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PERSISTENCE OF LOCAL POPULATIONS OF THE ROMAN SNAIL (*HELIX POMATIA* L.) FOR 15 YEARS IN CONDITIONS OF MODERATE AND CONSTANT ANTHROPOGENIC IMPACT – A CASE STUDY FROM CENTRAL EUROPE

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ABSTRACT: The Roman snail (*Helix pomatia* L.) has been exploited for food to the point where it has been subject to legal restrictions on its collection, and steps have been taken to monitor its distribution and abundance. There are, however, few cases where monitoring has involved the precise re-examination of accurately located populations, and these have confirmed persistence over periods of up to six years. Using a standard methodology, ten populations of *H. pomatia* near the town of Września (central Poland) first surveyed in 1999 were re-sampled in 2014. In all cases the snail populations had persisted, and the habitats had not altered significantly. These results indicate that in the absence of over-exploitation or habitat change populations of this species persist.

KEY WORDS: *Helix pomatia*, local populations, monitoring, long-term observations

The Roman snail (*Helix pomatia* L.) is one of the largest land snails in Europe. Although it has the most extensive range of any *Helix* species (WELTER-SCHULTES 2012, NEUBERT 2014), much of this distribution is a product of human introduction, as it has been exploited for food since Roman times, if not earlier (URBAŃSKI 1964, STĘPCZAK 1976, BŁOSZYK & KALINOWSKI 2015).

In recent times its popularity as food has led to over-collecting, especially in Western and Central Europe, including Poland (WELCH & POLLARD 1975, RĂDULESCU & LUSTUN 1980, WELLS & CHATFIELD 1992, STĘPCZAK 1976). This over-exploitation coupled with some habitat destruction due to use of chemicals and machines for maintenance of urban green spaces (ANDREEV 2006a, b, NEUBERT 2013) has reduced or eliminated many populations. Hence, the Roman snail was included in the IUCN Red List of Threatened Species (Lc category) (NEUBERT 2013), the European Red List of Non-marine Molluscs (CUTTELOD et al. 2011) and in Annex V of the EU Habitats Directive. The species is often farmed (WILLIAMS 2009, NEUBERT 2013), but wild populations may still be harvested in some countries, including Poland. However, there are legal restrictions in place and national authorities have a duty to monitor populations of this species and ensure that such monitoring is effective in determining acceptable levels of exploitation (LIGASZEWSKI et al. 2014, BŁOSZYK & KALINOWSKI 2015). In Poland, these restrictions and duties are laid out in the Regulation of the Minister of Environment dated 6 October 2014 (REGULATION 2014) on protecting animal species.

In previous studies both published (BŁOSZYK et al. 2010, 2012, TWOREK & ZAJĄC 2012) and in reports (RYBAK 2010, GŁOWACKA 2012, MISA 2014) we have provided data on monitoring particular populations of Roman snails for 5–9 years, thus contributing to the legal requirements. Here, we report on the monitoring of 10 randomly chosen sites of

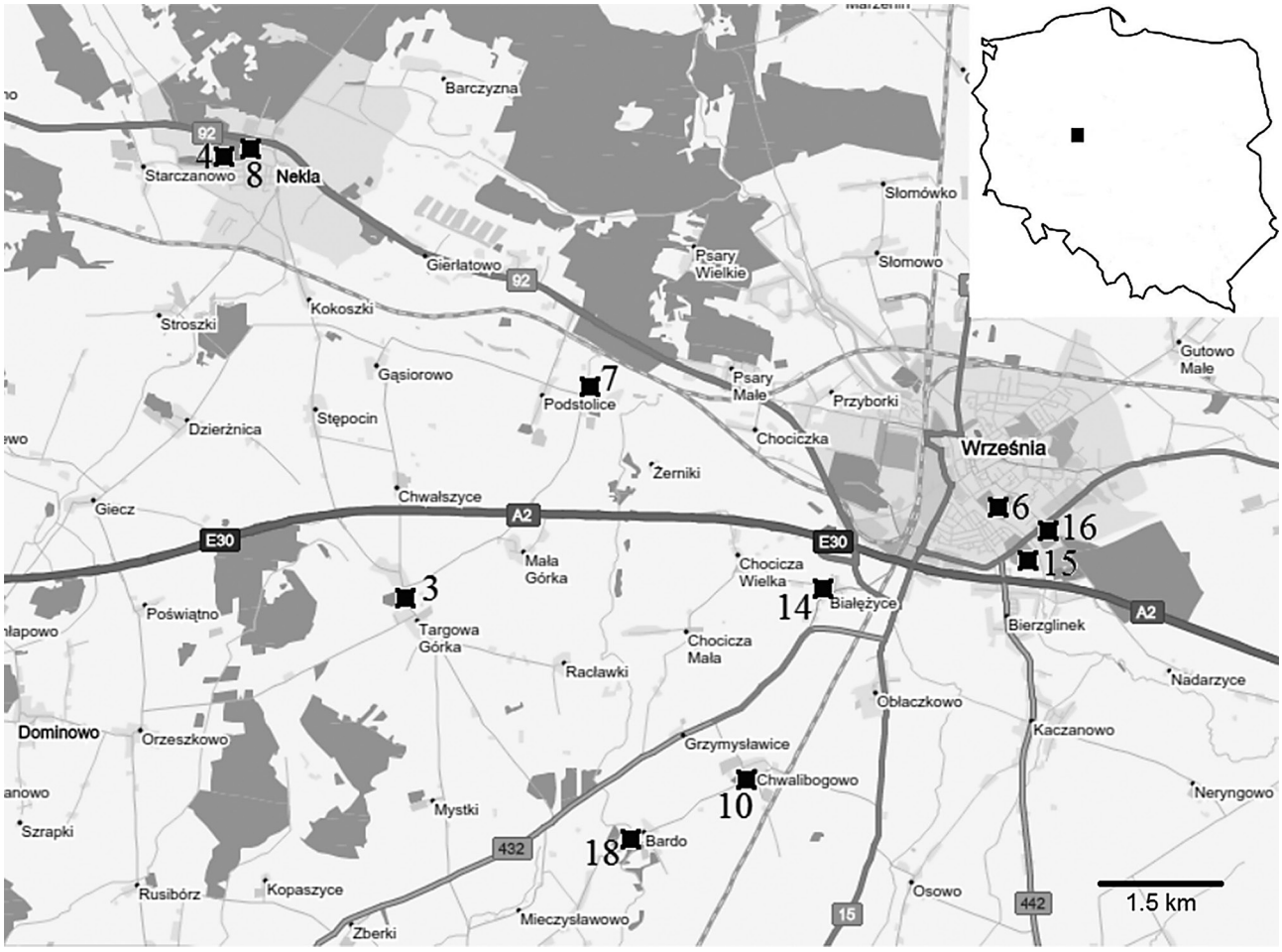

Fig. 1. Distribution of the studied sites near Września town (original numbering of sites provided by SZMIT 2000)

Table 1. Description of the studied sites in 1999 and 2014 (original numbering of sites provided by SZMIT 2000)

Site no.	Area surface [m²]	Vegetation (1999 and 2014)	Human impact	
			1999	2014
3	2400	*Acer pseudoplatanus*, *Acer campestre*, *Aesculus hippocastanum*, *Carpinus betulus*, *Sambucus nigra*, *Robinia pseudoacacia*, *Urtica dioica*, grasses	park area, mowed in 80%	park area, mowed in 80%, it has been recently surrounded by a solid fen
4	2000	*Aesculus hippocastanum*, *Carpinus betulus*, *Crataegus monogyna*, *Sambucus nigra*, *Salix* sp., *Urtica dioica*, grasses	abandoned park area, grass is mowed only in the vicinity of nearby buildings, the area is crossed by unpaved paths	
6	300	*Aesculus hippocastanum*, *Crataegus monogyna*, *Sambucus nigra*, *Euonymus europaeus*, *Urtica dioica*, grasses	park area, grass is entirely mowed and pathways locally paved, toilet buildings are present	
7	750	*Acer platanoides*, *Alnus glutinosa*, *Sambucus nigra*, *Urtica dioica*, grasses	abandoned area in the vicinity of allotments, a rubble chute, not mowed	
8	3000	*Acer negundo*, *Acer pseudoplatanus*, *Sambucus nigra*, *Urtica dioica*, grasses	abandoned park area	
10	2800	*Acer platanoides*, *Acer pseudoplatanus*, *Alnus glutinosa*, *Carpinus betulus*, *Corylus avellana*, *Robinia pseudoacacia*, *Sambucus nigra*, *Syringa vulgaris*, *Tilia cordata*, *Urtica dioica*, grasses, sedges, ivy	abandoned park area, not mowed however remains clean; within the park there are no pathways; the park is surrounded by thick scrubs and located in the vicinity of a road and railway tracks	
14	450	*Acer platanoides*, *Carpinus betulus*, *Lamium purpureum*, *Sambucus nigra*, *Salix* sp., *Tilia cordata*, *Urtica dioica*, *Lamium purpureum*, grasses	site located in the vicinity of a park and a road, mowed at least once a year	

Table 1. Continued

Site no.	Area surface [m²]	Vegetation (1999 and 2014)	Human impact	
			1999	2014
15	150	*Alnus glutinisa, Padus avium, Sambucus nigra, Arctium* sp., sedges	site in the vicinity of a road and allotments, not mowed	
16	30	*Alnus glutinosa, Glechoma hederacea, Rosa canina, Urtica dioica,* grasses	site in the vicinity of allotments, not mowed	
18	250	*Acer platanoides, Acer pseudoplatanus, Aesculus hippocastanum, Carpinus betulus, Sambucus nigra, Symphoricarpos albus, Robinia pseudoacacia, Ulmus glabra, Urtica dioica,* grasses	old, abandoned and littered park with a palace's ruins in its centre, in the vicinity of a road	

Table 2. Number of adult and juvenile individuals of *H. pomatia* in each site in 1999 and 2014

Year:	1999			2014		
Site no.	Adults	Juveniles	Total	Adults	Juveniles	Total
3	5	1	6	10	5	15
4	37	6	43	24	15	39
6	25	4	29	12	3	15
7	13	4	17	23	2	25
8	48	12	60	18	11	29
10	9	9	18	33	12	45
14	2	8	10	5	1	6
15	1	0	1	11	7	18
16	9	4	13	15	4	19
18	17	2	19	11	23	34

Table 3. Average temperatures (T), humidity (H) and precipitation (PP) for the city of Poznań (approximately 45 km in a straight line from the Września town) (http://www.tutiempo.net/clima/Poznan/123300.htm)

Year	Month	T [°C]	H [%]	PP [mm]
1999	May	13.5	66.6	59.43
	June	16.3	77.9	71.61
	July	20.2	67.2	46.24
2014	April	14.0	67.0	87.13
	May	11.2	68.1	64.00

Roman snail near Września town (Central Poland) in 2014, 15 years after they were first surveyed in 1999 (Szmit 2000). The distribution of the studied sites is shown in Figure 1. All of the sites were subject to human impact, with four of them being regularly mown with machines. Table 1 gives a brief description of each site.

Searching for individuals used the same methodology in both surveys: individuals were counted in April, May or June along two transects (each with a length of 50–150 m, depending on the area of the site). Each site was searched visually for 30 minutes between 7 and 11 a.m. (Koralewska-Batura 1999). Specimens recorded in this way were divided to two age classes: adults (fully developed shell, lip present) and juveniles (Table 2).

In all of the 10 sites verified in 1999, Roman snail populations had persisted over the 15 year period between surveys (Table 2). While there is only a weak and non-significant correlation between the numbers found on each occasion at each site, there is no sign of any radical alteration in abundance between surveys. During surveys in 1999, a total of 216 individuals were found (166 adults and 50 juveniles) (Szmit 2000). Fifteen years later, in 2014 we found a total of 245 individuals (162 adults and 83 juveniles) (Table 2). We did not notice any significant changes in environmental conditions in case of any of the studied site (Table 1). The proportion of juveniles found was greater in 2014 than in 1999. While this might be explained in many ways, we note that 2014 had warmer and wetter spring weather (Table 3), conditions that favor activity and reproduction (Stępczak 1976).

The important conclusion, however, is that under relatively consistent human management, populations of the Roman snail can persist without drastic changes in density for at least 15 years. Such an interval might therefore be an appropriate one for regular monitoring where no drastic changes in management have occurred.

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