

## New alien Molluscs in the Mediterranean Sea

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**Abstract:** The present work deals with alien molluscs recorded at three stations along the Levantine coast of Turkey between the years 2010 and 2014. Out of 14 identified species, *Lodderia novemcarinata*, *Eratoena sulcifera*, *Zafra obesula* and *Zafra pumila* are new records for the Mediterranean Sea, whereas the other species, i. e., *Finella pupoides*, *Cerithiopsis pulvis*, *Cerithiopsis tenthrenois*, *Rissoina ambigua*, *Rissoina bertholeti*, *Pseudorhaphitoma iodolabiata*, *Pyrgulina maiae*, *Cingulina isseli*, *Pyrunculus fourierii* and *Septifer cumingii*, are alien molluscs previously reported from the area. In the investigated material have been also encountered two rarely distributed gastropod species: *Colubraria reticulata* and *Vexillum hypatiae*. The present study deals with the new record alien species, and herein are provided some data on the taxonomy, ecology and distribution of the species, with their colour photographs. The study also includes the photographs of *Colubraria reticulata* and *Vexillum hypatiae*.

**Résumé :** Nouveaux Mollusques introduits en Mer Méditerranée. Le présent travail signale de nouvelles espèces de Mollusques introduits, récoltés dans trois stations sur le littoral turc de la Mer du Levant, entre 2010 et 2014. Parmi les 14 espèces identifiées, *Lodderia novemcarinata*, *Eratoena sulcifera*, *Zafra obesula* et *Zafra pumila* sont des espèces nouvellement signalées pour faune de Méditerranée, alors que les autres espèces comme *Finella pupoides*, *Cerithiopsis pulvis*, *Cerithiopsis tenthrenois*, *Rissoina ambigua*, *Rissoina bertholeti*, *Pseudorhaphitoma iodolabiata*, *Pyrgulina maiae*, *Cingulina isseli*, *Pyrunculus fourierii* et *Septifer cumingii* sont des espèces introduites déjà signalées. Dans le même matériel étudié ont été également rencontrées deux espèces de gastéropodes rares: *Colubraria reticulata* et *Vexillum hypatiae*. La présente étude examine les espèces introduites nouvellement signalées et fournit quelques données sur la taxonomie, l'écologie et la distribution des espèces, complétées de photographies en couleur. Le travail comprend également des photographies de *Colubraria reticulata* et *Vexillum hypatiae*.

**Keywords:** Alien Molluscs • Mediterranean Sea • New Record • Turkey • Levantine Coast

## Introduction

The introduction of alien species in the Mediterranean Sea is a process ongoing for years and the eastern Mediterranean, being close to the Suez Canal, seems to be the most suitable area for their settlements. Nowadays, out of 986 alien species known in the Mediterranean, 775 species were recorded in the eastern basin (Zenetos et al., 2012).

Along the Turkish coast, Iskenderun Bay, which is located in the eastern Levantine coast of Turkey, is one of the most convenient areas for the colonization of alien species, due to both its proximity to the Suez Canal and the intensive international maritime traffic in the bay. According to Çınar et al. (2011), out of 400 alien species distributed on the Turkish coasts, 330 species were recorded along the Levantine coast and, among the systematic groups, the molluscs are the richest one with 105 species of which 77 species have been reported from Iskenderun Bay (Bitlis-Bakır et al., 2012). Since the work performed by Çınar et al. (2011), some new alien molluscs have been added to the species list of the Turkish malacofauna (i. e., *Teredothyra dominicensis* (Bartsch, 1921), *Pseudorhaphitoma iodolabiata* (Hornung & Mermod, 1928), *Plocamopherus tilesii* Bergh, 1877, *Nudiscintilla cf. glabra* Lützen & Nielsen, 2005, *Eunaticina papilla* Gmelin, 1791, *Gouldiopa consternans* (Oliver & Zuschin, 2001), *Teredo bartschi* Clapp, 1923, *Caecum sepimentum* de Folin, 1868, *Crepidula fornicata* (Linnaeus, 1758) and *Ervilia scaliola* Issel, 1829) in the studies recently performed by Müller (2011), Öztürk (2012), Yokes et al. (2012), Mifsud & Ovalis (2012), Öztürk & Bitlis-Bakır (2013), Ovalis & Mifsud (2013 & 2014), Borges et al. (2014), Doğan et al. (2014) and Zenetos & Ovalis (2014) respectively. According to the species list compiled by Öztürk et al. (2014), a total of 1065 mollusc species have been recorded along the Turkish coasts up to day, of which 118 species have been stated as species with alien origin. The present study adds four more alien molluscs to the Mediterranean fauna.

## Materials and Methods

The representatives of the species dealing with herein, except for *Lodiella novemcarinata* and *Eratoena sulcifera*, were found in a detritic muddy material sampled by scuba diving in a locality near Kale (Hatay), on the eastern Levantine coast of Turkey between Iskenderun Bay and Samandağ, in June 2010 (Fig. 1, station 1). The material was taken at a depth of 16 m. The specimens of *Lodiella novemcarinata* were encountered in Iskenderun Bay (Fig. 1, station 2) (36°51'52"N-35°55'28"E), in a sandy mud material sampled at 9 m depth in 2010 and 2014. *Eratonia*

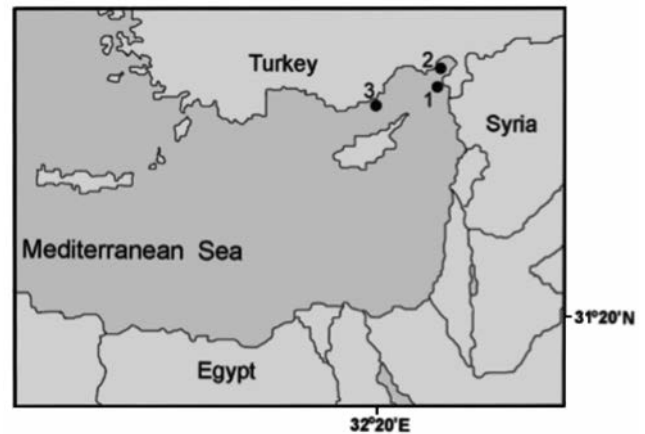


Figure 1. Map of the studied area.

*sulcifera*, however, was found in Taşucu (Tisan Peninsula) at a depth of 5 m in 2013.

The nomenclature of the species is given according to WoRMS (World Register of Marine Species).

The investigated specimens of each species, with individual catalogue numbers, are deposited in the museum collections of the Faculty of Fisheries (ESFM), Ege University, Izmir/Turkey and Can Geyran Seashell Center, Istanbul/Turkey.

## Result and Discussion

The examination of the materials sampled at three localities on the eastern Levantine coast of Turkey revealed the following alien mollusc species: *Lodderia novemcarinata* (Melvill, 1906), *Finella pupoides* Adams A., 1860, *Cerithiopsis pulvis* (Issel, 1869), *Cerithiopsis tenthrenois* (Melvill, 1896), *Rissoina ambigua* (Gould, 1849), *Rissoina bertholleti* Issel, 1869, *Eratoena sulcifera* (Gray in Sowerby G.B.I, 1832), *Zafra obesula* (Hervier, 1899), *Zafra pumila* (Dunker, 1858), *Pseudorhaphitoma iodolabiata* (Hornung & Mermod, 1928), *Pyrgulina maiiae* Hornung & Mermod, 1924, *Cingulina isseli* (Tryon, 1886), *Pyrrunculus fourierii* (Audouin, 1826) and *Septifer cumingii* Récluz, 1849. A fresh shell of *Epitonium lyra* (Sowerby II, 1844) was also found, but as the shell had no soft part, is not discussed herein. Some rarely distributed species along the Turkish coast such as *Colubraria reticulata* (*Cumia reticulata*) (de Blainville, 1829) (one specimen) and *Vexillum hypatiae* (Pallary, 1912) (4 specimens) were also encountered in the sampled material (Fig. 1, station 1).

Of the above reported species, *Lodderia novemcarinata*, *Eratoena sulcifera*, *Zafra obesula* and *Zafra pumila* are new reports for the Mediterranean fauna. The other mentioned species have been reported several times from different localities along the coasts of Turkey, and mostly

from the Turkish Levantine coast. *Finella pupoides* and *Rissoina bertholleti*, however, have also been recorded in the Aegean Sea by Öztürk & Can (2006) and Koçak & Katağan (2005) respectively.

Some taxonomic, ecologic and distributional features of the newly reported species are given below.

Class Gastropoda

Family Skeneidae

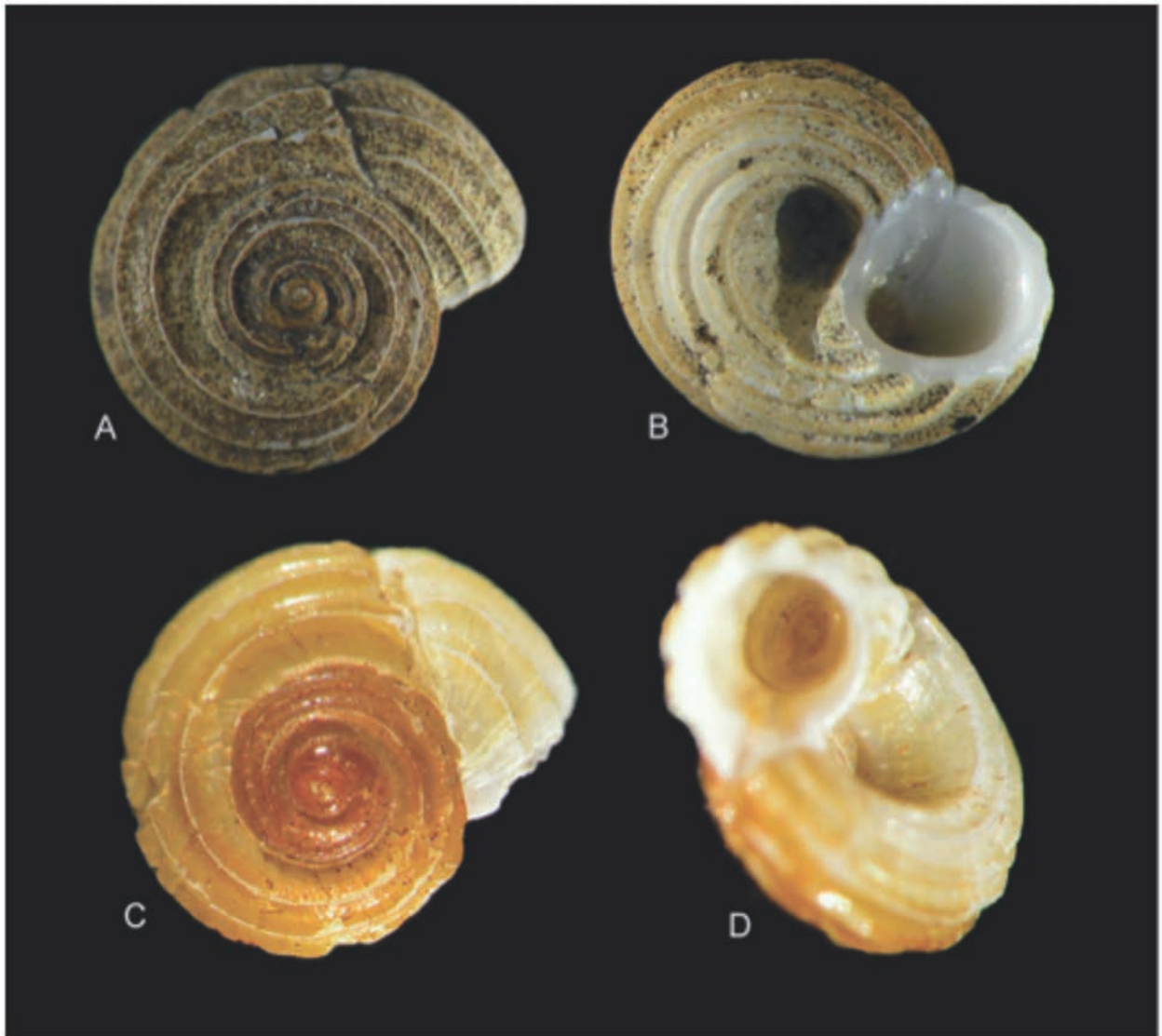
***Lodderia novemcarinata* (Melvill, 1906)**

(Fig. 2)

*Cyclostrema novem-carinatum*; Melvill, 1906:22, Pl. 3, figs 3, 3a (original description).

*Circulus novemcarinatus*; Janssen et al., 2011: 421, Pl. 18, fig. 1.

*Lodderia novemcarinata*; Bosch et al., 1995: 38, fig. 64. Shell small, strong, discoidally coiled and consists of strongly spirally keeled teleoconch whorls. Spire slightly elevated. On the last whorl there are nine spiral carinae, of which the sutural and inner umbilical keels weakly developed (as it was stated in the original description) and two carinae on the penultimate whorl. Between the keels evident growth lines. Aperture circular, slightly thickened and nacreous inside; with a corneous and multispiral operculum inside. A narrow callus extending on the columellar edge. Umbilicus wide and deep. The specimens are of whitish colour, but in some shells the surface, especially the spire whorls, may be rust-coloured. Five



**Figure 2.** *Lodderia novemcarinata* (Melvill, 1906): apical and basal views of two specimens ( $d_A = d_B = 5.1$  mm;  $d_C = d_D = 4.5$  mm).

specimens of the species have been found in Iskenderun Bay (Fig. 1, sta. 2), which shell sizes vary between 2.4 and 3.6 mm. The species was first encountered in 2010 at 8 m depth.

#### Distribution

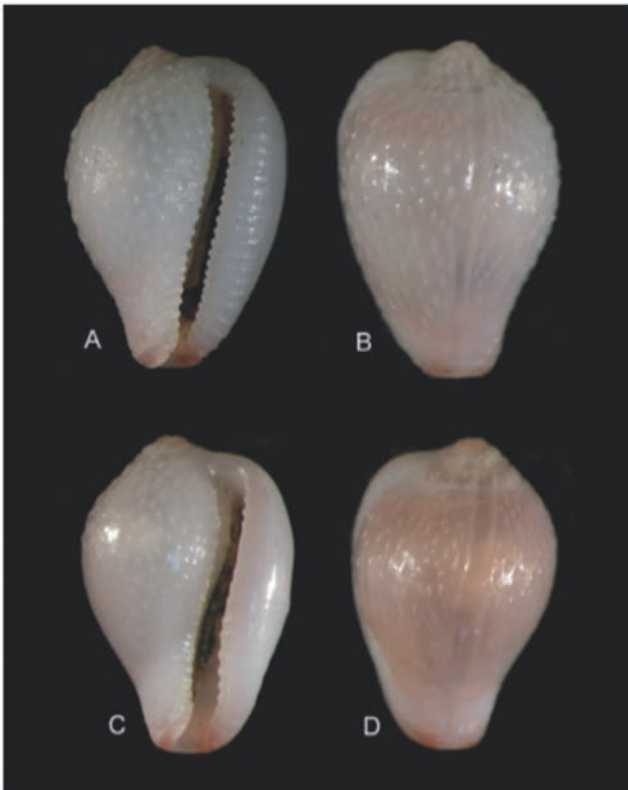
The type locality of the species is Gulf of Oman (Melvill, 1906: 23). At the present day, it is known to be distributed in the Gulf of Oman, Persian Gulf, along the coast of Masirah Island (Arabian Sea) and Red Sea (Bosch et al., 1995: 38; Janssen et al., 2011: 422). *Lodderia novemcarinata*, although, is known as a deep water species (Melvill, 1906: 285 m; Bosch et al., 1995: deep water), our specimens were recorded at depths of 8 and 10 m, from which depth (10 m) Janssen et al. (2011) reported his single specimen from the Red Sea, found in sand between coral patches (p. 379).

#### Family Triviidae

#### *Eratoena sulcifera* (Gray in Sowerby G.B.I., 1832)

(Fig. 3)

*Erato sulcifera*; Sowerby, 1832: 15, fig. 46, (*original description*).



**Figure 3.** *Eratoena sulcifera*: ventral (A, C) and dorsal (B, D) views of two specimens ( $h_A = h_B = 5.1$  mm;  $h_C = h_D = 4.5$  mm).

*Lachryma sulcifera*, Cernohorsky, 1968: 371, Pl. 52, figs 22, 22a.

*Proterato sulcifera*, Dekker & Orlin, 2000: 23.

Shell marginellid in shape, with elevated spire and blunt apex. Labial lip moderately broad and roundly angulate near shoulder. Shell sculpture consists of a shallow dorsal groove and numerous small granules. Aperture narrow, labial lip with 15-23 denticles; 8-18 denticles on the columella which may disappear posteriorly. Anterior columellar ridge transversely striate. The number of the denticles depend on the size of the individuals. Light pinkish in colour, with pink or pink brown anterior extremity. The height of the shell of the found specimens vary between 4.5 and 5.1 mm.

#### Distribution

The type locality of the species is Cape of Good Hope (Cernohorsky, 1968: 371). It is distributed throughout the Fiji Islands, tropical Indo-Pacific Ocean and Tuamotu Archipelago (Cernohorsky, 1968: 371). *Eratoena sulcifera* is a shallow water species which can be encountered under coral rocks. We have recorded three specimens under rocks in Taşucu (Tisan Peninsula) at a depth of 5 m in 2013.

#### Family Columbelloidea

#### *Zafra obesula* (Hervier, 1899)

(Fig. 4)

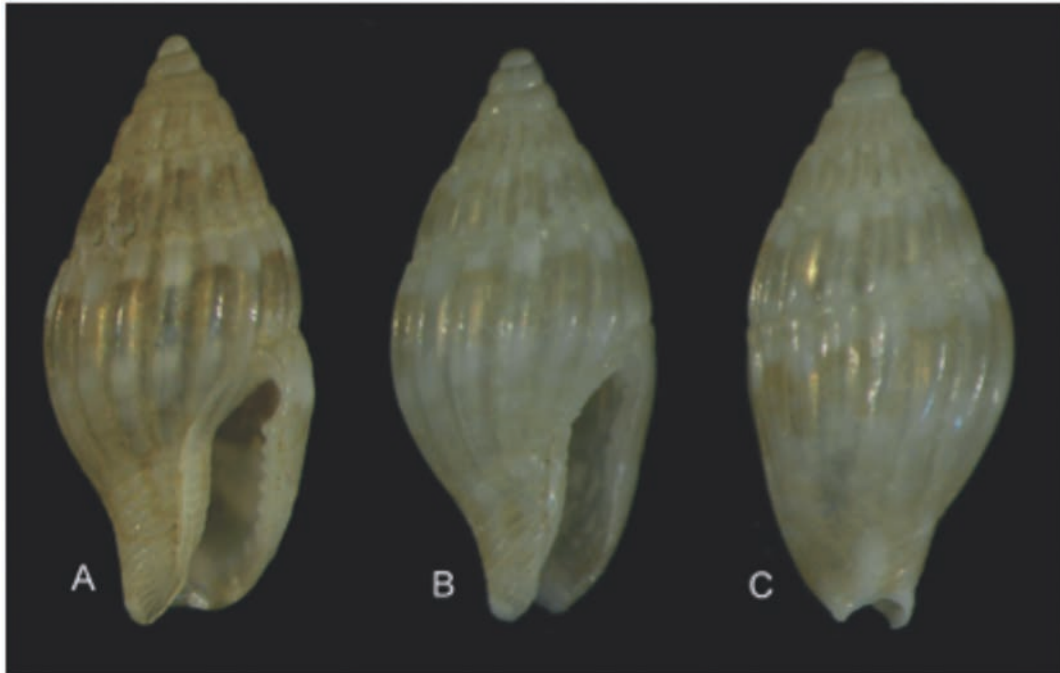
*Columbella obesula*; Hervier, 1899: 376-377, pl. 14 fig. 6 (*original description*).

*Zafra obesula*; de Maintenon, 2008: 365, fig. 37.

The shell of the species is wide, having nearly a globular aspect, with 3 smooth protoconch whorls and 3 to 3.5 teleoconch whorls. The sculpture of the shell consists of smooth and straight axial ribs weakening to the basal part of the body whorl and lacking in the area near the labrum. Ribs thickness almost equal to the interspaces between them. The dorsal part of the canal bears 3-5 spiral threads. Aperture elongated, outer lip thickened inside and with regularly denticulate edge. There are also less evident denticles on the columellar edge. Siphonal canal as in other *Zafra* species. The specimens are of whitish colour with straw coloured or tan spiral bands. Sometimes with wavy brown axial lines on the base. The shell of 10 recorded specimens vary from 2.8 to 3.4 mm in height.

#### Distribution

The type locality of the species is Lifou Island (New Caledonia, western Pacific Ocean) (Hervier, 1899: 376). The species is also distributed along Papua New Guinea and Madagascar coasts (OBIS), and in the Red Sea (Deker & Orlin, 2000).



**Figure 4.** *Zafra obesula*: ventral (A, B) and dorsal (C) views of two specimens ( $h_A = 3.1$  mm;  $h_B = h_C = 3.4$  mm).

***Zafra pumila* (Dunker, 1858)**

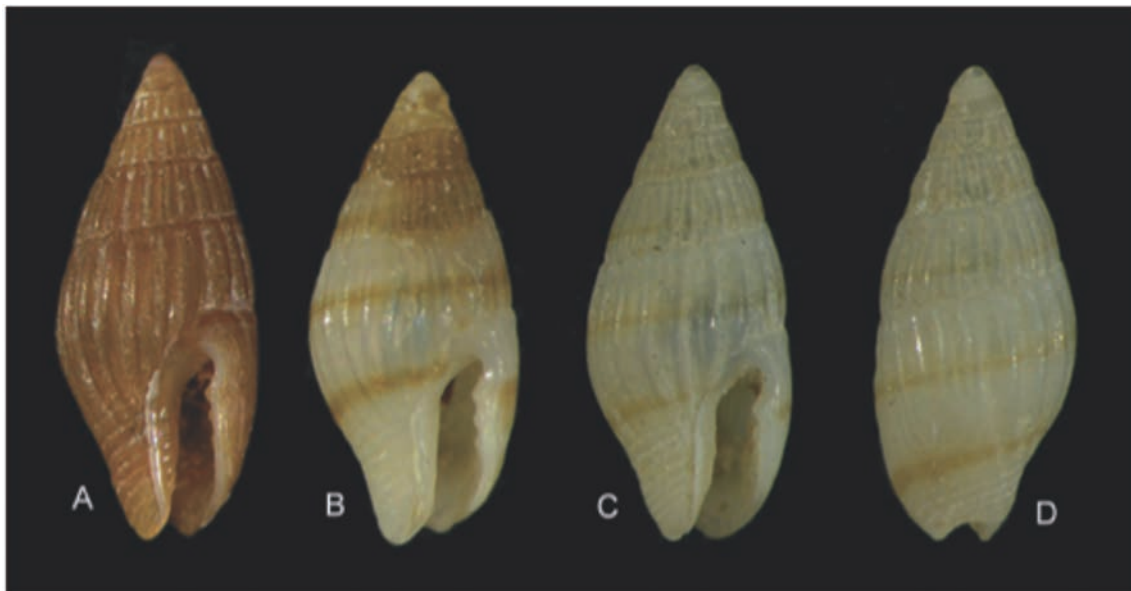
(Fig. 5)

*Columbella pumila*; Dunker, 1860: 224 (not figured).

*Zafra pumila*; Monsecour & Köhler, 2006: 297-298, fig. 49; de Maintenon, 2008: 365, fig. 39.

Shell fusiform, with about 3.5 protoconch whorls and 3.5 to 4 teleoconch whorls. Nearly straight axial ribs on the

surface. The axial ribs, being weaker and denser than the ribs of the other Mediterranean *Zafra* species, do not reach to the base of the shell. They also disappeared to the outer lip of the shell. There are 3-5 threads on the behind of anterior siphonal canal. Aperture elongated, outer lip thickened inside and with denticulation on it. The first denticles by the side of posterior siphonal canal are more evident than those disposed adapically. Less evident



**Figure 5.** *Zafra pumila*: ventral (A, B, C) and dorsal (D) views of three specimens ( $h_A = 4.1$  mm;  $h_B = 3.7$  mm;  $h_C = h_D = 3.9$  mm).

denticles on the columellar edge. According to Monsecour & Köhler (2006), the specimens belonging to the species may be of two colour morphs: one is brown overall (Fig. 5A); and the other ones in yellowish colour with two narrow brown spiral bands on the body whorl and one spiral band on the spire whorls, nearer to the lower suture (Fig. 5B & C). In the present study, by three specimens of two colour morphs have been recorded and their shell height vary from 3 to 4.1 mm.

#### Distribution

The type locality of the species is Decima (Japan) (Monsecour & Köhler, 2006). At the present day, it is widespread in the Indo-Pacific area. The species is known to be distributed along the shoreline from the Red Sea south to Natal (South Africa), and also on the Japanese and Polynesian coasts (Monsecour & Köhler, 2006).

Of the genus *Zafra*, two species were previously recorded in the Mediterranean: *Zafra savignyi* (Moazzo, 1939) and *Zafra selaspora* (Melvill & Standen, 1901). Both species are with Indo-Pacific origin. *Zafra savignyi* was recorded first in the Israeli coast in 1954 and later it extended its distributional area to the other coasts in the eastern Mediterranean (Zenetos et al., 2003). The first record of the second species is also from the Israeli coast in 1980 (van Aartsen, 1997) and later it expanded its area of distribution to the Turkish and Cypriot coasts (Palazzi, 1993; Buzzurro & Greppi, 1997). Of the dealing with herein *Zafra* species, *Z. obesula* has some similarities with *Z. selaspora*, but it differs from the last species being globular and having less evident wavy axial lines instead of evident flames in *Z. selaspora*.

In the Mediterranean, *Pseudorhaphitoma iodolabiata*, based on one specimen, was first reported from Iskenderun Bay (Levantine coast of Turkey) in 2012 (Öztürk, 2012). In the present study we encountered 5 more specimens of the species, and it can be classify among the established alien species.

As it was stated above, in the station 1 (Fig. 1) it was also found a shell of *Epitonium lyra* (Sowerby II, 1844), but the shell being with no soft part, was not taken into consideration. To introduce the species only, we illustrated it (Fig. 6). The species is distributed in Red Sea (Bosh et al., 1995: 109, Fig. 425).

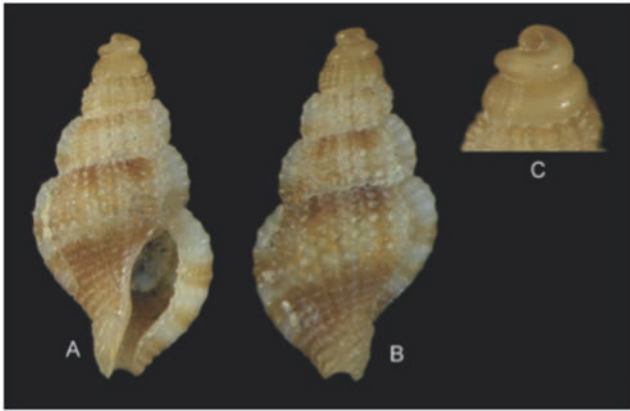
In this work, besides the alien species, there were also encountered some rarely distributed species along the Turkish coasts such as *Vexillum hypatiae* (Pallary, 1912) (Fig. 7) and *Colubraria reticulata* (de Blainville, 1829) (Fig. 8). The first species was previously reported from the area by Giannuzzi-Savelli et al (2003: 268) and the second one was recorded in Taşucu (Levantine coast of Turkey) by Buzzurro & Greppi (1996).



Figure 6. *Epitonium lyra*: ventral view of the found shell ( $h = 5.6$  mm).



Figure 7. *Vexillum hypatiae*: ventral and dorsal views of a specimen ( $h_A = h_B = 6.3$  mm).



**Figure 8.** *Colubraria reticulata*: ventral and dorsal views of a specimen and its protoconch ( $h_A = h_B = 6.4$  mm).

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