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Further two alien species for the Sicilian waters: *Aplus assimilis* (Reeve,1846) and *Mitrella psilla* (Duclos, 1846) (Gastropoda Neogastropoda)

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ABSTRACT The finding of two further non indigenous species for the Eastern Sicilian rocky coast is here reported. The neo-gastropods *Aplus assimilis* (Reeve, 1846) and *Mitrella psilla* (Duclos, 1846) were found living inside the arbor of Catania. Specimens regularly collected during these last five years demonstrate the stability of the populations of both the species inside the harbor, while no other materials emerged from the exam of samples collected around the finding locality. The presence of both the species along Italian coasts was previously ascertained in few scattered localities, while the current represents the first report for Sicily. A human-mediated diffusion is here supposed as for other species found in the island. This last finding brings back to the top the problem of the numerous alien species arrivals during these latest years in Sicily and, more generally, in the Mediterranean Sea.

KEY WORDS Gastropoda; alien species; *Aplus affinis*; *Mitrella psilla*; Catania, harbor; Sicily.

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INTRODUCTION

During surveys occurred along the Eastern part of Sicily with the intent to monitoring the molluscan fauna of the island, a specimen and some fragments of a non-autochthonous species were found along the central dock ("Sporgente Centrale") of the harbor of Catania. The species was successively identified as *Aplus assimilis* (Revee, 1846) and was supposed to be catched by fishing nets stretched out by fishermans around the arbor area and then cleaned on the dock. Subsequent samples made directly by scraping encrusting algae clusters on the sides of the same central dock provided some living specimens of this species and few of another, later classified as *Mitrella psilla* (Duclos, 1846).

The former gastropod is a pisaniid whelk native from Senegal to Marocco and present in the Canary Islands too (Ardovini & Cossignani, 2004; Poppe & Goto, 1991). Lopez Soriano & Quinonero Salgato (2014) reported the finding of one single specimen at the Ebro Delta, about thirty kms South-Estern to Tortosa, Terragona (Southern Spain), while Assaui et al. (2016) found it at Biserta (Tunisia). In Italy, *A. assimilis* was reported for the first time for Su Siccu, Sout-Eastern Sardinia (Nappo & Loi, 2015) and then for the harbor of Civitavecchia, Central Italy (Nappo et al., 2018).

The columbellid *M. psilla* originates from Angola (Pelorce & Boyer, 2005) to Mauritania (Rolán, 2005) along the West-African coasts and it was firstly reported in the Mediterranean from

Tunis (Antit et al., 2010). In Italy this latter species had been found by Nappo et al. (2019) in Forte Michelangelo, Civitavecchia harbor, together with *A. assimilis*. Finally, Martinez et al. (2020) uploaded the Western Mediterranean records of both the species with findings along the Spanish Mediterranean coast from Sagunto (Valencia) to Sant Carles de la Ràpita in the Ebro Delta (Tarragona).

The present record of both these species along the Eastern coast of Sicily enlarges its rapid spreading to the Eastern Mediterranean and adds further new biological and taxonomical informations concerning not the shell, which is well known and represented in the preceding papers, but instead the external soft body parts, which seem not to be previously reported.

MATERIAL AND METHODS

Some visual surveys among biological residuals conducted from November 2018 to January 2022 on the central dock of the harbor of Catania (Fig. 1) denounced the presence of both the studied species along the Sicilian coasts. Scraping out at 1–2 m depth little clusters of calcareous algae from a total surface of 50 cm^2 along the sides of the dock with a metallic putty knife and collecting them with a long handle (2.5 m) hand-towed net, with meshes of 3 mm, allowed us to ascertain whether they come from hard substrata present inside the harbor and whether they belonged to still living populations here established. Residuals obtained from one single sample were washed out with fresh water, put in a waterproof container with sea-water; specimens were picked out under a stereomicroscope, photographed with a digital cam and measured, while the external soft parts were draw utilizing classical graphite pencils and watercolor pastels.

ACRONYMS. Alberto Villari malacological collection, Messina, Italy (AVC); Danilo Scuderi malacological collection, Catania, Italy (DSC); sh/s.: empty shells; sp/s.: living collected specimen/s.

RESULTS

The under reported taxonomical descriptions does not illustrate the well documented shell features and color, which match those here observed in our material (Figs. 2–6), but rather the external soft parts of which we have not found any previous figure in literature.

Systematics

Classis GASTROPODA Cuvier, 1795
Subclass CAENOGASTROPODA Cox, 1960
Ordo NEOGASTROPODA Wenz, 1938
Superfamilia BUCCINOIDEA Rafinesque, 1815
Familia PISANIIDAE Gray, 1857
Genus *Aplus* De Gregorio, 1885

Aplus assimilis (Reeve, 1846)

MATERIAL EXAMINED. Catania, Sicily, harbor; first date of finding: November 28, 2018; 3 shs. Catania, same locality, June 05, 2019, 6 sps. and 3 shs. Catania, same locality, January-February 2022, 8 shs. and 1 sp.

DESCRIPTION OF THE EXTERNAL SOFT PARTS. Foot and siphon well developed, creamy in background color, brownish anteriorly, with tips and inferior margins almost black with white spots sparse all over the body; head of the same color, with a tendency to brownish in the distal portion; tips of the cephalic tentacles yellowish. Operculum corneous, lengthened, yellowish with black inferior margin (Fig. 7).

REMARKS. It was found together with the congeneric resident and common species *A. dorbignyi* (Payraudeau, 1826) and *A. scaber* (Locard, 1891). Numerous young specimens have been found from samples collected since 2018 to the last date of collecting material. Youngs are well differentiated by the smaller and more rounded protoconch (Fig. 3), while the characteristic shell sculpture, constituted by numerous spiral chords and regular not well developed ribs, is still not very well distinguished.

Classis GASTROPODA Cuvier, 1795
Subclass CAENOGASTROPODA Cox, 1960
Ordo NEOGASTROPODA Wenz, 1938
Superfamilia BUCCINOIDEA Rafinesque, 1815
Familia COLUMBELLIDAE Swainson, 1840
Genus *Mitrella* Risso, 1826

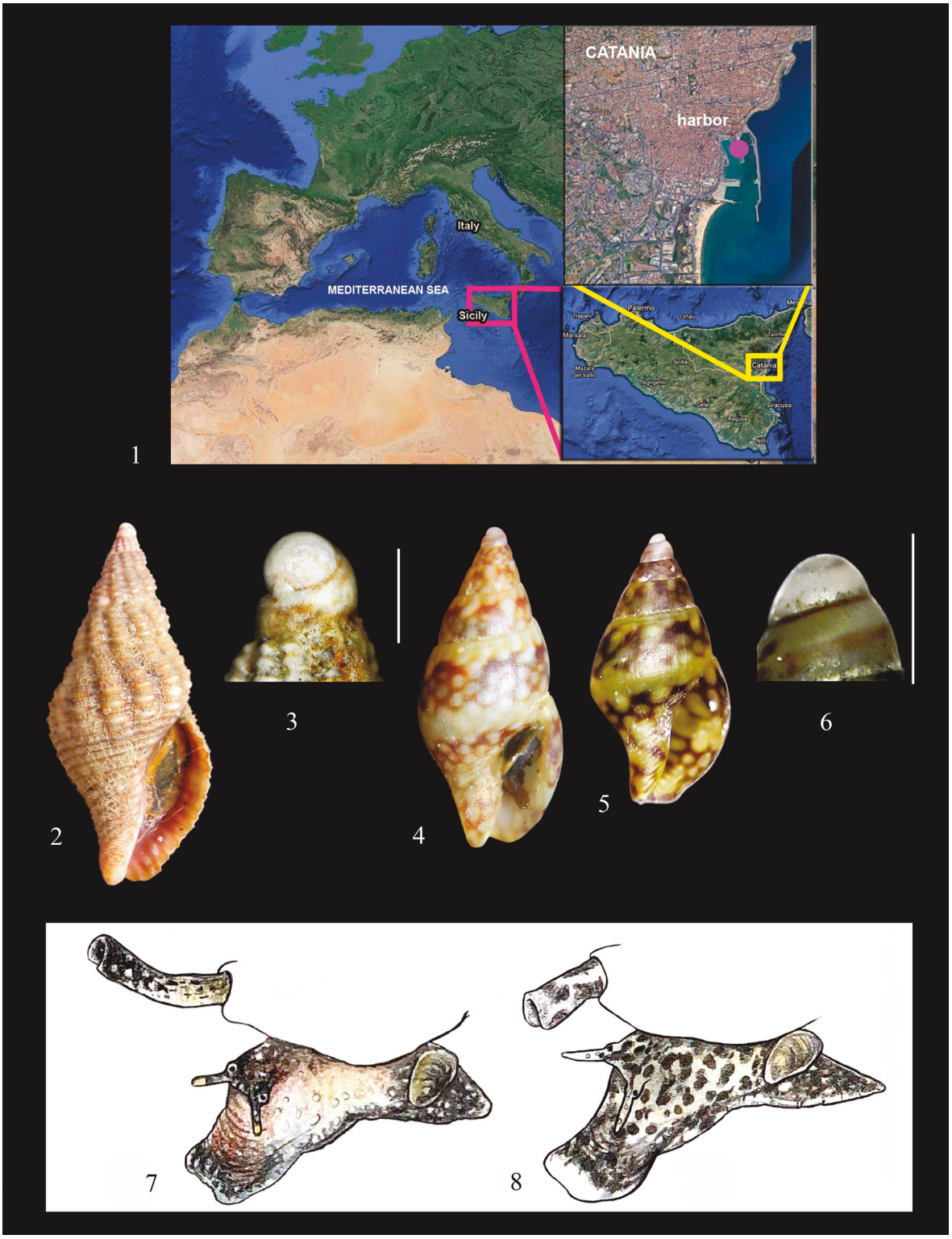

Figure 1. Geographic map of the record. Figure 2. *Aplus assimilis*, adult shell, harbor of Catania, h 13 mm. Figure 3. *A. assimilis*, same data, protoconch (line = 0.5 mm). Figure 4. *Mitrella psilla*, adult shell, harbor of Catania, h 6 mm. Figure 5. *M. psilla*, same data, young specimen, h 3.7 mm. Figure 6. *M. psilla*, same data, protoconch (line = 0.5 mm). Figure 7. Drawing of the external soft parts of *A. assimilis*, same data of sp. in Fig. 2. Figure 8. Drawing of the external soft parts of *M. psilla*, same data of sp. in Fig. 4.

Mitrella psilla (Duclos, 1846)

MATERIAL EXAMINED. Catania, Sicily, harbor; first date of finding: June 05, 2019, 3 sps.; Catania, same locality, January-February 2022, 6 shs. and 25 sp.

DESCRIPTION OF THE EXTERNAL SOFT PARTS. Foot and siphon well developed, anteriorly whitish in background color and creamy in the head and dorsal part, with black almost round spots sparse all over the body, but more dense in the anterior and posterior part of the foot; tips of the cephalic tentacles and of the siphon yellowish-white with rare and minute white spots. Operculum corneous, moderately lengthened, yellowish with black lower margin (Fig. 8).

REMARKS. The very abundant specimens of *M. psilla* were found together with the common Mediterranean congener *M. scripta* (Linnaeus, 1758). Young specimens (Fig. 5) have a shell more angled at in the peryphery, sharp lip and are usually more brilliant yellowish for the presence of a conspicuous periostracum. They bear a pointed protoconch (Fig. 6) of almost one whorl, pale grayish in color with a characteristic spiral dark band.

DISCUSSION

The finding of shells and living specimens in the same site during these last five years suggests that the populations of both the species inside the harbor is almost stable. Numerous sampling carried out even in adjacent areas had revealed no other findings. In comparison to *A. assimilis*, the lower number of specimens recorded among algae of the first 10 cm is probably linked to a preference of this latter for a slightly deeper fringe of infralittoral zone, where they were instead found abundant during the last sampling. They both do not seem to damage, at least at this point of its spreading step (five years from the first finding), the ecologically related congeners. The presence of numerous young specimens of *A. assimilis* lead us to conclude that the populations are still well structured judging from the specimens found, probably in winter, although the performed samplings were not numerous and conveniently planned. Further, better supported data are needed for the ecological study of the populations of both the species.

The present record of *A. assimilis* and *M. psilla* attests their rapid spreading to the Eastern Mediterranean, for which it represents the first record. The previous reported preferences (Nappo & Loi, 2015; Nappo et al., 2019; Martinez et al., 2020) of these species for lower waters, within crevices of calcareous algae in association with *Mytilus galloprovincialis* (Lamarck, 1819) (Bivalvia Mytilidae) are here also supported by the present data, to which we want to add the presence of a cospicuous population of *Mytilaster minimus* (Poli, 1795) (Bivalvia Mytilidae) which could represent a further source of prey. These species most probably arrived through water ballasts, as suggested for other species found in Sicily, hereafter discussed, whose first record inside the Mediterranean appeared as the unique landmark or unusually independent from those in other geographical localities around the ingress points to the basin.

It should be noted that in the Mediterranean Sea, which is characterized by waters with a higher salinity compared to those of the Atlantic or Indo-Pacific Oceans, both the species had ever been found in localities where important hydrographic basins are present: the Ebro river estuary in South-Spain, the Lac de Bizerte in Tunisia, the rivers Mignone and Marangone near the harbor of Civitavecchia and the mainly subterranean river Amenano, which emerge into the arbor of Catania. The absence of findings out of the harbor of Catania is probably linked to the higher salinity rate. This suggests that the water ballast as man-mediated mode of introduction of alien species cannot fully explain, alone, the rapidly increasing introductions of not native species in the Mediterranean Sea. In fact, in the recent past, only few most resistant species had constituted permanent populations inside the basin, mainly in the Southern Mediterranean localities, notwithstanding a well-developed net of marine communications pathways was still present. Nowadays ship traffic is increased. But two other important factors seem to play an important role in this phenomenon and transform little or big harbors in Mediterranean hot-spots to the introduction of alien species. The first is the long-standing problem of the global-warming, which facilitates the tropicalization of natural especially marine environments. The second is the presence of fresh-water affluxes inside or in the proximity of harbors, which reduces high salinity rate of the Mediterranean waters favoring a better acclimatization of larvae drained with water ballasts.

Examples along the same Eastern coasts of Sicily of the above mentioned connected causes are represented by the recent introduction of *Pinctada imbricata fucata* (A. Gould, 1850) (Scuderi, Balistreri & Germanà, 2019) and *Lottia iani* Scuderi, Nakano et Eernisse, 2021 (Scuderi, Nakano & Eernisse, 2021), *Fulvia fragilis* (Forskal in Niebuhr, 1775) and *Musculista senhousia* (Benson in Cantor, 1842) (Reitano & Brancato, 2009).

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