Neobisium (N.) tothi sp. nov., a new species from Hungary and Romania, and first records of Neobisium (N.) noricum Beier, 1939 from Hungary (Pseudoscorpiones: Neobisiidae)

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Abstract: A new pseudoscorpion species, Neobisium (Neobisium) tothi sp. nov., is described from Hungary and Romania. In addition, Neobisium (N.) noricum Beier, 1939 is reported from Hungary for the first time. Detailed descriptions and illustrations of the new species and the new specimens of N. (N.) noricum are presented here.

Key words: Arachnida, central and eastern Europe, soil zoology, alpine fauna, new faunistic data

1. Introduction
The pseudoscorpion fauna of central Europe is represented by numerous species. Some of them are widely distributed, like Neobisium sylvaticum (C. L. Koch, 1835) and Dactylochelifer latreillii (Leach, 1817), and others are endemic to individual geographical regions, like Chthonius hungaricus Mahnert, 1980 or Neobisium carinthiacum Beier, 1939. Until recently, 53 pseudoscorpion species have been recorded from Hungary, of which 13 belong to the genus Neobisium Chamberlin, 1930 (Harvey, 2013; Novák, 2013, 2015a, 2015c). The Romanian fauna is more diverse, with 74 recorded species, of which 24 belong to Neobisium (Harvey, 2013; Novák, 2012; Novák and Harvey, 2015). The new results on the pseudoscorpion fauna of these two countries (Kárpáthegyi, 2006, 2007; Novák, 2012, 2014, 2015a, 2015b, 2015c; Novák and Harvey, 2015) suggest that the pseudoscorpion fauna of central and southeastern Europe is still incompletely known. The pseudoscorpion family Neobisiidae is predominantly distributed in the Palearctic and Nearctic ecozones. The family currently includes 32 genera, of which 20 belong to the subfamily Microcreagrinae and 12 to Neobisiinae (Harvey, 2013). With more than 230 recognized species, the genus Neobisium is not only the largest neobisiid genus but one of the most diverse pseudoscorpion genera, exceeded only by the genus Chthonius C. L. Koch, 1843 (Chthoniidae). Species of Neobisium mostly occur in Europe and northern Africa, and their range also extends eastwards across the Middle East to India (Harvey, 2013).

The aim of this study is to discuss and give a detailed description of Neobisium (N.) tothi sp. nov. from Hungary and Romania and some new specimens of Neobisium (N.) noricum, which was known up to now only from Austria (Beier, 1939; Harvey, 2013). In addition, a new morphometric range, a few morphological variations, and a new distribution pattern in relation to the latter species are given.

2. Materials and methods
The examined specimens are preserved in 70% ethanol and lodged in the Hungarian Natural History Museum, Budapest, Hungary (HNHM) and the Kazinczy Ferenc Museum, Sátoraljaújhely, Hungary (KFM). Each sample is accompanied with inventory numbers of the relevant museum (e.g., “HNHM Pseud-Nr” and “KFM Pseud-Nr”).

The male holotype and female paratype of N. (N.) tothi sp. nov. were originally part of a dried collection and were fixed with water-soluble glue. The fixative was dissolved with warm water, but unfortunately the initial fixation caused some minor damage to the specimen. Furthermore, the collection data lacked any information regarding the habitat, the collecting method, or the date of collection for the paratype. In the case of older materials of N. (N.) tothi and N. (N.) noricum, there were no coordinates accompanying the collection data.

The materials were examined with a stereomicroscope and a Zeiss Axioskop 2 light microscope. The specimens were cleared in a 3:1 mixture of lactic acid and gelatin.

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Drawings were made with the aid of the Zeiss Axioskop 2 microscope. Measurements were taken by using Olympus Soft Imaging analySIS work 5.0 software.

Terminology and measurements mostly follow Chamberlin (1931), Harvey (1992), and Judson (2007).

3. Results and discussion

Family Neobisiidae Chamberlin, 1930
Genus Neobisium Chamberlin, 1930
Neobisium (Neobisium) tothi sp. nov.
Figures 1A–II

Figure 1. Neobisium (N.) tothi, sp. nov. (male holotype, if not mentioned otherwise): A- carapace, dorsal view; B-epistome developed, female paratype; C- epistome reduced, male paratype; D- anterior part of coxa I, ventral view; E- right chelicera, dorsal view; F- left pedipalp, dorsal view; G- right chela, lateral view of paraxial face; H- leg I; I- leg IV.
Type material. Holotype male (KFM Pseud-66), Hungary, Révleányvár, Motolla, 30.10.1993, leg.: G. Hegyessy. Paratypes: 1 male (HNHM Pseud-1878), Romania, Salaj County, Tusa (Tuszatelke), Ponor, 47°00.717′N, 22°44.525′E, 830 m a.s.l., pasture and fern (*Pteridium aquilinum*), 02.10.2014, leg.: Z. Bálint, L. Dányi, G. Katona, D. Murányi; 1 female (KFM Pseud-67) Hungary, Sátoraljaújhely, Sátor-hegy, date not recorded, leg.: G. Hegyessy.

Etymology. This species is named for László Tóth, my first biology teacher, who greatly inspired me to become a biologist.

Distribution: This species has been found in northeastern Hungary and northwestern Transylvania, Romania.

Diagnosis. Palpal femur 3.59–4.17 times longer than wide, basodorsal face and basal two-thirds of the lateral face of femur finely granulate, chelal fingers 1.38–1.52 times longer than hand (with pedicel), chelal length with pedicel 1.04–1.23 mm, fixed chelal finger 0.64–0.73 mm long; movable chelal finger with 48–62 continuous and relatively similar teeth, fixed chelal finger with 58–62 teeth, 2–4 small teeth situated between two large teeth in distal half of the fixed chelal finger; distance between chelal trichobothria *ib* and *ist* 1.95–2.10 times as long as between *ist* and *it*.

Description. Small-sized epigean pseudoscorpion. Carapace and tergites darker, other body parts lighter yellowish-brown. Measurements and ratios as in the Table.

Table. Measurements (in mm) and ratios of *Neobisium (N.) tothi* sp. nov. (KFM Pseud-66–67; HNHM Pseud-1878) and *Neobisium (N.) noricum* (HNHM Pseud-1680; 1879–1880). The basitarsus and telotarsus of leg I and the segments of leg IV of the female paratype of *N. (N.) tothi* were not measured due to the poor condition of the specimen.

<table>
<thead>
<tr>
<th></th>
<th>Neobisium (N.) tothi</th>
<th>Neobisium (N.) noricum</th>
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<tr>
<td></td>
<td>Males</td>
<td>Female</td>
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<tr>
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<td>1.91</td>
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<tr>
<td>Carapace</td>
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<td>0.95</td>
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<tr>
<td>Chelicera</td>
<td></td>
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<tr>
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<td>0.38/0.22</td>
</tr>
<tr>
<td>Finger</td>
<td>0.20–0.21</td>
<td>0.26</td>
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<tr>
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<td></td>
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<td>Femur</td>
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<td>3.59–4.06</td>
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<td>Chela</td>
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<td>1.23</td>
</tr>
<tr>
<td>Hand</td>
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<td>1.65–1.81</td>
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<tr>
<td>Pedicel</td>
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<td>0.07</td>
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<tr>
<td>Finger</td>
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<td>0.72–0.73</td>
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<td><strong>Leg I</strong></td>
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<td>Tibia</td>
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<td>Basitarsus</td>
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<td>2.62–3.21</td>
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<tr>
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<td><strong>Leg IV</strong></td>
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<td>1.63–1.71</td>
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<td>2.97–3.14</td>
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<td>5.23–5.58</td>
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<tr>
<td>Basitarsus</td>
<td>0.19–0.22/0.06–0.07</td>
<td>3.15–3.25</td>
</tr>
<tr>
<td>Telotarsus</td>
<td>0.27–0.32/0.05–0.06</td>
<td>5.03–5.15</td>
</tr>
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Coxal area. Pedipalpal coxa with 5 acuminate setae on manducatory process, plus 7–9 additional setae; coxae I–IV with setal formula 4–6: 5–8: 5–6: 5–8. Coxa I with long, triangular, and apically pointed anterolateral process; medial process rounded, with denticles (Figure 1D).


Chelicera (Figure 1E). Hand with 6–7 setae. Galeal seta situated submedially, 0.56–0.64× from the base of movable finger. Spinneret as a prominent hyaline tubercle with 6–7 silk ducts. Fixed and movable fingers respectively with 12–14 and 8–10 small and medium-sized teeth. Rallum with 8 blades, anterior margins of 2 distal blades finely pinnate, the most proximal blade enlarged basally and distinctly separated from the next blades. Serrula interior with 23–25 blades, serrula exterior with 22–25 blades.

Pedipalp (Figure 1F). Patella and chela entirely smooth, basodorsal face and basal two-thirds of the lateral face of femur finely granulate. Trochanter partly granulate, with tubercle. Femur 3.59–4.17, patella 2.27–2.55 times longer than broad. Chela slender and with markedly curved fingers in dorsal view (Figure 1G). Pedicel of chela with 2 dorsal micropores. Movable chelal finger 1.38–1.52 times longer than hand (with pedicel). Fixed chelal finger with 58–62 close-set teeth of unequal length; on the distal half of the finger, usually 2–4 normal-sized teeth between 2 larger teeth. Movable chelal finger with 48–62 rounded teeth, dental line ending slightly distal to trichobothrium b. Trichobothria of chelal fingers situated as in Figure 1G. Distance between trichobothria ib and ist 1.95–2.10 times as long as between ist and it. Base of fixed chelal finger with 2 microsetae situated distal to trichobothria eb and esb, and 3–4 further setae between them and isb.

Legs (Figures 1H and 1I). Surfaces smooth. Simple and smooth claws, arolia shorter than claws. Subterminal seta of telotarsus IV with a single serrate ramus. Tibia IV with a medial (TS = 0.42), basitarsus IV with a basal (TS = 0.12), and telotarsus IV with a submedial (TS = 0.33) tactile seta.

Remarks. Neobisium tothi is most similar to N. carcinoides; however, it differs from all other Neobisium species having similar chelal dentition in the granulation of the palpal femur. In N. carcinoides (Hermann, 1804), N. minimum (Beier, 1928), N. carciniacum Beier, 1939, and N. hermanni Beier, 1938, an additional difference is the absence of a definite epistome, while it is normally present in N. tothi. However, it is worth mentioning that in N. carcinoides, there was also observed a somewhat smaller topless epistome (Dashdamirov and Schawaller, 1992). Furthermore, the femora of N. carciniacum (0.90 mm) and N. hermanni (0.93 mm) are longer than in the new species (0.60–0.72 mm). Neobisium tothi differs from N. noricum by the relative length of the chelal finger (1.18–1.30× longer than hand with pedicel in N. noricum, and 1.38–1.52× in N. tothi) and the position of the chelal trichobothrium ist (distance between ib and ist 2.81–3.00 times as long as between ist and it in N. noricum and 1.95–2.10 times in N. tothi), and from N. jugorum (L. Koch, 1873) in the length/width ratio of the patella (2.8–3.0× in N. jugorum and 2.27–2.44× in N. tothi). Besides the granulation of the femur, N. tothi can be distinguished from N. carpathicum Beier, 1935 by the absence of the large middle tooth on the movable cheliceral finger. The new species differs from N. granulatum Beier, 1937, N. granulosum Beier, 1963, and N. simile (L. Koch, 1873) in palpal measurement data and proportions, e.g., pedipalpal femur length is 0.98–1.17 mm in N. granulatum, 0.87 mm in N. granulosum, and 1–1.10 mm in N. simile, as well as in the chelal dentition (in contrast to N. tothi, the three abovementioned species have teeth on the fixed chelal finger of equal length) (Beier, 1963).

Neobisium tothi has been collected from hilly and lower montane regions of Hungary and Romania (Figure 2). Unfortunately, we do not have much data regarding the habitats of the species.

Neobisium (Neobisium) noricum Beier, 1939

Figures 3A–3D

Type material: holotype: 1 male, Pfandlscharte (2500 m a.s.l.), High Tauern, 05.08.1925. Leg: Petz, Nr. 6442, Oberösterreichisches Landesmuseum, Linz, Austria (not investigated).

Material examined: 1 female (HNHM Pseud-1680), Austrian Alps, 300 m a.s.l., beech forest, 13.10.2014, leg.: E. Dudich.

Description. Small-sized epigean pseudoscorpions. All body parts yellowish-brown, carapace and tergites just slightly darker than other parts. Measurements and ratios as in the Table.

Carapace surface smooth, approximately as long as broad, with small, triangular, and topless epistome (Figure 3A). Two pairs of eyes, each with lenses; 2–3 pairs
of slitlike lyrifissures in ocular region (in one specimen, 5 lyrifissures), and two pairs near posterior margin. One pair of preocular setae present. Setal formula: m4m: 6: 6: 4–5 (total 22–23 with preocular setae).


     Chelicera (Figure 3B). Hand usually with 6 setae (5 in exceptional cases). Galeal seta situated 0.63–0.65× from base of movable finger. Spinneret as a prominent hyaline tubercle with 7–10 silk ducts. Fixed and movable chelal fingers respectively with 19–22 and 10–16 small and medium-sized teeth. Rallum with 8 blades, the 2 distalmost finely pinnate on anterior face. Basis of first blade enlarged, and it is separated from the proceeding one. Serrula interior with 25–29 blades, serrula exterior with 23–28 blades.

     Pedipalp (Figure 3C). Surfaces smooth. Trochanter with tubercle. Femur 3.78–4.06, patella 2.17–2.50 times longer than broad. Chela (Figure 3D) slender and with markedly curved fingers. Pedicel of chela with 5 dorsal micropores. Chelal fingers 1.18–1.30 times longer than hand (with pedicel). Fixed chelal finger with 56–71 close-set teeth of unequal length; on the distal half of the finger usually 2–5 normal-sized teeth between two larger teeth. Movable chelal finger with 54–69 rounded teeth, dental line ending slightly distal to trichobothrium b. Trichobothria of chelal fingers situated as in Figure 3D. Distance between trichobothria ib and ist 2.81–3.00 times as long as between ist and it. Base of fixed chelal finger with 4–5 microsetae situated distal to trichobothria eb and esb, and 2–3 further setae between them and isb (Figure 3D).

     Legs. Surfaces smooth. Simple and smooth claws, arolia on all legs shorter than claws. Subterminal seta of telotarsus IV with a single serrate ramus. Tibia IV with a medial, basitarsus IV with a basal, and telotarsus IV with a submedial tactile seta.

     Remarks. Neobisium noricum was described by Beier (1939) from Pfanndlscharte in the High Tauern, Austria. The single male holotype was found in humus and deposited in the Oberösterreichisches Landesmuseum (Linz, Austria). A second specimen was found near the type locality at
Großglockner Mountain by Bergthaler and Rêlys (2002), but no detailed morphological information was provided. As it was collected with a suction sampler, it may have been present on the soil surface or among detritus. Furthermore, in the collection of the Natural History Museum of Vienna (Austria), there are additional *N. noricum* specimens from Carinthia, Austria. According to the database of the collection, this material was determined by Beier but was not published. The data of these materials are as follows: No. 26310: Carinthia, Maria-Wörth, 08.07.1967, leg.: Strouhal H.; No. 26311: Carinthia, Eisenkappel-Vellach, 1900 m a.s.l., 01.10.1947, leg.: Schwieger H.; No. 26312: 4 ad., Carinthia, Eisenkappel-Vellach, Jovanberg, 1450 m, 25.06.1950, leg: Scheerpeltz O.; No. 26313: 1 ad., Eisenkappel-Vellach, Vellach Valley, 08.07.1950, leg.: Scheerpeltz O.; No. 26314: 6 ad., Hüttenberg, 18.07.1959, leg: Strouhal H.; No. 26317: 3 ad., Carinthia, Southern Koralpe, 1100 m a.s.l., 05.10.1970, leg.: Kreissl. The new specimens from Hungary were found in the westernmost part of the country, near the Austrian border, at the Soproni (Ödenburger) and Kőszegi (Günsner) Mountains (Figure 2). These two mountains are part of the Noricum biogeographical region and their fauna is under strong Alpine influence (Varga, 1964). In other soil-dwelling groups, mountain species with Alpine affinities are also represented in these two mountains, including the

**Figure 3. Neobisium (N.) noricum** Beier, 1939 (HNHM Pseud-1880): A- carapace, dorsal view (female); B- right chelicera (female), dorsal view; C- left pedipalp (male), dorsal view; D- left chela (male), lateral view.
earthworms Aporrectodea sineporis (Omodeo, 1952) and Dendrobeana vejlovskyi (Černosvitov, 1935) (Csuzdi and Zícsli, 2003), and the enchytraeid Fridericia discifera Healy, 1975 (Klára Dózsa-Farkas, personal communication).

The original description of *N. noricum* was rather brief and contained only a single illustration of the pedipalpal dorsal aspect (Beier, 1939). Subsequently, an abridged description and the same figure were published by Beier (1963), but no other description exists for this species in the literature. A more comprehensive description and illustrations of the species has been prepared on the basis of 2 males and 8 females collected from Hungary. Additionally, a few intraspecific variations of some morphological and morphometric characters are given. The new specimens correspond well with the descriptions of Beier (1939, 1963), but naturally they show greater variation in measurements and morphometric ratios, and in the number of chelal teeth. Until recently, *N. noricum* was considered an endemic species with a small area in the High Tauern (Mahnert, 2009), but the new data suggest that it is most likely an alpine species with a larger distribution ranging from 560 to 2500 m a.s.l. The new distribution records are the first from Hungary (Figure 2).

**Nomenclatural acts:** This work and the nomenclatural acts it contains have been registered in ZooBank. The ZooBank Life Science Identifier (LSID) for this publication is: [http://zoobank.org/urn:lsid:zoobank.org:pub:BB8A7386-6578-4E57-BDBCDE25A73C9BEF](http://zoobank.org/urn:lsid:zoobank.org:pub:BB8A7386-6578-4E57-BDBCDE25A73C9BEF).

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**References**


