



HAWAIIA MINUSCULA (A. BINNEY, 1841) – ANOTHER ALIEN SPECIES IN POLAND (MOLLUSCA: GASTROPODA: ZONITIDAE)

MARCIN KASZUBA & EWA STWORZEWICZ

Institute of Systematics and Evolution of Animals PAS, Sławkowska 17, 31-016 Kraków, Poland
(stworzewicz@isez.pan.krakow.pl)

ABSTRACT: *Hawaiiia minuscula* (A. Binney), yet another non-native snail, was found in Poland, in a greenhouse of the Jagiellonian University Botanic Garden in Kraków. Its accompanying terrestrial malacofauna is also presented.

KEY WORDS: terrestrial snails, *Hawaiiia minuscula*, alien species, botanic garden, Poland

INTRODUCTION

Hawaiiia minuscula (A. Binney, 1841) is regarded as a Nearctic species, distributed from Alaska and Newfoundland to Central America and the Antilles. It has been widely dispersed by man in Europe, where it lives mainly in greenhouses, in the Pacific islands (Hawaii, Pitcairn, Tahiti and many others) (PILSBRY 1946), Australia (http://www.ento.csiro.au/aicn/name_s/b_1857.htm) and Bermuda (BIELER & SLAPCINSKY 2000). Its far-eastern distribution area in Japan, Korea, Primorskiy Krai and islands of eastern Asia was long regarded as a result of introduction (PILSBRY 1946, ROTH & SADEGHIAN 2003). This view changed with the discovery of living *H. afghana* Riedel, 1963 in Afghanistan as well as that of fossil *H. antiqua* Riedel, 1963 in the Upper Miocene deposits of the Ciscaucasia and the Mid Miocene of Podolia (W. Ukraine) (GOZHNIK & PRYSYAZHNYUK 1978). Based on these findings RIEDEL (1963a, b, 1967, 1980) claimed that in the Neogene the genus had been widespread in North America and Asia, and the present east-Palaearctic distribution area of *H. minuscula* along the eastern coast of Asia and in its islands was a Tertiary relic. Recently *H. minuscula* was found also in subfossil dune deposits of one of the Ogasawara Islands; according to CHIBA et al. (2008) the finding suggests that the species is indigenous there.

In Europe *H. minuscula* is known as an anthroporous species, like in Madeira, North Africa and Israel (RIEDEL 1998). The first European finding

comes from an orchid-house in Nottingham (England) where the snail was found in 1883 (ELLIS 1969, as *Zonitoides minusculus*). Somewhat later it was recorded from greenhouses of Northern Ireland (STELFOX 1911) and, much later, from Sweden (PROSCHWITZ 1983, 2005), the Czech Republic (MÁCHA 1988, HORSÁK et al. 2004), the Netherlands, Germany (BENECKE & KAPPERS 1996), Austria (REISCHÜTZ 2002) and Norway (OLSEN 2002). In Italy shells of *H. minuscula* were found in flood debris of some ditches and in the mouth of a river in Tuscany, flowing however through agricultural area with numerous greenhouses (BODON et al. 2004).

It appears that *H. minuscula* can live in a wide variety of habitats. In the eastern United States it is regarded as a bare ground dweller, never occurring in leaf litter (HUBRICHT 1985), like in Bermuda (BIELER & SLAPCINSKY 2000). According to HUBRICHT (1985), it was found crawling on the bare ground of floodplains, meadows, roadsides, along railroads and on waste ground in urban areas. In the Niagara Frontier Region it was reported to live in gardens under leaves and loose stones (ROBERTSON & BLAKESLEE 1948). Similarly, in Primorskiy Krai *H. minuscula* lives in leaf litter (LIKHAREV & RAMMELMEYER 1952). The most precise information was given by RIEDEL (1967) from Korea, where the snail lives both in leaf litter of deciduous and mixed forests, and in shrubland or among stones on grassy slopes.

MATERIAL

Sixty three specimens of *H. minuscula* (Fig. 1), mostly empty shells but also live snails, were found in the “Holenderka” greenhouse of the Jagiellonian University Botanic Garden in Kraków. The snails were

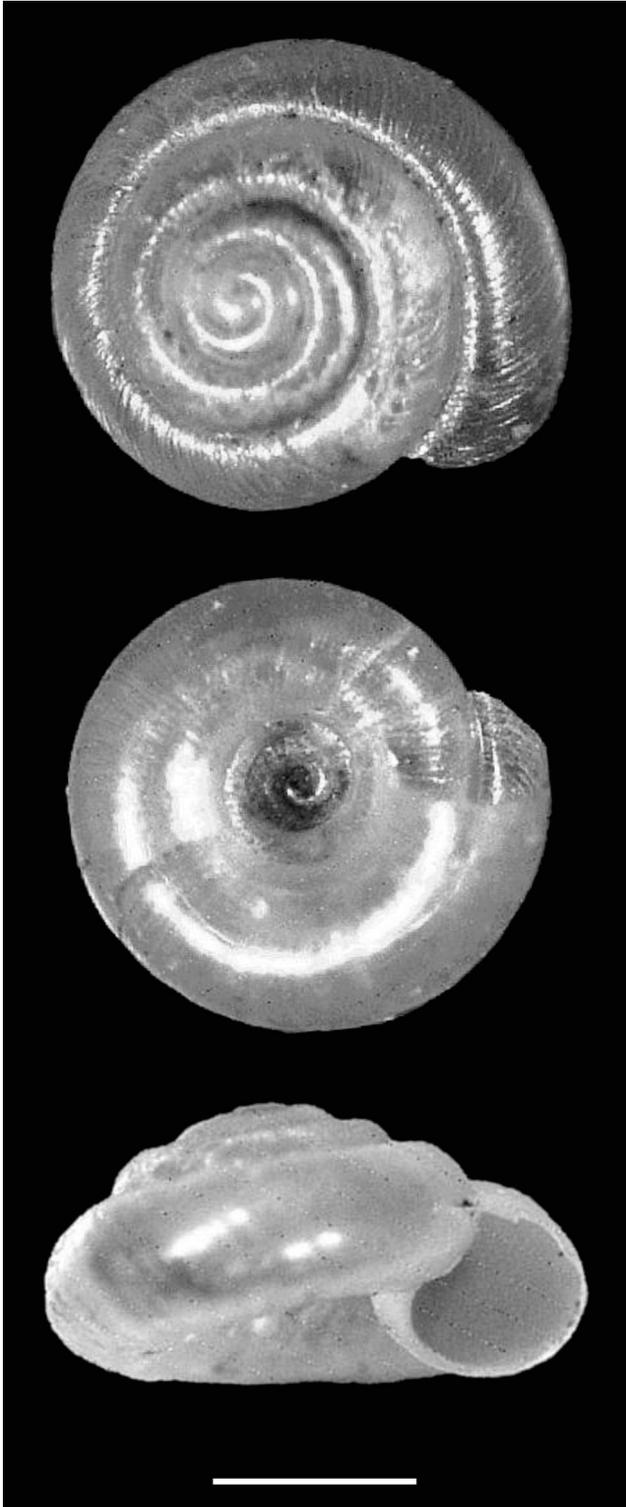


Fig. 1. Shell of *Hawaiiia minuscula* (Binney, 1840): top, bottom and frontal view. Scale bar 1 mm

collected on several occasions between December 2006 and March 2007. In the greenhouse various orchid species are mainly grown, but *Hawaiiia* shells were always found in only one site – a small bed of *Pilea* sp. (Urticaceae) (Fig. 2). Originally, *Pilea* inhabits tropical and subtropical zones of both Americas, Asia and Africa. The shells were discovered on the surface of soil among the *Pilea* plants.

H. minuscula is very small (diameter of our shells is 1.98–2.58 mm), with a delicate, light-gray or whitish and somewhat transparent shell consisting of about four whorls, distinctly striated above and nearly smooth underneath. The umbilicus is contained about three times in the shell diameter. The dimensions of specimens collected do not depart from those of specimens from the sites where the species is native (ex coll. Museum and Institute of Zoology, PAS, Warsaw), though shells from Pennsylvania are somewhat smaller than the other specimens (Table 1).

H. minuscula is somewhat similar to two other very small species – *Punctum pygmaeum* (Draparnaud, 1801) and *Helicodiscus singleyanus* (Pilsbry, 1890) but differs from the former in being clearly bigger and from the latter in having radial sculpture. Detailed differences between these three species were discussed by BODON et al. (2004).

Table 1. Dimensions (in mm) of shells of *Hawaiiia minuscula* from various localities: H – shell height, D – shell diameter, d – umbilicus diameter

Shell character	Pennsylvania, USA (n=6)	Cuba (n=9)	Kraków, Poland (n=15)
H			
min–max	1.03–1.14	1.15–1.39	1.10–1.46
Mean	1.08	1.25	1.24
SD	0.04	0.09	0.11
D			
min–max	1.98–2.21	2.17–2.40	1.98–2.58
Mean	2.10	2.27	2.22
SD	0.10	0.09	0.15
d			
min–max	0.55–0.97	0.65–0.75	0.58–0.88
Mean	0.65	0.70	0.71
SD	0.07	0.03	0.07
d/D			
min–max	0.28–0.34	0.29–0.33	0.29–0.35
Mean	0.31	0.31	0.32
SD	0.02	0.01	0.01
Number of whorls			
min–max	3.75–4	3.75–4	3.75–4
Mean	3.97	3.80	3.78
SD	0.13	0.11	0.09



Fig. 2. *Pilea* sp. in the "Holenderka" greenhouse – habitat of *Hawaiiia minuscula*

REMARKS

The conditions under which *H. minuscula* occurs in the greenhouse of the Kraków Botanic Garden have not undergone any changes for many years and it is impossible to ascertain how long this species has existed there. Most probably it was imported with horticultural merchandise, particularly orchid plants. MIENIS (2006) places *H. minuscula* among terrestrial snails typically found in commercial shipments.

Other greenhouses in the Botanic Garden were also searched, but without success. Likewise, *H. minuscula* was not recorded by ALEXANDROWICZ (1993) among terrestrial snails found in the hothouse with a water basin with tropical and subtropical plants and introduced water snails. The following terrestrial species were mentioned by that author: *Zonitoides arboreus* (Say, 1816), *Discus rotundatus* (O. F. Müller, 1774), *Oxychilus draparnaudi* (Beck, 1837), *Cochlicopa lubrica* (O. F. Müller, 1774), *Vitrea contracta* (Westerlund, 1871) and *Vallonia costata* (O. F. Müller, 1774).

Apart from *H. minuscula* some other alien species were found in the "Holenderka" greenhouse: *Z. arboreus* and *O. draparnaudi*. The most common snail was *D. rotundatus* with elevated spire, known from other European hothouses as a form *pyramidalis* Jeffreys (ELLIS 1969, MÁCHA 1971, HORSÁK et al. 2004), and not recorded from Poland to date. During the summer 2007 gastropods were also collected in the vicinity of the greenhouse, to check whether some of the greenhouse species may live outside during the summer. However, only species which in Poland occur in outdoor habitats were found: *Arion lusitanicus* Mabille, 1868, *A. fasciatus* (Nilsson, 1822), *Cepaea nemoralis* (Linnaeus, 1758), *C. hortensis* (O. F. Müller, 1774), and *Helix pomatia* Linnaeus, 1758. The first of them is a west European slug, currently expanding its range into Central Europe, including Poland, and especially its southern part; it is a serious agricultural and horticultural pest.



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