

# Spiders in stony debris in South Bohemian mountains

## Pavouci kamenitých sutí jihočeských pohoří

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### Abstract

Spider communities have been examined in stony debris at nine sites of the South Bohemian mountains, at elevations between 750 and 1300 m above sea level. These bare stony debris represent islets of the alpine mountain zone. Very cold microclimate appears to govern in stony debris both at high altitudes and on slopes of river valleys at lower altitudes. Moss layers on stones of the cold lower edges of these accumulations represent a specific environment, where the species *Diplocentria bidentata* was found. Other remarkable findings include the occurrence of the species *Clubiona alpicola*, *Bathypantes simillimus buchari* and *Trogloneta granulum*. Arachnofauna of the South Bohemian stony debris is characterized by the presence of three species groups.

*Key words:* Microclimate, geographic distribution, *Bathypantes simillimus*, *Clubiona alpicola*, *Diplocentria bidentata*, *Trogloneta granulum*.

### Introduction

A highly diverse mosaic of microclimatic conditions occurs in slope boulder accumulations. Two important gradients establish there: (1) between the upper and lower margins of the debris field and (2) between the surface and inner spaces of the debris (RŮŽIČKA et al. 1995). Stony debris facing the south can harbour some thermophilous plant and animal species. On boulder accumulations facing the north, i.e., primarily treeless non-xerothermic sites, vegetation type occurs which is closely related to some mountain or even subalpine vegetation (CHYTRÝ 1992). Ecosystems of stony debris can host isolated populations of invertebrates (RŮŽIČKA 1990, RŮŽIČKA & ZACHARDA 1994). Stony debris ecosystems contribute significantly to the spatial, site and biological diversity of the landscape (RŮŽIČKA 1993).

### Territory and sites examined

The territory of the broad southern corner of the Czech Republic includes the geomorphological unit of the Jihočeská Vysočina highland. The Český Les Mts., the Šumava Mts. (Bohemian Forest), and the Novohradské Hory Mts. form a section of the Czech border mountain system, the Blanský Les Mts. lies at the piedmont of the Šumava. About 125 km long and 80 km broad, the Šumava Mts. are the largest and highest part of this mountain system. Rising above 1000 m, the edges of the Šumava lie on both sides of the Czech-German and Czech-Austrian borders. The tops of the highest peaks rise as much as 300 m and more above the extensive flat mountain plateau. Due to the mountain glaciation, the Šumava was climatically more exposed in the Pleistocene than most of the other Bohemian regions were.

This is documented by the ample boulder accumulations (CHÁBERA 1955, 1982), the majority of which lie in protected areas. RŮŽIČKA (1988a, 1994a) reported about spiders in boulder accumulations at some sites of the South Bohemian mountains. The collection was repeated at selected sites in 1992–1994, and invertebrates were also collected at new sites (Fig. 1).

### 1. Skalky na Sádku

Lying in the Český Les Mountains, the Skalky na Sádku Natural Monument rises to about 800 m a.s.l., organism grid mapping quadrat 6542. The quartzite rocks and debris are grown with mixed forests. Five pitfall traps were laid in the depth of the debris for the period from 15 October 1993 to 21 July 1994.

### 2. Jezerní hora

The Šumava Protected Landscape Area, about 1300 m a.s.l., organism grid mapping quadrat 6845. An extensive quartzite block field is located on the southwestern slope. Four traps were placed in the debris on the ridge between the Jezerní Hora Mt. and the Svaroh Mt. for a period from 10 June 1992 to 16 October 1993.

### 3. Křemelná

The Šumava National Park, Křemelná river valley, about 750 m a.s.l., organism grid mapping quadrat 6846. On the northern, right bank of the river, to the north of the village Sedlo, lies the gneiss debris covered by a relict pine forests. Four traps lie there from 11 June 1992 to 17 October 1993.

### 4. Povydří

The Šumava National Park, Povydří Natural Monument, about 900 m a.s.l., organism grid mapping quadrat 6947. About 2 km under the Antigl, on the right bank of the Vydra river, there lie extensive accumulations of granite boulders, mostly covered by a forest. The boulders are typically over 2 m in size, owing to which an extensive system of underground cavities occurs on the slope. One trap was laid in the space under the boulders for a period from 21 July 1992 to 17 October 1993.

### 5. Obří Zámek

The Šumava National Park, Obří Zámek Natural Monument, about 850 m a.s.l., organism grid mapping quadrat 6847. The whole northern slope of the Obří Zámek hill above the Losenice river valley is covered by gneiss debris, which is partly bare and partly is covered by waterlogged relict pine forests (ALBRECHT 1982). Four traps lay in moss on the debris surface and in the depth of the debris from 3 October 1994 to 20 July 1995. The material was complemented by beating the pines.

### 6. Na Hradě

A gneiss block field on the Na Hradě hill, to the south of the village Bošice (CHÁBERA 1970), about 880 m a.s.l., organism grid mapping quadrat 6848. Six traps were laid in the stony debris on the slope and under a frost-riven cliff for a period from 29 October 1992 to 4 July 1993.

### 7. Mářský Vrch

The Mářský Vrch Natural Monument, elevation about 900 m, organism grid mapping quadrat 6949. The mountain consists of gneiss intersected by a porphyrite vein. The decay of this vein gave rise to a layer of boulders of several meters thickness, covering the northern edge

of the hilltop (CHÁBERA 1982). Four traps were laid in the boulder accumulation for a period from 22 July 1992 to 4 July 1993.

## 8. Klet

The Blanský Les Protected Landscape Area, Granátník rocky ridge, about 800 m a.s.l., organism grid mapping quadrat 7151. A smaller talus made up by granulite stones. Material was collected individually on 11 June 1993.

## 9. Kraví Hora

The Novohradské Hory Protected Landscape Area, Kraví Hora mountain, about 900 m a.s.l. (CHÁBERA 1955), organism grid mapping quadrat 7254. Six traps were placed under the boulders for a period from 17 June 1992 to 14 May 1993.

## Methods

The material was collected using large pitfall traps made of a rigid plastic (RŮŽIČKA 1982, 1988b), which were left between stones under the surface of the debris for one year. Hand-picking and moss sieving were also applied as supplementary methods.

## Results and discussion

A total of 365 spiders belonging to 64 species have been collected (Table 1). *Acantholycosa norvegica sudetica*, *Clubiona alpicola*, and *Bathyphantes simillimus buchari*, which are typical of stony debris in the alpine zone of the Krkonoše (Giant Mountains) at 1000–1550 m above sea level (RŮŽIČKA & ZACHARDA 1994) were found on the highest lying site of the Jezerní Hora Mt. (1300 m). *Clubiona alpicola* is a central European mountain species inhabiting stony biotopes typically at altitudes over 1000 m (BLICK et al. 1995). *Acantholycosa norvegica* and *Bathyphantes simillimus* are northern species with a disjunctive arcto-alpine distribution, which in central Europe are found in stony debris only (BUCHAR 1966, RŮŽIČKA 1994b).

It is noteworthy that all of these three species were found at the Obří Zámek site, at elevations of mere 850 m. The Losenice river valley is the lowest lying site where the species *Clubiona alpicola* was ever found in the Czech Republic. The occurrence of the species *Bathyphantes simillimus* gives evidence of exceedingly cold microclimate reigning in the extensive bare debris, lying on the valley slope exposed to the north. The debris is partly covered by thick layers of moss. The species *Rugathodes bellicosus*, *Lepthyphantes notabilis*, *Bathyphantes simillimus*, *Porrhomma egeria*, and *Trogloneta granulum* live in an immediate vicinity at sites with a mosaic-like surface formed by bare stones and moss cushions. *Trogloneta granulum* is a relict species which has been observed in a few caves and boulder accumulations in central Europe (RŮŽIČKA 1990, 1994a). The stony surface with moss cover and scarce trees on this locality represents a unique islet of northern nature in the mild climatic zone.

The forest block talus in the Vydra river valley at the Povydrí site is another extraordinarily cold place. The species *Bathyphantes simillimus* and *Diplocentria bidentata* were observed on the lower edge of the debris. Until now, the latter species was found only twice in the Czech Republic, viz. in moss in the basalt talus on the Plešivec mountain in the České Středohoří Protected Landscape Area (BUCHAR 1989) and in moss in the sandstone block formation in a gorge near the Teplická Jeskyně cave in the Teplické Skály in the Broumovsko Protected Landscape Area (RŮŽIČKA 1992), and was never trapped between bare stones in a stony debris.

## Conclusions

Bare stony debris in South Bohemian mountains, whose elevation only rarely exceeds 1300 m, represent islets of the alpine mountain zone.

Populations of some relict species inhabiting cold places remain not only at the highest mountain altitudes but also in deeply incised valleys where climatic inversion gives rise to a very cold microclimate. This inversion effect in valleys can be additionally strengthened by the accumulation of cold air on the lower edges of the block fields. Some of the species can only inhabit moss layers in cold places on the lower edges of the boulder accumulations.

Boulder accumulations on localities studied are so extensive and stabilized that they do not require any management. Only the Na Hradě and Mářský Vrch sites become gradually overgrown by trees, which in the future may require sensitive clear-cutting.

In total, previous research included, south Bohemian stony debris can be characterized by the presence of three species groups:

### 1. Lithobious species occurring exclusively in stony debris

*Rugathodes bellicosus* (occurring in the highest number of localities), *Bathyphantes similimus* (in high altitudes or cold spaces on lower margins), *Lepthyphantes notabilis* (in sunny parts), *Lepthyphantes tripartitus* (in cold parts), *Acantholycosa norvegica* and *Clubiona alpicola* (both in higher altitudes).

### 2. Species living regularly in shadowy underground spaces

*Meta menardi*, *Metellina merianae*, *Nesticus cellulanus* (all hemisynanthropic species) and *Porhomma egeria* (in natural habitats only).

### 3. Species occasionally occurring and tied in various degree to stony debris habitats

*Trogloneta granulum* (very rare species found in stabilised stony debris without air movement), *Diplocentria bidentata* (very rare species found in moss on lower margins of stony debris, where cold air accumulates), *Theridion betteni*, *Lepthyphantes pulcher* and *Sitticus pubescens* (all three living predominantly on rock surface), *Theonoe minutissima* and *Hilaira tatrca* (both living also in peat bogs), *Micrargus apertus* and *Walckenaeria capito*.

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**Tabulka 1.** – Přehled materiálu. Počty jedinců.

**Table 1.** – Survey of material. Numbers of specimens.

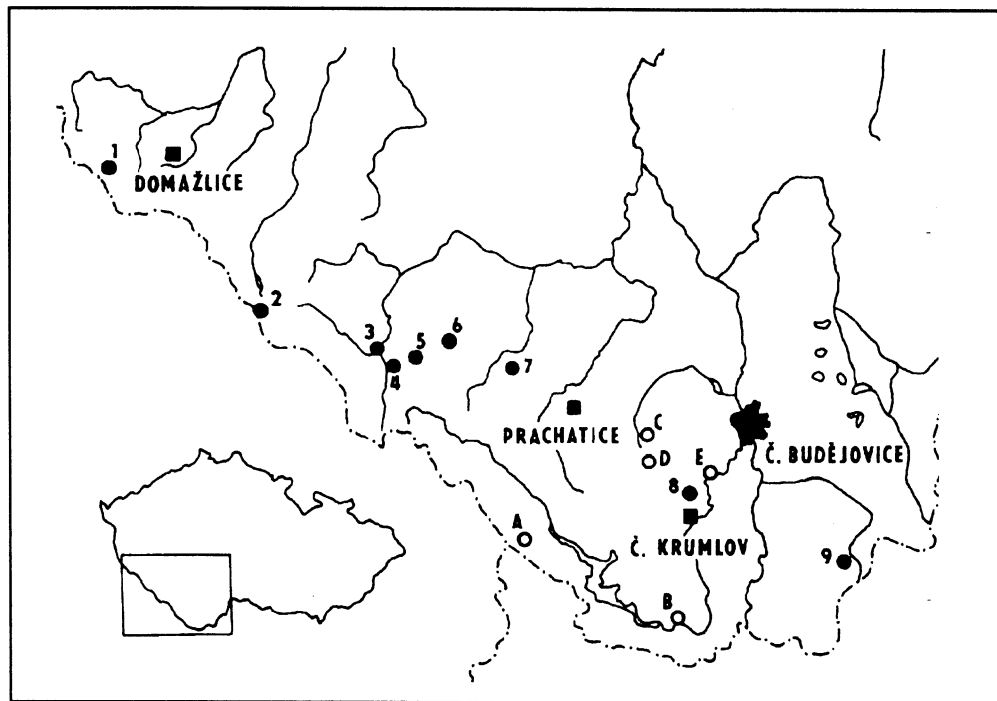
1. Skalky na Sádce, 2. Jezerní hora, 3. Křemelná, 4. Povydří, 5. Obří Zámek, 6. Na Hradě, 7. Mářský Vrch, 8. Klet, 9. Kraví hora.

species \ locality	1	2	3	4	5	6	7	8	9
<i>Segestriidae</i>									
<i>Segestria senoculata</i> (Linné, 1758)	–	1	5	1	1	2	–	–	2
<i>Dysderidae</i>									
<i>Harpactea hombergi</i> (Scopoli, 1763)	–	–	–	–	–	–	–	1	–
<i>Harpactea lepida</i> (C. L. Koch, 1838)	1	–	2	–	–	–	–	–	1
<i>Mimetidae</i>									
<i>Ero furcata</i> (Villers, 1789)	–	–	–	–	–	–	–	–	1
<i>Nesticidae</i>									
<i>Nesticus cellulanus</i> (Clerck, 1757)	–	–	4	–	3	3	–	–	–

species \ locality	1	2	3	4	5	6	7	8	9
<i>Theridiidae</i>									
<i>Achaearanea lunata</i> (Clerck, 1757)	-	-	-	-	-	-	-	-	1
<i>Pholcomma gibbum</i> (Westring, 1851)	-	2	-	-	-	-	-	-	-
<i>Rugathodes bellicosus</i> (Simon, 1873)	-	2	6	3	3	5	10	-	7
<i>Theonoe minutissima</i> (O. P. – Cambridge, 1879)	1	-	-	-	7	-	-	-	-
<i>Theridion betteni</i> Wiehle, 1960	-	-	-	-	1	1	-	-	1
<i>Theridion sisyphium</i> (Clerck, 1757)	-	-	-	-	2	-	-	-	-
<i>Theridion varians</i> Hahn, 1833	-	-	1	-	3	-	-	-	-
<i>Mysmenidae</i>									
<i>Trogloneta granulum</i> Simon, 1922	-	-	-	-	5	-	-	4	-
<i>Linyphiidae</i>									
<i>Bathyphantes simillimus buchari</i> Růžička, 1988	-	8	-	14	1	-	-	-	-
<i>Centromerita bicolor</i> (Blackwall, 1833)	-	-	-	-	1	-	-	-	-
<i>Centromerus sylvaticus</i> (Blackwall, 1841)	1	-	-	-	-	-	-	-	-
<i>Ceratinella brevis</i> (Wider, 1834)	-	-	-	-	2	-	-	-	-
<i>Drapetisca socialis</i> (Sundevall, 1832)	-	-	-	-	-	-	1	-	-
<i>Hilaira tatraica</i> Kulczynski, 1915	-	-	-	1	-	-	-	-	-
<i>Lepthyphantes alacris</i> (Blackwall, 1853)	2	2	4	1	-	-	5	-	4
<i>Lepthyphantes cristatus</i> (Menge, 1866)	-	-	-	-	1	2	-	-	-
<i>Lepthyphantes leprosus</i> (Ohlert, 1865)	-	-	-	-	-	-	1	3	1
<i>Lepthyphantes mansuetus</i> (Thorell, 1875)	-	-	-	-	-	-	-	-	1
<i>Lepthyphantes mengei</i> Kulczynski, 1887	4	-	-	-	1	-	-	-	-
<i>Lepthyphantes notabilis</i> Kulczynski, 1887	-	42	6	-	11	-	-	-	-
<i>Lepthyphantes pallidus</i> (O. P. – Cbr., 1871)	-	-	-	-	-	2	-	-	-
<i>Lepthyphantes pulcher</i> (Kulczynski, 1881)	-	2	-	-	-	-	-	-	-
<i>Lepthyphantes tripartitus</i> Miller & Svatoň, 1978	-	1	2	1	-	-	-	-	-
<i>Macrargus rufus</i> (Wider, 1834)	1	-	-	-	1	-	-	-	1
<i>Microneta viaria</i> (Blackwall, 1841)	1	-	-	-	-	-	-	-	-
<i>Porrhomma egeria</i> Simon, 1884	-	1	-	-	2	-	-	-	-
<i>Porrhomma pallidum</i> Jackson, 1913	-	-	-	1	-	1	-	-	-
<i>Diplocentria bidentata</i> (Emerton, 1882)	-	-	-	-	5	-	-	-	-
<i>Mecopisthes silus</i> (O. P. – Cambridge, 1872)	-	-	-	-	-	-	-	-	1
<i>Micrargus apertus</i> (O. P. – Cambridge, 1871)	5	1	-	2	-	-	-	-	4
<i>Pelecopsis elongata</i> (Wider, 1834)	-	1	-	-	-	-	-	-	-
<i>Sintula corniger</i> (Blackwall, 1856)	-	-	-	-	1	-	-	-	-
<i>Tapinoocyba affinis</i> Lessert, 1907	-	1	1	-	-	1	-	-	-
<i>Thyreosthenius parasiticus</i> (Westring, 1851)	-	-	-	-	-	-	5	-	1

species \ locality	1	2	3	4	5	6	7	8	9
<i>Walckenaeria atrotibialis</i> (O. P. – Cambridge, 1878)	-	-	-	-	-	-	1	-	-
<i>Walckenaeria capito</i> (Westring, 1861)	-	1	-	-	2	-	1	-	-
<i>Walckenaeria dysderoides</i> (Wider, 1834)	-	1	-	-	-	-	-	-	-
<i>Tetragnathidae</i>									
<i>Meta menardi</i> (Latreille, 1804)	1	1	-	1	-	-	2	-	-
<i>Metellina merianae</i> (Scopoli, 1763)	-	-	-	2	-	1	-	-	3
<i>Pachygnatha degeeri</i> Sundevall, 1830	-	-	-	-	-	-	-	-	1
<i>Araneidae</i>									
<i>Araneus sturmi</i> (Hahn, 1831)	-	-	-	-	1	-	-	-	-
<i>Cyclosa conica</i> (Pallas, 1772)	-	-	-	-	-	-	-	-	1
<i>Lycosidae</i>									
<i>Acantholycosa norvegica sudetica</i> (L. K., 1875)	-	7	-	-	14	-	-	-	-
<i>Alopecosa taeniata</i> (C. L. Koch, 1835)	-	-	-	1	3	-	-	-	-
<i>Xerolycosa nemoralis</i> (Westring, 1861)	-	-	-	-	1	-	-	-	-
<i>Agelenidae</i>									
<i>Coelotes terrestris</i> (Wider, 1834)	-	-	-	-	-	-	1	-	-
<i>Cicurina cicur</i> (Fabricius, 1793)	-	-	-	-	-	1	-	-	-
<i>Cryphoea silvicola</i> (C. L. Koch, 1834)	-	-	-	-	-	-	5	-	-
<i>Histopona torpida</i> (C. L. Koch, 1834)	-	-	-	-	2	-	-	-	5
<i>Tegenaria ferruginea</i> (Panzer, 1804)	-	-	1	-	-	-	-	-	-
<i>Tegenaria silvestris</i> L. Koch, 1872	1	-	-	1	8	1	1	-	1
<i>Cybaeidae</i>									
<i>Cybaeus angustiarum</i> L. Koch, 1868	-	-	1	-	-	-	-	-	-
<i>Hahniidae</i>									
<i>Hahnia ononidum</i> Simon, 1875	-	-	-	1	-	-	-	-	-
<i>Amaurobiidae</i>									
<i>Amaurobius fenestralis</i> (Stroem, 1768)	-	1	-	-	7	1	-	-	2
<i>Callobius claustrarius</i> (Hahn, 1833)	-	-	-	1	1	-	2	-	1
<i>Clubionidae</i>									
<i>Clubiona alpicola</i> Kulczynski, 1882	-	6	-	-	1	-	-	-	-

species \ locality	1	2	3	4	5	6	7	8	9
<i>Gnaphosidae</i>									
<i>Zelotes subterraneus</i> (C. L. Koch, 1833)	-	1	-	-	4	-	-	-	-
<i>Salticidae</i>									
<i>Evarcha flammata</i> (Clerck, 1757)	-	-	-	-	1	-	-	-	-
<i>Heliophanus aeneus</i> (Hahn, 1831)	-	-	-	-	1	-	-	-	-
Total number of specimens	18	82	33	36	92	21	35	8	40
Total number of species	10	19	11	15	30	12	12	3	20



**Obr. 1.** – Rozmístění zkoumaných stanovišť v jižních Čechách.

● Lokality studované v této práci. ○ Lokality studované jen v dřívějších pracích.

**Fig. 1.** – Location of collection sites in South Bohemia.

● Localities studied in the present study ○ Localities studied in previous studies only (Růžička 1988a, 1994a)  
1. Skalky na Sádce, 2. Jezerní Hora, 3. Křemelná, 4. Povydrří, 5. Obřív Zámek, 6. Na Hradě, 7. Mářský Vrch, 8. Klet, 9. Kraví Hora.

A. Plešné jezero, B. Luč and Čertova stěna, C. Vysoká Běta, D. Bulový, E. Třísov.