

## Data on the land snail fauna of the Fruska Gora Mountain (Serbia) with some biogeographical remarks

P. Sólymos, T. Gaudényi, T. Deli & A. Nagy

**Abstract:** Preliminary results are presented on the land snail fauna of the Fruska Gora Mountain. The investigated areas were forest associations near Cerevic and Rakovac. Thirty species were identified from hand collected material and from soil samples. The fauna showed general central European character with some interesting species occurrences (*Platyla banatica*, *Pomatias rivularis*, *Trichia erjavecii*).

**Key words:** biodiversity, Gastropoda, Mollusca, Praeillyricum

### Introduction

The Fruska Gora Mountain is located in the Srem region, interfluvium of Danube and Sava rivers, southwest of the town Novi Sad, Serbia (Yugoslavia). Concerning data on some interesting species (i.e. *Pomatias elegans* (O. F. Müller, 1774), *Pomatias rivularis*), the mountain has been investigated for a century (Schlesch 1929, Wagner 1938, Stamol & Jovanovic 1990). Contrary to its significant biogeographical situation, comparative and quantitative malacological works have not been done so far. In this study, we present our preliminary results on the land snail fauna of the Fruska Gora, and we also make some biogeographical comments on the fauna.

### Material and methods

The average height in the Fruska Gora Mountain is 400–600 m a.s.l. Here, the most common forest associations are oak, oak-hornbeam and beech forests with stands in which white linden dominates. We sampled the land snail fauna of closed plant associations between 19 and 20 of July, 2002. The basic characteristics of the sapling sites are listed in Table 1, for the location of these see Fig. 1.

The sampling sites were confined to areas of relatively uniform vegetation. We used direct search and soil sampling. Direct search was on-site hand collection dominated mostly by large species (according to vegetation and light conditions). In each sampling site, we spent approximately half an hour for four persons (a total of two hours), paying particular attention to logs, rocks and tree trunks. For soil and leaf litter sampling the samples were collected in one-litre amounts, five samples from each site. These samples were then sorted by 0.5 mm mesh and searched indoors mostly for small species and juvenile specimens. We did not take soil samples in all sites, the applied methods are listed in Table 1.

For identification of the species we used the works of Soós (1943) and Kerney et al. (1984). For nomenclature, we followed the CLECOM list (Falkner et al. 2001).

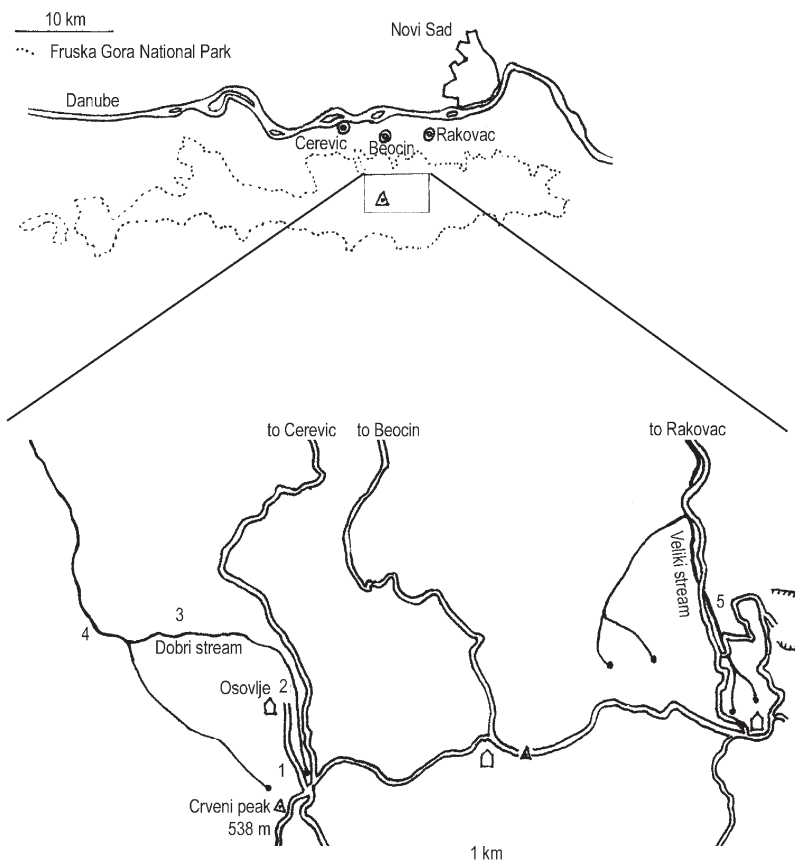


Fig. 1. Location of the Fruska Gora and the sampling sites. Numbers correspond to sites listed in Table 1.

Table 1.

Site No.	Location	Habitat	Date	Collecting method	
				Direct search	Soil sampling
1	Crveni peak	roadside scrub	19. 06. 2002	+	
2	Osovlje, N to Crveni peak	ravine forest	19. 06. 2002	+	
3	200 m N to Dobri steam	oak-hornbeam forest	19. 06. 2002	+	+
4	angle of the Dobri stream	streamside, oak-hornbeam forest	19. 06. 2002	+	+
5	near the Veliki stream	Illyr beech forest	20. 06. 2002	+	+

Basic characteristics of the sampling sites in the Fruska Gora. The location of the sites is depicted in Fig. 1.

## Results and discussion

We identified 634 specimens of 30 species from the collected material (Table 2). Additionally, the species *Monacha cartusiana* (O.F. Müller, 1774) was found in a ruderal roadside environment near the Veliki stream, south to Rakovac (collecting date: 20. 06. 2002, not listed in Table 2).

The species numbers of the sites north to the Crveni peak (site 1 and 2) were significantly lower than sites in the Cerevic and Rakovac valleys (site 3-5). This was partly because of the lower sampling intensity (no soil sampling was made). The number of species was highest in the angle of the Dobry stream (site 4) with 25 species. This value is relatively high, compared to Hungarian sites in southern Transdanubia (e.g. Mecsek Mountains).

*Platyla banatica* and *Pomatias rivularis* show similar patterns of distribution. Both occur in the Transylvanian Island Mountains and also reach the central part of the Carpathian Basin from the southern Transdanubian region (Soós, L. 1943, Wagner, H. 1938, Pintér et al. 1979, Fehér, Z. & Gubányi, A. 2001). Stamol & Jovanovic (1990) mentions the sympatric occurrence of *Pomatias elegans* and *P. rivularis* from Cerevic, however, we found only *P. rivularis*. Recent occurrence of *P. elegans* needs further investigations.

The forest fauna of the Fruska Gora is composed of general central European species. Although the Fruska Gora shares some characteristically east Alpine and Illiric species with the rest of the Transdanubian region of the Carpathian Basin (i.e. *Aegopinella ressmanni*, *Trichia erjavecii*). Based on our preliminary data, the fauna lack any endemic species from the Balkans, only wide ranging and wide ranging Alpine-Balkan species are present. Although, the sympatric occurrence of some malacological “curiosities” (i.e. *Platyla banatica*, *Pomatias rivularis*) reflects the biogeographical significance of the Fruska Gora.

Palaeontological evidence shows the role of the Fruska Gora in the late Pleistocene. Its island character contributed to the formation of various micro-habitats of different elevation and aspect, which enabled the species to shift with changing climate during the Quaternary (Gaudényi et al. 2001). The evaluation of the origin of the recent fauna of the Fruska Gora, the effects of contemporary Balkanic influences and the confirmation of the Praecillyricum concept (Sümegei, P. 2003) needs further comparative investigations.

## Összefoglalás

A dolgozat előzetes adatokat mutat be a szerémségi Fruska Gora szárazföldi Mollusca-faunájáról. Irodalmi források több érdekes faj előfordulása kapcsán említik a területet, ám a területen kvantitatív összehasonlító munka eddig még nem történt. Vizsgálatainkat a hegység gerincrégióján és északi oldalának patak völgyeiben végeztük. Egyelés mellett területenként öt földmintát vettünk viszonylag egynemű növényállományból. Mintavételeink alapján harminc szárazföldi csigafaj előfordulását mutattuk ki. Ezek közül figyelemre méltó a *Platyla banatica* és a *Pomatias rivularis* együttes előfordulása. Az erdei fauna a Dunántúl déli területeinek faunájával mutatja a legnagyobb hasonlóságot. A faunát alapvetően közép-európai fajok alkotják, a dél-Dunántúlra jellemző alpesi és illír fajok (*Aegopinella ressmanni*, *Trichia erjavecii*) mellett. Pleisztocén rétegsorok alapján kimutatható, hogy a Fruska Gora fontos szerepet játszott a későpleisztocén fauna-mozgások során, azonban a fauna eredetének és a recens illír hatások jelentőségének (Praecillyricum hipotézis) értékelése további összehasonlító vizsgálatokat igényel.

Table 2.

	Sampling sites				
	1	2	3	4	5
<i>Platyla banatica</i> (Rossmässler, 1842)			4	10	4
<i>Pomatias rivularis</i> (Eichwald, 1829)			24 (5)	34 (136)	8
<i>Carychium minimum</i> (O.F. Müller, 1774)					2
<i>Carychium tridentatum</i> (Risso, 1826)				3	20
<i>Succinella oblonga</i> (Draparnaud, 1801)			1		
<i>Cochlicopa lubrica</i> (O.F. Müller, 1774)				6	
<i>Sphyradium doliolum</i> (Bruguiere, 1792)					3
<i>Acanthinula aculeata</i> (O.F. Müller 1774)				2	
<i>Vertigo pusilla</i> (O.F. Müller, 1774)				20	
<i>Merdigera obscura</i> (O.F. Müller, 1774)				5	
<i>Cochlodina laminata laminata</i> (Montagu, 1803)	(1)	(2)		10 (6)	1 (5)
<i>Macrogastra ventricosa ventricosa</i> (Draparnaud, 1801)				(12)	3 (1)
<i>Clausilia pumila pumila</i> (C. Pfeiffer, 1828)				3	3
<i>Laciniaria plicata</i> (Draparnaud, 1801)				4	(1)
<i>Balea biplicata biplicata</i> (Montagu, 1803)	(3)			15 (4)	
<i>Punctum pygmaeum</i> (Draparnaud, 1801)				1	
<i>Discus perspectivus</i> (Megerle von Mühlfeld, 1816)			2	7 (3)	10 (3)
<i>Vitrea diaphana diaphana</i> (S. Studer, 1820)			2		
<i>Vitrea subrimata</i> (Reinhardt, 1871)					1
<i>Vitrea contracta</i> (Westerlund, 1871)			1	2	
<i>Euconulus fulvus</i> (O.F. Müller, 1774)				7	
<i>Daudebardia rufa rufa</i> (Draparnaud, 1805)				1	
<i>Aegopinella ressmanni</i> (Westerlund, 1883)			3	63	6 (7)
<i>Fruticicola fruticum</i> (O.F. Müller, 1774)	(8)		(1)	3 (6)	1
<i>Euomphalia strigella strigella</i> (Draparnaud, 1801)		(1)	(1)	3 (7)	1
<i>Trichia erjavecii</i> (Brusina, 1870)				1 (12)	1
<i>Monachoides incarnatus incarnatus</i> (O.F. Müller, 1774)	(18)	(10)	2 (8)	14 (22)	14 (7)
<i>Isognomostoma isognomostomos</i> (Schröter, 1784)				2	
<i>Cepaea vindobonensis</i> (A. Férussac, 1821)			1	(6)	
<i>Helix pomatia</i> Linnaeus, 1758	(1)		1	1	(1)
Clausiliidae indet.		(2)	2	118 (1)	6
Number of species	5	3	12	25	16

The collected species by sites. Numbers in parentheses represent individual numbers collected by direct search, numbers without parentheses represent individuals collected by soil sampling (a total of 5 samples per site). For the characterisation and location of the sampling sites see Table 1 and Fig. 1.

## Acknowledgements

Thanks are due to P. Sümegi, Z. Varga and E. Hornung for their helpful comments, to S. Markovic for his help in transportation and to the Gaudényi family for their hospitality. The research was supported by the Unitas Malacologica Student Research Award granted to T.G. and P.S., and the authors are grateful to R. Cameron for improving the application material.

## References

- Falkner, G., Bank, R.A. & Proschwitz, T.v. 2001. Check-list of the non-marine molluscan species-group taxa of states of northern, atlantic and central Europe (CLECOM I). *Heldia* 4: 1–76.
- Fehér, Z. & Gubányi, A. 2001. The distribution of Hungarian Molluscs. The catalogue of the Mollusca Collection of the Hungarian Natural History Museum. Hungarian Natural History Museum, Budapest.
- Gaudényi, T., Jovanovic, M., Markovic, S.B. & Sümegi, P. 2001. Pleistocene shade-loving malacofauna from Fruska Gora (Serbia). In: Salvini-Plaven, L. et al. (eds.), World Congress of Malacology, Vienna, Austria. pp. 114.
- Kerney, M.P., Cameron, R.A.D. & Jungbluth, J.H. 1984. Die Landschnecken Nord- und Mitteleuropas. P. Parey, Hamburg-Berlin.
- Pintér, L., Richnovszky, A. & Szigethy, A. 1979. Distribution of the recent Mollusca of Hungary. *Soosiana*, suppl. 1., Budapest.
- Schlesch, H. 1929. Über das rezente Vorkommen von *Pomatias elegans* Müll. in Ungarn usf. *Archiv für Molluskenkunde* 61: 14–17.
- Soós, L. 1943. A Kárpát-medence Mollusca-faunája. Akadémiai Kiadó, Budapest.
- Stamol, V. & Jovanovic, B. 1990. Distribution of land snails *Pomatias elegans* (O. F. Müller, 1774) and *Pomatias rivulare* (Eichwald, 1829) (Mollusca: Gastropoda) in Yugoslavia. *Scoplia* 21: 1–42.
- Wagner, H. 1938. Die Vorbereitung der Gattung *Pomatias* in Ungarn einst und jetzt, mit Bemerkungen über das rezente Vorkommen des neuentdeckten *Pomatias costulatum* Rm. und des *Pomatias elegans* Müll. *Basteria* 3(3): 40–46.
- Sümegi, P. 2003. Quartermalacological examinations. In: Bognar, A., Schweitzer, F. & Szőőr, G. (eds.), Susak - Environmental reconstruction of a loess island in the Adriatic. Geographical Research Institute, Budapest, pp. 110–117.

SÓLYMOS, Péter  
Department of Ecology  
Faculty of Veterinary Sciences, Szent István University  
1077 Budapest, Rottenbiller u. 50  
E-mail: psolymos@univet.hu

DELI, Tamás  
5500 Gyomaendrőd, Móricz u. 2.  
E-mail: tdofo@freemail.hu

GAUDÉNYI, Tivadar  
Institute of Geography, University of Novi Sad  
Trg D. Obradovica 3, 21000 Novi Sad, Serbia/Yugoslavia  
E-mail: tiv@neobee.net

NAGY, Antal  
HAS-UD, Evolutionary Genetics  
and Conservation Biology  
Research Group  
4010 Debrecen, P.O.B. 3  
E-mail: nagyant@delfin.unideb.hu

