow through the cooling water conduits. This, in turn, leads to mechanical damage of pumps, corrosion of condenser tubes and reduction in heat transfer efficiency (Masilamoni *et al.*, 2002).

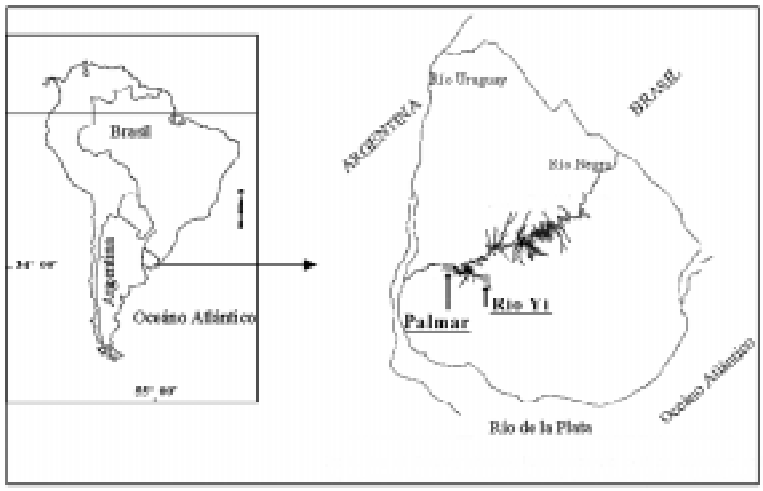

Fig. 1. Map of Uruguay showing the locations where *Limnoperna fortunei* were found (Río Yí and Palmar).

When invasive species colonize ecosystems two types of colonization behavior are expected (GESAMP, 1997; Smith *et al*., 1999): as invasive species type A with a high dispersion rate or as invasive species type B, with characteristics of rare species. The first seems to be the case of *L. fortunei* in Uruguayan and Argentinan water bodies. The invasive behavior of *L. fortunei* also can affect the natural environment, changing the community of autochthonous mollusks and favoring or reducing the settlement of other invertebrates fauna (Darrigran *et al*., 1998). Recently, Darrigran *et al.,* (1998) reported that in 1991 the species had a mean density of 5 ind./m^2, in Argentina, two years later its density reached 80,000 ind./m^2 and actually its current density is about 150,000 ind./m^2. This fact shows the high invasive behavior of the species. The few studies carried out about benthic communities in the lotic systems of Uruguay, do not allow us to estimate the power of dispersion of this species.

Biological characteristics of the species add to the environmental characteristics of de la Plata Basin (e.g. salinity variation) it could be to favor the high colonization rate. The higher reproductive rate, the swimming larval phase, eurihaline attributes and the epifaunal habitat are the characteristics that explain its successful invasion in different water courses at de la Plata Basin (Darrigran *et al*., 1999, Darrigran & Ezcurra de Drago, 2000).

The mollusk fauna in the littoral zones of the Río de la Plata when *L. fortunei* were recorded, suffered reduction in species richness and density, other invertebrates like oligochaetes and lechees were favored (Martin and Darrigran, 1994; Darrigran *et al*., 1998). Its presence in aquatic environments also promoted important changes in the diet of autochthonous fishes (López Armengol y Casciotta, 1998; Montalto *et al*., 1999; Penchaszadeh *et al*., 2000).

Studies about the life and the reproductive cycle of this species are scarce, especially for the South American organisms. According to Morton (1982, 1991) *L. fortunei* from the Hong Kong area has one reproductive event per year and no hermafroditism cases have been reported. On the other hand, in Argentina, the first place were the species was recorded in South America, Darrigran *et al.* (1999) reported five reproductive events, being three of low intensity. Iwasaki and Uryu (1998) found that the species from Kyoto reproduced only once a year, from June to September. The larger spawning in the Río de la Plata (Darrigran *et al*., 1999) developed during temperature changes, starting with both the maximum and the minimums. This characteristic would be one of the causes responsible for the high rate of dispersion and for the high densities recorded in South America water bodies.

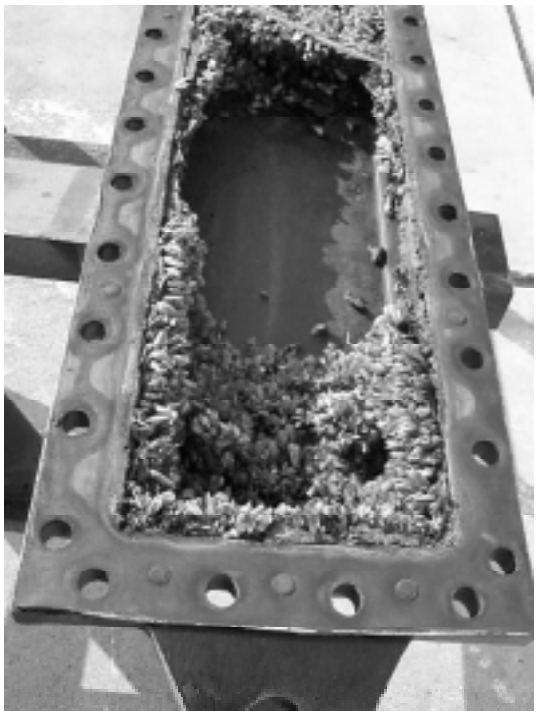

Fig. 2. Macrofouling of *Limnoperna fortunei* into the water distribution systems of Palmar hydroelectric power plant.

Taking into account the records of this species in the Río de la Plata region, *L. fortunei* seems to have tolerance to a wide range of environmental conditions (Darrigran and Ezcurra de Drago 2000), that in addition to its early sexual maturity, high fecundity and semelparity (Darrigran *et al.,* 1999), favors its dispersion and its easy introduction in new environment. After the rapid colonization of the new environment, this species becomes dominant (Morton, 1989).

According to the information presented in this note, it seems to be necessary the development of research programs that focus on the life history, reproductive characteristics sexual adaptive strategies of this species. Knowledge of these biological and ecological characteristics of *L. fortunei* will permit to plan strategies with the attempt to solve the problems that this invasive species causes, both for the natural and for the human environment.

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