

**SPECIES DIVERSITY AND HABITAT DISTRIBUTION OF THE  
MALACOFAUNA (*MOLLUSCA: BIVALVIA, GASTROPODA*) OF  
SURNENA SREDNA GORA MOUNTAIN  
(SOUTHERN BULGARIA)**

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**ABSTRACT.** The massif of Surnena Sredna Gora mountain is situated between 25° and 26° meridians, and south from central parts of Stara Planina mountain. From south Surnena Gora borders on the Upper Tracian Valley.

There were no any detailed studies on the species diversity of freshwater bivalves and gastropods in Surnena Sredna Gora mountain. The aim of our study was to investigate the species diversity and habitat distribution of the whole recent malacofauna (*Bivalvia* and *Gastropoda*) of the region.

The study was carried out during the period of 2001-2005. The molluscs were collected by hand and for the smallest species a sieve for soil samples was used. There were 10 habitat types considered for studying the malacofauna distribution.

Total of 80 species of *Mollusca* in the study area were registered. The total of 23 species of *Mollusca* were newly found for Surnena Sredna Gora mountain. From the freshwater habitats the richest were the small rivers and the karst springs. With highest diversity from land habitat types were the river bank forests.

**KEY WORDS:** diversity, habitat, malacofauna, Mollusca, Bulgaria

### **INTRODUCTION**

The malacofauna (*Mollusca*: freshwater mussels – *Bivalvia* and freshwater and land snails - *Gastropoda*) of the small mountain massifs as Surnena Sredna Gora in Bulgaria are not well studied. Recently a new species of the genus *Vitrea* Fitzinger, 1833 was described from this area (IRIKOV & GEORGIEV, 2004). There were only few reports of 3 land gastropod species for the region of this mountain from DAMJANOV &

LIHAREV (1975): *Tandonia kusceri* (Wagner 1931), *Limax macedonicus* Hesse 1928 and *Helix figulina* Rossmassler 1839. There were reported and 55 land gastropod species for the lowland and mountain slopes` vicinities of Stara Zagora town (IRIKOV & GEORGIEV, 2002). Land snails (9 species) were also reported in the region as intermediate hosts of protostrongylid nematodes (GEORGIEV & GEORGIEV, 2002; 2003; 2004).

There were no any studies on the species diversity of freshwater bivalves and gastropods in the region and no information on the habitat distribution of the land gastropods there. No land snails were reported from caves in Surnena Sredna Gora (BERON, 1994).

The aim of our study was to investigate the species diversity of the whole malacofauna (*Bivalvia* and *Gastropoda*) of Surnena Sredna Gora and its habitat distriburion.

### STUDY AREA

The massif of Surnena Sredna Gora mountain is situated between 25° and 26° meridians, and south from central parts of Stara Planina mountain. From south Surnena Gora borders on the Upper Tracian Valley.

The climate is mainly transcontinental, but around the region of Bratan Peak (the highest point of the mountain: 1236 m a.s.l.) is mountainous. The middle winter temperatures rising from -4° to 1° C, and the middle summer ones from 18° to 23° C. The rainfalls are from 550 to 700 mm/year. The cliffs are represented by limestone in the lower parts and metamorphs on the higher parts of the mountain (DOBREV, 1979).

There were 8 UTM grid quadrants, situated in the region of Surnena Sredna Gora mountain investigated:

1. UTM: MH00, Southern slope of the mountain, around Oriahovitsa village, *Salix alba* L. river-bank and *Quercus* spp. forest.
2. UTM: MH01, Northern slope of the mountain, north from Edrevo village, Edrevska river, open bush and grassland area around it.
3. UTM: LH90, Southern slope and crest of the mountain, around and north from Kolena and Dalboki villages, open bush and grassland area – *Carpinus orientalis* Mill. and *Pliurus spina-christi* Mill. dominated, *Pinus nigra* Arn., *Pinus sylvestris* L., *Quercus* spp. and *Fagus sylvatica* L. forests; *Alnus glutinosa* (L.) river bank forest.
4. UTM: LH80, north from Stara Zagora town, Southern slope and crest of the mountain, open bush and grassland area – *Carpinus orientalis* Mill. and *Pliurus spina-christi* Mill. dominated, *Pinus nigra* Arn., *Pinus sylvestris* and *Quercus* spp. forests, *Alnus glutinosa* (L.), *Ulmus* sp. and *Salix alba* L. river bank forest; Bedechka river.
5. UTM: LH70, Southern slope of the mountain, south from Ostra Mogila village: caves „Vassil Levski“ and „Labirinta“; open bush and grassland area – *Carpinus orientalis* Mill. and *Paliurus spina-christi* Mill. dominated, *Alnus glutinosa* (L.),

- Ulmus minor* Mill., *Carpinus betulus* L. and *Salix alba* L. river bank forest; Banska river.
6. UTM: LH79, Southern slope of the mountain, near Starozagorski Bani resort complex, open bush and grassland area – *Carpinus orientalis* Mill. and *Pliurus spina-christi* Mill. dominated, *Alnus glutinosa* (L.), *Ulmus minor* L., *Carpinus betulus* L. and *Salix alba* L. river bank forest; *Quercus cerris* L. and *Quercus frainetto* Ten. forest; Banska river.
  7. UTM: LG69, Southern slope of the mountain, north from Stojan Zaimovo village, *Quercus* spp. forest; *Salix alba* L. river bank forest; Stojan Zaimovska river.
  8. UTM: LH40, Rozovets village - open bush and grassland area – *Carpinus orientalis* Mill. and *Pliurus spina-christi* Mill. dominated, *Alnus glutinosa* (L.), *Ulmus* sp. and *Salix alba* L. river bank forest; Rozovska river; around Bratan Peak – *Fagus sylvestris* L. forest, near cement base of military tower.

### MATERIAL AND METHODS

The study was carried out during the period of 2001-2005. The molluscs were collected by hand and for the smallest species a sieve for soil samples was used. The live specimens were conserved in 75% alcohol but the shells as a dry material. The land snail species were determined using keys by DAMJANOV & LIHAREV (1975), KERNEY, CAMERON & JUNGBLUDGH (1983) and the freshwater molluscs mainly by ZHADIN (1952). The species names used are mainly according DEDOV (1998) and ANGELOV (2000).

There were 10 habitat types considered for studying the malacofauna as follows: for the freshwater species: 1. rivers, 2. karst springs, 3. channels, 4. dams; and for the land species: 5. *Quercus* spp. forests; 6. *Fagus sylvatica* forests; 7. *Pinus* spp. forests; 8. river bank forests where *Alnus glutinosa*, *Ulmus minor*, *Carpinus betulus* and *Salix alba* were the dominant tree species; 9. open bush and grassland areas where various grass species, *Carpinus orientalis* and *Pliurus spina-christi* dominated.

### RESULTS AND DISCUSSION

Total of 5 species of *Bivalvia*, 12 freshwater and 63 land species of *Gastropoda* (total of 80 species of *Mollusca*) were registered (Table 1 and 2). The land snails were 26,6% of the land Bulgarian malacofauna (237 species, DEDOV, 1998; IRIKOV, 2001; 2003; IRIKOV & GEORGIEV, 2004). The freshwater malacofauna of Surnena Sredna Gora mountain was 18,8% from the whole Bulgarian one (90 species, ANGELOV, 2000; HUBENOV, 2001).

The species *Cerņuella virgata variabilis* was not found in the UTM-quadrants investigated, but it was reported in the region of Stara Zagora town (IRIKOV & GEORGIEV, 2002) and for pasture grasslands in the southern mountain slope (GEORGIEV & GEORGIEV, 2004). *Helix pomatia* was found only in the northern slope of Surnena Gora, where its presence probably is favoured by the climate influence of Stara Planina mountain. The shell of this species differs from the dominant form, and we consider that detailed examination of the genital system is needed. One of the most widely spread *Helicidae*-species was *Helix figulina*, reported for the region and

by DAMJANOV & LIHAREV (1975), and we consider that in the paper of GEORGIEV & GEORGIEV (2004), the species reported as *Helix vulgaris* Rossmassler 1839 (one specimen), in actuality probably was *Helix figulina*.

The species *Pupilla muscorum* Linnaeus 1758, was not included in the table because in the region studied it was strongly synanthropic. It was reported for Stara Zagora town (IRIKOV & GEORGIEV, 2002) and was found in yards of Rozovets village during the present study (UTM: LH40).

Some unidentified species of molluscs were found: *Pseudamnicola* sp., (*Prosobranchia*: *Hydrobiidae*), *Monacha* sp. (*Pulmonata*: *Hygromiidae*) (*Gastropoda*), and *Pisidium* sp. (*Bivalvia*: *Sphaeriidae*), and we consider a precise anatomical study is needed.

The total of 10 various habitat types and the species distribution of the malacofauna within were studied. From the freshwater habitats the richest were the typical for the region small rivers (17 species, 100% from the freshwater malacofauna of the region) and karst springs (8 species, 50% from the freshwater malacofauna of the region). With highest diversity from land habitat types (53 species, 84% from all land snails registered) were the river bank forests with dominant tree species as *Alnus glutinosa*, *Ulmus minor* and *Carpinus betulus*, contributing favourable conditions by their highly nutrition leave-detritus, combining with the high humidity along the rivers. High species diversity had and the open grassland and bush areas with dominants as *Paliurus spina-christi* and *Carpinus betulus* (41 species, 65% from all registered land species) and the *Quercus* spp. forests (37 species, 59% from all registered land species). In the *Pinus* spp. forests 22 land snail species were found (34,9% from all registered land species), but with obvious diversity were where *Pinus sylvestris* dominated. In the caves only one gastropod species (1,6%) was found alive, and thriving: *Oxychilus glaber striarius*, in „Labirinta“ cave. This was the first record of a land snail for this cave. The other land snail species were registered only as shells in „Vassil Levski“ cave.

## CONCLUSIONS

Total of 5 species of *Bivalvia*, 12 freshwater and 63 land species of *Gastropoda* (total of 80 species of *Mollusca*) were registered in the study area.

The land snails were 26,6% of the whole land Bulgarian malacofauna. The freshwater malacofauna of Surnena Sredna Gora mountain was 18,8% from the whole Bulgarian one.

The total of 23 species of *Mollusca* were newly found for Surnena Sredna Gora mountain (5 species of *Bivalvia*, 12 species of freshwater and 6 land *Gastropoda*), and it was the first study on the freshwater molluscs in the region ever done.

From the freshwater habitats the richest were the typical for the region small rivers (17 species, 100% from the freshwater malacofauna of the region) and karst springs (8 species, 50% from the freshwater malacofauna of the region). With highest diversity from land habitat types (53 species, 84% from all land snails registered) were the river bank forests. High species diversity had and the open grassland and bush areas (41 species, 65% from all registered land species) and the *Quercus* spp.

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**Table 1.** Species diversity and habitat distribution of the freshwater malacofauna (*Bivalvia* and *Gastropoda*) of Surnena Sredna Gora mountain.

species	habitat type				locality
	rivers	springs	channels	dams	
<i>Gastropoda</i>					
<i>Valvata piscinalis</i> (O. F. Mueller 1774)	+	+	-	-	4, 5, 6, 7
<i>Bythinella austriaca</i> (Frauenfeld 1857)	+	+	-	-	4, 5, 6
<i>Pseudamnicola consociella euxina</i> Wagner 1927	+	+	-	-	4
<i>Pseudamnicola</i> sp.	+	+	+	-	4
<i>Acroloxus lacustris</i> (Linnaeus 1758)	+	-	+	+	4
<i>Radix ovata</i> (Draparnaud 1801)	+	-	+	-	4, 5, 6
<i>Galba truncatula</i> (O. F. Mueller 1774)	+	-	-	-	2,
<i>Ancylus fluviatilis</i> O. F. Mueller 1774	+	+	+	+	4, 5, 6
<i>Planorbis carinatus</i> O. F. Mueller 1774	+	-	+	+	1, 2,
<i>Gyraulus albus</i> (O. F. Mueller 1774)	+	-	-	-	1, 2,
<i>Planorbarius corneus</i> (Linnaeus 1758)	+	-	+	+	6
<i>Physella acuta</i> (Draparnaud 1805)	+	-			1, 2,
<i>Bivalvia</i>					
<i>Unio pictorum</i> (Linnaeus 1758)	+	-	-	+	6
<i>Anodonta cygnaea</i> (Linnaeus 1758)	+	-	-	-	4, 5
<i>Musculium lacustre</i> (O. F. Mueller 1774)	+	+	-	-	4, 5
<i>Pisidium casertanum</i> (Poli 1791)	+	+	-	-	1, 4, 5
<i>Pisidium</i> sp.	+	+	-	-	4

**Table 2.** Species diversity and habitat distribution of the land malacofauna (*Gastropoda*) of Surnena Sredna Gora mountain. Legend: qcf-*Quercus* spp. forest, ff-*Fagus sylvatica* forest, pr-*Pinus* spp. forest, rbf-river bank forest, obg-open bush and grassland area, cav-cave.

species	habitat type						locality
	qcf	ff	pf	rbf	obg	cav	
1	2	3	4	5	6	7	8
<i>Pomatias elegans</i> (Mueller 1774)	+	+	+	+	+	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Carychium minimum</i> Mueller 1774	+	-	-	+	+	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Truncatellina cylindrica</i> (Ferussac 1821)	-	-	+	+	+	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Argna macrodonta rumelica</i> (Hesse 1916)	-	-	-	+	-	-	4
<i>Agardhiella truncatella</i> (Pfeiffer 1841)	+	-	-	+	-	?	5, 6
<i>Sphyradium doliolum</i> (Bruguere 1792)	-	-	-	+	-	-	3, 4, 5, 8
<i>Vallonia costata</i> (Mueller 1774)	+	-	-	+	+	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Vallonia pulchella</i> (Mueller 1774)	+	-	+	+	+	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Vallonia enniensis</i> (Gredler 1856)	-	-	-	+	+	-	4
<i>Vallonia excentrica</i> Sterki 1892	-	-	-	+	+	-	4
<i>Acanthinula aculeata</i> (Mueller 1774)	+	-	-	+	-	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Merdigera obscura</i> (Mueller 1774)	+	-	-	+	+	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Mastus rosmaessleri</i> (L. Pfeiffer 1846)	-	-	+	-	+	-	3
<i>Zebrina detrita</i> (Mueller 1774)	+	-	+	+	+	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Pseudohodrula seductilis</i> (Rosmaessler 1846)	+	-	+	+	+	-	1, 2, 3, 4, 5, 6, 7
<i>Chondrula microtraga</i> (Rosmaessler 1839)	-	-	+	-	+	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Eubrephulus bicallosus</i> (L. Pfeiffer 1846)	-	-	-	-	+	-	6
<i>Cochlicopa lubrica</i> (Mueller 1774)	+	-	-	+	+	-	2, 3, 4, 5, 6, 7, 8
<i>Cochlicopa lubricella</i> (Porro 1838)	+	-	-	+	-	-	3, 4, 5, 8
<i>Cochlodina laminata</i> (Montagu 1803)	+	+	-	+	+	-	2, 3, 4, 5, 6, 7
<i>Macedonica marginata</i> (Rosmaessler 1835)	+	-	-	+	-	-	6
<i>Laciniaria plicata</i> (Draparnaud 1801)	+	-	-	+	+	-	4, 5, 7
<i>Balea biplicata</i> (Montagu 1803)	+	-	-	+	-	-	1, 6
<i>Bulgarica varnensis</i> (L. Pfeiffer 1848)	+	+	-	+	+	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Succinea oblonga</i> Draparnaud 1801	-	-	-	+	-	-	4
<i>Oxyloma elegans</i> (Risso 1826)	-	-	-	+	-	-	1, 2, 3, 4, 6, 7, 8
<i>Cecilioides acicula</i> (Mueller 1774)	+	-	-	+	+	-	4, 5
<i>Cecilioides spelaeus</i> (A. Wagner 1914)	+	-	-	+	+	-	4, 5
<i>Arion sylvaticus</i> Lohmander 1937	+	+	-	+	-	-	3, 4, 5
<i>Euconulus fulvus</i> (Mueller 1774)	+	-	-	+	+	-	1, 4, 5, 8
<i>Vitrina pellucida</i> (Mueller 1774)	-	-	-	-	+	-	5
<i>Vitrea neglecta</i> Damjanov & Pinter 1969	-	-	-	+	-	-	8
<i>Vitrea contracta</i> (Westerlund 1871)	-	-	-	+	-	?	4
<i>Vitrea pygmaea</i> O. Boettger 1880	+	-	+	+	+	-	4
<i>Vitrea vereae</i> Irikov, Georgiev & Riedel 2004	+	-	+	-	+	-	3, 5
<i>Aegopinella minor</i> (Stabile 1864)	+	-	-	+	+	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Oxychilus glaber striarius</i> (Westerlund 1881)	+	+	+	+	+	+	1, 2, 3, 4, 5, 6, 7, 8
<i>Oxychilus inopinatus</i> (Ulicny 1887)	-	-	+	+	-	-	3, 4
<i>Daudebardia rufa cycladum</i> Martens 1889	+	+	-	+	-	-	3, 4, 5, 7
<i>Daudebardia brevipes</i> (Draparnaud 1805)	+	-	-	+	+	?	1, 2, 3, 4, 5, 6, 7, 8
<i>Zonitoides nitidus</i> (Mueller 1774)	-	-	-	+	-	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Tandonia kusceri</i> (Wagner 1931)	+	-	-	+	+	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Tandonia budapestensis</i> (Hazay 1881)	-	-	-	+	-	-	6
<i>Tandonia cristata</i> (Kaleniczenko 1851)	-	-	-	+	+	-	2, 3, 4, 5
<i>Punctum pygmaea</i> (Draparnaud 1801)	+	-	-	-	+	-	4, 5, 8
<i>Limax maximus</i> Linnaeus 1758	+	-	-	+	-	-	1, 2, 3, 4, 6, 7, 8
<i>Limax macedonicus</i> Hesse 1928	+	-	+	+	+	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Deroceras sturanyi</i> (Simroth 1894)	-	-	-	+	-	-	1, 2, 3, 4, 5, 6, 7, 8
1	2	3	4	5	6	7	8
<i>Deroceras turcicum</i> (Simroth 1894)	+	+	+	+	+	-	1, 2, 3, 4, 5, 6, 7, 8

<i>Deroceras reticulatum</i> (Mueller 1774)	-	-	+	+	+	-	4, 5
<i>Krynickyllus urbanskii</i> (Wiktor 1971)	-	-	+	+	-	-	3, 5
<i>Cepaea vindobonensis</i> (Ferussac 1821)	+	-	+	+	+	-	1, 2, 3, 4, 5, 6, 7, 8
<b><i>Helix pomatia</i> Linnaeus 1758</b>	-	-	-	-	+	-	2
<i>Helix lucorum</i> Linnaeus 1758	+	+	+	+	+	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Helix figulina</i> (Rossmassler 1839)	-	-	+	-	+	-	1, 2, 3, 4, 5, 6, 7
<i>Bradybaena fruticum</i> (Mueller 1774)	-	-	-	+	-	-	5, 6
<i>Lindholmyola girva</i> (Deshayes 1839)	+	+	+	+	+	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Xerolenta obvia</i> (Menke 1828)	+	-	+	-	+	?	1, 2, 3, 4, 5, 6, 7, 8
<i>Perforatella incarnata</i> (Mueller 1774)	+	-	-	+	-	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Monacha cartusiana</i> (Mueller 1774)	-	-	+	+	+	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Monacha carascaloides</i> (Bourguignat 1855)	-	-	+	+	+	-	1, 2, 3, 4, 5, 6, 7, 8
<i>Monacha</i> sp.	-	-	-	-	+	-	2, 3
<i>Euomphalia strigella mehadiae</i> (Bourguignat 1881)	+	-	-	+	-	-	1, 2, 3, 4, 5, 6, 7, 8