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# INVERTEBRATES OF DOBŠINÁ ICE CAVE AND STRATENÁ CAVE SYSTEM, SLOVAK PARADISE, SLOVAKIA

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**Abstract:** So far, 262 invertebrate taxa have been identified in the entire Stratená Cave System, 91 of which occupy Dobšiná Ice Cave. Individual entrances to the system are situated on slopes covered by a mountain spruce forest. The parietal fauna of the entrance sections of the Stratená and Psie diery Caves consists of a rich dipteran community. The collapsed doline at the entrance of Dobšiná Ice Cave represents a peculiar microclimatically inverse habitat inhabited by cold-adapted species of soil fauna. The shallow soil profile at the entrance of Dobšiná Ice Cave is occupied by recently discovered Collembola species *Megalothorax dobsinensis*. Its existence is exclusively limited to the cold and wet parts of the entrance microclimatic gradient. The cave sections filled permanently with glaciers are the poorest in terms of species diversity, with only 4 invertebrate species recorded. Collembola *Deuteraphorura kratochvili* and *Protaphorura janosik* are Carpathian endemics. *P. janosik* is characteristic of the entire cave system, occasionally with higher population density on the ice surface. Unglaciated parts of the Stratená Cave System represent an environment with a more microclimatic balanced regime with an air temperature between 3–6 °C. These parts are the habitat of troglobiotic and eutroglophilic invertebrates such as mite *Pantelozetes cavaticus* and *Cyrtolaelaps mucronatus*, collembolans *Pygmarrhopalites aggtelekiensis* and *Megalothorax carpaticus*, isopod *Mesoniscus graniger* and diplopod *Allorhiscosoma sphinx*. The Stratená Cave is the *locus typicus* of troglobiotic mite *Foveacheles troglodyta* (family Rhagidiidae). The cave system is also rich in standing water habitats. Due to its macroscopic dimensions, *Niphargus tatrensis* is the most striking stygobiotic crustacean in the Stratená Cave System. Other typical representatives of the aquatic fauna are minute crustaceans *Elaphoidella* sp. and *Bathynella natans* occupying pools in unglaciated parts of the Dobšiná Ice Cave. The presence of highly adapted terrestrial and aquatic cave invertebrates, some of them classified as glacial relicts, indicates the stable environmental conditions of the Dobšiná Ice Cave despite its long-term exploitation as a tourist cave.

**Key words:** ice caves, climatically inverse habitats, cave fauna, glacial relict, Western Carpathians

## INTRODUCTION

The environmental conditions of caves provide habitats for various organisms, including invertebrates. Investigation of cave fauna of the Slovak Paradise does not have a long tradition. This was probably due to the fact that there was no larger non-glaciated cave known in the area till the middle of the last century. Thus, a more systematic biological research in the caves of the Slovak Paradise began only after 1945 (Košel, 1984). Most of the early studies were focused on the inverse habitats at the entrance of the Dobšiná Ice Cave, characterised by liverworts and moss cushions overgrowing rocks (Stach, 1949; Nosek, 1969; Růžička and Vávra, 1993; Kováč et al., 1999). These are commonly occupied by cold tolerant collembolans *Hypogastrura crassaegranulata* and *Appendisotoma absoloni*, and coleopterans *Choleva nivalis* and *Duvalius bokori valyianus* (Gulička, 1975; Hůrka and Pulpán, 1980; Hůrka et al., 1989). In deeper parts of the cave, Gulička (1975) found diplopod *Allorhiscosoma sphinx* species endemic to the Western Carpathians. Data on the aquatic fauna of the Dobšiná Ice Cave are still scarce. In the deeper non-glaciated parts of the cave, as well as in the spring situated below the cave entrance, ostracods *Cypridopsis subterranea, C. vidua* and *Candona candida* were recorded (Petkovski, 1966; Gulička, 1975, 1982; Čaputa, 1985). Štěrba (1956) found crustaceans *Arcticocamptus cuspidatus* var. *ekmani*, *Gammarus fossarum*, *Niphargus* sp. and Ostracoda gen. sp. occupying the brook below the spring.

Occurrence of stygobiotic crustacean *Niphargus tatrensis* in the Stratená Cave was mentioned by Košel (1984).

In the last two decades, a more intensive zoological research was carried out in the caves of the Slovak Paradise in order to get more complex data on the overall structure of the invertebrate communities in this area. Collembola communities in Duča and Stratená Caves were studied by Kováč and Košel (1998) and Kováč et al. (1999). The authors found the caves occupied by three obligate cave collembolans species, namely *Pygmarrhopalites aggtelekiensis*, *Deuteraphorura kratochvili* and *Protaphorura janosik*.

More recently, Kováč et al. (2006) carried out comprehensive invertebrate research in the Dobšiná Ice Cave, focusing on both the terrestrial and aquatic habitats in three types of environments: (1) non-glaciated cave sections, (2) glaciated cave section, and (3) entrance section with climate inversion. The authors identified a broad spectrum of invertebrates, predominantly Acari, Collembola, and Coleoptera, with only 23 taxa found in the cave parts. Diverse colonies of microfungi were isolated from the cave sediments and air (Nováková, 2006). The latest detailed research of invertebrate communities was conducted in the Duča Cave (Kováč et al., 2012). The entrance habitats of the Dobšiná Ice Cave represent the type locality of collembolan species *Megalothorax dobsinensis* considered to be glacial relict (Papáč et al., 2019). It has yet to be found deeper in the cave, where the surfaces of the water pools host another species of the same genus *Megalothorax carpaticus* (Papáč and Kováč, 2013).

The aim of this contribution is to provide comprehensive data on invertebrate communities of the Dobšiná Ice Cave and other parts of the Stratená Cave System, summarizing literary sources as well as previously unpublished data.

## LOCALITY

The National Natural Monument Dobšiná Ice Cave is a famous tourist cave located in the Slovak Paradise National Park, Slovakia. The cave entrance has been known since time immemorial, previously under the name “ice hole”. The first official documentation of the cave was made by E. Ruffíny in 1870, when he descended into the cave interior. Immediately after discovery, the cave attracted much attention from the professional and general public.

The Dobšiná Ice Cave represents a unique, partly glaciated underground system, which scientifically ranks among the most important subterranean sites worldwide, listed as such among the UNESCO World Heritage Sites (Bella et al., 2005).

Speleo-genetically, the Dobšiná Ice Cave is a part of an extensive, multilevel Stratená Cave System including in addition the Duča Cave and Psie diery Cave, with a total length of more than 23 km (Bella et al., 2018). The entrance to the Dobšiná Ice Cave is a collapsed doline at an elevation of 969 m a.s.l. situated in a north-facing slope. The collapse separated the Dobšiná Ice Cave with 1,483 m of passages from the remainder of the Stratená Cave System. The main part of the Dobšiná Ice Cave consists of a large chamber containing perennial ice masses. The beginning of the ice filling development is estimated to 250–140,000 years ago. The average air temperature in glaciated Great Hall is –2.7 °C to –3.9 °C in February and approximately +0.2 °C in August. Unglaciated deeper parts of the cave are warmer with air temperature ranging between +0.8 °C and +3.5 °C. The Dobšiná Ice Cave is a statodynamic cave with a different winter and summer regime of air circulation (Korzystka et al., 2011; Bella and Zelinka, 2018; Kováč, 2018). In the neighbouring Stratená Cave, the humidity is balanced and reaches the values from 95 to 100%. Average temperatures fluctuate around the average outside temperature, except for sites near the surface. The average air temperature in Stratená Cave is 4.9 °C, the lowest values of temperature were measured in the parts near Dobšiná Ice Cave. In the longitudinal profile of the cave system, in the direction from southeast to northwest across the Duča massif, temperatures gradually decrease because of different orientation of the massif towards the sun (Tulis and Novotný, 1989).

The surroundings of the cave entrances, or the cave sections that are in close contact with the surface, provide relatively suitable food sources and microclimate conditions for invertebrates. The Dobšiná Ice Cave and Duča Cave represent collapsed dolines formed by limestone scree slopes covered by soil, leaves, and pioneer vegetation (mostly mosses and liverworts). Other entrances to this complex cave system are substantially smaller, lacking collapsed-entrance morphology. Both Dobšiná Ice Cave and Stratená Cave System are basically oligotrophic systems, where the food supply is limited to organic material dissolved in percolating water and very scarce wood residues and bat droppings (guano).

Even though this cave system is one of the most numerous wintering sites of bats in Slovakia, guano is present in minimal quantities here. This is because the bats are almost absent from the cave during summers. The bottoms of most lakes within the cave are covered with allochtonic fluvial sediments. Water levels in the cave lakes vary greatly during the year, depending on the hydrological conditions on the surface (Novotný and Tulis, 2005).

Regarding zoogeographic regions of the cave and karst fauna, the territory of the Slovak Paradise National Park is a well differentiated karst region belonging to the Bukkiko-Gemerico-Scepusicum supraregion (Košel, 2012).

## MATERIAL AND METHODS

Presented data are based on available literature sources (Kováč and Košel, 1998; Fenďa and Košel, 2000; Kováč et al., 2006, 2012) and were significantly supplemented by original, unpublished data collected by V. Košel and in case of Collembola, by N. Raschmanová and Ľ. Kováč. Some invertebrate collections were made in Psie diery Cave in September 2019. We used a combination of several collecting methods: pitfall trapping, hand collecting, extraction of exposed baits, as well as extraction in photo-eclector and sifting of organic material found in the caves and cave entrances. A plankton net was used to collect aquatic fauna in the sinter pools and puddles formed in cave sediments. Within the cave system, the entrance parts of Dobšiná Ice Cave, Duča, Psie diery, and Stratená Cave were examined in detail.

Habitats in different parts of the cave system were selected, based on their heterogeneity, for collecting terrestrial and aquatic fauna in order to cover a substantial diversity of invertebrates. Table 1 provides a summary taxonomic overview of invertebrates known from the caves within the Stratená Cave System, along with references to the literature sources of this data.

## RESULTS AND DISCUSSION

The combination of trophic conditions and microclimatic factors significantly affected the diversity and distribution of invertebrates in the Stratená Cave System. Altogether, 262 invertebrate taxa were identified in the entire cave system, including 91 species found in the Dobšiná Ice Cave (Tab. 1). More comprehensive studies on invertebrates were previously carried out in the other two major cave systems of the Western Carpathians. In the Domica–Baradla Cave System situated in the Slovak and Aggtelek Karst (Kováč et al., 2005; Papáč et al., 2014), 503 invertebrate taxa were found, while 122 invertebrate taxa were recorded in the Demänová Cave System in the Low Tatra Mts (Kováč et al., 2002; Kováč and Višňovská, 2014). The Stratená Cave System is geographically situated between the above-mentioned cave systems and is characterized by the presence of a wider spectrum of endemic, cold-adapted forms of invertebrates. Several invertebrate species occupying the Dobšiná Ice Cave represent obligate cave forms with endemic distribution limited either exclusively to the caves of the Slovak Paradise or more broadly to several southern karst regions of the Western Carpathians (Košel, 2009, 2012). Thus, the Stratená Cave System represents an important biospeleological site of the Western Carpathians.

### Faunistic overview

#### Rotifera

Because of their adaptability, rotifers are widely distributed in freshwater, marine, and limno-terrestrial habitats. There are even a few parasitic species known. Parasitic rotifers include, among others, rare trophic types belonging to the genera *Balatro*, which are endoparasites of annelid worms (Košel, 1973). The presence of *Balatro calvus* was confirmed in annelid specimens (fam. Enchytraeidae) found in Stratená Cave (Košel, unpubl).

#### Crustacea

The examples of fauna associated with ice caves may be found among aquatic crustaceans. Microscopic stygobiotic syncarid *Bathynella natans* (Fig. 1) and copepod *Elaphoidella* sp. inhabit pools in non-glaciated parts of the Dobšiná Ice Cave with water temperature around 3 °C. *B. natans* belongs to Bathynellacea group, of which three species have been reported in the Slovak caves (Brtek, 1994). It is the most common inhabitant of micro-spaces of submerged sediments (freatobiont) in various types of subterranean waters (hyporheic habitats), marginally occurring in standing waters, e.g. sinter

Fig. 1. Stygobiotic crustacean *Bathynella natans* lives in pools of unglaciated parts of the Dobšiná Ice Cave, body length 1.5 mm. Photo: Z. Višňovská

pools in the Biely Dóm Hall of the Dobšiná Ice Cave. Macroscopic amphipod *Niphargus tatrensis* was observed in the sinter pools and lakes in Stratená Cave and Psie diery Cave (Košel, 1984; Hudec and Mock, 2011). *N. tatrensis* represents a stygobiotic species inhabiting groundwaters of the karst areas in central and northern Slovakia (Kováč et al., 2014).

*Isopoda*

Among the nine representatives of terrestrial crustaceans known in the Stratená Cave System, only isopod *Mesoniscus graniger* (Isopoda, Oniscoidea) is regarded as a cavernicolous species. It is a blind and depigmented form predominantly inhabiting caves and endogeic habitats (Mlejnek and Ducháč, 2001, 2003). Geographic distribution of *M. graniger* covers the Carpathian Mountains, the Dinaric Mountains, and the Julian Alps (Derbák et al., 2018). The absence of this saprophagous terrestrial crustacean in the Dobšiná Ice Cave is presumably associated with a low air temperature not exceeding 3.5 °C, as well as with poor food sources (in the form of decaying organic material) present in the cave. It has been observed that *M. graniger* prefers food sources containing several essential compounds, e.g. algae, fungi, and bat guano (Šustr et al., 2005, 2009). *Trachelipus difficilis* is a relatively rare petricolous species with occasional occurrence on the walls of cave entrances (Fig. 2).

Fig. 2. Rare petricolous isopod *Trachelipus difficilis*, occasional inhabitant of the walls in cave entrances, body length 2 cm. Photo: A. Mock

Acari

*Mesostigmata*

In total, 23 taxa were found throughout the Stratená Cave System. Predatory mites of the Mesostigmata group are represented by euryvalent species, widely distributed in various surface microhabitat, e. g. *Proctolaelaps pygmaeus* and *Veigaia nemorensis*. Several eutroglophiles, such as *Cyrtolaelaps mucronatus*, *Parasitus loricatus*, *Uroobovella advena*, *Vulgarogamasus oudemansi,* and *V. remberti* form rich and stable populations in the cave system. The first two species represent typical components of the Western Carpathian caves. In general, *P. loricatus* prefers deeper parts of the caves, but it has not been found yet in ice caves. The guanophile *U. advena* occupies bat guano and rich organic material supplies in the Psie diery Cave (Fenďa and Košel, 2000).

*Oribatida*

Of the total number of 53 taxa, only 11 oribatid species were recorded in the Stratenská, Duča, and Dobšiná Ice Cave. Of these, only *Pantelozetes cavaticus*, *Gustavia microcephala*, and *Ceratozetes macromediocris* inhabit deeper cave parts. The last two species are common inhabitants of surface habitats without closer relation to the cave environment. The occurrence of the other oribatids is considered to be random, as evidenced by low number of collected individuals and the presence of two xerophilic species *Cymberemaeus cymba* and *Sphaerozetes piriformis*, as well as species found in rodent fur *Ceratoppia bipilis* and *Xenillus tegeocranus*. Most of Oribatida were found in wood residues near the cave entrances,

mainly in Duča Cave. The only exception is *P. cavaticus*, which is the most abundant oribatid species in the Western Carpathian caves. The occurrence of large numbers of individuals and the presence of juvenile stages at collecting site indicate its successful reproduction in subterranean habitats (Ľuptáčik, 2006; Kováč et al., 2014).

*Prostigmata*

Rhagidiid mites are among the other Acari best adapted to subterranean life. Two species of this family were identified across the entire Stratená Cave System, namely *Foveacheles troglodyta* and *Poecilophysis spelaea*. The first species is currently the only Western-Carpathian rhagidiid with striking troglomorphic features. The Stratená Cave is *P. spelaea* type locality (Zacharda, 1988). After its discovery, the species was also found in other caves in central Slovakia, i. e. in the caves of Muránska planina Plateau, Western Tatra Mts. *P. spelaea* represents a glacial relict, inhabiting colder European caves and larger stone debris (Kováč et al., 2014).

Opiliones

The total number of Opiliones species known in Slovakia reaches 35. Of this, only 13 species have been registered in Slovak caves (Šestáková and Mihál, 2014; Kováč et al., 2014). Most of the harvestmen found in the caves represent petricolous forms occupying walls of the cave entrances. Carpathian species *Ischyropsalis manicata* inhabits mainly the mountain karst caves. The species is widely distributed in forests and is usually found under stones. In addition, *I. manicata* is closely associated with the subterranean environment, which is manifested by the ability of individuals to reproduce in the cave entrance zones as well as the partial depigmentation of their bodies (Stašiov et al., 2003).

Araneae

There are many species that are considered troglophiles, predominantly those of the family Linyphiidae. The tendency to colonize shallow as well as deep subterranean habitats is characteristic of many species of the genus *Porrhomma*. Nearly half of the species belonging to this genus possess distinct morphological adaptations towards subterranean mode of life. *P. rosenhaueri*, characterized by reduced eyes and pale body, has been found to occupy Duča Cave. The species appears to be the main cavernicolous species of the cold mountain caves, found also in other caves of the Slovak Paradise. The distribution range of *P. rosenhaueri* extends over a large part of Europe. *P. convexum* is another species recorded in Duča Cave. The species is known from all over Europe and North America. Compared to the previous *Porrhomma* species, *P. convexum* has significantly larger eyes and is fully pigmented. Yet, it prefers wet and cold subterranean habitats (Košel, 2012; Růžička, 2018).

Diplopoda

Diplopods belong to the dominant representatives of cave macroarthropods. Many surface species inhabit caves either temporarily or accidentally. *Allorhiscosoma sphinx* is endemic to central karst areas of the Western Carpathians and is considered a eutroglophile species (Fig. 3). It lives and reproduces in the aphotic zones of caves. *A. sphinx* forms numerous populations across the entire Stratená Cave System, except for its glaciated parts (Kováč et al., 2006). *Leptoiulus mariae* is another endemic diplopod recorded in the Stratená Cave System. Carpathian endemics *Chelogona carpathicum* and *Leptoiulus liptauensis* are edaphic forms typical of high-altitude habitats. Besides, they are often found in cold sites at lower altitudes, such as deep gorges and cold cave entrances, including those into the Stratená Cave System (Gulička, 1975).

Chilopoda

Chilopods are frequent predators of small invertebrates at cave entrances; however, obligatory subterranean forms are absent in Slovak caves (Kováč et al., 2014). Species of the genus *Lithobius* occur commonly in hypogean habitats. Of these, *L. erythrocephalus* and *L. forficatus* were recorded in the Stratená Cave. *L. erythrocephalus* often penetrates deeper into the aphotic zones of caves. Its distribution is restricted to the Eastern Alps and the Carpathians. *L. forficatus* occurs exclusively in parts of the caves that are close to the surface. It is one of the most widespread chilopod species, with a broader distribution range extending over Europe, the Caucasus, and northern Africa (Országh et al., 1994).

Fig. 3. Western Carpathian endemic diplopod *Allorhiscosoma sphinx*, body length 1.5 cm. Photo: Ľ. Kováč

Collembola

Collembola are among the most diversified groups of arthropods in subterranean habitats. In the Dobšiná Ice Cave and Stratená Cave System, 39 taxa of Collembola were detected, of which only 26 species occupy the entrance parts. Three species are considered as obligate cave forms: *Deuteraphorura kratochvili*, *Protaphorura janosik* (Fig. 4) and *Pygmarrhopalites aggtelekiensis* (Fig. 5). The first species is a typical inhabitant of caves of central Western Carpathians, but also caves of the southern karst regions. *Megalothorax carpaticus* and *P. janosik* represent glacial relicts associated with caves of alpine karst or cold caves at lower elevations. Based on the latest observations, *P. janosik* is endemic to the Western and Eastern Carpathians, inhabiting both karst and pseudokarst caves (Parimuchová et al., 2017). *P. aggtelekiensis* is a species linked to the areas with a plateau type of karst and is considered to be Tertiary relict with well-developed troglomorphic characters (Kováč et al., 2016). In Slovakia, the species was recorded for the first time in the Stratená Cave, surprisingly remotely from *locus typicus* that is Baradla Cave (Nosek and Paoletti, 1984). In the Dobšiná Ice Cave, *P. aggtelekiensis* occupies even the cold parts with the air temperature 3.3 – 3.7 °C (Košel, 2009). *Megalothorax*

Fig. 4. Troglobiotic Collembola *Protaphorura janosik*, species characteristic of the cave system with occurrence on ice surfaces, body length 4 mm. Photo: Ľ. Kováč & A. Parimuchová

Fig. 5. Obligate cave collembolan species *Pygmarrhopalites aggtelekiensis,* body length 1.5 mm. Photo: Ľ. Kováč & P. Ľuptáčik

Fig. 6. Collembola *Hypogastrura crassaegranulata* occurs in moss cushions at the entrance of the Dobšiná Ice Cave, body length 1.3 mm. Photo: Ľ. Kováč & N. Raschmanová

*dobsinensis*, discovered recently in a superficial subterranean habitat at the entrance of the Dobšiná Ice Cave, is most likely another glacial relict. It is restricted to a cold and wet habitat, along an inversed temperature gradient at the cave entrance. Morphology of *M. dobsinensis* does not show any clear troglomorphisms, however, its known distribution suggests preference of this species to the cold cave entrances of the Western Carpathians (Papáč et al., 2019). Stach (1949) described subspecies *Hypogastrura crassaegranulata dobsinensis* from moss cushions at the entrance of the Dobšiná Ice Cave (Fig. 6) as well as a similar form on the alpine soils of the High Tatra Mts. as subspecies *H. c. crassaegranulata*. However, *H. c. dobsinensis* was later synonymized with the nominal form *H. crassaegranulata* (Skarżyński, 2006).

Coleoptera

The coleopterans belong to the dominant groups of cavernicolous fauna. Previous attention of collectors was focused mainly on carabid coleopterans, specifically to the genus *Duvalius*. Of this, *Duvalius bokori valyianus* occurs the Stratená Cave System. The species has broad distribution within the territory of eastern Slovakia where it inhabits surface as well as endogeic microhabitats, and partially also caves. Another coleopteran *Choleva nivalis*, family Leiodidae, can be considered a glacial relict due to its preference of cave entrances and its occasional presence in deeper parts of the cold caves. Coleopterans of the family Staphylinidae, can be also found in cold subterranean habitats. However, *Quedius mesomelinus,* the most common species found in the Stratená Cave System, does not reach the same population quantity and frequency as in warmer caves (Kováč et al., 2014).

Diptera

Dipteran flies are an important and regular component of parietal communities in the entrance section of caves throughout the year. Several species are permanent inhabitants of aphotic and stenothermic parts of caves during their larval stages. However, dipteran diversity in the deeper sections of caves is apparently lower, and populations are usually very scattered in the cave depending on the availability of the food source, i.e. decaying organic materials. In Stratená Cave System, we found 57 species of 10 families. Families Heleomyzidae and Mycetophilidae had the highest diversity, with 21 and 16 species recorded, respectively. We found the highest dipteran diversity in the Stratená Cave with 48 species, of which 46 species belonged to the parietal fauna. This number is related to numerous visits to the cave and a complex sampling from the cave entrance to a distance of about 100 m from the closure inside the cave (space with regular occurrence of the parietal fauna). *Trichocera maculipennis* and *Bradysia forficulata* are permanent residents of deeper parts of the caves, where they successfully reproduce. These cave dipterans were collected using pitfall traps and baits. Dipteran communities of Dobšiná Ice Cave and Duča Cave are greatly reduced due to unfavorable climatic conditions, especially in winter (frozen entrance parts).

Table 1. Overview of terrestrial and aquatic invertebrates of Dobšiná Ice Cave and Stratená Cave System (• troglobiont/stygobiont)

| Taxa | Dobšiná Ice Cave | | | | Stratená Cave | | Duča Cave | | Psie diery Cave | Data source |
|---|---|---|---|---|---|---|---|---|---|---|
| | Entrance | *glaciated parts* | *non-glaciated parts* | | Entrance | Cave | Entrance | Cave | | |
| | | Zrútený dóm Dome | Kvapľová sieň Hall | Biely dóm Dome | | | | | | |
| NEMATODA | | | | | | + | | | | Košel (2009) |
| ROTIFERA | | | | | | | | | | |
| *Balatro calvus* Claparède, 1867 | | | | | + | | | | | Košel (unpubl.) |
| ANNELIDA | | | | | | | | | | |
| **Oligochaeta** | | | | | | | | | | |
| fam. Enchytraeidae | + | | | | | | | | | Kováč et al. (2006) |
| *Buchholzia appendiculata* (Buchholz, 1862) | | | | | + | | | | | Košel (unpubl.) |
| *Enchytraeus* sp. | | | | | + | | | | | Košel (unpubl.) |
| *Enchytraeus buchholzi* Vejdovsky, 1878 | | | | | + | | | | | Košel (unpubl.) |
| *Henlea nasuta* (Eisen, 1878) | | | | | + | | | | | Košel (unpubl.) |
| *Marionina argentea* (Michaelsen, 1889) | | | | | + | | | | | Košel (unpubl.) |
| MOLLUSCA | | | | | | | | | | |
| **Gastropoda** | + | | | | | | | | | Kováč et al. (2006) |
| *Cochlodina laminata* (Montagu, 1803) | + | | | | | | | | | Merkel (1885) as *Clausilia laminata* var. *fuscilabris* |
| *Ena montana* (Draparnaud, 1801) | + | | | | | | | | | Merkel (1885) as *Buliminus montanus* |
| *Isognomostoma isognomostomos* (Schröter, 1784) | + | | | | | | | | | Merkel (1885) as *Triodopsis personata* |
| *Petasina unidentata carpatica* (Polinski, 1929) | + | | | | | | | | | Merkel (1885) as *Fruticicola carpatica* |
| ARTHROPODA | | | | | | | | | | |

| Taxa | Dobšiná Ice Cave | | | | Stratená Cave | | Duča Cave | | Psie diery Cave | Data source |
|---|---|---|---|---|---|---|---|---|---|---|
| | Entrance | *glaciated parts* | *non-glaciated parts* | | | | | | | |
| | | Zrútený dóm Dome | Kvapľová sieň Hall | Biely dóm Dome | Entrance | Cave | Entrance | Cave | | |
| Crustacea | | | | | | | | | | |
| **Copepoda** | | | | | | | | | | |
| •*Elaphoidella* sp. | | | | + | | | | | | Kováč et al. (2006) |
| **Ostracoda** | | | | | | | | | | |
| *Candona candida* (O.F.Müller, 1776) | | | + | | | | | | | Čaputa (1985) |
| *Cypridopsis subterranea* Wolf, 1919 | | | + | | | | | | | Petkovski (1966) |
| *Cypridopsis vidua* (O. F. Müller, 1776) | | | + | | | | | | | Čaputa (1985) |
| **Syncarida** | | | | | | | | | | |
| •*Bathynella natans* Vejdovský, 1882 | | | | + | | | | | | Kováč et al. (2006) |
| **Amphipoda** | | | | | | | | | | |
| •*Niphargus tatrensis* Wrześniowski, 1888 | | | | | | + | | | + | Košel (1984), Hudec & Mock (2011) |
| **Isopoda** | | | | | | | | | | |
| *Hyloniscus mariae* Verhoeff, 1908 | + | | | | | | | | | Rudy et al. (unpubl.) |
| *Lepidoniscus minutus* (Koch, 1838) | + | | | | | | | | | Rudy et al. (unpubl.) |
| *Ligidium germanicum* Verhoeff, 1901 | | | | | | | + | | | Rudy et al. (unpubl.) |
| *Ligidium hypnorum* (Cuvier, 1792) | + | | | | | | | | | Rudy et al. (unpubl.) |
| *Mesoniscus graniger* Frivaldszky, 1865 | | | | | | | | + | + | Gulička (1975), Košel (1984), unpubl., Kováč et al. (2012) |
| *Platyarthrus hoffmannseggii* Brandt, 1833 | + | | | | | | | | | Rudy et al. (unpubl.) |
| *Protracheoniscus politus* (C.L. Koch, 1841) | + | | | | | | | | | Kováč et al. (2006) |
| *Trachelipus difficilis* Radu, 1950 | + | | | | | | | | + | Mock (unpubl.), Rudy et al. (unpubl.) |

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| | | Zrútený dóm Dome | Kvapľová sieň Hall | Biely dóm Dome | Entrance | Cave | Entrance | Cave | | |
| *Trichoniscus carpaticus* Tabacaru, 1974 | | | | | | | + | | | Rudy et al. (unpubl.) |
| Chelicerata | | | | | | | | | | |
| **Acari** | | | | | | | | | | |
| Oribatida | | | | | | | | | | |
| *Achipteria* sp. | | | | | | | + | | | Kováč et al. (2012) |
| *Anachipteria deficiens* Grandjean, 1932 | | | | | | | + | | | Kováč et al. (2012) |
| *Belba clavigera* Willmann, 1954 | | | | | | | + | | | Kováč et al. (2012) |
| *Berniniella* cf. *conjuncta* (Strenzke, 1951) | | | | | | | + | | | Kováč et al. (2012) |
| *Carabodes* cf. *tenuis* Forsslund, 1953 | | | | | | | + | | | Kováč et al. (2012) |
| *Carabodes reticulatus* Berlese, 1913 | | | | | | | + | | | Kováč et al. (2012) |
| *Ceratoppia bipilis* (Hermann, 1804) | + | | | | | | + | | | Kováč et al. (2006, 2012) |
| *Ceratoppia quadridentata* (Haller, 1880) | | | | | | | + | | | Kováč et al. (2012) |
| *Ceratozetes macromediocris* Shaldybina, 1970 | | | + | | | | | | | Kováč et al. (2006) |
| *Ceratozetes thienemanni* Willmann, 1943 | | | | | | | + | | | Kováč et al. (2012) |
| *Cultroribula juncta* (Michael, 1885) | | | | | | | + | | | Kováč et al. (2012) |
| *Cymberemaeus cymba* (Nicolet, 1855) | + | | | | | | | | | Kováč et al. (2012) |
| *Damaeus gracilipes* (Kulczyński, 1902) | | | | | | | + | | | Kováč et al. (2012) |
| *Dissorhina ornata* (Oudemans, 1900) | | | | | | | + | | | Kováč et al. (2012) |
| *Dissorhina* sp. | | | | | | | + | | | Kováč et al. (2012) |
| *Eobrachychthonius oudemansi* Hammen, 1952 | | | | | | | + | | | Kováč et al. (2012) |

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| | | Zrútený dóm Dome | Kvapľová sieň Hall | Biely dóm Dome | Entrance | Cave | Entrance | Cave | | |
| *Epidamaeus berlesei* (Michael, 1898) | | | | | | | + | | | Kováč et al. (2012) |
| *Eueremaeus valkanovi* (Kunst, 1957) | | | | | | | + | | | Kováč et al. (2012) |
| *Eupelops* sp. | | | | | | | + | | | Kováč et al. (2012) |
| *Chamobates birulai* Kulczyński, 1902 | + | | | | | | + | + | | Kováč et al. (2012) |
| *Chamobates spinosus* Sellnick, 1928 | + | | | | | | | | | Kováč et al. (2006) |
| *Chamobates voigtsi* (Oudemans, 1902) | | | | | | | + | | | Kováč et al. (2012) |
| *Gustavia microcephala* (Nicolet, 1855) | | + | | | | | | | | Kováč et al. (2006) |
| *Hermannia gibba* (C. L. Koch, 1839) | | | | | | | + | | | Kováč et al. (2012) |
| *Kunstidamaeus* cf. *nidicola* (Willmann, 1936) | | | | | | | + | | | Kováč et al. (2012) |
| *Liebstadia* sp. | | | | | | | + | | | Kováč et al. (2012) |
| *Liochthonius sellnicki* (Thor, 1930) | | | | | | | + | | | Kováč et al. (2012) |
| *Mesotritia nuda* (Berlese, 1887) | | | | | | | + | | | Kováč et al. (2012) |
| *Metabelba pulverosa* (Strenzke, 1953) | | | | | | | + | | | Kováč et al. (2012) |
| *Multioppia glabra* (Mihelcic, 1955) | | | | | | | | + | | Kováč et al. (2012) |
| *Nothrus palustris* C. L. Koch, 1839 | | | | | | | | + | | Kováč et al. (2012) |
| *Oppia* sp. | | | | | | + | | | | Košel (unpubl.) |
| *Oppiella* cf. *keilbachi* (Moritz, 1969) | | | | | | | + | | | Kováč et al. (2012) |
| *Oppiella marginedentata* (Subias, 1977) | | | | | | | + | + | | Kováč et al. (2012) |
| *Oppiella subpectinata* (Oudemans, 1900) | | | | | | | + | + | | Kováč et al. (2012) |
| *Oribatella berlesei* (Michael, 1898) | + | | | | | | | | | Kováč et al. (2006) |
| *Oribatella* sp. 1 | | | | | | | + | | | Kováč et al. (2012) |

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| | | Zrútený dóm Dome | Kvapľová sieň Hall | Biely dóm Dome | Entrance | Cave | Entrance | Cave | | |
| *Oribatella* sp. 2 | | | | | | | + | | | Kováč et al. (2012) |
| *Oribatella* sp. 3 | | | | | | | + | | | Kováč et al. (2012) |
| •*Pantelozetes cavaticus* (Kunst, 1962) | | | | | | + | | | | Košel (2009, 2012) |
| *Pergalumna* sp. | + | | | | | | | | | Kováč et al. (2006) |
| *Phthiracarus* sp. | | | | | | | + | + | | Kováč et al. (2012) |
| *Porobelba* sp. | | | | | | | + | | | Kováč et al. (2012) |
| *Quadroppia quadricarinata* (Michael, 1885) | | | | | | | + | | | Kováč et al. (2012) |
| *Rhisotritia ardua* (C. L. Koch, 1841) | | | | | | | + | | | Kováč et al. (2012) |
| *Scheloribates laevigatus* (Koch, 1835) | | | | | | | + | | | Kováč et al. (2012) |
| *Scheloribates latipes* (C.L. Koch, 1841) | + | | | | | | | + | | Kováč et al. (2006, 2012) |
| *Scheloribates pallidulus* (Koch, 1841) | | | | | | | + | | | Kováč et al. (2012) |
| *Sphaerozetes piriformis* (Nicolet, 1855) | + | | | | | | + | | | Kováč et al. (2006, 2012) |
| *Steganacarus striculus* (Koch, 1836) | | | | | | | + | | | Kováč et al. (2012) |
| *Suctobelba* cf. *altvateri* Moritz, 1970 | | | | | | | + | | | Kováč et al. (2012) |
| *Xenillus tegeocranus* (Hermann, 1804) | + | | | | | | | | | Kováč et al. (2006) |
| Mesostigmata | | | | | | | | | | Kováč et al. (2006) |
| *Arctoseius semiscissus* (Berlese, 1892) | | | | | | | + | | | Kováč et al. (2012) |
| *Cyrtolaelaps chiropterae* Karg, 1971 | | | | | | | | + | | Fenďa & Košel (2000) |
| *Cyrtolaelaps mucronatus* (G. et R. Canestrini, 1881) | | | + | + | + | + | | + | + | Fenďa & Košel (2000), Kováč et al. (2006, 2012) |
| *Dermanyssus carpathicus* Zeman, 1979 | | | | | | | + | | | Kováč et al. (2012) |

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| | | Zrútený dóm Dome | Kvapľová sieň Hall | Biely dóm Dome | Entrance | Cave | Entrance | Cave | | |
| *Dinychus perforatus* Kramer, 1886 | | | | | | | | + | | Kováč et al. (2012) |
| *Euryparasitus emarginatus* (C.L.Koch, 1839) | | | | | + | | | | | Košel (unpubl.) |
| *Gamasellus montanus* (Willmann, 1936) | | | | | | | + | | | Kováč et al. (2012) |
| *Leioseius* sp. | | | | | | | + | | | Kováč et al. (2012) |
| *Lysigamasus* sp. | | | | | | | + | | | Kováč et al. (2012) |
| *Ornithonissus sylviarum* (Canestrini et Fanzago, 1877) | | | | | | | + | | | Kováč et al. (2012) |
| *Paragarmania dentritica* (Berlese, 1918) | + | + | + | + | | | | | | Kováč et al. (2006) |
| *Parasitus* sp. | | | | | | | + | | | Kováč et al. (2012) |
| *Parasitus loricatus* (Wankel, 1861) | | | | | | | | + | + | Fenďa & Košel (2000) |
| *Poecilochirus necrophori* Vitzthum, 1930 | | | | | | | | + | | Fenďa & Košel (2000) |
| *Proctolaelaps pygmaeus* (J. Müller, 1860) | | | | + | | | | | | Kováč et al. (2006) |
| *Uroobovella advena* (Trägårdh, 1912) | | | | | + | + | | | + | Fenďa & Košel (2000); Košel (unpubl.) |
| *Veigaia* sp. | | | | | | | | + | | Kováč et al. (2012) |
| *Veigaia cerva* (Kramer, 1876) | | | + | | | | | | | Kováč et al. (2006) |
| *Veigaia nemorensis* (C.L. Koch, 1839) | | | + | | + | + | + | + | | Kováč et al. (2006, 2012), Košel (unpubl.) |
| *Vulgarogamasus oudemansi* (Berlese, 1903) | | | | | | | | + | + | Fenďa & Košel (2000) |
| *Vulgarogamasus remberti* (Oudemans, 1912) | + | | + | | | | | + | + | Fenďa & Košel (2000), Kováč et al. (2006, 2012) |
| *Zercon carpathicus* Sellnick, 1958 | | | | | | | + | | | Kováč et al. (2012) |

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| *Zercon curiosus* Trägårdh, 1910 | | | | | | | + | | | Kováč et al. (2012) |
| *Zercon* sp. | | | | | | | + | | | Kováč et al. (2012) |
| Prostigmata | + | | + | | | | | + | | Kováč et al. (2006, 2012) |
| fam. Acaridae | | | | | | | | | | |
| *Acotyledon* sp. | | | | | | + | | | | Košel (unpubl.) |
| *Tyrophagus* sp. | | | | | | + | | | | Košel (unpubl.) |
| fam. Anoetidae | | | | | | | | | | |
| *Anoetus* sp. | | | | | | + | | | | Košel (unpubl.) |
| fam. Labidostomatidae | | | | | | | | + | | Kováč et al. (2012) |
| fam. Pygmephoridae | | | | | | | | | | |
| *Pygmephorus erlangensis* Krzcal, 1959 | | | | | + | | | | | Košel (unpubl.) |
| fam. Rhagidiidae | | | | | | | + | + | | Kováč et al.. (2012) |
| •*Foveacheles troglodyta* Zacharda, 1988 | | | | | | + | | | | Zacharda (1988) |
| *Poecilophysis spelaea* (Wankel, 1861) | | | + | | | | | | | Kováč et al. (2014) |
| **Pseudoscorpionida** | + | | | | | | | + | | Kováč et al. (2006), Košel (1984) |
| *Neobisium* sp. | | | | | | | | | + | Košel & Ducháč (unpubl.) |
| *Neobisium hermanni* Beier, 1938 | | | | | | | | + | | Ducháč (1998) |
| *Neobisium sylvaticum* (C.L.Koch, 1835) | | | | | + | | | | | Košel & Ducháč (unpubl.) |
| **Araneae** | | | + | | | | | | | Kováč et al. (2006) |
| *Amaurobius fenestralis* (Ström, 1768) | + | | | | | | | | | Kováč & Mock (unpubl.) |

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| *Macrargus rufus* (Wider, 1834) | + | | | | | | | | | Kováč & Mock (unpubl.) |
| *Meta menardi* (Latreille, 1804) | | | | | + | | | | | Košel (unpubl.) |
| *Metelina merianae* (Scopoli, 1763) | | | | | + | | | | | Košel (unpubl.) |
| *Porrhomma convexum* (Westring, 1851) | | | | | | | | + | | Kováč et al. (2012) |
| *Porrhomma rosenhaueri* (L. Koch, 1872) | | | | | | | | + | | Košel (2009, 2012 as *P. myops*), Řezáč (unpubl.) |
| *Tegenaria silvestris* L. Koch, 1872 | | | | | + | | | | | Košel (unpubl.) |
| *Tenuiphantes alacris* (Blackwall, 1853) | | | | | + | | | | | Košel & Miller (unpubl.) |
| **Opiliones** | | | | | | | | | | |
| *Gyas annulatus* (Olivier, 1791) | | | | | | | + | | | Gulička (1975) |
| *Ischyropsalis manicata* C. L. Koch, 1865 | | | | | + | | | + | + | Košel (1984), Košel (unpubl.) |
| *Leiobunum rupestre* (Herbst, 1799) | | | | | + | | + | | | Košel (unpubl.) |
| *Platybunus bucephalus* C.L.Koch, 1835 | | | | | + | | | | | Košel (unpubl.) |
| *Trogulus nepaeformis* (Scopoli, 1763) | | | | | + | | | | | Košel (unpubl.) |
| *Trogulus tricarinatus* (Linnaeus, 1767) | + | | | | | | | | | Kováč et al. (2006) |
| Myriapoda | | | | | | | | | | |
| **Diplopoda** | | | | | | | | | | |
| *Allorhiscosoma sphinx* (Verhoeff, 1907) | | | + | | + | + | + | + | + | Gulička (1975), Košel (1984), Kováč et al. (2006, 2012) |
| *Glomeris tetrasticha* C.L. Brandt, 1833 | + | | | | | | | + | | Kováč et al. (2006, 2012) |
| *Chelogona carpathicum* (Latzel, 1882) | + | | | | | | | | | Gulička (1975), Kováč et al. (2006) |

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| *Leptoiulus mariae* Gulička, 1952 | | | | | | | | + | | Gulička (1975) |
| *Leptoiulus liptauensis* (Verhoeff, 1899) | | | | | | | | + | | Gulička (1975) |
| *Polydesmus complanatus* (Linnaeus, 1761) | | | | | | | | + | | Kováč et al. (2012) |
| *Polyzonium* sp. | + | | | | | | | | | Kováč et al. (2006) |
| **Chilopoda** | | | | | | | | | | |
| *Lithobius erythrocephalus schulleri* Verhoeff, 1925 | | | | | | + | | | | Országh et al. (1994) |
| *Lithobius forficatus* (Linnaeus, 1758) | | | | | | + | | | | Országh et al. (1994) |
| Hexapoda | | | | | | | | | | |
| **Collembola** | | | | | | | | | | |
| *Allacma fusca* (Linné, 1758) | + | | | | | | | | | Kováč et al. (2006) |
| *Anurida granaria* (Nicolet, 1847) | | | | | | | | | + | Kováč & Košel (1998), Kováč et al. (1999) |
| *Appendisotoma absoloni* Rusek, 1966 | + | | | | | | | | | Nosek (1969) |
| *Ceratophysella engadinensis* (Gisin, 1949) | | | | | | | | + | | Kováč et al. (1999) |
| *Ceratophysella granulata* Stach, 1949 | + | | | | | + | + | + | + | Kováč et al. (1999, 2006, 2012) |
| *Desoria hiemalis* (Schött, 1893) | + | | | | | | | | | Raschmanová & Kováč (unpubl.) |
| *Desoria propinqua* (Axelson, 1902) | | | | | | | | | + | Kováč & Košel (1998), Kováč et al. (1999) |
| •*Deuteraphorura kratochvili* (Nosek, 1963) | | + | | | | + | | + | + | Kováč & Košel (1998 as *D.* cf. *hussoni*), Kováč et al. (1999, 2006, 2012) |

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| | | Zrútený dóm Dome | Kvapľová sieň Hall | Biely dóm Dome | Entrance | Cave | Entrance | Cave | | |
| *Deutonura albella* (Stach, 1920) | + | | | | | | | | | Raschmanová & Kováč (unpubl.) |
| *Doutnacia xerophila* Rusek, 1974 | + | | | | | | | | | Raschmanová & Kováč (unpubl.) |
| *Entomobrya nivalis* (Linné, 1758) | + | | | | | | | | | Raschmanová & Kováč (unpubl.) |
| *Folsomia manolachei* Bagnall, 1939 | + | | | | | | | | | Raschmanová & Kováč (unpubl.) |
| *Hymenaphorura pseudosibirica* (Stach, 1954) | | | | | | | + | | | Kováč et al. (2012) |
| *Hypogastrura crassaegranulata* (Stach, 1949) | + | | | | | | | | | Stach (1949), Nosek (1969), Paclt (1957), Kováč et al. (2006) |
| *Hypogastrura* sp. | + | | | | | | | | | Kováč et al. (2006) |
| *Lepidocyrtus lignorum* (Fabricius, 1775) | + | | | | | | | | | Kováč et al. (2006) |
| *Lepidocyrtus violaceus* (Fourcroy, 1785) | + | | | | | | | | | Raschmanová & Kováč (unpubl.) |
| *Megalothorax carpaticus* Papáč et Kováč, 2013 | | | + | | | | | | | Kováč et al. (2006), Papáč & Kováč (2013) |
| *Megalothorax dobsinensis* Papáč, Raschmanová et Kováč, 2019 | + | | | | | | | | | Papáč et al. (2019) |
| *Megalothorax* cf. *hipmani* Papáč et Kováč, 2013 | + | | | | | | | | | Raschmanová & Kováč (unpubl.) |
| *Mesaphorura jirii* Rusek, 1982 | | | | | | + | | | | Kováč et al. (1999) |
| *Orchesella flavescens* (Bourlet, 1839) | + | | | | | | | | | Kováč et al. (2006) |
| *Pachyotoma recta* (Stach, 1929) | + | | | | | | | | | Raschmanová & Kováč (unpubl.) |

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| | | Zrútený dóm Dome | Kvapľová sieň Hall | Biely dóm Dome | Entrance | Cave | Entrance | Cave | | |
| *Parisotoma notabilis* (Schäffer, 1896) | | | | | | | | | + | Kováč et al. (1999) |
| *Plutomurus carpaticus* Rusek et Weiner, 1978 | + | | | | | | | + | + | Kováč & Košel (1998), Kováč et al. (1999, 2012), Raschmanová & Kováč (unpubl.) |
| *Pogonognathellus flavescens* (Tullberg, 1871) | + | | | | | | + | | | Kováč et al. (1999, 2006, 2012) |
| *Protaphorura armata* (Tullberg, 1869) | + | | | | | | | | | Raschmanová & Kováč (unpubl.) |
| *Protaphorura aurantiaca* (Ridley, 1880) | + | | | | | | | | | Raschmanová & Kováč (unpubl.) |
| •*Protaphorura janosik* Weiner, 1990 | | + | + | + | | + | | + | + | Kováč & Košel (1998), Kováč et al. (1999, 2006, 2012) |
| *Protaphorura pannonica* (Haybach, 1960) | + | | | | | | | | | Raschmanová & Kováč (unpubl.) |
| *Protaphorura tricampata* (Gisin, 1956) | | | | | | | | | + | Kováč et al. (1999) |
| *Pseudachorutes corticicolus* (Schäffer, 1896) | + | | | | | | | | | Raschmanová & Kováč (unpubl.) |
| *Pseudisotoma monochaeta* (Kos, 1942) | + | | | | | | | | | Raschmanová & Kováč (unpubl.) |
| *Pseudosinella thibaudi* Stomp, 1977 | + | | | | | | | | | Raschmanová & Kováč (unpubl.) |
| •*Pygmarrhopalites aggtelekiensis* (Stach, 1929) | | | + | + | | + | | | + | Kováč & Košel (1998), Kováč et al. (1999, 2006) |
| *Pygmarrhopalites pygmaeus* (Wankel, 1860) | | | | | | | + | + | + | Kováč & Košel (1998), Kováč et al. (1999, 2012) |
| *Tetrodontophora bielanensis* (Waga, 1842) | + | | | | | | + | | | Kováč et al. (1999, 2006) |
| *Willemia scandinavica* Stach, 1949 | + | | | | | | | | | Raschmanová & Kováč (unpubl.) |

| Taxa | Dobšiná Ice Cave | | | | Stratená Cave | | Duča Cave | | Psie diery Cave | Data source |
|---|---|---|---|---|---|---|---|---|---|---|
| | Entrance | *glaciated parts* | *non-glaciated parts* | | | | | | | |
| | | Zrútený dóm Dome | Kvapľová sieň Hall | Biely dóm Dome | Entrance | Cave | Entrance | Cave | | |
| *Xenylla brevisimilis* Stach, 1949 | + | | | | | | | | | Raschmanová & Kováč (unpubl.) |
| **Coleoptera** | | | | | | | | | | |
| fam. Leiodidae | | | + | | | | | | | Kováč et al. (2006) |
| *Catops longulus* Kellner, 1846 | | | | | | | | + | | Kováč et al. (2012) |
| *Choleva nivalis* (Kraatz, 1856) | + | | | | | | | | | Růžička & Vávra (1993) |
| fam. Carabidae | | | | | | | | | | |
| *Duvalius bokori valyianus* (Bokor, 1922) | + | | | | | + | | + | + | Gulička (1975), Hůrka & Pulpán (1980), Hůrka et al. (1989), Košel (1984, 2009), Kováč et al. (2012) |
| *Leistus rufomarginatus* (Duftschmid, 1812) | | | | | | + | | | | Košel & Kožíšek (unpubl.) |
| *Pterostychus oblongopunctatus* (Fabricius, 1787) | | | | | | + | | | | Košel & Kožíšek (unpubl.) |
| fam. Staphylinidae | + | | | | | | | | | Kováč et al. (2006) |
| *Bryaxis frivaldszkyi slovenicus* (Machulka, 1926) | | | | | | | + | + | | Kováč et al. (2012) |
| *Bryaxis monstrosetibialis* (Stolz, 1923) | | | | | | | | + | | Košel & Kolimár (unpubl.), Kováč et al. (2012) |
| *Microscydmus nanus* (Schaum, 1844) | | | | | | | + | | | Kováč et al. (2012) |
| *Quedius mesomelinus* Marsham, 1802 | | | | | + | | | + | + | Košel (unpubl.), Košel (1984), Kováč et al. (2012) |
| fam. Nitidulidae | | | | | | | | | | |
| *Epuraea melanocephala* (Marsham, 1802) | | | | | | | + | | | Kováč et al. (2012) |
| **Auchenorrhyncha** | + | | | | | | | | | Kováč et al. (2006) |
| **Hymenoptera** | + | | | | | | | | | Kováč et al. (2006) |

| Taxa | Dobšiná Ice Cave | | | | Stratená Cave | | Duča Cave | | Psie diery Cave | Data source |
|---|---|---|---|---|---|---|---|---|---|---|
| | Entrance | *glaciated parts* | *non-glaciated parts* | | | | | | | |
| | | Zrútený dóm Dome | Kvapľová sieň Hall | Biely dóm Dome | Entrance | Cave | Entrance | Cave | | |
| **Diptera** | + | + | + | | | | | | | Kováč et al. (2006) |
| fam. Phoridae | | | | | | | | | | |
| *Triphleba antricola* (Schmitz, 1918) | | | | | | | | + | | Kováč et al. (2012) |
| fam. Trichoceridae | | | | | | | | | | |
| *Trichocera maculipennis* Meigen, 1818 | | | + | | + | + | | + | + | Kováč et al. (2006, 2012), Košel (unpubl.) |
| *Trichocera regelationis* (Linnaeus, 1758) | | | | | + | | | + | + | Košel (unpubl.) |
| fam. Limoniidae | | | | | | | | | | |
| *Dactylolabis sexmaculata* (Macquart, 1826) | | | | | + | | | | | Košel (unpubl.) |
| *Chionea araneoides* Dalman, 1816 | | | | | | | | + | | Košel (unpubl.) |
| *Limonia nubeculosa* Meigen, 1804 | | | | | + | | | | + | Košel (unpubl.) |
| fam. Tipulidae | | | | | | | | | | |
| *Tipula* (*Vestiplex*) *scripta* Meigen 1830 | | | | | + | | | | | Košel & Martinovský (1994) |
| *Tipula* (*Savtschenkia*) *subsignata* Laskschewitz, 1933 | | | | | + | | | | | Košel & Martinovský (1994) |
| fam. Bolitophilidae | | | | | | | | | | |
| *Bolitophila austriaca* (Mayer, 1950) | | | | | + | | | | | Košel (unpubl.) |
| *Bolitophila cinerea* (Meigen, 1818) | | | | | | | | | + | Košel (unpubl.) |
| *Bolitophilla hybrida* (Meigen, 1804) | | | | | + | | | | + | Košel (unpubl.) |
| *Bolitophila maculipennis* Walker, 1836 | | | | | + | | | | | Košel (unpubl.) |
| *Bolitophilla saundersi* (Curtis, 1836) | | | | | + | | | | + | Košel (unpubl.) |
| fam. Mycetophilidae | | | | | | | | | | |

| Taxa | Dobšiná Ice Cave | | | | Stratená Cave | | Duča Cave | | Psie diery Cave | Data source |
|---|---|---|---|---|---|---|---|---|---|---|
| | Entrance | *glaciated parts* | *non-glaciated parts* | | | | | | | |
| | | Zrútený dóm Dome | Kvapľová sieň Hall | Biely dóm Dome | Entrance | Cave | Entrance | Cave | | |
| *Exechiopsis distendens* (Lackschewitz, 1937) | | | | | + | | | | | Košel (unpubl.) |
| *Exechiopsis furcata* (Lundström, 1911) | | | | | + | | | | | Košel (unpubl.) |
| *Exechiopsis indecisa* (Walker, 1856) | | | | | + | | | | | Košel (unpubl.) |
| *Exechiopsis intersecta* (Meigen, 1818) | | | | | + | | | | | Košel (unpubl.) |
| *Exechiopsis januarii* (Lundström, 1913) | | | | | + | | | | | Košel (unpubl.) |
| *Exechiopsis lackschewitziana* (Stackelberg, 1948) | | | | | | | | | + | Košel (unpubl.) |
| *Exechiopsis ligulata* (Lundström, 1913) | | | | | + | | | | | Košel (unpubl.) |
| *Exechiopsis magnicauda* (Lundström, 1911) | | | | | + | | | | | Košel (unpubl.) |
| *Exechiopsis pseudindecisa* Laštovka & Matile, 1974 | | | | | + | | | | | Košel (unpubl.) |
| *Exechiopsis subulata* (Winnertz, 1863) | | | | | + | | | | | Košel (unpubl.) |
| *Exechiopsis unguiculata* (Lundström, 1911) | | | | | + | | | | | Košel (unpubl.) |
| *Mycetophila strobli* Laštovka, 1972 | | | | | + | | | | | Košel (unpubl.) |
| *Mycetophila uninotata* Zetterstedt, 1852 | | | | | + | | | | | Košel (unpubl.) |
| *Speolepta leptogaster* (Winnertz, 1863) | | | | | | | | + | + | Košel (unpubl.), Kováč et al. (2012) |
| *Tarnania dziedzickii* (Edwards, 1941) | | | | | + | | | | | Košel (unpubl.) |
| *Tarnania fenestralis* (Meigen, 1818) | | | | | + | | | | | Košel (unpubl.) |
| fam. Culicidae | | | | | | | | | | |
| *Culex pipiens* Linnaeus, 1758 | | | | | + | | | | | Košel (unpubl.) |
| *Culiseta alaskaensis* (Ludlow, 1906) | | | | | + | | | | | Košel (unpubl.) |
| *Culiseta glaphyroptera* (Schiner, 1864) | | | | | + | | | | | Košel (unpubl.) |

| Taxa | Dobšiná Ice Cave | | | | Stratená Cave | | Duča Cave | | Psie diery Cave | Data source |
|---|---|---|---|---|---|---|---|---|---|---|
| | Entrance | *glaciated parts* | *non-glaciated parts* | | | | | | | |
| | | Zrútený dóm Dome | Kvapľová sieň Hall | Biely dóm Dome | Entrance | Cave | Entrance | Cave | | |
| fam. Sciaridae | | | | | | | | | | |
| *Bradysia forficulata* (Bezzi, 1914) | | | | | | + | | + | + | Košel (2001), Kováč et al. (2012) |
| fam. Heleomyzidae | | | | | | | | | | |
| *Eccoptomera emarginata* Loew, 1862 | | | | | + | | | | + | Martinek (1984), Košel & Martinek (unpubl.) |
| *Eccoptomera obscura* (Meigen, 1830) | | | | | + | | | | | Košel & Martinek (unpubl.) |
| *Eccoptomera pallescens* (Meigen, 1830) | | | | | + | | | | + | Košel & Martinek (unpubl.) |
| *Gymnomus amplicornis* (Czerny, 1924) | | | | | + | | | | | Martinek (1982) |
| *Gymnomus caesius* (Meigen, 1830) (=*Scoliocentra*) | | | | | + | | | | + | Martinek (1984) |
| *Gymnomus czernyi* Papp et Woźnica, 1993 | | | | | + | | | | + | Papp & Woźnica (1993) |
| *Gymnomus europaeus* Papp et Woźnicza, 1993 | | | | | | | | | + | Košel & Martinek (unpubl.) |
| *Gymnomus spectabilis* (Loew, 1862) (=*Scoliocentra*) | + | | | | + | | | | + | Martinek (1982), Kováč et al. (2006 as *Scoliocentra spectabilis*), Košel & Martinek (unpubl.) |
| *Heleomyza captiosa* (Gorodkov, 1962) | | | | | + | | | | + | Martinek (1984 & unpubl.) |
| *Heleomyza modesta* (Meigen, 1838) | | | | | + | | | | + | Martinek (1984) |
| *Heleomyza serrata* (Linnaeus, 1758) | | | | | + | | | | | Košel & Martinek (unpubl.) |
| *Heteromyza commixta* Collin, 1901 | | | | | + | | | | | Košel & Martinek (unpubl.) |
| *Heteromyza oculata* Fallen, 1820 | | | | | + | | | | | Košel & Martinek (unpubl.) |
| *Heteromyza rotundicornis* (Zetterstedt, 1846) | | | | | + | | | | | Košel & Martinek (unpubl.) |
| *Sapromyza basalis* Zetterstedt, 1847 | | | | | + | | | | | Košel & Martinek (unpubl.) |

| Taxa | Dobšiná Ice Cave | | | | Stratená Cave | | Duča Cave | | Psie diery Cave | Data source |
|---|---|---|---|---|---|---|---|---|---|---|
| | Entrance | *glaciated parts* | *non-glaciated parts* | | | | | | | |
| | | Zrútený dóm Dome | Kvapľová sieň Hall | Biely dóm Dome | Entrance | Cave | Entrance | Cave | | |
| *Sapromyza setiventris* Zetterstedt, 1847 | | | | | + | | | | | Košel & Martinek (unpubl.) |
| *Scoliocentra amplicornis* (Czerny, 1924) | | | | | | | | | + | Košel & Martinek (unpubl.) |
| *Scoliocentra brachypterna* (Loew, 1873) | | | | | | | | | + | Košel & Martinek (unpubl.) |
| *Scoliocentra ventricosa* (Becker, 1859) | | | | | + | | | | + | Martinek (1982) |
| *Scoliocentra villosa* (Meigen, 1830) | | | | | + | | | | | Martinek (1982) |
| fam. Sphaeroceridae | | | | | | | | | | |
| *Crumomyia nigra* (Meigen, 1830) | | | | | + | | | | , | Košel & Roháček (unpubl.) |
| *Crumomyia parentela alpicola* (Roháček 1980) | | | | | + | | | | | Košel & Roháček (unpubl.) |
| *Crumomyia setitibialis* (Spuler, 1925) | | | | | + | | | | | Košel & Roháček (unpubl.) |
| fam. Nycteribiidae | | | | | | | | | | |
| *Basilia italica* Theodor, 1954 | | | + | | | | | | | Hůrka (1984) |
| **Lepidoptera** | | | | | | | | | | |
| *Hypena obesalis* Treitschke, 1829 | | | | | + | | | | | Košel (unpubl.) |
| *Aglais io* (Linnaeus, 1758) | | | | | | | | | + | Košel (unpubl.) |
| *Scoliopteryx libatrix* (Linnaeus, 1758) | | | | | + | | | | + | Košel (unpubl.) |
| *Triphosa dubitata* (Linnaeus, 1758) | + | | | | + | | | + | + | Kriesch (1875), Košel (unpubl.) |
| **Trichoptera** | + | | | | | | | | | Kriesch (1875) |
| *Micropterna testacea* (Gmelin, 1769) | | | | | + | | | | + | Košel (unpubl.) |
| *Stenophylax permistus* McLachlan, 1895 | | | | | + | | | | + | Košel (unpubl.) |
| **Siphonaptera** | + | | | | | | | | | Kováč et al. (2006) |

| Taxa | Dobšiná Ice Cave | | | | Stratená Cave | | Duča Cave | | Psie diery Cave | Data source |
|---|---|---|---|---|---|---|---|---|---|---|
| | Entrance | *glaciated parts* | *non-glaciated parts* | | Entrance | Cave | Entrance | Cave | | |
| | | Zrútený dóm Dome | Kvapľová sieň Hall | Biely dóm Dome | | | | | | |
| *Ischnopsyllus hexaclenus* Kolenati, 1856 | | | + | | | | | | | Hůrka (1969) |
| *Ischnopsyllus simplex mysticus* Jordan, 1942 | | | + | | | | | | | Hůrka (1969) |
| **Number of taxa** | **68** | **5** | **22** | **7** | **74** | **24** | **65** | **48** | **48** | |

## CONCLUSION

The karst system of the Stratená Cave represents a unique complex of relatively well-preserved subterranean habitats with extensive underground spaces and many rare, relict, and endemic subterranean forms typical of the Western Carpathians, or even smaller local regions.

In total, 262 invertebrate taxa were recorded in the Stratená Cave System, of which 91 taxa were found in the Dobšiná Ice Cave. A smaller part of this spectrum consists of obligate subterranean forms (troglobionts/stygobionts = 8). Based on the presence of typical species and microclimatic conditions, we can define three zones of species distribution within the cave system. Only four species were recorded in glaciated sections, two of which are obligate cave collembolans *Deuteraphorura kratochvili* and *Protaphorura janosik*. Unglaciated sections represent the largest part of the cave system with endemic and obligate cave arthropods, such as rhagidiid species *Foveacheles troglodyte* and oribatid species *Pantelozetes cavaticus*, collembolans *Pygmarrhopalites aggtelekiensis* and *Megalothorax carpaticus*, and eutroglophilous diplopod *Allorhiscosoma sphinx*. Typical groundwater fauna is represented by crustaceans, specifically by stygobiont *Niphargus tatrensis* and phreatobionts *Elaphoidella* sp. and *Bathynella natans*. The climatically inverted entrance part of Dobšiná Ice Cave with cold thermal regime throughout the year, is inhabited by several cold-adapted soil-dwelling species. The occurrence of the recently discovered collembolan *Megalothorax dobsinensis*, a glacial relict, is limited exclusively to a cold and wet section of the local microclimatic gradient with stony debris covered primarily by soil (MSS).

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