

DIVERSITY OF SNAILS AND SLUGS (Mollusca, Gastropoda) IN PRESPA NATIONAL PARK (ALBANIA)

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1. Introduction

The molluscs are group of high conservation value, because of their low mobility, respectively high portion of endemics and a large proportion of relict and endangered species. They often have limited distribution and easy vulnerability to change of the local condition and/or habitat destruction.

2. Methodology

2.1. Sampling methods

The molluscs were collected by hand and with soil sifting in all present type of habitats.

2.2. Determination of species and their distribution areals

The main sources used for determination of the molluscs are: Damjanov & Likharev (1975), Wiktor (1996), Kerney & Cameron (1996), Schultes (2012),

3. Investigated area

A number of localities were visited during the research of mollusc fauna of Prespa National Park, Albania. All of the localities are summarized in Tab. 1.

Table 1. Investigated *localities* for the mollusc fauna of Prespa National Park, Albania

№	Localities	Coordinates	Alt. (m)	Habitats
1.	Great Prespa lake shore southern of vill. Tuminec (= Kallamasi)	N40°53'31.0" E020°56'22.5"	856	limestone rocks with bushes (Pruno webbii–Juniperetum excelsae)
2.	Great Prespa lake shore,	N40°52'19.3" E020°55'33.8"	855	limestone rocks with bushes
3.	Albania, vill. Gorna Gorica (=Gorica e Madhe), near church	no point	no	open terrain
4.	Galichitsa Mts., near Macedonian border, southern of border-crossing „Subotino“	N40°54'35.6" E020°53'42.2"	975	limestone meadow between forests of Quercus frainetto and Quercus cerris
5.	Galichitsa Mts.	N40°53'53.1" E020°51'53.2"	1311	Festuco heterophyllae-Fagetum, log
6.	Galichitsa Mts., “Pikina Voda” area	N40°54'20.0" E020°51'15.0"	1565	limestone meadow with single bushes and trees
7.	Galichitsa Mts., “The tower of the war” area	N40°54'44.0" E020°50'59.3"	1736	alpine limestone meadow
8.	Galichitsa Mts.	N40°54'38.5" E020°50'51.9"	1731	Fagus forest
9.	The yard of Administration of National park „Prespa”	N40°52'54.6" E020°55'14.8"	866	meadow
10.	Lesser Prespa lake, near vill Tren, in front of the cave „Shpela e Trenit“	N40°40'20.0" E020°59'12.7"	856	rocks
11.	Lesser Prespa lake, „Shuec” area	N40°41'05.0" E020°59'54.3"	863	Buxus sempervirens on limestone rock-base
12.	Lesser Prespa lake, „Rakicko” area	N40°43'28.3" E020°58'36.5"	1109	limestone pasture with single bushes
13.	Great Prespa lake shore, vill. Globočani (=Gollomboc)	N40°51'26.9" E020°56'34.5"	865	limestone rocks
14.	Great Prespa lake shore, near vill. Zrnosko (=Zaroshka), Ralnik area	N40°46'00.5" E020°55'39.8"	868	Buxus sempervirens shrubland (highly degraded and modified Querco-Carpinetum orientalis forest) on limestone rocks
15.	Great Prespa lake shore, near church of St. Tanas, NE of vill. Pustec (=Liqenas)	N40°47'30.8" E020°54'48.4"	868	Morus tree, limestone rocks
16.	Great Prespa lake shore, near vill. Globočani (Gollomboc)	N40°51'33.6" E020°56'57.4"	855	limestone rocks
17.	Great Prespa lake shore, near	N40.89425	857	meadows

No	Localities	Coordinates	Alt. (m)	Habitats
18.	vill. Tuminec (= Kallamasi) Lesser Prespa lake, near vill Zagradets	E20.93737 N40°40'36.2" E021°00'14.0"	866	limestone rocks, Buxus
19.	up to Great Prespa lake, near vill. Cerje	N40°45'08.4" E020°56'36.3"	1126	limestone rocky meadows, Quercus trojana
20.	Galichitsa Mts., Plaja e Pusit peak	N40°52'47.6" E020°50'30.8"	2204	limestone rocks near patch of snow
21.	Galichitsa Mts., Plaja e Pusit peak	N40°52'55.9" E020°50'27.2"	2269	limestone rocks near patch of snow
22.	Great Prespa lake shore, up to vill. Globočani (=Gollomboc)	N40.85231° E020.94718°	918	Quercus trojanae-Carpinethum orientalae, limestone rocks base
23.	Great Prespa lake shore, up to vill. Globočani (=Gollomboc)	N40.84560° E020.94928°	1035	limestone rocky meadows
24.	Galichitsa Mts., "The tower of the war" area	N40.91389° E020.84337°	1814	alpine limestone meadow
25.	Galichitsa Mts., "The tower of the war" area	N40.91360° E020.84195°	1830	alpine limestone meadow and rocky slopes
26.	Great Prespa lake shore, rocky church near Mostets	N40.84197° E020.96154°	870	limestone rocks
27.	Great Prespa lake shore, island "Mal Grad"	N40.79158° E020.93314°	859	limestone rocks, bushes
28.	Great Prespa lake shore, rocky church near Dlaboko, church "St. Marena"	N40.88691° E020.97272°	853	limestone rocks

4. Results

4.1. Species diversity

In total, 56 mollusc species were recorded in Prespa National Park (Albania): 32 terrestrial snails, 9 slugs, 13 freshwater snails and 2 mussel species (Tab. 2).

Table 2. *Alphabetic list of the molluscs in National park "Prespa Lake", Albania. The number of localities corresponded with Tab. 1*

No.	SPECIES	LOCALITIES	COMMENTS
Terrestrial snails			
1	<i>Alinda biplicata distincta</i> (Sturany, 1894)	1, 2, 7, 10, 14, 15, 16, 18, 27, 28, 29	
2	<i>Candidula rhabdotoides</i> (Wagner, 1928)	1, 7, 11, 12, 14, 18, 20, 25, 27, 28, 29	

No.	SPECIES	LOCALITIES	COMMENTS
3	<i>Cecilioides janii</i> (De Betta and Martinati, 1855)	14	new for Albania
4	<i>Cecilioides tumulorum</i> (Bourguignat, 1856)	14, 28	
5	<i>Cerneuella</i> cf. <i>virgata</i> (Mendes da Costa, 1778)	14	
6	<i>Chondrina arcadica</i> (Reinhardt, 1881)	1, 2, 14, 16	
7	<i>Chondrula macedonica</i> Wagner, 1914	1, 7, 11, 12, 20, 25, 26, 27, 29	
8	<i>Chondrula</i> cf. <i>microtragus</i> (Rossmassler, 1839)	1, 6, 11, 12, 14, 18, 27, 28	
9	<i>Chondrula</i> cf. <i>tridens</i> (Müller, 1774)	2, 11, 14, 24, 29	
10	<i>Helix lucorum</i> Linnaeus, 1758	2, 3, 4, 6, 9, 10, 11, 12, 13, 24	
11	<i>Helix philibinensis</i> Rossmässler, 1839	1, 2, 6, 11, 14, 15	
12	<i>Helix secernenda</i> Rossmässler, 1847	7, 21, 26	
13	<i>Jaminia quadridens</i> (Müller, 1774)	2, 16	
14	<i>Lauria cylindracea</i> (da Costa, 1778)	14, 16	
15	<i>Lindholmiolla corcyrensis</i> (Deshayes, 1839)	4, 7, 11, 12, 14, 18, 19, 23, 25, 26	
16	<i>Merdigera obscura</i> (Müller, 1774)	5, 13	
17	<i>Monacha</i> sp.	7, 17, 23, 26	
18	<i>Montenegrina</i> sp.	1, 7, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20, 21, 23, 25, 26, 27, 28, 29	
19	<i>Oligolimax</i> sp.	16	
20	<i>Orcula wagneri wagneri</i> Sturany, 1914	22, 25, 26	
21	<i>Oxychilus</i> sp.	1, 2, 10, 13, 14	
22	<i>Pyramidula cephalonica</i> (Westerlund, 1898)	16	
23	<i>Pyramidula pusilla</i> Gittenberger and Bank, 1996	14, 16, 28	
24	<i>Strigilodelima conspersa</i> (L. Pfeiffer, 1848)	14, 15	
25	<i>Truncatellina cylindrica</i> (Ferussac, 1807)	14, 16	
26	<i>Truncatellina rothi</i> (Reinhardt, 1916)	14, 16	
27	<i>Xerolenta obvia</i> (Menke, 1828)	1, 4, 6, 17, 21	
28	<i>Vitrea</i> af. <i>botterii</i> (L. Pfeiffer, 1853)	7, 14, 29	
29	<i>Vitrea</i> sp.	16, 21	
30	Vitrinidae, af. <i>Semilimacella</i> sp.	14	
31	Vitrinidae, af. <i>Vitrina</i> sp.	6, 7, 16, 20, 21, 22, 26	
32	<i>Zebrina detrita</i> (Müller, 1774)	1, 6, 11, 12, 14, 15, 24, 27	

Slugs

No.	SPECIES	LOCALITIES	COMMENTS
33	<i>Deroceas</i> sp. (Müller, 1774)	7	
34	<i>Lehmannia</i> cf. <i>brunneri</i> (Wagner 1931)	5, 13	
35	<i>Limacus</i> cf. <i>flavus</i> (Linnaeus, 1758)	13	
36	<i>Limax</i> cf. <i>conemenosi</i> Böttger, 1882	13	
37	<i>Limax</i> cf. <i>corcyrensis</i> (Simroth, 1905)	13	
38	<i>Limax</i> cf. <i>graecus</i> Simroth, 1889	7	
39	<i>Limax</i> cf. <i>maximus</i> Linnaeus, 1758 complex	8	
40	<i>Tandonia</i> <i>macedonica</i> (Rähle, 1974)	7, 8?	
41	<i>Tandonia</i> cf. <i>serbica</i> (Wagner, 1931)	9	
Freshwater snails			
42	<i>Bithynia</i> <i>prespensis</i> Hadžišće, 1963	1	
43	<i>Gyraulus</i> <i>albus</i> (Müller, 1774) - new for Prespa lake!	1	New for Prespa lake
44	<i>Gyraulus</i> (<i>Carinogyraulus</i>) <i>stankovici</i> Hadzisce, 1955	16	
45	<i>Lymnaea</i> <i>stagnalis</i> (Linnaeus, 1758)	1, 10, 16	
46	<i>Planorbarius</i> <i>arabatzis</i> Reischutz, Reischutz & Fischer 2008	1, 16	New for Albania
47	<i>Planorbarius</i> <i>corneus</i> (Linnaeus, 1758)	1, 10, 16	
48	<i>Planorbis</i> <i>planorbis</i> (Linnaeus, 1758)	1	
49	<i>Planorbis</i> <i>presbensis</i> Sturany, 1894	16, 29	
50	<i>Prespolitorea</i> af. <i>valvataeformis</i> Radoman 1973	14	
51	<i>Radix</i> <i>auricularia</i> (Linnaeus, 1758)	1, 10, 16	
52	<i>Stagnicola</i> <i>corvus</i> (Gmelin, 1791)	1	
53	<i>Valvata</i> <i>piscinalis</i> (O. F. Müller, 1774)	1	
54	<i>Valvata</i> <i>stenotrema</i> Polinski, 1929	1, 16	New for Albania and Prespa lake
Mussels			
55	<i>Dreissena</i> <i>presbensis</i> Kobelt, 1915	1, 16	
56	Shaeriidae	28	

4.2. Important species

The information on the important mollusc species is given in Tab. 3 and Fig. 1. In total, 23 species can be considered as endemic, 9 are relict species, 9 species are threatened according to the European red list of threatened snails and one species has significant economic importance.

Table 3. Importance of the mollusks in National park “Prespa lake”, Albania. Abbreviation: **endemic:** BL – Balkan endemics, WBL – Western Balkan endemics, GL – Galichitsa Mts. endemics, OPL – Ohrid-Prespa lakes endemics; **protected:** IUCN – included in “The IUCN Red List of Threatened Species” (Europe) as LC – least concern, VU – vulnerable, NT – near threatened; EN - endangered, CR - critically endangered; **relicts** – RL – relict species

No.	SPECIES	ENDEMICS	RELICTS	PROTECTED	ECONOMIC IMPORTANCE
	Terrestrial snails	BL-4, WBL-6	RL-1	LC-14, NT-2	
	<i>A. biplicata distincta</i>	WBL		--	
	<i>C. rhabdotoides</i>	BL		IUSN - LC	
	<i>C. janii</i>	--		--	
	<i>C. tumulorum</i>	--		--	
	<i>C. cf. virgata</i>	--		IUSN - LC	
	<i>Ch. arcadica</i>	--		IUSN - LC	
	<i>Ch. macedonica</i>	BL		IUSN - LC	
	<i>Ch. cf. microtragus</i>	BL		IUSN - LC	
	<i>Ch. cf. tridens</i>	--		IUSN - NT	
	<i>H. lucorum</i>	--		IUSN - LC	YES
	<i>H. philibinensis</i>	BL		IUSN - LC	
	<i>H. secernenda</i>	WBL		IUSN - LC	
	<i>J. quadridens</i>	--		IUSN - LC	
	<i>L. cylindracea</i>	--	RL	--	
	<i>L. corcyrensis</i>	WBL		IUSN - LC	
	<i>M. obscura</i>	--		IUSN - LC	
	<i>Monacha sp.</i>	--		--	
	<i>Montenegrina sp.</i>	--		--	
	<i>Oligolimax sp.</i>	--		--	
	<i>O. wagneri</i>	WBL		IUSN - NT	
	<i>Oxychilus sp.</i>	--		--	
	<i>P. cephalonica</i>	WBL		--	
	<i>P. pusilla</i>	--		--	
	<i>S. conspersa</i>	WBL		--	
	<i>T. cylindrica</i>	--		IUSN - LC	
	<i>T. rothi</i>	--		IUSN - LC	
	<i>X. obvia</i>	--		IUSN - LC	
	<i>V. cf. botterii</i>	--		--	
	<i>Vitrea sp.</i>	--		--	

<i>af. Semilimacella sp.</i>	--		--
<i>af. Vitrina sp.</i>	--		--
<i>Z. detrita</i>	--		--
Slugs	BL – 4, WBL – 1, GL - 1		--
<i>Deroceras sp.</i>	--		--
<i>L. cf. brunneri</i>	BL		--
<i>L. cf. flavus</i>	--		--
<i>L. cf. conemenosi</i>	BL		--
<i>L. cf. corcyrensis</i>	WBL		--
<i>L. cf. graecus</i>	BL		--
<i>L. cf. maximus</i>	--		--
<i>T. macedonica</i>	GL		--
<i>T. cf. serbica</i>	BL		--
Freshwater snails	OPL - 6	RL-6	LC-6, VU-2, NT-1, EN-2, CR- 1
<i>B. prespensis</i>	OPL	RL	IUSN - EN
<i>G. albus</i>	--		IUSN - VU
<i>G. stankovici</i>	OPL	RL	IUSN - EN
<i>L. stagnalis</i>	--		IUSN - LC
<i>P. corneus arabatzis</i>	OPL	RL	--
<i>P. corneus</i>	--		IUSN - LC
<i>P. planorbis</i>	--		IUSN - LC
<i>P. presbensis</i>	OPL	RL	IUSN - VU
<i>P. af. valvataeformis</i>	OPL	RL	IUSN - CR
<i>R. auricularia</i>	--		IUSN - LC
<i>S. corvus</i>	--		IUSN - LC
<i>V. piscinalis</i>	--		IUSN - LC
<i>V. stenotrema</i>	OPL	RL	IUSN - NT
Mussels	OPL - 1	RL-1	NT - 1
<i>D. presbensis</i>	OPL	RL	IUSN - NT
<i>Sphaeriidae</i>	--		--
TOTAL	BL – 8, WBL – 7, GL – 1, OPL - 7	RL-9	LC-20, VU-2, NT-4, EN-2, CR- 1

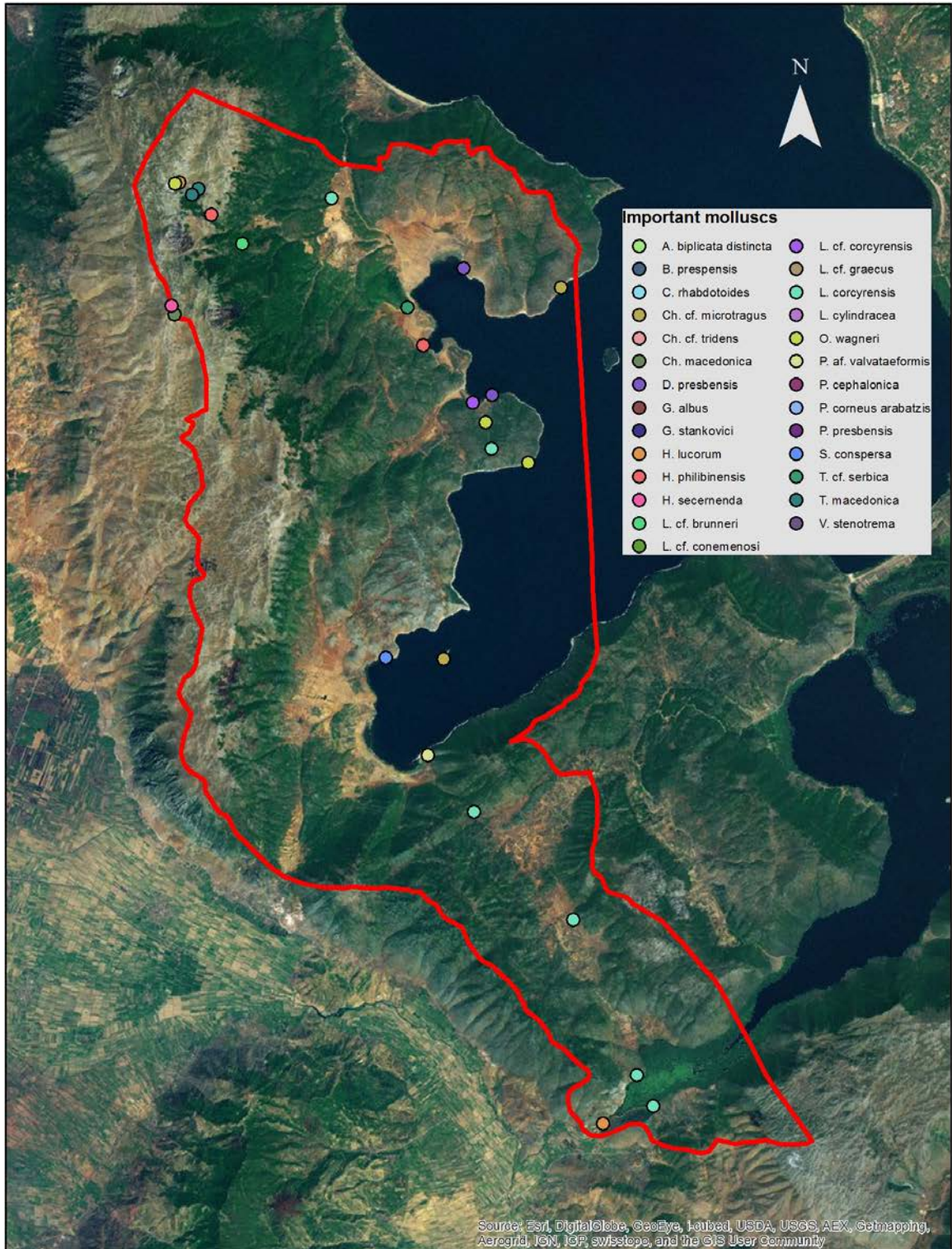


Figure 1. *Distribution of the important mollusc species in Prespa National Park (Albania).*

4.3 Important localities for the investigated group

According to the biodiversity of the terrestrial snails, the richest localities are № 14¹ (20 species), № 1 (10 species) and № 7 (9 species). Localities in which were found terrestrial gastropod species with high conservation value (endemics, IUSN species, relicts) are: № 1, 2, 7, 10, 11, 12, 14, 15, 16, 18, 20, 24, 25, 26, 27, 28 and 29. The richest localities in species with high conservation value are: № 14 - 6 species, № 1 - 5 species, № 11 - 4 species, № 2, 7, 12, 18, 27, 28, 29 - 3 species. For the slugs the richest localities are № 13 - 4 species, № 7 - 3 species and № 8 - 2 species.

So far the results that the unique localities for some of terrestrial gastropods' species are: locality № 14 for the species: *C. janii*, *C. cf. virgata* and *Semilimacella* sp.; № 16: *Oligolimax* sp. and *P. cephalonica*; № 7: *Deroceras* sp. and *L. cf. graecus*; № 8 : *L. cf. maximus*; № 9: *T. cf. serbica*; № 13: *L. cf. flavus*, *L. cf. conemenosi* and *L. cf. corcyrensis*.

The freshwater molluscs were found in soil samples near the shores of Lake Prespa or collected manually in coastal sediments, they were not applied with specific hydrobiological methods for collection. In this regard, the analysis of their biodiversity can serve only as an indirect measure of the habitats.

According to the biodiversity of the freshwater molluscs, the richest localities are: № 1 (11 species) and № 16 (8 species). Localities in which were found important species of freshwater molusks (endemics, IUSN species, relicts), are: 1, 10, 16 , 28 and 29.

So far the results that the unique localities for some of terrestrial gastropods' species are: № 1 for the species *B. prespensis*, *G. albus*, *P. planorbis*, *S. corvus* and *V. piscinalis*; № 14: *P. af. valvataeformis*; № 16: *G. stankovici* and № 28: Shaeriidae.

According summarizing result the most important localities are:

- № 1 (southern of vill. Tuminec = Kallamasi) - one of the richest in terrestrial and freshwater species locality, an important locality for value species (see Tab. 3) and only locality for 5 species of freshwater molluscs;
- № 7 (Galichitsa Mts., "The tower of the war" area) - one of the richest in terrestrial species locality, an important locality for value species (see Tab. 3) and only locality for 2 species of terrestrial snails.
- № 13 (vill. Globočani = Gollomboc) - one of the richest in slugs locality and only locality for 3 species of them.
- № 14 (Ralnik area near vill. Zrnosko = Zaroshka) - the richest in terrestrial snail locality, an important locality for value species (see Tab. 3) and only locality for 3 species of terrestrial snails.

1 The numbers of the localities corespond with the numbers in Tab. 1.

To this list we can add the locality № 16, which is the only locality for some species with high conservation value (see Tab. 2 and 3).

The species of economic importance *H. lucorum* was found in localities 2, 3, 4, 6, 9, 10, 11, 12, 13 and 24.

4.4. Important habitats for the investigated group

The most important habitats for terrestrial gastropods and slugs are:

- limestone rocky habitats near the shore of Prespa lake (with or without grasses, bushes, and single trees);
- alpine meadows and pastures on limestone base;
- alpine limestone rocks.

5. Threats

The area of Lake Prespa in the National Park "Prespa" in Albania is less populated and non-intensive exploited. Potential threats to biodiversity of the terrestrial gastropods could be intensive building in region Prespa lake shore, extraction of inert materials near the lake and pollution of habitats. For freshwater molluscs the main risk is pollution of the lake with wastewater, fertilizers, etc. other from surrounding villages.

6. Recommendations

Primary method for protection of invertebrates is the protection of their habitats. The uniqueness of the region around Lake Prespa and as a refuge of many relict species and reservoir of many species of high conservation value suggest that this region must be placed under protection. Of special interest for molluscs are the calcareous rocky habitats around the lake as well as alpine grasslands on carbonate base and limestone rocks in the height parts of Galichitsa Mauntais. The mollusks are group of high conservation value, because of their low mobility, respectively high portion of endemics and a large proportion of relict and endangered species. They often have limited distribution and easy vulnerability to change of the local condition and/or habitat destruction. We would like to recommend a more extended targeted research in the area of Prespa and Ohrid Lake and the surrounding mountains, as well as protection of the specific habitats of molluscs – mainly rocky limestone areas.

7. References

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