Eukoenenia spelaea (Peyerimhoff, 1902) - a cave dwelling palpigrade (Arachnida, Palpigradida) from the Slovak Karst

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Kováč Ľ.: *Eukoenenia spelaea* (Peyerimhoff, 1902) - a cave dwelling palpigrade (Arachnida, Palpigradida) from the Slovak Karst
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Eukoenenia spelaea (Peyerimhoff, 1902) was recorded during biospeleological investigations in the Slovak Karst Biosphere Reserve. In total 11 specimens were extracted from sediment rich in humus in Ardovská Cave during seven sampling occasions in 1997-1998. Occurrence of palpigrades in the cave is restricted to 40-80 m distance from the entrance. It is the first record of Palpigradida in Slovakia. *E. spelaea* inhabits also three Hungarian caves located in the orographic unit Slovak-Aggtelek Karst: Szabadság Cave, Baradla Cave and Meteor Cave. Specimens from these caves were classified into subspecies *E. spelaea vagvoelgyii* (Szalay, 1956). Because of unclear taxonomic status, this form is provisionally attached to *E. spelaea*-complex.

Keywords: Palpigradida, Slovak Karst, biospeleology.

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Introduction

Palpigradida represent a blind, whitish arachnids of small size (1 - 2.5 mm) in which the prosoma is covered by a carapace of three pieces, and the opisthosoma is of 11 somites. The last three somites are narrowed and bearing a long, plurisegmented flagellum (Savory, 1977; Condé, 1996). They live in soil, primarily in the intertropical realm or in caves, a refugium in cool countries (Condé, 1996).

Szalay (1956) described *Koenenia vagvoelgyii* from Szabadság Cave in the Aggtelek Karst in Hungary. Subsequently, Dózsa-Farkas and Loksa (1970) referred two other caves in the Aggtelek Karst (Baradla Cave, Meteor Cave) with the occurrence of the same palpigrade species. They made a revision of topotypes and transferred it as subspecies into *Eukoenenia austriaca* (Hansen, 1926). Finally, Condé (1972) transposed the same form as subspecies to *E. spelaea* (Peyerimhoff, 1902), based on ventral chaetotaxy of IV-VI opisthosomal segments: thick serrated seta a3 in *E. spelaea* present, in *E. austriaca* absent.

During biospeleological research in the Slovak Karst Ardovská Cave was explored as further locality with the occurrence of *E. spelaea* (Fig. 1).

Methods

Ardovská Cave was sampled for invertebrates with special attention to soil microarthropods. The cave is located on the south-western margin of the Silická Plateau in

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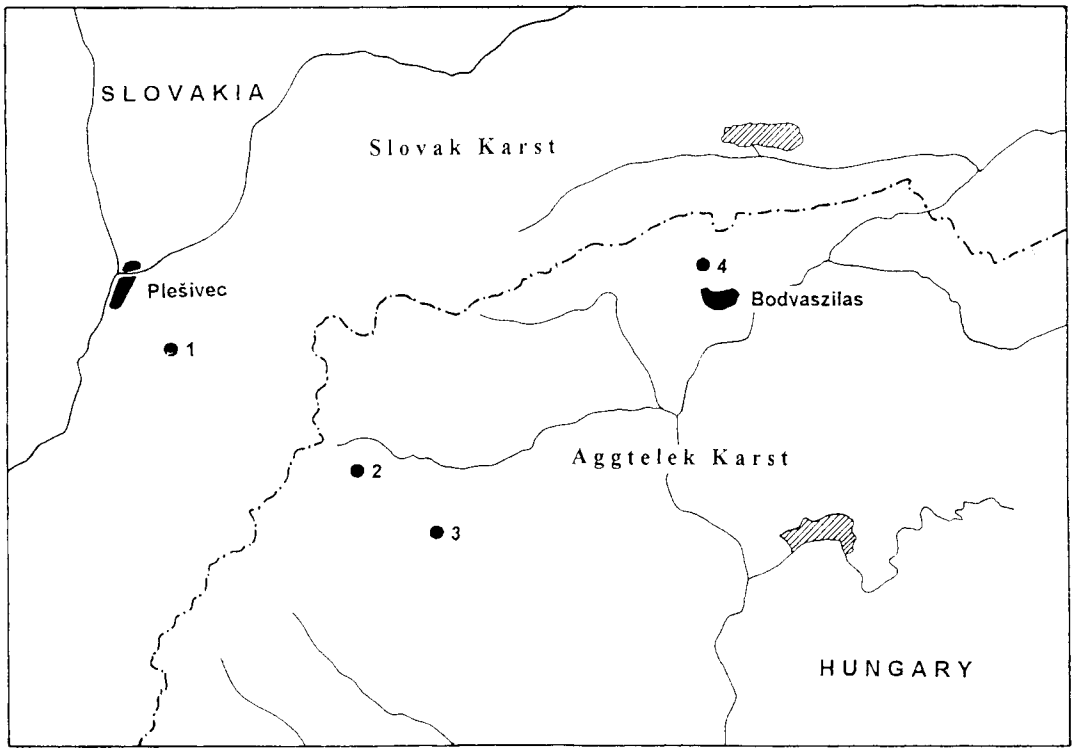

Fig. 1. Distribution of *Eukoenenia spelaea*-complex in the Slovak-Aggtelek Karst: 1 - Ardovská Cave, 2 - Baradla Cave, 3 - Szabadság Cave, 4 - Meteor Cave.

the Slovak Karst Biosphere Reserve (48°31′ N, 20°25′ E). This is a static cave with constant temperature +10.8°C (Droppa, 1961) and total length 1,300 m. Entrance is situated in 315 m altitude and whole cave consists of principally two levels of passages created by underground stream (Kučera, 1964) (Fig. 2). A temporal stream is still running through the lower level of the cave.

Exploration of invertebrate fauna was concentrated to genetically older upper level with bottom substrate rich in humus. Following collecting methods were used:

1) extraction of bottom sediment, bat guano and rotten wood in a high-gradient apparatus (Crossley and Blair, 1991),
2) exposition of baits (1-2 months) and their subsequent extraction as in previous method,
3) pitfall trapping using Barber traps filled with 4 % formaldehyde and modified traps made of plastic funnel and vial filled with 96 % etylalcohol,
4) hand collecting.

Results

Biospeleological investigations in Ardovská Cave in the Slovak Karst revealed stable microarthropod communities. In Collembola, for example, low number of species was recorded where troglobites shared high densities (Kováč, 1998).

Palpigrades were repeatedly registered in the cave during six sampling occasions: 23.IV.,

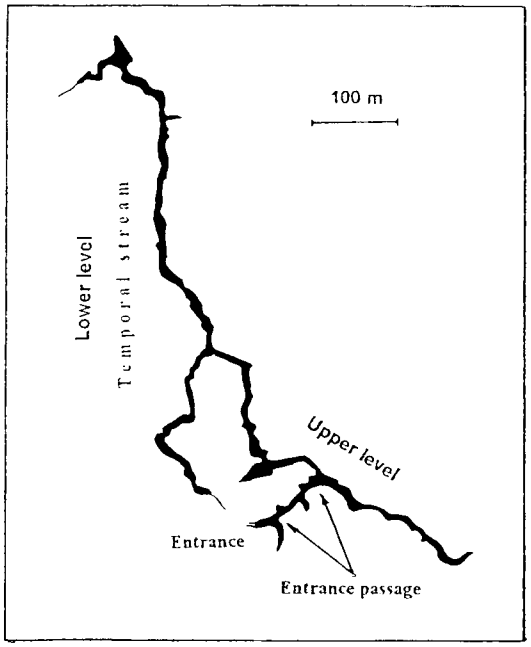

Fig. 2. Ardovská Cave (after Kučera, 1964)

13.VI., 4.IX. and 30.X.1997; 5.III. and 8.VII. 1998. Extraction of bottom substrate appeared as the only successful collecting technique. Sampling in regular 20 m long sections across passages in upper cave level showed that palpigrades were restricted to 40-80 m distance from the entrance in the first passage. The place is located in aphotic zone and in moisture and temperature gradient as stable microclimatic conditions of this static cave begin from roughly 60 m inward (Droppa, 1961).

Specimens from samplings in 1997 consisted of 3 adult females and 1 stage A. Further seven individuals from 1998 are actually studied taxonomically.

Discussion

Discovery of cave Palpigradida in the Slovak Karst is not surprising. Possibility of occurrence of this arachnid group in Slovak territory has already been highlighted by Gulička (1975) since *E. s. vagvoelgyii* was detected in three caves of the Aggtelek Karst, Hungarian part of the orographic unit Slovak-Aggtelek Karst. This is the northernmost area with the distribution of Palpigradida in Europe. *E. spelaea* is documented from complete Alpine arch, Western Carpathians and from the north of the Dinaric mountains. Interestingly, *E. s. vagvoelgyii*, except known localities in the Western Carpathians, was reported also from Austrian Alps in the Palaeozoic of Graz (Condé and Neuherz, 1977).

Totally, four subspecies of *E. spelaea* were described: *E. s. spelaea* (Peyerimhoff, 1902) (France), *E. s. hauseri* Condé, 1974 (Croatia), *E. s. strouhali* Condé, 1972 (Austria) and *E. s. vagvoelgyii* (Hungary). The situation is, however, complicated because two subspecies were described based on one adult specimen only. Moreover, two closely related species of the genus from the Carpathians in Romania (*E. condei*, *E. margaretae*) were described using doubtful criteria. The subspecies status of *E. spelaea* is unclear and material apparently needs taxonomic revision. Palpigradida belonging to *E. spelaea* should therefore be considered as *E. spelaea*-complex (Condé, pers. comm.).

Hand collecting is a current technique for sufficient Palpigradida sampling. Extraction of bottom substrate in high-gradient apparatus is considered, based on present study, as further possible method. In the same way a palpigrade specimen, belonging to *E. austriaca*-complex, was extracted from bottom substrate in the catacombs of the St. Stephen's Cathedral in Vienna (Christian, 1998).

The specimen found in Vienna catacombs comes from Pleistocene Danube gravel mixed with moist fine-grained material and anthropogenic debris. It suggests Palpigradida as component of interstitial fauna in Central Europe. The presence of these animals in

Ardovská Cave is also very likely connected with existence of interstitial environment. Firstly, substrate from which the specimens were extracted, is composed of fine limestone grains mixed with organic substrate (bat guano, flooded humic particles). Secondly, Ardovská Cave is located at the end of blind valley (polje) in boundary between Triassic limestones and Neogene gravels. The occurrence of Palpigradida in deeper layers of the Neogene gravels in the surroundings of the cave may be expected as these are regarded as river delta accumulations of Pannonian sea (Kučera, 1964).

Limited occurrence of palpigrades in cave passage close to the entrance is an interesting phenomenon. Loksa (1961) observed the same habit in the 1600 m long Szabadság Cave in the Aggtelek Karst, where these arachnids were registered in the 50-250 m distance from the cave entrance.

Ardovská Cave represents newly discovered refuge of *Eukoenenia spelaea*-complex in the Western Carpathians. Further studies concentrated on „milieu souterrain superficiel" and more suitable collecting techniques may bring better understanding of distribution and ecology of Palpigradida in Central Europe.

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