Xeropicta (Gastropoda, Hygromiidae) goes west: the first record of *X. krynickii* (Krynicki, 1833) for Montenegro, with a description of its shell and genital morphology, and an additional record of *X. derbentina* (Krynicki, 1836) for Italy

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Abstract

*Xeropicta krynickii* (Krynicki, 1833) has a peri-Black Sea distribution, extending its range as far as Middle East. The species has never been recorded further West of Skopje (Macedonia). Recent collecting in Podgorica (Montenegro) revealed the presence of this taxon thus widening its range toward West, even if most probably the species has been introduced by human activities. *Xeropicta derbentina* (Krynicki, 1836) has been recorded from a single site in NE Italy. A second site has been recently discovered along a docking area of Trieste’s harbour (Italy).

Key words: *Xeropicta krynickii*, *Xeropicta derbentina*, Montenegro, Italy, human dispersal.

Introduction

Xerophilous Hygromiidae species are easily spread by human activity, and their often disjunct patterns of distribution reflect this. They are also often impossible to identify without dissection, making the tracking of changes in range hard to accomplish. We have recently collected many living specimens of a xerophilous hygromiid on the meadows and lawn grass in the surroundings of the University of Montenegro (Podgorica). The shell is yellowish-creamy in colour, with many fine and delicate bands, depressed and widely umbilicated, recalling that of *Xerolenta obvia* (Menke, 1828) which is known to be present in Montenegro. Anatomical and conchological studies revealed that this snail belongs to *Xeropicta krynickii* (Krynicki, 1833). This species was described from Crimea and is known to have peri-Black Sea distribution, extending to the Caspian Sea, Azerbaijan, Iran, Syria, Lebanon, Jordan, Israel and Egypt. The species has been probably introduced also to Dodecanese Islands, Cyprus and Crete (Schütt 2001: 446, 449; Welter-Schultes 2012: 571). The species has never previously been recorded further west than Skopje (Macedonia) (cf. Bank 2011).

There are few recent papers dealing with the Montenegrin Hygromiidae (e.g. De Winter & Maassen 1992, Maassen 1995, Subai 2009), and both old and recent inclusive checklists or specialized treatises (Jaeckel *et al.* 1957, Schileyko 2005, Bank 2011, Welter-Schultes 2012) refer to very few papers as sources of the original data: Walderdorff (1864: 504-505) Wohlberedt (1909: 658-661), Sturany & Wagner (1915:...
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14-21, Polinski (1924:130-132), Jaeckel sen. (1954: 70-86) and Jaeckel & Meise (1956: 26). Nevertheless, the Montenegrin hygromiid fauna recorded by Bank (2011) and Welter-Shultes (2012) contains the following species and subspecies.

- **Euomphalia strigella strigella** (Draparnaud, 1801)
- **Monacha cartusiana** (Müller, 1774)
- **Monacha (Monacha) dofeiini** (Besse, 1928)
- **Monacha (Monacha) frequens** (Mousson, 1859)
- **Trochoidea (Trochoidea) pyramidata** (Draparnaud, 1805)
- **Trochoidea (Trochoidea) trochoidea** (Poirier, 1789)
- **Trochulus (Trochulus) erjaveci** (Brusina, 1870)
- **Petasina (Filicinaella) filicina bosnensis** (Möllendorff, 1873)
- **Xerocrassa (Xerocrassa) rhabdotra** (Surany, 1901)
- **Xerocampylaea zelebori** (L. Pfeiffer, 1853)
- **Cernuella (Cernuella) virgata** (Da Costa, 1778)
- **Xeromunda vulgarissima vulgarissima** (Mousson, 1859)

This list is certainly incomplete. **Cernuella cfr. cisalpina** (Rossmässler, 1837) is present in Montenegro (Willy De Mattia, personal unpublished data), and neither author mentions any of the “small Cernuella group” species (see Giusti et al. 1995: 446). Furthermore, the identities of names such as “Helicopsis variabilis Drap”, “Candidula profuga Schm.” and “Candidula meridionalis Mouss.” cited by Wohlberedt (1909: 659) are still uncertain and in need of a careful evaluation (see also Bodon et al. 1995: 50). Wohlberedt (1909: 659) also cited “H. homoleuca”, which is a junior synonym of Xeropicta derbentina (Krynicki, 1836) (De Mattia 2007: 8), for Montenegro: Mount Volujak (E of Kotor). The identity of such species can only be assessed by the analysis of the genital morphology since the shell can be easily confused with other very similar species present nearby (Xerolenta obvia and Xeromunda vulgarissima). Wohlberedt did not give any anatomical information and we must consider the presence of X. derbentina in Montenegro doubtful and in need of confirmation following the current, up-to-date taxonomical methods.

Hence, to assist future work on this difficult group of hygromiids, we give in this paper a detailed morphological (shell and genital anatomy) description of the Montenegrin populations of X. krynickii, also comparing it with another population from Mainland Greece. Recently, Diego Viola from Trieste (Italy), brought to the attention of one of the authors (WDM) the presence of a large population of a “wide umbilicated, totally white hygromiid snail” from a small portion of scrubland directly on the seaside along the industrial harbour of Trieste. Anatomical and conchological studies, in this paper hereinafter provided, revealed the identity of this snail as X. derbentina.

**Material and Methods**

**Xeropicta krynickii**: Montenegro: meadows and lawn grass near the University campus, Podgorica, 42°26′33.48″N, 19°14′22.89″E, 40 m asl, L. Pešić leg., 15.ix.2014. Lawn grass near Delta shopping mall, Podgorica, 42°26′22.96″N, 19°14′20.90″E, 40 m asl, L. Pešić leg., 15.ix.2014. Lawn grass near the bridge over the Morača river, Podgorica, 42°26′11.99″N, 19°15′10.02″E, 35 m asl, V. Pešić leg., 25.ix.2014.

**Xeropicta krynickii**: Greece: 22 km E of Livadia toward Thiva, (Sterea Ellada), approx. 38°23′N 23° 0.55′E, 18.iv.2013.

**Xeropicta derbentina**: Montenegro: meadows and lawn grass near the bridge over the Morača river, Podgorica, 42°26′11.99″N, 19°15′10.02″E, 35 m asl, V. Pešić leg., 25.ix.2014.

**Xeropicta derbentina**: Italy: Trieste, coastal scrub along the “Canale Navigabile” (Navigable Channel) at the eastern end of the Trieste’s industrial harbour 45°36′37.58″N 13°48′26.69″E, 1 m asl, W. De Mattia leg. 18.iv.2013.

Living specimens from Montenegro and Italy were drowned in water and then fixed in 85 % ethanol. The morphological and anatomical examinations, photos and drawings were carried out with a Zeiss stereomicroscope. In the anatomical explanation, terms proximal and distal refer to the gonad. All scale bars in anatomical plates: 1 mm. All scale bars in shell plates: 1 cm. The following abbreviations are used in the Figures: A atrium; AG albumen gland; BC bursa copulatrix; CLS crest-like structure of the genital atrium; DBC duct of bursa copulatrix; DG digitiform glands; DP distal penis; E epiphallus; F flagellum; FHD first hermaphrodite duct; J jaw; ME mantle edge; P penis; PA penial appendage; PP penial papilla; PR penial
retractor muscle; S stylophore; SDS section of distal stylophore; SE section of epiphallus; SPP section of penial papilla; SV section of vagina; UOS uterine ovispermiduct; V vagina; VD vas deferens.

Description and diagnosis

Genus Xeropicta Monterosato, 1892

Xeropicta krynickii (Krynicki, 1833)

Montenegrin populations

Shell (Figs. 25-26). Dextral, subglobe to depressed, moderately robust; protoconch light brown; teleoconch creamy to light yellowish in colour, with six fine, interrupted bands visible only on lower side of the last whorl; a white continuous band is present along the last whorl; external surface of teleoconch waxy with well-defined, irregularly spaced growth lines; spire conical to slightly raised, with 4 ⅓ - 4 ¾ regularly growing, convex whorls, last whorl large and swollen, only moderately descending near aperture; umbilicus open, wide about ¼ of the maximum shell diameter; sutures deep; aperture rounded to moderately elliptical, periscope interrupted, never reflected at external, seldom with a thin whitish thickening on the palatal inner margin.

Shell dimensions diameter 15.2±0.8 mm (range 14.3–16.3 mm); height 9.2±0.9 mm (range 8.6–9.4 mm) (n=6). Ratio D/H 1.6.

Genitalia

(Figs. 1-12). The proximal part of the vagina has 10-14 digitiform (sometimes branched) glands, disposed in four tufts of 2-4 units. The dart-sac complex, entering the distal vagina on opposite sides (2+2 dart-sac complex), consists of two proximal, club-like, longer, dart-bearing, and two distal, club-like, shortest, dartless stylophores. Cavities of each of the 4 stylophores open almost independently into the vagina. The penial flagellum is moderately long and slender. The epiphallus is roughly three times longer than the flagellum. The penis is approximately half as long as epiphallus, without any penial sheath. It has a slender, smooth, penial papilla with a circular apical opening. The penial papilla has an outer sheath and presents a large, extended corpus cavernosus (Fig. 5). The genital atrium contains a slender and conical penial appendage, which is usually twice as long as the penis. A large crest-like structure develops from the tip of this appendage and extends to the atrial aperture while gradually increasing in height (fig. 3). A second smaller, lobated crest-like structure can be found in this appendage, parallel to the main one, situated on its right.

Greek population

Figures 26 and 27 depict the shell of a specimen of X. krynickii from Livadia (Sterea Ellada, Mainland Greece). In all investigated specimens from Greece (n=18) the width of the umbilicus is about one fifth that shell. This ratio can also be seen in, amongst others, De Mattia (2007: 11) and Welter-Schultes (2012: 571). In the genital anatomy, some differences from Montenegrin specimens can be detected as regards the morphology of the penial papilla and the 2+2 stylophores. Greek specimens constantly show a penial papilla with lateral opening and much shorter proximal stylophores (Figs. 4, 7, 23, and 24).

Xeropicta derbentina (Krynicki, 1836)

Italian population

Shell and genitalia are shown in Figs 13 and 28. This second known Italian population of X. derbentina belongs to the group of “short penial flagellum” Xeropicta species (cfr. Altena 1960; Hesse 1934) and perfectly matches the anatomical and shell descriptions provided for the species (Hesse 1926; Schileyko 1978; De Mattia 2007).
Figures 1-9. Genitalia of *Xeropicta krynickii* from Podgorica, Montenegro. 1-2 whole genitalia, gonad excluded; 3 inner structure of distal genitalia; 4 dart sac complex; 5 section of penial papilla; 6 section of vagina; 7 penial papilla; 8 digitiform glands; 9 inner structure of epiphallus.
Figures 10-13. 10-12 genitalia and jaw of *Xeropicta krynickii* from Podgorica, Montenegro. 10 mantle edge; 11 first hermaphrodite duct; 12 jaw; 13 whole genitalia, gonad excluded, of *Xeropicta derbentina* from Trieste (Italy).

**Remarks**

While the newly discovered populations of *X. krynickii* in Montenegro show all the major diagnostic features of the species (Hesse 1926; Schileyko 1978; De Mattia 2007), they show some differences in shell and genital morphology compared to other studied populations and in particular to the Greek population reported here. It is not clear that these differences are taxonomically significant. There is a long list of synonyms associated with *X. krynickii* (Bank 2011), and it is evident that a revision of the genus is needed using modern methods.

The discovery of *X. krynickii* in Montenegro extends the known range of this species. To date the westernmost locality known has been Skopje (Macedonia) (cfr Bank 2011). It seems likely that it will be found in other places in the western Balkans, and possibly elsewhere in the eastern Mediterranean region. The apparent spread of this species has almost certainly been aided by humans.

*Xeropicta derbentina* was recorded for the first time in Italy by De Mattia (2007). It was collected on grass and branches of halophilous plants on sandy dunes next to the seaside in an undisturbed site near the mouth of the Isonzo river (province of Gorizia). The origin of this population, probably the result of an anthropochorous dispersal, is likely to be very old. In fact, more than a century ago Stossich (1899: 11) cited “*Xerophila arenosa* Ziegler. In luoghi sterili a Monfalcone” (“*Xerophila arenosa* Ziegler. Along sterile fields near Monfalcone”). In contrast, this newly discovered population probably settled only during recent times. The new site is a heavily disturbed industrial docking area which has repeatedly undergone multiple and drastic urban reshuffles during past decades. It seems unlikely that an old settled population (from the 1800s) could survive such severe environmental changes. The intense docking activity further strengthens the hypothesis of a relatively recent settlement. *X. derbentina* has notoriously been carried over long distances, as evidenced by the now very abundant populations in southern France (Aubry *et al.* 2006).
Figures 14-24. Genitalia of *Xeropicta krynickii* from Livadia (Sterea Ellada, Greece). 14 whole genitalia, gonad excluded; 15 inner structure of distal genitalia; 16 section of penial papilla; 17 section of epiphallus; 18 section of distal stylophore; 19 section of vagina; 20 digitiform glands; 21 mantle edge; 22 first hermaphrodite duct; 23 penial papilla; 24 dart sac complex.
Figures 25-28. 25-26 shells of *Xeropicta krynickii* from Podgorica, Montenegro; 27 shell of *X. krynickii* from Livadia (Beozia, Greece); 28 shell of *X. derbentina* from Trieste (Italy).

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