



PSEUDOSCORPIONS (ARACHNIDA: PSEUDOSCORPIONES) OF KYSUCE REGION (NORTH SLOVAKIA)

Klára CVOPOVÁ, Lucia VIČANOVÁ, Jana CHRISTOPHORYOVÁ

Department of Zoology, Faculty of Natural Sciences, Comenius University, Mlynská dolina, Ilkovičova 6, SK 842 15 Bratislava, Slovakia. Email: christophoryova@gmail.com

CVOPOVÁ, K., VIČANOVÁ, L. & CHRISTOPHORYOVÁ, J. 2024. Pseudoscorpions (Arachnida: Pseudoscorpiones) of Kysuce region (North Slovakia). *Entomofauna carpathica*, 36(2): 127-140.

Abstract: For the first time, pseudoscorpions in the Kysuce region were studied thoroughly, with specimens collected individually and by sieving from 11 localities. A total of 104 specimens belonging to ten species and four families were recorded. One male was identified only to the genus level *Neobisium* Chamberlin, 1930. The highest species diversity of pseudoscorpions was found under stones and in the substrate. The families Chthoniidae and Neobisiidae were represented by epigeic species, and dendrophilous species mainly presented the families Chernetidae and Cheliferidae. The species *Chelifer cancroides* (Linnaeus, 1758) and *Lamprochernes chyzeri* (Tömösváry, 1883) were found as synanthropic, and *Neobisium carcinoides* (Hermann, 1804) was found on a mushroom. Summarizing the published data, another species, *Neobisium sylvaticum* (C.L. Koch, 1835), was added. Thus, 11 pseudoscorpion species are known from the Kysuce region.

Key words: Central Europe, diversity, faunistics, pseudoscorpion, Slovakia

INTRODUCTION

Pseudoscorpiones are an ancient and uniform group distributed worldwide, except for the Antarctic and Arctic regions (WPC 2022). They are most commonly found in leaf litter, soil, decaying organic material, the mould of tree hollows, or under tree bark. Some species live in association with other animals, such as ants, bees, small ground mammals, or birds and their nests. Others use insects, arachnids, birds, or small mammals for phoretic associations.

The present research aims to determine the species diversity of pseudoscorpions of Kysuce region in Slovakia which belongs to an almost unexplored area in terms of pseudoscorpion fauna. CHRISTOPHORYOVÁ (2010) published results on pseudoscorpions living under bark, tree hollows, and nests in Slovakia. As part of the research, collections were also made in two localities in Kysuce: Oščadnica and Oščadnica-Lalíky. One deutonymph of *Neobisium*

carcinoides (Hermann, 1804) was captured in an oak tree hollow in the Oščadnica-Lalíky. At the second locality in Oščadnica, seven females of *Neobisium sylvaticum* (C.L. Koch, 1835) were recorded in nests of three bird species (CHRISTOPHORYOVÁ 2010). These were only known pseudoscorpion data from the studied area.

MATERIALS AND METHODS

Description of methods and material processing

Pseudoscorpions were collected at 11 localities in Kysuce during one season (Fig. 1). The material was sampled from different natural habitats. It was collected under stones and tree bark, decomposing organic material, and leaf litter. Pseudoscorpions were collected using sieving and individual collecting with an entomological tweezer.

The collected material was fixed in 70% and 95% ethanol. Some specimens were immersed in lactic acid for clearing and studied on temporary slide mounts. After the study, they were rinsed in water and returned to 70% ethanol. Morphological and morphometric analyses were performed using a Leica DM1000 compound microscope with an ICC50 Camera Module (LAS EZ application v. 1.8.0). Measurements were taken from digital images using the Axio-Vision 40LE application. Digital photographs of the species were taken using a Canon Eos 5D Mark II camera attached to a Zeiss Axio Zoom V16 stereomicroscope. A series of photographs were produced manually, combined using Zerene Stacker software, and subsequently edited in Adobe Photoshop CC (v. 24.2.1). The spatial data used in the map were displayed in QGIS software (v. 3.36.2) and subsequently edited in Adobe Photoshop CC (v. 24.2.1).

Pseudoscorpions were identified using the key in KRAJČOVIČOVÁ et al. (2022) and for the *Lamprochernes* genus the data from CHRISTOPHORYOVÁ et al. (2023) were also used. Nomenclature for all taxa follows BENAVIDES et al. (2019) and WPC (2022), with genera and species in each family arranged alphabetically. The material is deposited in the zoological collections at Comenius University, Bratislava, Slovakia.

List of studied localities

1. Krásno nad Kysucou: 49.37115°S, 18.81732°W, 513 m a.s.l., mixed forest.
2. Krásno nad Kysucou-Blažkov: 49.38296°S, 18.84696°W, 533 m a.s.l., coniferous forest.
3. Krásno nad Kysucou-Zákysučie: 49.37058°S, 18.83397°W, 389 m a.s.l., beech-hornbeam forest.
4. Krásno nad Kysucou-Zákysučie: 49.37062°S, 18.83568°W, 375 m a.s.l., family house.
5. Krásno nad Kysucou-Zákysučie: 49.37165°S, 18.83582°W, 376 m a.s.l., meadow.
6. Kysucké Nové Mesto: 49.30038°S, 18.78523°W, 353 m a.s.l., drugstore.

7. Kysucké Nové Mesto, Public Park: 49.30032°S, 18.78334°W, 356 m a.s.l., public park.
8. Oščadnica: 49.43892°S, 18.88483°W, 467 m a.s.l., village, by the stream.
9. Oščadnica, Calvary: 49.44131°S, 18.88570°W, 511 m a.s.l., calvary, mixed forest.
10. Oščadnica, Forest Park near the manor house: 49.42285°S, 18.84016°W, 424 m a.s.l., forest park.
11. Rudina: 49.29013°S, 18.72149°W, 469 m a.s.l., coniferous forest.

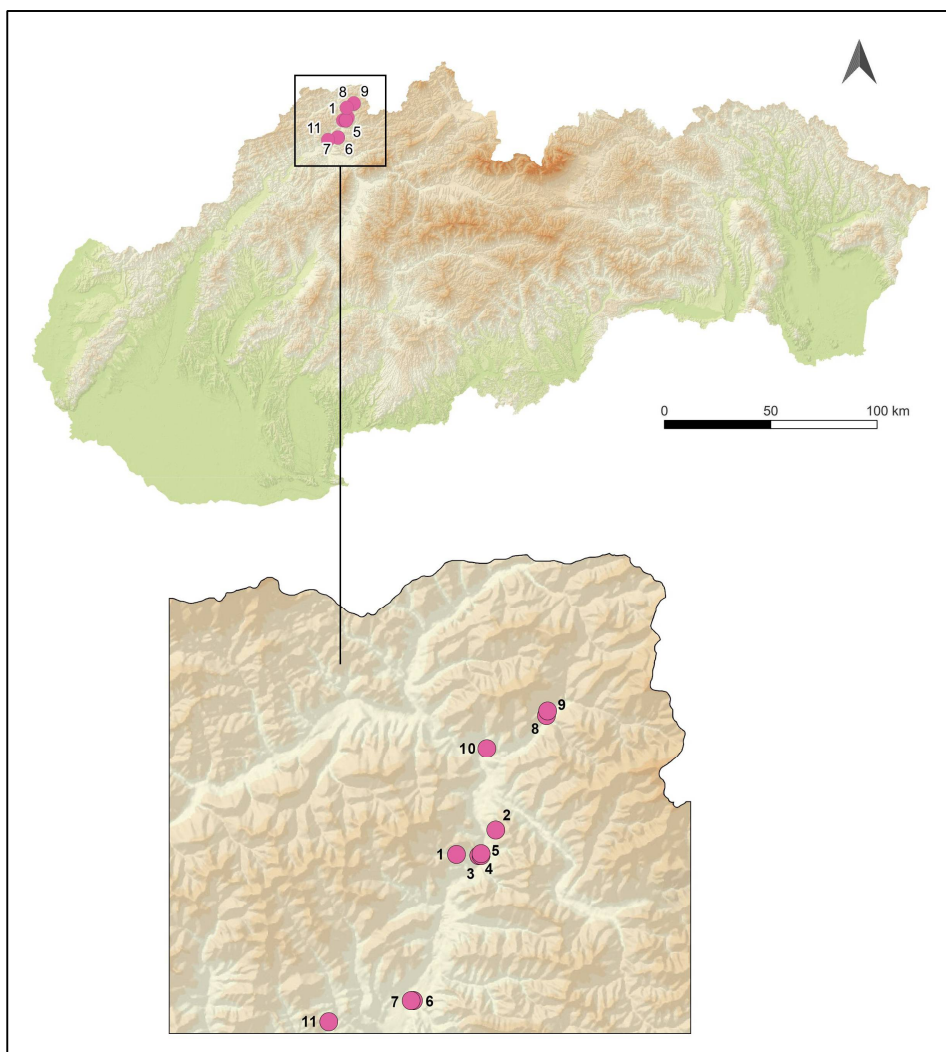


Fig. 1. Studied localities in Kysuce region, Slovakia. For the locality codes, see List of studied localities.

RESULTS AND DISCUSSION

A total of 104 pseudoscorpions from ten species belonging to four families were identified. One male of *Neobisium* was identified only at the genus level. The most abundant locality was Oščadnica – Forest Park, where up to five species of pseudoscorpions were captured. The most numerous families were Chernetidae (54 specimens) and Cheliferidae (28 specimens). Neobisiidae (16 specimens) and Chthoniidae (6 specimens) were the least abundant families. Most of the recorded specimens were dendrophilous (71), living under tree bark (*Mesochelifer resslii*, *Chernes hahnii*). Epigeic species, found in leaf litter and decomposed organic material, were represented by ten specimens (*Neobisium carcinoides*, *Lamprochernes chyzeri*, *Pselaphochernes scorpioides*). The taxa *Chthonius carinthiacus*, *C. heterodactylus*, *Ephippiochthonius tetrachelatus*, *Neobisium carcinoides*, *N. erythroactylum*, and *Neobisium* sp. were collected under stones. *Lamprochernes chyzeri* and *Chelifer cancroides* were synanthropic, and *N. carcinoides* was found on a mushroom.

The following information is given for each record: numerical code of the sampling site (see List of studied localities), habitat, collecting method, date, developmental stage (♀ – female, ♂ – male, DN – deutonymph, PN – protonymph, TN – tritonymph), and collector names. Data on distribution in Europe, habitat preferences, or taxonomic considerations are also given and discussed for each taxon.

Order Pseudoscorpiones de Geer, 1778

Suborder Heterosphyronida Chamberlin, 1929

Superfamily Chthonioidea Daday, 1889

Family Chthoniidae Daday, 1889

Chthonius carinthiacus Beier, 1951

New data: 3: collected individually under the stones, 27.7.2023, 1 ♀, leg. K. Cvopová, J. Christophoryová, L. Vičanová.

Distribution in Europe: Austria, Czech Republic, Hungary, Italy, Romania, Slovakia, Slovenia, Switzerland (WPC 2022).

Remarks: *Chthonius carinthiacus* has a palearctic distribution (WPC 2022). In Slovakia, it occurred in deciduous and mixed forests, in the garden of a family house, near or in caves, where it lived in leaf litter, compost heaps, or wood mould (CHRISTOPHORYOVÁ 2009; CHRISTOPHORYOVÁ et al. 2011b, 2014, 2017b, 2017c; JÁSZAYOVÁ & CHRISTOPHORYOVÁ 2019; JÁSZAYOVÁ & JÁSZAY 2021).

The female in Kysuce was collected in the beech-hornbeam forest under stones, which corresponds to the known ecological preferences of the species.

Chthonius heterodactylus Tömösváry, 1883 (Fig. 2A)

New data: 10: collected individually under the stones, 28.7.2023, 2 ♀♀, leg. K. Cvopová, J. Christophoryová, L. Vičanová.

Distribution in Europe: Czech Republic, Germany, Greece, Hungary, Poland, Romania, Slovakia, Ukraine (WPC 2022).

Remarks: *Chthonius heterodactylus* has a palearctic distribution (WPC 2022). In Slovakia it preferred deciduous and mixed forests, where it occurred in leaf litter, moss and dead wood (KRUMPÁL & KIEFER 1981, KRUMPÁL & KRUMPÁLOVÁ 2003, KRAJČOVIČOVÁ et al. 2016, CHRISTOPHORYOVÁ et al. 2017b, JÁSZAYOVÁ & CHRISTOPHORYOVÁ 2019, JÁSZAYOVÁ & JÁSZAY 2021, 2022).

In the Kysuce region, it was collected under stones in a forest park.

Ephippiochthonius tetrachelatus (Preyssler, 1790) (Fig. 2B)

New data: 8: collected individually under the stones, 28.7.2023, 2 ♀♀, 1 ♂, leg. J. Christophoryová, L. Vičanová.

Distribution in Europe: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Luxembourg, Moldova, Monaco, Netherlands, Northern Macedonia, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom (WPC 2022).

Remarks: Apart from Europe, *Ephippiochthonius tetrachelatus* is also distributed in America, Africa, Asia, and Australia (WPC 2022). The species is eurytopic and occurs in various types of biotopes and habitats. It is also true for its occurrence in Slovakia, it was collected mainly in leaf litter and soil, compost heaps, or mould in ground hollows of trees (CHRISTOPHORYOVÁ 2010, 2013; CHRISTOPHORYOVÁ et al. 2014, 2016, 2017c; ČERVENÁ et al. 2020). More rarely, it was found in bird nests, anthills or under the bark of trees (CHRISTOPHORYOVÁ et al. 2017a, 2017b; ČERVENÁ et al. 2020).

In the Kysuce region, the species was found under stones.

Suborder Icocheirata Harvey, 1992

Superfamily Neobisioidea Chamberlin, 1930

Family Neobisiidae Chamberlin, 1930

Neobisium (Neobisium) carcinoides (Hermann, 1804) (Fig. 2C)

New data: 2: collected individually on a mushroom, 22.6.2024, 1 ♀, leg. K. Cvopová; **3:** collected individually under the stones, 27.7.2023, 3 ♀♀, 3 ♂♂, 1 TN, 1 DN, leg. K. Cvopová, J. Christophoryová, L. Vičanová; **9:** collected

individually under the stones, 28.7.2023, 1 ♀, 1 TN, leg. J. Christophoryová, L. Vičanová; **10**: sieving of leaf litter and decomposed organic material, 28.7.2023, 1 TN, leg. K. Cvopová, J. Christophoryová, L. Vičanová; **11**: collected individually under the stones, 30.7.2023, 1 ♀, leg. K. Cvopová.

Distribution in Europe: Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Montenegro, Netherlands, Northern Macedonia, Norway, Poland, Portugal, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Ukraine, United Kingdom (WPC 2022).

Remarks: *Neobisium carcinoides* is widespread in Asia and Africa in addition to Europe (WPC 2022). The species is eurytopic and often the most abundant species of the family Neobisiidae in the obtained samples (BEIER 1963). It was recorded in various types of dry as well as wet biotopes, mostly in leaf litter, moss, compost heaps and under stones in deciduous and mixed forests (CHRISTOPHORYOVÁ 2009, 2013; CHRISTOPHORYOVÁ & KRUMPÁL 2010; CHRISTOPHORYOVÁ et al. 2016, 2017c; JÁSZAYOVÁ & JÁSZAY 2021, 2022; NOVÁK 2024). Less frequently it was collected in tree microhabitats, dead wood, or bird nests (CHRISTOPHORYOVÁ 2010; CHRISTOPHORYOVÁ et al. 2017a, 2017b).

In the Kysuce region, it was collected in four localities in different types of forest and was found under stones. This confirms the published data that the species is predominantly epigeic.

***Neobisium (Neobisium) erythroductylum* (L. Koch, 1873) (Fig. 2D)**

New data: **1**: collected individually under the stones, 3.8.2023, 1 ♂, leg. K. Cvopová; **11**: collected individually under the stones, 30.7.2023, 1 ♀, leg. K. Cvopová.

Distribution in Europe: Austria, Bosnia and Herzegovina, Croatia, Czech Republic, Germany, Greece, Hungary, Italy, Poland, Romania, Serbia, Slovakia, Slovenia, Ukraine (WPC 2022).

Remarks: The distribution of *Neobisium erythroductylum* extends to Asia in addition to Europe (WPC 2022). In Slovakia, this typical epigeic species lives in leaf litter and in the upper part of soil in forests (KRUMPÁL & KRUMPÁLOVÁ 2003, CHRISTOPHORYOVÁ et al. 2014).

During the present research in the Kysuce region, the species was recorded only as epigeic.

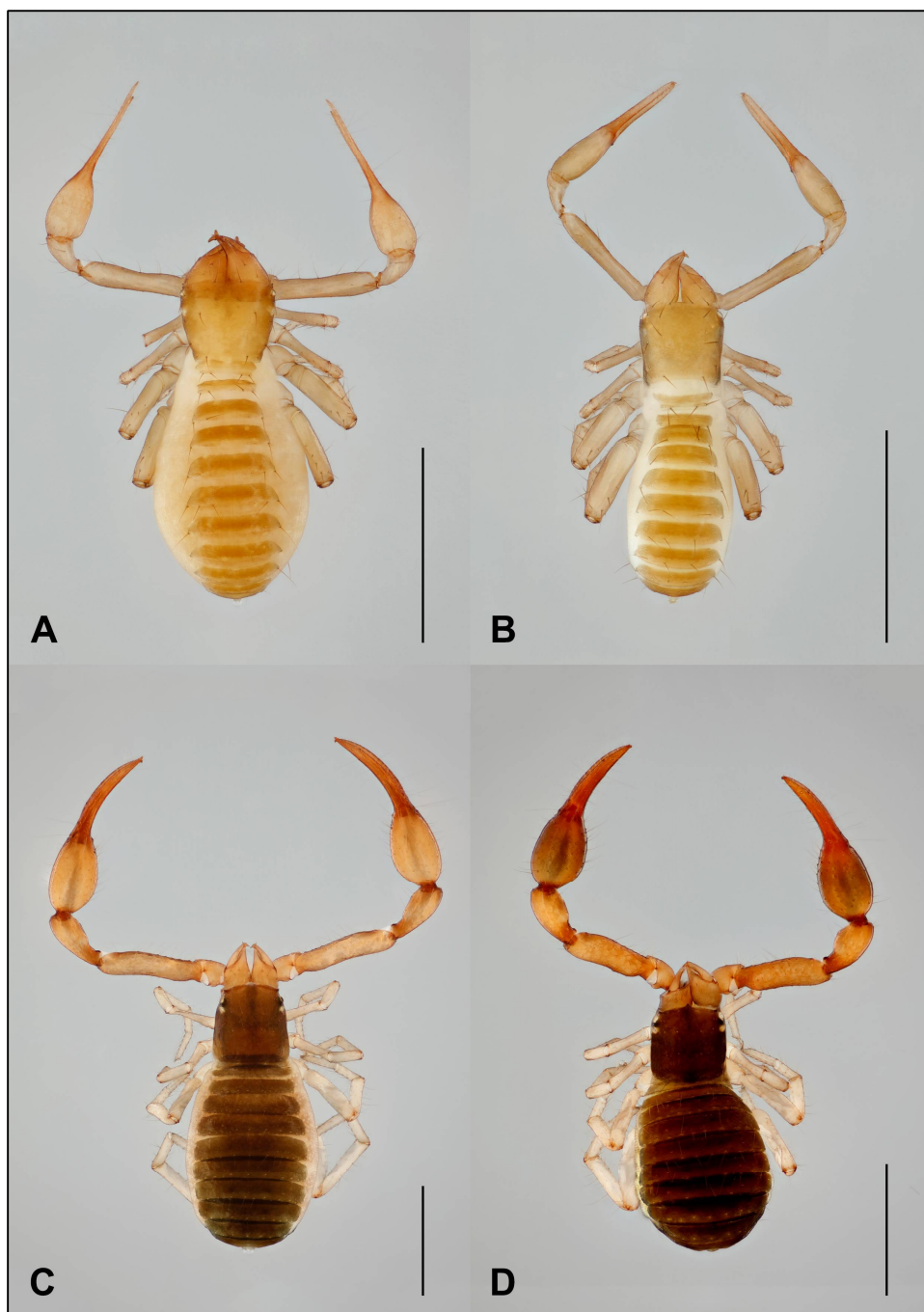


Fig. 2. Pseudoscorpions of Chthoniidae and Neobisiidae from Kysuce region. A. *Chthonius heterodactylus* (♀). B. *Ehippochthonius tetrachelatus* (♂). C. *Neobisium carcinoides* (♂). D. *Neobisium erythroductylum* (♂). Scale bars: 1 mm.

Neobisium (Neobisium) sp. Chamberlin, 1930

New data: 9: collected individually under the stones, 28.7.2023, 1 ♂, leg. J. Christophoryová, L. Vičanová.

Remarks: The male was missing its pedipalps when found, without which it lacked sufficient reliable taxonomic characters. Therefore, the male was identified only to the genus level.

Superfamily Cheliferoidae Risso, 1827

Family Cheliferidae Risso, 1827

Chelifer cancroides (Linnaeus, 1758) (Fig. 3A)

New data: 6: collected individually on the floor in a drugstore, 13.9.2024, 1 ♂, leg. K. Cvopová.

Distribution in Europe: Albania, Austria, Belarus, Belgium, *Bosnia* and Herzegovina, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Moldova, Netherlands, North Macedonia, Norway, Poland, Romania, Russia (European part), Serbia, Slovakia, Spain, Sweden, Switzerland, United Kingdom (WPC 2022).

Remarks: *Chelifer cancroides* is a cosmopolitan species (WPC 2022) that prefers synanthropic habitats, including bird nests and bat guano near human settlements. This is also confirmed by records from Slovakia (CHRISTOPHORYOVÁ 2010, CHRISTOPHORYOVÁ et al. 2011a, 2014, 2017a).

The male recorded in Kysuce was also synanthropic and was collected in a drugstore.

Mesochelifer resslī Mahnert, 1981 (Fig. 3B)

New data: 7: collected individually under the bark of fir tree, 5.9.2023, 19 ♀♀, 5 ♂♂, 1 TN, 2 DN, leg. K. Cvopová.

Distribution in Europe: Austria, Belarus, Czech Republic, Estonia, Germany, Greece, Italy, Poland, Slovakia, Switzerland (SAMMET et al. 2016, WPC 2022, JUST et al. 2023).

Remarks: *Mesochelifer resslī* is widespread in Europe and Central Asia (WPC 2022). It is a dendrophilous species typically occurring under tree barks in coniferous forests (CHRISTOPHORYOVÁ et al. 2017b, ČERVENÁ et al. 2020). Very interesting was the recent discovery of the species in phoretic association with the stonefly (HETEŠOVÁ & CHRISTOPHORYOVÁ 2022).

In the park in Kysucké Nové Mesto, besides adults, nymph stages were also collected, which proves that the species prefers the environment under the bark of pine trees, where it reproduces and overcomes its development.

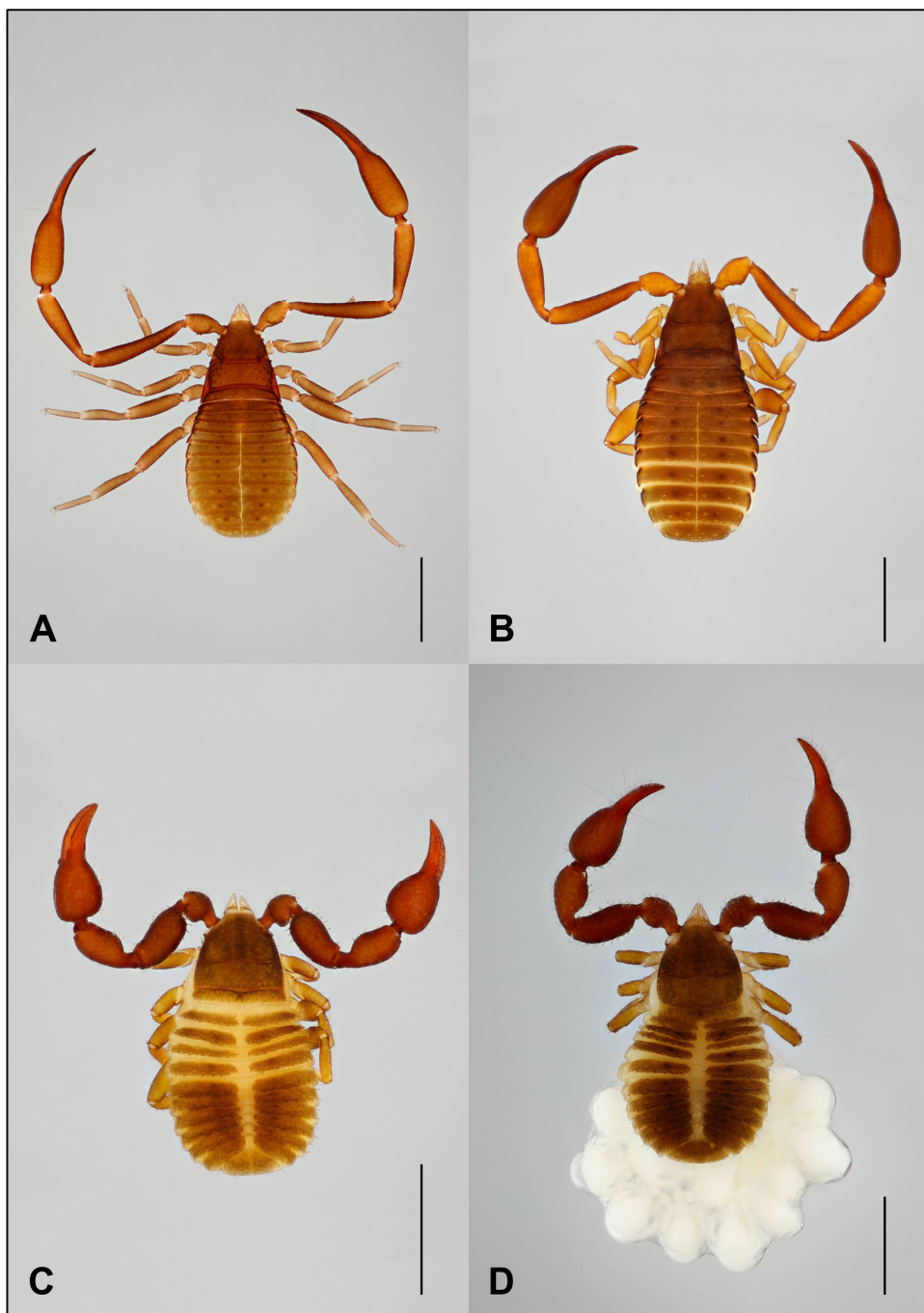


Fig. 3. Pseudoscorpions of Cheliferidae and Chernetidae from Kysuce region. **A.** *Chelifer cancroides* (♂). **B.** *Mesochelifer resslii* (♂). **C.** *Chernes hahnii* (♀). **D.** *Chernes hahnii* with eggs (♀). Scale bars: 1 mm.

Family Chernetidae Menge, 1855

Chernes hahnii (C.L. Koch, 1839) (Figs 3C, 3D)

New data: **3:** collected individually under the bark of a dry broken tree, 27.7.2023, 1 ♂, leg. K. Cvopová, J. Christophoryová, L. Vičanová; **5:** collected individually under the bark of apple tree, 31.7.2023, 2 ♂♂, 1 TN, 1.7.2024, 1 ♀ (with eggs), 2 ♂♂, leg. K. Cvopová; **10:** collected individually under maple bark, 28.7.2023, 6 ♀♀, 2 ♂♂, 1 TN, 28 PN, leg. K. Cvopová, J. Christophoryová, L. Vičanová.

Distribution in Europe: Austria, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Croatia, Czech Republic, France, Germany, Hungary, Italy, Lithuania, Luxembourg, Moldova, Netherlands, Northern Macedonia, Poland, Romania, Russia (European part), Slovakia, Switzerland, Turkey (European part), Ukraine (ČERVENÁ et al. 2021, WPC 2022, HLEBEC et al. 2023).

Remarks: *Chernes hahnii* has a palearctic distribution (WPC 2022). It is a typical dendrophilous species that lives mainly under the bark of trees and in tree hollows (CHRISTOPHORYOVÁ 2010, KRAJČOVIČOVÁ & CHRISTOPHORYOVÁ 2014, CHRISTOPHORYOVÁ et al. 2017b, ČERVENÁ et al. 2020). It also lives in bird nests and anthills (CHRISTOPHORYOVÁ 2010, CHRISTOPHORYOVÁ et al. 2017a).

In the Kysuce region, *C. hahnii* was found under the bark of trees in three localities in the beech-hornbeam forest, meadow, and forest park, thus confirming published data.

Lamprochernes chyzeri (Tömösváry, 1883) (Fig. 4A)

New data: **4:** collected individually on a wall in a family house, 17.10.2024, 1 ♀, leg. K. Cvopová; **10:** sieving of leaf litter and decomposed organic material, 28.7.2023, 1 ♀, 4 ♂♂, leg. K. Cvopová, J. Christophoryová, L. Vičanová.

Distribution in Europe: Albania, Austria, Belarus, Belgium, Bulgaria, Croatia, Czech Republic, Denmark, Estonia, Finland, Germany, Hungary, Italy, Latvia, Montenegro, Northern Macedonia, Norway, Poland, Romania, Slovakia, Sweden, Switzerland, Ukraine, United Kingdom (SAMMET et al. 2016, CHRISTOPHORYOVÁ & JABLONSKI 2018, WPC 2022, CHRISTOPHORYOVÁ et al. 2023).

Remarks: *Lamprochernes chyzeri* has a palearctic distribution (WPC 2022). CHRISTOPHORYOVÁ et al. (2023) used an integrated approach in a taxonomy of *Lamprochernes* in Europe. Based on the results of molecular, karyological, and morphometric data, they found that the species *L. chyzeri* cannot be morphologically distinguished from the newly described species *L. abditus* Christophoryová, Krajčovičová, Šťáhlavský, Španiel & Opatova, 2023 (CHRISTOPHORYOVÁ et al. 2023). So far, no new species has been confirmed in Slovakia. The collected specimens from Kysuce were identified only based on

morphological characters, therefore they were for now assigned to the species *L. chyzeri*.

Lamprochernes chyzeri inhabits decomposing organic material, especially compost heaps (CHRISTOPHORYOVÁ et al. 2017c, 2023; ČERVENÁ et al. 2020). It was also collected under the bark of trees (KRUMPÁL & CHRISTOPHORYOVÁ 2007; CHRISTOPHORYOVÁ et al. 2017b) or documented from phoretic associations (CHRISTOPHORYOVÁ 2023).

New records in the Kysuce region confirm the known habitat preferences of the species.

Pselaphochernes scorpioides (Hermann, 1804) (Fig. 4B)

New data: 10: sieving of leaf litter and decomposed organic material, 28.7.2023, 3 ♀♀, 1 ♂, leg. K. Cvopová, J. Christophoryová, L. Vičanová.

Distribution in Europe: Albania, Austria, Belgium, Bosnia and Herzegovina, Bulgaria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Monaco, Netherlands, Norway, Poland, Portugal, Romania, Russia (European part), Slovakia, Spain, Sweden, Switzerland, Ukraine, United Kingdom (SAMMET et al. 2016, WPC 2022).

Remarks: *Pselaphochernes scorpioides* has a palearctic distribution (WPC 2022). The species inhabits mainly decomposing organic material (CHRISTOPHORYOVÁ et al. 2017c). It can be found also in the soil of deciduous forests (CHRISTOPHORYOVÁ 2013, CHRISTOPHORYOVÁ et al. 2016), in anthills (CHRISTOPHORYOVÁ et al. 2017a), in tree hollows (KRAJČOVIČOVÁ & CHRISTOPHORYOVÁ 2014, CHRISTOPHORYOVÁ et al. 2017b) or Malaise traps (KRAJČOVIČOVÁ & CHRISTOPHORYOVÁ 2014).

In the Forest Park in Oščadnica, four individuals were found in sieved substrate. Predominantly deciduous trees characterize the park; thus, the occurrence of the species is consistent with known published data.

After summarizing the published data (CHRISTOPHORYOVÁ 2010), one species, *Neobisium sylvaticum*, was added. Thus, 11 pseudoscorpion species are known from the Kysuce region. The material was collected over a short time, during which it was difficult to obtain the specimens due to unfavourable climatic conditions (especially because of the long winter). Nevertheless, it was possible to record a relatively high number of species. In addition to the collections from other habitat types (bird nests or tree hollows), further pseudoscorpion species will certainly be added in the future, especially from the families Cheiridiidae, Cheliferidae, and Chernetidae.

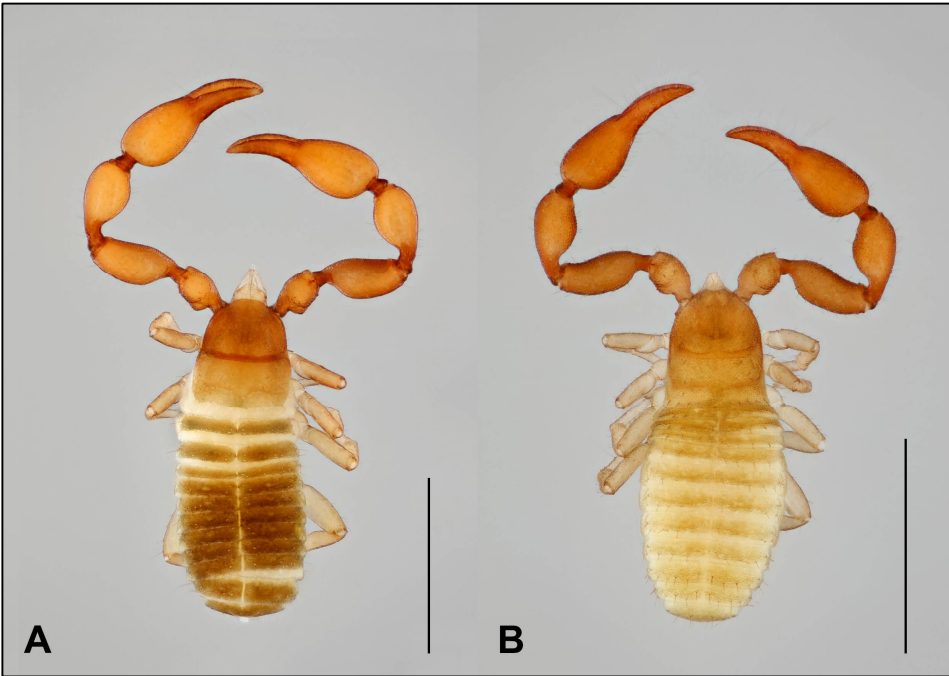


Fig. 4. Pseudoscorpions of Chernetidae from Kysuce region. A. *Lamprochernes chyzeri* (♀). B. *Pselaphochernes scorpoides* (♂). Scale bars: 1 mm.

ACKNOWLEDGEMENTS

We are grateful to Alica Christophoryová for her technical assistance with the figures.

REFERENCES

- BEIER, M. 1963. Ordnung Pseudoscorpionidea (Afterskorpione). *Bestimmungsbücher zur Bodenfauna Europas*. Vol. 1. Akademie-Verlag, Berlin, 313 pp.
- BENAVIDES, L.R., COSGROVE, J.G., HARVEY, M.S. & GIRIBET, G. 2019. Phylogenomic interrogation resolves the backbone of the Pseudoscorpiones tree of life. *Molecular Phylogenetics Evolution* 139: 106509.
- CHRISTOPHORYOVÁ, J. 2009. Šťúriky – Pseudoscorpiones, pp. 125-135. In: MAŠÁN, P. & MIHÁL, I. (eds) *Pavúkovce Cerovej vrchoviny*. Štátna ochrana prírody SR (Banská Bystrica), Správa CHKO Cerová vrchovina (Rimavská Sobota), Ústav zoológie SAV (Bratislava) a Ústav ekológie lesa SAV (Zvolen).
- CHRISTOPHORYOVÁ, J. 2010. Šťúriky (Pseudoscorpiones) pod kôrou stromov, v dutinách a v hniezdach na Slovensku. *Folia faunistica Slovaca* 15(1): 1-12.
- CHRISTOPHORYOVÁ, J. 2013. A faunistic study on the pseudoscorpions (Arachnida: Pseudoscorpiones) of oak-hornbeam forests in SW Slovakia. *Munis Entomology & Zoology Journal* 8(2): 634-645.

- CHRISTOPHORYOVÁ, J. 2023. Pozor, černý pasažér! Co víme o forézii štírků. *Živa* 1: 34-37.
- CHRISTOPHORYOVÁ, J., GRUĽA, D. & KRAJČOVIČOVÁ, K. 2017a. New records of pseudoscorpions (Arachnida: Pseudoscorpiones) associated with animals and human habitats in Slovakia and the Czech Republic. *Arachnologische Mitteilungen* 53: 67-76.
- CHRISTOPHORYOVÁ, J. & JABLONSKI, D. 2018. First record of the genus *Lamprochernes* (Pseudoscorpiones: Chernetidae) in the Republic of Macedonia. *Biharean Biologist* 12(1): 53-55.
- CHRISTOPHORYOVÁ, J., JAJCAYOVÁ, D. & KRAJČOVIČOVÁ, K. 2017b. Pseudoscorpions (Arachnida: Pseudoscorpiones) living in tree microhabitats in Slovakia. *Klapalekiana* 53: 283-297.
- CHRISTOPHORYOVÁ, J., KAŇUCHOVÁ, A. & KRAJČOVIČOVÁ, K. 2017c. Faunistic survey of pseudoscorpions (Arachnida: Pseudoscorpiones) collected from compost heaps in Slovakia. *Klapalekiana* 53: 11-19.
- CHRISTOPHORYOVÁ, J., KRAJČOVIČOVÁ, K. & KAŇUCHOVÁ, A. 2016. Pseudoscorpions (Arachnida: Pseudoscorpiones) collected in cemeteries in Slovakia. *Klapalekiana* 52: 33-41.
- CHRISTOPHORYOVÁ, J., KRAJČOVIČOVÁ, K., ŠŤÁHLAVSKÝ, F., ŠPANIEL, S. & OPATOVA, V. 2023. Integrative Taxonomy Approach Reveals Cryptic Diversity within the Phoretic Pseudoscorpion Genus *Lamprochernes* (Pseudoscorpiones: Chernetidae). *Insects* 14: 122.
- CHRISTOPHORYOVÁ, J. & KRUMPÁL, M. 2010. Štúriky (Pseudoscorpiones) PR Šúr, pp. 105-114. In: MAJZLAN, O. & VIDLIČKA, Ľ. (eds) *Príroda rezervácie Šúr*. Ústav zoológie SAV, Bratislava.
- CHRISTOPHORYOVÁ, J., KRUMPÁLOVÁ, Z., KRIŠTOFÍK, J. & ORSZÁGHOVÁ, Z. 2011a. Association of pseudoscorpions with different types of bird nests. *Biologia* 66: 669-677.
- CHRISTOPHORYOVÁ, J., MOCK, A. & ĽUPTÁČIK, P. 2011b. *Chthonius* (*Chthonius*) *carinthiacus* and *Chthonius* (*Ephippiochthonius*) *tuberculatus* new to the fauna of Slovakia (Pseudoscorpiones: Chthoniidae). *Arachnologische Mitteilungen* 42: 23-28.
- CHRISTOPHORYOVÁ, J., ŠŤÁHLAVSKÝ, F. & KRAJČOVIČOVÁ, K. 2014. Štúriky (Arachnida, Pseudoscorpiones) pohoria Burda (NPR Kováčovské kopce). *Folia faunistica Slovaca* 19(2): 161-167.
- ČERVENÁ, M., KRAJČOVIČOVÁ, K. & CHRISTOPHORYOVÁ, J. 2020. Recent data about diversity and distribution of pseudoscorpions (Arachnida: Pseudoscorpiones) collected from different habitat types in Slovakia. *Klapalekiana* 56: 1-18.
- ČERVENÁ, M., SELNEKOVIČ, D. & CHRISTOPHORYOVÁ, J. 2021. New records of chernetid and cheliferid species (Arachnida: Pseudoscorpiones) from North Macedonia. *Natura Croatica* 30(1): 251-256.
- HETEŠOVÁ, E. & CHRISTOPHORYOVÁ, J. 2022. Recent data about pseudoscorpion (Pseudoscorpiones) phoresy from Slovakia with new host and phoront records. *Revista Ibérica de Aracnología* 41: 37-40.

- HLEBEC, D., PODNAR, M., KUČINIĆ, M. & HARMS, D. 2023. Molecular analyses of pseudoscorpions in a subterranean biodiversity hotspot reveal cryptic diversity and microendemism. *Scientific Reports* 13: 430.
- JÁSZAYOVÁ, A. & CHRISTOPHORYOVÁ, J. 2019. Štúriky (Arachnida, Pseudoscorpiones) okolia Ardotskej jaskyne a Silickej ľadnice. *Biodiversity & Environment* 11(2): 64-71.
- JÁSZAYOVÁ, A. & JÁSZAY, T. 2021. Pseudoscorpions (Arachnida: Pseudoscorpiones) from leaf litter of the Slovak Karst National Park. *Arachnologische Mitteilungen* 61: 77-83.
- JÁSZAYOVÁ, A. & JÁSZAY, T. 2022. New data on pseudoscorpions (Arachnida: Pseudoscorpiones) in north-east Slovakia. *Arachnologische Mitteilungen* 63: 30-38.
- JUST, P., ŠŤÁHLAVSKÝ, F., BOGUSCH, P., ASTAPENKOVÁ, A. & OPATOVA, V. 2023. Dispersal capabilities do not parallel ecology and cryptic speciation in European Cheliferidae pseudoscorpions (Pseudoscorpiones: Cheliferidae). *Diversity* 15(1040): 1-20.
- KRAJČOVIČOVÁ, K. & CHRISTOPHORYOVÁ, J. 2014. Faunistic survey of pseudoscorpions (Arachnida: Pseudoscorpiones) collected from trees and using Malaise traps in Slovakia and the Czech Republic. *Klapalekiana* 50: 167-180.
- KRAJČOVIČOVÁ, K., IGONDOVÁ, E., MAJZLAN, O. & BLAŽEK, R. 2016. Pseudoscorpions (Arachnida: Pseudoscorpiones) of Malá Fatra National Park, Strážovské vrchy Protected Landscape Area and Žilinská kotlina Basin (Slovakia). *Folia faunistica Slovaca* 21(1): 1-7.
- KRAJČOVIČOVÁ, K., ŠESTÁKOVÁ, A., CHRISTOPHORYOVÁ, J., LITAVSKÝ, J., PURKART, A. & FENĎA, P. 2022. *Základy arachnologického výskumu*. Univerzita Komenského, Bratislava, 167 pp.
- KRUMPÁL, M. & CHRISTOPHORYOVÁ, J. 2007. Štúriky (Pseudoscorpiones) PR Ostrov Kopáč, pp. 95-100. In: MAJZLAN, O. (ed.) *Príroda Ostrova Kopáč*. Fyzioterapia OZ, Bratislava.
- KRUMPÁL, M. & KIEFER, M. 1981. Príspevok k poznaniu štúrikov čeľade Chthoniidae v ČSSR (Pseudoscorpionidea). *Zprávy Československé Společnosti Entomologické při ČSAV (Praha)* 17: 127-130.
- KRUMPÁL, M. & KRUMPÁLOVÁ, Z. 2003. Štúriky – Pseudoscorpiones, pp. 115-126. In: MAŠÁN, P. & SVATOŇ, J. (eds) *Pavúkovce národného parku Poloniny (Arachnida: Araneae, Pseudoscorpiones, Opiliones, Acari – Parasitiformes)*. Štátna ochrana prírody SR Banská Bystrica a Správa Národného parku Poloniny, Snina.
- NOVÁK, J. 2024. An updated checklist for the pseudoscorpion fauna of Hungary (Arachnida: Pseudoscorpiones). *Zootaxa* 5433(1): 51-95.
- SAMMET, K., TALVI, T., SÜDA, I. & KURINA, O. 2016. Pseudoscorpions (Arachnida: Pseudoscorpiones) in Estonia: new records and an annotated checklist. *Entomologica Fennica* 27: 149-163.
- WORLD PSEUDOSCORPIONES CATALOG 2022. World Pseudoscorpiones Catalog. Natural History Museum Bern. Web Service available online at <http://www.wac.nmbe.ch>