

## Aquatic Invasions Records

## New records of *Corbicula fluminea* (Müller, 1774) in Galicia (Northwest of the Iberian Peninsula): Mero, Sil and Deva rivers

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### Abstract

This paper presents new records of Asian clam *Corbicula fluminea* in the rivers Mero, Sil and Deva. Records from the Rivers Sil and Deva showed the increase of its spread in the Miño river basin. Findings in the Mero basin represented the first Iberian record of this species outside the Miño basin. Furthermore, it was the most north-western record in the Iberian Peninsula.

**Key words:** *Corbicula fluminea*, *Magaritifera margaritifera*, alien species, Galicia, Iberian Peninsula

### Introduction

The Asian clam *Corbicula fluminea* (Müller, 1774) was first reported in Iberian waters by Mouthon (1981). Since 1989 its presence has been known in Galicia, in the southern area of the Miño basin (Araujo et al. 1993; Antunes and Weber 1996; Sousa et al. 2007, 2008a; Ayres 2008). The Asian clam's distribution and density in the lower part of the Miño basin (i.e. the last 70 km comprising all of the international section (Spain-Portugal); Sousa et al. 2005, 2007, 2008a, 2008c, 2008d and 2008e) is well studied. It is also known that there is both geographical expansion and population growth in this area but that no new records were described in Galicia apart from those in the southern part of the River Miño basin.

The Miño is the largest river in Galicia (approximately 300 km long) and the rivers Deva and Sil are tributaries of its basin located in the southwest of Galicia. The River Mero (northwest of Galicia) flows into the Atlantic Ocean next to the city of A Coruña; the Barcés is the Mero's main tributary. Both rivers meet in the Cecebre reservoir.

### Materials and methods

The first observations of *C. fluminea* were in June and August 2009 during sampling of freshwater bivalves in Galician rivers. Sampling,

based on check sampling points was done to approximate the range extension of this alien species. The searching method utilized river checkpoints, wading and examination via a glass-bottomed bucket for initial observations. In the River Mero, maximum densities were also estimated using a quadrat (25×25 cm<sup>2</sup>) in places with the highest abundance. All the individuals were counted and sieved using a mesh size of 2 mm.

### Results and discussion

#### *The River Deva*

Individuals were detected at the end of the River Deva next to the Frieira Dam in San Martiño de Valongo (Figure 2) where a low abundance of *C. fluminea* was found at one point. No dead shells or live individuals were found at the ten check points upstream (Figure 2).

#### *The River Sil*

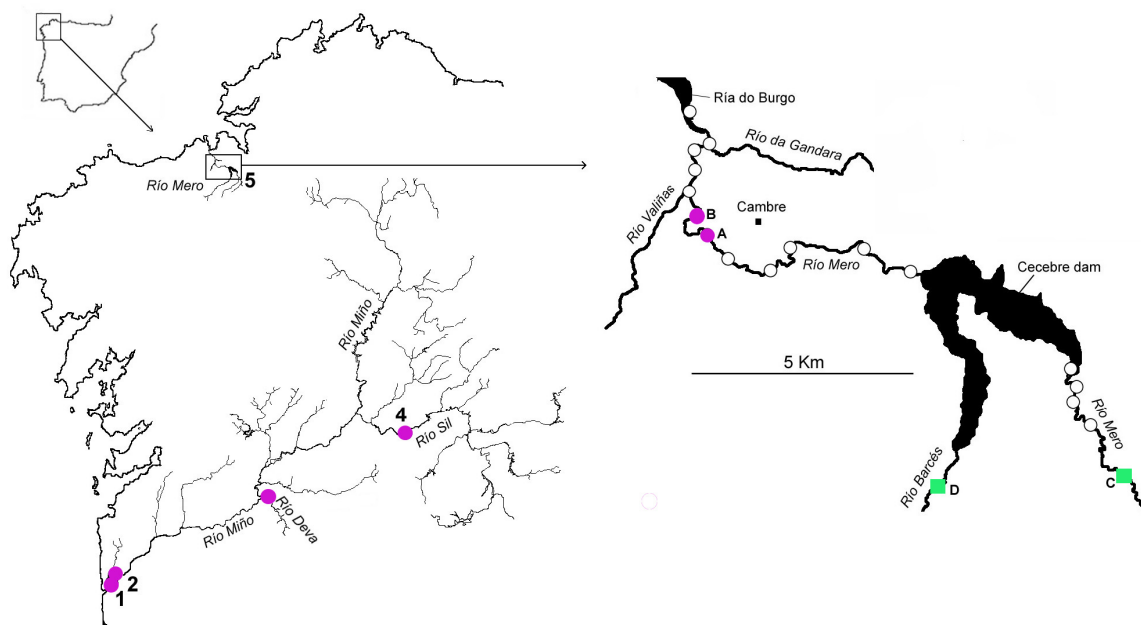
In the River Sil a great number of dead shells were detected between the San Martiño dam (Petín) and Santiago dam (A Rúa) in a transect of 400 m (Figure 2). However, no live individuals were found. They were however located in deep places, in the reservoirs and in upstream areas. New sampling to detect live individuals should be implemented in this river area.

### The River Mero basin

The *C. fluminea* (Figure 1) population is located down-stream of the Cecebre dam from Apeadoiro Cambre-Sigras (point A) to Ponte da Agra (point B). From Ponte da Agra to the mouth of the river five more checks to test for the presence of *C. fluminea* were done. Two of them were carried out in tributaries (the Valiñas River and Rego da Gándara) with a negative result (Figure 1). Upstream of the Cecebre dam the presence of *C. fluminea* was not detected in the Rivers Mero and Barcés. The highest maximum density of *C. fluminea* was found in Apeadoiro Cambre-Sigras (estimated 2120 ind./m<sup>2</sup>) in contrast to Ponte da Agra (estimated 1960 ind./m<sup>2</sup>). The presence of the red swamp crayfish, *Procambarus clarkii* (Girard, 1852), was also found in point B and in the Cecebre reservoir too. Furthermore, upstream of the Cecebre dam, some individuals of the threatened bivalve *Margaritifera margaritifera* were found at one point in the river Mero and also at one point in the River Barcés (Figure 2). *Margaritifera margaritifera* is classified as *Endangered* (EN) on the *IUCN Red List* and is classified as *Endangered* in CATGEA. Furthermore it is also included in *Habitat Directive* (D 92/43/EEC) Annex II and mentioned in the *Bern Convention Annex III*.



**Figure 1.** *Corbicula fluminea* from the River Mero. Photograph by Adolfo Outeiro



**Figure 2.** Distribution of *C. fluminea* in the Miño and Mero basins. Purple dots indicate present records in Galicia. Green squares indicate records of *M. margaritifera* in the Mero basin. White dots indicate points in which presence of *C. fluminea* was not detected in the present study. See Tables 1 and 2 for additional information.

**Table 1.** Records of *Corbicula fluminea* in the River Miño basin.

| Record No.<br>(map ref.) | River          | Record coordinates |              | Record date | Reference                          |
|--------------------------|----------------|--------------------|--------------|-------------|------------------------------------|
|                          |                | Latitude, N        | Longitude, W |             |                                    |
| 1                        | Miño           | 41°57'             | 8°44'        | 1989        | Araujo et al. 1993                 |
| 1                        | Miño           | 41°58'             | 8°42'        | 1991        | Antunes and Weber 1996             |
| 1                        | Miño           | 42°01'             | 8°38'        | 2004-2008   | Sousa et al. 2005, 2007, 2008a,c,e |
| 2                        | Centeans ponds | 42°07'             | 8°37'        | 2008        | Ayres 2008                         |
| 3                        | Deva           | 42°07'             | 8°10'        | 2009        | Present study                      |
| 4                        | Sil            | 42°23'             | 7°05'        | 2009        | Present study                      |

**Table 2.** Records of *Corbicula fluminea* and *Margaritifera margaritifera* in the River Mero basin.

| Record No.<br>(map ref.) | Point | River  | Location              | Species                 | Record coordinates |              | Record date | Reference     |
|--------------------------|-------|--------|-----------------------|-------------------------|--------------------|--------------|-------------|---------------|
|                          |       |        |                       |                         | Latitude, N        | Longitude, W |             |               |
| 5                        | A     | Mero   | Cambre-Sigras         | <i>C. fluminea</i>      | 43°16'             | 8°21'        | 2009        | Present study |
| 5                        | B     | Mero   | Ponte da Agra         | <i>C. fluminea</i>      | 43°14'             | 8°23'        | 2009        | Present study |
| -                        | -     | Mero   | San Cipriano de Ribes | <i>M. margaritifera</i> | -                  | -            | 1878        | Macho 1878    |
| -                        | -     | Barcés | San Vicente de Vigo   | <i>M. margaritifera</i> | -                  | -            | 1878        | Macho 1878    |
| 5                        | C     | Mero   | Abegondo              | <i>M. margaritifera</i> | 43°07'             | 8°17'        | 2009        | Present study |
| 5                        | D     | Barcés | San Vicente de Vigo   | <i>M. margaritifera</i> | 39°21'             | 10°03'       | 2009        | Present study |

The Asian clam has traits that make it a successful invader: a short life span, high fecundity and high adaptability to colonize new environments (McMahon 2000). According to our data its spread across Galicia is increasing.

The new record in the River Mero was the first finding in Galicia outside of the River Miño basin and it should be noted that there are no natural connections between these two basins. The new records on the rivers Deva and Sil confirm the high spread of *C. fluminea* in the Miño basin and probably the fact that the River Miño estuary is a potential source for the introduction of *C. fluminea* into other aquatic ecosystems (Sousa et al. 2008a). An example of this is the high density and biomass of *C. fluminea* just 200 m below the Frieira (Sousa et al. 2008a).

The vector of introduction is unknown. On the one hand, it is known that in some shops in A Coruña *C. fluminea* is sold as an ornamental bivalve for aquariums (personal observation). On the other hand the lack of control for fishermen's gear, tackle and techniques may be the main cause of this spread. Furthermore, as local residents do not consider this species to be alien, they may spread it in an unconscious way.

Species belonging to the genus *Corbicula* have been described as having negative effects on ecosystems, especially to native unionid populations: bioturbation processes (Vaughn and Hakenkamp 2001) and filter feeding (Yeager et al. 1994) can disturb the habitat and affect the recruitment of juvenile native mussels. Moreover, both living and dead shells can give rise to biofouling problems (Pimentel et al. 2000)

The *M. margaritifera* records in the River Mero are in accordance with the classical records of Macho (1878) but at present there is an extremely low abundance compared with other Galician rivers such as the Eo and Masma Rivers (Outeiro et al. 2008). In the River Mero basin, the Asian clam could be considered as an introduced opportunistic invader of habitats where freshwater pearl mussel populations have been reduced by anthropogenic effects, but its further spread represents a threat to other, less disturbed mussel habitats and to Galician freshwater ecosystems.

An effective control and management focused on environmental education is necessary in Galicia to prevent new invasions into other rivers, to avoid biofouling problems and to protect the native protected mussels, which are keystone species in stream ecosystems.

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