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SHORT COMMUNICATION KISA MAKALE

First record of alien gastropods *Epitonium aranea* Bonfitto, 2018 and *Stosicia annulata* (Dunker, 1860) (Mollusca) from the Mediterranean Sea

İki yabancı gastropod türünün [*Epitonium aranea* Bonfitto, 2018 ve *Stosicia annulata* (Dunker, 1860) (Mollusca)] Akdeniz'den ilk defa kaydedilmesi

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Abstract: In a benthic material taken from the Levantine coast of Türkiye, *Epitonium aranea* Bonfitto, 2018, a species previously known from the Red Sea only, and *Stosicia annulata* (Dunker, 1860) distributed in Japan Sea, Persian Gulf and Central and East Indian Ocean were recorded for the first time from the Mediterranean Sea. Along with two unknown species from the region, herein have also been dealing with *Melanella* sp., *Oscilla virginiae* Peñas, Rolán and Sabelli, 2020 and *Zafra pumila* (Dunker, 1860) which are poorly known species from the area, and some remarks of the taxonomy and distribution of the studied taxa are discussed.

Keywords: Mollusca, alien species, Mediterranean Sea, new record, Turkish coast

Öz: Türkiye'nin Levant Denizi kıyılarından alınan bir bentik materyalde, daha önce sadece Kızıldeniz'den bilinen *Epitonium aranea* Bonfitto, 2018 ile Japon Denizi, Basra Körfezi ve Orta ve Doğu Hint Okyanusu'nda dağılım gösteren *Stosicia annulata* (Dunker, 1860) türleri Akdeniz'de ilk defa bulunmuştur. Bu çalışmada, bölgeden bilinmeyen bu iki türün yanı sıra, *Melanella* sp., *Oscilla virginiae* Peñas, Rolán ve Sabelli, 2020 ve bölgeden az bilinen yumuşakçalar arasında yer alan *Zafra pumila* (Dunker, 1860) türleri de bulunmuş olup, incelenen türlerin taksonomik ve dağılım özellikleri tartışılmıştır.

Anahtar kelimeler: Mollusca, yabancı tür, Akdeniz, yeni kayıt, Türkiye kıyıları

INTRODUCTION

The Mediterranean Sea, which is a semi enclosed ecosystem, is one of the prominent hotspots of marine bioinvasions on earth (Rilov and Galil, 2009) and most of the known species in this ecosystem are assessed to have successfully established, being recorded for multiple times (Zenetos et al., 2022).

The alien species being successfully established in an introduced area may restructuring established food webs, importing new diseases and competition with native organisms for food and space. Other ecological changes may occur when the invading organisms reproduce with native species, altering the gene pool (Occhipinti Ambrogi, 2001). Invaders are also capable of colonizing every ecosystem on earth, changing the ecological relations within communities, altering evolutionary processes, and causing dramatic changes in native populations, including extinctions (Mack et al., 2000). Gastropods, which are in the majority among the alien species, cause a multitude of environmental and socioeconomic impacts in many habitats, represent a major threat to native plants and animals. They also consist one of the significant problems in agriculture, resulting in economic losses by reducing the yield (Kesner and Kumschick, 2018).

Regarding the housed alien species number, there are significant differences among the Mediterranean basins. Eastern Mediterranean, being close to the Suez Canal, which is one of the main pathways for entering of alien species, includes highest number species, where the taxa with Indo-Pacific origin dominated. The lowest alien species diversity occurs in the western Mediterranean, where fouling and ballast water of ships seem to be the main vector for transportation of alien species (Zenetos et al., 2012; Galil et al., 2018).

Among the Mediterranean countries, Türkiye is one of the most impacted one. İskenderun Bay, which is found in close distance to the Suez Canal and the dense maritime traffic occurring due to the oil transportation from the Ceyhan Oil Terminal, attracts attention as a hotspot area of the region from where was reported 77 alien species (Bitlis Bakır et al., 2012). Çınar et al. (2021) reported 539 species belonging to 18 taxonomic groups, 404 of which have been estimated as established ones, including the list of alien species distributed on the Turkish coasts by the end of 2020. In terms of the number of species, molluscs rank first with 123 species. The number of alien molluscs has been increased from 105 species (Çınar et al., 2011) to 123 for a period nearly one decade. *Epitonium vaillanti* (Jousseaume, 1912) recorded from the Turkish Levantine coast (Öztürk et al., 2023a), *Phosinella digera* (Laseron, 1956) found on the Turkish Levantine coast

(in Taşucu) and *Circulus octoliratus* (Carpenter 1856) recorded from Taşucu and İskenderun Bay (Levantine coast of Türkiye) (Ovalis and Mifsud, 2019; Öztürk et al., 2023b) should be added to the last published checklist (Çınar et al., 2021). *P. digera* and *C. octoliratus* have been overlooked in the recently published checklist by Çınar et al. (2021).

In the present study is dealing with two new record gastropod species for the Mediterranean Sea (*E. aranea* and *S. annulata*), recorded in the İskenderun Bay (Levantine coast of Türkiye), along with some other poorly known alien species.

MATERIALS AND METHODS

The material was sampled from off Konacık Sütunlu Liman (Colonnade Port) (İskenderun Bay), eastern Levantine coast of Türkiye. Konacık Sütunlu Liman is located within the borders of Konacık village (Arsuz-Hatay) and is in a distance approximately 8 km from Arsuz district center (Figure 1). On the coast of Konacık village there are the ruins of an ancient port city from the Hellenistic period, and for this reason, it was called the "Colonnade Port" by the local people.

Figure 1. Map of sampled area and locality

The benthic material, in which the species dealing with herein were found, was sampled from a depth of about 48 m (36°23'46"N- 35°50'19"E) on August 23, 2022 (Figure 1). The material was muddy sand with shell fragments and sea urchin skeletons and was fixed with 4% formaldehyde. In the laboratory, the material was washed with tap water on a 0.5 mm mesh and then sorted under a stereomicroscope. Both living individuals and empty shells were identified and counted. In the present study, only the alien gastropods have been taken into consideration. The nomenclature of the studied species is given according to WoRMS (World Register of Marine Species).

The studied specimens of each species, with individual catalogue numbers, are deposited in the museum collections of the Faculty of Fisheries (ESFM), Ege University, İzmir/Türkiye.

RESULTS AND DISCUSSION

The examination of the sampled benthic material revealed 16 specimens and 5 shells belonging to nine alien mollusc taxa, from which four species are within the subclass Caenogastropoda [*Epitonium aranea* Bonfitto, 2018; *Melanella* sp., *Stosicia annulata* (Dunker, 1860) and *Zafra pumila* (Dunker, 1860)] and five species are from the subclass Heterobranchia [*Leucotina natalensis* Smith, E. A., 1910; *Cingulina isseli* (Tryon, 1886); *Oscilla virginiae* Peñas, Rolán and Sabelli, 2020; *Pyrgulina pupaeformis* (Souverbie, 1865) and *Pyrunculus fourierii* (Audouin, 1826)]. According to the recent publication by Zenetos et al. (2022), including the alien species distributed in the Mediterranean Sea, *E. aranea* and *S. annulata* were recorded for the first time from the Mediterranean Sea. On the other hand, *O. virginiae* and *Melanella* sp. are new records for the Turkish mollusc fauna as reported by this study. Among the other taxa, some are well known species such as *L. natalensis*, *C. isseli*, *P. pupaeformis* and *P. fourierii*. All the previously known species were recorded from the Turkish Levantine coast, except for *L. natalensis* and *P. fourierii* which were also reported from the Aegean coast of Türkiye.

Some taxonomic, ecologic, and distributional features of newly recorded or poorly known species are given below.

Taxonomic account

Epitoniidae Berry, S. S., 1910

Epitonium aranea Bonfitto, 2018 (Figure 2)

Epitonium aranea; Bonfitto, 2018: 119-129, fig. 4, A-K

Material examined: 1 specimen (ESFM-GAS/2022-01).

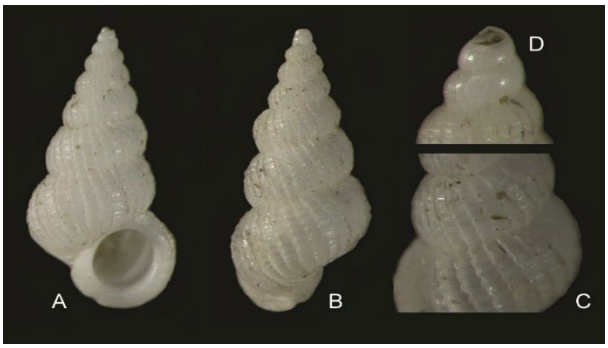

Figure 2. *Epitonium aranea*: ventral (A) and dorsal (B) views of the sampled specimen, axial ribs under magnification (C) and the protoconch of the specimen (D). (A=B=4.3 mm)

Remarks: The type locality of the species is the Red Sea (off Yemen), found on muddy sand at 76 m depth (Bonfitto, 2018: 124). The species is with a glossy protoconch of about 3.5 whorls and is characteristic having a reticulated sculpture of regular meshes caused by the crossing of axial ribs and spiral threads. Axial ribs (23 on the body whorl) are thin, stripe-

like, and sinuous (Figure 2). Aperture oval, outer lip thick and columella auriculate.

Distribution: The species was hitherto known from its type locality (Red Sea) only (Bonfitto, 2018). The present record is the first one for the Mediterranean Sea. The location, where the species was found, being in the close distance to the Suez Canal, it is suggested the species to have penetrated the Mediterranean by this pathway.

Eulimidae Philippi, R. A., 1853

Melanella sp. (Figure 3)

Melanella sp. 2; Mbazios et al., 2020: 35, fig. 7a.

Melanella conoidea; Manousis et al., 2021: 39, fig. 5e.

Material examined: 1 specimen (ESFM-GAS/2022-02).

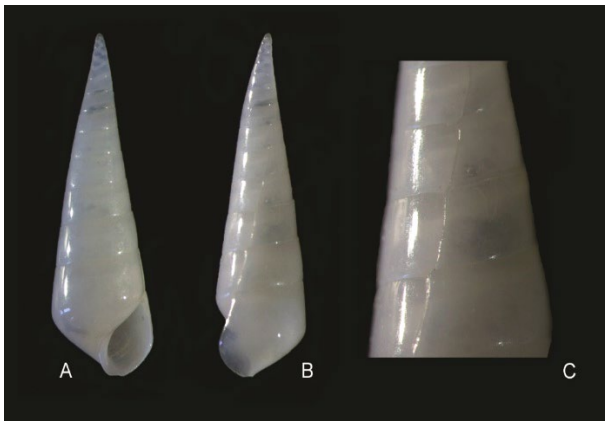

Figure 3. *Melanella* sp.: ventral (A), lateral (B) and incremental scars (C) views of the found specimen (A=B=6.3 mm)

Remarks: The shell in grey-white colour, conical, shiny and consists of 11 flat teleoconch whorls. Apical part sinuous. Incremental scars evident. The species is characteristic with subangulated body whorl and angulated outer lip of the aperture. By its shell shape and characteristics of the body whorl, the specimen looks very similar to that of *Melanella conoidea* (Kurtz and Stimpson, 1851), which is a species distributed along the Atlantic coasts from North Carolina to Uruguay at depths between 0-538 m (Rosenberg et al., 2009: 643), but more specimens need to be studied to understand whether we are dealing with a known species or a new undescribed one.

A similar specimen was reported by Mbazios et al. (2020: 35, fig. 7A) as *Melanella* sp. 2, which specimen was compared by the authors to *Parvioris ibizenca* (Nordsieck, 1968), *Melanella conoidea* (Kurtz and Stimpson, 1851) and fossil records of Chirli (2009) and, although existence of some differences, the specimen was found quite similar to *Melanella conoidea* and *M. lactea* (Grateloup, 1838). After a while, a similar specimen was identified as *Melanella conoidea* by Manousis et al. (2021: 39, fig. 5e). The authors were also in opinion that the specimen considered by Mbazios et al. (2020) as *Melanella* sp. 2 was a *Melanella conoidea* (Manousis et al., 2021: 32).

Distribution: *Melanella* sp. is distributed along the Hellenic (Mbazios et al., 2020; Manousis et al., 2021) and Turkish coasts (the present study).

Zebinidae Coan, 1964

Stosicia annulata (Dunker, 1860) (Figure 4)

Rissoina annulata; Dunker, 1860: 235 (*not figured*).

Material examined: 2 specimens (ESFM-GAS/2022-3).

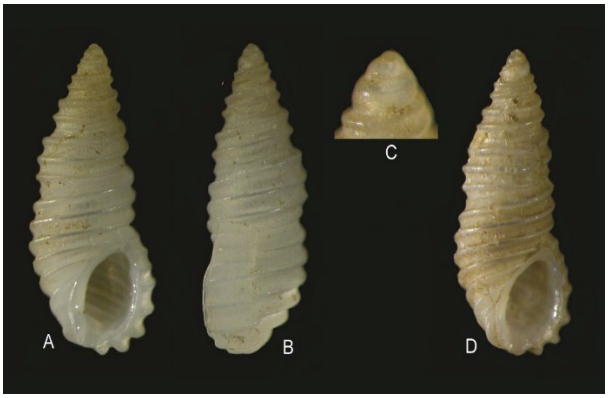

Figure 4. *Stosicia annulata*: ventral (A, D) and dorsal (B) views of the sampled specimens and the protoconch (C) of the specimen A (A=B=3.4 mm; D=3.4 mm).

Remarks: The type locality of the species is Japan coasts (WoRMS).

Shell thick, consists of about 4 teleoconch whorls and a smooth protoconch of nearly 3 whorls (Figure 4C). On the whorls strong spiral ribs with canaliculated interspaces. On the body whorl 6 ribs, 3 ribs on the penultimate whorl and two ribs on the initial whorls. Aperture ovoid, outer lip thickened. In whitish colour.

Distribution: The species is known to be distributed in Japan Sea to Kyushu (Okutani, 2000: 160), Persian Gulf and Gulf of Oman (Bosch et al., 1995: 48), western Indian coast, Indochina, Central and East Indian Ocean (Mukhopadhyay, 2015: 92-93). Its report in the present study is the first one for the Mediterranean Sea.

Pyramidellidae Gray, 1840

Oscilla virginiae Peñas, Rolán and Sabelli, 2020 (Figure 5)

Material examined: 2 shells (ESFM-GAS/2022-04).

Remarks: The type locality of *O. virginiae* is Aqaba (Jordan), 5-15 m (Peñas et al.,2020).

Shell minute, solid and consists of 4 teleoconch whorls with spiral ribs on. On the first two whorls there is two ribs, of which adapical one is wider. On the third whorl the upper rib bifurcates and on the body whorl they become three ribs, of which the upper two ribs being closer to each other. One of the shells (A) was with eroded protoconch and the other shell (B) has a protoconch with submerged nucleus. No visible axial elements. Aperture oval-shaped, an evident tooth on the columella

and thin outer lip. The differences of the species from the similar ones (*C. isseli*, *Oscilla galilae* and *Miralda* sp.) were clarified in the study by Albano et al. (2021: 46).

Distribution: Red Sea (Jordan and Egypt coasts) (Peñas et al., 2020) and eastern Mediterranean Sea (Israeli coast) (Albano et al., 2021). The present record is the second one from the Mediterranean Sea.

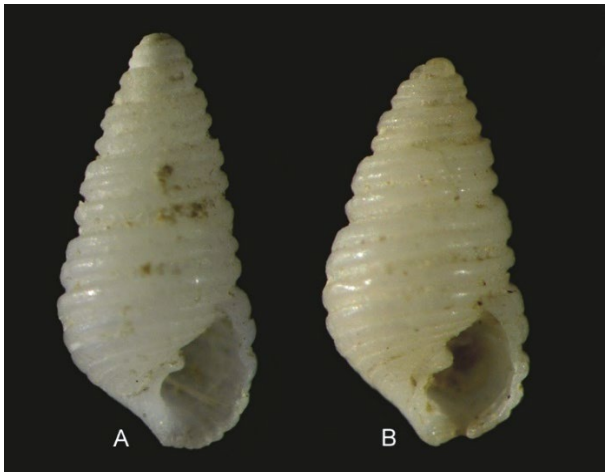

Figure 5. *Oscilla virginiae*: ventral views of the sampled shells (A=2.9 mm; B=2.3 mm).

Columbellidae Swainson, 1840

Zafra pumila (Dunker, 1860) (Figure 6)

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

Material examined: 2 specimens (ESFM-GAS/2022-05).

Figure 6. *Zafra pumila*: ventral (A) and dorsal (B) views of one of the sampled specimens (A=B=4.0 mm).

Remarks: The type locality of the species is Decima (Japan) (Monsecour and Köhler, 2006).

In the Mediterranean Sea, the species was first recorded from the Turkish Levantine coast in June 2010 (Öztürk et al., 2015). According to Monsecour and Köhler (2006), the specimens belonging to the species may being of two-colour morphs: one is brown overall and the second one 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. Along the Turkish Levantine coast both colour morphs have been recorded (Figure 6A, B and Öztürk et al., 2015 fig. 5 A, B, C). Recently, 7 specimens of *Z. pumila* was also found in Taşucu (Tisan Bay) (Levantine cost of Türkiye) in a sandy substrate taken at 8 m depth (Panayotis Ovalis, pers. comm.).

Distribution: *Zafra pumila* is widespread in the Indo-Pacific area. The species is also distributed along the shoreline from the Red Sea south to Natal (South Africa), and on the Japanese and Polynesian coasts (Monsecour and Köhler, 2006). Since June 2010 it also occurs in the Mediterranean Sea (Öztürk et al., 2015).

The other alien species detected in the present study (*L. natalensis*, *C. isseli*, *P. pupaeformis* and *P. fourierii*) are widely distributed in the Mediterranean and have been assessed as established species (Figure 7). All above-mentioned species are distributed on the Levantine coast of Türkiye (Çınar et al., 2021), except for *L. natalensis* and *P. fourierii*, which are also distributed along the Turkish Aegean coast (Öztürk et al., 2017).

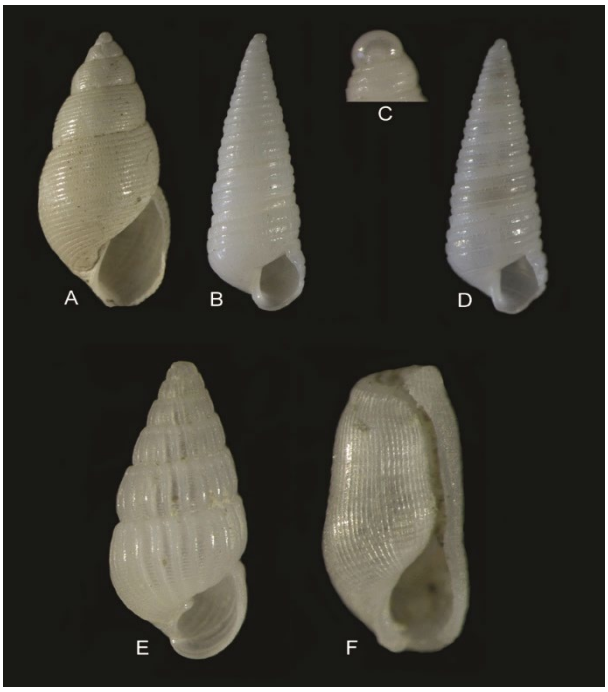

Figure 7. The alien species detected within the present study and widely distributed in the Mediterranean Sea. **A.** *Leucotina natalensis*; **B.** *Cingulina isseli*; **C.** protoconch of the specimen B; **D.** *C. isseli*; **E.** *Pyrgulina pupaeformis* and **F.** *Pyrunculus fourierii* (A=7.2 mm; B=5.9 mm; D=5.5 mm, E=3.7 mm and F=2.3 mm)

The penetration of non-indigenous species into the Mediterranean Sea is a process that has been going on for years, although it has increased in last decades depending on

many factors such as widening of the Suez Canal, intensive marine transport, and rapid climate warming.

In a recent study by Zenetos et al. (2022), comprising the alien species in the Mediterranean Sea reported to the end of 2021, 1366 alien taxa were examined, of which 751 species are assessed as established, 232 taxa as casual, and 70 species were evaluated as questionable ones. However, the number of alien species in different groups also varies depending on the years, and the establishment success or status of some species can be changed in a shorter period, due to their adaptation to the environmental conditions in the recipient ecosystem. For example, after the year 2020 only, 21 more mollusc species have been assessed to be in established status in the Mediterranean (Zenetos et al., 2022). The same fact is also valid for the Turkish coasts, where some species such as *Pseudorhaphitoma iodolabiata* (Hornung and Mermod, 1928), *Circulus novemcarinatus* (Melvill, 1906), *Zafra pumila* (Dunker, 1860) and *Varicopeza pauxilla* (Adams, A., 1855) which have been increased to the established rank for a period nearly one decade (since 2012), being recorded for multiple times from different localities on the Turkish Levantine coast (Bilal Öztürk, pers. data). On the other hand, out of 230 alien mollusc taxa known from the Mediterranean Sea (Zenetos et al., 2022), 123 species were also detected on the Turkish coasts, which number was increased by 23% since 2011 (Çınar et al., 2021). Their number is varied according to the seas and most species (113 species) are known from the Turkish Levantine coast, whereas the lowest number species (3 species) were detected along the Turkish Black Sea coast. With the species dealing with herein, is being added two more species to the Mediterranean mollusc fauna and four species to the Turkish marine mollusc inventory.

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AUTHOR CONTRIBUTIONS

Bilal Öztürk: Designing of the study, identification of the investigated species, writing of the draft, submission, writing-review, and editing. Murat Recevik: Sampling and sorting of the materials.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest or competing interests.

ETHICS APPROVAL

No specific ethical approval was necessary for the study.

DATA AVAILABILITY

For any questions the corresponding author should be contacted.

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