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CEPAEA HORTENSIS (O. F. MÜLLER, 1774) (MOLLUSCA: GASTROPODA) IN CROATIA?

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Štamol, V. & Slapnik, R.: *Cepaea hortensis* (O. F. Müller, 1774) (Mollusca: Gastropoda) in Croatia? Nat. Croat., Vol. 24, No. 2., 331–336, Zagreb, 2015.

Based on characteristics provided by the genital organs, the presence of the species *Cepaea hortensis* (O. F. Müller, 1774), reported from Croatia from a single site in the literature, is refuted. According to our current knowledge this species should be deleted from the terrestrial snail fauna of Croatia.

Key words: land snails, *Cepaea hortensis*, Croatia

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Na osnovu determinacije po spolnim organima negirano je postojanje vrste *Cepaea hortensis* na jednom jedinom literaturnom nalazištu u Hrvatskoj, te je zaključeno da prema sadašnjim spoznajama vrstu treba brisati iz faune kopnenih puževa Hrvatske.

Ključne riječi: kopneni puževi, *Cepaea hortensis*, Hrvatska

According to literature data, there are three species of the genus *Cepaea* in Croatia: *C. hortensis* (O. F. Müller, 1774), *C. nemoralis* (Linnaeus, 1758) and *C. vindobonensis* (C. Pfeiffer, 1828). The genus *Cepaea* is understood here after Bank, 2013, while Neiber & Hausdorf, 2015 introduce a new genus *Caucasotachea* for *Cepaea vindobonensis*. *C. nemoralis* and *C. vindobonensis* were mentioned in the earliest malacology papers concerning the Croatian area and have been reported to the present day (for example Küster, 1842; Anonymus, 1846; Frauenfeld, 1856; Bielz, 1865; Brusina, 1866, 1867, 1870, 1872; Erjavec, 1874; Cubich, 1875; Clessin, 1879; Stossich, 1879, 1880, 1883; Böttger, 1880, 1880a; Hirc, 1881, 1886, 1905, 1910, 1918; Sturany, 1895; Soós, 1904; Kormos, 1907; Wagner, 1932; Bole, 1958; Štamol, 1989, 1995, 2010; Bank, 2007, 2010, 2013; Héra & Uherkovich, 2008; Uherkovich *et al.*, 2008). In contrast, *C. hortensis* was recorded as a certain species for Croatia in 1867 (Brusina, 1867), while just 13 years earlier, it was listed as a questionable record for Dalmatia (Strobel, 1854). The first detailed locality, Podsused, which is found within the present day city limits of Zagreb, was given by the Croat S. Brusina (1870). However, S. Clessin (1879), a German malacologist who conducted numerous studies in Croatia, was uncertain of the accuracy of this determination. O. Böttger (1880), another German malacologist, also claimed that he did not know whether this species indeed lives in Croatia. Once again, Clessin (1887) expressed his doubt regarding the presence of this species in Croatia. Further authors either cited Brusina's record, or collected the species themselves at the only published record in Croatia (Horváth, 1887; Soós, 1904;

Tab. 1. *Cepaea nemoralis* from Podsused, Zagreb and island of Rab. SH: shell height; SW: shell width.

specimen label	Locality	SH (mm)	SW (mm)	shell lip	distal mucus gland (no. of branches)	proximal mucus gland (no. of branches)	dart
6768-2	Podsused, Zagreb	17	23	purple-brown	3	3	
6768-3	Podsused, Zagreb	17	23	white	3	2	
6768-4	Podsused, Zagreb	17	22	purple-brown	3	3	
6770-1	Podsused, Zagreb	14	20	white	4	3	simple blades
6770-2	Podsused, Zagreb	17	22	white	3	3	simple blades
6770-3	Podsused, Zagreb	15	22	white	2	2	
6770-4	Podsused, Zagreb	17	22	white	4	4	simple blades
x	Kampor, Island of Rab	16	21	white	3	2	simple blades

Hirc, 1905; Csiki, 1906; Kormos, 1907; Štamol, 1989). Because of these later publications, suspicions as to the accuracy of the determination were dissipated. Therefore, it comes as no surprise that the Fauna Europaea database and other comprehensive malacofauna works cite Croatia as within the distribution range of the species *C. hortensis* (Ehrmann, 1933; Bank, 2007, 2010, 2013; Štamol, 2010; Lajtner *et al*., 2013).

The problem in differentiating *C. hortensis* and *C. nemoralis* is that both species display a high amount of shell variation in size, colour and banding (Klemm, 1973; Cameron & Redfern, 1976; Kerney & Cameron, 1979; Kerney *et al*., 1983; Horsák *et al*., 2013). As a rule, the shell of *C. hortensis* should be smaller than that of *C. nemoralis*, have a parallel upper and a columellar lip edge, a lighter lip and greater distance of the lowest spiral band from the umbilicus, while the shell of *C. nemoralis* is characterised by a darker lip, shorter distance of the lowest spiral band from the umbilicus, and the non-parallel positioning of the upper and columellar mouth edge (Klemm, 1973; Kerney & Cameron, 1979; Kerney *et al*., 1983; Fechter & Falkner, 1990). The latter criteria can be the result of subjective assessment, which is not usually reliable. Both species have morphs that lack a lower spiral band, and therefore the distance of the lower spiral band from the umbilicus cannot always serve for their differentiation. The colour of the lip remains a relatively easy differentiating characteristic. However, there are individuals of "*C. nemoralis* in which white-lipped shells occur, and of *C. hortensis* in which dark-lipped forms occur" (Cameron, 2003), which hinders determination with certainty. Cameron (2003) believes that individuals with a non-standard lip colour "are usually in a minority among the population, and it is usually obvious that they are the same size as those with the "right" lip colour." The general opinion is that the only certain differentiation is possible by the anatomy of the genital organs and their formation (Aubertin, 1927), in particular by the "structure of the mucus glands, and of the dart itself"Cameron (2003), which in the case of "*C. hortensis* has bifurcated blades … while [that] of *C. nemoralis* is simple. *C. hortensis* usually has 4 or more branches of each mucus gland, *C. nemoralis* 3

or less" (Kerney & Cameron, 1979). The same differences in the genital organs were mentioned by Kerney *et al*. (1983) and Welter-Schultes (2012).

In order to be certain which species is present at Podsused, V. Štamol and E. Kletečki collected specimens there of dark-lipped and light-lipped *Cepaea* for dissection. In the spring of 2015, Mr Žarko Krstinić sent the first author a specimen of a light-lipped *Cepaea* from the island of Rab which, in terms of lip colouration, could be considered *C. hortensis*. The anatomy of the genital organs was examined in the specimen from the island of Rab and from seven specimens of *Cepaea* from the only literature locality for *C. hortensis* for Croatia: Podsused in Zagreb. Of these seven specimens, two had a pronounced dark lip, while five had a white lip. The number of branches of each mucus gland ranged from 2 to 4 (Tab. 1). In all individuals displaying a love dart, it had the shape characteristics of *C. nemoralis*, including two specimens with four branches of the mucus gland. On the basis of this analysis, it was concluded that according to the current knowledge, *C. hortensis* is not present at the only literature locality, or on the island of Rab, and it should be deleted from the Croatian fauna, and therefore from the Red List of Terrestrial Snails of Croatia (Lajtner *et al*., 2013).

C. hortensis is a central European species (Ehrmann, 1933; Jaeckel *et al*., 1958; Klemm, 1973), or can be considered a western/central European species (Kerney & Cameron, 1979; Kerney *et al*., 1983). According to the literature data, regarding nearby countries, it has been recorded in Hungary (Bank, 2007, 2013), primarily its western part (Klemm, 1973; Kerney *et al*., 1983), Austria (Bank, 2007, 2013), primarily its northern part (Klemm, 1973), Bosnia (Ehrmann, 1937; Jaeckel *et al*., 1958; Bank, 2010), Montenegro (Bank, 2010), Serbia and/or Kosovo (Bank, 2010). Slovenia is not included in the distribution range according to Fauna Europaea (Bank, 2007, 2013) and Bank (2010), though in some papers, *C. hortensis* is reported as present in its area (Bole, 1969; Polenec, 1973; Bole 1974, 1977; Bole & Slapnik 1997; Vaupotič & Velkovrh, 1997; Culiberg *et al*., 1998). Jaeckel *et al*. (1958) lists "Istria, croatische Littorale", which means Istria and/or the Croatian Littoral (in Croatian: Hrvatsko primorje). As previously stated (Štamol, 2010), this term is no proof of the existence of the species in Croatia, (i) because this does not confirm its presence in the Croatian Littoral, (ii) because the Istria Peninsula is encompassed by two countries (Croatia and Slovenia), and often the region of Trieste (Italy) has been included as part of this peninsula. However, it does suggest that this species is present somewhere in those regions, either the Croatian part of the northern Adriatic or the nearby areas of Slovenia and/or Italy. It should certainly be noted that *C. hortensis* is not recorded as present in Italy (Alzona, 1971; Klemm, 1973; Bank, 2010, 2013). Unfortunately, there are no data to indicate whether the determinations for Slovenia, Bosnia, Montenegro, Serbia and/or Kosovo, and for Istria and/or Croatian Littoral were performed on the basis of the anatomy of the genital organs. All facts considered, the data on the general distribution range of *C. hortensis* do not conclusively state that this species is not present in Croatia, though the data tend to support this conclusion. Also, the current conclusion of the absence of *C. hortensis* in Croatia also raises suspicions as to its presence in Bosnia, Montenegro, Serbia and/or Kosovo, and perhaps in all or in parts of Slovenia.

C. hortensis is spreading vigorously in Hungary and probably will occur sooner or later in Slavonia, which is a Croatian region that borders Hungary (Fehér, pers. comm.).

In 2011 (Silvertown *et al*., 2011; Fehér, pers. comm.) there was a citizen science based project Evolution MegaLab. *Cepaea* species were used as the model organism, data were collected by a wide range of volunteers and were used in evolutionary and ecological

studies. The recent paper reveals that the distinction between *C. hortensis* and *C. nemoralis* is not such an easy task as previously believed and therefore those studies which are based on citizen science-collected data should be treated with some reservation.

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