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New records of scuttle flies (Diptera: Phoridae) from caves in the Bakony Mountains, Hungary

R. Henry L. DISNEY*, Csaba KUTASI** Lajos Tamás KATONA** and Sándor TÓTH***

*Department of Zoology, University of Cambridge, Cambridge CB2 3EJ, England; e-mail: rhld2@hermes.cam.ac.uk
**Bakony Museum of the Hungarian Natural History Museum, ZIRC, Hungary;
e-mails: kutasi@index.hu, finci99@freemail.hu
***H-8420 ZIRC, Széchenyi u. 2, Hungary; e-mail: flycatcher@vnet.hu

Abstract: Eleven species of Phoridae were obtained during the survey of invertebrates fauna of four caves in the Bakony Mountains of Hungary. Four species are new records for Hungary: *Borophaga bennetti* Disney, 2010, *Megaselia tenebricola* Schmitz, 1934, *Megaselia vernalis* (Wood, 1909) and *Triphleba flexipalpis* Schmitz, 1927.

Key words: Diptera, Phoridae, caves, Bakony Mountains, Hungary, new records

INTRODUCTION

The biospeleological researches on the Hungarian caves have a great tradition (Horusitzky & Siegmeth 1914). Unfortunately in recent decades only few investigations have been carried out.

All caves in Hungary have been protected since 1961. Most of the caves are in the Bükk and Bakony mountain ranges. The Bakony Mountains are the most complex geological region in Hungary. The mountains are composed of numerous karst-, and non-karstic (sedimentary and volcanic) caves. As a consequence, the caves are very diverse (Eszterhás & Szentes 2013).

In 2009 the staff of the Natural History Museum of Bakony Mountains and the local caver clubs started to discover the cave fauna of the Bakony Mts Some of these caves, were never zoologically studied before.

One of the previously investigated caves is the Lóczy Cave, where 50 years ago Imre Loksa collected 21 species of arthropods (Oniscoidea, Diplopoda, Diplura, Collembola, Pseudoscorpionidea, Araneae), using pitfall traps (Loksa 1960).

About 30 years ago, István Eszterhas collected invertebrates from Kapolcsi Pokol Hole. He has published data on 20 arthropods (Collembola, Isopoda, Diplopoda, Araneae, Lepidoptera, Diptera). Among Diptera, he found the individuals of the three genera belonged to the family Phoridae (*Phora* sp., *Megaselia* sp., *Conicera* sp.) (Eszterhás 1986). These individuals were identified to genera level only. Unfortunately, the collected material has been lost.

PLACE AND METHODS OF THE STUDY

Between 2009 and 2012 invertebrates were collected in one small basalt cave and three limestone caves in the Bakony Mountains (Fig. 1). The three studied caves are under the management of the Balaton-felvidéki National Park, they are partly open to the public.

The Csodabogyós Cave is situated at Balatonederics, in the Keszthely Mts. which is part of the Bakony Mts. The cave formed in the Late Triassic period in Ederics Limestone formation. It is a 5200 m long and 121 deep multi level system of fissures cave. The cave chambers are notable for various dripstone formations, therefore it has been strictly protected since 1992 (Kárpát 2003, Anonymus 2012).

The Lóczy Cave is near Balatonfüred. It was discovered in 1882. The 154 m long and 15 m deep cave was formed by upwelling thermal water in Füred Limstone in the Late Triassic period, and it has been highly protected too since 1982 (Hazslinszky 2003, Anonymus 2012).

The Takó Cave is near Eplény. It is a 60 m long limestone cave (Anonymus 2012).

The Kapolcsi Pokol Hole is a 56 m long tectonic basalt cave. The thick basalt blocks in this cave dam the seeping water, which emerges as a spring. This spring feeds a small lake. The size of the lake varied, because after the water reaches a certain level a siphon system drains it. The lake appears mainly in the spring, after thawing (Eszterhás & Szentes 2010).

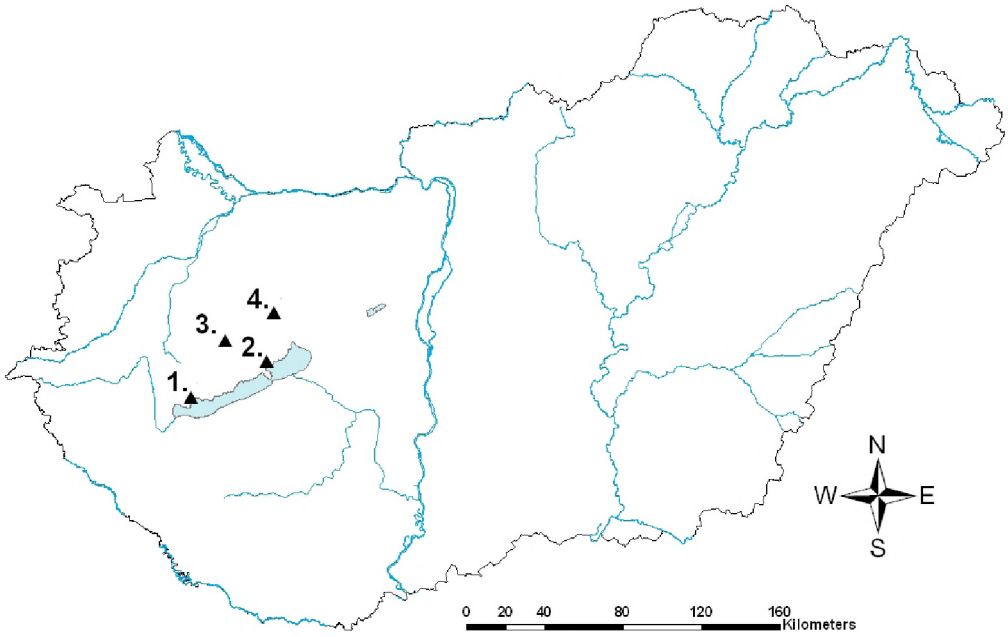

Fig. 1. Location of the studied caves in Hungary: 1 – Csodabogyós cave, Balatonederics (B-C), 2 – Lóczy cave, Balatonfüred (B-L), 3 – Pokol cave, Kapolcs (K-P), 4 – Takó cave, Veszprém (V-T).

The invertebrates were collected during a few visits in each cave between March 2009 and December 2012, using 250 cm^3 volume pitfall traps, filled with ethylene glycol. Twelve traps in each cave were arranged from the entrance of the cave till the last viable parts. Stinking cheese was used as bait material. The arthropod material has been separated into orders. All specimens were preserved in 70 % ethanol.

The material of Phoridae was identified by RHL Disney. The specimens from the samples were mounted on slides in Berlese Fluid (Disney 2001) and examined under a compound microscope, and deposited in the University of Cambridge Museum of Zoology.

The codes for the labels for the samples (coordinates and altitude) from the four caves are as follows:

B-C = Balatonederics: Csodabogyós-barlang limestone cave: 46°47.822' N, 17°21.873' E, 396 m a.s.l.
B-L = Balatonfüred: Lóczy-barlang limestone cave: 46°58.140' N, 17°52.409' E, 248 m a. s. l.
K-P = Kapolcs: Pokol Hole ("Hell Cave") basalt cave: 46°56.823' N, 17°35.302' E, 272 m a.s.l.
V-T = Veszprém: Takó-barlang limestone cave: 47°11.702' N, 17°54.974' E, 354 m a.s.l.

Results

The scuttle flies found in the four caves belonged to eleven species. Of the 461 specimens collected 172 (37.3%) were males and 289 (62.7%) were females.

Borophaga bennetti Disney, 2010

Material: K-P, 28 Mar–5 Jul 2012, 1 male, 1 female; K-P, 7 Jul–13 Nov 2012, 11 males, 4 females.

Remarks: This is a new record for Hungary, but it was only recently distinguished from two similar species (Disney 2010). It was previously only known from the British Isles.

Diplonevra florescens (Turton, 1801)

(Bibio florea Fabricius, 1794*)*

Material: B-C, 5 Jun–19 Oct 2010, 3 females.

Remarks: The larvae feed on invertebrate and vertebrate carrion, including occasionally on human corpses (Disney 2006), but females visit carrion not only to oviposit but also to obtain a protein rich meal when their eggs are still immature (Disney 1994).

Megaselia breviterga (Lundbeck, 1920*)*

Material: K-P, 7 Jul–13 Nov 2012, 1 female.

Remarks: The identification of this species has been recently clarified with the recognition that specimens reported from caves in the Nearctic Region belong to a sibling species (Disney 2012c). Females have been reported on dead mice, but less than a quarter were gravid (Disney 2012b, 2013).

Megaselia pleuralis (Wood, 1909)

Material: K-P, 7 Jul–13 Nov 2012, 1 female.

Remarks: The recognition of the females of this species has been recently clarified (Disney 2012a). It has been reared from pigeon dung and other decaying materials (Disney 1994).

Megaselia posticata (Strobl, 1898)

Material: K-P, 28 Mar–5 Jul 2012, 1 male 2 females; K-P, 7 Jul–13 Nov 2012, 2 male, 1 female.

Megaselia rufipes (Meigen, 1804)

Material: V-T, 12 May 2009–30 Jan 2010, 1 female; B-C, 5 Jun–19 Oct 2010, 7 females; K-P, 28 Mar–5 Jul 2012, 1 female; K-P, 7 Jul–13 Nov 2012, 2 males.

Remarks: The larvae feed on a wide range of decaying organic materials, including vertebrate carrion and hence their occurrence in forensic cases (Disney 1994). Adults are common in caves in Europe, for example in Belgium (Leruth 1936, 1939), Germany (Weber 1989, Prescher & Zaeniker 2005), Spain (Disney 2009), and the Balkan Peninsula (Langourov 2002); and also in Afghanistan (Lindberg 1961, 1962).

Megaselia tenebricola Schmitz, 1934

Material: K-P, 28 Mar–5 Jul 2012, 1 male.

Remarks: This appears to be new record for Hungary. The species is common in caves elsewhere in Europe (e.g. Langourov 2002, Pérez Fernández 2007, Disney 2009).

Megaselia vernalis (Wood, 1909)

Material: K-P, 28 Mar–5 Jul 2012, 1 male.

Remarks: This appears to be a new record for Hungary. It has been reported from caves in Germany (Prescher & Zaenker 2005) and Spain (Pérez Fernández 2006).

Triphleba antricola (Schmitz, 1918)

Material: V-T, 12 May 2009–30 Jan 2010, 6 males, 10 females; V-T, 5 Dec 2009–30 Jan 2010, 5 males, 6 females; B-C, 17 Dec 2009–27 Feb 2010, 23 males, 29 females; B-C, 17 Dec 2009–27 Feb 2010, 78 males, 110 females; B-C, 5 Jun–19 Oct 2010, 3 males, 14 females; B-C, 27 Feb–5 Jun 2010, 6 males, 8 females; B-C, 27 Feb–5 Jun 2010, 9 males, 5 females; B-C, 5 Jun–19 Oct 2010, 1 male, 8 females; B-C, 19 Oct 2010–13 Jan 2011, 4 males, 18 females; B-C, 19 Oct 2010–13 Jan 2011, 2 males, 37 females; B-L, 25 Nov 2010–4 Feb 2011, 14 males, 9 females; K-P, 28 Mar–5 Jul 2012, 2 females; K-P, 5 Jul–13 Nov 2012, 9 females.

Remarks: This is one of the principal species characteristic of caves in Europe (e.g. Franz 1949, Matile 1970, Disney 1994, Weber 1989, Langourov 2002, Prescher & Zaenker 2005).

Triphleba flexipalpis Schmitz 1927

Material: V-T, 5 Dec 2009–30 Jan 2010, 2 males, 1 female.

Remarks: This appears to be a new record for Hungary. Schmitz (1949) reported the eggs and larvae on baits of rotting meat. In Germany it has been recorded in deep crevices in limestone in the months of October to December (Prescher & Sipple 2009).

Triphleba hyalinata (Meigen 1830)

Material: V-T, 5 Dec 2009–30 Jan 2010, 1female.

Remarks: The larvae are carrion breeders and have featured in forensic cases (e.g. Leclercq & Watrin 1973, Disney 2006). Adults have been reported from caves in the Balkan Peninsula in winter (Langourov 2002).

Summary

Four species found in the present study, i.e. *Borophaga bennetti*, *Megaselia tenebricola*, *M vernalis* and *Triphleba flexipalpis* appear to be new records for Hungary. In the case of *B. bennetti* it is possible that it has been recorded but misidentified as *B. agilis* (Meigen), from which it has only since been distinguished (Disney 2010). Ádam & Papp (1996, 2001) listed *B. agilis* as being likely to occur in Hungary.

Of the eleven species recorded, six were only trapped in the basalt cave, three species only in limestone caves and two species (*M. rufipes* and *T. antricola*) in both sorts of cave.

Currently, 250 species of Phoridae are noted from Hungary, but the expected number of species likely exceeds 500 (Ádam & Papp 2001).

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STRESZCZENIE

[Nowe dla Węgier gatunki zadrowatych (Diptera: Phoridae) wykazane z jaskiń Gór Bakony]

W trakcie badań prowadzonych nad stawonogami, zasiedlającymi jaskinie górskie (lata 2009–2012, Bakony Mts., Węgry), w materiale zebranym metodą pułapek Barbera, stwierdzono jedenaście gatunków Phoridae. Wśród gatunków zadrowatych, cztery gatunki okazały się nowymi dla fauny Węgier: *Borophaga bennetti* Disney, 2010, *Megaselia tenebricola* Schmitz, 1934, *Megaselia vernalis* (Wood, 1909) i *Triphleba flexipalpis* Schmitz, 1927.

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