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Faunistic records of pseudoscorpions (Arachnida: Pseudoscorpiones) from South East Poland

Faunistické údaje o šťúrikoch (Arachnida: Pseudoscorpiones) z juhovýchodného Poľska

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Abstract. Pseudoscorpions deposited in the zoological collections of the Museum of Natural History, University of Wroclaw, Poland were studied. Specimens were sifted from leaf litter in forests in the Carpathians, South East Poland, at altitudes from 340 to 640 m a.s.l. 511 specimens of 10 taxa and three families were identified. The most numerous family was Neobisiidae (472 specimens, six taxa), the families Chthoniidae (31 specimens, three species) and Chernetidae (8 specimens, one species) were less abundant. General comments are given on finds and distribution of each taxon. Of the species recorded, two were of exclusively Carpathian distribution: *Mundochthonius carpaticus* Rafalski, 1948 and *Neobisium polonicum* Rafalski, 1936. From a faunistic point of view, the finding of *Chthonius ischnocheles* (Hermann, 1804), quite a rare species for Poland, is of interest.

INTRODUCTION

Arachnid faunistic papers by Nowicki (1874) and Kulczyński (1876) are among the earliest works to cover pseudoscorpions from Poland, specifically from Galicia. Later Rafalski (1936, 1937) collected and described *Neobisium polonicum* Rafalski, 1936 from localities between the River Cheremosh (western Ukraine) and the River San (southeastern Poland and western Ukraine). This was followed by the description of *Mundochthonius carpaticus* Rafalski, 1948 from the Pieniny Mountains (Western Carpathians), Ojców-Valley near Kraków and Chornohora (Eastern Carpathians) (Rafalski 1948). Rafalski (1967) developed the catalogue of pseudoscorpions from Poland including 38 recent species. The species *Neobisium jugorum* (L. Koch, 1873) was later excluded (the actual locality is situated in Belianske Tatras in Slovakia (Verner 1960)), and the species *Neobisium minutum* (Tömösváry, 1883) (the locality details were erroneous (Beier 1963)). In the next period, a series of faunistic works were published. Jędryczkowski (1985) examined 15 pseudoscorpion species from Mazovia, adding *Mesochelifer ressli* Mahnert, 1981 new for the Polish fauna. Later, 14 species were recorded from both Bieszczady Mountains and Świętokrzyskie Mountains (Jędryczkowski 1987a,b, 2000a). Four groups of invertebrates from Masurian Lake District were studied, and 10 pseudoscorpion species were found (Jędryczkowski 1995). Altogether 13 pseudoscorpion species were recorded from several environmental types in Roztocze (Jędryczkowski 1996). Jędryczkowski (1997) studied the distribution of Carpathian elements in three arachnid orders (Araneae, Pseudoscorpiones, Opiliones) in Poland. The author discussed six pseudoscorpion

species of exclusively Carpathian distribution. Based on published data and newly collected specimens, 10 pseudoscorpion species were recorded from both Pieniny Mountains and Babia Góra (Jędryczkowski 2000b, 2003). Summarizing all data, the pseudoscorpion fauna of Poland comprises 39 species (Harvey 2013, Jędryczkowski 2014).

The aim of the present study is to provide new data about pseudoscorpions from material deposited in the Museum of Natural History, University of Wroclaw, Poland, collected in the Carpathians, South East Poland.

MATERIAL AND METHODS

Pseudoscorpions were collected by Dariusz Twardy at eight localities in the Carpathians, South East Poland during the years 2013 and 2014. All specimens were sifted from leaf litter. In one sample (locality one), we were unable to obtain precise coordinates or exact biotope type. The body and in some cases dissected appendages of specimens were studied as temporary slide mounts using lactic acid as the clearing medium, then rinsed in water and returned to 70% ethanol. Collected specimens were identified using the identification key in Christophoryová et al. (2011). Nomenclature follows Harvey (2013) and Zaragoza (2017). The material is deposited in the zoological collections of the Museum of Natural History, University of Wroclaw, Poland.

List of localities

1. Bieszczady Mts., Bereżki, Ustrzyki Górne (49°08′N, 22°40′E; 640 m a.s.l.), forest.
2. Bieszczady Mts., Bereżki, Ustrzyki Górne (49°08′30″N, 22°39′54″E; 640 m a.s.l.), Alnetum incanae, Dentario glandulosae-Fagetum.
3. Bieszczady Mts., Bereżki, Ustrzyki Górne (49°08′49″N, 22°40′28″E; 620 m a.s.l.), Dentario glandulosae-Fagetum.
4. Słonne Mts., Manasterzec, Sanok (49°33′47″N, 22°14′58″E; 420 m a.s.l.), Carpinion betuli, Dentario glandulosae-Fagetum, Salicion albae.
5. Słonne Mts., Sanok-Olchowce (49°33′52″N, 22°14′16″E; 350 m a.s.l.), Abies-Fagus, Carpinion betuli.
6. Słonne Mts., Sanok-Olchowce (49°33′57″N, 22°14′15″E; 340 m a.s.l.), Abies-Fagus, Carpinion betuli.
7. Słonne Mts., Załuż, Sanok (49°31′55″N, 22°19′07″E; 350 m a.s.l.), Abies-Fagus, Carpinion betuli.
8. Słonne Mts., Załuż, Sanok, Paproć Mt. (49°32′05″N, 22°18′43″E; 440 m a.s.l.), Carpinion betuli.

RESULTS AND DISCUSSION

During the research, 511 specimens of 10 taxa and three families were identified. The most numerous family was Neobisiidae (472 specimens, six taxa); the families Chthoniidae (31 specimens, three species) and Chernetidae (8 specimens, one species) were less abundant. Pseudoscorpions of the genus *Roncus* were only identified to genus level.

Faunistic data of recorded taxa

The list of taxa collected is given below, with locality code (see *List of localities*), data and number of developmental stages (female: ♀, male: ♂, tritonymph: t, deutonymph: d, protonymph: p).

Chthoniidae Daday, 1888

Chthonius heterodactylus Tömösváry, 1882
1: 29.viii.2014, 10 ♀♀, 5 ♂♂; **2:** 27.v.2014, 4 ♀♀, 1 ♂; **3:** 14.ix.2014, 3 ♀♀, 2 ♂♂, 1 t.
Epigean species, known from the Western Sudetes (Germany) to the Southern Carpathians (Romania), through the whole Carpathian range (Gardini 2014). Altogether 26 specimens

were collected at three localities, all of them situated in the Bieszczady Mts. In Poland, the species is known from Western (Kotlina Nowotarska basin, Babia Góra) and Eastern Beskids (Pieniny Mountains, Bieszczady), and is to be found in leaf litter, under stones and pieces of wood in deciduous forests (Rafalski 1967, Jędryczkowski 1987a, 2000a,b, 2003). In Roztocze, it was collected in a fir forest (Jędryczkowski 1996).

Chthonius ischnocheles (Hermann, 1804)
1: 29.viii.2014, 3 ♀♀, 1 ♂.
Widely distributed European species (Harvey 2013). Four adults were sieved from leaf litter in forest of unspecified type in the Bieszczady Mts. In Poland, the species has previously been recorded only once, in the Pomerian Lakeland (Rafalski 1967). It was found in leaf litter, under stones and pieces of wood (Rafalski 1967).

Mundochthonius carpaticus Rafalski, 1948
4: 29.x.2013, 1 ♀.
Carpathian species distributed in the Czech Republic, Slovakia, Poland and Ukraine (Harvey 2013). One female was sieved from leaf litter in deciduous forest in the Słonne Mts. Rafalski (1948) added the species as new for the Polish fauna, from Pieniny Mountains and Ojców--Valley near Kraków. It was found in leaf litter in mixed forests. Later it was recorded from several other localities, where it occurs in leaf litter, humus, under stones and pieces of wood in deciduous and mixed forests (Rafalski 1967, Jędryczkowski 1985, 1987a,b, 2000a,b).

Neobisiidae Chamberlin, 1930

Neobisium* (*Neobisium*) *carcinoides (Hermann, 1804)
1: 29.viii.2014, 2 ♀♀, 1 t; **2:** 27.v.2014, 1 ♀, 2 ♂♂; **3:** 17.ix.2014, 1 ♀; **7:** 15.xi.2013, 5 ♀♀, 1 ♂; **7:** 7.v.2014, 12 ♀♀, 10 ♂♂.
Eurytopic species widely distributed in Europe and in some countries in Africa, Central and South Asia (Harvey 2013). Altogether 35 specimens were sifted from leaf litter in deciduous forests at four localities. In Poland, the species is well known from many localities. It has regularly been found in hundreds in forests, parks, moors, and caves where it was collected under stones or pieces of wood, in leaf litter, under bark, in humus or moss (Rafalski 1967, Jędryczkowski 1985, 1987b, 1995, 1996, 2000a).

Neobisium* (*Neobisium*) cf. *crassifemoratum (Beier, 1928)
1: 29.viii.2014, 7 ♀♀, 6 ♂♂, 6 t, 1 d, 1 p; **2:** 27.v.2014, 1 ♂, 3 t, 1 d; **3:** 14.ix.2014, 8 ♀♀, 14 ♂♂, 4 t, 1 d; **3:** 17.ix.2014, 2 ♀♀, 15 ♂♂, 2 t; **4:** 29.x.2013, 6 ♀♀, 8 ♂♂, 1 t; **5:** 6.ix.2013, 2 ♀♀, 3 ♂♂; **6:** 2.x.2013, 16 ♀♀, 8 ♂♂; **7:** 10.ix.2013, 3 ♀♀; **7:** 15.xi.2013, 11 ♀♀, 11 ♂♂; **7:** 7.v.2014, 1 ♀, 1 ♂, 2 t; **8:** 8.i.2014, 1 ♀, 3 ♂♂.
Neobisium crassifemoratum is distributed in Central and Eastern Europe and extends to Turkey, Georgia and Azerbaijan (Harvey 2013). Altogether, 149 specimens were collected in deciduous forests at all studied localities. The species was preliminary identified as *N.* cf. *crassifemoratum*. A revision of the *N. crassifemoratum* species group is needed because, for example, differences in carapace chaetotaxy or palpal measurements between this species and *N. brevidigitatum* (Beier, 1928) remain unclear. In Poland, the species was collected under

stones and in leaf litter in beech forests in the Bieszczady Mts. (Rafalski 1967, Jędryczkowski 2000a). Jędryczkowski (1996) found one male in a beech hollow in Roztocze.

Neobisium* (*Neobisium*) *fuscimanum (C.L. Koch, 1843)
1: 29.viii.2014, 5 ♂♂, 2 d; **3:** 14.ix.2014, 3 ♀♀, 5 ♂♂; **3:** 17.ix.2014, 1 ♀; **4:** 29.x.2013, 1 ♀; **5:** 6.ix.2013, 2 ♂♂; **6:** 2.x.2013, 2 ♂♂; **7:** 15.xi.2013, 1 ♂, 1 t; **7:** 7.v.2014, 1 ♂, 1 t; **8:** 13.ix.2013, 1 ♂.
Mainly European species (Central and Eastern Europe) with distribution range extending to Turkey, Georgia and Iran (Harvey 2013). During the present research, 26 specimens were sifted from leaf litter in deciduous forests at almost all localities. In Poland, it has been collected at many localities, in leaf litter, moss and under stones in deciduous and mixed forests (Rafalski 1967, Jędryczkowski 1987a, 2000a,b, 2003).

Neobisium* (*Neobisium*) *polonicum Rafalski, 1936
1: 29.viii.2014, 1 ♀, 1 ♂, 1 d; **2:** 27.v.2014, 1 ♀; **3:** 14.ix.2014, 7 ♀♀, 6 ♂♂; **3:** 17.ix.2014, 3 ♀♀, 5 ♂♂; **5:** 6.ix.2013, 1 ♀; **6:** 2.x.2013, 3 ♂♂; **7:** 10.ix.2013, 2 ♂♂; **7:** 7.v.2014, 1 ♂; **8:** 8.i.2014, 1 ♀.
Typical inhabitant of Eastern Carpathians, recorded from Ukraine, Poland, Slovakia and Romania (Harvey 2013). A total of 33 specimens were sifted from leaf litter at almost all studied localities. Rafalski (1937) collected it from more than 20 localities between the River Cheremosh (western Ukraine) and the River San (southeastern Poland and western Ukraine). The species occurs in deciduous forests, near stream and river banks in moisty leaf litter, moss or under big stones (Rafalski 1937, 1967, Jędryczkowski 1987a, 2000a).

Neobisium* (*Neobisium*) *sylvaticum (C. L. Koch, 1835)
1: 29.viii.2014, 1 ♀; **3:** 14.ix.2014, 5 ♀♀, 3 ♂♂; **3:** 17.ix.2014, 3 ♀♀, 3 ♂♂; **4:** 29.x.2013, 10 ♀♀, 9 ♂♂, 2 t; **6:** 2.x.2013, 2 ♀♀, 4 ♂♂; **7:** 15.xi.2013, 7 ♀♀, 3 ♂♂.
Known from almost all of Europe (except Scandinavia) and ranges to Turkey, Armenia and Georgia (Harvey 2013). The species has been collected at five localities; 52 specimens were sifted from leaf litter in deciduous forests. In Poland, it was recorded at many localities in deciduous, mixed and coniferous forests where it lives mainly in leaf litter, but it is able to climb on shrubs and herbs (Rafalski 1967, Jędryczkowski 1987a, 1996, 2000a,b). It has also been found under the bark of dead trees and in humus (Jędryczkowski 1987b).

***Roncus* sp.**
1: 29.viii.2014, 10 ♀♀, 9 ♂♂, 1 t; **2:** 27.v.2014, 6 ♀♀, 8 ♂♂, 16 t; **3:** 14.ix.2014, 12 ♀♀, 3 ♂♂, **3:** 17.ix.2014, 1 ♀, 4 ♂♂; **5:** 6.ix.2013, 8 ♀♀, 1 ♂; **6:** 2.x.2013, 3 ♀♀, 2 ♂♂; **7:** 10.ix.2013, 2 ♀♀, 1 ♂; **7:** 7.v.2014, 2 ♀♀, 41 ♂♂, 42 t; **8:** 13.ix.2013, 4 ♀♀, 1 ♂.
The majority of the recorded specimens belong to the genus *Roncus*, altogether 177 specimens from seven localities. In Poland, the species *Roncus transsilvanicus* Beier, 1928 is known, distributed in the Eastern Carpathians (Rafalski 1967, Jędryczkowski 1987a, 2000a). The genus includes several species complexes without known morphological or morphometric characters, and cytogenetic studies have shown the existence of even new species in Europe (Šťáhlavský et al. 2013). That is why the specimens were only identified to genus level.

Chernetidae Menge, 1855

Chernes cimicoides (Fabricius, 1793)
1: 29.viii.2014, 1 ♀, 1 ♂, 1 t; **5:** 6.ix.2013, 1 ♀, 1 ♂; **6:** 2.x.2013, 1 ♀; **7:** 7.v.2014, 1 ♀, 1 ♂. This species is distributed in Europe, Eurasia and Kazakhstan (Harvey 2013). A total of eight specimens were collected at four studied localities. In Poland, the species has been recorded from many localities in deciduous, mixed and coniferous forests, where it is found in leaf litter, humus, under bark and sometimes in anthills (Rafalski 1967, Jędryczkowski 1985, 1987b, 1996, 2000a). Jędryczkowski (1995) collected the species from a birds' nest.

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REFERENCES

BEIER M. 1963: *Ordnung Pseudoscorpionidea (Afterskorpione)*. *Bestimmungsbücher zur Bodenfauna Europas*. *Vol. 1*. Akademie-Verlag, Berlin, 313 pp.

CHRISTOPHORYOVÁ J., ŠŤÁHLAVSKÝ F. & FEDOR P. 2011: An updated identification key to the pseudoscorpions (Arachnida: Pseudoscorpiones) of the Czech Republic and Slovakia. *Zootaxa* **2876**: 35–48.

GARDINI G. 2014: The species of the Chthonius heterodactylus group (Arachnida, Pseudoscorpiones, Chthoniidae) from the eastern Alps and the Carpathians. *Zootaxa* **3887**: 101–137.

HARVEY M. S. 2013: *Pseudoscorpions of the World*. *Version 3.0.* http://museum.wa.gov.au/catalogues-beta/pseudoscorpions. Western Australian Museum Perth (accessed 26 February 2019).

JĘDRYCZKOWSKI W. B. 1985: Zaleszczotki (Pseudoscorpiones) Mazowsza. (Pseudoscorpions (Pseudoscorpiones) of Mazovia). *Fragmenta Faunistica Musei Zoologici Polonici* **29**: 77–83 (in Polish, English abstract and summary).

JĘDRYCZKOWSKI W. B. 1987a: Zaleszczotki (Pseudoscorpiones) Bieszczadów. (Pseudoscorpions (Pseudoscorpiones) of the Bieszczady Mts.). *Fragmenta Faunistica Musei Zoologici Polonici* **30**: 341–349 (in Polish, English abstract and summary).

JĘDRYCZKOWSKI W. B. 1987b: Zaleszczotki (Pseudoscorpiones) Gór Świętokryskich. (Pseudoscorpions (Pseudoscorpiones) of Świętokrzyskie Mts). *Fragmenta Faunistica Musei Zoologici Polonici* **31**: 135–157 (in Polish, English abstract and summary).

JĘDRYCZKOWSKI W. B. 1995: Bezkręgowce lądowe (Isopoda, Diplopoda, Pseudoscorpiones, Opiliones) Pojezierza Mazurskiego. (Invertebrates (Isopoda, Diplopoda, Pseudoscorpiones, Opiliones) of Mazurian Lake Region). *Fragmenta Faunistica Musei Zoologici Polonici* **37**: 505–520 (in Polish, English abstract and summary).

JĘDRYCZKOWSKI W. B. 1996: Zaleszczotki (Pseudoscorpiones) Roztocza. (Pseudoscorpions (Pseudoscorpiones) of Roztocze). *Fragmenta Faunistica Musei Zoologici Polonici* **39**: 21–27 (in Polish, English abstract and summary).

JĘDRYCZKOWSKI W. B. 1997: Ecological factors in the distribution of Carpathian elements in Poland. Pp. 127–131. In: ZABKA M. (ed.): *Proceedings of the 16th European College of Arachnology*. Wyzsza Szkola Rolnicko-Pedagogiczna, Siedlce, 334 pp.

JĘDRYCZKOWSKI W. B. 2000a: Zaleszczotki (Pseudoscorpionida) wybranych środowisk Bieszczadów. (Pseudoscorpions (Pseudoscorpionida) in selected habitats in the Bieszczady Mountains). *Monografie Bieszczadzkie 2000* **7:** 105–110 (in Polish, English abstract and summary).

JĘDRYCZKOWSKI W. B. 2000b: Zaleszczotki (Pseudoscorpionidea). [Pseudoscorpions (Pseudoscorpionidea)]. *Flora I Fauna Pienin – Monografie Pienińskie* **1:** 125–126 (in Polish).

JĘDRYCZKOWSKI W. B. 2003: Zaleszczotki (Pseudoscorpionidea) masywu Babiej Góry. (Pseudoscorpions (Pseudoscorpionidea) of the Babia Góra Massif). Pp. 99–101. In: WOŁOSZYN B. W., WOŁOSZYN D. & CELARY W. (eds): *Monografia Fauny Babiej Góry*. Komitet Ochrony Przyrody Polskiej Akademii Nauk, Kraków, 489 pp. (in Polish, English abstract and summary).

JĘDRYCZKOWSKI W. B. 2014: *Lista gatunków zaleszczotków (Pseudoscorpionidea) Polski*. [*List of pseudoscorpions* (*Pseudoscorpionidea*) *of Poland*]. http://www.arachnologia.edu.pl/pl/gatunki/17-zaleszczotki-polski.html (accessed 26 February 2019).

KULCZYŃSKI W. 1876: Dodatek do fauny pajęczaków Galicyi. [Contribution to the arachnid fauna of Galicia]. *Sprawozdanie Komisyi Fizyjograficznéj*, *Kraków* **10:** 41–67 (in Polish).
NOWICKI M. 1874: Dodatek do fauny pajęczaków Galicyi. [Contribution to the arachnid fauna of Galicia]. *Sprawozdanie Komisyi Fizyjograficznéj*, *Kraków* **8**: 1–11 (in Polish).
RAFALSKI J. 1936: Neobisium (Neobisium) polonicum nov. spec. Nowy gatunek zaleszczotka (Pseudoscorpionidea). [Neobisium (Neobisium) polonicum nov. spec. New pseudoscorpion species (Pseudoscorpionidea)]. *Sprawozdania Poznanskiego Towarzystwa Przyjaciol Nauk* **9**: 119 (in Polish).
RAFALSKI J. 1937: Neobisium (Neobisium) polonicum nov. spec. Nowy gatunek zaleszczotka (Pseudoscorpionidea). [Neobisium (Neobisium) polonicum nov. spec. New pseudoscorpion species (Pseudoscorpionidea)]. *Prace Komisji Matematyczano-Pryzyrodniczej, Poznanskie Towarzystwo Przyjacíol Nauk B* **8**: 159–172 (in Polish, German summary).
RAFALSKI J. 1948: Mundochthonius carpaticus sp. nov., nowy gatunek zaleszczotka (Pseudoscorpionidea). (Mundochthonius carpaticus, a new species of Pseudoscorpionidea). *Annales Musei Zoologici Polonici* **14**: 13–20 (in Polish, English summary).
RAFALSKI J. 1967: Zaleszczotki. [Pseudoscorpions]. Pseudoscorpionidea. *Katalog Fauny Polski* **32 (1)**: 1–34 (in Polish).
ŠŤÁHLAVSKÝ F., CHRISTOPHORYOVÁ J. & HENDERICKX H. 2013: A karyological study of four European species of Roncus (Pseudoscorpiones: Neobisiidae). *European Journal of Entomology* **110**: 393–399.
VERNER P. H. 1960: Příspěvek k poznání štírků Československa (Pseudoscorpionidea). [Contribution to the knowledge of pseudoscorpions of Czechoslovakia]. *Věstník Československé Zoologické Společnosti* **24**: 167–169 (in Czech, German summary).
ZARAGOZA J. A. 2017: Revision of the Ephippiochthonius complex in the Iberian Peninsula, Balearic Islands and Macaronesia, with proposed changes to the status of the Chthonius subgenera (Pseudoscorpiones, Chthoniidae). *Zootaxa* **4246 (1)**: 1–221.

SÚHRN

Cieľom práce bola identifikácia šťúrikov zo zbierky Prírodovedného múzea, Univerzity Vroclav v Poľsku. Jedince boli zbierané počas rokov 2013 a 2014 preosevom hrabanky v lesoch nachádzajúcich sa v oblasti Karpát (juhovýchodné Poľsko) v nadmorských výškach 340 až 640 m n. m. Šťúriky boli spracované na dočasné preparáty s použitím kyseliny mliečnej ako presvetľovacieho média. Celkovo bolo identifikovaných 511 jedincov patriacich do 10 taxónov a do troch čeľadí. Najpočetnejšie bola zastúpená čeľaď Neobisiidae (472 jedincov, 6 taxónov), čeľade Chthoniidae (31 jedincov, 3 druhy) a Chernetidae (8 jedincov, 1 druh) boli menej početne zastúpené. Počas výskumu boli zaznamenané dva karpatské elementy *Mundochthonius carpaticus* Rafalski, 1948 a *Neobisium polonicum* Rafalski, 1936. Z faunistického hľadiska je zaujímavý nález, pre Poľsko pomerne vzácneho, šťúrika *Chthonius ischnocheles* (Hermann, 1804).