



## NOTES ON THE ACTIVITY OF THE ROMAN SNAIL (*HELIX POMATIA* L.)

JERZY BŁOSZYK<sup>1,2</sup>, JUSTYNA KACPROWICZ<sup>1</sup>, ZOFIA KSIĄŻKIEWICZ-PARULSKA<sup>1\*</sup>

<sup>1</sup>Department of General Zoology, Faculty of Biology, Adam Mickiewicz University in Poznań, Umultowska 89, 61-614 Poznań, Poland

<sup>2</sup>Natural History Collections, Faculty of Biology, Adam Mickiewicz University in Poznań, Umultowska 89, 61-614 Poznań, Poland

\*corresponding author: [zofia.ksiazkiewicz@gmail.com](mailto:zofia.ksiazkiewicz@gmail.com)

**ABSTRACT:** A study of Roman snail (*Helix pomatia* L.) populations in Wrocław shows that even in the active season and under favourable conditions the proportion of snails active or resting on the surface rather than buried in the soil is usually much less than 50%. This confirms earlier studies on this and other species. Variation in the proportion found on the surface was not related to weather conditions at the time, nor were troughs and peaks correlated among sites.

**KEY WORDS:** *Helix pomatia*, local populations, activity, weather conditions

The Roman snail (*Helix pomatia* L.) is a common inhabitant of large urban agglomerations where it occurs in various synanthropic habitats, e.g. garden squares, parks and cemeteries (URBAŃSKI 1964, STĘPCZAK 1976, BŁOSZYK et al. 2010, 2012). In Poland the species is active from April to September and breeds intensively in May and June (STĘPCZAK et al. 1983, TWOREK & ZAJĄC 2012). Activity is dependent both on external conditions and on the internal state of the snail.

WELLS (1944) described 3–5 day cycles of activity under laboratory conditions favourable to activity. BŁOSZYK et al. (2015) showed that even in the period of the highest activity, in favourable weather conditions (i.e. after rain, when temperature ranged from 11°C to 19°C, STĘPCZAK et al. 1983), about 80% of a Roman snail population was inactive and remained buried in the ground.

The aim of this study was to investigate further what proportion of the population remains above ground under good conditions for activity whether actively crawling or not. The research was conducted in Wrocław (SW Poland) – the fourth largest city of Poland that is located in the Odra River Valley. Nine sites (Fig. 1, Table 1), varying in size, were chosen,

within which *Helix pomatia* (both adults and juveniles) above ground were searched for and counted. Searches were carried out at weekly intervals for a total of 13 occasions between 4 April and 27 June 2014. Each search, covering the whole area, took between 15 and 40 minutes, varying with the size of the area, and was carried out between 07.30 and 09.00. In each search we counted all individuals above ground. Each snail was individually numbered on the shell with waterproof marker on the occasion when it was first found. Thus on each occasion (Table 2) we had records of snails seen for the first time (unmarked) and those that had been seen previously (marked) at each site.

In sites 1 to 4, no unmarked snails were found on the last few sampling occasions. The total number of marked snails thus represents a minimum estimate of the number of snails present. In the remainder (sites 5 to 9) unmarked snails were still being found even on the last occasion. The total number of snails found is therefore certainly an underestimate of the actual population size, assuming that there were no snails leaving or entering the site and that there was no mortality or recruitment into the category of snails large enough to be marked. No dead and marked shells were found and movement in and out of the



Fig. 1. Studied sites (1–9) in the city of Wrocław

sites is likely to be small (POLLARD 1974, BŁOSZYK et al. 2015). Table 2 also shows estimates of the population sizes at these sites using the Petersen-Lincoln index (SOUTHWOOD & HENDERSON 2000), based on data for the last sampling occasion. These estimates are based on small numbers, and their standard errors will be large, but they demonstrate that the populations may have been substantially larger than indicated by the total number of snails found.

Table 2 shows the proportion of snails found above ground relative to the minimum estimated population size at each site (the number of snails found overall) on each occasion, assuming no losses or gains during the period of study. This proportion varied from 3.8 to 83.3%; the mean proportion for each site varied between 13 and 28%. The 83.3% recorded on occasion 5 at site 1 is much greater than at any other site or occasion (the next greatest is 45.8% at site 2). Site 1, allotment gardens, may have been

watered through periods of dry weather, enabling snails to stay on the surface in dry periods.

Variation in the proportion of snails above ground on each occasion shows no correlation among sites, and does not appear to relate to the weather on each occasion (Fig. 2). We note that these proportions are maxima, since our estimates of population size are likely to be too low, especially in sites 5 to 9. We suspect that the variation in these proportions relates to the microclimate and soil conditions of each site; sites 8 and 9 were particularly exposed and the proportions are low. BŁOSZYK et al. (2015) have shown that even in good weather conditions it is unusual to find more than 30% of the population above ground. The study of WILLIAMSON et al. (1977) on *Cepaea nemoralis* also found that less than 50% of snails in the population were found active on the surface even in conditions suitable for activity. This study confirms these findings; it must be unusual to find more

Table 1. Brief description of the studied sites (1–9) – type of habitat, area and geographical coordinates

Site No.	Type of habitat	Area [m <sup>2</sup> ]	Short description	Geographical coordinates	
				N	E
1.	Allotments	135	open area, adjacent to patch with vegetables	51°09'01,06"	17°06'31,16"
2.	Scrubs	250	partially shaded area, scrubs near a road	51°09'10.80"	17°06'53.56"
3.	Rubbish dump	366	area partially shaded by scrubs and trees	51°09'10.19"	17°06'14.89"
4.	Cemetery	1273	area shaded by trees	51°08'39.51"	17°06'55.90"
5.	Deciduous forest	276	fragment of the forest in the vicinity of a road	51°10'09.81"	17°07'47.29"
6.	Wasteland	174	area shaded by trees, near houses	51°08'49.52"	17°07'50.16"
7.	Abandoned allotments	496	area partially shaded by scrubs, in the vicinity of a road	51°08'58.73"	17°06'48.53"
8.	Meadow	5463	open area near a gravel road	51°08'18.09"	17°06'22.59"
9.	Railway embankment	347	open area in a direct vicinity of a railway embankment	51°08'53.00"	17°06'27.08"



Table 2. Details of the numbers of marked and unmarked snails found at each site on each occasion and the proportion these represent of the whole population. The right hand column gives the total number of snails marked over the period and, in brackets, the estimates of population size given by the Petersen-Lincoln index for those sites were still yielding unmarked snails. The third entry in each cell gives the mean proportion of snails found on the surface over all occasions for each site

Site	Individuals	Occasion													Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	
1	new	6	5	1	17	14	5	0	0	0	0	0	0	0	48
	recaptured	0	1	3	5	26	14	12	10	14	16	17	7	5	
	total	6	6	4	22	40	19	12	10	14	16	17	7	5	
	% observed	12.5	12.5	8.3	45.8	83.3	39.6	25	16.7	29.2	33.3	35.4	14.6	10.4	28.2
2	new	6	11	7	0	17	12	1	1	3	1	0	0	0	59
	recaptured	0	2	5	5	8	15	10	11	14	10	6	9	11	
	total	6	13	12	5	25	27	11	12	17	11	6	9	11	
	% observed	10.2	22	20.3	8.5	42.4	45.8	18.6	20.3	28.8	18.7	10.2	15.3	18.6	21.5
3	new	12	10	3	18	9	0	0	8	4	0	0	0	0	64
	recaptured	0	2	7	9	15	19	8	18	22	21	23	13	7	
	total	12	12	10	27	24	19	8	26	26	21	23	13	7	
	% observed	18.8	18.8	15.6	42.2	37.5	29.7	12.5	40.6	40.6	32.8	35.9	20.3	10.9	27.4
4	new	7	3	2	4	0	5	0	0	1	1	0	0	0	23
	recaptured	0	1	1	3	4	2	5	1	5	4	2	2	2	
	total	7	4	3	7	4	7	5	1	6	5	2	2	2	
	% observed	30.4	17.4	13	30.4	17.4	30.4	21.7	4.3	26.1	21.7	8.7	8.7	8.7	18.4
5	new	3	4	5	7	2	0	0	5	3	0	0	4	1	34
	recaptured	0	0	2	2	6	3	5	0	4	2	3	3	4	(41)
	total	3	4	7	9	8	3	5	5	7	2	3	7	5	
	% observed	8.8	11.8	20.6	26.5	23.5	8.8	14.7	14.7	20.6	5.9	8.8	20.6	14.7	15.4
6	new	13	2	7	1	4	0	11	4	14	3	4	2	6	71
	recaptured	0	3	3	6	7	9	8	0	8	15	13	21	15	(91)
	total	13	5	10	7	11	9	19	4	22	18	17	23	21	
	% observed	18.3	7.1	14.1	9.9	15.5	12.7	26.8	5.6	31	25.4	23.9	32.4	29.6	19.4
7	new	9	9	9	20	18	3	3	4	6	7	7	6	4	105
	recaptured	0	1	4	6	5	10	8	11	10	8	10	10	10	(154)
	total	9	10	13	26	23	13	11	15	16	15	17	16	14	
	% observed	8.6	9.5	12.4	24.8	21.9	12.4	10.5	14.3	15.2	14.3	16.2	15.2	13.3	14.5
8	new	12	9	5	5	3	4	5	3	4	6	5	5	10	76
	recaptured	0	2	3	4	5	5	7	7	5	6	8	8	7	(112)
	total	12	11	8	9	8	9	12	10	9	12	13	13	17	
	% observed	15.8	14.5	10.5	11.8	10.5	11.8	15.8	13.2	11.8	15.8	17.1	17.1	22.4	14.5
9	new	21	7	3	0	4	7	1	3	4	2	6	8	8	74
	recaptured	0	3	4	4	3	7	5	3	4	5	6	3	4	(198)
	total	21	10	7	4	7	14	6	6	8	7	12	11	12	
	% observed	28.4	13.5	9.5	5.4	9.5	18.9	8.1	8.1	10.8	9.5	16.2	14.9	16.2	13

than half of any population active at the same time. On the numbers involved we are unable to determine if there are differences in this respect between adults and juveniles. This could be a focus of further study, as there is evidence that adults and juveniles behave differently (POLLARD 1974).

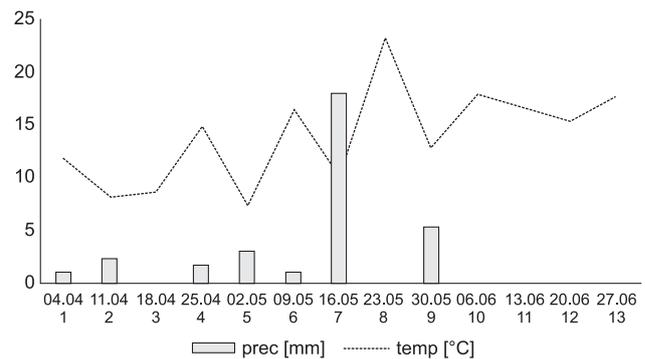


Fig. 2. Mean temperature (temp) and sum of precipitation (prec) for particular occasions (1–13), during the study period 4 April – 27 June in the city of Wrocław (source: <http://www.tutiempo.net>)



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## REFERENCES

- BŁOSZYK J., MACHNIKOWSKI M., NAPIERAŁA A., GOŁDYN B., RYBSKA E., STĘPCZAK K., SZYBIAK K., KONWERSKI S., LESZCZYŃSKA-DEJA K., DYLEWSKA M., KALINOWSKI T., JANKOWIAK A. 2010. Assessment of abundance and distribution of the Roman snail (*Helix pomatia* Linnaeus, 1758) in Kujawsko-Pomorskie voivodeship. *Folia Malacol.* 18: 113–121. <http://dx.doi.org/10.2478/v10125-010-0014-z>
- BŁOSZYK J., RYBSKA E., KALINOWSKI T., JANKOWIAK A., NAPIERAŁA A. 2012. Assessment of abundance and distribution of the Roman snail (*Helix pomatia* L.) in Poland. II. Podlaskie voivodeship. *Folia Malacol.* 20: 305–309. <http://dx.doi.org/10.2478/v10125-012-0021-3>
- BŁOSZYK J., KALINOWSKI T., SZYBIAK K., NOWAK M., NAPIERAŁA A. 2015. Metapopulations of the Roman snail (*Helix pomatia* L.) analysed with the GPS system. In: NOWAK M. (ed.). The scientific, technological and legal background in the creating integrated databases of biotic elements. Wyd. Nauk. UAM, Poznań, pp. 103–113.
- POLLARD E. 1974. Aspects of ecology of *Helix pomatia* L. *J. Anim. Ecol.* 44: 305–329. <http://dx.doi.org/10.2307/3865>
- SOUTHWOOD T. R. E., HENDERSON P. A. 2000. Ecological methods. Edn 3. Blackwell, Oxford.
- STĘPCZAK K. 1976. Występowanie, zasoby, uzyskiwanie i ochrona ślimaka winniczka (*Helix pomatia* L.) w Polsce. *Wyd. Nauk. UAM Poznań, ser. zool.* 3: 1–68.
- STĘPCZAK K., ŁAWNICZAK H., WIELAND A. 1983. Dobowa i sezonowa aktywność ślimaków winniczków (*Helix pomatia* L.). In: STĘPCZAK K., BOGUICKI Z. (eds). Ślimak winniczek (*H. pomatia* L.) – biologia, morfologia muszli, problemy przechowalnictwa i transportu w punktach skupu i bazach eksportowych. *Prace Kom. Biol. PTPN* 66: 13–35.
- TWOREK S., ZAJĄC K. 2012. Ślimak winniczek i stan jego populacji w województwie małopolskim. Instytut Ochrony Przyrody PAN, Regionalna Dyrekcja Ochrony Środowiska & Wydawnictwo OPAK, Cracow.
- URBAŃSKI J. 1964. Ślimak winniczek *Helix pomatia* L. – jego systematyka, biologia, znaczenia znaczenie gospodarcze i ochrona. *Ochrona Przyrody* 29: 215–254.
- WELLS G. P. 1944. The water relations of snails and slugs. III. Factors determining activity in *Helix pomatia* L. *J. Exp. Biol.* 20: 79–87.
- WILLIAMSON P., CAMERON R. A. D., CARTER M. A. 1977. Population dynamics of the landsnail *Cepaea nemoralis* L.: a six-year study. *J. Animal Ecol.* 46: 181–194. <http://dx.doi.org/10.2307/3955>

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