

Short Communication

First record of Atlantic mud piddock, *Barnea (Anchomasa) truncata* (Bivalvia, Pholadidae) in Argentina

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Abstract

The present work reports the finding of an exotic bivalve, *Barnea (Anchomasa) truncata*, in the intertidal zone of the Bahía Blanca Estuary Argentina (38° Lat S), more than 2000 km south from the edge of its native range in South America (21° Lat S, Brazil). Lines of evidence suggest that larval transport by shipping is the probable entry route of this species. The most apparent modification created by the introduction of this species is the generation of greater complexity and habitat heterogeneity in the mud tidal plain of the estuary; the consequent effects on the local biota should therefore be evaluated.

Key words: Pholadidae, non-indigenous bivalve, Bahía Blanca estuary, South America

Introduction

The introduction of exotic species is considered one of the main threats to biodiversity at different scales and extent (IUCN 2000). Although the Argentinean coastline was long considered pristine, it is now severely affected by biological invasions (Orensanz et al. 2002; Bortolus and Schwindt 2007). Some of the best documented examples of invasions are the polychaete *Ficopomatus enigmaticus* (Fauvel, 1923) (Schwindt et al. 2001), the macroalgae *Undaria pinnatifida* (Harvey) Suringar, 1873 (Casas et al. 2004) and the Pacific oyster *Crassostrea gigas* (Thunberg, 1793) (Carrasco and Baron 2009).

The Pholadidae, known as piddocks and angelwings, are a family of highly specialized bivalves adapted for boring into inorganic and organic substrates of variable hardness. They build tubular burrows, by using their shell to mechanically erode the substratum, and stay within it for their whole lifespan (Turner 1954). Although these groups of bivalves are among the dominant organisms of many intertidal and subtidal soft rock habitats, relatively little is known about their general biology and ecology because of their cryptic lifestyle (Pinn et al. 2005, 2008).

Two species belonging to this group commonly occur on the American Atlantic coasts: *Barnea (Anchomasa) truncata* (Say, 1822) and *Barnea (Anchomasa) lamellosa* (d'Orbigny, 1846). *B. (A.) truncata*, the Atlantic mud piddock, occurs from Maine-USA to Sepetiba Bay-Brazil (North to South America), and is also recorded along the central and southern coast of South Africa. Although *B. (A.) lamellosa* has a distribution limited to the coasts of Uruguay and Argentina (Turner 1954; Monari 2009). This contribution reports for the first time the presence of *B. (A.) truncata*, in the intertidal zone of the Bahía Blanca Estuary Argentina, more than 2000 km south from the edge of its native range in South America.

Methods

The Bahía Blanca estuary (38°40'S – 39°25'S; 61°30'W – 62°40'W), is a wide coastal wetland in temperate South America. This coastal area is suitable for the navigation of large vessels, which has allowed the development of a complex port system. The examined material was taken at low tide from the intertidal fringe of Ingeniero White Port digging in the mud with a spade. Qualitative samplings were carried out in

Table 1. Morphological differences between *Barnea* (A.) *truncata* and *B. (A.) lamellosa*.

Shell morphology	<i>Barnea</i> (A.) <i>truncata</i>	<i>Barnea</i> (A.) <i>lamellosa</i>
Umbo position	Near the anterior third of the shell	More central
Umbonal reflection	Closely appressed over umbos but free anteriorly	Free for its entire length
Protoplax		
Shape	Parallel sides	Lanceolate
Posterior lobes	No	Yes
Pointed at the front	No	Yes
Longitudinal ridge	No	Yes
Upturned lateral margins	No	Yes
Posterior margin of the shell	Truncated	Rounded
Anterior margin of the shell	Slightly pronounced	Projected forward
Pedal gape	Oval and little concave	Rounded and more concave

November 2009, April 2010 and October 2010. During these samplings, 59 individuals were collected and subsequently analyzed in the laboratory. Taxonomic identification at species level was made following Turner (1954). In addition, a critical examination of the specimens deposited in the Argentine Museum of Natural Sciences Buenos Aires, Argentina (specimens MACN-In 20213) and those located in the Oceanographic Museum "Professor E. C. Rios", of the Federal University of Rio Grande, Brazil (specimens 9390, 15191, 16619, 18497, 20044, 47823) was made. Afterwards, all the examined material was deposited in the Malacology collection of the Argentine Institute of Oceanography (IADO-CONICET) and a complete specimen was sent to the Argentine Museum of Natural Sciences Buenos Aires, Argentina (MACN-In 38385).

To assess the presence and density of piddock population, an additional quantitative survey was performed in September 2010. An area of 530 m² of intertidal fringe was delimited during low tide, and 20 PVC corers (20 cm in diameter and 30 cm deep) were arranged at random. Samples were sieved through a mesh of 1 mm. Retained piddocks were counted and the maximum shell length of each individual was measured to the nearest 0.01 mm with a vernier digital calipers.

Results

The total number of specimens collected in 2009 and 2010 was 125. Shells of examined pholadids range between 14 to 55 mm in length. They are white, elongated, and fragile with concentric ridges and radial ribs becoming weaker towards

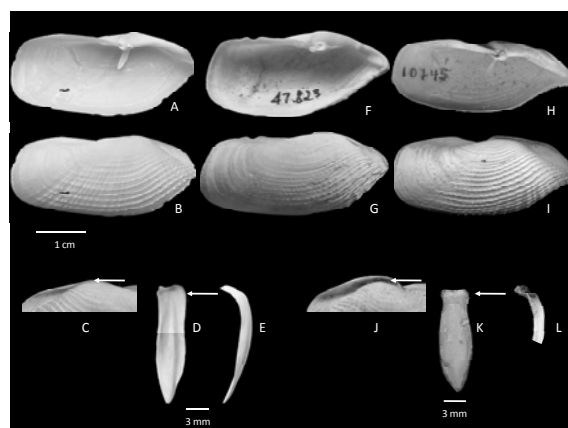


Figure 1. *Barnea* (A.) *truncata* found in Bahía Blanca estuary. (A) internal view of left valve, (B) external view of right valve, (C) detail of the umbonal reflection (D) dorsal view of protoplax, arrow indicates the absence of lobes, (E) lateral view of protoplax. *Barnea* (A.) *truncata* of Brazil, (F) internal view of left valve, (G) external view of right valve. *Barnea* (A.) *lamellosa* of Argentina, (H) internal view of left valve, (I) external view of right valve, (J) detail of the umbonal reflection. *Barnea* (A.) *lamellosa* found in Bahía Blanca estuary, (K) dorsal view of protoplax, arrow indicates the lobes, (L) lateral view of protoplax showing the upturned lateral margins (Photograph by Sandra Fiori).

the back of the shell. They have a single dorsal plate (protoplax) with weak growth lines. The inner shell surface shows a styloid projection, the apophysis, extending from beneath the umbo (Figure 1). Table 1 lists the characters differentiating *B. (A.) truncata*, the native species of Bahía Blanca, from *B. (A.) lamellosa*. Considering all the checked specimens of checked specimens, 10 of them clearly correspond to the description of *B. (A.) lamellosa*. In other 20 specimens, the position of the umbo and the protoplax features are those of *B. (A.) truncata*;

however, the posterior margin is more rounded (or less truncated). The remaining specimens fit with the morphological description of *B. (A.) truncata* published by Turner (1954).

The location where the Atlantic mud piddock was found in 2009 was visited every two months until October 2010. Nevertheless the piddock population was usually accessible during 1 h of low tide, in spring (September and October 2010) or during those periods when wind conditions allowed a further drop of the sea level (April 2010).

The length of the sampled piddock ranged from 22 to 54 mm and their mean density was 40.23 ± 36.53 individuals/m². Complete and empty piddock shells, from 14 to 54 mm, were found as in their life-position, with a mean density of 117.33 ± 81.92 dead individuals/m².

Discussion

This paper documents the southernmost American location of the *B. (A.) truncata* about 2000 km distance from its native distribution range. In April 2009, individuals of a wide range of sizes were registered in the study area for the first time, indicating that the population was already established. This intertidal piddock bed is exposed only for a short period of time during spring low tides or in periods when winds favors more low-water, which suggests its continuity in the subtidal zone.

The available information about the benthic macrofauna of the Bahía Blanca estuary is isolated and sporadic. Nevertheless, several surveys were made between 1981 and 1983, and one was made in 2000 in order to describe the spatial structure of intertidal and subtidal communities of soft substrates. In those studies there was no record of *B. (A.) truncata*, which infers that the appearance of this species into this ecosystem is relatively recent (Elias 1985; Elias and Bremec 1986; Elias et al. 2001).

From 1970 to the present (2011), the presence of exotic marine species in the Bahía Blanca estuary has been well documented (bryozoans, Lichtschein and Bastida 1980; tunicates, Martinez et al 1984; crustaceans, Hoffmeyer 2004; dinoflagellates, Barria de Cao and Piccolo 2008; hydrozoans, Molina et al. 2008; Foraminifera, Calvo-Marcilese and Langer 2010; bivalves, dos Santos and Fiori 2010). For many of these species it has been proposed that the accidental introduction through ballast water

from ships is the most probable entry route to the ecosystem. The location of the population of *B. (A.) truncata* in the port area (with heavy traffic from vessels of different nationalities), the long permanence of their larvae in the water column (Turner 1954; Chanley 1965), and its absence in intermediate locations between Sepetiba Bay (southern native range) and the Bahía Blanca estuary (Elias et al. 2001; Scarabino 2003; Giberto et al. 2004), may suggest that the entry route of this species was also through ballast water. However, the natural expansion of this species is a possibility that should also be taken into account, considering that the lack of records in intermediate locations could be associated with the cryptic life style of this species, which further restricts the chances of its discovery.

Invasive bivalve species, like *Barnea (A.) truncata*, that introduce new attributes to ecosystems are expected to have significant ecological impacts (Shea and Chesson 2002; Darrigran and Damborenea 2011). Perhaps the most obvious physical environmental change caused by invasive bivalves is the introduction or addition of shells to the benthic habitat. In the particular case of shallow burrowing bivalves, their shells often serve as substrate for the attachment and refuge of a variety of sessile organisms (Gutiérrez et al. 2003; Souza et al. 2009). This survey showed the prolonged persistence of empty shells of dead piddocks in life-position and in densities that exceed those of living clams. Thus, the most apparent species modification is the generation of a greater complexity and hetero-geneity of habitat in the soft bottom (mud and silt) of the estuary. The effect of these changes on the local biota should be evaluated. Further studies are necessary to understand the consequences of the appearance of *B. (A.) truncata*, especially its engineering activities on the structure and processes of communities, and the factors that might influence dispersion of this species.

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