

Two non-indigenous populations of *Melanoides tuberculata* (Müller, 1774) (Gastropoda, Cerithioidea) in Malta

Deux populations introduites de *Melanoides tuberculata* (Müller, 1774) (Gastropoda, Cerithioidea) à Malte

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Résumé – La présence de l'espèce invasive *Melanoides tuberculata* (Müller, 1774), un escargot d'eau douce et d'eau saumâtre, est ici documentée de Mosta et de Bahrija à Malte. Les coquilles de ces populations sont morphologiquement distinctes de celles des populations de Salini, première donnée sur l'île en 1981.

Mots-clés – Malta, espèce invasive, espèce introduite, *Melanoides tuberculata*

Abstract – The invasive *Melanoides tuberculata* (Müller, 1774), a freshwater and brackish water snail, is reported from Mosta and Bahrija in Malta. Shells from these populations are morphologically distinct from a population at Salini first recorded in 1981.

Keywords – Malta, invasive species, alien species, *Melanoides tuberculata*

The freshwater and brackish cerithioid *Melanoides tuberculata* (Müller, 1774) is a subtropical to tropical species indigenous to a wide range spanning from Algeria to Japan (Madhyastha 2010). According to Glaubrecht (1996) the taxon refers to a widely varying group of strains that reproduce parthenogenetically, and are therefore difficult to categorize using traditional species delimitation concepts. In fact, several different genetic morphs with very different environmental requirements have been reported and named (Facon *et al.* 2003), all of which are synonymous with Müller's taxon.

The original range of *Melanoides tuberculata* includes Morocco, Libya and Egypt, and the gastropod's autochthonous status in the Maltese islands has been a matter of debate.

The first record by Issel (1868) locates a population, already extinct by 1910 (Caruana Gatto 1910), in a now-vanished stream close to the Grand Harbour (Figure 1), while the next record from 113 years later consists of several specimens found at Salini (Cachia 1981).

Searches for live specimens in the area post-2000 have proven fruitless, though empty shells remain abundant (C. Cachia 2011, personal communication; DC personal observation). Mienis (1988), commenting on the same population, argues that it is

likely that the species was "re/introduced" on account of its popularity with aquarium owners, establishing itself as easily as it did northward of Africa, for example in Austria (Stagl 1993), Germany (Glöer & Meier-Brook 1994), and even further afield in the Americas in North America (Russo 1974), Mexico (DC ex coll.) and Brazil (Vaz



Figure 1 – Locations in Malta from which *Melanoides tuberculata* (Müller, 1774) has been recorded, according to Issel (1868), Cachia (1981) and the present study.



Figure 2 – Sampled sites in Malta: **left** Mosta site; **right** Bahrija

et al. 1986), as well as in some Pacific islands, where it was probably introduced accidentally with vegetation from outside the region (Haynes 1990; Ellison 2008). On the other hand, Giusti *et al.* (1995) are of the opinion that Malta is probably in the species natural range, especially given the fact that Quaternary fossils are known from Puglia and the Balearic Islands (Esu 1980; Beckmann 2007).

In March 2011, eight live specimens of *M. tuberculata* were retrieved by one of the authors (AS) from a small stream leading to Speranza valley in Mosta (35°54'23"N, 14°24'46"E) (Figures 1 & 2). Subsequent visits in the same year, in April, yielded 16 live specimens, while in July only three empty shells were found. In February 2012, during a survey of vegetation in Bahrija valley, live specimens of *M. tuberculata* were found on mud in running water at the bottom of the valley by the authors (AS, JS). Further investigation the same month revealed a clump of about 45 specimens gathered around organic sediment, presumably of vegetable origin, beneath a rock (35°53'54"N, 14°20'21"E) (Figures 1 & 2), together with six specimens scattered in the vicinity.

The locations in Malta from which *M. tuberculata* has been reported are marked on the map in Figure 1. Representative samples from each of the two newly recorded populations were collected and compared with shells from Salini (35°94'58"N, 14°42'25"E) collected by one of the authors (DC) and C. Mifsud (Rabat, Malta) from

1998 to 2006. Consistent differences in shell morphology and colouration were observed, as described by Pointier (1989), despite a similar in size.

Namely, most of the Bahrija specimens (Figure 3A) had almost equally defined axial and longitudinal striae, leading to highly evident reticulation, while the spiral striae in the Mosta and Salini specimens were the most noticeable sculptural aspect, especially in the latter. A unifying feature of the Bahrija and Salini specimens was the translucency of the shells, independent of whether the animals were alive or not.

The Mosta shells (Figure 3B) were more opaque, broader, darker, thicker, and had flatter whorls, while generally exhibiting a higher extent of decollation than any specimen from the other two samples. Reddish rows of spots which characterize the Salini population (Figure 3C) were much fainter in the Bahrija specimens and absent in the Mosta specimens. None of the specimens showed any distinct tuberculation.

The Bahrija specimens are very similar to those seen in aquarium shops around the island, observed by the authors (DC, AS) across the span of about 5 years, suggesting that they probably found their way into the wild through anthropogenic dispersal. Whereas Speranza valley dries up during summer months, the stream in Bahrija is permanent, allowing the mollusc community to survive, proliferate and therefore compete from one year to the next. Bahrija

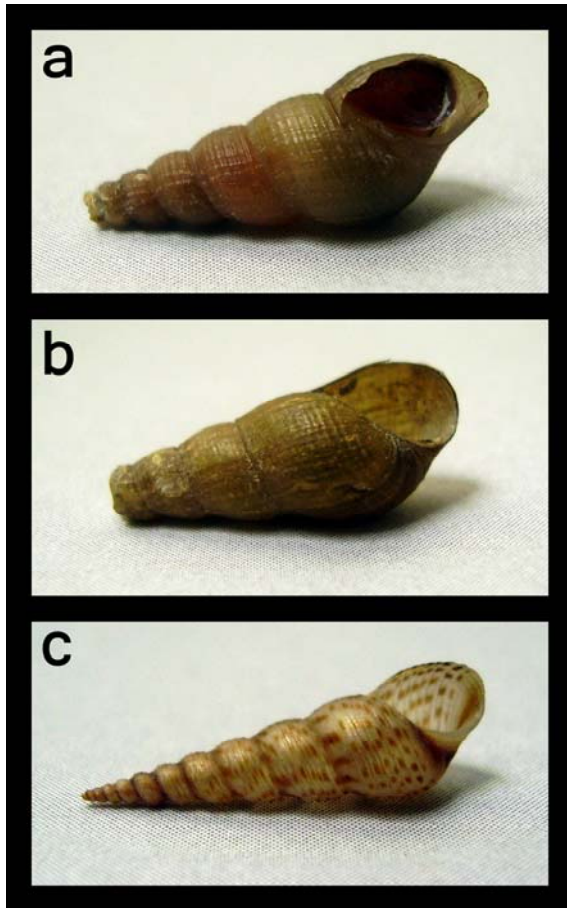


Figure 3 – Shells of *Melanoides tuberculata* from Malta. Specimens from **A.** Bahrija (35°53'54"N, 14°20'21"E) ex coll. DC RG1825, **B.** Mosta (35°54'23"N, 14°24'46"E) ex coll. DC RG1826, **C.** Salini (35°94'58"N, 14°42'25"E) ex coll. DC RG1827.

valley is a locality where the locally endangered hydrobiids *Pseudoamnicola moussonii* (Calcar, 1841) and *Mercuria* cf. *similis* (Draparnaud, 1805) find refuge.

Due to its high rate of proliferation and tolerance to environmental fluctuation, *M. tuberculata* has been proven to displace native freshwater gastropods in other areas of introduction (Murray 1971; Pointier & McCullough 1989), and its further spread through rare freshwater habitats in Malta, mainly through well-meaning aquarists who do not want to kill surplus snails in their possession, may be of serious detriment to these threatened or endangered native mollusc populations (Cilia 2009).

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