



NEW FINDING SITES OF SOME INTERESTING SPECIES OF CROATIAN TERRESTRIAL MALACOFUNA (MOLLUSCA: GASTROPODA TERRESTRIA)

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The paper gives information on new finding sites of the terrestrial snails *Pupilla triplicata* (S. Studer, 1820), *Medora dalmatina aquila* (L. Pfeiffer, 1846), *Paralaoma servilis* (Shuttleworth, 1852), *Daudebardia rufa rufa* (Draparnaud, 1805), *Caracollina lenticula* (Michaud, 1831) and *Xerotricha conspurcata* (Draparnaud, 1831), which are rarely recorded for the fauna of Croatia. The new finds are on the islands of Vis, Biševo, Brusnik, Svetac, Palagruža and Mala Palagruža, which constitute parts of central and southern Dalmatia (Croatia).

Key words: terrestrial snails, threats to snails, Dalmatia, Croatia

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U radu su iznesena nova nalazišta kopnenih puževa *Pupilla triplicata* (S. Studer, 1820), *Medora dalmatina aquila* (L. Pfeiffer, 1846), *Paralaoma servilis* (Shuttleworth, 1852), *Daudebardia rufa rufa* (Draparnaud, 1805), *Caracollina lenticula* (Michaud, 1831) i *Xerotricha conspurcata* (Draparnaud, 1831) koji su rijetko bilježeni za hrvatsku faunu. Nova nalazišta nalaze se na otocima Visu, Biševu, Brusniku, Svecu, Palagruži i Maloj Palagruži koji su sastavni dio srednje i južne Dalmacije (Hrvatska).

Ključne riječi: kopneni puževi, ugroženost puževa, Dalmacija, Hrvatska

INTRODUCTION

Our investigations into the terrestrial snails of some central and southern Dalmatia islands (southern Croatia), the first of which was conducted in 1985 and the last in 2008, were directed mainly at the area of Vis, and the outer islands, i.e. the Palagruža area and the island of Jabuka, whose point of departure for the research trips is the island of Vis (Fig. 1). The islands researched long since attracted the atten-



Fig. 1. a) Map of Croatia with location of researched area; b) map of researched area with position of the islands and city of Split.



tion of malacologists because of their isolation (for example, Palagruža and Jabuka), and because of the special origin and geological diversity as compared with the other eastern Adriatic islands (the volcanic origin of the island of Jabuka and part of Brusnik). The results of their work are seen in the descriptions of new taxa (for example, *Charpentieria gibbula pelagosana* (O. Boettger, 1877), *Eobania vermiculata pelagosana* (M. Stossich, 1877), *Chondrula quinquedentata pelagosana* (Sturany, 1901), *Eobania vermiculata kamenensis* Berberović, 1963, *Cornu aspersum pelagosanus* Berberović,

1963) and the finds of some molluscs that are rare in Croatian terrestrial fauna, such as *Caracollina lenticula* (STURANY, 1915; REISCHÜTZ & REISCHÜTZ, 1999). In our investigations we also found species that have rarely been recorded for the fauna of Croatia. As the discoveries of new finding sites are expanding our knowledge of the distribution, habitats and risk status of these species, and their possible need for protection, we are now publishing them.

MATERIALS AND METHODS

Large snails were collected individually, while for the smaller taxa, soil samples of about 2 dm³ were taken, from which, after drying and sieving through a number of mesh sizes, from 1 cm to 1 mm, the snails were separated. The first field trips were made in 1985, and the last in April 2008; there were systematic investigations in 1995, 1996 and 2008. The results of the research works presented in this paper cover the following central and southern Dalmatian islands: Vis, Biševo, Brusnik, Svetac, Palagruža, Mala Palagruža, Jabuka (Fig. 1). The results are based only on specimens of taxa that are not deposited by the sea. The material is stored in the Main Collection of Recent Molluscs of the Croatian Natural History Museum in Zagreb (Croatia).

RESULTS AND DISCUSSION

The names of snails are given according to CLECOM (FALKNER *et al.*, 2001) while for taxa not covered by this, NORDSIECK (2007) was used. For every taxon, synonyms are quoted in chronological order from the works in which they are stated for the (possible) Croatian area. Then (possible) Croatian findings from north to south with sites quoted from the literature are given. Then comes a list of finding sites from our field research, in which each site is accompanied by the UTM coordinates for a 10 × 10 km field. A question mark in front of the taxon or locality name, followed by a colon, denotes our doubt as to the validity of the data. A question mark in front of the taxon or locality name, not followed by a colon, denotes the doubt of the cited author in the validity of the data.

***Pupilla (Pupilla) triplicata* (S. Studer, 1820)**

Pupa (Pupilla) triplicata Stud., – WESTERLUND, 1875: 124.

Pupilla triplicata Studer 1820, – EHRMANN, 1937: 48.

Pupilla triplicata (Studer 1820), – JAECKEL *et al.*, 1957: 146.

Pupilla triplicata (Studer 1820), – KLEMM, 1973: 165.

Pupilla (Pupilla) triplicata (S. Studer 1820), – www.faunaeur.org

Literature finding sites:

Istria: WESTERLUND, 1875: 124 (»Istria«).

Dalmatia: WESTERLUND, 1875: 124 (»Dalm.«); EHRMANN, P., 1937: 48 (»Dalmatien«); JAECKEL *et al.*, 1957: 146 (»Dalmatien«); KLEMM, 1973: 165 (»Dalmatien«).

Croatia: www.faunaeur.org (»Croatia«).

Our finding sites:

Island of Svetac: Sv. Andrija (church), 17 m a.s.l., WH66; Baršćanovice (bay), WH66; Štandarac (region), 306 m a.s.l., WH66; Veli Rat (region), 104 m a.s.l., WH66; Veli Rat (region), 135 m a.s.l., WH66; Zlatna glava (summit) – Veli Rat (region), 190 m a.s.l., WH66; Kraljičino (=Teutina kula), 225 m a.s.l., WH66; Zaruška (bay), 30 m a.s.l., WH56; Zaruška (bay), 42 m a.s.l., WH56; Križice (point) – Zaruška (bay), 12 m a.s.l., WH56.

Island of Vis: Stončica (bay) on the north east part of the island, ca 4.5 km NEE of the city of Vis, 5 m a.s.l., XH06.

By a review of the available literature we determined that *Pupilla triplicata* has been recorded to date only in general terms for Dalmatia (WESTERLUND, 1875: 124; EHRMANN, 1937: 48; JAECKEL *et al.*, 1957: 146; KLEMM, 1973: 165) and for Istria (WESTERLUND, 1875: 124). Because of the various historical understandings of what is meant by Dalmatia, according to some of which it includes areas outside Croatia, and because Istria, although mostly Croatian, also includes parts of Slovenia and Italy, the data from the references stated do not give any certain information about the existence of this snail in Croatia. An Internet search gave information about *Pupilla triplicata* in Croatia (www.faunaeur.org) but we are unsure if this is based on the previously mentioned data from the literature or on some precise sites. Thus our research probably provides the first reliable information about the existence of the snail *Pupilla triplicata* in Croatia, with the first defined Croatian finding sites.

Pupilla triplicata is frequent on the island of Svetac and was very numerous in the finding sites. Its habitats are diverse: rocky grasslands, garrigue, forests of Aleppo pine (*Pinus halepensis*). On some of the closer islands, such as Brusnik and Biševo, it was not found; on the island of Vis we found it only at one site and in a small number of specimens. Perhaps this is why REISCHÜTZ & REISCHÜTZ (1999) in their relatively recent research did not find *Pupilla triplicata* on Vis.

Habitat changes brought about by the use of pesticides, reduction of areas of rocky grassland, garrigue and pine woods will bring about a smaller abundance of the population of this snail. We think this will lead to a reduction of the population but will not threaten the survival of the species on Svetac island, because of the presence of the taxon in various habitats and the low intensity of the negative anthropogenic changes, as a result of the low population and relative inaccessibility of the island. By contrast, on Vis, where *Pupilla triplicata* is not very numerous and where, because of tourism and farming, the habitats are either disappearing or being chemically contaminated, its survival is questionable.

Most often the range of the taxon *Pupilla triplicata* is stated as being Alpine and Eastern European (EHRMANN, 1937: 48; JAECKEL *et al.*, 1957: 146; KERNEY *et al.*, 1983: 119), while some cite it as Alpine-Southern European (TURNER *et al.*, 1998: 166), or

as Mediterranean-Southern Alpine and Caucasian-Asian, stretching as far as Lake Baikal (SCHÜTT, 2005: 67). It has been recorded for Andorra, Spain, France, Italy, Switzerland, Germany, Poland, Czech Republic, Slovakia, Austria, Slovenia, Hungary, Croatia, Montenegro, Albania, Greece, Romania, Bulgaria and the Ukraine (www.faunaeur.org) while SCHÜTT (2005: 67) lists it for Turkey. This is then a species with a large range in which the space of Croatia fits logically. Why it has not been recorded more often, at least in fairly recent systematic investigations of Croatia, is hard to say, although the localisation of the range occurs as one solution.

***Medora dalmatina aquila* (L. Pfeiffer, 1846) – Fig. 2**

Clausilia aquila Parreiss, – KÜSTER, 1847: 281/282.

Clausilia dalmatina Partsch var. *Curzolana* KÜSTER, 1847: 31, Fig. 1.

Clausilia dalmatina Partsch var. *Lagostana* KÜSTER, 1847: 31, Fig. 8.

Clausilia aquila Parr., – PARREYSS ¹?1849: [1].

Clausilia aquila Parr. ead. var. *major*, – PARREYSS, ?1849: [1]

Clausilia aquila Parreyss Pfr. No 94., – CHARPENTIER, 1852: 373.

Clausilia dalmatina Partsch, Küst. var. *Lagostana* Küst., – CHARPENTIER, 1852: 373.

Clausilia aquila Parr., – ROSSMÄSSLER, 1854-1859: 43/44, No.856.

Clausilia (Medora) Aquila Parr., – SCHRÖCKINGER-NEUDENBERG, 1865: 314.

Clausilia Lagostana Küster, – BRUSINA, 1874: 184.

Clausilia aquila Pars., – STALIO, 1876: 4.

Medora aquila Parr., – KOBELT, 1897: 319.

Clausilia (Medora) aquila (Parr.) Pfr., 1846, – WESTERLUND, 1901: 88.

Clausilia (Medora) aquila Parr., – GALVAGNI, 1902: 368.

Clausilia (Medora) aquila Pfr., – STURANY, 1915: 401, 402, 403.

Alopiia (Medora) dalmatina aquila, – WAGNER, 1918: 4.

Alopiia (Medora) dalmatina aquila Pfr., – WAGNER, 1922: 90.

Medora dalmatina aquila (Pfr. 1846), – JAECKEL *et al.*, 1957: 152, 184.

Medora dalmatina aquila (L. Pfeiffer 1846), – NORDSIECK, 1970: 35.

Medora dalmatina aquila (L. Pfeiffer 1846), – ZILCH, 1977: 121.

Medora dalmatina aquila (L. Pfeiffer 1846), – FRANK, 1991: 359.

Medora dalmatina aquila (L. Pfeiffer 1846), – FRANK, 2000: 83/84.

Medora dalmatina aquila (Pfeiffer 1846), – REISCHÜTZ *et al.*, 2002: 54, 55.

Medora dalmatina aquila (L. Pfeiffer 1846), – www.faunaeur.org

¹ Although there is no year of publication in the original paper, considering citations in other authors' papers it can be concluded that Parreyss' paper originates from ca 1849.

Literature finding sites:

Island of Korčula: KÜSTER, 1847: 31, 281/282 (»Insel Curzola«); ROSSMÄSSLER, 1854–1859: 43/44, No.856 (»Insel Corzzola«); STURANY, 1915: 401 (»Curzola«); WAGNER, 1918: 4 (»Kurzola I.«); WAGNER, 1922: 90 (»I. Kurzola«); NORDSIECK, 1970: 35 (»Pupnatska Luka a. Korčula; im mittleren Teil der I. Korčula«); ZILCH, 1977: 121 (»Insel Curzola«); FRANK, 1991: 359 (»mittlerer Teil der Insel«); FRANK, 2000: 83/84 (»I. Curzola (=Korčula); im mittleren Teil der Insel; transition to *M. d. gravida*: vom mittleren Korčula – Pupnatska Luka); REISCHÜTZ *et al.*, 2002: 54, 55 (»Umg. der Höhle oberhalb von Pupnatska Luka; bei der Höhle oberhalb Pupnatska Luka«).

Island of Lastovo: KÜSTER, 1847: 31, Fig. 8, 281/282 (»Insel Lagosta«); PARREYSS, ?1849: [1] (Ins. Lagosta); CHARPENTIER, 1852: 373 (»Ins. Lagosta«); ROSSMÄSSLER, 1854–1859: 43/44, No.856 (»Lagosta«); GALVAGNI, 1902: 368 (»Lagosta«); STURANY, 1915: 401 (»Lagosta«); WAGNER, 1918: 4 (»Lagosta I.«); WAGNER, 1922: 90 (»I. Lagosta«); NORDSIECK, 1970: 35 (»I. Lastovo«); ZILCH, 1977: 121 (»bei Lagosta; Insel Lagosta«); FRANK, 1991: 359 (»Insel Lastovo«); FRANK, 2000: 83/84 (I. Lastovo).

Islet of Tajan (kod Lastova): STURANY, 1915: 401, 402, 403 (»Tajan«); WAGNER, 1918: 4 (»Sc. Tajan«); WAGNER, 1922: 90 (»I. Tajan«); NORDSIECK, 1970: 35 (»auf der I. Lastovo und den umliegenden kleineren Inseln«); FRANK, 1991: 359 (»Insel Lastovo und umliegende kleinere Inseln«); FRANK, 2000: 83/84 (»I. Lastovo und den umliegenden kleineren Inseln«).

Island of Sušac: NORDSIECK, 1970: 35 (»Die *Medora* von der I. Sušac... ist...eine Form, die der *aquila* näher stehts als der *gravida*«); FRANK, 2000: 83/84 (*M. dalmatina*, der *aquila* näher als der *gravida*: Sušac).

Dalmatia: SCHRÖCKINGER-NEUDENBERG, 1865: 314 (»Dalm.«); BRUSINA, 1874: 184 (»Dalmacija«); STALIO, 1876: 4 (»Dalmazia«); KOBELT, 1897: 319 (»Dalmatien«); WESTERLUND, 1901: 88 (»Dalm.«); JAECKEL *et al.*, 1957: 152, 184 (»Dalmatien«).

Croatia: www.faunaer.org (»Croatia«).

Innaccurate literature finding sites:

Pelješac: STURANY, 1915: 401 (»Sabioncello«); Wagner, 1918: 4 (»Halbinsel Sabioncello«); WAGNER, 1922: 90 (»Sabioncello«).

Konavle: STURANY, 1915: 401 (»Canali-Tal südlich von Ragusa«); WAGNER, 1918: 4 (»Canalital südlich von Ragusa«).

Our finding sites:

Island of Biševo: Špilja kod Gatule (cave), Gatula (region), SW part of the island, 60 m a.s.l., WH85; Gatula (region), SW part of the island, 70 m a.s.l., WH85; Gatula (region), SW part of the island, 80 m a.s.l., WH85; Gatula (region) – Potok (settlement), 70 m a.s.l., WH85.

The great interest of the finds of door snails of the genus *Medora* inheres in many taxa being found in very limited and small areas of a given region so that, in spite of the relatively large shells, the find is often linked with good luck in field research. In addition, isolated finding sites mean that the populations tend to be distinctive, and



Fig. 2. *Medora dalmatina aquila* (L. Pfeiffer, 1846) from the island of Biševo: specimen A, H = 14,8 mm: a) frontal view; b) dorsal view; c) specimen B, H = 17 mm, frontal view.

the definition of whether they belong to a new or an existing taxon is a challenge for the malacologist. This was the case with the taxon *Medora dalmatina aquila* on the island of Biševo (Fig. 2). We found it in the southern part of the island, on steep coastal cliffs and, sporadically, a few specimens at a time at two non-coastal sites. The population on Biševo shows certain differences from those of *Medora dalmatina aquila* from Korčula and Lastovo. The specimens have a strong anterior part of upper palatal plica and strong basalis that in most specimens is seen on a vertical view, which is the characteristic of the taxon *M. d. aquila*, but in most specimens the parietal lip is attached to the last whorl, which is a characteristic of *M. d. gravida*. Such a combination of characteristics is given by NORDSIECK (1970: 35) for specimens from the island of Sušac; he considers them closer to the taxon *aquila* than to *gravida*. The island of Sušac is, although 50 km from Biševo island, the closest finding site of any taxon of *Medora*, and thus of the subspecies *M. d. aquila* of the Biševo population.

We have stated the characteristics of the Biševo population on the basis of specimens from the steep coastal cliffs in the southern part of the island where the most *Medora* specimens were found. It is interesting that three specimens at the site »Špilja kod Gatule« show more similarities with *gravida*, for apart from the attached parietal lip, they also have a weakly expressed anterior part of upper palatal fold and a basalis almost completely reduced. The greatest discrepancies are found in specimens from the site between the area of Gatula and the settlement of Potok at about 100 m a.s.l., found, unfortunately, only in fragments, but still clearly showing that these were ridged specimens. According to this characteristic, they are similar to *M. d. leucopleura*.

The survival of the *Medora* population on Biševo depends primarily on the preservation of the steep, rocky slopes on which it lives in large numbers as well as on willingness to refrain from destroying individuals by for example collection. The small area of the habitat of this subspecies and the, by all accounts, small population make it possible for adverse changes to the habitat (reduction of the area) and the collection of individuals to have an essential effect on the survival of *Medora dalmatina aquila* on Biševo island.

Finding sites of *Medora dalmatina aquila* hitherto acknowledged cover some south Dalmatian islands: the central part of Korčula island, of Lastovo and the islet of Tajan near Lastovo, and the island of Sušac. The Sušac population, as mentioned above, has several characteristics of the taxon *M. d. gravida* (NORDSIECK, 1970: 35). The finding sites on the southern Dalmatian coast at Konavle and on Pelješac refer, according to NORDSIECK (1970: 35) to *M. d. gravida* and not to *M. d. aquila*, as stated by BÖTTGER (1880: 111), STURANY (1915: 401) and WAGNER (1918: 4). The new finding site, the island of Biševo, is about 50 km distant from the nearest other site (Sušac island) and is at the same time the northernmost finding site of the taxon *M. d. aquila*.

***Paralaoma servilis* (Shuttleworth, 1852)**

? : ?*Aspasita* sp., – WAGNER, 1932: 731.

Toltecia pusilla (Lowe, 1831), – MAASSEN, 1984: 160.

Paralaoma caputspinulae (Reeve, 1852), – MAASSEN, 1993: 88.

- Toltecia pusilla* (Lowe, 1831), – ŠTAMOL & VELKOVHR, 1995: 219, 227, 230, 234, 235.
Toltecia pusilla (Lowe 1831), – SCHMITZ, 1999: 38.
Paralaoma servilis (Shuttleworth 1852), – REISCHÜTZ & REISCHÜTZ, 2002: 50.
Paralaoma servilis (Shuttleworth, 1852), – ŠTAMOL, 2004: 105.
Paralaoma servilis (Shuttleworth, 1852), – ŠTAMOL & KLETEČKI, 2005: 17.
Paralaoma servilis (Shuttleworth 1852), – SCHÜTT, 2005: 158.
Paralaoma servilis (Shuttleworth, 1852), – DE MATTIA, 2006: 124, 125, 126.
Paralaoma servilis (Shuttleworth 1852), – www.faunaeur.org.

Literature finding sites:

- Motovun: MAASSEN, 1993: 88 (»Mirna-Genist bei Motovun, Istrien«); DE MATTIA, 2006: 124 (»Motovun«).
 ?: Opatija: WAGNER, 1932: 730 (»Abbazia; Volosca«); MAASSEN, 1984: 161/162 (»?Opatija; ?Volosca«).
 Bakarac: DE MATTIA, 2006: 124, 125 (»Bakarac«).
 Crikvenica: MAASSEN, 1984: 160 (»Crikvenica«); ŠTAMOL & VELKOVHR, 1995: 219, 227, 230, 234, 235 (»Crikvenica«); DE MATTIA, 2006: 124 (»Crikvenica«).
 Novi Vinodolski: MAASSEN, 1984: 160 (»Novi«); ŠTAMOL & VELKOVHR, 1995: 219, 227, 230, 234, 235 (»Novi Vinodolski«); DE MATTIA, 2006: 124 (»Novi«).
 Island of Lošinj: ŠTAMOL & VELKOVHR, 1995: 219, 227, 230, 234, 235 (»Veli Lošinj, I. Lošinj«); DE MATTIA, 2006: 124 (»Veli Lošinj«).
 Island of Dugi otok: ŠTAMOL, 2004: 105: (»Dugo polje, Sali«); ŠTAMOL & KLETEČKI, 2005: 17 (»Dugo polje, Sali; Luka«); DE MATTIA, 2006: 124, 126 (»Telašćica«).
 Mouth of Neretva: DE MATTIA, 2006: 124 (»Neretva estuary near Komin«), DE MATTIA, 2006: 125 (»Neretva estuary«).
 Ston: DE MATTIA, 2006: 124, 125 (»Ston, Pelješac«).
 Konavle: REISCHÜTZ & REISCHÜTZ, 2002: 50 (»Ljutaquelle in Ljuta«); DE MATTIA, 2006: 124 (»Konavle in Ljuta valley«).
 Croatia: www.faunaeur.org (»Croatia«).

Innaccurate literature finding site:

- Island of Cres: SCHMITZ, 1999: 38 (»Cres«); SCHÜTT, 2005: 158 (»Cres«).

Our finding sites :

- Island of Svetac: Sv. Andrija (church), 17 m a.s.l., WH66; Štandarac (region), 306 m a.s.l., WH66; Veli Rat (region), 104 m a.s.l., WH66; Veli Rat (region), 135 m a.s.l., WH66; Batal (region), 215 m a.s.l., WH56; Zlatna glava (summit) – Veli Rat (region), 172 m a.s.l., WH66; Zlatna glava (summit) – Veli Rat (region), 190 m a.s.l., WH66; Kraljičino (=Teutina kula), 225 m a.s.l., WH66.

The interest of this snail lies in its being recorded for certain in Croatia relatively recently, a mere 20 years ago, when MAASSEN (1984: 161/162) found it in Crikveni-

ca and Novi Vinodolski. MAASSEN (1984: 161/162) then hypothesised that the juvenile specimens that H. WAGNER (1932: 730/731) collected in the area of Opatija, and of which he was unable to determine the species, adding them to the genus *Aspasita*, were in fact *Paralaoma servilis*, which would be, if the assumption could be proved, the first information about the existence of this taxon in Croatia. Later the taxon was recorded at 8 more sites in various areas of the eastern Adriatic coast: in Motovun in Istria (MAASSEN, 1993: 88), in Veli Lošinj on the Kvarner island of Lošinj (ŠTAMOL & VELKOVHRH, 1995: 219, 227, 230, 234, 235), in Ljuta, Konavle, southern Dalmatia (REISCHÜTZ & REISCHÜTZ, 2002: 50), and at two sites on the northern Dalmatian Dugi Otok (ŠTAMOL, 2004: 105; ŠTAMOL & KLETEČKI, 2005: 17). DE MATTIA (2006: 124, 125) gives three new sites: Bakarac in the northern coastline (Hrvatsko primorje region) and in southern Dalmatia, Komin at the mouth of the Neretva and Ston on the Pelješac peninsula. The position of the finds supports the assumption that *Paralaoma servilis* is distributed continuously all along the eastern Adriatic coast (DE MATTIA, 2006: 126).

At this time I would point out that SCHMITZ (1999: 38) and SCHÜTT (2005: 158) gave an inaccurate 'quotation' from ŠTAMOL & VELKOVHRH (1995) about the existence of *Paralaoma servilis* on the island of Cres, for in this paper only the existence of *Paralaoma servilis* on the island of Lošinj is mentioned.

On Svetac island the species is very numerous and frequent. It is found in various habitats: Aleppo pine (*Pinus halepensis*) forests, olive groves, garrigue, rocky grasslands and rocks.

It is interesting that on the neighbouring islands, whether the smaller Brusnik or the more or less identically sized Biševo or the much bigger Vis, this species of terrestrial snail, according to our field research and the data from the literature, does not exist. If we accept the theory of the spread of the species anthropogenically, it is hard to believe that this species could have been transferred only to the island of Svetac in this way but not to the neighbouring islands such as Biševo and Vis, which have often been settled by the same inhabitants and where human activities have been more or less the same (mainly viticulture) and where the ecological conditions are relatively similar. If we accept the opinion that *Paralaoma* must originally have existed in this area, the question must be asked why it has subsisted only on Svetac.

Because of the diverse habitats and the abundance of the species on Svetac, it is there probably not threatened. The modernisation of life brings about greater use of pesticide and the disappearance of some natural habitats. We believe that these phenomena that have a negative impact on terrestrial snails will not be of such a scale that on the almost uninhabited and poorly connected Svetac island they will bring about the disappearance of the species *Paralaoma servilis*.

There are various explanations about the original range of the snail *Paralaoma servilis*. It has been said that it is Mediterranean (KERNEY *et al.*, 1983: 36) and yet also that the original range, because of the ease with which this small species spreads with human activity cannot be precisely determined (DE MATTIA, 2006: 124). *Paralaoma servilis* has spread over almost the whole of Europe; it is recorded in Africa in Algeria, Morocco and the Cape Verde archipelago, in Asia in Turkey and

Saudi Arabia, and in North America in the USA, including Alaska (DE MATTIA, 2006: 124) and in New Zealand (BANK & MAASSEN, 1998: 55).

***Daudebardia (Daudebardia) rufa rufa* (Draparnaud, 1805)**

Daudebardia rufa Drap., – WOHLBEREDT, 1909: 705.

Daudebardia rufa Fer., – HIRC, 1910: 42, 43.

Daudebardia rufa (Draparnaud 1805), – EHRMANN, 1937: 96.

Daudebardia rufa rufa (Draparnaud 1805), – JAECKEL *et al.*, 1957: 158, 186.

Daudebardia (Daudebardia) rufa (Draparnaud, 1805), – WAGNER, 1952: 104.

Daudebardia rufa (Draparnaud 1805), – KLEMM, 1973: 262.

Daudebardia rufa (Draparnaud), – MAASSEN, 1978: 63, 65

Daudebardia (Daudebardia) rufa (Draparnaud 1805), – www.faunaeur.org.

Literature finding sites:

Brušane: WAGNER, 1952: 104 (»Velebit-Gebirge: Brušane bei Gospić«).

Radmanove Mlinice, Omiš: MAASSEN, 1978: 63, 65 (»Radmanove Mlinice, Omiš«)
?Slavonia: HIRC, 1910: 42, 43 (»možda Slavonija«).

South Croatia: EHRMANN, 1937: 96: (»...von Südkroatien südwärts...«); KLEMM, 1973: 262 (»...von Südkroatien südwärts fast auf der ganzen Balkanhalbinsel,...«).

Dalmatia: WOHLBEREDT, 1909: 705 (»Dalmatien«); JAECKEL *et al.*, 1957: 158, 186 (»Dalmatien«).

Croatia: JAECKEL *et al.*, 1957: 158, 186 (»Kroatien«); www.faunaeur.org (»Croatia«).

Our finding sites :

Island of Vis: Stončica (region), 4,5 km NEE of the city of Vis, 20 m a.s.l., XH06; Stončica (region), 4,5 km NEE of the city of Vis, 30 m a.s.l., XH06; Sv. Duh (church), 2,5 km SE of the city of Komiza, 550 m a.s.l., WH96; Sv. Andrija (pit), Sv. Andrija (hill), 0,75 km S of the city of Vis, WH96.

The interest of this snail, whether taking it as species or nominal subspecies lies in its scanty records in Croatia and the still more scarce statements of defined sites. The oldest possible Croatian site for *Daudebardia rufa* is Dalmatia (WOHLBEREDT, 1909: 705), although we assume that the data refer to the Boka Kotorska area, which today is in Montenegro, where Wohlberedt's research was mainly focussed. WAGNER (1952: 104) too states Dalmatia as a finding site of this kind of snail, luckily making it clear that his sites were Herceg Novi (»Castelnuovo«) and Budva (»Budua«), which are today Montenegrin towns. Our assumption is that the site Dalmatia in JAECKEL *et al.* (1957) is based on these literature references, which actually relate to the area of the Bay of Kotor. In the literature there is also mention of »southern Croatia« as an area of distribution (EHRMANN, 1937; KLEMM, 1973) and »perhaps Slavonia« (HIRC, 1910: 42, 43) and »Croatia« (JAECKEL *et al.*, 1956: 158, 186). There are only two specific sites in Croatia mentioned: one is in Lika (Brušane near Gospić) (WAGNER, 1952: 104) and the other is in central Dalmatia (Radmanove

Mlinice near Omiš) (MAASSEN, 1978: 63, 65). Thus the island of Vis is the third finding site for *Daudebardia rufa* in Croatia. There we found it at only 4 localities and in very few specimens. Perhaps this is why REISCHÜTZ & REISCHÜTZ (1999) did not find *Daudebardia rufa* on Vis. Pine (*Pinus halepensis*) woods, dry stone walls, rocks and pits are its habitats on Vis. We also found representatives of the genus *Daudebardia* on Biševo island. Unfortunately, the species were too juvenile to allow of determination of the species.

This taxon of snail is found at few sites and always in a small number of specimens, which would tend to suggest the population is not abundant. For these reasons all actions that bring about the physical destruction of the habitat (construction of roads, tourist facilities and the like) or chemical destruction (use of pesticides) of the habitats could have a crucial effect on the maintenance of *D. (D.) rufa rufa* on Vis.

The range of the species *Daudebardia rufa* is marked as southeastern European and central European (JAECKEL *et al.*, 1957: 158) or as central European and southern European with a Pontic origin (KERNEY *et al.*, 1983). It has been noted for France, Italy, Switzerland, Liechtenstein, Luxembourg, Germany, Poland, Ukraine, Czech Republic, Slovakia, Hungary, Austria, Slovenia, Croatia, Bosnia-Herzegovina, Serbia and/or Montenegro, Romania, Bulgaria, Macedonia, Albania, Greece and Cyprus (www.faunaeur.org) while SCHÜTT (2005: 235) also cites it for Turkey and Algeria. Shell variability has led to the formation of several subspecies the validity of which is disputed by some malacologists.

Caracollina (Caracollina) lenticula (Michaud, 1831)

Helix lenticula Férussac, – FÉRUSSAC & DESHAYES, 1820–1851: 361.

Helix lenticula Fér., – STROBEL, 1854: 115.

Helix (Gonostoma) lenticula Fér., – BIELZ, 1865:179.

Helix lenticula FPr., – BRUSINA, 1874: 185.

Zonites lenticula Fer., – STALIO, 1876: 1.

Helicodonta (Caracollina) lenticula Fér., – STURANY, 1915: 398.

Helicodonta lenticula, – KUŠČER, 1930: 39.

Caracollina lenticula (Michaud 1831), – REISCHÜTZ & REISCHÜTZ, 1999: 37.

Caracollina (Caracollina) lenticula (Michaud 1831), – www.faunaeur.org.

Literature finding sites:

Island of Hvar: STROBEL, 1854: 115 (»Lesina«); BIELZ, 1865: 179 (»Insel Lesina«); STURANY, 1915: 398 (»auf Lesina«).

Island of Svetac: STURANY 1915: 398 (»Sant'Andrea«); KUŠČER, 1930: 39 (? školj Sv. Andrije).

Island of Vis: REISCHÜTZ & REISCHÜTZ, 1999: 37 (»Komiza«).

Dalmatia: FÉRUSSAC & DESHAYES, 1820–1851: 361, Pl. 66, f. 1 (»Dalmatie«); BRUSINA, 1874: 185 (Dalmacija); STALIO, 1876: 1 (»Dalmaz.«).

Croatia: www.faunaeur.org (»Croatia«).

Our finding sites:

Island of Vis: Sv. Nikola (church), Komiža (city), 60 m a.s.l., WH86.

Island of Biševo: Mežuporat (settlement), 10 m a.s.l., WH85.

Island of Svetac: Sv. Andrija (church), 17 m a.s.l., WH66; Kraljičino (=Teutina kula), 225 m a.s.l., WH66; Zaruška (bay), 30 m a.s.l., WH56; Križice (point) – Zaruška (bay), 12 m a.s.l., UTM: WH56.

Island of Brusnik: W part, WH66.

Island of Mala Palagruža: 2–10 m a.s.l., XG09.

Island of Palagruža: quarry, XG09; ridge of the island, XG09.

The interest of this taxon lies in the scanty and until recently dubious data about its existence in Croatia. The history of records of *Caracollina lenticula* in Croatia starts with the French malacologists FÉRUSSAC & DESHAYES who published in the 1820–1851 period the first part of their »Histoire naturelle générale et particulière des mollusques terrestres et fluviatiles« in which this taxon was already mentioned for Dalmatia. The then Dalmatia covered areas that are outside the borders of today's Croatia and we cannot take such statements as certain evidence that the species exists in Croatia. From the same reason Brusina's information (BRUSINA, 1874: 185) about *Helix lenticula* and Stalio's statements (STALIO: 1876: 1) about *Zonites lenticula* in Dalmatia also give no reliable information about the existence *Caracollina lenticula* in Croatia.

The first fairly concrete finding site of *Caracollina lenticula* in Croatia is the island of Hvar (STROBEL, 1854: 115; BIELZ, 1865: 179). STURANY (1915: 398) also recorded it for the island of Svetac, and mentions that WAGNER stated it as being present on Hvar, a statement for which I have found no confirmation in the works of Wagner. KUŠČER (1930: 39) casts doubt on the existence of this snail on Svetac, thinking that there it was »perhaps only washed up by the sea«, and does not refer to Hvar. KUŠČER (1930: 39) probably based his assumption on the appearance of southern (Albanian and Montenegrin) species of terrestrial snails in Croatian bays open to the southern winds that were washed up by the sea (BRUSINA, 1872: 150; KOBELT, 1897: 310). Since papers in the 19th century very seldom state whether taxa really live in some locality or whether they are just deposited there by the sea, and state inaccurate sites more often than is done in contemporary works, the existence of this taxon in Croatia on the basis of data up to 1930 about finding sites on Hvar and Svetac was dubious after the work of KUŠČER (1930). Such a situation lasted until the publication of results of terrestrial malacofauna of the island of Vis (REISCHÜTZ & REISCHÜTZ, 1999: 37) when the species was found in Komiža in areas in which it was certainly not cast up by the sea. This then confirmed the existence of the taxon *Caracollina lenticula* in Croatia.

In our field research the species was found in new finding sites (the islands of Biševo, Brusnik, Mala Palagruža, Palagruža) and the finds on the islands of Svetac and Vis were confirmed. The habitats covered rocky grasslands, garrigues and dry stone walls. On most of these islands we found this species at few sites and in a small number of specimens, although it was more numerous on the islands of Svetac and Vis.

The currently relatively satisfactory abundance of the species on Svetac and Vis can rapidly be made dubious because of the small area that the population occupies there and because of the habitats that are exposed to anthropogenic impacts, particularly on Vis: the use of pesticides, the disappearance of dry stone walls and garrigues. It is a similar matter on Biševo. On the little island of Brusnik, the introduction of rabbits, which brought about important changes in the habitat, did not lead to the disappearance of the taxon, but it is possible that any additional anthropogenic or natural change might have a crucial importance for the survival of *Caracollina lenticula*. On the very distant and isolated islands of Palagruža and Mala Palagruža, the population is small, but still on the whole regulated by natural and not anthropogenic conditions.

The species has a western Mediterranean and Atlantic range (FECHTER & FALKNER, 1990: 218), whence, by human activity, it spread throughout the whole of the Mediterranean. It has been recorded in Gibraltar, Portugal, Spain, France, Italy, Malta, Greece and Cyprus (www.faunaeur.org) and SCHÜTT (2005: 447) also quotes it for Turkey, Syria and Israel. It is interesting that there are no data about its existence in neighbouring Montenegro (JAECKEL *et al.*, 1957; www.faunaeur.org) or Albania (JAECKEL *et al.*, 1957; DHORA & WELTER-SCHULTES, 1996; www.faunaeur.org). Finds in Italy are in the regions on the western side of the Apennines (Leghorn, Tuscany, Lazio, Calabria, Sicily), except for Puglia on the eastern side of the Apennines, which has a coastline on the Adriatic (ALZONA, 1971).

***Xerotricha conspurcata* (Draparnaud, 1801)**

- Helix conspurcata* Drap., – STROBEL, 1854: 119.
Helix (Xerophila) conspurcata Dr., – BIELZ, 1865: 207.
Helix (Xerophila) conspurcata Drap., – SCHRÖCKINGER-NEUDENBERG, 1865: 316.
Helix (Xerophila) conspurcata Draparnaud, – KREGLINGER, 1870: 104.
Helix conspurcata Drap., – BRUSINA, 1874: 185.
Helix (Xerophila) conspurcata Drap., – BÖTTGER, 1880: 105.
Helix conspurcata Dr., – BRAUN, 1887: 107.
Helix (Xerophila) conspurcata Drap., – BRAUN, 1887: 109.
Xerophila conspurcata Drp., – KÖHLER, 1912: 79.
Helicella (Xerotricha) conspurcata Drap., – STURANY, 1915: 399, 402.
Helicella conspurcata (Drap. 1801), – JAECKEL *et al.*, 1957: 163.
Xerotricha conspurcata Monterosato 1892, – BOLE, 1969: 102.
Xerotricha conspurcata (Draparnaud, 1801), – HAUSDORF, 1990: 59.
Xerotricha conspurcata (Draparnaud 1801), – REISCHÜTZ & REISCHÜTZ, 1999: 37.
Xerotricha conspurcata (Draparnaud 1801), – FRANK, 2000: 120.
Xerotricha conspurcata (Draparnaud 1801), – KITTEL, 2002: 443.
Xerotricha conspurcata (Draparnaud 1801), – REISCHÜTZ *et al.*, 2002: 55.
Xerotricha conspurcata (Draparnaud 1801), – www.faunaeur.org.

Literature finding sites:

- Island of Brač: KITTEL, 2002: 443 (»Bol (beim Dominikanerkloster, an bewachsenen Kalkfelsen)«).
- Island of Hvar: STROBEL, 1854: 119 (»Lesina«); BIELZ, 1865: 207 (»Lesina«); BÖTTGER, 1880: 105 (»auf Lesina«); BRAUN, 1887: 107 (»Lesina«).
- Island of Vis: REISCHÜTZ & REISCHÜTZ, 1999: 37 (»NW Ortsrand von Komiza; am südlichen Ortsrand von Komiza; Podšpilje; Bacvica, Vis-Komiza«).
- Island of Brusnik: BRAUN, 1887: 109 (»Insel Brusnik«).
- Island of Korčula: STROBEL, 1854: 119 (»Curzola«); BIELZ, 1865: 207 (»Curzola«); REISCHÜTZ *et al.*, 2002: 55 (»Stadt Korčula«).
- Island of Jabuka: Sturany, 1915: 399, 402 (»Pomo«).
- Dubrovnik: STROBEL, 1854: 119 (»Ragusa«); BIELZ, 1865: 207 (»Ragusa«); BÖTTGER, 1880: 105 (»Ragusa«); KÖHLER, 1912: 79 (»im Garten der Villa Adria«).
- Istria: SCHRÖCKINGER-NEUDENBERG, 1865: 316 (»Istr.«).
- Illyria: KREGLINGER, 1870: 104 (»Illyrien«).
- Dalmatia: SCHRÖCKINGER-NEUDENBERG, 1865: 316 (»Dalm.«); KREGLINGER, 1870: 104 (»Dalmatien«); BRUSINA, 1874: 185 ([indirectly:] Dalmacija); STURANY, 1915: 399 (»Dalmatien«); JAECKEL *et al.*, 1957: 163 (»Dalmatien«); BOLE, 1969: 102 (»Dalmacija«); HAUSDORF, B., 1990: 59 (»Dalmatien«); FRANK, 2000: 120 (»Dalmatien«).
- Croatia: www.faunaeur.org (»Croatia«).

Our finding sites :

- Island of Vis: Žena glava (settlement), 254 m a.s.l., WH96; Sv. Nikola (church), Komiža (city), 50 m a.s.l., WH86; Milna (bay), 10 m a.s.l., XH06; Podšpilje (village), 180 m a.s.l., WH96; Podšpilje (village), 210 m a.s.l., WH96; Brajkovica (region), Komiža (city)-1,5 km E, 210 m a.s.l., WH96.
- Island of Biševo: Mezuporat (settlement), 10 m a.s.l., WH85.
- Island of Svetac: Sv. Andrija (church), 17 m a.s.l., WH66; Baršćanovice (bay), WH66; Donji Voje (bay), WH56; Veli Rat (region), 135 m a.s.l., WH66; Kraljičino (=Teutina kula), 225 m a.s.l., WH66; Zaruška (bay), 30 m a.s.l., WH56.
- Island of Palagruža: quarry, XG09; ridge of the island, XG09; slope below the lighthouse, NNE eksp., XG09; lighthouse-weather station, XG09.

The interest of this snail that has a wide range is in the relatively few finding sites in Croatia, and its local appearances on the islands of Brač (KITTEL, 2002: 443) and Korčula (REISCHÜTZ *et al.*, 2002: 55).

Xerotracha conspurcata has previously been noted for Dalmatia (BOLE, 1969: 102; BRUSINA, 1874: 185; FRANK, 2000: 120; HAUSDORF, B., 1990: 59; JAECKEL *et al.*, 1957: 163; KREGLINGER, 1870: 104; SCHRÖCKINGER-NEUDENBERG, 1865: 316; STURANY, 1915: 399), for Istria (SCHRÖCKINGER-NEUDENBERG, 1865: 316) and Illyria (KREGLINGER, 1870: 104). The finding site defined as Dalmatia, if it is a matter of old data or new data based on the old, or Illyria and Istria are not certainly coterminous with Croatia because of various historical understandings of these place names that are

not always within the borders of today's Croatia. Still, these general data do have confirmation in concrete Croatian sites in the central and southern Dalmatian area, on the islands of Brač (KITTEL, 2002: 443), Hvar (BIELZ, 1865: 207; BÖTTGER, 1880: 105; BRAUN, 1887: 107), Vis (REISCHÜTZ & REISCHÜTZ, 1999: 37), Brusnik (BRAUN, 1887: 107), Korčula (BIELZ, 1865: 207; REISCHÜTZ *et al.*, 2002), Jabuka (STURANY, 1915: 399), and just one coastal site, in Dubrovnik (BIELZ, 1865: 207; BÖTTGER, 1880: 105; KÖHLER, 1912: 79). It is interesting that in recent malacological investigations of the island of Korčula (REISCHÜTZ *et al.*, 2002) and of Brač (KITTEL, 2002), *Xerotricha conspurcata* was found at only one site each of many localities explored in these islands, which suggests a markedly localised distribution on these islands. Contemporary research into some of the northern eastern Adriatic areas (FISCHER *et al.*, 2000; FRANK 1991; GRAACK 1989; ŠTAMOL & POJE, 1998; ŠTAMOL & VELKOVHR, 1995) did not show the existence of the taxon there, which because of the very localised appearance of the taxon and the only partial degree of exploration of the area does not say that *Xerotricha conspurcata* certainly does not exist in the area of the north east Adriatic.

In our investigations we found this snail on rocky grasslands, along dry stone walls and in the garrigue. *Xerotricha conspurcata* was abundant on Svetac (a new finding site), on Vis (a known site) and Palagruža (a new finding site), and it was not abundant on Biševo (a new finding site). All these islands are in the area of central Dalmatia (Vis, Biševo, Svetac) or southern Dalmatia (Palagruža), i.e. in areas where the previously known and defined Croatian finding sites also belong.

Changes in habitats of this species brought about by the replacement of natural habitats by built structures, roads, the use of pesticides in the olive groves, vineyards and other farmland, the replacement of dry stone walls by concrete walls reduce the area of suitable habitats, and some of them will lead to the direct death of individuals, hence leading to the reduction of the abundance of the population. Still, because of the current small human population and slight degree of urbanisation, we are of the opinion that except on Vis island these actions are not so extensive as to bring about the disappearance of the species on the islands investigated.

Xerotricha conspurcata has an originally western Mediterranean range, whence, probably via human activity, it spread to the eastern Mediterranean (HAUSDORF, 1990: 59) and it is known from Morocco, Algeria, Tunisia, Gibraltar, Portugal, Spain, France, Italy, Malta, Croatia, Albania and Greece all the way to Turkey (HAUSDORF, 1990: 59; [www. fauneur.org](http://www.fauneur.org)). In Israel it was recorded in 1982, and it is possible that it also lives in Lebanon (HAUSDORF, 1990: 50).

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² See footnote 1.

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SAŽETAK

Nova nalazišta nekih zanimljivih vrsta hrvatske kopnene malakofaune (Mollusca: Gastropoda terrestria)

V. Štamol & E. Kletečki

Tijekom istraživanja kopnene malakofaune nekih srednjedalmatinskih i južnodalmatinskih otoka nađene su vrste koje su rijetko bilježene u literaturi za hrvatska područja. Radi se o pet svojti širokih areala (*Pupilla triplicata*, *Paralaoma servilis*, *Daudebardia rufa rufa*, *Caracollina lenticula*, *Xerotricha conspurcata*) i o jednoj endemičnoj podvrsti uskog rasprostranjenja (*Medora dalmatina aquila*). Svojti *Pupilla triplicata* je nalaz na istraživanom području (na otocima Svecu i Visu) prvi definiran nalaz u Hrvatskoj. Svojti *Caracollina lenticula* sa dosada poznata samo tri nalazišta u Hrvatskoj, od koja su dva bila dvojbena, potvrđena su dva nalaza (dvojbeni nalaz: otok Svetac i siguran nalaz: otok Vis), te su nađena četiri nova nalazišta (otoci Biševo, Brusnik, Palagruža i Mala Palagruža). Dodatna zanimljivost nalaza *Caracollina lenticula* u Hrvatskoj je u tome što su najbliža nalazišta ove mediteranske vrste u Grčkoj i u Italiji (Puglia), dok je nema u bližoj nam Albaniji i susjednoj Crnoj Gori. *Daudebardia rufa* predstavljena s nominalnom podvrstom, do sada poznata sa samo dva definirana nalazišta u Hrvatskoj, nađena je na novom nalazištu, otoku Visu. *Paralaoma servilis* je relativno nedavno nađena u Hrvatskoj (1984. g.), do našeg nalaza na otoku Svecu nezabilježena na istraživanom području. *Xerotricha conspurcata* do sada zabilježena na 7 lokaliteta u Hrvatskoj, sada je nađena na još tri lokaliteta (otoci Biševo, Brusnik i

Palagruža). *Medora dalmatina aquila* je do sada nađena na otocima Lastovu, Tajanu, Sušcu i Korčuli. Naš nalaz na otoku Biševu je najsjevernije nalazište ove svojte.

Kako se radi, kod većine vrsta, o svojstama širokih areala i sa relativno širokom ekološkom valencom (izuzetak je *M.d. aquila*) nameće se pitanje zašto ove svojte nisu bile češće zabilježene za hrvatska mediteranska područja. Pretpostavljamo da su razlozi tome 1. metode sakupljanja (većina podataka potječe iz radova 19. i prve polovice 20. stoljeća u kojima su metode sabiranja bile takve da su uglavnom skupljane velike vrste, a one čije kućice su manje od 5 mm su promicale, npr. *Pupilla triplicata*, *Daudebardia rufa*, *Paralaoma servilis*); 2. slaba istraženost Hrvatske (veliki dijelovi Hrvatske, pa čak i hrvatske obale, koja je bila uvijek u centru interesa malakoloških istraživanja, slabo su istraženi obzirom na cjelokupnu kopnenu malakofaunu; istraživanja su bila vezana za određenu sistematsku skupinu – najčešće rod); 3. moguća trenutna lokaliziranost svojte u Hrvatskoj (možda se radi o novim vrstama u Hrvatskoj unesenim čovjekom koje se još nisu uspjele proširiti po čitavom području s pogodnim staništima npr. *Xerotricha conspurcata*); 4. trajna lokaliziranost svojte (uvjetovana uglavnom relativnom rijetkošću pogodnih staništa: *Medora dalmatina aquila*); 5. relativna nepristupačnost staništa istraživačima (strme litice *Medora dalmatina aquila*).

Među prikazanim puževima najugroženija je stenoendemična podvrsta *Medora dalmatina aquila* zbog lokalne pojavnosti, uskih stanišnih zahtjeva i mogućeg sabiranja od strane malakologa i kolekcionara. Za sve ostale svojte obrađenih puževa promjene biotopa uzrokovane modernizacijom života koje se očituju npr. u pretvaranju suhozidova u žbukane zidove, primjeni pesticida, te nestanku izvornih staništa – travnjaka, gariga i borika koji se, zbog galopirajućeg turizma na otoku Visu, zamjenjuju sve više prometnicama i turističkim objektima, može imati presudnu ulogu na opstanak vrsta na istraživanom području.

SUMMARY

New finding sites of some interesting species of Croatian terrestrial malacofauna (Mollusca: Gastropoda terrestria)

V. Štamol & E. Kletečki

During research into the terrestrial malacofauna of some central and southern Dalmatia islands, species were found that are seldom recorded in the literature for the area of Croatia. These were five taxa with broad ranges (*Pupilla triplicata*, *Paralaoma servilis*, *Daudebardia rufa rufa*, *Caracollina lenticula*, *Xerotricha conspurcata*) and one endemic subspecies with a narrow range (*Medora dalmatina aquila*). This was the first time a find of the taxon *Pupilla triplicata* was defined in the territory of Croatia (on the islands of Svetac and Vis). Previously only three finding sites of *Caracollina lenticula* in Croatia were known, and two of them were dubious; two finds were confirmed (the dubious find was on the island of Svetac and the certain find on the island of Vis), and four new finding sites were discovered (the islands of Biševo,

Brusnik, Palagruža and Mala Palagruža). An additionally interesting feature of the find of *Caracollina lenticula* in Croatia is that the closest finding sites were in Greece and Italy (Puglia), while there have been no records in Albania or Montenegro, which are much closer. *Daudebardia rufa* represented by a nominal subspecies, known to date only in two defined finding sites in Croatia, was discovered in a new site, the island of Vis. *Paralaoma servilis* was found relatively recently in Croatia (1984) but until our find on the island of Svetac was not recorded in the area investigated. *Xerotricha conspurcata* has so far been recorded in 7 sites in Croatia, and now has been found on three more sites (islands Biševo, Brusnik and Palagruža). *Medora dalmatina aquila* had previously been found on the islands of Lastovo, Tajan, Sušac and Korčula; our find on the island of Biševo is the most northerly finding site of this taxon.

Since with most of these species we are dealing with broad-range taxa and a relatively wide ecological valence (*M.d. aquila* is an exception) the question arises why these taxa were not recorded more frequently in the Croatian Mediterranean area. We supposed that the reasons for this are 1. the methods of collection (most data derive from papers of the 19th and early 20th century in which the collection methods were such that on the whole large species were collected, while those with shells smaller than 5 mm slipped through, such as *Pupilla triplicata*, *Daudebardia rufa*, *Paralaoma servilis*); 2. the poor exploration of Croatia (large areas of Croatia, even the Croatian coast, which was always in the centre of interest of malacological research were poorly investigated with respect to the entirety of the terrestrial malacofauna; investigations were related to a certain systematic group – most often a genus); 3. the possible momentary localisation of a taxa in Croatia (perhaps to do with a new introduced species in Croatia that has not yet managed to spread over a whole area with suitable habitats, such as *Xerotricha conspurcata*); 4. the permanent localisation of a taxon (on the whole conditioned by a relative rarity of suitable habitats: *Medora dalmatina aquila*); 5. relative inaccessibility of habitats to researchers (the steep cliffs favoured by *Medora dalmatina aquila*).

Among the snails presented, the most threatened is the narrowly endemic subspecies *Medora dalmatina aquila* because of its very local appearance, its narrow demands on habitats and collection activities by scientists or hobbyists. For all the other taxa of snails studied, the changes in biotopes brought about by the modernisation of life and manifested in for example the turning of dry stone walls into rendered walls, the application of pesticides and the disappearance of the original habitats of rocky grasslands, garrigue and pine woods that, because of the rapid development of the tourist industry on Vis island, are increasingly being replaced by roads and tourist structures, can have a crucial role for the survival of the species on the area investigated.