Biol Invasions (2011) 13:281–284
DOI 10.1007/s10530-010-9838-0

INVASION NOTE

# *Manayunkia speciosa* Leidy (Polychaeta: Sabellidae): introduction of this nonindigenous species in the Neotropical Region (Uruguay river, South America)

**Laura C. Armendáriz · Analía Paola · Alberto Rodrigues Capítulo**

Received: 15 June 2010 / Accepted: 5 July 2010 / Published online: 15 July 2010


**Abstract** We report the migration of *Manayunkia speciosa* from its distribution in North America into the Neotropical Region (Argentina). We collected specimens from November 2007 to March 2009 in the lower Uruguay River-at 33° 5.01′S 58° 12′W, 33° 5.9′S 58°25.2′W from sediments reaching densities of 2,890 ind. $m^{-2}$, at a mean abundance of 350 ind. $m^{-2}$. Introductions of nonindigenous species, resulting intentionally or accidentally from anthropic activities, cause significant changes in ecosystems. In aquatic environments, polychaetes are a key invasive group that increases the geographical range of several species through human activities. *M. speciosa* may have reached the Río de la Plata Basin through a shipping vector and thereafter the Uruguay River by self-navigation.

**Keywords** *Manayunkia speciosa* · Polychaeta · First record · Uruguay river · Neotropical Region

L. C. Armendáriz (✉) · A. R. Capítulo
Instituto de Limnología Dr. Raúl A. Ringuelet (ILPLA-CONICET La Plata-UNLP), CC 1888
La Plata, Argentina
e-mail: larmendariz@ilpla.edu.ar

L. C. Armendáriz · A. Paola · A. R. Capítulo
Facultad de Ciencias Naturales y Museo, UNLP, La Plata, Argentina

A. R. Capítulo
Consejo Nacional de Investigaciones Científicas y Técnicas (CONICET), Buenos Aires, Argentina

## Introduction

*Manayunkia speciosa* Leidy (Sabellidae, Fabriciinae) was first found in tubes of mud attached to stones in the Schuylkill River (Pennsylvania) by Leidy in 1858. At a new location, the Egg Harbor River (New Jersey), the species was later described in the first complete record of a strictly fresh-water polychaete and one closely related to the marine genus *Fabricia* (Leidy 1883). New specimens were then collected from these sites by Potts (1884) and Foulke (1884), and some 45 years later, by Meehean (1929) in the Duluth, Wisconsin Harbor (Lake Superior). A decade afterwards, Krecker (1939) found specimens of *Manayunkia* in Lake Erie and considered that this material belonged to the same species as had been collected by Meehean (1929) from Lake Superior, yet differed sufficiently to be considered a separate species from *M. speciosa*. This author then gave the name of *M. eriensis* for the Great-Lakes specimens. Hartman (1951), in a review of the subfamily Fabriciinae, indicated that *M. eriensis* Krecker might be the same as *M. speciosa* Leidy. Pettibone (1953) finally redescribed the species and placed *M. eriensis* in synonymy with *M. speciosa*.

In subsequent years, additional specimens of *M. speciosa* were collected from a wider area extending from Lake Superior (Michigan, Wisconsin) to California and Oregon (Pettibone 1953). The species was then recorded in new localities, such as

Lake St. Clair (Ontario, Michigan), St. Marys River (Ontario, Michigan), the Sevenmile Canal (Oregon), two lakes in northern Alaska, the Ottawa River, Cayuga Lake (New York), Simmon's Bayou (Mississippi), besides being collected again in Lake Erie (Hiltunen 1965; Britt 1965; Hazel 1966; Holmquist 1967; Mackie and Qadri 1971; Spencer 1976; Croskery 1978; Brehm 1978). Its distribution by that time covered the east- and west-coast river systems of North America, the Great Lakes region, and the coast of the Gulf of Mexico.

In more recent years, the studies on *M. speciosa* have focussed on aspects of its population dynamics, reproductive biology, and the role of the species as an intermediate host for Myxozoan parasites of the salmonids *Ceratomyxa shasta* and *Parvicapsulum minibicornis* (Bartholomew et al. 1997, 2006; Stocking and Bartholomew 2007; Wilzbach and Cummins 2007).

As stated above, to date this species has only been recorded in freshwater habitats of the Nearctic Region, from Alaska to the coast of the Gulf of Mexico (Spencer 1976; Brehm 1978; Rouse 1996; Stocking and Bartholomew 2007; Glasby and Timm 2008; Glasby et al. 2009). The purpose of this report is to document the first record for *M. speciosa* in the Neotropical Region, thus extending the limit of its distribution from the United States to Argentina and as such representing the southernmost localization of this species within the Americas.

## Material, methods and results

The Uruguay River, arising in Geral Mountain, Brazil, is one of the longest South American rivers and along with the Paraná River and its tributaries unite with the Río de la Plata river in the Del Plata basin. The 1,770-km length of the Uruguay River serves as the border between Argentina and Brazil, and further downstream between Argentina and Uruguay. The uses of its waters include navigation, power generation, fishing, and recreation.

For the study we conducted 5 samplings seasonally between November 2007 and March 2009 in the lower Uruguay River. The area of study was located at 33° 5,018′ S 58° 12,647′ W; 33° 5,205′ S 58° 22,415′ S; 33° 5,940′ S 58° 25,202′ W; 33° 7,441′ S 58° 22,968′ W, near a pulp factory and covered the main channel, the bays, and the reed beds along the banks of the river. The material was collected with dredges and fixed in situ with 5% formalin, and physicochemical variables were recorded during each sampling date.

The sediments from the study area were mainly plastic silty clay with small proportions of scarcely sorted quartz sand (Iriondo and Kröhling 2004). The values for the physicochemical variables measured were very similar between the different habitats analyzed, with the turbidities and conductivities exhibiting their widest range in these areas. The mean physicochemical variables registered were: water temperature, 20.0°C (with variation between 9.7 and 30.1); depth, 4.0 m (between 0.9 and 9.6 m); turbidity, 68.4 UTN (from 13 to 185.2 UTN); conductivity, 64.4 μS $cm^{-1}$ (from 46.7 to 177 μS $cm^{-1}$); pH, 8.1 (between 7.3 and 9.3); and dissolved oxygen, 8.9 mg $l^{-1}$ (from 7.2 to 12.8 mg $l^{-1}$).

In the laboratory the samples were washed on a sieve of 0.5-mm mesh size. The material thus obtained was stained with erythrosin, picked out of the sediment under a stereoscopic microscope, and identified by light microscopy. The specimens were preserved in 70% aqueous alcohol. Some of the individuals were measured (total length, maximum width, thorax and abdomen length, and length of the radioles) under an Olympus model CX31 compound microscope.

A total of 360 individuals of *M. speciosa* were collected during the study. These specimens are deposited in the Colección Argentina de Invertebrados, Museo Argentino de Ciencias Naturales Bernardino Rivadavia (MACN-In 37788), Argentina.

The general description of the specimens collected from the Uruguay River coincided with that made by Leidy (1858, 1883) and Pettibone (1953). The lengths of the thoracic segments, except for the first, were regular and greater than the widths. The abdominal segments were much shorter and narrower than the thoracic. The mean total length and maximum width coincided with those observed by Leidy (1883) and were lower than those obtained by Pettibone (1953). The anal segment, or pygidium, is short, rounded, and without eyespots. Both males and females were present, and two females were found with eggs (in March 2009).

*Manayunkia speciosa* was found in sediments at densities reaching as high as 2,890 ind. $m^{-2}$ (in June 2008). The presence of egg-bearing females, although in sparse numbers, indicates that the population is capable of carrying out the initial phases of reproduction. The fauna accompanying *M. speciosa* in this study was represented by the following taxa: Nematoda; Oligochaeta; Bivalvia and Gastropoda molluscs; Ostracoda; Caenida, Chironomidae, and Elmidae insects.

## Discussion

Introductions of nonindigenous species are widely thought to be one of the most powerful direct drivers of biodiversity loss and/or alteration in ecosystems, together with habitat and climate change, overexploitation of species, and pollution. Inland waters in particular are highly susceptible to either inadvertent or deliberate introductions of species and to the subsequent spread of the new arrivals through intensive human use, the natural linkages among streams and lakes, and the dispersal capability of aquatic organisms. Biological invasions are not a phenomenon caused only by human activities, but the number of species involved and the frequency of their relocation have grown enormously as a direct result of the expansion of trade and transport (Penchaszadeh 2005; El Haddad et al. 2007; Ciutti and Cappelletti 2009).

The transfer of alien species in aquatic environments may occur by different mechanisms, including transport by maritime vessels through hull fouling or in the ballast tanks. Accordingly, the scattered distribution of *M. speciosa* in the Nearctic region has in the past attracted the attention of certain authors (Meehean 1929; Brehm 1978) who suggested that the species may have been introduced to some of its new locations in the ballast tanks of ships. Polychaetes are a significant group within the list of invasive organisms, the geographical range of several of whose species has been increased through human activities (Penchaszadeh 2005; El Haddad et al. 2007; Glasby and Timm 2008).

We therefore suppose that *M. speciosa* arrived at the Del Plata Basin through shipping as a vector and thus reached the Uruguay River as part of the usual navigation route. We still have no criteria for establishing whether this introduction of the polychaete is recent or not; nor, given the current state of knowledge, can we predict whether or not *M. speciosa*, as a new invasive species, would be especially aggressive in South American ecosystems.

In South America, the system of the Río de la Plata and its adjacent sea area is hardly immune to the problem of biological invasions. Among the exotic species recorded in these areas can be cited *Ficopomatus enigmaticus* (Fauvel, 1923); *Balanus glandula* Darwin, 1854; *B. amphitrite* Darwin, 1854; *Crassostrea gigas* (Thumberg, 1793), *Corbicula fluminea* (Müller, 1774), *Limnoperna fortunei* (Dunker, 1857) and *Rapana venosa* (Valenciennes, 1846), several having been more recently introduced during the decades of the 80 s and 90 s (Penchaszadeh 2005).

In agreement with several authors (Pettibone 1953; Hazel 1966; Spencer 1976; Brehm 1978; Stocking and Bartholomew 2007), we further believe that *M. speciosa* may have a geographical distribution beyond the Nearctic Region, but might have nevertheless escaped notice either because of the polychaete's small size, its semitransparent body, its tendency to gather and coat its body with fine material; or simply because of inadequate collection methods. We would also speculate that this species could pass unnoticed because of its low population densities (Pettibone 1953; Brehm 1978). Most of the existing records have been based on only a few individuals, with the exception of Hiltunen (1965), who reported more than 45,000 ind. $m^{-2}$ in the mouth of the Detroit River. The mean abundance recorded by us in the present study, however, was intermediate at about 350 ind. $m^{-2}$. The extent of this polychaete's further dispersion within this portion of the Neotropical region remains to be investigated.

**Acknowledgments** We would like to thank Dr. Donald Haggerty for the English translation of the manuscript. Scientific contribution No 888 from the Instituto de Limnología "Dr. Raúl Ringuelet".

## References

Bartholomew JL, Whipple MJ, Stevens DG, Fryer JL (1997) The life cycle of *Ceratomyxa shasta*, a myxosporean parasite of salmonids, requires a freshwater polychaete as an alternate host. J Parasitol 83:859–868

Bartholomew JL, Atkinson SD, Hallett SL (2006) Involvement of *Manayunkia speciosa* (Annelida: Polychaeta: Sabellidae) in the life cycle of *Parvicapsula minibicornis*, a

myxozoan parasite of Pacific salmon. J Parasitol 92:742–748
Brehm WT (1978) First Gulf of Mexico coast record of *Manayunkia speciosa* (Polychaeta: Sabellidae). Northeast Gulf Sci 2:73–75
Britt NW (1965) A brief note on the distribution of the polychaete, *Manayunkia speciosa* Leidy, in Western Lake Erie. Ohio J Sci 65:175–176
Ciutti F, Cappelletti C (2009) First record of *Corbicula fluminalis* (Müller, 1774) in Lake Garda (Italy), living in sympatry with *Corbicula fluminea* (Müller, 1774). J Limnol 68:162–165
Croskery P (1978) The freshwater co-occurrence of *Eurytemora affinis* (Copepoda: Calanoida) and *Manayunkia speciosa* (Annelida: Polychaeta): possible relicts of a marine incursion. Hydrobiologia 59:237–241
El Haddad M, Capaccioni Azzati R, García-Carrascosa AM (2007) *Branchiomma luctuosum* (Polychaeta: Sabellidae): a non-indigenous species at Valencia Port (western Mediterranean Sea, Spain). J Mar Biol Assoc 5660:1–8
Foulke SG (1884) Some notes on *Manayunkia speciosa*. Proc Acad Nat Sci Phil 36:48–49
Glasby CJ, Timm T (2008) Global diversity of polychaetes (Polychaeta; Annelida) in freshwater. Hydrobiologia 595:107–115
Glasby CJ, Timm T, Muir AI, Gil J (2009) Catalogue of non-marine Polychaeta (Annelida) of the World. Zootaxa 2070:1–52
Hartman O (1951) Fabricinae (Feather-duster polychaetous annelids) in the Pacific. Pacific Sci 5:379–391
Hazel CR (1966) A note on the freshwater polychaete, *Manayunkia speciosa* Leidy, from California and Oregon. Ohio J Sci 66:533–535
Hiltunen JK (1965) Distribution and abundance of the polychaete *Manayunkia speciosa* Leidy, in western Lake Erie. Ohio J Sci 65:183–185
Holmquist C (1967) *Manayunkia speciosa* Leidy—a freshwater polychaete found in Northern Alaska. Hydrobiologia 29:297–304
Iriondo M, Kröhling D (2004) The parent material as the dominant factor in Holocene pedogenesis in the Uruguay River Basin. Rev Mexicana Cien Geol 21:175–184
Krecker FH (1939) Polychaete annelid worms in the Great Lakes. Science 89:153
Leidy J (1858) Proc Acad Nat Sci Phil 10:90
Leidy J (1883) *Manayunkia speciosa*. Proc Acad Nat Sci Phil 35:204–212
Mackie GL, Qadri SU (1971) A polychaete, *Manayunkia speciosa*, from the Ottawa River, and its North American distribution. Can J Zool 49:780–782
Meehean O (1929) *Manayunkia speciosa* (Leidy) in the Duluth Harbor. Science 70:479–480
Penchaszadeh PE (2005) Invasores: Invertebrados exóticos en el Río de la Plata y región marina aledaña. (Coord). 1° edición, Eudeba, Buenos Aires, Argentina, 384 pp
Pettibone MH (1953) Fresh-water polychaetous annelid, *Manayunkia speciosa* Leidy, from Lake Erie. Biol Bull 105:149–153
Potts E (1884) Note on *Manayunkia speciosa*. Proc Acad Nat Sci Phil 36:21–22
Rouse GW (1996) New *Fabriciola* and *Manayunkia* species (Fabriciinae: Sabellidae: Polychaeta) from Papua New Guinea. J Nat Hist 30:1761–1778
Spencer DR (1976) Occurrence of *Manayunkia speciosa* (Polychaeta: Sabellidae) in Cayuga Lake, New York, with additional notes on its North American distribution. Trans Am Micr Soc 95:127–128
Stocking RW, Bartholomew JL (2007) Distribution and habitat characteristics of *Manayunkia speciosa* and infection prevalence with the parasite *Ceratomyxa shasta* in the Klamath River, Oregon–California. J Parasitol 93:78–88
Wilzbach P, Cummins K (2007) Recommendations for the study of the distribution and population dynamics of the freshwater polychaete, *Manayunkia speciosa* in the Lower Klamath River. U.S. Geological Survey, California Cooperative Fish Research Unit. Humboldt State University, Arcata