

First record of the predation of the introduced freshwater bivalve *Limnoperna fortunei* (Mytilidae) by the native fish *Micropogonias furnieri* (Sciaenidae) in the Río de la Plata estuary, South America

Primer registro de depredación del bivalvo introducido *Limnoperna fortunei* (Mytilidae) por el pez autóctono *Micropogonias furnieri* (Sciaenidae) en el estuario del Río de la Plata, América del Sur

María Fernanda LÓPEZ ARMENGOL* and Jorge R. CASCIOTTA**

Recibido el 2-V-1997. Aceptado el 13-IV-1998

ABSTRACT

Predation on the introduced *Limnoperna fortunei* by the native fish *Micropogonias furnieri* in the Río de la Plata estuary is here reported. *Limnoperna fortunei* was found in fishes between 200 and 250 mm of standard length which bear strong pharyngeal jaws capable of crushing the shells. This mytilid was not found in small fishes (60 to 123 mm standard length), which feed primarily on crustaceans. The possibility of biological control upon *L. fortunei* through predation by *M. furnieri* appears unlikely, because this marine fish is limited to the estuarine zone of the Río de la Plata.

RESUMEN

Se registra la depredación de *Limnoperna fortunei* por el pez autóctono *Micropogonias furnieri* en el estuario del Río de la Plata. Este bivalvo fue hallado en el contenido estomacal de peces con longitud estándar entre 200 y 250 mm que poseen fuertes mandíbulas faríngeas capaces de quebrar las valvas. Este mitilido no fue hallado en peces de pequeña talla (60 a 123 mm de longitud standard), que se alimentan principalmente de crustáceos. El control biológico de *L. fortunei* por efecto de la depredación de *M. furnieri* parece poco probable, debido a que la distribución de este pez marino se limita a la zona del estuario del Río de la Plata.

KEY WORDS: *Limnoperna fortunei*, *Micropogonias furnieri*, Río de la Plata estuary, predation, biological control.

PALABRAS CLAVES: *Limnoperna fortunei*, *Micropogonias furnieri*, estuario del Río de la Plata, depredación, control biológico.

INTRODUCTION

The mytilid *Limnoperna fortunei* (Dunker, 1857) is a freshwater bivalve originary from rivers and streams of

China and Southeast Asia (MORTON, 1977). This species was unintentionally introduced by ships from Southeast

* Instituto de Embriología, Biología e Histología, Facultad de Ciencias Médicas, Universidad Nacional de La Plata, CONICET, calle 60 y 120, 1900 La Plata, Argentina.

** Departamento Científico Zoología Vertebrados, CIC-Museo de La Plata, Universidad Nacional de La Plata, Paseo del Bosque, 1900 La Plata, Argentina.

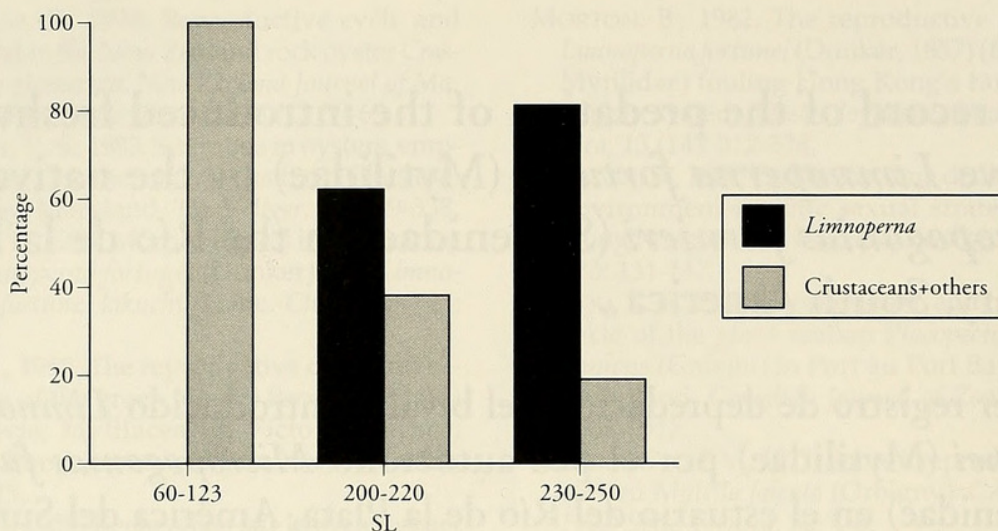


Figure 1. The relationship between standard fish length (SL) and the frequency of items of the gut contents, $n=17$.

Figura 1. Relación entre la longitud estándar (SL) del pez y la frecuencia de los elementos del contenido intestinal, $n=17$.

Asian countries to Argentina (DARRIGRAN AND PASTORINO, 1995).

Limnoperna fortunei inhabits both the Uruguayan and the Argentinean coasts of the Río de la Plata. In Argentina, it was first recorded in 1991 at Bagliardi beach ($34^{\circ} 55' S$, $57^{\circ} 49' W$) (PASTORINO, DARRIGRAN, MARTIN AND LUNASCHI, 1993). Today, this species has a widespread distribution from Anchorena beach ($34^{\circ} 29' S$, $58^{\circ} 28' W$) to Punta Piedras ($35^{\circ} 26' S$, $57^{\circ} 08' W$) (DARRIGRAN, 1995). In Uruguay, *L. fortunei* was cited at San José and Colonia Departments (SCARABINO AND VERDE, 1994).

The colonization by this mytilid in Argentina has been very successful. In 1991 it was found as isolated groups of five or six individuals, and two years later (May 1993) there were 82, 151 individuals $\cdot m^{-2}$. This species attaches with its byssus to natural or artificial hard substrate, such as wooden-logs, roots, stones, or pipes. Natural hard substrates, formed by compact Pleistocene mud-sand (=“caliche”) in the Argentinean coast of Río de la Plata, outcrop in many localities, such as Anchorena beach, Punta Piedras, and Magdalena.

The introduction of *L. fortunei* in the Río de la Plata has caused environmental and economic problems (DARRIGRAN,

1995). This species contributes to biofouling in boats and water supplies, in a way similar to that caused by *Dreissena polymorpha* (Pallas, 1771) in USA, Canada, and Europe (LE PAGE, 1992; KOVALAK, LONGTON AND SMITHEE, 1992; STANCZYKOWSKA AND LEWANDOWSKI, 1992). Since *L. fortunei* has no local competitors and a high biotic potential (DARRIGRAN AND PASTORINO, 1995), its spread in the Río de la Plata promoted a research program aimed at finding possible control mechanisms.

Predation by fishes is one potential means of control (LEPAGE, 1992; FRENCH AND BURR, 1992; DARRIGRAN AND COLAUTI, 1994). However, predation on *L. fortunei* by native fishes in Río de la Plata was unknown. *Micropogonias furnieri* (Desmarest, 1823) is a marine drum (“corvina rubia”), which occurs in the mouth of the Río de la Plata, reaching upstream Buenos Aires city at Núñez beach (LÓPEZ AND CASTELLO, 1967). The adults of this species have strong pharyngeal jaws armored with molariform teeth capable of crushing shells.

The aim of this paper is to describe the presence of this mytilid in the diet of the native drum, *Micropogonias furnieri* and to evaluate this fish as a potential biological control agent.

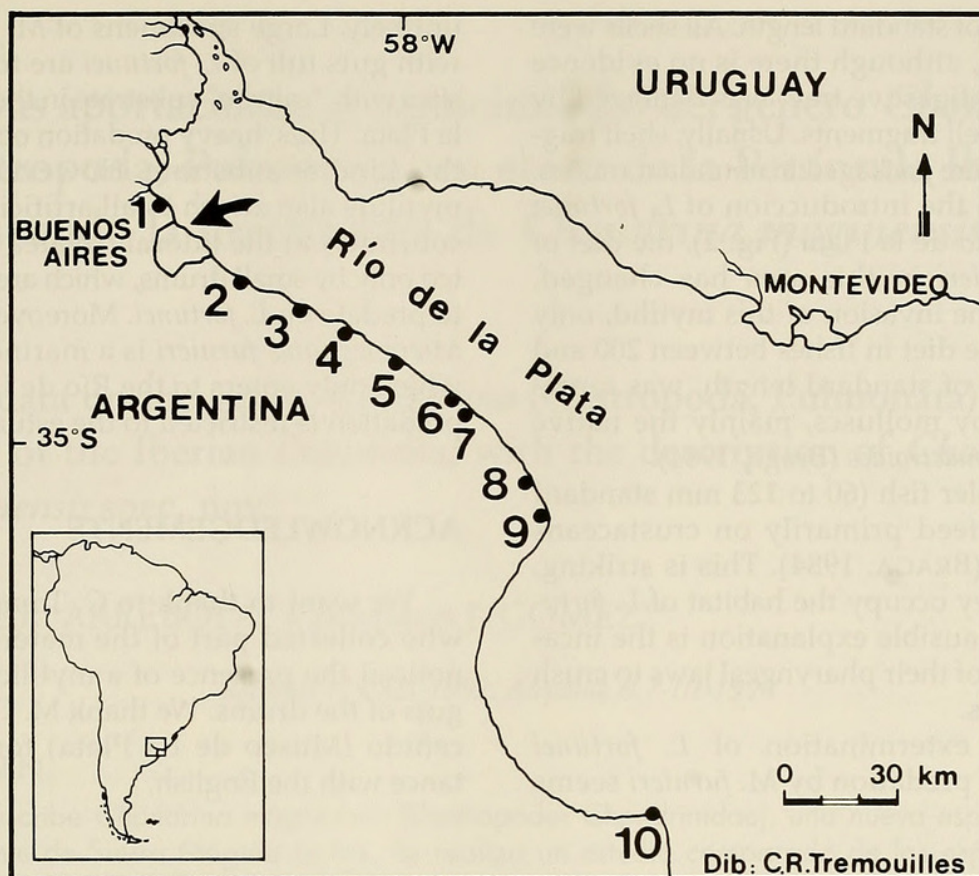


Figure 2. Map showing the distribution of *Limnoperna fortunei* at the Río de la Plata estuary (modified from DARRIGRAN AND PASTORINO, 1995). 1: Anchorena beach; 2: Quilmes; 3: Punta Lara; 4: Bagliardi beach; 5: Punta Blanca; 6: Atalaya; 7: Magdalena; 8: Punta Indio; 9: Punta Piedras; 10: Punta Rasa. The arrow indicates the northernmost record of *Micropogonias furnieri* in the Río de la Plata estuary.

Figura 2. Mapa de la distribución de *Limnoperna fortunei* en el estuario del Río de la Plata (modificado de DARRIGRAN Y PASTORINO, 1995). 1: Balneario Anchorena; 2: Quilmes; 3: Punta Lara; 4: Balneario Bagliardi; 5: Punta Blanca; 6: Atalaya; 7: Magdalena; 8: Punta Indio; 9: Punta Piedras; 10: Punta Rasa. La flecha indica el extremo Norte de la distribución de *Micropogonias furnieri* en el estuario del Río de

MATERIAL AND METHODS

Seventeen specimens of *Micropogonias furnieri* were collected by fishermen with fishing rod in the Río de la Plata close to Magdalena city ($35^{\circ} 03' S$, $57^{\circ} 29' W$) during daylight in Spring (October and December of 1996). Only in this season, this fish reaches the coast and is easily caught by fishermen. Standard length (SL) was measured from the tip of the snout to the base of the caudal fin. The guts were fixed in 10% formalin. Preys in the gut contents were identified and counted under a dissecting microscope Wild M5.

Ligaments of *L. fortunei*, were counted to avoid a possible overesti-

mation of mytilids in guts (as could happen by counting valves). Frequency of occurrence was used to indicate the proportion of *Limnoperna* and other kind of prey in fish gut.

RESULTS AND DISCUSSION

Fortynine *Limnoperna fortunei* were found in guts of *Micropogonias furnieri* between 200 and 250 mm of standard length, which have pharyngeal jaws well developed. The number of *L. fortunei* in guts increases with size class of *M. furnieri* (Fig. 1). This mytilid is the most important food item (60 to 80%) in drums above

199 mm of standard length. All shells were crushed, although there is no evidence that the digestive tract was damaged by sharp shell fragments. Usually, shell fragments were packaged in abundant mucus.

With the introduction of *L. fortunei* in the Río de la Plata (Fig. 2), the diet of *M. furnieri* in this area has changed. Before the invasion of this mytilid, only 7% of the diet in fishes between 200 and 250 mm of standard length, was represented by molluscs, mainly the native *Erodona mactroides* (Braga, 1984).

Smaller fish (60 to 123 mm standard length) feed primarily on crustaceans (Fig. 1) (BRAGA, 1984). This is striking, since they occupy the habitat of *L. fortunei*. A plausible explanation is the incapability of their pharyngeal jaws to crush the shells.

The extermination of *L. fortunei* through predation by *M. furnieri* seems

unlikely. Large specimens of *M. furnieri* with guts full of *L. fortunei* are found in sites with "caliche" substrate in the Río de la Plata. Thus, heavy predation occurs on this kind of substrate. However, these mytilids also attach to all artificial hard substrates in the littoral, an area inhabited only by small drums, which are unable to predate on *L. fortunei*. Moreover, since *Micropogonias furnieri* is a marine drum which only enters to the Río de la Plata, predation is restricted to the estuary.

ACKNOWLEDGEMENTS

We want to thank to C. Tremouilles who collected part of the material and noticed the presence of a mytilid in the guts of the drums. We thank M. O. Mancañido (Museo de La Plata) for assistance with the English.

BIBLIOGRAPHY

- BRAGA, L., 1984. *Contribución al conocimiento de la alimentación de los Sciaenidae y las adaptaciones del aparato digestivo a sus respectivos regímenes*. Tesis 422, Universidad Nacional de La Plata, Argentina, 210 pp.
- DARRIGRAN, G., 1995. ¿Un problema para los sistemas naturales de agua dulce del Mercosur? *Revista "Museo"*, 5: 85-87.
- DARRIGRAN, G AND COLAUTI, D., 1994. Potencial control del molusco invasor *Corbicula fluminea* (Müller, 1774) en el Río de la Plata. *Comunicaciones de la Sociedad de Malacología del Uruguay*, 7 (66-67): 368-373.
- DARRIGRAN, G. AND PASTORINO, G., 1995. The recent introduction of a freshwater asiatic bivalve, *Limnoperna fortunei* (Mytilidae) into South America. *The Veliger*, 38(2): 171-175.
- FRENCH III, J. R. P. AND BUR, M. T., 1992. Predation of the zebra mussel (*Dreissena polymorpha*) by the freshwater drum in western lake Erie. In Nalepa, T. F. and Schloesser, D. W. (Eds.), *Zebra Mussel. Biology, impacts, and control*. Lewis Publishers, Boca Raton, Florida: 453-463.
- KOVALAK, W. P., LONGTON, G. D. AND SMITHEE, R. D., 1992. Infestation of power plant water systems by the Zebra Mussel (*Dreissena polymorpha* Pallas). In Nalepa, T. F. and Schloesser, D. W. (Eds.), *Zebra Mussel. Biology, impacts, and control*. Lewis Publishers, Boca Raton, Florida: 359-379.
- LE PAGE, W. L., 1992. The impact of *Dreissena polymorpha* on waterworks operations at Monroe, Michigan: a case history. In Nalepa, T. F. and Schloesser, D. W. (Eds.), *Zebra Mussel. Biology, impacts, and control*. Lewis Publishers, Boca Raton, Florida: 333-358.
- LOPEZ, R. AND CASTELLO, J. P., 1967. Corvinas del Río de la Plata. *Tirada del Museo Argentino de Ciencias Naturales "Bernardino Rivadavia", Extra, Nueva Serie N° 67 del Boletín del Servicio de Hidrografía Naval*, 5 (1): 14-27.
- MORTON, B., 1977. Freshwater fouling bivalves. *Proceedings of the first International Corbicula Symposium*. Texas Christian University: 1-14.
- PASTORINO, G., DARRIGRAN, G., MARTIN, S. M. AND LUNASCHI, L., 1993. *Limnoperna fortunei* (Dunker, 1857) (Mytilidae), nuevo bivalvo invasor en aguas del Río de la Plata. *Neotrópica*, 39 (101-102): 34.
- SCARABINO, F. AND VERDE, M., 1994. *Limnoperna fortunei* (Dunker, 1857) en la costa uruguaya del Río de la Plata (Bivalvia: Mytilidae). *Comunicaciones de la Sociedad Malacológica del Uruguay*, 7 (66-67): 374-375.
- STANCZYKOWSKA, A. AND LEWANDOWSKI, K., 1992. Thirty years of studies of *Dreissena polymorpha* ecology in Mazurian lakes of northeastern Poland. In Nalepa, T. F. and Schloesser, D. W. (Eds.), *Zebra Mussel. Biology, impacts, and control*. Lewis Publishers, Boca Raton, Florida: 3-37.



López Armengol, María Fernanda. and Casciotta, Jorge R. 1998. "First record of the predation of the introduced freshwater bivalve *Limnoperna fortunei* (Mytilidae) by the native fish *Micropogonias furnieri* (Sciaenidae) in the Rio de la Plata estuary, South America." *Iberus : revista de la Sociedad*

Espan

~

ola de

Malacologi

,

a 16, 105–108.

View This Item Online: <https://www.biodiversitylibrary.org/item/101510>

Permalink: <https://www.biodiversitylibrary.org/partpdf/98391>

Holding Institution

Smithsonian Libraries

Sponsored by

Biodiversity Heritage Library

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at



López Armengol, María Fernanda. and Casciotta, Jorge R. 1998. "First record of the predation of the introduced freshwater bivalve *Limnoperna fortunei* (Mytilidae) by the native fish *Micropogonias furnieri* (Sciaenidae) in the Rio de la Plata estuary, South America." *Iberus : revista de la Sociedad*

Espan

~

ola de

Malacologi

,

a 16, 105–108.

View This Item Online: <https://www.biodiversitylibrary.org/item/101510>

Permalink: <https://www.biodiversitylibrary.org/partpdf/98391>

Holding Institution

Smithsonian Libraries

Sponsored by

Biodiversity Heritage Library

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at



López Armengol, María Fernanda. and Casciotta, Jorge R. 1998. "First record of the predation of the introduced freshwater bivalve *Limnoperna fortunei* (Mytilidae) by the native fish *Micropogonias furnieri* (Sciaenidae) in the Rio de la Plata estuary, South America." *Iberus : revista de la Sociedad*

Espan

~

ola de

Malacologi

,

a 16, 105–108.

View This Item Online: <https://www.biodiversitylibrary.org/item/101510>

Permalink: <https://www.biodiversitylibrary.org/partpdf/98391>

Holding Institution

Smithsonian Libraries

Sponsored by

Biodiversity Heritage Library

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at



López Armengol, María Fernanda. and Casciotta, Jorge R. 1998. "First record of the predation of the introduced freshwater bivalve *Limnoperna fortunei* (Mytilidae) by the native fish *Micropogonias furnieri* (Sciaenidae) in the Rio de la Plata estuary, South America." *Iberus : revista de la Sociedad*

Espan

~

ola de

Malacologi

,

a 16, 105–108.

View This Item Online: <https://www.biodiversitylibrary.org/item/101510>

Permalink: <https://www.biodiversitylibrary.org/partpdf/98391>

Holding Institution

Smithsonian Libraries

Sponsored by

Biodiversity Heritage Library

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at



López Armengol, María Fernanda. and Casciotta, Jorge R. 1998. "First record of the predation of the introduced freshwater bivalve *Limnoperna fortunei* (Mytilidae) by the native fish *Micropogonias furnieri* (Sciaenidae) in the Rio de la Plata estuary, South America." *Iberus : revista de la Sociedad*

Espan

~

ola de

Malacologi

,

a 16, 105–108.

View This Item Online: <https://www.biodiversitylibrary.org/item/101510>

Permalink: <https://www.biodiversitylibrary.org/partpdf/98391>

Holding Institution

Smithsonian Libraries and Archives

Sponsored by

Biodiversity Heritage Library

Copyright & Reuse

Copyright Status: In copyright. Digitized with the permission of the rights holder.

License: <http://creativecommons.org/licenses/by-nc-sa/3.0/>

Rights: <https://biodiversitylibrary.org/permissions>

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at

<https://www.biodiversitylibrary.org>.