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Molluscs (Mollusca) (Terrestrial Gastropods and Freshwater Gastropods et Bivalvia) in Sakar Mountain (Bulgaria)

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Abstract: This paper presents new data on the Mollusca in Sakar Mountain in Bulgaria. As a result of the research conducted a total nimber of 59 terrestrial and 14 freshwater species and subspecies of molluscs, of which 45 are terrestrial and 14 freshwater, belonging to 22 families have been identified. For the first time 27 taxa are reported in the fauna of Sakar Mountain: 21 terrestrial and six freshwater species and subspecies. For the firsdt time a zoogeographical and conservation analysis has been conducted of the accessible malacofauna.

Key words: terrestrial and freshwater snails, Sakar Mountain, Bulgaria

Introduction

Sakar Mouuntain is located in Southeast Bulgaria along the border with Republic

of Turkey. To the east and to the west the mountain is marked out by two of the largest Bulgarian rivers – Tundzha and Maritsa. Sakar Mountain is low (the highest elevation is 856 m) and the greater part of it is covered by deciduous oak tree forests. The arable areas, open shrubland and pastures occupy basically the southern part of the mountain. The whole mountain is crossed by a large number of small brooks that often run dry during the summer. During the last century several thousand micro dams were built all over the mountain tou serve the pruposes of the agri farms. Climatewise Sakar Mountain is transitional mediterranean with warm and mild winters and hot and dry summers. The rock formations include large rocks and groups of rocks. The larger rock formations in Sakat are three – they are near the villages of Cherepovo, Yerusalimovo, as well as near the river valley of the river Tundzha.

The summarized data of the terrestrial mollusca of Bulgaria have been presented in Damjanov & Likharev (1975), and of the freshwater mollusca in Angelov (2000) and mostly in Georgiev D.G. (2014). At the end of the twentieth century the Bulgarian research workers started intensive and thorough study of the malacofauna in separate physical geographical regions and in some smaller, geographically differentiated territories of the country. The result of this reserch was the data obtained for Golo Bardo Mts. (Mitov & Radoslavov, 1997), North Pirin Mts. (Dedov & Mitov, 1998), Kresna Gorge (Antonova & Dedov, 2001), Zemen Gorge (Antonova & Dedov, 2002), Dobrostanski Ridge in Western Rhodopes (Irikov, 2002), East Rhodope Mts. (Irikov & Dedov, 2004), Sarnena Sredna Gora Mts. (Georgiev D.G., 2005), Sakar Mts. (Georgiev D.G., 2005), West Rhodope Mts. (Irikov & Mollov, 2006), Svetiiliyski Height in Southeast Bulgaria (Georgiev D.G., 2006), Sinite Kamani Nature Park in Stara Planina Mts. (Georgiev D.M., 2008), Alibotush Mts. (Dedov, 2008), Azmashki Hill in Thracean Lowland (Georgiev D.G., et al., 2009), Sashtinska Sredna Gora Mts. (Georgiev D.G. & Stoycheva, 2009), Osogovo Mts. (Dedov & Mitev, 2008), Bulgarian Black Sea Coast (Irikov & Mollov, 2014), Strandzha Mts. (Irikov & Mollov, 2015). In all the works cited a lot of new information is available of the respective regions with systematic ecological and zoogeographic data, habitat distribution of the malacofauna; revisions were made of incorrrectly reported species and new taxa

were described, such as *Macedonica hartmuti* Irikov 2003, *Macedonica teodorae* Irikov 2006, *Macedonica dobrostanica* Irikov, 2012, *Alinda biplicata alibotushensis* Dedov 2009, *Alinda atanasovi kremenensis* Dedov, 2009, *Macedonica brabeneci prismatica* Dedov, 2012. At this stage the malacofauna in the southrn regions of Bulgaria could be considered best researched.

There is not much data collected in Sakar Mountain. Urbański & Wiktor (1968) report the presence of *Limax macedonicus* Hesse 1928, in the region of Topolovgrad. Damjanov & Likharev (1975) report some terrestrial snails in the mountains without specifying the exact localities. Georgiev (2005) for the first time published a list of the species of mollusca from Sakar. There are two mistakes in this article, namely, *Limax macedonicus* Hesse 1928 (= *Limax graecus* Simroth 1889), was originally reported in the region of the town of Topolovgrad by Urbański & Wiktor (1968), and not by Damjanov & Likharev (1975) and there are two other species omitted in the literature reference reported by Damjanov & Likharev (1975) – *Limax cinereoniger* Wolf 1803 и *Trichia erjaveci* (Brusina 1870). The study of Georgiev D.G. (2005) is only partial as it covers a restricted region in the southern and southwestern parts of the mountain. The goal of the present study was to obtain more data of the malacofauna of Sakar.

Material and Methods

The whole material of mollusca was collected by Georgi Gerdzhikov during the period 2009-2013. For the purpose of the study the following types of habitat were visited within the physical geographic boundaries of Sakar Mountain. The data on the the diversity of the species of mollusca were collected in 84 different localities (Figure 1, Table 1). Small size mollusca (2-5mm), collected in accordance with special methods by sifting the soil through a system of sieves, were not collected. Mollusca were identified by families and species and were mapped. The species were identified conhologically and anatomically by means of catalogues and data from publications. The material is preserved in the collection of Dr Irikov at the Paissii Hilendarski University of Plovdiv. The zoogeographic categories (complexes, elements and subelements) are in accordance with Gruev & Bechev (2000). The Bulgarian nature protection legislation, the European conventions and the criteria of IUCN were implemented for the conservation status of the species.

Results

As result of the research conducted in Sakar Mountain a total of 59 species and subspecies of mollusca have been identified, of them 45 terrestrial and 14 freshwater belonging to 22 families. For the first time 27 taxa are reported for the fauna of Sakar Mountain, of them 21 terrestrial and 6 freshwater species and subspecies (Table 2, species marked by an asterisk). Taking into consideration the taxa reported by Georgiev D.G. (2005), the total number of mollusca in Sakar Mountain up to the present moment amounts to 75 species and subspecies: 59 terrestrial and 16 freshwater. Some of the taxa reported by Georgiev D.G. (2005) were corrected and adjusted systematically: *Balea biplicata* (Montagu, 1803) = *Alinda biplicata orientalis* Nordsieck 2008, *Bulgarica denticulata* (Olivier, 1801) = *Bulgarica denticulata thessalonica* (Rossmässler, 1839), *Daudebardia rufa* (Draparnaud, 1805) = *Daudebardia rufa cycladum* Martens, 1889, *Monacha cartusiana* (O.F. Müller, 1774) = *Monacha claustralis* (Menke, 1828), *Monacha pilosa* Pinter L., 1969 = *Monacha ovularis* (Bourguignat, 1855). As result of the anatomical study of comprehensive material of the species of the genus *Monacha* Fitzinger, 1833, the *M. cartusiana* reported by Georgiev D.G. (2005) in the Sakar Mountain was not determined. Instead the total material researched by us belongs to the *M. claustralis*, with mass distribution in the mountain.

In the cove of the river Tundzha, near the village of Srem (loc. N 45, Fig. 1) we found a *Monacha* specimen conhologically and above all anatomically corresponding to *Monacha liebegottae* Hausdorf, 2000 (Figures 2, 3), until now reported only on two islands in the northeastern part of the Aegean Sea. In order to report however this first for the European mainland new habitat it will be necessary to collect and researxh more material in the future.

Zoogeography. In terms of the zoogeographic affiliation of the small size terrestrial snails which were not subject to our study but have been registered and reported in Sakar Mountain by Georgiev D.G. (2005), our opinion is as follows: Siberian complex, Euroasiatic Palaearctic element, Eurosiberian subelement, *Vertigo antivertigo* (Draparnaud, 1801), Holarctic element *Vertigo pigmaea* (Draparnaud, 1801), *Vallonia costata* (O. F. Müller, 1774), *Cochlicopa lubricell*a (Porro, 1838), European complex, Mid European element *Carychium minimum* O. F. Müller, 1774, *Truncatellina cilindrica* (Ferussac, 1807), *Aegopinella minor* (Stabile, 1864), *Vitrina pellucida* (O. F. Müller 1774), *Deroceras sturanyi* (Simroth 1894),

Fig. 1. Localities where moluscs were collected in Sakar Mountain.

Submediterranean element, Eastsubmediterranean subelement *Vitrea neglecta* Damjanov et L. Pinter, 1969, Southwestern Asiatic complex, Irano-Turanian subelement *Vitrea pygmaea* (O. Boettger, 1880), Asia Minor subelement *Vitrea riedeli* Damjanov et L. Pinter, 1969, Balkan Endemiks *Cecilioides tumulorum* (Bourguignat 1856), Bulgarian Endemix *Vitrea vereae* Irikov, Georgiev, Riedel, 2004.

The 45 species of terrestrial mollusca identified in our study have the following zoogeographic affiliation: Siberian complex – 6 taxa of which 3 belong to the Euroasiatic Palaearctic element, 1 of which is part of the Eurosiberian subelement, and 2 belong to the Transpalearctic subelement, whereas the other 3 species of this complex belong to the Holarctic element. 22 taxa belong to the European complex: Mid European element – 6 species, Atlantic element with Atlanto-Mediterranean subelement – 2 species, Submediterranean element – 14 species, of which 2 species belong to the Holosubmediterranean subelement, 3 species belong to the Euxinian subelement, and 9 species belong to the Eastsubmediterranean subelement. 13 species belong to the Southwestern Asiatic complex, all belong to the Subiranian element, 12 of which belong to the Asia Minor subelement and only 1 to the Irano-Turanian subelement. Only 1 species belongs to the Steppe-Euroasiatic complex, Steppe element, Pontosubmediterranean subelement. There are 3 species belonging to the Balkan Endemiks, and no Bulgarian Endemiks have been identified (Table 2).

The 14 species of freshwater mollusca identifed by us have the following zoogeographic affiliation: Siberian complex – 8 species, all belonging to the Euroasiatic Palaearctic element, 2 of which belong to the Transpalearcic subelement, 5 to the Holopalearctic subelements, 1 to the Eurosiberian subelement. 4 species belong to the European complex and the Mid European element. 1 specie belongs to the Northern Holartic complex, Arctic element и Arctic-alpine subelement. One specie belongs to the North American complex and represents an invasive component (Dillon & Wethington 2006, Semenchenko et. al., 2008), due to which it has been excluded from the zoogeographic classification (Table 2).

The two freshwater millusca reported by Georgiev (2005) in our opinion have the following zoogeographic affiliation: *Psidium amnicum* (O. F. Müller, 1774) belongs to the Siberian complex, Euroasiatic Palaearctic element, Eurosiberian subelement, and *Pisidium casertanum* (Poli, 1791) is a cosmopolitan species.

Conservation status. Pursuant to the Bulgarian nature protection legislation, the European conventions and directives, as well as the IUNC criteria, 19

Table 1. List of samples collected during the study in Sakar Mountains
(number of samples, description of localities, GPS coordinates, habitat description and altitude)

Loc. No.	Localities	GPS coordinates	Habitats	Alt.
1.	Holy Trinity Monastery in the vicinity of the village of Ustrem	N42.03362 E26.42817	deciduous forest with small river	153m
2.	Grassland close to the village of Mihalich	N41.84969 E26.42647	Grassland	338m
3.	Grassland and rocky field north of the village of Sladun	N41.85651 E26.45393	grassland in rocky field	166m
4.	Kirchova Fountain near the town of Topolovgrad	N42.06262 E26.32654	stream in mixed forest	348m
5.	Beliya micro dam along the road between the villages of Mramor and Srem	N42.04472 E26.43828	dam side, arable area	145m
6.	Pastrogorska River, south of the village of Pastrogor	N41.80968 E26.20057	river side	98m
7.	Pastrogorska River, north of the village of Pastrogor	N41.86950 E26.20551	river side, forest belt and arable areas along the river	142m
8.	Southeast of the village of Oreshnik	N42.06714 E26.38527	rocky gulch with stream, arable areas, communities of *Paliurus spina-christi* and other xerophytic shrubs	254m
9	Marble quarry on the northern outskirts of the town of Topolovgrad	N42.09967 E26.33233	abandoned marble quarry bordering on pastures	313m
10.	Halvadzhieva Fountain area west of the town of Topolovgrad	N42.08806 E26.31453	arable areas, xerophytic brushwood, small brook	338m
11.	Village zone south of the town of Topolovgrad	N42.07297 E26.33622	small vineyard plantations and orchards in summerhouses neighbourhood with large tracts of *Paliurus spina-christi* and plantations of fruit-trees	417m
12.	Bukelon Fortress near the village of Matochina	N41.85348 E26.54684	dry grass and shrubs	176m
13.	Micro dam west of the road from Topolovgrad to the village of Golyam Manastir before the road fork to the village of Chukurovo	N42.13421 E26.35031	willow trees, shrubsushes and rushes near a dam	312m
14.	River Fishera under the rock formation near the village of Varnik	N41.84609 E26.51197	river alluvium in a riverside dense longose forest	92m
15.	Kanakliiska riverside, east of Svilengrad, in close proximity of the town	N41.76494 E26.21436	riverside vegetation	57 m
16.	River Sokolitsa between the villages of Mednikarevo and Obruchishte	N42.13126 E25.97554	river bank with thin vegetation	119m
17.	Svilengrad	N41.76269 E26.20631	courtyard of house	55m
18.	River Sokolitsa near the bridge to the village of Vladimirovo	N42.12477 E26.14143	detritus on river bank	173m
19	River Tundzha between the villages of Knyazhevo and Srem	N42.06409 E26.50491	sand strip along the river Tundzha	88 m
20	Darkaya site by the river Tundzha near the village of Radovets	N41.95695 E26.53148	pasture and rocks near a river	178m
21.	Paleocastro site, Topolovgrad	N42.07904 E26.30328	rocks in a mixed forest	416m
22	Water fountain north of the village of Bulgarska Polyana	N42.03647 E26.20033	water fountain basin, field around the fountain	442m
23.	Quarry southeast of Topolovgrad	N42.08542 E26.35944	stone quarry	295m
24.	Quarry and hill near Ibryam Fountain, west of Topolovgrad	N42.09638 E26.31995	rocks and xerophytic shrubs and grass	327m
25.	Hill and river south of the quarry near the village of Mramor	N42.03059 E26.41313	river, dry grass, shrubs, deciduous forest	175m
26	River Levchenska near the village of Levka	N41.86319 E26.27314	river bed	158m

Table 1. Continued

Loc. No.	Localities	GPS coordinates	Habitats	Alt.
27.	Along the road between the villages of Mladinovo and Pastrogor	N41.89589 E26.22811	dry grass and shrubs	268m
28.	River Tashmanska south of the road between the villages of Radovets and Studena	N41.92450 E26.44675	rivulet with rocky southern bank, riverside vegetation	343m
29	Arable areas east of the village of Mramor	N42.04900 E26.41280	arable areas	223m
30	Outskirts of deciduous forest between the villages of Raykova Mogila and Shtit	N41.82400 E26.33477	deciduous oak tree forest, bordering on grassland and shrubs	225m
31.	Town of Topolovgrad	N42.08572 E26.33430	park between blocks of flats	304m
32	Neighbourhood of the village of Bogomil	N41.99379 E26.02994	crumbling rocks along the road	326m
33.	Dvata Mosta site between Topolovgrad and the village of Sakartsi	N42.06694 E26.30275	mixed forest and river	277m
34.	Road fork for Dervishka Mogila and Mount Vishegrad above the village of Planinovo	N41.95344 E26.36548	mixed forest	507m
35.	Micro dam along the road between the villages Levka and Lisovo	N41.89194 E26.26025	micro dam side	301 m
36.	Hill in the southern end of the village of Ustrem	N42.01572 E26.46197	grasslike xerophytic vegetation	132m
37.	Road fork to the village of Lesovo	N41.87486 E26.25069	dry grass and shrubs	264m
38.	North side of Sinapovo Dam	N42.10135 E26.44816	dams, hydrophytic and xerophytic vegetation, arable areas	160m
39.	Old road between the villages of Orlov Dol and Hlyabovo	N42.10520 E26.23156	open spaces of drought resistant grasses and shrubs	241m
40.	River Duganovska at the influx into River Tundzha near the village of Knyazhevo	N42.10009 E26.50724	small brook with diverse vegetation on its banks	99m
41.	Micro dam near river Sokolitsa by the village of Obruchishte	N42.13686 E25.95267	micro dam with exuberant vegetation, arable areas	112m
42.	Bridge across river Sokolitsa near the village of Madrets	N42.13128 E26.09634	sand banks with thin vegetation along the river	150m
43.	Bridge across river Boaza near the village of Ustrem	N42.02604 E26.47187	bank of a stream	84m
44.	Mount Mandrata foot south of the village of Ustrem	N41.98578 E26.48267	arable areas and shrubs	166m
45.	The bridge across Tundzha near the village of Srem	N42.05388 E26.47551	river cove forests, scanty terrestrial vegetation of hydrophytic plants, sand strips	88m
46.	Bridge across the river Sokolitsa near the village of Hlyabovo	N42.06040 E26.23744	riverside vegetation	301m
47.	Between the villages of Levka and Mustrak	N41.87675 E26.29773	roadside vegetation	298m
48.	Micro dam and stream at the road fork to the village of Sakartsi	N42.06041 E26.28882	micro dam and stream, diciduous trees and shrubs along the stream	331m
49.	Road between the villages of Studena and Dervishka Mogila	N41.92472 E26.39464	vineyards and dry grass, micro dam	349m
50.	Vineyard plantations east of Topolovgrad	N42.11203 E26.38529	vineyards	238m
51.	River Medlika south of the village of Srem	N42.03644 E26.47080	arable areas and boundary strips	92m
52.	2 km northeast of the village of Mladinovo	N41.94619 E26.25489	micro dam, deciduous forest, arable areas	392m
53.	Water fountain and micro dam in the deciduous forest along the road to the village of Dervishka Mogila	N41.90936 E26.33675	deciduous forest	452m
54.	Southern road fork to the village of Dervishka Mogila	N41.89794 E26.33225	water fountain, stream, grassland along road	416m

Table 1. Continued

Loc. No.	Localities	GPS coordinates	Habitats	Alt.
55.	Vineyards by the micro dam near the village of Captain Petko Voyvoda	N42.08410 E26.40563	Vineyards	221m
56.	River Bakardere near the village of Jerusalimsko	N41.90189 E26.09039	rocky gulch, deciduous forest, stream	79m
57.	Mouth of river Boaza near the village of Ustrem	N42.03208 E26.48812	river, river cove forest	79m
58.	Road fork to the village of Levka	N41.87492 E26.21533	abandoned arable areas	181m
59.	Rock massif along the road from Harmanli to the village of Bulgarin	N41.94681 E25.94058	vulcanic rocks overgrown with scanty shrubs of *Paliurus spina-christi*	130 m
60.	Trudovashka Fountain near the road fork between the villages of Orlov Dol and river Kamenna	N42.11919 E26.25598	pasture, clusters of shrubs and trees near a water fountain	232m
61.	Rock church near the village of Matochina	N41.84451 E26.53290	dry grass and stony ground	180m
62.	1.5 km southeast of the village of Sinapovo	N42.10833 E26.47342	arable areas	183m
63.	Thracian mound near the village of Knyazhevo	N42.11404 E26.49636	coniferous trees, arable areas	114m
64.	West of the village of Pastrogor	N41.84239 E26.19172	abandoned arable areas	166m
65.	Quarry north of the village of Shtit	N41.84133 E26.34620	limestone hill with vegetation of steppe nature, in proximity of a dry gulch and a hill overgrown with oak tree forest	340m
66.	Zhelezen Izvor site south of Topolovgrad	N42.04878 E26.35264	stream in deciduous forest with exuberant undergrowth	394m
67.	Stream south of the village of Sakartsi	N42.04090 E26.29561	stream with exuberant vegetation between deciduous forest and pastures	343m
68.	Farm yard near the village of Mramor	N42.04054 E26.40451	among the stems and leaves of thistle	190m
69.	Hill by river Pastrogorska north of the village of Pastrogor	N41.88283 E26.20514	deciduous forest	181m
70.	Region of former uranium mine near the village of Orlov Dol	N42.09729 E26.22837	deciduous forest	255m
71.	River Levchanska, on the road from Svilengrad to the village of Dimitrovche	N41.79018 E26.24747	dense longose riverside vegetation along the bank of the river	96m
72.	Under the bridge across the river Tundzha near the village of Knyazhevo	N42.11662 E26.51279	river cove forest by the river	97m
73.	Near the village of Chukurovo	N42.14000 E26.40021	deciduous forest next to a large pasture	185m
74.	Village of Dervishka Mogila	N41.92464 E26.35928	courtyard of tumbledown house	518m
75.	Under the bridge of the river Hantche (river Sinapovska) near the road fork to the village of Orlov Dol	N42.11467 E26.27118	riverside vegetation	193m
76.	Rock massif between the village of Cherepovo and Petolachka site	N42.00878 E26.17192	xerophytic shrubs by the roadside, deciduous oak tree forest with small brook and rocks	495m
77.	1 km east of the village of Kostur	N41.97381 E26.29241	pasture with shrubs, single trees and small rocks	475m
78.	River Sokolitsa southwest of of the village of Orlov Dol	N42.09850 E26.22010	deciduous forest, exuberant grass vegetation in the proximity of a clearing	217m
79.	Mount Vishegrad	N41.99667 E26.32497	deciduous forest	774m
80.	Bridge across the river Golyama Reka in the village of Dripchevo	N41.98171 E26.21328	riverside overgrown with herbaceous hygrophilic vegetation	382m
81.	Mangara site near Mount Vishegrad	N42.00583 E26.28618	deciduous forest	725m

Table 1. Continued

Loc. No.	Localities	GPS coordinates	Habitats	Alt.
82.	Bridge across river Sinapovska ner the village of Chukarovo	N42.15119 E26.39176	sand banks, exuberant riverside vegetation	131m
83.	Branitsa micro dam along the road from the village of Branitsa to the town of Harmanli	N42.00667 E26.06901	micro dam, arable areas, drought resistant shrubs	338m
84.	Rock massif near the village of Cherepovo	N42.01486 E26.15072	rocky gulch, deciduous forest and brook	467m

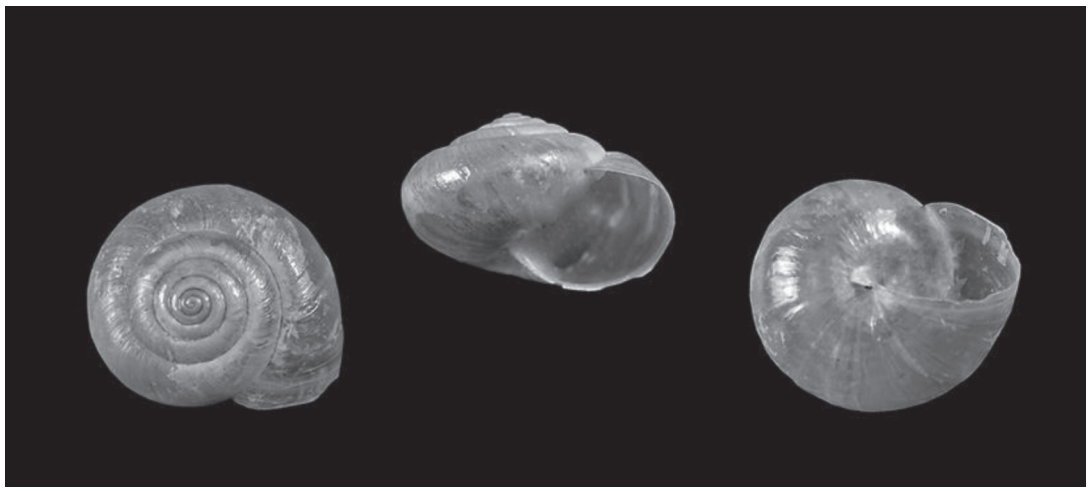

Fig. 2. Deposit of *Monacha liebegottae* Hausdorf, 2000 in Bulgaria: Sakar Mountain, River Tundzha in the proximity of the village of Srem (N42°03`11.0`` E26°28`26.1``, 82 alt.), 28 November 2009, collected by G. Gerdzhikov.

Fig. 3. *Monacha* (*Monacha*) *liebegottae***?** Hausdorf, 2000. Sakar Mountain, in the proximity of the village of Srem. Genital system photographed by B. Nikolov.

Table 2. List of molluscs species, collected during the study, locations of each species, zoogeographic categories and conservation status of the species.

Legend: Abbreviation: new records for the mountains – with an arctiasterisk; Zoogeography: Northern Holartic complex **NH** – Arctic element **A**, Arctic-alpine subelement **Aa**; Siberian faunistic complex **S** – Eurosiatic Palaearctic element **EAP**, Eurosiberian subelement **Esb**, Transpalaearctic subelement **Tr**, Holopalaearctic subelement **Hp**, Holarctic element **H**; European faunistic complex **E** – Mid European element **MidE**; Submediterranean element **SbM**, Holosubmediterranean subelement **HsbM**, Eastsubmediterranean subelement **EsbM**, Euxinian subelement **Eux**; Atlantic element **Atl**, Atlanto-Mediterranean subelement **AtlM**; Steppe-Euroasiatic complex **Eas** – Steppe element **St**, Pontosubmediterranean subelement **PsbMst**; Southwestern Asiatic complex **SWAS** – Subiranian element **SbIr**, Asia Minor subelement **MAs**, Irano-Turanian subelement **IT**; Balkan Endemiks **BE**. **Conservation**: Red List IUCN, (**CR**) Critically Endangered, (**NT**) Near Threatened, (**LC**) Least Concern, but no concrete measures for the conservation of these species, such as, certain species are recommended monitoring and conservation of their habitats, Annex IV of the Bulgarian Biodiversity Act (**A IV**, **BBA**), (**EC**) Habitats Directive (**92/43/ECC**), (**HD92-App. II**, **IV**).

Species/subspecies	Locality	Zoogeographic categories	Conservation status
Class GASTROPODA			
Order Neritopsina			
Family **Neritidae**			
* *Theodoxus fluviatilis* (Linnaeus, 1758)	45	E, MidE	LC
Order Neotaenioglossa			
Family **Pomatiidae**			
Pomatias elegans (O.F. Müller, 1774)	1,2,3,4,5,6,7,8,10,11,12,13,14,45	E, Atl., AtlM	
Order Ectobranchia			
Family **Valvatidae**			
* *Valvata piscinalis* (O.F. Müller, 1774)	10,14,15,26,43	S, EAP, Tr	LC
Order Pulmonata			
Family **Lymnaeidae**			
Galba truncatula (O.F. Müller, 1774)	4,7,33,53,74	S, EAP, Hp	
Radix auricularia (Linnaeus, 1758)	15,26,35,38,45,82	S, EAP, Hp	LC
Family **Physidae**			
Physella acuta (Draparnaud, 1805)	6,8,15,16,19,22,35,38,40,45,52,53,54,82,106	NAic	
Family **Planorbidae**			
* *Planorbarius corneus* (Linnaeus, 1758)	7,14,15,16,38,71	S, EAP, Esb	LC
* *Planorbis planorbis* (Linnaeus, 1758)	7,15,33,38,67,80	S, EAP, Hp	LC
Family **Ancylidae**			
Ancylus fluviatilis (O.F. Müller, 1774)	7,25,33,67,80	E, MidE	LC
Family **Valloniidae**			
Vallonia pulchella (O. F. Müller, 1774)	4,6,16,17,45	S, H	
Family **Cochlicopidae**			
Cochlicopa lubrica (O. F. Müller, 1774)	4,6,18,45	S, H	
Family **Enidae**			
Merdigera obscura (O. F. Müller 1774)	13,18,47	E, MidE	LC
Pseudochondrula seductilis (Rossmässler, 1846)	1,3,6,7,8,9,21,23,24,25,27,28,37	SWAS, SbIr, MAs	LC
Chondrula microtragus (Rossmässler, 1839)	2,3,4,6,8,9,10,14,21,23,24,25,28,31,33,34, 35,36,37,38,39,40,41,42,45,50	SWAS, SbIr, MAs	LC
* *Chondrula tricuspidata* (Küster, 1841)	4,10,16,43,45	SWAS, SbIr, MAs	LC
Eubrephulus bicallosus (L. Pfeiffer, 1847)	3,4,8,9,10,11,18,23,33,34,39,48,66	SWAS, SbIr, MAs	LC
Mastus rossmaessleri (L. Pfeiffer, 1846)	5,8,23,38,39,45,49,50,51,53,54,55,56,57,59	SWAS, SbIr, MAs	LC
* *Mastus carneolus* (Mousson, 1863)	54	SWAS, SbIr, MAs	LC
Zebrina detrita (O. F. Müller, 1774)	1,2,3,6,8,9,10,12,14,23,24,25,38,50,54, 61,62,63,64,65	E, SbM, HsbM	
Zebrina kindermanni (L. Pfeiffer, 1853)	45,50	SWAS, SbIr, MAs	LC
Multidentula ovularis (Olivier, 1801)	6	SWAS, SbIr, MAs	LC
Family **Clausiliidae**			

Table 2. Continued

Species/subspecies	Locality	Zoogeographic categories	Conservation status
* *Cochlodina laminata laminata* (Montagu, 1803)	66	E, MidE	
* *Laciniaria plicata plicata* (Draparnaud, 1801)	4,66,67	E, MidE	
* *Alinda biplicata orientalis* Nordsieck, 2008	40	BE	
* *Bulgarica denticulata thessalonica* (Rossmässler, 1839)	1,5,14,25,28,33,36,45,49,59,67,69	BE	
Family **Succineidae**			
Succinea oblonga Draparnaud, 1801	4,55	S, EAP, Tr	
* *Oxyloma elegans* (Rissso, 1826)	28,38,40,43,45,80	S, EAP, Tr	
Family **Gastrodontidae**			
* *Zonitoides nitidus* (O. F. Müller, 1774)	6,7,14,18,71	S, H	
Family **Zonitidae**			
* *Daudebardia rufa cycladum* Martens, 1889	4,13,66,72	E, SbM, EsbM	
Oxychilus glaber (Westerlund, 1881)	4,10,16,18,24,25,33,34,38,39,40,42,45,53, 54,66,69,71,72,74,75,77,78	E, SbM, EsbM	
Oxychilus inopinatus (Ulicny, 1887)	66	E, SbM, EsbM	
Family **Arionidae**			
Arion subfuscus (Draparnaud ,1805)	79	S, EAP, Esb	
Family **Milacidae**			
Tandonia kusceri (H. Wagner, 1931)	8,16,31,46,74	E, SbM, EsbM	
* *Tandonia budapestensis* (Hazay, 1881)	72	E, SbM, EsbM	
* *Tandonia cristata* (Kaleniczenko, 1851)	45,74	E, SbM, Eux	
Family **Limacidae**			
* *Limax maximus* Linnaeus, 1758	4,77,79,81	E, MidE	
* *Limacus flavus* Linnaeus, 1758	17	E, SbM, Eux	
* *Limacus maculatus* (Kaleniczenko, 1851)	31	E, SbM, Eux	
Family **Agriolimacidae**			
Deroceras turcicum (Simroth, 1894)	8,18,28,38,45,48,51,54,72,74,75,77,78	E, SbM, EsbM	
* *Deroceras thersites* (Simroth, 1886)	4,13,14,45,18,24,25,26,34,39,40,46,48,53, 55,66,75,77,78,79,82,83,	BE	
Family **Helicodontidae**			
Lindholmiola girva (Fivaldsky, 1835)	1,4,5,6,8,9,10,21,24,25,27,28,31,33,34,38, 56,65,66,69,70,73,74,76,77,79,83,84	E, SbM, EsbM	LC
Family **Hygromiidae**			
Xerolenta obvia Menke, 1828	2,3,4,5,7,8,9,10,11,12,13,14,16,17,21,23,2 4,25,26,31,34,36,37,38,45,47,49,50,51,55, 57,58,59,60,61,62,63,64,65,68,71	E, SbM, EsbM	
* *Helicopsis striata* (O. F. Müller, 1774)	50	E, SbM, HsbM	LC
* *Xeropicta krynickii* (Krinicki, 1833)	17	SWAS, SbIr, MAs	
* *Monachoides incarnatus* (O. F. Müller, 1774)	80	E, MidE	LC
* *Cernuella virgata* (Da Costa, 1778)	16,17	E, Atl., AtlM	LC
* *Monacha claustralis* (Menke, 1828)	1,8,12,13,14,15,16,18,27,30,32,35,36,38, 40,44,45,49,50,51,55,59,60,66,68,71,77, 78,80,82,	E, SbM, EsbM	LC
Monacha carascaloides (Bourguignat, 1855)	1,3,10,14,20,24,30,39,49,59,63,69,84	SWAS, SbIr, MAs	LC
* *Monacha ovularis* (Bourguignat, 1855)	14,18,30,45,46,56,60,78,82	SWAS, SbIr, MAs	NT
Euomphalla strigella (Draparnaud, 1801)	77	E, MidE	
Family **Helicidae**			
Helix figulina Rossmässler, 1839	2,3,7,8,9,12,13,23,24,25,27,29,30,38,39, 44,45,49,50,51,58,60,61,62,64,65	SWAS, SbIr, MAs	LC

Table 2. Continued

Species/subspecies	Locality	Zoogeographic categories	Conservation status
Helixl ucorum Lnnaeus, 1758	6,7,8,10,13,14,16,17,21,30,32,40,41,45, 60,78,81	SWAS, SbIr, IT	A IV, BBA
Cepaea vindobonensis (Ferussac, 1821)	8,9,10,13,14,45,16,18,23,41,42,45,50, 75,82	Eas, St, PsbMst	LC
Class BIVALVIA			
Order Eulamellibranchia			
Family **Unionidae**			
Unio crasus Retzius, 1788	7,14,19,40,45,49,75,78,82	E, MidE	CR, EC (HD92-App. II, IV)
* *Unio tumidus* Retzius, 1788	19,40,45	S, EAP, Tr	LC
Unio pictorum (Linnaeus, 1758)	19,45,72	E, MidE	LC
Anodonta cygnaea (Linnaeus, 1758)	7,18,38	S, EAP, Hp	LC
* *Anodonta anatina* (Linnaeus, 1758)	38	S, EAP, Hp	LC
Family **Sphaeriidae**			
Pisidium nitidum Jenyns, 1832	4,8,45	NH, A, Aa	

species of the terrestrial and 11 species of the freshwater snails have the status of nature protected. In accordance with the IUNC criteria a total of 27 species are classified as Least Concern, but there are no available measures for their protection. For some of these species additional research is recommended, as well as monitoring and protection of their habitats. One specie is Critically Endangered and it is included in the Habitats Directive (92/43/ECC), (HD92-App. II, IV), one is Near Threatened, and one more is Included in Annex IV of the Bulgarian Biodiversity Act (Table 2).

Conclusion

Based on the research conducted we consider the malacofauna of Sakar Mountain relatively well studied yet this does not exclude the discovery of some locally distributed species in the future. As a whole the species diversity of Sakar Mountain is not great and this is due to the monotypic habitats and lanfscape characteristics, as well as to the warm and dry climate. The altitude of the mountain is small, open grassland and shribland areas prevail with significantly smaller forest areas. The vegetation is steppe-like, thermophillic and drought resistant. As much as geology is concerned, silicate substrates prevail in the mountain and this limits the presence of a large number of calciphile species of snails and above all species of the family Clausiliidae Gray 1855. Last but not least the climatic conditions are also important and they are characterized as a whole with mild winter and hot summer with long periods of drought; the hydrological resources include small and short brooks, as well as numerous average and small size dams and reservoirs.

As a whole species of the European complex prevail in the terrestrial malacofauna of Sakar which is due to the large number of Submediterranean and more precisely Eastsubmediterranean species. The large number of Eastsubmediterranean species is result of the geographic position and the warm climate with very mild winter. Similar to Strandzha Mountain the presence of only two species of Holosubmediterranean subelement (vide Irikov & Mollov, 2015) supports the belief of these authors that the southeastern part of Bulgaria represents a separate eastern zone with specific characteristics in the Submediterranean region. In the second place there are species of the Southwestern complex where with the exception of one species all other species are of Asia Minor origin which is the result of the geographical proximity of Asia Minor, as well as the similarity of the landscape and the types of habitats in the Middle East. The third, significantly smaller group are the species of the Siberian complex which are polivalent and widespread on the European continent. The Steppe-Asian complex has been represented only by one regional Ponto-submediterranean specie. In contrast to the neighbouring Strandzha Mountain, it is clearly noticeable that the Euxinic species are only few in number (vide Irikov & Mollov, 2015), which is due to the absence of identical forest habitats and specific wetlands. From the point of view of endemism Sakar Mountain cannot be claimed to be a form-generating region, it is more a region in which the European euribiont combines with the Asia Minor drought resistant malacofauna.

In the freshwater malacofauna of Sakar Mountain prevail snails from the Siberian complex and above all from the European-Asian Palearctic element and the Holo-palearctic subelement which is explicable bearing in mind their euribiontics. It is disturbing that an invasive component, *Physella acuta* (Draparnaud, 1805) has been identified, as it is of North American origin.

Ecologically the malacofauna of Sakat Mountain comprises mainly thermophillic and drought resistant species which is due to the xerothermic nature of the mountain. The latter determines the presence of more species of the family Enidae Woodward, 1903. The presence of relatively quite numerous freshwater snails and clams is due to the numerous micro dams and irrigation facilities rather than to the wealth of the natural water resources.

The principal threats for the malacofauna in the mountain are the frequent and long summer droughts, accompanied by numerous conflagrations, as well as the extermination of habitats and the deforestation.

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Мекотели (Mollusca) (сухоземни и сладководни гастроподи и миди) от Сакар планина (България)

Атанас Ириков, Георги Герджиков

(Резюме)

За първи път в настоящата статия се представя пълен преглед на сухоземната малакофауна на Сакар планина (Югоизточна България), на базата на досега публикувани данни и нови изследвания. В резултат на изследването са установени общо 59 вида и подвида мекотели, от които 45 са сухоземни и 14 сладководни, принадлежащи към 22 семейства. В статията са включени всички известни до сега таксони, както и 27 нови вида и подвида и много нови находища. За първи път е направен зоогеографски и консервационен анализ на наличната малакофауна. Статията е с обзорен характер и заедно с новите данни представлява добра основа, върху която да бъдат надграждани резултатите от бъдещи изследвания.