

# New data on the Pseudoscorpion fauna of the caves of the Bakony Mountains, Hungary

J. NOVÁK<sup>1</sup> & CS. KUTASI<sup>2</sup>

<sup>1</sup>János Novák, Eötvös Loránd University, Department of Systematic Zoology and Ecology, H-1117 Budapest, Pázmány P. sétány 1/C, Hungary. E-mail: novakjanos01@gmail.com

<sup>2</sup>Csaba Kutasi, Bakony Museum of the Hungarian Natural History Museum, Zirc, 8420 Zirc, Rákóczi tér 3-5, Hungary. E-mail: kutasi@nhmus.hu

**Abstract.** Examining cave samples from the Bakony Museum of the Hungarian Natural History Museum, Hungary two pseudoscorpion species were found; *Chthonius ressl* Beier, 1956 and *Neobisium carcinoides* (Hermann, 1804). *C. ressl* is new to the pseudoscorpion fauna of Hungary. The morphological characters of the specimens found are discussed in detail and drawings of the *C. ressl* specimens are given.

**Keywords.** Pseudoscorpiones, new records, faunistics, Central Europe.

## INTRODUCTION

The pseudoscorpion fauna of the Bakony Mts. (Hungary) was studied earlier by Loksa (1960, 1966), Szalay (1968), and Novák (2011). As a result of these investigations eleven pseudoscorpion species belonging to six families were reported as follows: *Chthonius tetrachelatus* (Preyssl, 1790), *Neobisium carcinoides* (Hermann, 1804), *Neobisium erythro-dactylum* (L. Koch, 1873), *Neobisium simile* (L. Koch, 1873), *Neobisium sylvaticum* (C. L. Koch, 1835), *Roncus lubricus* L. Koch, 1873, *Atemnus politus* (Simon, 1878), *Chelifer cancroides* (Linné, 1758), *Rhacochelifer peculiaris* (L. Koch, 1873), *Pselapho-cernes scorpioides* (Hermann, 1804) and *Withius piger* (Simon, 1878). This seems to be quite large number in comparison with many other Hungarian middle ranges (Kárpáthegeyi 2007); however, the pseudoscorpion fauna of the Bakony Mts. is still understudied.

The zoological research on the Hungarian caves has a great tradition (Csiki & Mihók 1914); however, in the last decades only a few investigations have been carried out. In 2009 the Natural

History Museum of Bakony Mountains and the local caving clubs started to investigate the cave fauna of the Bakony Mts. Some of these caves, like the Csodabogyós Cave (discovered only recently in 1990) were never studied zoologically before.

More than 50 years ago Imre Loksa collected material using pitfall traps in the Lóczy Cave; some of his results were published, including the presence of *Chthonius tetrachelatus* (Preyssl, 1790) in the cave (Loksa 1960).

Both of the recently studied caves belong to the authority of the Balaton-felvidéki National Park and are partly open to the public.

The Csodabogyós Cave is situated at Balatonederics, in the Keszthelyi Mts. which is part of the Bakony Mts. The cave was formed in the Late Triassic period in the Ederics Limestone formation, and represents a 5200 m long and 121 m deep multi level system of fissures. The cave chambers are decorated with various dripstone formations, making it highly protected since 1992 (Kárpát 2003).

The Lóczy Cave of Balatonfüred was discovered in 1882 and open to the public in 1934. The 154 m long and 15 m deep cave was formed by upwelling thermal water in the Füred Limestone formation during the Late Triassic period, and it is highly protected since 1982 (Hazslinszky 2003).

The aim of our present study is to report on the pseudoscorpion fauna of the two above mentioned caves of the Bakony Mts.

## MATERIAL AND METHODS

The specimens were collected in 250 cm<sup>3</sup> volume pitfall traps filled with ethylene glycol in both caves. In addition, during the winter sterilized straw was placed in the Csodabogyós Cave, two months later the arthropods were collected from this substrate using simple Tullgren funnels.

The specimens were cleared in lactic acid and examined by stereo and compound light microscopy. Drawings were made with the aid of a Zeiss Axioskop 2 microscope. Measurements were taken with the Olympus Soft Imaging analySIS work 5.0 software. The specimens were identified using the publications of Beier (1956, 1963) and Judson (1990).

The identified material is deposited at the HNHM Bakony Museum, in 70% ethanol. Each item is accompanied with an inventory number („NHMB Pseud-Nr.”).

GPS coordinates of the investigated caves are as follows: Lóczy Cave, Balatonfüred: 46° 58.140' N; 17° 52.409' E; 248 m asl. Csodabogyós Cave, Balatonederics: 46° 47.822' N; 17° 21.873' E; 396 m asl.

## RESULTS

### *Neobisium carcinoides* (Hermann, 1804)

*Material examined.* NHMB Pseud-0035: 1♂, Balatonederics, Csodabogyós Cave, Lián cham-

ber, 70 m from the entrance, 30 m under the surface, from straw, 17.12.2009–27.02.2010. Leg.: Lajos Tamás Katona & Csaba Kutasi; NHMB Pseud-0036: 1♀ Balatonederics, Csodabogyós Cave, Bezengő, 50 m from the entrance, 30 m under the surface, pitfall traps, 19.10.2010–13.01.2011. Leg.: Lajos Tamás Katona & Csaba Kutasi & Zsolt Csermák; NHMB Pseud-0037: 1♂ 1♀ Balatonederics, Csodabogyós Cave, Óriás chamber, 40 m from the entrance, 30 m under the surface, pitfall traps, 27.02.2010–06.05.2010. Leg.: Lajos Tamás Katona; NHMB Pseud-0038: 1♀ Balatonederics, Csodabogyós Cave, Chamber no. 5, 60 m from the entrance, 30 m under the surface, pitfall traps, 19.10.2010–13.01.2011. Leg.: Lajos Tamás Katona & Csaba Kutasi & Zsolt Csermák.

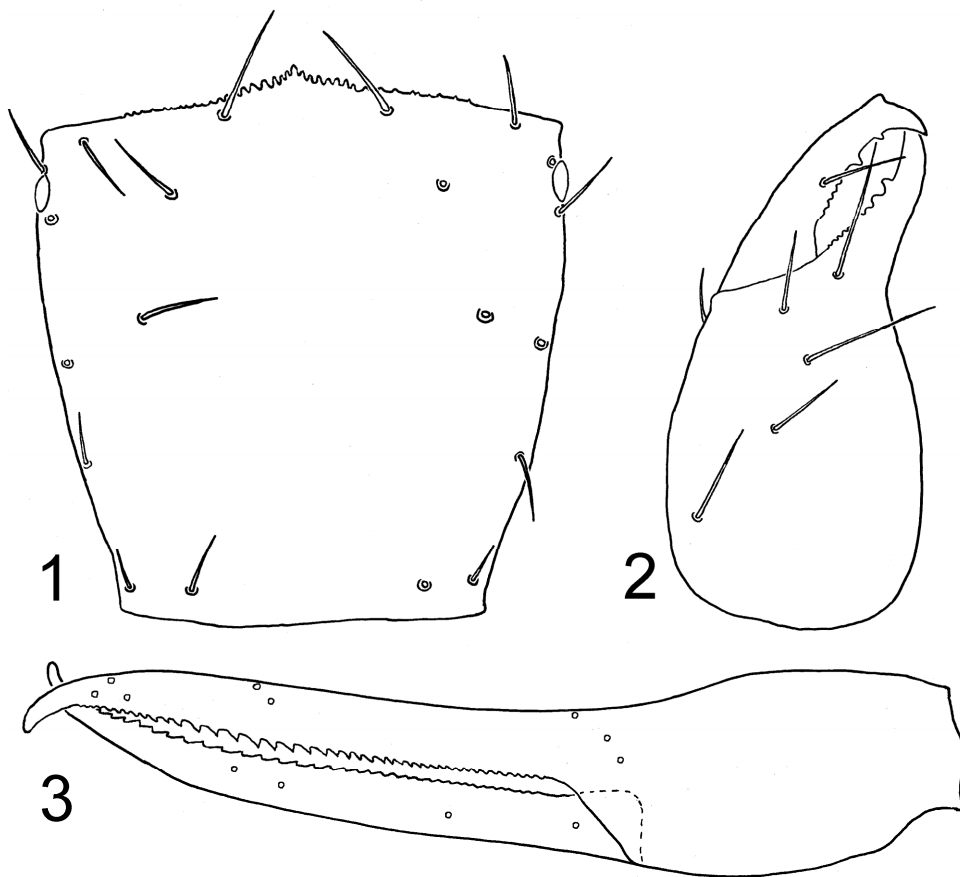
### *Chthonius ressl* Beier, 1956

(Figures 1–3)

*Material examined.* NHMB Pseud-0033: 1♂, Balatonfüred, Lóczy Cave, Hátsó-kar, 50 m from the entrance and 1–2 m under the surface, pitfall traps, 25.09.2011–26.03.2012. Leg.: Lajos Tamás Katona & Csaba Kutasi & Zsolt Csermák; NHMB Pseud-0034: 1♂, Balatonfüred, Lóczy Cave, Középső-kar, 50 m from the entrance and 1–2 m under the surface, pitfall traps, 28.06.2011–25.09.2011. Leg.: Lajos Tamás Katona & Csaba Kutasi.

*Short description. Measurements* (in mm). Body length 1.00–1.12. Carapace length 0.30–0.32. Carapace breadth, anterior margin 0.30. Carapace breadth, posterior margin 0.22–0.24. Length of chelicer: 0.30–0.32. Breadth of chelicera 0.14–0.15. Movable cheliceral finger length 0.14–0.17. Palpal femur length 0.33–0.36. Palpal femur breadth 0.07. Palpal tibia length 0.14–0.15. Palpal tibia breadth 0.09. Palpal chela length 0.52. Movable chelal finger length 0.32–0.35. Chelal hand length 0.17–0.20. Chelal hand breadth 0.11.

*Carapace* (Fig. 1). Approximately as long as broad, the posterior margin narrower than the anterior. Epistome prominent and dentate, the



Figures 1–3. *Chthonius resslii* Beier, 1956. 1 = Carapace, 2 = Chelicera, 3 = Pedipalp. Scale bar = 0.1 mm.

dentition is weakly continuous along the anterior margin. A pair of anterior eyes with weak lenses is present. The carapace bears 20 setae, with two long and two short on the posterior margin. Setal formula: 4:6:4:2:4.

*Chelicera* (Fig. 2). Six setae on the cheliceral hand, and one on the movable finger. Fixed cheliceral finger with 8 small and 2 large teeth; movable finger with one large and 6 small teeth and one isolated apical tooth. Spinneret low and rounded.

*Chela*. Chelal finger somewhat less than twice as long as the hand. Fixed finger with 38–42, movable with 35–37 triangular and pointed teeth (Fig. 3). Teeth of the movable finger and the proximal and distal third of the fixed teeth are close-set. At the medial third of the fixed finger

the teeth are separated, but the distance between them is less than their basal length.

*Opisthosoma*. Tergal chaetotaxy from tergite I. to X: 4:4:4:4:6:6:6:6:6:8. Sternal chaetotaxy from sternite IV. to X: 10:7:6:6:6:6:6. The anal cone bears 2 setae.

*Male genital region*. Sternite II. with 10, sternite III. with 8 microsetae.

*Coxal area*. coxa II. with 7, coxa III. with 4 spines.

## DISCUSSION

Before the present investigation only three pseudoscorpion species were known from cavernicolous habitats in Hungary, *Chthonius tetra-*

*chelatus* (Preyssler, 1790) from the Lóczy Cave (Loksa 1960), *Neobisium (Blothrus) slovacum* Gulicka, 1977 from the Meteor Cave (Aggtelek Karst) (Duchác & Mlejnek 2000) and *Neobisium (Neobisium) biharicum* Beier 1939 from the Imre Cave (Pilis Mts) (Novák 2013). It is also worth noting that during the investigations of the Csodabogyós cave a new mesostigmatid mite species for the Hungarian fauna, *Hypoaspis fishtowni* Ruf & Koehler 1993, was also reported (Szabó *et al.* 2013).

*N. carcinoides* was recently reported from the Bakony Mts. (Novák 2011), and occurs all over Europe (Harvey 2013).

*C. ressl*, according to the list of Harvey (2013) is new to the fauna of Hungary. This spe-

cies was originally described from Austria by Beier (1956), later it was reported from France (Judson 1990), Slovakia (Mock *et al.* 2004; 2005) and the Czech Republic (Šťáhlavský 2006). Judson concluded that *Chthonius parvulus* Inzaghi, 1981 is a junior synonym of *C. ressl* therefore it occurs in Italy as well (Judson 1990) (Fig. 4).

The morphological and morphometrical characters of the specimens found correspond well with Beier's original description (Beier 1956) and with Judson's redescription (Judson 1990). However, a greater variability was observed in the number of chelal teeth, the number of spines of coxae II and in the measurement data. With respect to our present knowledge, after its recording from Slovakia, this is the second report of this species from the Carpathian Basin.



Figure 4. Distribution of *Chthonius ressl* in Europe.

Both species reported here are originally epigeal, their presence in caves should be regarded as occasional occurrences, which means that they are troglone species (Sket 2008). Cave occurrence of *C. tetrachelatus* and *N. carcinoides* is already known in the literature (Mahnert 2013).

With *N. carcinoides* and *C. resslii* the number of pseudoscorpion species occurring in caves in Hungary is increased from three to five. Further records of *C. resslii* from Hungary are also expected.

**Acknowledgements** – The authors would like to thank Lajos Tamás Katona, Zsolt Csermák, Attila Piri and Szilárd John for their help in the cave collecting work, and Gergely Balázs for his help in the translation of the cave terms. We are especially grateful to Dr. Gerald Legg for his linguistic help and his comments and advices and to Dr Giulio Gardini for confirming the Italian locations of *Chthonius resslii*. Special thank to the prominently public benefit organization of the Bakonyi Természettudományi Múzeum Baráti Köre for supporting financially the project. The valuable comments of the two anonymous reviewers are also acknowledged.

## REFERENCES

- BEIER, M. (1956): Bemerkenswerte Pseudoscorpioniden-Funde aus Niederösterreich. *Entomologisches Nachrichtenblatt Wien*, 8: 24–25.
- BEIER, M. (1963): *Ordnung Pseudoscorpionidae (Afterscorpione)*. In: D'AGUILAR, J. & BEIER, M. & FRANZ, H. & RAW, F. (Eds.) Bestimmungsbücher zur Bodenfauna Europas. Lieferung 1., Akademie-Verlag, Berlin, pp. 313.
- CSIKI, E. & MIHÓK, O. (1914): *A hazai barlangok állatvilágának irodalma, különös tekintettel a barlangi bogarakra. 1850–1913*. In: SIEGMETH, K. & HORUSITZKY, H. (Eds.) A magyarországi barlangok és az ezekre vonatkozó adatok irodalmi jegyzéke 1549–1913. A Magyar Királyi Földtani Intézet Kiadványa, Budapest, p. 69–74.
- DUCHÁČ, V. & MLEJNEK, R. (2000): *Records of the pseudoscorpion Neobisium (Blothrus) slovacum (Neobisiidae) in caves and chasms of the slovak karst*. In: MOCK, A., KOVÁČ, L. & FULÍN, M. (Eds.) Fauna jaskýň (Cave fauna). [Proceedings of the workshop 20–21 October, 1999 East Slovakian Museum in Košice] East Slovakian Museum, Košice, p. 15–20.
- HARVEY, M.S. (2013): *Pseudoscorpions of the World*. version 3.0. Western Australian Museum, Perth. Available from: <http://museum.wa.gov.au/catalogues-beta/pseudoscorpions> (accessed 9 April 2014).
- HAZSLINSZKY, T. (2003): *Lóczy-barlang*. In: SZÉKELY, K. (Ed.) Magyarország fokozottan védett barlangjai. Mezőgazda Kiadó, Budapest p. 365–367.
- JUDSON, M.L.I. (1990): On the presence of *Chthonius (C.) halberti* Kew and *Chthonius (C.) resslii* Beier in France with remarks on the status of *Kewochthonius* Chamberlin and *Neochthonius* Chamberlin (Arachnida, Chelonethida, Chthoniidae). *Bulletin du Muséum National d'Histoire Naturelle Paris*, (4) 11: 593–603.
- KÁRPÁT, J. (2003): *Csodabogyós-barlang*. In: SZÉKELY, K. (Ed.) Magyarország fokozottan védett barlangjai. Mezőgazda Kiadó, Budapest, p. 375–378.
- KÁRPÁTHEGYI, P. (2007): Pseudoscorpions of Hungary. *Folia Historico Naturalia Musei Matraensis*, 31: 81–90.
- LOKSA, I. (1960): Faunistisch-systematische und ökologische Untersuchungen in der Lóczy-höhle bei Balatonfüred. *Annales Universitatis Scientiarum Budapestiensis de Rolando Eötvös Nominatae: Sectio Biologica*, 3: 253–266.
- LOKSA, I. (1966): *Die bodenzöologische Verhältnisse der Flaumeichen-Buschwälder Südostmitteleuropas*. Akadémiai Kiadó, Budapest, pp. 437.
- MAHNERT, V. (2013): Pseudoscorpione (Arachnida, pseudoscorpiones) aus Höhlen des Großherzogtums Luxemburg. *Ferrantia*, 69: 108–114.
- MOCK, A., LUPTÁČIK, P., FENĎA, P. & PAPÁČ, V. (2004): Biologická charakteristika jaskýň Bujanovských vrchov (Čierna hora). *Aragonit*, 9: 35–40.
- MOCK, A., LUPTÁČIK, P., FENĎA, P., SVATOŇ, J., ORSZÁGH, I. & KRUMPÁL, M. (2005): *Terrestrial arthropods inhabiting caves near Veľký Folkmar (Čierna hora Mts., Slovakia)*. In: TAJOVSKÝ, K., SCHLAGHAMERSKÝ, J. & PIŽL, V. (Eds.) Contributions to Soil Zoology in Central Europe I. Institute of Soil Biology, Academy of Sciences of the Czech Republic, České Budějovice, pp. 95–101.
- NOVÁK, J. (2011): Adatok a Bakony álskorpió-faunájához (Arachnida: Pseudoscorpiones). *Folia Musei Historico-Naturalis Bakonyiensis*, 28: 67–70.
- NOVÁK, J. (2013): First records of *Larca lata* (Hansen 1884) and *Neobisium biharicum* Beier 1939 from

- Hungary. *Opuscula Zoologica Budapest*, 44(2): 161–166.
- SKET, B. (2008): Can we agree on an ecological classification of subterranean animals? *Journal of Natural History*, 42 (21–22): 1549–1563.
- ŠŤÁHLAVSKÝ, F. (2006): Štírci (Arachnida: Pseudoscorpiones) Národního parku Podyjí. *Klapalekiana*, 42: 167–178.
- SZABÓ, Á. & RIPKA, G. & HAJDU, ZS. & TEMPFLI, B. & VARGA, M. & MÉSZÁROS, I. & KUTASI, CS. & NÉMETH, T. & PÉNZES, B. (2013): New data on the mesostigmatid mite fauna of Hungary (Acari: Mesostigmata). *Acta Phytopathologica et Entomologica Hungarica*, 48(1): 149–154.
- SZALAY, L. (1968): *Pókszabásúak I.* In: Magyarország Állatvilága (Fauna Hungariae) LXXXIX., 18., Akadémiai Kiadó, Budapest, pp. 122.