



MALACOFAUNA OF SELECTED PROTECTED LANDSCAPE AREAS IN BOHEMIA (CZECH REPUBLIC)*

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Molluscan diversity in selected Protected Landscape Areas (PLA) of Bohemia (Czech Republic) was monitored. For the study, the small-scale PLAs of the Slavkovský Les, the Blanský Les, and the Labské Pískovce were selected. Over 12 500 specimens in total representing 62 mollusc species were found within 2012–2013 by means of hand collecting and sieving the litter layer. To evaluate similarity among the localities, the Jaccard and Sørensen's indices were calculated. The significance of such data is mainly in their presentation in the available resources such as peer-reviewed scientific journals.

molluscs; protected areas; PLA; biodiversity; national nature reserve; Natura 2000



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INTRODUCTION

Recently, biodiversity has been understood as one of the most important resources coming from the ecosystems. Nowadays biodiversity issues have become a global problem. The European Commission found that the Natura 2000 network plays a key role in significant reduction of biodiversity losses in addressing the 2020 target (Kruk et al., 2010).

The molluscs represent one of important invertebrate groups in terrestrial as well as in aquatic ecosystems. Many authors have considered the molluscs as being a suitable group of invertebrates for examining the patterns and the distribution of terrestrial biotic diversity (Ložek, 2005). Because of their dependence on soil, vegetation and ecological characteristics of their environment often serve many authors as site quality bioindicators. The molluscs are frequently used also in toxicological studies (Killeen, 1998; Kienast et al., 2011; Gerlach et al., 2013; Ramirez, 2013). Their limited ability to migrate also means that the distribution of individual species reflects past local events; on the model group of molluscs the changes in local environment over long timespans are illustrated (Ložek, 1982, 1993, 2001; Gerlach et al., 2013). Moreover, of the non-marine molluscs on the recent

IUCN Red List, 20% (i.e. 1233) species have been registered at the European level (Cuttelod et al., 2011). Out of the total number of 249 species in the Czech Republic, over 50% have recently been on the Red List (Beran et al., 2005).

Despite all given arguments, there is a lack of reviewed faunistic studies in Europe (Opermanis et al., 2014). Moreover, available scientific literature does not address faunistic studies not only to molluscan fauna and it is quite difficult to find basic information about diversity and distribution in protected landscape areas. The management of protected areas in most European countries includes monitoring and periodic review of conservation objectives, usually at a frequency of at least once a decade (Kruk et al., 2010). A small part of these surveys also concerns molluscan fauna; however, the published faunistic information is very fragmented among different journals, often published in non-reviewed journals or elsewhere and therefore not well tracked. The biodiversity data are a very important tool for biodiversity assessment. The availability of data on biodiversity remains a significant constraint on conservation planning, over time some species may be lost from a site, others may be discovered or either could be new colonizers not previously recorded (Gaston et al., 2008).

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MATERIAL AND METHODS

Study sites

The data were collected during a four-year period (2010–2013). All GPS coordinates are given in WGS84 format.

Slavkovský Les PLA (GPS: 50°04'N, 12°45'E)

Slavkovský Les is a protected landscape area (PLA) of upland green vegetation very little influenced by man. A large part of the south-western forests of the Slavkovský Les is formed by vast raised bogs covered by Swiss mountain pine, immature birch, and typical bog species. Large forest complexes together with bogs represent an enormous natural water reserve that positively influences the water regime of the vast surrounding areas. For its great variety of natural localities and numerous plant and animal species, the Slavkovský Les PLA has also been included in the Natura 2000 System of Sites of Community Importance. The PLA is a home for a whole range of orchids and other rare and protected flora and some endemic species. Local fauna includes some rare and endangered species, too.

Kladská Peat Bogs NNR (GPS: 50°01'N, 12°40'E) is a national nature reserve (NNR) formed of five separate peat bogs with an important water accumulation function. Several selected forest areas have been left to natural development processes, without human intervention. The majority of the raised bog area is covered with bog pines of a primeval character with the dominant Swiss mountain pine (*Pinus rotundata* L.) on wet Gleysols. In the extensive and inaccessible areas of the Kladská Peat Bogs, characteristic plant and animal communities with many rare and endangered species can be found. For example, there are large populations of beetles (Coleoptera), common butterflies (Lepidoptera), the damp environment attracts certain amphibians and reptiles and several rare and endangered bird species.

Blanský Les PLA (GPS: 48°54'N, 14°17'E)

This PLA was established in 1990 in South Bohemia and covers an area of 222 km². The area is characterized mostly as forested upland. The lowest elevation is 422 m in the Vltava canyon and the highest elevation (1083 m) is the peak of Mt. Klet.

The entire PLA is of a great natural value, due to the variety of geological bedrock in the area. The area is characterized by a relatively low precipitation level and warmer climate. The geological and climatic factors support the occurrence and composition of species which are close to their natural state. Both the forest and non-forest vegetation is very valuable and fauna is represented by a large number of rare and

endangered insect and mollusc species occurring on limestones. The Blanský Les PLA is in the national list of sites of Natura 2000.

Brouskův Mlýn NNR (GPS: 48°52'N, 14°41'E) covers an area of 138.20 ha with elevations of 455–466 m. The protected area lies in South Bohemia close to the village of Třebeč. The NNR lies on fluvial sediments (Quaternary sands and gravels) in a mildly warm climatic zone. The subject of the protection is an extensive complex of valuable aquatic, wetland, and meadow vegetation communities with the occurrence of many rare and endangered plant species. The area provides nesting and feeding biotopes for wetland birds as well as abundant populations of amphibians, molluscs, and wetland insects. Brouskův Mlýn NNR is a part of the proposed Stropnice Site of Community Importance. The territory is inhabited by a very rich population of dragonflies, hygrophilous species of beetles, flies, and spiders.

Rovná NNM (GPS: 49°17'N, 13°56'E) covers an area of 216 ha and protects a damp meadow which lies on the north-west bank of the Rovenský rybník Fishpond. The meadow lies at 416–418 m a.s.l. The bedrock is covered with clay or gravel sand, sandy clay loams, and alluvial clay and fluvial sediments. The present soiltype are Gleysols. The subject of protection are mesophilous (*Arrhenatherion* alliance) and mesohygrophilous meadow communities with many species of rare and endangered plants as well as the specific meadow insect fauna. The rescue programme is aimed at suitable management interventions strengthening the population of spring gentian – extensive grazing, grass cutting, breaking up the turf, raking up and removing leaves and old plant matter, removal of competitive non-indigenous plant species and flooding the territory to improve its hydrological conditions, or even watering the individual plants. The meadow is home to common hygrophyte animal species but also to certain beetle species which are characteristic for drier, short-stemmed meadows (e.g. the European chinch bug (*Ischnodemus sabuleti* F.) and some rare representatives of the Diptera).

Terčino Údolí NNM (GPS: 48°47'N, 14°45'E) is situated at 490–550 m a.s.l. and covers an area of 138.3 ha. The territory lies in South Bohemia, in a mildly warm climatic region between the Novohradské hory Mts. and the Třeboň Basin. The NNM represents an early landscape gardening of the most important historical parks in the Czech Republic. In addition to the landscaping value, there were found populations of protected plants (also of great botanical value) and animals of regional significance. The forest stands in the NNM are almost entirely cultural in origin, which means that they were heavily influenced by man. From the native trees oak (*Quercus*) dominates here, other species include white pine (*Pinus strobus* L.) and Douglas trees (*Pseudotsuga*). Severely endangered hermit beetles, rare leaf and rove beetles, and several

rare and endangered bird species were found in the monument.

Labské Pískovce PLA (GPS: 50°50'N, 14°18'E)

Labské Pískovce is located in the Ústí nad Labem region and covers an area of 24 300 ha. It was declared in 1972 to protect the landscape values, its appearance, typical characteristics and natural resources. The PLA forms the most extensive region of block sandstone in Central Europe. The significance of the Elbe sandstones PLA is underlined by its inclusion in the Natura 2000 system of European Union protected areas. It covers an area of several protected bird species and an area of selected protected habitats, plants, and animal species.

Boží Dar Peat Bogs NNR (GPS: 50°24'N, 12°54'E) in the Karlovy Vary region was declared a reserve on an area of 929.57 ha with elevations of 954–1115 m a.s.l. The subject of the protection is a complex of slope and watershed peat bogs on talus resurgences of underground water as well as mountain peaty meadows which merge into heathlands. The predominant forest communities are the natural climax spruce forests and waterlogged spruce stands. The characteristic vegetation cover on the forest-free areas are the communities of mountain raised bog and peaty meadows. The vertebrate fauna includes significant bird species, strong populations of adder (*Vipera berus* L.), and viviparous lizard (*Zootoca vivipara* L.). The invertebrate fauna includes namely ground beetles (Coleoptera) and butterflies (Lepidoptera).

Novodomské Peat Bogs NNR (GPS: 50°32'N, 13°15'E), situated NW of the town of Chomutov on a total area of 575 ha with elevations of 810–830 m a.s.l., was declared in 1967. The subject of protection is a watershed peat bog complex with powerful springs of underground water. A range of typical flora and fauna are bound to these biotopes. Typical peat land species in the undergrowth include e.g. labrador tea (*Ledum palustre* L.), dwarf birch (*Betula nana* L.) or marsh andromeda (*Andromeda polifolia* L.). The fauna includes typical mountain forest species and several significant bird and invertebrate species.

Jezerka NNR (GPS: 50°32'N, 13°28'E) was declared in 1969 on a territory of 136 ha. The reserve lies in the district of Chomutov and Most on the valley slopes at elevations between 342 and 706 metres. The subject of protection are the preserved mixed forest growths with predominating approximately 250 years old beech stands and one of the highest oak communities in the Czech Republic. Flora and fauna include specially protected plant species as well as significant animal species including amphibians, many birds or bats. The invertebrate fauna is also significant, 19 forest mollusc species have been recorded. The territory is negatively influenced by the presence of a large

open-cast brown coal mine which lies at the distance of 50 m from the NNR border.

Methods of collecting

Terrestrial species of molluscs were collected based on L o ž e k 's (1956) method of direct hand picking; in the case of clearly determinable species these were only counted and left at the site. Species that required a more precise determination were killed in soda water, preserved in ethanol, and laboratorily analyzed. While browsing the site, we tried to cover all types of habitats within the site with special attention to shady and moist sites, rocks and dead wood. Besides hand collecting, the samples of leaves, litter, and tick top soil layer were collected using a special entomological sieve (mesh size 1 cm²). The collected completely dried materials and shells were studied under a magnifying glass in the laboratory.

The collection and classification of aquatic species was based on the method by B e r a n (2002). Aquatic specimens were collected using a metal sieve with a diameter of 25 cm (mesh size 0.5 × 0.5 mm) by washing out the bottom substrate and also the submerged and other aquatic vegetation. Additionally, samples of objects submerged in water (litter, rocks, wood) were directly collected.

Similarity evaluation

For comparing the species diversity among sites, similarity indices were calculated. We used Jaccard's and Sørensen's indices in standard commonly used forms:

$$Ja = \frac{S_{AB}}{S_A + S_B - S_{AB}} \quad \text{and} \quad Sö = \frac{2S_{AB}}{S_A + S_B}$$

where:

Ja = Jaccard index value

$Sö$ = Sørensen index value

S_{AB} = number of species positive for both localities

$S_{A(B)}$ = number of species positive for locality A or B

RESULTS

Altogether over 12 500 molluscs (data not presented) belonging to 62 species were collected during a two-year period (2012–2013) and assessed following the determination keys by L o ž e k (1956) and H o r š á k et al. (2010), the division into ecogroups followed L i s i c k ý (1991) (Tables 2, 3).

To interpret the results better, the analyzed localities (Table 1) were divided into two groups of peat lands and grassy localities.

The results of mollusc occurrence for peat lands are shown in Table 2. In peat land localities altogether

Table 1. Summary of studied locations

Locality	GPS (WGS84)	Number
Rovná NNM	49°17'N, 13°56'E	1
Terčino Údolí NNM	48°47'N, 14°45'E	2
Brouskův Mlýn NNR	48°52'N, 14°41'E	3
Boží Dar Peat Bogs NNR	50°24'N, 12°54'E	4
Kladská Peat Bogs NNR	50°01'N, 12°40'E	5
Novodomské Peat Bogs NNR	50°32'N, 13°15'E	6
Jezerka NNR	50°32'N, 13°28'E	7

NNM = national nature monument, NNR = national nature reserve

over 500 individuals of 21 mollusc species were found. Out of this number, 5 species (23.8%) are included in the Red List of threatened invertebrates of the Czech Republic (Beran et al., 2005).

The results for mollusc occurrence in the second group of localities represented by meadow, wetland, and beech forest are shown in Table 3.

At grassy localities altogether ca. 12 000 individuals of 57 mollusc species were collected and analyzed. Out of this number, seven species (11.3%) are treated based on the Red List of threatened invertebrates of the Czech Republic (Beran et al., 2005). Moreover, ten species (16.13%) are classified as 'near treatment' species.

Similarity indices

To evaluate similarity among all localities, the Jaccard's and Sørensen's indices were calculated (Table 4). The highest similarity was found between localities No. 1 and 3 (indices values $Ja = 60.6\%$; $S\ddot{o} = 43.5\%$).

Table 2. Occurrence of mollusc species in peat land localities

Ecogroup*	Species	Treat level**	Locality number		
			4	5	6
10 RV(SG)	<i>Anodonta cygnea</i> (Linnaeus, 1758)	VU		X	
7 MS	<i>Arion fasciatus</i> (Nilsson, 1823)	LC			X
3 Sli	<i>Arion fuscus</i> (O.F. Müller, 1774)	LC	X	X	X
2 SI(MS)	<i>Arion rufus</i> (Linnaeus, 1758)	LC			X
1 SI	<i>Arion silvaticus</i> Lohmander, 1937	LC			X
7 MS	<i>Cochlicopa lubrica</i> (O.F. Müller, 1774)	LC	X		X
3 SIh	<i>Deroceras praecox</i> Wiktor, 1966	NT			X
2 SI(HG)	<i>Deroceras rodnae</i> Grossu et Lupu, 1965	NT	X		X
8 HG	<i>Deroceras sturanyi</i> (Simroth, 1894)	LC		X	
1 SI	<i>Discus ruderatus</i> (Férussac, 1821)	NT			X
7 MS	<i>Euconulus fulvus</i> (O.F. Müller, 1774)	LC	X		
9 PD	<i>Euconulus praticola</i> (Reinhardt, 1883)	VU		X	
2 SI(MS)	<i>Limax cinereoniger</i> Wolf, 1803	LC	X	X	
1 SI	<i>Malacolimax tenellus</i> (O.F. Müller, 1774)	LC		X	
7 MS	<i>Oxychilus cellarius</i> (O.F. Müller, 1774)	LC		X	
10 RV-PDt	<i>Pisidium casertanum</i> (Poli, 1791)	LC	X		
7 MS	<i>Punctum pygmaeum</i> (Draparnaud, 1801)	LC	X		
8 HG	<i>Semilimax semilimax</i> (J. Férussac, 1802)	LC			X
8 HG	<i>Succinella oblonga</i> (Draparnaud, 1801)	LC		X	X
7 MS	<i>Vittrina pellucida</i> (O.F. Müller, 1774)	LC	X		
9 PD	<i>Zonitoides nitidus</i> (O.F. Müller, 1774)	LC			X
	Summary	–	8	8	11

*Ecogroup abbreviations used in Table 2 and Table 3 (based on L i s i c k ý, 1991): 1 SI (SILVICOLAE) = strictly woodland species; 1 SI(p) = petrophilous woodland species; 2 SI(MS) = mesohydrophilous woodland species; 2 SIh = shrub species; 2 SI(HG) = hydrophilous woodland species; 3 SIh = strongly hydrophilous woodland species; 3 Sli = species of wetland forests; 4 ST (STEP-PICOLAE) = steppe species; 4 STp = species associated with limestone rocks; 4 ST(SI) = semi-steppe species; 5 PT (PRATICOLAE) = open-country species; 5 PTp = open-country petrophilous species; 5 PT(SI) = semiwoodland species, but preferring open-country; 5 SS (SILVISTEPPICOLAE) = forest-steppe species; 6 XC = thermophilous and xerophilous species; 7 MS (MESICOLAE) = eurytopic to eurycious species; 7 SIp = petrophilous and woodland species; 8 HG (HYGRICOLAE) = hydrophilous species; 9 PD (PALUDICOLAE) = strongly hydrophilous species (polyhydrophilous); 10 = aquatic species, divided into subclasses of: 10 RV-PDt = species of flowing waters and temporary pool species, 10 SG-PDt = limnophilous and paludicolous species, 10 SG-RV = eurytopic species; 10 SG (STAGNICOLAE) = species of stagnant and permanent waters; 10 PD (PALUDICOLAE) = species of swamps and marshes; 10 PDt = species of periodic wetlands

** Treat level (according Beran et al., 2005): VU = Vulnerable; LC = Least Concern; NT = Near Threatened

Table 3. Occurrence of mollusc species in grassy localities - Part 1

Ecogroup	Species	Treat level	Locality number			
			1	2	3	7
1 SI	<i>Aegopinella nitidula</i> (Draparnaud, 1805)	NT	X	X	X	X
1 SI	<i>Aegopinella pura</i> (Alder, 1830)	LC	X			
–	<i>Aegopis verticillus</i> (Lamarck, 1822)	VU	X			
10 PDt	<i>Anisus leucostoma</i> (Millet, 1813)	NT			X	
2 SI(MS)	<i>Arianta arbustorum</i> (Linnaeus, 1758)	LC		X		
2 SI(MS)	<i>Arion fuscus</i> (O.F. Müller, 1774)	LC		X	X	X
7 MS	<i>Arion lusitanicus</i> Mabille, 1868	LC		X	X	
3 Sli	<i>Arion rufus</i> (Linnaeus, 1758)	LC	X	X	X	
1 SI	<i>Arion silvaticus</i> Lohmander, 1937	LC		X		X
10 SG-RV	<i>Bathyomphalus contortus</i> (Linnaeus, 1758)	LC		X	X	
9 PD	<i>Carychium minimum</i> O.F. Müller, 1774	LC	X		X	
8 HG	<i>Carychium tridentatum</i> (Risso, 1826)	LC	X			
2 SI(MS)	<i>Cepaea hortensis</i> (O.F. Müller, 1774)	LC	X	X		
7 MS	<i>Cochlicopa lubrica</i> (O.F. Müller, 1774)	LC	X		X	X
6 XC	<i>Cochlicopa lubricella</i> (Rossmässler, 1835)	LC	X		X	
1 SI	<i>Cochlodina laminata</i> (Montagu, 1803)	LC				X
8 HG	<i>Columella edentula</i> (Draparnaud, 1805)	LC	X			
1 SI	<i>Daudebardia rufa</i> (Draparnaud, 1805)	NT		X		
8 HG	<i>Deroceras laeve</i> (Linnaeus, 1758)	LC			X	
1 SI	<i>Deroceras turcicum</i> (Simroth, 1894)	NT			X	
2 SI(MS)	<i>Discus rotundatus</i> (O.F. Müller, 1774)	LC		X	X	X
1 SI	<i>Discus ruderatus</i> (Férussac, 1821)	NT		X		X
7 MS	<i>Euconulus fulvus</i> (O.F. Müller, 1774)	LC	X		X	X
9 PD	<i>Euconulus praticola</i> (Reinhardt, 1883)	VU			X	
5 SS	<i>Euomphalia strigella</i> (Draparnaud, 1801)	LC				X
10 SG-PD-t	<i>Galba truncatula</i> (O.F. Müller, 1774)	LC	X		X	
10 SG	<i>Gyraulus albus</i> (O.F. Müller, 1774)	LC		X	X	
10 SG	<i>Gyraulus crista</i> (Linnaeus, 1758)	LC	X			X
2 S1th	<i>Helix pomatia</i> Linnaeus, 1758	LC	X		X	X
2 SI(MS)	<i>Limax cinereoniger</i> Wolf, 1803	LC				X
7 S1p	<i>Limax maximus</i> Linnaeus, 1758	LC	X			
10 SG	<i>Lymnaea stagnalis</i> (Linnaeus, 1758)	LC			X	
3 S1h	<i>Macrogastra ventricosa</i> (Draparnaud, 1801)	NT				X
1 SI	<i>Malacolimax tenellus</i> (O.F. Müller, 1774)	LC		X		
2 SI(MS)	<i>Monachoides incarnatus</i> (O.F. Müller, 1774)	LC				X
7 MS	<i>Nesovitrea (Perpolita) hammonis</i> (Ström, 1765)	LC	X		X	X
7 MS	<i>Oxychilus cellarius</i> (O.F. Müller, 1774)	LC			X	X
10 RV-PDt	<i>Pisidium casertanum</i> (Poli, 1791)	LC	X			
10 PD	<i>Pisidium pseudosphaerium</i> Favre, 1927	CR			X	
10 PD	<i>Planorbis planorbis</i> (Linnaeus, 1758)	LC	X			
7 MS	<i>Punctum pygmaeum</i> (Draparnaud, 1801)	LC	X		X	X
10 PD	<i>Segmentina nitida</i> (O.F. Müller, 1774)	VU			X	
8 HG	<i>Semilimax semilimax</i> (J. Férussac, 1802)	LC	X	X	X	X
10	<i>Stagnicola palustris</i> O.F. Müller, 1774	LC	X		X	
9 PD	<i>Succinea putris</i> (Linnaeus, 1758)	LC	X	X	X	
8 HG	<i>Succinella oblonga</i> (Draparnaud, 1801)	LC	X	X	X	

Table 3. Occurrence of mollusc species in grassy localities - Part 2

Ecogroup	Species	Treat level	Locality number			
			1	2	3	7
7 MS	<i>Trochulus hispidus</i> (Linnaeus, 1758)	LC	X	X		
3 SIh	<i>Urticicola umbrosus</i> (C. Pfeiffer, 1828)	LC		X		X
5 PT(SI)	<i>Vallonia costata</i> (O.F. Müller, 1774)	LC	X		X	X
5 PT	<i>Vallonia pulchella</i> (O.F. Müller, 1774)	LC	X		X	
10 PD	<i>Valvata cristata</i> O.F. Müller, 1774	LC	X			
7 SIp	<i>Vertigo alpestris</i> Alder, 1838	VU	X			
8 HG	<i>Vertigo angustior</i> Jeffreys, 1830	VU	X			
9 PD	<i>Vertigo antivertigo</i> (Draparnaud, 1801)	VU	X		X	
5 PT	<i>Vertigo pygmaea</i> (Draparnaud, 1801)	NT	X		X	
7 MS	<i>Vitrina pellucida</i> (O.F. Müller, 1774)	LC	X	X	X	X
9 PD	<i>Zonitoides nitidus</i> (O.F. Müller, 1774)	LC	X		X	X
	Summary	–	33	19	33	22

For explanation of abbreviations see Table 2

Contrary, the smallest index value was found between localities No. 1 and 5 ($Ja = 4.9\%$; $S\ddot{o} = 2.5\%$).

DISCUSSION

The faunistic study presented herein comprises of 62 mollusc species from seven selected protected small-scale localities in protected areas. The species distribution at peatland localities was very low (21 species), contrary to that at grassy localities (57 species). Peat lands were particularly represented only by common and ubiquitous species (mostly slugs), which are more tolerant to acidity (pH value) and low calcium content in the litter layer. Also the greenery was better developed and grown in grassy localities, peat land localities provided specific conditions for wetland plat communities. The similarity of localities was evaluated based on individual species occurrence. For this calculation two commonly used indices were applied. Both indices revealed a relatively high

similarity at localities No. 1 (Rovná NNM) and No. 3 (Brouskův Mlýn NNR). These localities are situated at a direct distance of about 70 km, at a similar altitude, in the same climatic region. The similarity of molluscan fauna is given by the character of the localities; both are wet meadow habitats situated close to water source. Also a majority of common species is strongly linked to wet grass habitats. On the other hand, unsurprisingly, low similarities were found among grassy lands and peat lands.

During the study, several species of molluscs included in the Red List of threatened invertebrates of the Czech Republic were found. Specifically, of the total number of 62 species, 16 species were included in the Red List – 7 species as vulnerable (VU) and 9 species as nearly threatened (NT). The following paragraphs briefly describe the most interesting endangered species.

Aegopis verticillus (Lamarck, 1822) – VU. This forest species is the largest glass snail (family

Table 4. Percentage expressions of the similarity among the studied localities by Sørensen ($S\ddot{o}$) index (left bottom part) and Jaccard (Ja) index (right top part) (in %)

↓ $S\ddot{o}/Ja$ →	1	2	3	4	5	6	7
1	x	30.8	60.6*	24.4	4.9	22.7	40.0
2	18.2	x	42.3	14.8	22.2	40.0	39.0
3	43.5	26.8	x	24.4	19.5	27.3	47.3
4	13.9	8.0	13.9	x	25.0	31.6	40.0
5	2.5	12.5	10.8	14.3	x	21.1	20.0
6	12.8	25.0	15.8	18.8	11.8	x	36.4
7	25.0	24.2	31.0	25.0	11.1	22.2	x

1 = Rovná NNM, 2 = Terčino Údolí NNM, 3 = Brouskův Mlýn NNR, 4 = Boží Dar Peat Bogs NNR, 5 = Kladská Peat Bogs NNR, 6 = Novodomské Peat Bogs, 7 = Jezerka NNR

*the highest and the smallest values are bolded

Zonitidae) in the Czech Republic. The species inhabits moist woodland and especially decaying wood in scree forests. It was also found under leaves and between stones on humid soils, often in shallow holes in the soil and in mountain forests of lower altitudes.

In this study, its presence was confirmed in the Rovná NNM, which is consistent with previous studies (Ložek, 1998).

***Anodonta cygnea* (Linnaeus, 1758)**. An interesting finding was the bivalve species *Anodonta cygnea* from the site Kladská Peat Bogs NNR. This species is the largest species of mussels in the Czech Republic and occupies static waters and larger slow moving rivers. Water basins of peat lands are generally very inhospitable to molluscs, however in this NNR the species was relatively abundant. According to the PLA Communication Centre, the basin is regularly limed to maintain optimum pH for carp breeding. The carp breeding provides an easier introduction and survival for the clams in this kind of environment.

***Vertigo* O.F. Müller, 1773**. The speciose genus of *Vertigo* comprises tiny snails. The centre of distribution is in the north. In Europe, some of its species are regarded as strongly endangered and internationally protected. For example, *V. angustior* is included in the IUCN Red List and monitored by the Natura 2000 project.

***Vertigo angustior* Jeffreys, 1830 – VU**. Typically inhabiting open alkaline undisturbed wetlands in lower altitudes, this species is mapped by Natura 2000. In the Czech Republic, *V. angustior* is not too rare and has a scattered distribution. The species is threatened mainly by the destruction of alkaline wetlands.

CONCLUSION

Results of the faunistic study on molluscs in several PLAs in the western part of the Czech Republic (Bohemia) were presented. As already mentioned, publishing raw faunistic data is generally unpopular, but data from faunistic surveys are of great value to other scientists, are important for monitoring valuable sites in time or for monitoring invasive and introduced species. The significance of such data is mainly in their presentation in the available resources such as peer-reviewed scientific journals.

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