DIVERSITY OF LAND SNAIL FAUNA IN CAPREI AND RÂMEȚ GORGES NATURE RESERVES (TRASCĂU MOUNTAINS, ROMANIA)

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The land snail fauna of limestone areas is particulary rich, because of the favorable conditions in this type of habitats. The paper presents the land snail fauna of two less studied natural reserves located in the Trascău Mountains, Caprei and Râmețului Gorges. A number of 57 land snail species were identified. Most of the snails were found in the forest habitat, where the presence of calcium in the substrate is completed by a high level of humidity and the diversity of microhabitats. The malacofauna of limestone walls is less diverse, but the species present here are developing large populations. Five endemic species were found, among which are the door snails *Alopia bielzi tenuis* and *Alopia livida iulii*.

Keywords: land snails, endemic species, diversity, Râmeț Gorges, Caprei Gorges, Trascău Mountains.

INTRODUCTION

Besides their cultural and historical values, the karst areas and the caves developed here are extremely valuable natural resources, hosting a wide variety of often unique ecological niches (Pipan & Culver, 2013), and therefore sheltering a large biodiversity including high species endemism (Culver & Sket, 2000).

Land snail communities are particlularily rich on limestones as they generally require large amounts of calcium for their shells and eggs (Kerney & Cameron, 1979; Gärdenfors, 1992; Nekola, 1999; Horsák, 2006). Snails contribute significantly to the general biodiversity of the limestone areas, and are important contributors to invertebrate biomass, by developing large populations.

The Western Carpathians – Apuseni Mountains – include some of the most interesting karst areas in Romania. Many of them are well studied but some still remain with very poor reference regarding different groups. Besides the classical malacological works describing the malacofauna of Romania or Transylvania, including informations regarding the Apuseni Mountains (Bielz, 1867; Kimakowicz, 1890; Rotarides, 1930; Wagner, 1942; Grossu, 1981, 1983, 1986, 1987), more recently there are several papers concerning mostly the land snails of their western part (Bába & Sárkány-Kiss, 1999 a, b; Bába & Sárkány-Kiss, 2001; Domokos & Váncsa,

2005; Domokos & Lennert, 2007; Lengyel & Páll-Gergely, 2010). The only recent paper focusing on the land snails of Trascău Mountains is that of Bába and Sárkány-Kiss (1998) regarding Cheile Turzii, while data from their southern part is included in the study of Cameron *et al*. (2011) regarding the forest land snails of Transylvania.

This paper is focusing on the land snail fauna of two limestone gorges located in the eastern and southern part of the Trascău Mountains, with poor previous specific reference regarding the land snail fauna.

MATERIAL AND METHODS

THE STUDY SITE

Cheile Râmețului Nature Reserve located in the central-eastern part of the Trascău Mountains, Central Romania consists of Jurasic limestone dominated by two limestone massives, Uzmezeu in north and Fundoi in south (Fig. 1). They are the remains of an old limestone plateau, in which the Geoagiu Valley has dug a very picturesque key (Fig. 2). The tourist pressure is relatively low in the area because of the distance from urban areas and the difficult access.

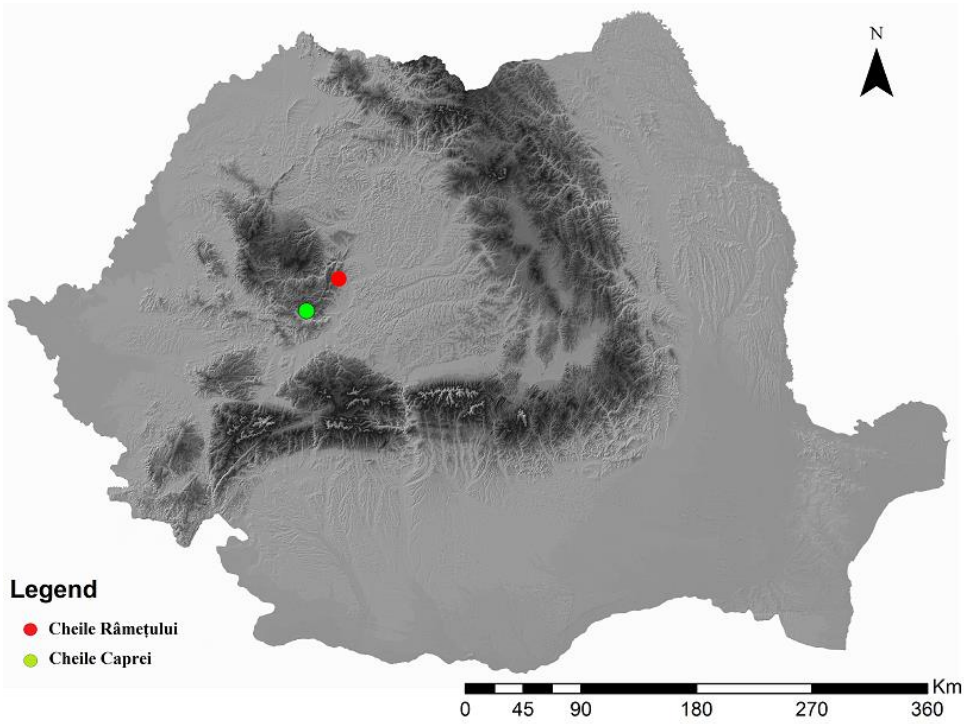

Fig. 1. The location of the study area (Râmeț Gorges and Caprei Gorges Nature Reserves).

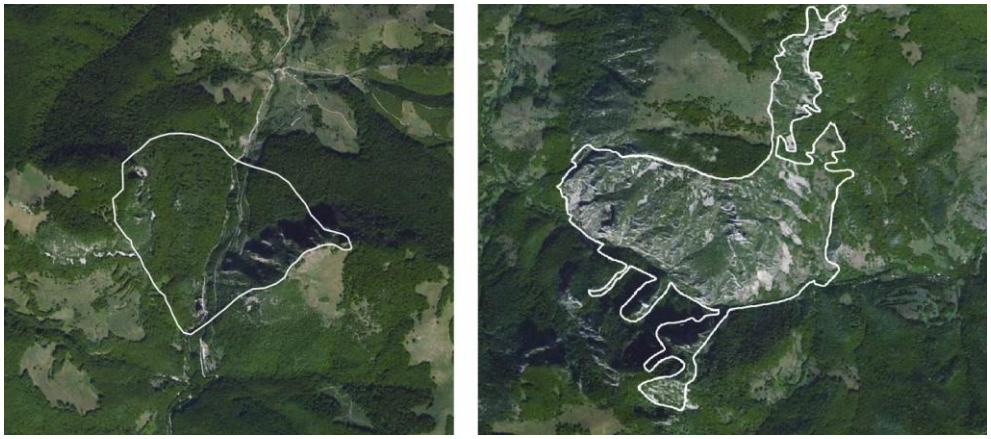

Fig. 2. The limits of Caprei Gorges Nature Reserve on the Feneș River valley (left) and Râmeț Gorges Nature Reserve on the Geoagiu River (right).

Cheile Caprei Nature Reserve (110 ha) is located in the southern part of the Trascău Mountains (Figs. 1–2). The reserve is also named Cheile Fenișului after the Feneș River that crosses the gray Jurasic limestones. On the west side, the reservation's boundary consists of the Dâmbăului plateau, with an altitude of 1200–1300 m, while at its eastern limit stays the Corabia massif. The relief reflects the difference in hardness of these geological formations and explains the two isolated rocks formed at the southern end of the keys, with heights of 67 and 75 m, which are called Pietrele Caprei (the goat's rocks), which give the name of the reserve (Cheile Caprei – the Goat's Gorges).

SAMPLING

The study was carried out in 2016 and 2017. Samples were taken in both locations from two habitat types, limestone walls and forest of *Fagus sylvatica* and *Carpinus betulus.*

The snails were collected by visual searching and for the microsnails leaf litter and soil samples were taken. Surface leaf litter and soil was collected after sieving trough a 1 cm net. The litter samples were dried in laboratory, fractioned by sieving and sorted under a stereomicroscope. All the snails were preserved in 70% ethanol.

The snails were identified in the laboratory to species according to Kerney & Cameron (1979), Grossu (1981, 1983, 1985, 1987) and Welter-Schultes (2012). Nomenclature follows Fauna Europaea (Bank, 2017).

RESULTS AND DISCUSSION

A number of 57 land snail species were identified in the area of the two limestone gorges. The species list is presented in the Table 1.

Table 1

The list of land snail species identified in Caprei and Râmeț Gorges

	Family/Species	Caprei Gorges		Râmeț Gorges	
		forest	limestone walls	forest	limestone walls
	Family Aciculidae				
1.	*Platyla polita* (Hartmann, 1840)	x	x		
2.	*Platyla banatica* (Rossmässler, 1842)			x	x
3.	*Platyla perpusilla* (Reinhardt, 1880)	x	x	x	x
	Family Carychiidae				
4.	*Carychium tridentatum* Müller, 1774	x		x	x
	Family Cochlicopidae				
5.	*Cochlicopa lubrica* (Müller, 1774)	x			
6.	*Cochlicopa lubricella* (Rossmässler, 1834)		x		
	Family Pyramidulidae				
7.	*Pyramidula pusilla* (Vallot, 1801)	x	x		x
8.	*Pyramidula rupestris* (Draparnaud, 1801)				x
	Family Vertiginidae				
9.	*Truncatellina cylindrica* (A. Ferussac, 1807)	x	x	x	
10.	*Vertigo alpestris* Alder, 1838	x			
11.	*Vertigo pusilla* O.F. M**ü**ller, 1774			x	x
12.	*Vertigo pygmaea* (Draparnaud, 1801)			x	
	Family Pupillidae				
13.	*Pupilla muscorum* (Linnaeus, 1758)	x			
14.	*Pupilla triplicata* (Studer, 1820)			x	
15.	*Pupilla alpicola* (Charpentier, 1837)			x	
	Family Chondrinidae				
16.	*Granaria frumentum* (Draparnaud, 1801)		x		x
17.	*Chondrina arcadica* subsp. *clienta* (Westerlund, 1883)		x		x
18.	*Chondrula tridens* O.F. M**ü**ller, 1774			x	
	Family Orculidae				
19.	*Sphyradium doliolum* (Bruguiere, 1792)	x	x	x	x
20.	*Orcula dolium* (Draparnaud, 1801)				x
21.	*Orcula jetschini* M. Kimakowicz, 1883	x			
	Family Strobilopsidae				
22.	*Spelaeodiscus triarius* (Rossmässler, 1839)	x	x	x	x
	Family Valloniidae				
23.	*Vallonia costata* (O.F. Müller, 1774)	x			x
24.	*Vallonia excentrica* Sterki, 1893				x
	Family Enidae				
25.	*Merdigera obscura* (O.F. Müller, 1774)	x			
26.	*Mastus bielzi* (M. von Kimakowicz, 1890)	x		x	

	Family Punctidae				
27.	*Punctum pygmaeum* (Draparnaud, 1801)	x		x	
	Family Vitrinidae				
28.	*Vitrina pellucida* (O.F. Müller, 1774)	x		x	x
	Family Pristilomatidae				
29.	*Vitrea transsylvanica* (O.F. Müller, 1774)	x		x	x
30.	*Vitrea diaphana* (Studer, 1820)			x	
	Family Oxychilidae				
31.	*Aegopinella pura* (Alder, 1830)		x	x	
32.	*Aegopinella epipedostoma* (Fagot, 1879)	x		x	x
33.	*Oxychilus glaber* (Rossmassler, 1835)	x	x	x	x
34.	*Oxychilus draparnaudi* (H. Beck, 1837)	x	x	x	
35.	*Carpathica calophana* (Westerlund, 1881)	x		x	
	Family Euconulidae				
36.	*Euconulus fulvus* (O.F. Müller, 1774)	x			
	Family Clausiliidae				
37.	*Alopia livida iulii* (Wagner, 1913)		x		
38.	*Alopia bielzii tenuis* (Bielz, 1861)				x
39.	*Cochlodina laminata* (Montagu, 1803)	x			
40.	*Cochlodina orthostoma* (Menke, 1828)	x		x	
41.	*Cochlodina marisi* (Schmidt, 1868)			x	x
42.	*Ruthenica filograna* (Rossmässler, 1836)	x	x	x	x
43.	*Clausilia dubia* Draparnaud, 1805	x	x	x	x
44.	*Laciniaria plicata* (Draparnaud, 1801)	x		x	
45.	*Vestia elata* (Rossmässler, 1836)	x		x	
46.	*Vestia turgida* (Rossmässler, 1836)	x			
47.	*Pseudalinda stabilis* (Pfeiffer, 1847)	x		x	
48.	*Bulgarica cana* (Held, 1836)	x			
49.	*Bulgarica vetusta* (Rossmässler, 1836)	x		x	x
	Family Bradybeidae				
50.	*Fruticicola fruticum* (O.F. Müller, 1774)	x		x	
	Family Hygromiidae				
51.	*Trochulus bielzi* (Bielz, 1860)	x		x	
52.	*Euomphalia strigella* (Draparnaud, 1801)	x			
	Perforatella dibothrion (M. von Kimakowicz, 1884)	x			
53.	*Monachoides vicinus* (Rossmässler, 1842)	x		x	
	Family Helicidae				
54.	*Isognomostoma isognomostomos* (Schroter, 1784)	x		x	
55.	*Faustina faustina* (Rossmässler, 1835)	x	x	x	x
56.	*Drobacia banatica* (Rossmässler, 1838)	x		x	
57.	*Helix pomatia* Linnaeus, 1758	x			

Among the 57 land snail species, 47 species were present in Caprei Gorges, and 43 in Râmeț Gorges. A number of 29 species are common for the two studied areas, species characteristic for limestones or typical forest species. Since the area of exposed limestone cliffs in Râmeț Gorges is much more extensive than in Caprei Gorges, the diversity of limestone snails is higher, species like *Pyramidula rupestris*, *Pupilla triplicata*, *Orcula dolium*, *Vallonia excentrica* were found only here.

Higher diversity was found in forest compared to limestone habitats. Since the conditions are more favorable for the presence of land snails, some rock dweling species cohabit here with typical forest species. Five endemic species were identified in the area: *Mastus bielzi, Orcula jetschini, Cochlodina marisi, Alopia bielzi tenuis* and *Alopia livida iulii*. Each of the gorges has its own endemic *Alopia* species, *Alopia bielzi tenuis* is present in Râmeț Gorges, while *Alopia livida iulii* inhabits Caprei Gorges. This endemic door snails are developing large populations living in the crevices of the limestone walls and feeding on algae.

The land snail fauna of Cheile Turzii, in the north-eastern area of the Trascău Mountains is richer, as reported by Baba & Sarkany (1998). The authors found there 55 species, to which are added those mentioned in the previous works, some of them having undergone over the time changes in nomenclature or being currently synonyms with other species. However, some species found in the eastern and southern area of Trascău Mountains, Râmețului and Caprei Gorges are not present in Cheile Turzii. Such are *Bulgarica cana, Bulgarica vetusta, Vitrea transsylvanica, Pyramidula pusilla* and *Platyla banatica.*

CONCLUSIONS

The limestone area of the Trascău Mountains shelter a rich malacofauna, including endemic and protected species as is the case of *Drobacia banatica*, the Banat rock snail, one of the four land snail species present in Romania that is included in Annex II of EC Habitats Directive. Although the area is not subject of a very severe human disturbance, because of the fact that the gorges are difficult to acced and not very popular, there are some potential treats that can subject the land snails. It is the case of rock climbing that is allowed on the two limestone blocks located at the entrance of the Caprei Gorges, the same area were *Alopia livida iulii* was found. This activity could severely menace the surviving of this subspecies in the area.

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