

A new record of the invasive reef-building polychaete *Ficopomatus enigmaticus* (Fauvel, 1923) in the Claromecó Creek (Argentina) expands its distribution in the south-west Atlantic Ocean

Un nuevo registro del poliqueto invasor formador de arrecifes *Ficopomatus enigmaticus* (Fauvel, 1923) en el arroyo Claromecó (Argentina) expande su distribución en el Atlántico sudoeste.

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Abstract

Ficopomatus enigmaticus is an invasive reef-forming polychaete that has become globally distributed in marginal marine environments with subtropical and temperate climates. In Argentina it has been recorded up to now, from east to west, in the Mar Chiquita lagoon and the ports of Mar del Plata and Quequén. Recently, in the Claromecó creek, more than 100 km from Quequén, a reef formed by gregarious polychaetes has been found, which could be identified as belonging to this species. This finding considerably expands its distribution in the southwestern Atlantic Ocean and raises concerns about its possible expansion towards the Bahía Blanca estuary, where its presence could alter the geomorphology and ecology of the region.

Keywords: biological invasion, biotic reef, Serpulidae, south-west Atlantic

Resumen

Ficopomatus enigmaticus es un poliqueto invasor formador de arrecifes que tiene una distribución global en ambientes marinos marginales de clima subtropical y templado. En Argentina se lo ha registrado, hasta ahora, de este a oeste, en la albufera de Mar Chiquita y los puertos de Mar del Plata y Quequén. Recientemente, en el arroyo Claromecó, a más de 100 km de Quequén, se ha encontrado un arrecife formado por serpúlidos poliquetos gregarios, que pudieron ser identificados como pertenecientes a esta especie. Este hallazgo amplía considerablemente su distribución en el sudoeste del Océano Atlántico, y alerta acerca de su posible expansión en dirección al estuario de Bahía Blanca, donde su presencia podría alterar la geomorfología y ecología de la región.

Palabras clave: arrecife biótico, Atlántico sudoeste, invasión biológica, Serpulidae.

Introduction

Ficopomatus enigmaticus (Fauvel, 1923) is a polychaete annelid (Polychaeta: Serpulidae) that secretes calcareous tubes, in which it lives, of about 2 mm in diameter and up to 55 mm long. They are gregarious and settle their tubes on virtually any hard substrate in shallow waters up to three meters deep, in subtropical and temperate climate zones. It is very resistant to pollution but sensitive to wave energy. It tolerates wide ranges of salinity and pH. However, it grows better in estuaries and lagoons under brackish waters and high organic matter content, where aggregations of thousands of individuals can form reefs of several meters in diameter, which can coalesce to create wide platforms (Orensanz *et al.* 2002; Schwindt *et al.* 2004a). It is a filter-feeder on suspended organic matter and phytoplankton, with a fast growth rate (Dittman *et al.* 2009). It reproduces by pelagic planktonic planktotrophic larvae (Dittman *et al.* 2009) that can be mobile for more than a month before settling (Obenat & Pezzani 1994) and could be transported in ballast water. Their tubes can settle on boat hulls and be carried by seabirds (Costa *et al.* 2019).

It is considered an ecosystem engineer capable of modifying the ecology and geomorphology of the environments in which it thrives. The presence of *Ficopomatus* reefs alters water circulation and sediment transport and generates topographic positive relief (Schwindt *et al.* 2004b); and its filtering activity decreases turbidity and increases water oxygenation (Bianchi & Morri 1996; Schwindt *et al.* 2001; Luppi & Bas 2002; Bruschetti *et al.* 2008, 2009; Dittman *et al.* 2009). These changes

can favor numerous species, which find food, shelter, and nesting and breeding areas in their reefs (Bruschetti 2019; Bazterrica *et al.* 2020). On the other hand, they have negative effects: hindering the navigation of shallow-draft vessels, altering fishing activities (Bruschetti 2019), producing fouling of structures and blockage of pipelines (Orensanz & Estivariz 1971; Dittman *et al.* 2009).

It was first recorded in 1921 in a brackish water channel in the Normandy region (France) and described by Fauvel (1923) as *Mercierella enigmatica*. Almost at the same time, or very soon after, it was recorded in nearby places in France, London docks, Morocco, Tunisia and the Black Sea (Fauvel 1933). At first it was considered native to the Mediterranean (Fauvel 1933), and afterwards to some region of the Indian Ocean (India or Australia), but there is no certainty about its region of origin (Dittman *et al.* 2009). It currently has a global but disjunct distribution throughout temperate and warm-temperate regions of both hemispheres, even in isolated areas such as the Caspian Sea (Dittman *et al.* 2009; <https://obis.org/taxon/130988>).

It was first mentioned in the Atlantic of South America in 1938 in Uruguay (Monro 1938). Subsequently, in Argentina it was recorded in the estuary of the Quequén River (Rioja 1943), the port of Mar del Plata (Bastida 1968), the lagoon of Mar Chiquita (Orensanz & Estivariz 1971), and at the mouth of some streams in intermediate regions, Los Cueros (Orensanz & Estivariz 1971) and La Tigra (Pan & Marcoval 2014) (<http://www.inbiar.uns.edu.ar>) (Fig. 1 A, B).

The Claromecó Creek is one of the main watercourses in the southwest of Buenos Aires province and flows into the sea, next to the town of the same name. Its course is around 135 km long (Carbone & Piccolo 2002; Sosa *et al.* 2017) and is embedded in Quarternary sediments, forming scarps about 6 m high (Kokot *et al.* 2011). There is west-to-east littoral drift in the region (Bértola *et al.* 2009), although the spike at the mouth of the creek, generally oriented to the southwest, is sometimes oriented to the northeast and sometimes not observable, which is evidence of equilibrium transport (Kokot *et al.* 2011). Rock formations composed of sandy silts, generally attributed to the Ensenadense (Pleistocene), outcrop in the creek bed, forming a series of waterfalls in its channel (Kokot *et al.* 2011), of no more than one and half meters of vertical expression (Sosa *et al.* 2017), known as the *Siete Cascadas* (Seven Waterfalls) (Fig. 1C). The coastal drift current in this area is changing, there is a coastal transport considered in equilibrium (Kokot *et al.* 2011) or predominantly towards the east (Isla *et al.* 2022).

The aim of this study is to present a new record of *Ficopomatus enigmaticus* in the Claromecó Creek, which expands its distribution in the southwest Atlantic Ocean, and to analyze its potential ecologic implications.

Materials and methods

The *Primera Cascada* (First Waterfall), the Claromecó Creek waterfall closest to the sea, is around 1700 meters from the shore and at aprox. 8.5 MASL (Meters Above Sea Level) (38°50'49" S, 60°05'13" W) (Fig. 1 C). It is composed of a series of outcrops that alter the current of the creek. In one of them, about one meter long, a mass of serpulid tubes with living annelids was observed forming an encrusting reef along almost its entire edge downcurrent (Fig. 2). A sample was taken

from the reef and tubes, after been cleaned of sediment and organic matter, were analyzed: they are white, sometimes covered with a brown layer, presumably algae, of about 2 mm of diameter, gradually increasing towards anterior end and semicircular to circular in cross-section, bearing at irregular intervals collar-like rings; all characters that coincide with those described for *Ficopomatus enigmaticus* (Fauvel) (Hove & Weerdenburg 1978) (Fig. 2 D).

Discussion

This finding extends the known distribution area of *F. enigmaticus* in Argentina westward by more than 100 km; and demonstrates its ability to colonize small watercourses, settle relatively far from the coast, and disperse even against the prevailing drift current. The relatively small size of the *Ficopomatus* reef and its isolated occurrence could indicate a recent colonisation event.

To the west, approximately 200 km from Claromecó, lies the Bahía Blanca Estuary (Fig. 1 B). Between Claromecó and Bahía Blanca there are several rivers and creeks (Quequén Salado, Sauce Grande) that the polychaete could use as stepping stones to extend westward. If it arrived in the region, it would find large expanses of brackish water and shallow areas with a temperate climate (Perillo & Piccolo 1999), similar to the areas where it has spread most widely (Dittman *et al.* 2009; <https://obis.org/taxon/130988>). This would provide an environment where it could easily expand. As an ecological engineer, its presence there, as has happened elsewhere and been mentioned previously, would modify water circulation and sediment transport, alter the ecology of the region by favoring or harming the development of certain species, disrupt navigation and fishing activities, and could cause fouling of structures and blockage of pipelines.



Figure 1: A. Map of Argentina. The rectangle indicates the region detailed in B. B. Detail of the south-west coast of the Buenos Aires province. Red dots mark the localities where *Ficopomatus enigmaticus* has been recorded, and the new register (Claromecó). C. Lower course of the Claromecó Creek, with the location of the Primera Cascada (First Waterfall).

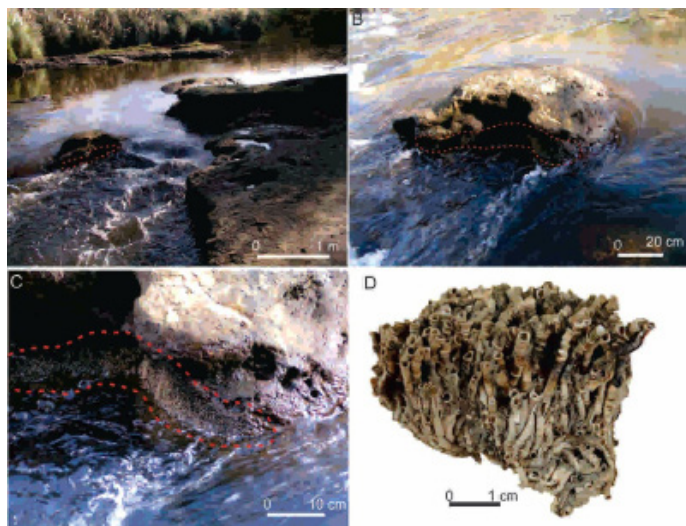


Figure 2: A. Primera Cascada (First Waterfall) of the Clacomecó Creek. View from south. Interrupted red line shows the location of encrusting reef of *Ficopomatus enigmaticus*. B. Detail of the encrusting reef of *F. egimaticus*. C. Bundle of tubes of *F. enigmaticus* from the above mentioned reef.

Concluding remarks

All of the above demonstrates that the presence of *F. enigmaticus* in Argentina is not limited to the coastal region between Mar Chiquita and Quequén, as was believed until now. It extends more than 100 km further west, at least as far as Claromecó; and raises the serious possibility of its expansion to other areas, such as the Bahía Blanca Estuary, where there are favorable conditions for its establishment, and its presence there would surely alter the geomorphology and ecology of the region.

This is the R-539 contribution of IDEAN

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