



THE ROMAN SNAIL (*HELIX POMATIA* LINNAEUS, 1758) IN NORTHERN MAZOVIA

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ABSTRACT: In northern Mazovia *Helix pomatia* L. is rare and found only in some anthropogenic habitats; in the 55 sites studied its frequency was 9%. Neither abundance nor biomass and size structure of its populations departed from those reported from other regions of Poland. Its rarity, the scattered localities and its absence even in apparently optimum natural habitats confirm the earlier view that it is an introduced species in the region. Comparison with the earlier data indicates no expansion tendency within the last 35–40 years. The estimated area occupied by the species in the whole Mazovian voivodeship does not exceed 50 km². These single populations, even when dense, may be threatened because of their isolated character; they should not be exploited and deserve protection.

KEY WORDS: *Helix pomatia*, northern Mazovia, occurrence, density, size structure

INTRODUCTION

Because of its large size and economic importance *Helix pomatia* Linnaeus, 1758 is the best known native snail. However, literature information on its occurrence in Poland is scanty (URBAŃSKI 1963, DZIABASZEWSKI 1975, STĘPCZAK 1976). One of the reasons may be its size which requires different methods of quantitative studies, compared to most other terrestrial gastropods (STĘPCZAK 1976). In Poland such studies on a larger scale included only the former Poznań voivodeship, several voivodeships in the western part of the country (URBAŃSKI et al. 1982) and, to a much lesser extent, Małopolska (DYDUCH-FALNIOWSKA et al. 2000). There were practically no such data for Mazovia, and according to STĘPCZAK's (1976) inquiry the Roman snail is rare in the area.

The Roman snail is a south-eastern and central European species, and its present range, especially in the north of Europe, is a result of synanthropisation (WIKTOR 2004). In Poland it is at present common almost everywhere in the lowlands and uplands, and less so in the mountains where it reaches ca. 1,000 m a.s.l. (URBAŃSKI 1957, 1963, WIKTOR 2004). Its natural range includes the southern and south-eastern parts of

the country, as indicated by the absence of its subfossil shells in the deposits of northern Poland (URBAŃSKI 1963). In the remaining area it was first introduced in the Middle Ages, starting with the 10th and 11th c., by monks from southern Europe who used it as food during fast, and then again, also for culinary reasons, in the 18th c., on a small scale, into manor parks and gardens (URBAŃSKI 1963, STĘPCZAK 1976). From there it spread to natural habitats where it "went native", so that now it is difficult to ascertain the limits of its original distribution range (WIKTOR 2004).

The Roman snail occupies two different kinds of habitats: damp and xerothermic – sparse, humid scrub and warm limestone substrata. It is often found near small water bodies or streams, among nettles, in deciduous forests, old parks, gardens and cemeteries (URBAŃSKI 1957, 1963, DZIABASZEWSKI 1975, WIKTOR 2004, DZIĘCIOŁ 2005). It is not a forest-dweller and there is no correlation between the area of deciduous forests in the region and the number of its localities; furthermore, out of the 548 records from Poland as much as 62% were synanthropic localities (STĘPCZAK 1976).

The aim of this study was an analysis of the occurrence and condition of populations of *H. pomatia* in the northern part of Mazovian voivodeship, and an es-

timate of the possibility of its exploitation or necessity of protection in the region.

METHODS

Field studies were conducted in August and the beginning of September 2006 in the northern part of Mazovian voivodeship, in the districts Wyszków, Mława, Maków Mazowiecki, Ostrów Mazowiecka and Ostrołęka. Based on topographic maps 1:50,000 or 1:100,000 and on field observations, 53 sites were selected, and two in the adjacent area of Podlasie voivodeship, near Łomża (Fig. 1); the latter were similar in character to the sites in Mazovia. All the sites were potentially good habitats for the species (riverine forests, scrub, forest edges with deciduous trees). In each site a team of 4–5 persons searched the area during 15–20 minutes for live snails or empty shells. Where the snails were present, quantitative samples were taken, except one of the Łomża sites: in three sites from four randomly selected plots of 5 × 5 m size, in one (Maków Mazowiecki), because of its

size and topography, from one plot (ca. 150 m²). The plot size was determined during preliminary studies in Lasek Bielański in Warsaw, assuming a plot where 2–30 snails could be collected as satisfactory (KALINOWSKA 1981). The collected snails were cleaned with filter paper, counted, their maturity was estimated based on the presence of lip, their whorls were counted and the shell height, width and the so called “diameter” were measured (STĘPCZAK 1982) with electronic caliper to the nearest 0.1 mm; they were weighed with electronic balance to the nearest 0.01 g; the size structure of the population was assessed, as well as density and biomass per 100 m². The total abundance and biomass of the studied populations were also estimated, as well as the size of the area inhabited by the species in the whole of Mazovian voivodeship.



Fig. 1. Occurrence of Roman snail in the northern part of Mazovia

RESULTS

The total number of collected snails was 89: 62 in August, nearly all of them fully active, and 27 in September, only five of which were fully active, while 11 were retracted in their shells and 11 had epiphragms. Nearly all the collected snails were mature, only four had no lip and shells of 3–4 whorls; the remaining individuals, with lips formed, had 4 (rarely) to 4.5 or 5 whorls.

The snails were found in five sites (F=9%), three (F=6%) within the boundaries of Mazovian voivodeship, all in the Maków district (Fig. 1). The sites were located in suburban areas (Różan and Maków Mazowiecki) or transformed agricultural areas (park near the former village school and forest near a cemetery – village Kalinowo near Łomża). No Roman snail was found in any examined natural habitat which could be adequate with respect to its humidity and vegetation (Table 1).

The size of the snails was similar between the sites (Table 2). The smallest individual had shell nearly 20 mm high, the largest – 45.5 mm high. The shell width ranged from 20.1 to 45.7 mm, the "diameter" from 20.9 to 46.9 mm. The individual biomass varied widely not only between the sites but most of all within them (Table 2), ranging from 3.0 to 36.1 g. This could re-

sult from the fact that some snails had already produced epiphragms, having lost much water. The size structure of the Roman snail populations in three sites (Fig. 2) was similar – individuals of the two largest size classes dominated. The size structure in Różan 1 was distinctly different.

Table 1. Occurrence of Roman snail in various habitats in the northern part of Mazovia (08–09.2006)

Habitat type	Number of localities	
	Total	With Roman snail
Edge of forest; deciduous forest	14	0
Meadow in forest near a river	16	0
Meadow with shrubs and trees	15	0
Village cemetery	2	1
Village refuse heap	2	0
Suburban green area	3	3
Country park	1	1

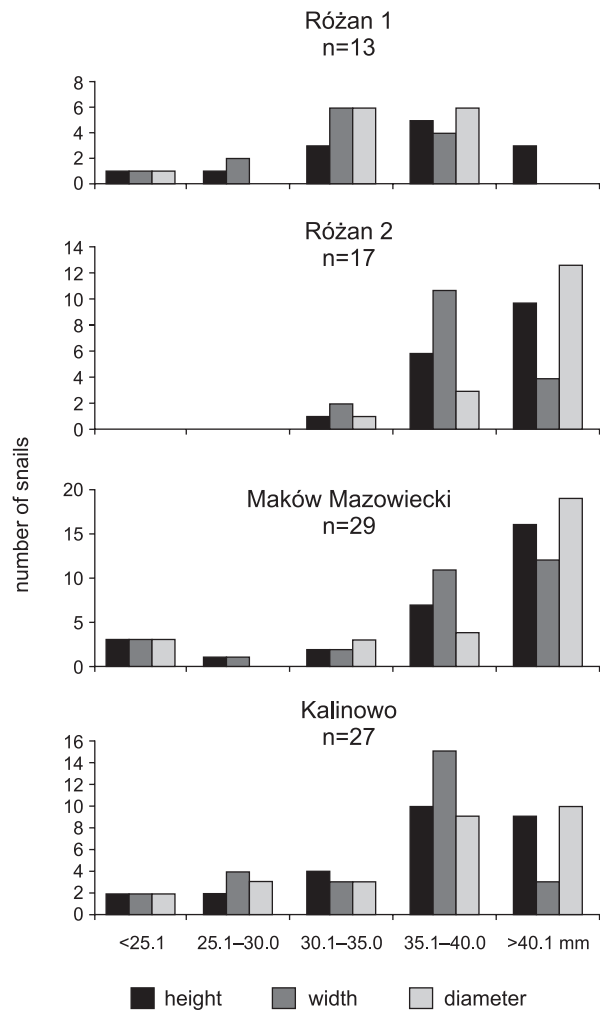


Fig. 2. Size structure of Roman snail at the localities in the northern part of Mazovia

Table 2. Shell measurements [mm] and biomass [g fresh weight] of Roman snail from the northern part of Mazovia (08–09.2006) (mean±SD and range)

Locality	n	Height	Width	Diameter	Biomass
Różan 1	13	36.1±5.6	32.8±4.7	34.4±5.0	17.0±5.4
		20.1–40.7	20.1–37.8	20.9–39.5	3.6–25.5
Różan 2	17	40.3±3.2	37.9±2.8	40.7±2.2	24.4±4.2
		32.3–45.3	31.0–40.7	34.7–43.8	16.5–31.9
Maków Mazowiecki	29	38.4±6.7	37.3±6.2	39.7±6.8	23.3±8.6
		19.7–45.4	23.7–45.7	21.4–46.9	3.2–36.1
Kalinowo	27	35.5±9.4	33.4±8.5	35.6±9.1	14.9±6.5
		22.4–44.8	22.4–42.9	23.2–44.8	4.4–23.6

The mean density converted to 100 m² (Table 3) ranged from 13 (Różan 1) to 27 (Kalinowo). The density variation within sites (between plots) differed among the sites; it was very small in Różan 2, and very high in Kalinowo. The mean biomass ranged from 220 g/100 m² in Różan 1, to 417 g/100 m² in Kalinowo. The biomass variation within the sites was similar to that observed for the density (Table 3).

The total area of the sites with the Roman snail was small, ca. 600 m² ares in Maków Mazowiecki, ca. 10,000 m² in Różan 1, ca. 3,000–10,000 m² in Różan 2, where it was difficult to find clear boundaries of the habitat and ca. 20,000 m² in Kalinowo. Estimates of the total abundance and biomass in each site (Table 4) yielded small values, and in view of the small differences in the density and biomass per unit area, they depended mainly on the total size of the habitat patch. There is no information on the proportion of area occupied by favourable habitats (cemeteries, old parks, suburban allotment gardens) in Mazovian voivodeship or its individual districts, but this indicates that their area is extremely small. Assuming that they constitute even 1% of the voivodeship area and that the frequency of *H. pomatia* in them is 10%, the total area inhabited by the species may constitute 0.1% of voivodeship area, i.e. ca. 36 km².

DISCUSSION

In the northern part of Mazovian voivodeship the Roman snail was found only in some of the examined anthropogenic habitats; natural habitats, potentially favourable for the species, were devoid of it (Table 1). Comparison of STĘPCZAK's (1976) inquiry data of 1969–1974 with the results of our studies, through superposition of distribution maps (Fig. 3) after computer scale adjustment, shows that despite the time difference and different methods they are very well compatible. According to M. GRUŻEWSKI (personal communication) the snail, abundant in anthropogenic sites in the environs of Łomża, is absent from natural habitats also in that area. Even in its preferred habitats it is rare. SULIKOWSKA (1998) found it only in one of the eight examined manor parks in the Mazovian Lowland. Furthermore, in the study area, except for one site (cemetery in Dzierzgowo, Mława district) with numerous *Cepaea nemoralis* (Linnaeus, 1758), no other large snails or slugs were observed.

The extremely low frequency in the studied area indicates a scattered, very insular occurrence of the Roman snail. It is all the more significant, considering that the sites were selected not randomly but because of their apparent adequacy for the snail. The distribution pattern may have historic reasons: in Mazovia there were no larger social groups interested in intro-

Table 3. Density and fresh weight of Roman snail in the northern part of Mazovia (08–09.2006) (mean±SD and range)

Locality	Individuals/100 m ²	Biomass/100 m ²
Różan 1	13±10 4–28	220±143 73–428
Różan 2	17±3 12–20	415±67 323–496
Maków Mazowiecki	19	450
Kalinowo	27±32 0–80	417±551 0–1361

Table 4. Estimation of the total number and biomass of Roman snail populations in the northern part of Mazovia (08–09.2006)

Locality	Area [m ²]	Number of snails	Biomass [kg]
Różan 1	ca. 10,000	1,300	22
Różan 2	ca. 3,000–10,000	500–1,700	12–41
Maków Mazowiecki	ca. 600	100	3
Kalinowo	ca. 20,000	5,400	83

ducing the Roman snail. At the same time the potentially adequate habitats are small, isolated patches among the prevailing conifer plantations which are avoided by the snail, preventing its spontaneous dispersal.

The mean density and biomass of the Roman snail (Table 3) in its sites do not depart from the corresponding values reported for other regions of Poland (e.g. ŁOMNICKI et al. 1964). The mean size of individuals in the sites is also within the reported range (STĘPCZAK 1976, DZIĘCIOŁ 2005). In the literature the absence of juveniles (ŁOMNICKI et al. 1964, DZIABASZEWSKI 1975) is emphasised as an effect of the hidden life style. Among the collected specimens there were some with very small, and others with very large biomass, compared to the literature data (Table 2). The large variation in biomass of the same individual, depending on the ambient humidity and temperature, is a characteristic feature of terrestrial snails (DZIABASZEWSKI 1975, STĘPCZAK 1976). The mean individual biomass is in agreement with data of other authors (URBAŃSKI 1963, MUSIAŁ & SIKORA 1982, DZIĘCIOŁ 2005). The estimated size of the inhabited area (36 km²) is however very small, by two orders of magnitude smaller than that calculated by STĘPCZAK (1976).

Is the Roman snail rare in Mazovia? Formally rare species should meet at least one of the following crite-

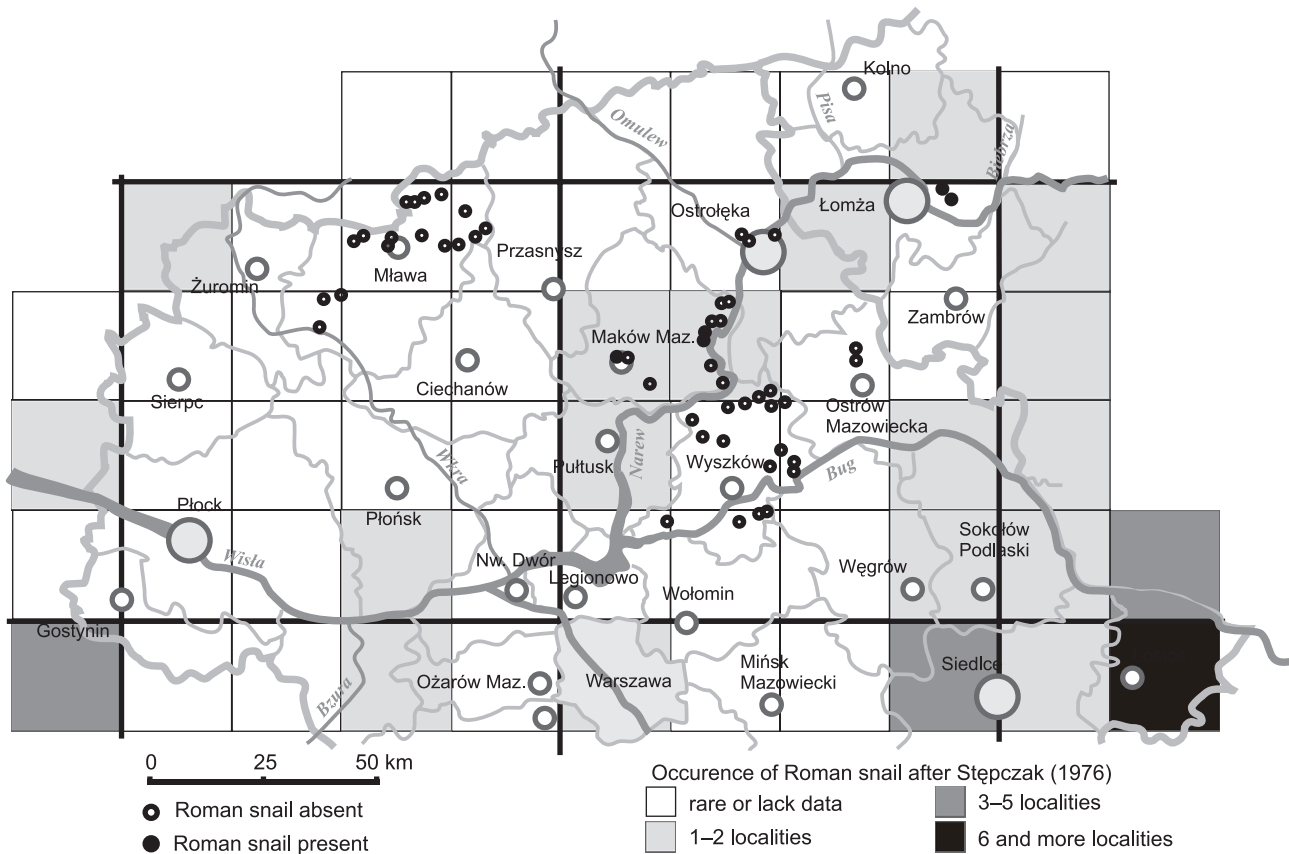


Fig. 3. Occurrence of Roman snail in the northern part of Mazovia in 1969–1974 and 2006

ria: small size of the geographical range, narrow tolerance to habitat conditions, small size of the local population (MACKENZIE et al. 2000, PULLIN 2004). The Roman snail has a large distribution range, its tolerance range is rather narrow, and the size of local populations is small. Though not globally rare, it is rare locally and regionally. This is also confirmed by the small size of collections from the earlier studies in the area (URBAŃSKI 1963, STĘPCZAK 1976). The scattered, isolated localities of the Roman snail are not remains of its former, larger distribution range, and its small mobility (ŁOMNICKI et al. 1964, FALNIOWSKI 2001) makes each individual population isolated from the others. In this situation they can not be treated as subpopulations of one metapopulation and the chances of survival of each of them are small. According to MACARTHUR & WILSON's (1963) model of island biogeography their extinction can be expected, and the smaller the habitat patch, the faster the ex-

tingtion will be; on the other hand, chances of recolonisation seem to be small. Extinction of entire populations of the Roman snail in Wielkopolska and some regions of western Poland was observed by STĘPCZAK (2006); also in Warsaw a large population on the Służewiecki Stream became extinct between 2001 and 2006. The Roman snail is very rare in northern Mazovia; it occurs only in few specific habitats and at least within the last 35–45 years shows no expansion tendency. It should not be exploited in that region, and its populations should be protected.

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