

Molluscan fauna of the Javoříčský Karst (Czech Republic, central Moravia)

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Abstract: Data about Recent molluscan fauna of the Javoříčský Karst are given. Altogether 77 species (76 species of Gastropoda, 1 species of Bivalvia) were recorded. Molluscan fauna is dominated by woodland communities occurring in various types of woodland habitats while elements of open grounds and aquatic habitats are poorly represented. Of prime importance is the occurrence of the Alpine and Carpathian elements at the same place as well as the records of sensitive woodland species *Bulgarica cana* and overlooked slug *Deroceras turcicum*, both new ones for the area of the Javoříčský Karst. The list of recorded molluscs is enclosed in this paper as well as the quadrangle mapping of important species *Orcula dolium* and *Itala ornata*. Due to the confusion of epilithic species *Chondrina avenacea*, reported from the area studied in the end of 19th century, the distributions of *Chondrina clienta* and *Chondrina avenacea* in the Czech Republic are shortly commented and compared in the form of quadrangle maps.

Key words: Czech Republic, Javoříčský Karst, list of species, *Orcula dolium*, *Itala ornata*, quadrangle mapping

Introduction

Several karst areas are present in the Czech Republic. Among them, the Bohemian Karst and Moravian Karst represent a typically developed karst phenomenon. Other, generally small karstic areas show poorly or partly developed karst phenomenon. The fragmentarily developed karst phenomenon is mostly characterised by subterranean features while surface ones are often absent.

Although the Javoříčský Karst shows fragmentarily developed karst phenomenon, its molluscan fauna is rather varied, much like the malacofauna of the Bohemian or Moravian Karst. Convenient geological substrate in combination with well-preserved vegetation cover in the area of Javoříčský Karst enables the development of rich malacofauna.

The aim is to describe Recent malacological features of the Javoříčský Karst as an element in the evaluation of palaeoenvironmental changes during the Postglacial Period in question.

Geographical position of the Javoříčský Karst

The Javoříčský Karst is situated in central Moravia, close to the NE margin of the Drahanská vysočina Upland. This densely forested karst area is built up of Middle Devonian limestone overlain by Lower Carboniferous rocks. Limestone bodies of the Javoříčský Karst are lens-shaped on the surface, but merge at the depth, allowing communication of karstic waters beneath the non-karstic rocks (Panoš, V. 1962). Geographical position of the Javoříčský Karst is figured in comparison with the position of the Bohemian Karst and Moravian Karst, the two largest karst areas in the Czech Republic (Fig. 1). The area of Javoříčský Karst is roughly delimited by the Ospělov – Hvozď – Hvozdečko villages (see Fig. 2).

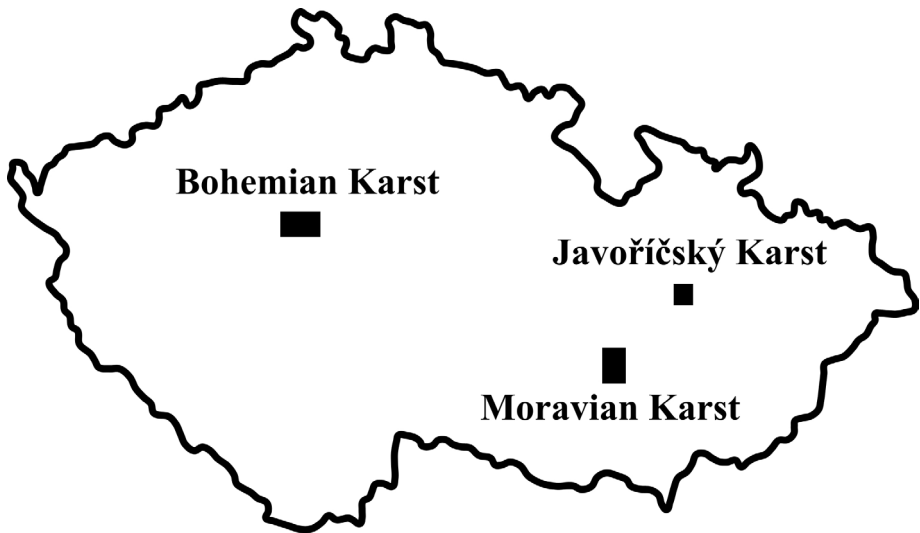


Fig. 1. Geographical position of the Bohemian Karst, Moravian Karst and Javoříčský Karst in the Czech Republic.

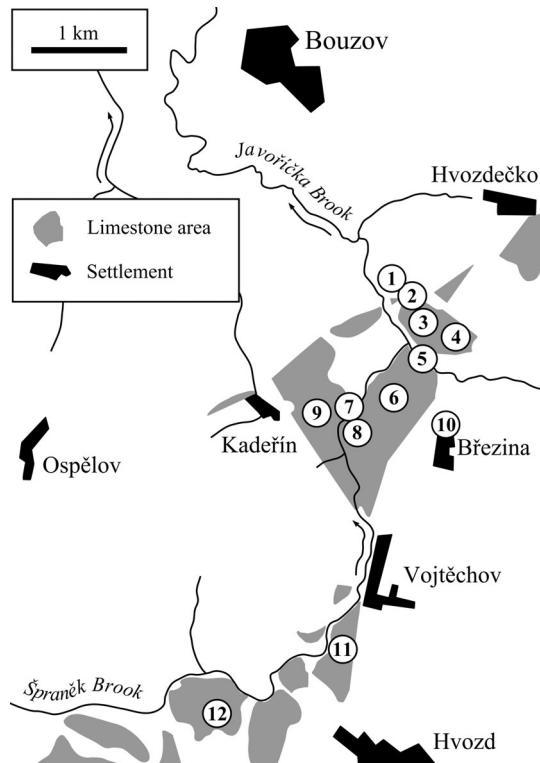


Fig. 2. Geographical position of the localities studied. Explanation of locality numbers in the text "Material and methods".

History of malacological investigations

Due to the long tradition of malacological investigations in the Czech Republic, the first reports on some Mollusca from the area of Javoříčský Karst are more than 100 years old (Uličný, J. 1885, 1889, 1896). Data from the earliest period of collecting are related to vicinity of Bouzov, Ludmírov, Kadeřín and Milkov with no precise localization. Only the localities of Zkamenělý zámek and Průchodnice are better localized. Nevertheless, 47 species were reported from this area (Table 1) in this period. The main body of molluscan fauna consisted of common mid-European species; including a number of sensitive woodland elements of Alpine and Carpathian zoogeographical distribution.

Table 1. Molluscan fauna found in the area of Javoříčský Karst at the end of 19th century.

List of species	Uličný, J. (1885)	Uličný, J. (1889)	Uličný, J. (1896)
<i>Aegopinella nitens</i> (*)			+
<i>Aegopis verticillus</i>	+		
<i>Alinda biplicate</i>		+	+
<i>Anisus leucostoma</i>			+
<i>Arianta arbustorum</i>			+
<i>Bathyomphalus contortus</i>			+
<i>Carychium minimum</i>			+
<i>Causa holosericea</i>			+
<i>Cecilioides acicula</i>			+
<i>Cepaea hortensis</i>			+
<i>Cepaea vindobonensis</i>			+
<i>Chondrina avenacea</i> (**)			+
<i>Clausilia dubia</i>			+
<i>Clausilia parvula</i>			+
<i>Cochlicopa lubrica</i>			+
<i>Cochlicopa lubricella</i>			+
<i>Cochlodina laminata</i>			+
<i>Cochlodina orthostoma</i>			+
<i>Ena montana</i>			+
<i>Euconulus fulvus</i>			+
<i>Euomphalia strigella</i>			+
<i>Faustina faustina</i>	+		+
<i>Fruticicola fruticum</i>			+
<i>Galba truncatula</i>			+
<i>Granaria frumentum</i>			+
<i>Helicigona lapicida</i>			+
<i>Helicodonta obvoluta</i>			+
<i>Helix pomatia</i>			+
<i>Isognomostoma isognomostomos</i>			+
<i>Itala ornata</i>	+		+
<i>Laciniaria plicata</i>			+
<i>Macrogastra ventricosa</i>			+
<i>Monachoides incarnatus</i>			+
<i>Orcula dolium</i>			+
<i>Oxychilus glaber</i>			+
<i>Oxyloma elegans</i>			+
<i>petasina unidentata</i>			+
<i>Pupilla muscorum</i>			+
<i>Pyramidula pusilla</i>			+
<i>Radix peregra</i>			+
<i>Succinea putris</i>			+
<i>Succinella oblonga</i>			+
<i>Truncatellina cylindrica</i>			+
<i>Vallonia costata</i>			+
<i>Vallonia pulchella</i>			+
<i>Vertigo angustior</i>			+
<i>Vitrea diaphana</i>			+
<i>Zonitoids nitidus</i>			+

The 20th century malacofauna evidence is known from the published data of several authors: Burian, B. (1938), Hudec, V. (1955, 1960, 1962), Kavka, V. (1961), Kostrz, B. (1968). Unpublished data are also available – Brabenec's collection deposited in the National Museum in Prague. Vašátko, J. (pers. comm.) collected and documented 44 terrestrial molluscan species from the central area of the Javoříčský Karst at the end of the 20th century. Horsák, M. (pers. comm.) performed occasional collecting in the year 2001 and documented dwarf snail *Vertigo alpestris*, besides other species. The last data about molluscan fauna, presented in this paper, are based on intensive collecting activities of its author.

Material and methods

The area of Javoříčský Karst provides very good conditions for the development of rich molluscan fauna due to its limestone substrate and well-preserved vegetation cover mostly reconstructed as *Eu-Fagion* and *Luzulo-Fagion*. Under these circumstances, 12 representative sites were selected and investigated using hand collecting, complemented by soil sifting. The sampling sites are listed below with coordinates, altitudes and data of collecting. The geographical position of the localities is figured on the sketch-map (Fig. 2).

List of localities studied:

1. **Calcareous Tufa accumulation** deposited by a small karst spring on the southern slope of Paní hora Hill and the right side of the Javoříčka Brook (*Picea, Fagus*), partly open moist habitat, N: 49°40'45.53'', E: 16°54'39.67'', 370 m above sea level, quadrangle 6367, 20–22 May 2002, Hlaváč lgt., det. et. coll.
2. **Majka Cave**, entrance and its surroundings on the northern slope of Paní hora Hill (*Acer, Fagus, Fraxinus, Picea*), N: 49°40'44.09'', E: 16°54'52.29'', 430 m a.s.l., 6367, 10. 5. 2001, 26 July 2001, Hlaváč lgt., det. et. coll.
3. **V habří Cave**, entrance and its surroundings on the southern slope of Paní hora Hill (*Picea, Carpinus*), N: 49°40'32.91'', E: 16°54'56.92'', 400 m a.s.l., 6367, 22 June 2001, 23 June 2001, Hlaváč lgt., det. et. coll.
4. **Za hájovnou Cave**, entrance and its surroundings on the southeastern slope of Paní hora Hill (*Picea, Fagus*), N: 49°40'28.66'', E: 16°55'05.62'', 405 m a.s.l., 6367, 22 June 2001, 23 June 2001, Hlaváč lgt., det. et. coll.
5. **Javoříčka Brook**, close to its confluence with the Špraněk Brook, N: 49°40'30.16'', E: 16°54'49.21'', 370 m a.s.l., 6367, 10 May 2001, Hlaváč lgt., det. et. coll.
6. **Špraněk National Nature Reserve**, fragment of *Eu-Fagion*, shady rocks and woodland in the surroundings of the Javoříčské Cave, N: 49°40'10.64'', E: 16°54'36.40'', 450 m a.s.l., 6367, 11 May 2001, 1 June 2001, 23 June 2001, Hlaváč lgt., det. et. coll.
7. **Špraněk Brook**, N: 49°40'03.25'', E: 16°54'10.78'', 370 m a.s.l., 6367, 11 May 2001, Hlaváč lgt., det. et. coll.
8. **Zkamenělý zámek rock formation**, open rocky habitats in the upper part (primary woodless) and woodland (*Fagus, Acer, Tilia, Picea*) on the slopes in the Špraněk Brook valley, N: 49°40'01.41'', E: 16°54'22.74'', 430 m a.s.l., 6367, 1 June 2001, 23 June 2001, Hlaváč lgt., det. et. coll.

9. **Kadeřínská stráž**, woodland (*Fagus*, *Acer*, *Tilia*, *Picea*) slope on the left side of the Špraněk Brook in front of Zkamenělý zámek rock formation, N: 49°40'17.24'', E: 16°54'10.06'', 420 m a.s.l., 6367, 1 June 2001, Hlaváč lgt., det. et. coll.
10. **Březina village**, northern margin of the village, ruderal habitat, N: 49°39'59.43'', E: 16°55'08.27'', 415 m a.s.l., 6367, 22 May 2002, Hlaváč lgt., det. et. coll.
11. **Taramka Nature Monument**, fragment of *Eu-Fagion*, close to northern margin with karst spring, N: 49°38'43.90'', E: 16°54'11.48'', 450 m a.s.l., 6367, 5 June 2001, Hlaváč lgt., det. et. coll.
12. **Průchodnice Nature Reserve**, fragment of *Luzulo-Fagion*, N: 49°38'28.04'', E: 16°53'10.72'', 504 m a.s.l., 6367, 5 June 2001, Hlaváč lgt., det. et. coll.

The sampling sites are dominated by an important proportion of deciduous forest with beech, lindens and maples on the northern slopes while hornbeam stands are dominating on the southern ones. Fragmentarily preserved deciduous forests are surrounded by monospecific culture of spruce. Open patches on sunny rock walls occur only in the upper part of Zkamenělý zámek rock formation. It is evaluated as primary woodless.

The main body of species were identified according to Ložek, V. (1956, 1964) and Kerney, M. P. et al. (1983). The rock snail *Pyramidula pusilla* (Vallot) was identified according to Gittenberger, E. – Bank, R. A. (1996), and the overlooked element in the Czech Republic, the slug *Deroceras turcicum* (Simroth) according to Reise, H. – Hutchinson, J. M. C. (2001). The nomenclature follows Turner, H. et al. (1998) with small modifications based on Juříčková, L. et al. (2001).

Results

Collecting on various types not only of woodland habitats documents high abundance of molluscan fauna, as shown in the enclosed table (Table 2). The table allows to draw basic molluscan ecological characteristics. The area of Javoříčský Karst has a well-preserved molluscan fauna typical for the uplands dominated by woodland communities. These communities occur in relatively extensive beech forests with admixture of another broad-leaf trees (*Acer*, *Tilia*, *Fraxinus*).

The main body of forest malacocoenoses consists of widespread European and mid-European species, such as *Alinda biplicata*, *Cochlodina laminata*, *Cochlodina orthostoma*, *Macrogastra plicatula*, *Macrogastra ventricosa*, *Laciniaria plicata*, *Ena montana*, *Aegopinella pura*, *Fruticicola fruticum*, *Monachoides incarnatus*, *Petasina unidentata*, *Arianta arbustorum*, *Isognomostoma isognomostomos* etc., including a number of thermophilous southern elements (e.g., *Helicodonta obvolvata*, rarely *Discus perspectivus*). The Carpathian endemites are represented by *Monachoides vicinus* and *Faustina faustina*, while *Aegopsis verticillus* is the only real Alpine woodland element in the area studied. The West Carpathian snail *Plicuteria lubomirskii* is documented very rarely at the localities studied but its centre of distribution here is confined to open or semi-open swamp habitats on the banks of the Javoříčka and Špraněk brooks. The same holds for the hygrophilous snails *Succinea putris*, *Oxyloma elegans* and *Perforatella bidentata*. These snails often climb on plant vegetation, with the exception of *Perforatella bidentata* that lives on soil surface.

Shady talus slopes under the rock walls host specific malacofauna consisting predomi-

Table 2. Molluscan representation at the localities studied.

		List of species	Locality No.												
			1	2	3	4	5	6	7	8	9	10	11	12	
A	1	<i>Acanthinula aculeata</i> (Müll.)	–	–	2	–	–	1	–	8	8	–	–	–	
		<i>Aegopinella pura</i> (Alder)	7	–	–	–	–	10	–	22	41	–	–	–	
		<i>Aegopis verticillus</i> (Fér.)	–	5	–	–	–	22	–	5	–	–	–	–	
		<i>Arion silvaticus</i> Lohmander	1	2	–	–	–	1	–	1	–	–	–	–	
		<i>Bulgarica cana</i> (Held)	–	–	–	–	–	–	–	1	3	–	–	–	
		<i>Cochlodina laminata</i> (Mtg.)	–	3	8	2	–	6	–	8	31	–	1	–	
		<i>Cochlodina orthostoma</i> (Menke)	–	1	–	–	–	52	–	17	6	–	–	1	
		<i>Daudebardia rufa</i> (Drap.)	3	1	–	–	–	5	–	3	2	–	–	–	
		<i>Deroceras turcicum</i> (Simroth)	–	–	–	–	–	–	–	1	–	–	–	–	
		<i>Discus perspectivus</i> (von Mühlfeldt)	6	–	–	–	–	–	–	–	–	–	–	–	
		<i>Ena montana</i> (Drap.)	1	17	–	–	–	9	–	6	3	–	–	–	
		<i>Faustina faustina</i> (Rssm.)	1	12	12	1	–	11	–	2	2	–	–	2	
		<i>Helicodonta obvoluta</i> (Müll.)	–	2	–	–	–	2	–	–	4	–	–	–	
		<i>Isognomostoma isognomostomos</i> (Schr.)	–	1	–	–	–	2	–	–	–	–	–	–	
		<i>Lehmannia marginata</i> (Müll.)	–	–	–	–	–	–	–	7	3	–	–	–	
		<i>Macrogastra plicatula</i> (Drap.)	–	–	–	–	–	–	–	2	34	–	–	–	
		<i>Monachoides incarnatus</i> (Müll.)	2	11	7	1	–	8	–	4	1	1	2	2	
		<i>Oxychilus depressus</i> (Sterki)	–	1	–	–	–	–	–	–	–	–	–	–	
		<i>Petasina unidentata</i> (Drap.)	1	–	–	–	–	8	–	2	4	–	–	–	
		<i>Platyla polita</i> (Hartmann)	–	1	–	–	–	1	–	3	4	–	–	–	
		<i>Semilimax semilimax</i> (Fér.)	–	–	–	–	–	–	–	–	1	–	–	–	
	<i>Vitrea pusilla</i> Müll.	–	–	–	–	–	1	–	4	–	–	–	–		
	<i>Vitrea diphana</i> (Stud.)	–	10	–	–	–	1	–	1	–	–	–	–		
	<i>Vitrea subrimata</i> (Rein.)	–	–	–	–	–	3	–	10	14	–	–	–		
	2	W (M)	<i>Alinda biplicata</i> (Mtg.)	5	44	10	6	–	51	–	6	16	–	1	3
			<i>Arianta arbustorum</i> (L.)	–	–	–	–	–	5	–	–	–	–	–	–
			<i>Arion subfuscus</i> 8Drap.)	1	–	1	–	–	–	–	5	2	5	1	2
			<i>Cepaea hortensis</i> (Müll.)	–	3	–	–	–	3	–	1	1	1	–	–
			<i>Discus rotundatus</i> (Müll.)	–	–	–	–	–	1	–	–	–	–	–	–
			<i>Fruticicola fruticosa</i> (Müll.)	–	1	1	–	–	2	–	5	–	1	–	–
			<i>Limax cinereoniger</i> Wolf	–	1	–	1	–	1	–	2	1	–	–	–
			<i>Oxychilus glaber</i> (Rssm.)	7	19	–	1	–	11	–	5	2	–	1	–
			<i>Aegopinella minor</i> (Stab.)	–	4	4	1	–	1	–	–	1	–	–	1
		W(s)	<i>Helix pomatia</i> L.	–	2	8	2	–	4	–	3	2	1	–	1
			<i>Eucobresia diaphana</i> (Drap.)	–	–	–	–	–	–	–	4	–	–	–	–
		W(H)	<i>Vitrea crystallina</i> (Müll.)	2	2	–	–	–	–	–	–	–	–	–	–
			<i>Macrogastra ventricosa</i> (Drap.)	1	–	–	–	–	–	–	1	1	–	–	–
		3		<i>Monachoides vicinus</i> (Rssm.)	–	1	–	–	–	3	–	–	–	–	–
				<i>Perforatella bidentata</i> (Gmelin)	1	–	–	–	–	–	–	–	–	–	–
	<i>Granaria frumentum</i> (Drap.)			–	–	–	–	–	–	–	5	–	–	–	
	4	S	<i>Pupilla sterrii</i> (Voith)	–	–	–	–	–	–	–	17	–	–	–	
			<i>Chondrina clienta</i> (West.)	–	–	–	–	–	–	–	23	–	–	–	
<i>Pyramidula pusilla</i> (Vallot)			–	–	–	–	–	39	–	28	–	–	4		
Sf		<i>Truncatellina cylindrica</i> (Fér.)	–	–	–	–	–	–	–	25	–	–	–		
		<i>Vallonia costata</i> (Müll.)	–	–	1	–	–	1	–	12	–	–	–		
		<i>Vallonia pulchella</i> (Müll.)	–	–	–	–	–	–	–	5	–	–	–		
5		or	<i>Itala ornata</i> (Rssm.)	–	2	3	–	–	15	–	41	–	–	4	
			<i>Cochlicopa lubricella</i> (Porro)	–	–	–	–	–	–	–	7	–	–	–	
6		C	<i>Euomphalia strigella</i> (Drap.)	–	–	–	–	–	1	–	1	–	–	–	
	<i>Boettgerilla pallens</i> (Simroth)		1	–	–	–	–	–	–	–	1	–	–		
	<i>Cochlicopa lubrica</i> (Müll.)		4	–	–	–	–	–	–	–	–	–	–		
	<i>Limax maximus</i> L.		–	–	–	–	–	–	–	–	1	–	–		
	<i>Oxychilus cellarius</i> (Müll.)		1	1	–	1	–	4	–	–	–	–	1		
	<i>Perpolita hammonis</i> (Ström)		1	–	–	–	–	–	–	–	–	–	–		
	<i>Plicutera lubomirskii</i> (Slósarskii)		–	–	–	–	–	–	–	1	–	1	–		
	<i>Punctum pygmaeum</i> (Müll.)		–	47	38	–	–	1	–	21	5	–	–		
	<i>Trichia hispida</i> (L.)		–	–	–	–	–	–	–	1	–	5	–		
	<i>Vitrea contracta</i> (West.)		–	1	–	–	–	1	–	–	–	–	–		

		List of species	Locality No.													
			1	2	3	4	5	6	7	8	9	10	11	12		
C	7		Vitrina pellucida (Müll.)	1	1	–	–	–	6	–	10	4	1	–	1	
		Mf	Clausilia parvula Fér.	–	1	–	38	–	33	–	56	–	–	–	10	
		W(f)	Clausilia dubia Drap.	–	5	–	–	–	40	–	–	2	–	–	–	–
			Helicigona lapicida (L.)	–	1	2	1	–	3	–	–	–	–	–	–	3
			Laciniaria plicata (Drap.)	–	20	47	9	–	51	–	33	59	–	–	–	14
		Orcula dolium (Drap.)	–	–	–	–	–	12	–	–	–	–	–	–	–	
	8		Carychium tridentatum (Risso)	23	16	–	–	–	–	–	1	14	–	–	–	
			Succinella oblonga (Drap.)	1	–	–	–	–	–	–	–	–	–	–	–	
	D	9		Carychium minimum Müll.	7	–	–	–	–	–	–	–	–	–	–	
				Oxyloma elegans (Risso)	2	–	–	–	–	–	–	–	–	–	–	
			Succinea putris (L.)	1	–	–	–	–	–	–	–	–	–	–		
			Vertigo antivertigo (Drap.)	2	–	–	–	–	–	–	–	–	–	–		
			Zonitoides nitidus (Müll.)	5	–	–	–	–	–	–	–	–	–	–		
10			Ancylus fluviatilis Müll.	–	–	–	–	5	–	–	–	–	–	–		
			Anisus leucostoma (Millet)	6	–	–	–	–	–	–	–	–	–	–		
			Bythinella austriaca (von Frauenfeld) agg.	4	–	–	–	–	–	–	–	–	–	30		
			Galba truncatula (Müll.)	8	–	–	–	4	–	1	–	–	–	–		
			Pisidium casertanum (Poli)	12	–	–	–	12	–	3	–	–	–	–		
	Radix peregra	–	–	–	–	2	–	2	–	–	–	–				

nantly of woodland species, such as *Daudebardia rufa*, *Oxychilus glaber* and very rare *Oxychilus depressus*. They are inhabited also by other dendrophilous snails in the presence of dead and decaying wood. Of prime importance is the occurrence of sensitive woodland species *Bulgarica cana*, which was registered for the first time in the area studied.

Shady rock walls are characterized by several Clausiliid species, such as *Clausilia dubia* and *Laciniaria plicata*. The snail *Helicigona lapicida* often lives on the rocks, too. Of great importance is the East Alpine and West Carpathian snail *Orcula dolium* living on the foot of the rock walls in the Špraněk National Nature Reserve close to the Javoříčské Cave.

Open xeric habitats on calcareous substrates, typically developed only in the upper part of Zkamenělý zámek rock formation are characterized by several xerothermophiles. Only *Granaria frumentum*, *Pupilla sterrii*, *Truncatellina cylindrica*, *Vallonia costata* and *Vallonia pulchella* were recorded as well as rupestral species *Chondrina clienta* and *Pyramidula pusilla*.

The Zkamenělý zámek rock formation represents a unique fragment of the karst phenomenon. Xerothermophilous elements living in the sunny upper parts are substituted in a sequence down to the Špraněk Brook valley. The snails *Granaria frumentum* and *Pupilla sterrii* disappear in the slightly shady rocky parts while *Pyramidula pusilla* is still rarely present; especially *Itala ornata* appears over large areas. The open habitat elements absolutely disappear in the lower parts of the rock formation where woodland and debris communities dominate the malacofauna. There, snails *Vertigo alpestris* and *Causa holosericea*, both collected by different authors in the past (Hudec, V. 1955, 1960, Kostrz, B. 1968, Horsák, M. pers. comm.) document slightly submontane conditions on the bottom of the Špraněk Brook valley.

The area of Javoříčský Karst shows a marked absence of aquatic habitats. These habitats are restricted only to two brooks that are often dry in the summer time. The presence of very moist spring tufa deposition with small patches of stagnant water is the head of aquatic habitats. Freshwater molluscan community consists of several common species (see Table 2). Of prime biogeographic importance is the occurrence of dwarf Prosobranch *Bythinella austriaca* agg., living in subterranean waters and karst springs.

Notes on important molluscan species

Some molluscan species occurring in the area of Javoříčský Karst will be commented here due to their zoogeographical importance or their relative rareness in the Czech Republic.

Orcula dolium (Draparnaud, 1801)

This species of East Alpine and West Carpathian distribution was documented at one locality only (Špraněk Nation Nature Reserve). The data from the end of 19th century (Uličný, J. 1896) related to the vicinity of Bouzov village can be identified as the Špraněk NNR at present. The repeated documenting during the investigation in the past century (Hudec, V. 1955, 1962, Kostrz, 1968) sufficiently confirms its occurrence.

The centre of the occurrence of *Orcula dolium* in the Czech Republic lies in the White Carpathians Mts. There, it occurs throughout the area investigated being, however, confined to natural habitats with calcareous soils (Ložek, V. 1989). Other isolated data come from the area of Štramberký Karst in northern Moravia (Lisický, M. J. 1991) and Hostýnské vrchy Mts. (Hudec, V. 1954a). The westernmost occurrence in the Czech Republic is documented in the area of Hřebečský hřeben Ridge in the vicinity of Svitavy (Hrubý, I. 1966).

The quadrangle mapping of the snail *Orcula dolium* documents its continuous distribution in the Czech Republic only in the area of White Carpathians (Fig. 3).

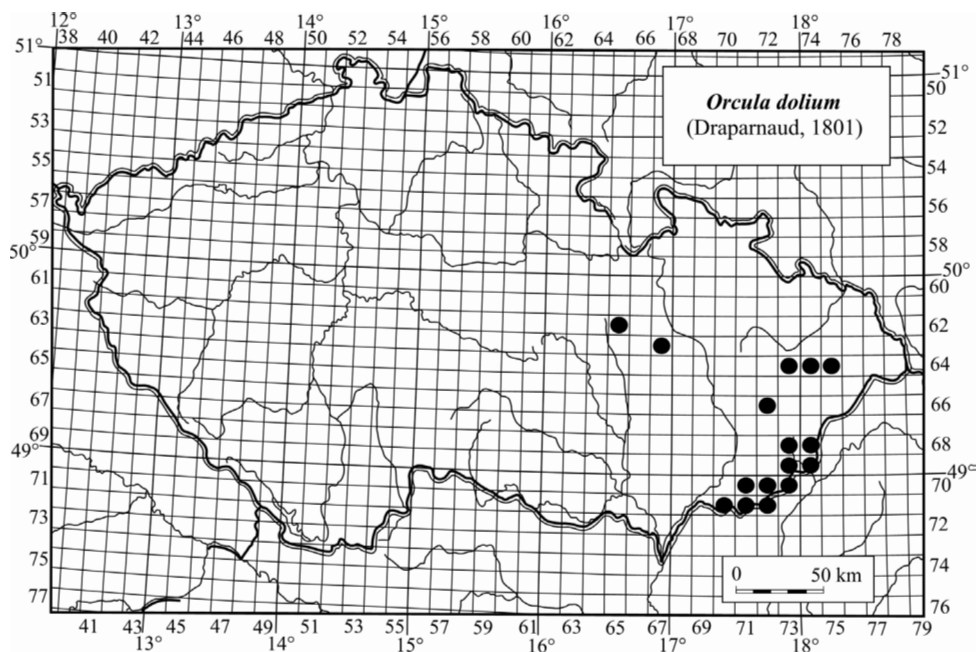


Fig. 3. Recent distribution of the snail *Orcula dolium* (Draparnaud, 1801) in the Czech Republic.

***Itala ornata* (Rossmässler, 1836)**

This species is more widely distributed than *Orcula dolium* mentioned above. *Itala ornata* is a rupestral species of East Alpine zoogeographical distribution. It inhabits various types of strongly calcareous rocks or limestone rock walls from slightly sunny to shadowed habitats. Very strong populations occur in the area of Javoříčský Karst.

Its present distribution in the Czech Republic is confined to calcareous fine-grained sandstones in the Orlické hory Mts. foothills, especially in the valleys of Tichá Orlice and Divoká Orlice rivers, as well as in the valleys of their tributaries. A frequent occurrence is also documented from secondary habitats at castle ruins in that area. *Itala ornata* was rarely evidenced further south from its continuous distribution in the Czech Republic. Its distribution was summarized by Ložek, V. (1956) and Hudec, V. (1954b).

The quadrangle mapping of the snail *Itala ornata* is enclosed, documenting a continuous distribution in the Orlické hory Mts. foothills with sporadic occurrence farther south (Fig. 4).

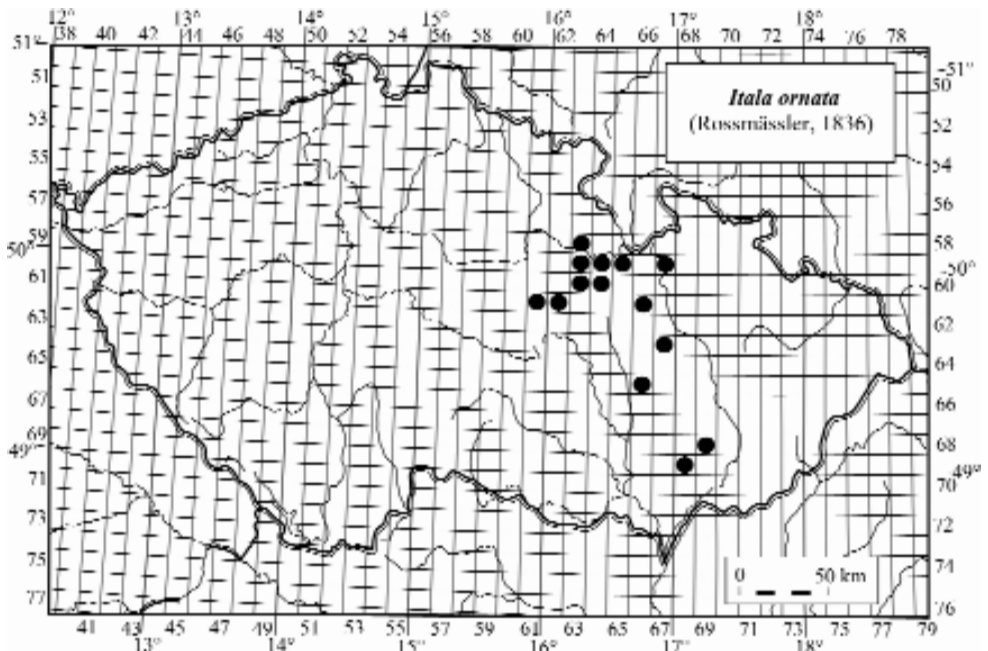


Fig. 4. Recent distribution of the snail *Itala ornata* (Rossmässler, 1836) in the Czech Republic.

***Chondrina clienta* (Westerlund, 1883)**

The latest investigation in the area of Javoříčský Karst confirmed a strong population of *Chondrina clienta* on sunny limestone rock at Zkamenělý zámek rock formation. Its identification repeatedly eliminated the presence of *Chondrina avenacea* in the area of Javoříčský Karst reported by Uličný, J. (1896).

Analogically, Ložek, V. (1949) mentioned the only occurrence of *Chondrina clienta* in the whole area of the Moravian Karst. The product of this identification is that the Alpine and SouthEast European *Chondrina clienta* lives only in the karstic areas of Moravia while

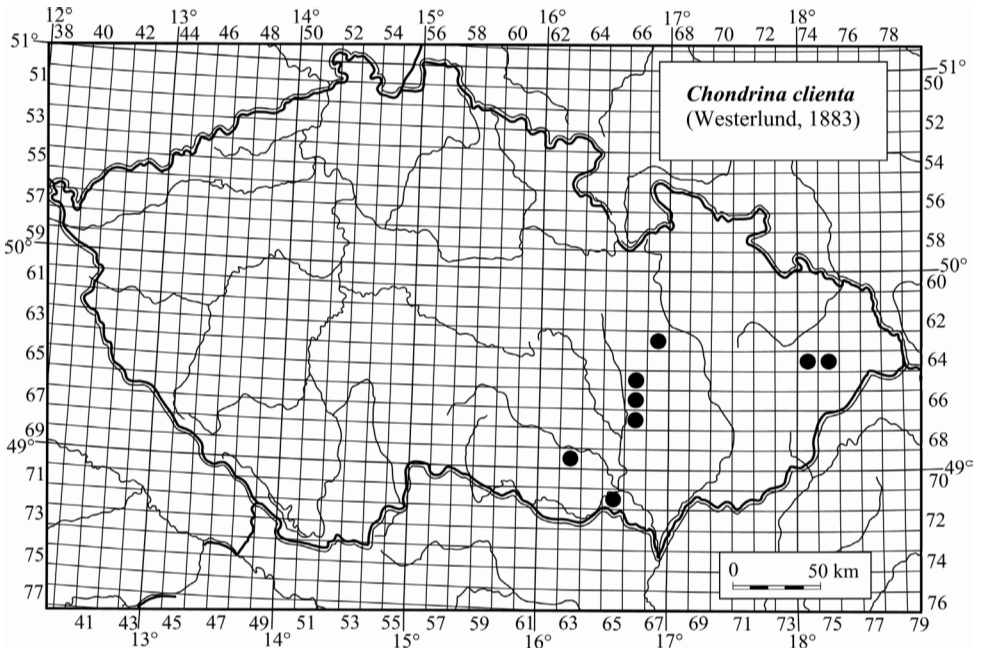


Fig. 5. Recent distribution of the snail *Chondrina clienta* (Westerlund, 1883) in the Czech Republic.

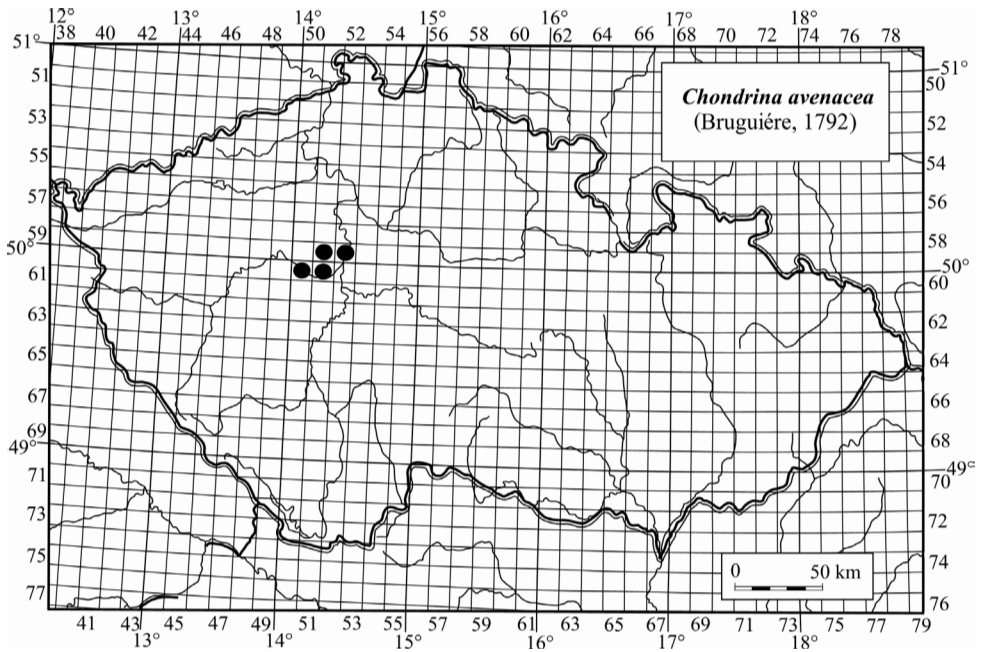


Fig. 6. Recent distribution of the snail *Chondrina avenacea* (Bruguière, 1792) in the Czech Republic.

Alpine and West European *Chondrina avenacea* occurs only in the Bohemian Karst (Fig. 5, 6.). Their occurrences figured in the maps are based on published data (Hudec, V. 1960, Ložek, 1948, 1974, V. Uličný, M. J. 1991) and the author's collecting.

***Deroceras turcicum* (Simroth, 1894)**

Deroceras turcicum, usually cream-coloured slug, shares many external morphological features with other species of the genus, including the very common *Deroceras reticulatum*. It can be identified only on the basis of accurate dissections of internal organs, especially the genitalia.

The species has been long overlooked in the Czech Republic. Based on new investigation, Reise, H. – Hutchinson, J. M. C. (2001) documented this slug at several localities in the Sudetes and in the Moravian Karst. The new occurrence in the area of Javoříčský Karst is confined to natural woodland habitats with an important proportion of broad-leaf trees dominated by beech, lindens and maples on the northern slopes of Zkamenělý zámek.

Discussion and conclusion

The Recent molluscan fauna of the Javoříčský Karst is relatively well known. This last investigation documented 77 species (76 species of Gastropoda, 1 species of Bivalvia) collected at 12 localities of various types, predominantly of woodland habitats. Compared to the known species from the end of 19th century (Table 1), the present study documented a distinct species enrichment. Some xerothermophilous species were not confirmed by this study, especially focused on woodland habitats, (e.g., *Pupilla muscorum*, *Cepaea vindobonensis*, *Xerolenta obvia*). On the other hand, other, not only woodland species were recorded, such as *Monachoides vicinus*, *Oxychilus depressus*, *Macrogastra plicatula*, *Plicuteria lubomirskii* etc. (see Table 2). Of prime importance is the new occurrence of sensitive Clausiliid species *Bulgarica cana* and overlooked element *Deroceras turcicum*.

Submontane talus species *Causa holosericea* documented by Uličný, J. (1896) was not recorded at present but this species probably lives in the area of Javoříčský Karst, as indicated by its collecting in the 1950s and 1970s (Hudec, V. 1955, Brabenec's collection deposited in the Nation Museum in Prague).

The list of the Mollusca living in the area of Javoříčský Karst is still open, and other species will be probably added after the intensive author's investigation. The ample recognition of the Recent molluscan fauna becomes a strong point because of Holocene biostratigraphic investigations.

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