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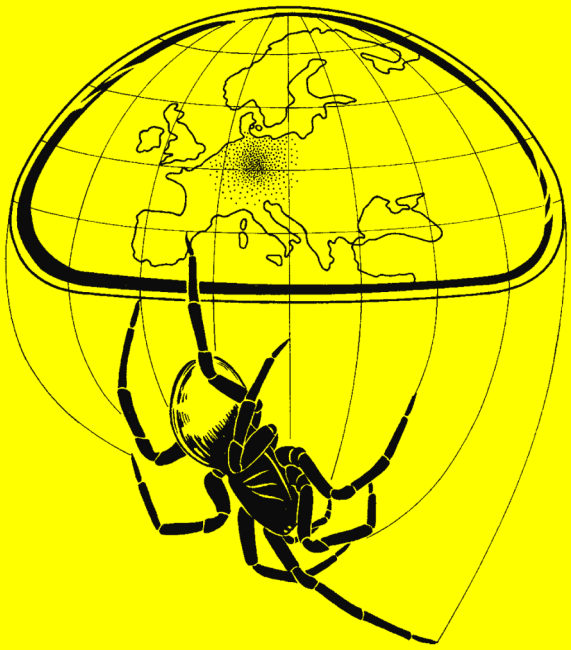

Arachnologische Mitteilungen

Arachnology Letters

Heft / Volume 53 **Karlsruhe, April 2017**

ISSN 1018-4171 (Druck), 2199-7233 (Online) www.AraGes.de/aramit

Arachnologische
Mitteilungen

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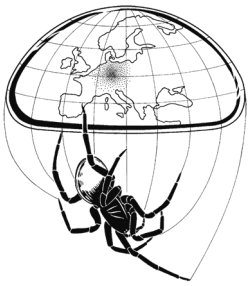

Logo: P. Jäger, K. Rehbinder

Publiziert von / Published by
Arachnologische Gesellschaft e.V.
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Druck / Print
Druckerei Isensee, Oldenburg
verlag@isensee.de

Arachnologische Mitteilungen sind berücksichtigt in:

Arachnology Letters are indexed by:

Biological Abstracts, Directory of Open Access Journals (https://doaj.org/toc/2199-7233), Elektronische Dokumente der Universitätsbibliothek der Goethe Universität, Frankfurt am Main (http://publikationen.ub.uni-frankfurt.de/frontdoor/index/index/docId/14663), Elektronische Zeitschriften-Bibliothek (http://rzblx1.uni-regensburg.de/ezeit), Index Copernicus, Journals Master List (http://journals.indexcopernicus.com/Arachnologische+Mitteilungen,p1166,3.html), Scopus (http://info.scopus.com), Virtuelle Fachbibliothek Biologie (http://www.vifabio.de/vifabioDOC/detail/?ID=14663), Zoological Record/Biological Abstract/BIOSIS Previews, Thomson Reuters Master Journal List (http://ip-science.thomsonreuters.com/cgi-bin/jrnlst/jlresults.cgi?PC=MASTER&Full=arachnologische%20mitteilungen).

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Additions to the crab spider fauna of Iran (Araneae: Thomisidae)

Najmeh Kiany, Saber Sadeghi, Mohsen Kiany, Alireza Zamani & Sheidokht Ostovani

doi: 10.5431/aramit5301

Abstract. In this study, the crab spider (Thomisidae) fauna of Fars Province in Iran is investigated and some additional new records are given for both the country and the province. The species *Monaeses israeliensis* Levy, 1973, *Synema anatolica* Demir, Aktas & Topçu, 2009, *Thomisus unidentatus* Dippenaar-Schoeman & van Harten, 2007 and *Xysticus abramovi* Marusik & Logunov, 1995 are new records for Iran, while *Heriaeus spinipalpus* Loerbroks, 1983, *Ozyptila tricoloripes* Strand, 1913, *Runcinia grammica* (C. L. Koch, 1837), *Synema globosum* (Fabricius, 1775), *Thomisus zyuzini* Marusik & Logunov, 1990, *Xysticus kaznakovi* Utochkin, 1968, *X. loeffleri* Roewer, 1955 and *X. striatipes* L. Koch, 1870 are new to the fauna of Fars Province.

Keywords: Fars, faunistic study, new records

Zusammenfassung. Ergänzungen zur Krabbenspinnenfauna des Iran (Araneae: Thomisidae). Im Rahmen dieser Studie wurden die Krabbenspinnen (Thomisidae) der Fars Provinz im Iran erfasst. Die Arten *Monaeses israeliensis* Levy, 1973, *Synema anatolica* Demir, Aktas & Topçu, 2009, *Thomisus unidentatus* Dippenaar-Schoeman & van Harten, 2007 und *Xysticus abramovi* Marusik & Logunov, 1995 sind Neunachweise für den Iran, während *Heriaeus spinipalpus* Loerbroks, 1983, *Ozyptila tricoloripes* Strand, 1913, *Runcinia grammica* (C. L. Koch, 1837), *Synema globosum* (Fabricius, 1775), *Thomisus zyuzini* Marusik & Logunov, 1990, *Xysticus kaznakovi* Utochkin, 1968, *X. loeffleri* Roewer, 1955 und *X. striatipes* L. Koch, 1870 erstmals für die Fars Provinz nachgewiesen werden konnten.

In spite of recent increases in the faunistic data on Thomisidae in Iran, the family must be considered as poorly studied in this country (Zamani et al. 2014). The number of known Iranian species exceed 51 species in 14 genera (Zamani 2016, Zamani et al. 2016a) which is less than what is known in some of the neighbouring countries e.g. 88 species for Turkey (Bayram et al. 2016) and 57 species for Azerbaijan (Otto 2016). The present study was designed to gather more data on the thomisid fauna of Fars Province in southern Iran.

Material and methods

The spiders were collected from different localities in the province during 2015–2016, using various collecting methods, e.g. hand collecting, sweeping, beating and litter sampling. Specimens were preserved in 80% ethyl alcohol in the field and deposited in the Zoological Museum of the Department of Biology, Shiraz University (ZM-CBSU, curators: Dr. H.R. Esmaeilie and Dr. S. Sadeghi). Global distributions follow the World Spider Catalog (WSC 2016), and data on the local distributions mostly follow Zamani et al. (2016a). Identifications were mostly based on available references such as Levy (1973, 1985), Dippenaar-Schoeman (1989), Marusik & Logunov (1990, 1995), Roberts (1993), Dippenaar-Schoeman & van Harten (2007) and Nentwig et al. (2016). Digital photographs were obtained using a Canon EOS 7D camera attached to an Olympus CH-2 stereomicroscope. The images were stacked using Helicon Focus 5.3.

Abbreviations

RTA = retrolateral tibial apophysis
VTA = ventral tibial apophysis
ITA = intermediate tibial apophysis

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submitted 10.8.2016, accepted 17.11.2016, online 27.1.2017

Results

A total number of 14 species from seven genera were identified, including four new records for Iran and eight new records for the province.

Genus *Heriaeus* Simon, 1875

Heriaeus spinipalpus Loerbroks, 1983 (Fig. 1)

Determination. Loerbroks (1983), Ono & Martens (2005).
Material examined. IRAN, Fars Province: 1♂, 4♀♀ (#3386), Lar-Jahrom Rd., near Nasiri Amin village (28°21'56.70"N, 53°58'09.85"E), 1171.5 m, 6.5.2016 (N. Kiany); 2♂♂ (#3402), Kazeroon, Bishapoor, Tang-e Chovgan (29°47'1.50"N, 51°35'10.37"E), 708.5 m, 20.4.2016 (N. Kiany); 1♀ (#3414), Kavar-Firoozabad Rd, Mook (29° 9'41.60"N, 52°38'6.35"E), 1918 m, 3.5.2016 (N. Kiany); 1♀ (#3415), Beyza, Maloosjan, Industrial zone (29°52'11.23"N, 52°27'16.44"E), 1787 m, 12.4.2016 (N. Kiany).

This species can be distinguished from others by having a distinct spike from the basal part of the male palpal tibia and an epigynum which is characterized by a large central hood (Loerbroks 1983, Ono & Martens 2005).
Habitat. The specimens were collected by hand and beating nets from bushes and shrubs.
Global distribution. Eastern Mediterranean (WSC 2016), in detail: Turkey, Syria, Turkmenistan, Caucasus, Iran (Zamani et al. 2016a).
Distribution in Iran. Tehran, Fars (new province record, southernmost known locality across its entire range).

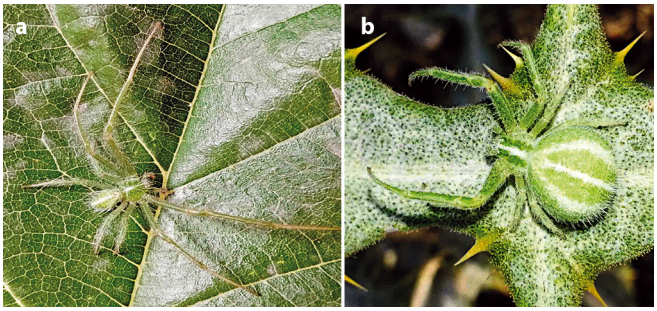


Fig. 1: *Heriaeus spinipalpus*; **a.** Habitus of male, dorsal view; **b.** Habitus of female, dorsal view

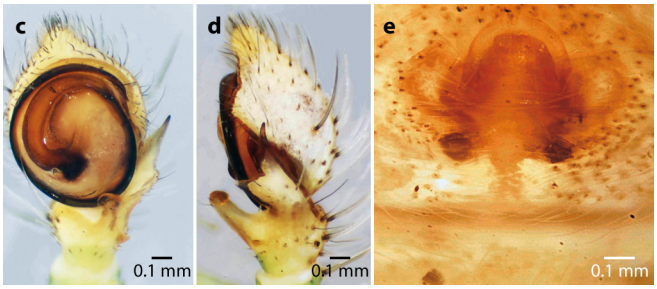


Fig. 1: *Heriaeus spinipalpus*; **c.** Male palp, ventral view; **d.** Male palp, retrolateral view; **e.** Epigynum, ventral view

Genus *Monaeses* Thorell, 1869
***Monaeses israeliensis* Levy, 1973** (Fig. 2)
Determination. Levy (1973), Bayram et al. (2007).
Material examined. IRAN, Fars Province: 1♂, 1♀ (#3411), Kazeroon, Qaemie Rd, Dehnovenghelab, Tang-e Kaviri village (29°47'18.13"N, 51°34'33.44"E), 816 m, 21.4.2016 (N. Kiany).

This species is closely related to *M. paradoxus* (Lucas, 1846), but can be easily distinguished by the form of the VTA which is inclined in *M. israeliensis*. They also differ in the form of the RTA (*M. paradoxus* does not have star-shaped RTA). The epigynum is also different; the sclerotized areas in *M. paradoxus* are far from each other and do not touch, and also the shape of intromittent orifice is different between these species (Levy 1973).
Habitat. The specimens were found in meadows and were collected using sweep nets.
Global distribution. Greece, Turkey, Israel, Lebanon, Central Asia (WSC 2016), Iran (new record).
Distribution in Iran. Fars (new record, southernmost known locality across its entire range).
Comments. Compared to the figures provided by Levy (1973) and Bayram et al. (2007), in the absence of more material our identification in this case should be considered as provisional. In comparison to Levy (1973), our male specimen has a more oblique VTA, and although RTA has a stellate tip, one of its arms does not have a pointed and dentate tip. Furthermore, the tutacular apophysis is rounded and not narrowing.

Genus *Ozyptila* Simon, 1864
***Ozyptila tricoloripes* Strand, 1913** (Fig. 3)
Determination. Levy (1985).
Material examined. IRAN, Fars Province: 4♂♂ (#3348), Beyza, Maloosjan gardens (29°51'27.35"N, 52°29'6.32"E), 1723 m, 18.9.2015 (N. Kiany); 1♂ (#3347), Bavanaat, Haraat (30°12'28.41"N, 54° 0'51.60"E), 1800 m, 30.9.2015 (S. Sadeghi); 1♂ (#3346), Bavanat, Soryan (30°26'49.50"N, 53°39'25.74"E), 2172 m, 3.9.2015 (M. Hakimara).

This species can be distinguished from other *Ozyptila* species by having a tegulum with three crescentic folds and a forked embolic tip. The epigynum is characterised by its hood-like structure on the epigynal plate, which distinguishes it from *O. confluens* (C. L. Koch, 1845) which has no hood, but has a large downward-projecting septum (Levy 1975).
Habitat. The specimens were found on the soil and decomposing leaves and were collected by hand and with a Berlese funnel.
Global distribution. Turkey, Israel, Azerbaijan, Turkmenistan, Kazakhstan (WSC 2016), Iran (Zamani et al. 2016a).
Distribution in Iran. Golestan, Fars (new province record, southernmost known locality across its entire range).

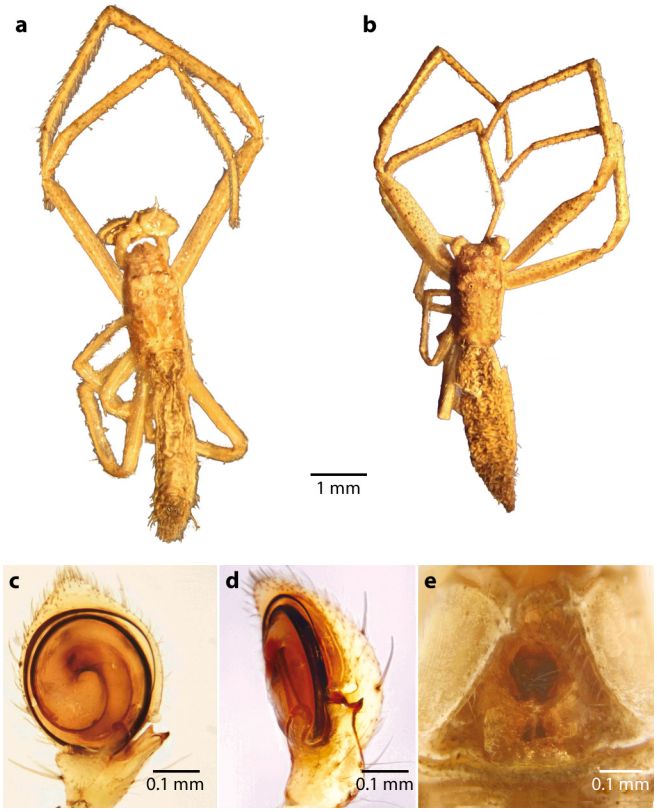


Fig. 2: *Monaeses israeliensis*; **a.** Habitus of male, dorsal view; **b.** Habitus of female, dorsal view; **c.** Male palp, ventral view; **d.** Male palp, retrolateral view; **e.** Epigynum, ventral view

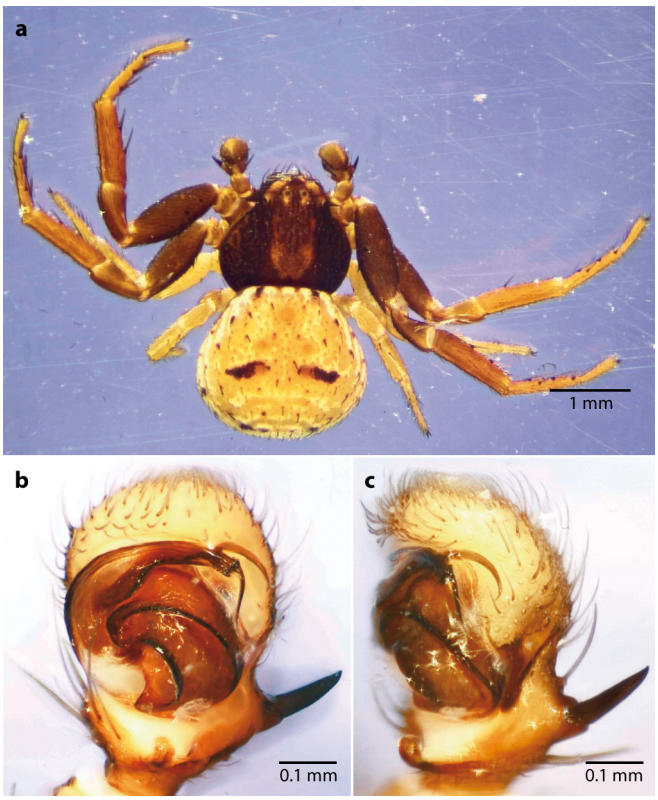


Fig. 3: *Ozyptila tricoloripes*; **a.** Habitus of male, dorsal view; **b.** Male palp, ventral view; **c.** Male palp, retrolateral view

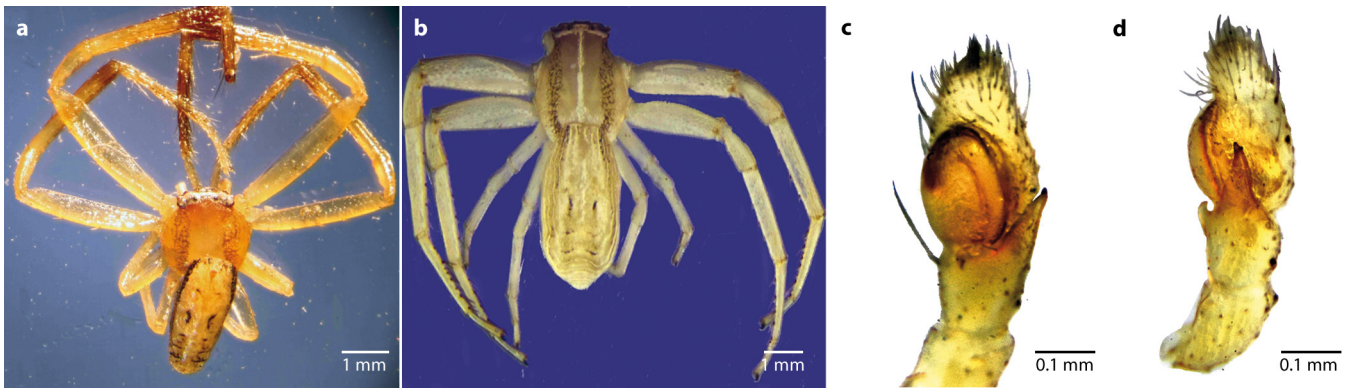


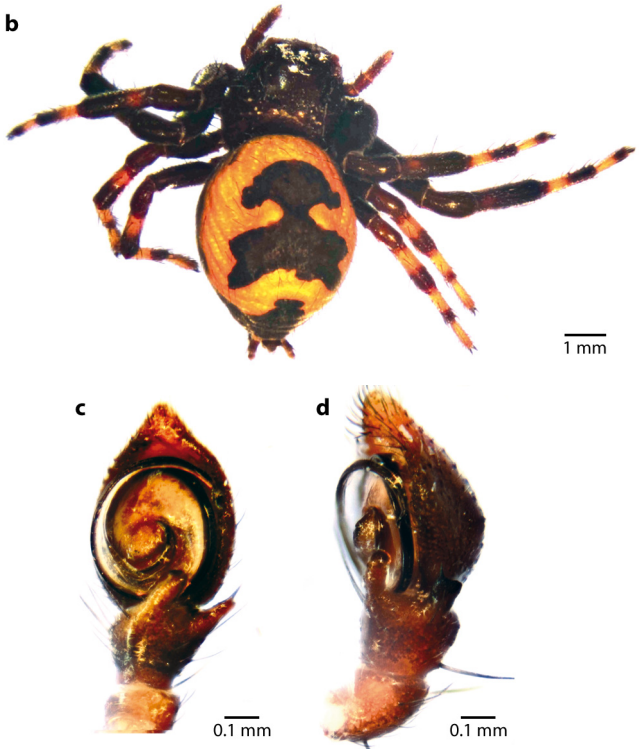
Fig. 4: *Runcinia grammica*; **a.** Habitus of male, dorsal view; **b.** Habitus of female, dorsal view; **c.** Male palp, ventral view; **d.** Male palp, retrolateral view

Genus *Runcinia* Simon, 1875
***Runcinia grammica* (C. L. Koch, 1837)** (Fig. 4)
Determination. Levy (1973), Ono & Martens (2005).
Material examined. IRAN, Fars Province: 1♂, 2♀♀ (#3375), Kazeroon, Qaemie Rd, Dehnovenghelab, Tang-e Kaviri village (29°47'18.13"N, 51°34'33.44"E), 816 m, 21.4.2016 (N. Kiany).

This species can be distinguished from others by having a very short VTA and a cone-shaped RTA. The epigynum is characterised by its transparent central hood with its opening directed towards the epigastric furrow, and two dark sclerotic rings (Levy 1973).
Habitat. The specimens were found in meadows and were collected using sweeping and beating nets.
Global distribution. Palaearctic, St. Helena, South Africa, Lesotho (WSC 2016).
Distribution in Iran. Khuzestan, Mazandaran, Tehran, Fars (new province record).

Genus *Synema* Simon, 1864
***Synema anatolica* Demir, Aktas & Topçu, 2009** (Fig. 5)
Determination. Demir et al. (2009).
Material examined. IRAN, Fars Province: 1♂ (#3388), Sepidan, Roodbal village (30°06'08.96"N, 52°01'54.80"E), 1884 m, 7.10.2015, maturation date, 3.4.2016 (N. Kiany); 4♂♂, 3 subadult ♀♀ (#3387), Kavar-Firoozabad Rd, Mook (29°9'41.60"N, 52°38'6.35"E), 1918 m, 3.5.2016; 1♂ (#3390), Arjan, Khanzenian Rd, Haft Barm, Balezar village (29°50'26.72"N, 52°1'23.63"E), 2189.5 m, 21.5.2016 (N. Kiany).

Fig. 5: *Synema anatolica*; **a.** Habitus of male, dorsal view; **b.** Habitus of female, dorsal view; **c.** Male palp, ventral view; **d.** Male palp, retrolateral view



This species can be distinguished from *S. plorator* (O. P.-Cambridge, 1872) by its unique embolic tip shape and its RTA structure. The epigynum is also different in the shape of the spermathecae, which are reniform (Demir et al. 2009).
Habitat. The specimens were collected by hand from milk-vetch plants (*Astragalus* spp.) and spurges (*Euphorbia* spp.).
Global distribution. Turkey (WSC 2016), Iran (new record).
Distribution in Iran. Fars (new record, south-easternmost across its entire range).

***Synema globosum* (Fabricius, 1775)** (Fig. 6)
Determination. Levy (1975), Ono (1988), Kim & Lee (2012).
Material examined. IRAN, Fars Province: 1♂ (#3399), Estahbaan, Abshar (29°6'27.83"N, 54°1'34.71"E), 1940.5 m, 17.5.2016 (N. Kiany).

This species can be distinguished from *S. plorator* by having a small palp, with its tibia distinctly longer than wide, its spiniform RTA and thinner embolic tip. The epigynum is characterised by the form of the spermathecae and their accompanying structures (Levy 1975).
Habitat. The single specimen was found using beating nets, while it hunted on spurges (*Euphorbia* sp.).

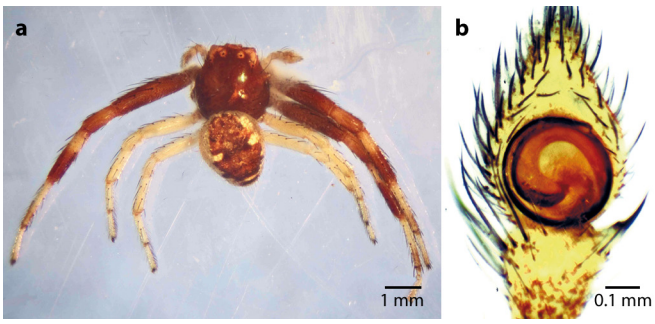


Fig. 6: *Synema globosum*: **a.** Habitus of male, dorsal view; **b.** Male palp, ventral view

Global distribution. Palaearctic (WSC 2016).
Distribution in Iran. Gilan, Golestan, Mazandaran, Zanjan, Fars (new province record).

Genus *Thomisus* Walckenaer, 1805
***Thomisus onustus* O. Pickard-Cambridge, 1885** (Fig. 7)
Determination. Roberts (1998), Almquist (2006), Kim & Lee (2012).
Material examined. IRAN, Fars Province: 2♂♂ (#3394), Beyza, Hoseinabad (29°58'08.37"N, 52°22'03.38"E), 1659.5 m, 11.8.2015 (N. Kiany); 2♂♂ (#3395), Beyza, Maloosjan, Industrial zone (29°52'11.23"N, 52°27'16.44"E), 1787 m, 12.4.2016 (N. Kiany); 1♀ (#3396), Eghlid-Marvdasht Rd, near Igder village (30°27'19.79"N, 52°17'17.03"E), 2168 m, 3.9.2016 (N. Kiany); 4♂♂ (#3391), Arjan, Khanzenian Rd, Haft Barm, Balezar village (29°50'26.72"N, 52°1'23.63"E), 2189.5 m, 21.5.2016 (N. Kiany); 1♀ (#3372), Kavar-Firoozabad Rd, Mook (29°9'41.60"N, 52°38'6.35"E), 1918 m, 3.5.2016 (N. Kiany); 1♀ (#3397), Shiraz, Ghalat, Shabshotori (29°49'3.97"N, 52°18'8.79"E), 2130 m, 12.8.2015 (N. Kiany); 1♀ (#3409), Shiraz, Chamran (29°41'4.62"N, 52°28'47.54"E), 1658 m, 13.4.2016 (M. Kiany); 1♀ (#3389), Shiraz, Derak (29°40'30.27"N, 52°26'34.73"E), 1722 m, 28.4.2016 (M. Kiany).

This species can be distinguished from *T. zyuzini* Marusik & Logunov, 1990 by its long VTA and RTA and the arrangement of the basal tibia tubercle on the male palp, and the circular shape of intromittent orifice which is directed anteriad in the epigynum (Marusik & Logunov 1990, 1995).

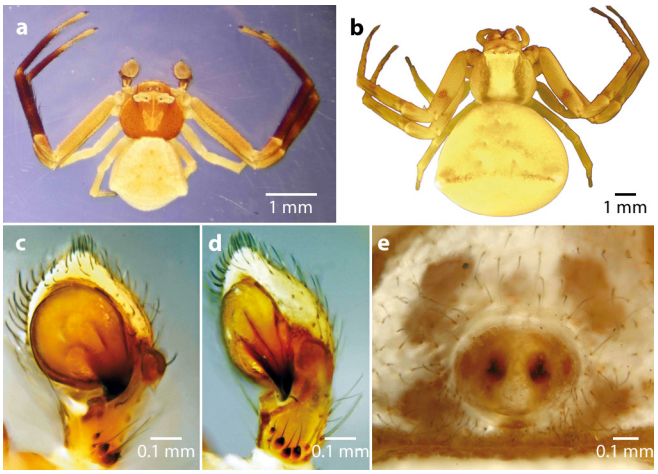


Fig. 7: *Thomisus onustus*; **a.** Habitus of male, dorsal view; **b.** Habitus of female, dorsal view; **c.** Male palp, ventral view; **d.** Male palp, retrolateral view; **e.** Epigynum, ventral view

Habitat. The specimens were found on a variety of flowers and herbs, usually at their flowering peak. They were collected by hand and by using sweeping and beating nets.
Global distribution. Palaearctic (WSC 2016).
Distribution in Iran. Ardebil, Fars, Gilan, Golestan, Mazandaran, Razavi Khorasan, South Khorasan, Tehran, Zanjan.

***Thomisus unidentatus* Dippenaar-Schoeman & van Harten, 2007** (Fig. 8)
Determination. Dippenaar-Schoeman & van Harten (2007).
Material examined. IRAN, Fars Province: 4♂♂, 2♀♀ (#3374), Darab, Hasan abad Qanat (28°47'43.10"N, 54°18'02.92"E), 1085.5 m, 14.9.2015 (N. Kiany, M. Kiany); 3♂♂, (3377), Darab, Cheshme Golabi (28°47'15.14"N, 54°22'18.60"E), 1103 m, 14.9.2015 (N. Kiany, M. Kiany); 1♀ (#3371), Sepidan, Roodbal village (30°06'08.96", 52°01'54.80"E), 1884 m, 7.10.2015 (N. Kiany); 1♂ (#3370), Jahrom, simakaan-ghir Rd, Date gardens (28°28'45.68"N, 53°30'7.71"E), 1097 m, 8.10 2015, maturation date 3.4.2016 (N. Kiany); 3♂ (#3369), Ghir-Firoozabad Rd, Rikan village (28°34'48.54"N, 52°58'14.65"E), 1119 m, 5.5.2016 (N. Kiany); 8♂♂, 1♀ (#3378), Kazeroon, Bishapoor, Tang-e Chovgan (29°47'1.50"N, 51°35'10.37"E), 708.5 m, 20.4.2016 (N. Kiany); 2♂♂ (#3368), Lamerd-Lar Rd, Gardaneh Hesham, Chahshoor (27°26'25.22"N, 53°19'21.38"E), 908 m, 6.5.2016 (N. Kiany); 1♂, 1♀ (#3382), Lamerd, Velayat Blvd (27°20'35.58"N, 53°10'26.46"E), 416.5 m, 6.5.2016 (N. Kiany); 1♂ (#3379), Farashband-Firoozabad Rd., Khargheh (28°53'42.30"N, 52°22'39.48E), 4.5.2016 (N. Kiany); 1♂ (#3380), Khonj, near Eshkaft-e Khan (27°44'45.42"N, 53°21'19.60"E), 560 m, 27.5.2016 (N. Kiany); 2♂♂ (#3384), Lar, Lar-Jahrom Rd (27°41'49.50"N, 54°20'15.80"E), 844 m, 6.5.2016 (N. Kiany); 2♂♂ (#3376), Shiraz, Poleghadir, 1528.5 m, 9.5.2016 (N. Kiany); 1♂ (#3383), Lamerd Rd, Alamarvdasht, near Aboohana village (27°42' 31"N, 53°2' 42"E), 482 m, 5.5 2016 (N. Kiany, M. Kiany); 7♂♂, 1♀ (#3373), Kazeroon, Qaemie Rd, Dehnovenghelab, Tangekaviri village (29°47'18.13"N 51°34'33.44"E), 816 m, 21.4.2016 (N. Kiany); 1♂, 1♀ (#3413), Gerash-Evaz Rd, Nowrouz Park (27°45'26.46"N, 54° 1'51.64"E), 1000 m, 5.6.2016 (N. Kiany).

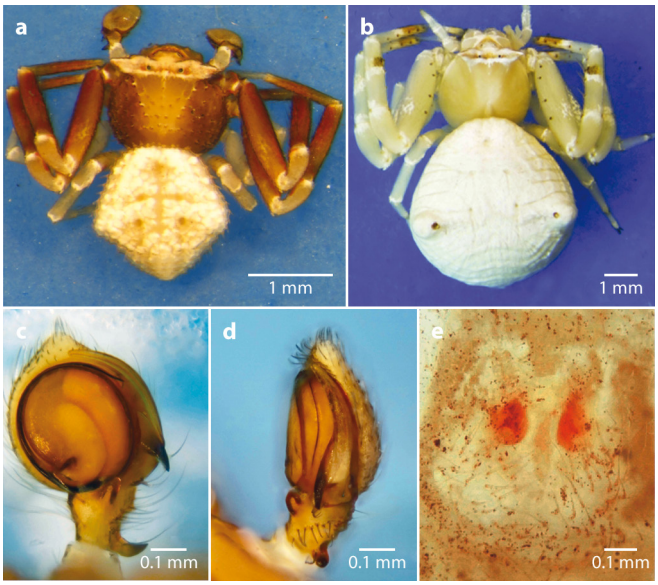


Fig. 8: *Thomisus unidentatus*; **a.** Habitus of male, dorsal view; **b.** Habitus of female, dorsal view; **c.** Male palp, ventral view; **d.** Male palp, retrolateral view; **e.** Epigynum, ventral view

This species closely resemble *T. citrinellus* Simon 1875, but can be distinguished by its single crescent-shaped RTA in the male palp and two crescent-shaped intromittent orifices in the epigynum.

Habitat. The specimens were found on a variety of flowers and flowering trees and were collected by hand and by using sweeping and beating nets.

Global distribution. Yemen (WSC 2016), Iran (new record). Distribution in Iran: Fars (new record, northernmost across its entire range).

***Thomisus zyuzini* Marusik & Logunov, 1990** (Fig. 9)

Determination. Marusik & Logunov (1990, 1995), Demir et al. (2008).

Material examined. IRAN, Fars Province: 1♂ (#3363), Beyza, Hosein abad (29°58'08.37"N, 52°22'03.38"E), 1659.5 m, 11.8.2015 (N. Kiany); 1♂ (#3364), Shiraz, Chamran (29°41'4.62"N, 52°28'47.54"E), 1658 m, 13.4.2016 (M. Kiany); 2♂♂ (#3365), Lamerd-Lar Rd, Gardaneh Hesham, Chahshoor 27°26'25.22"N, 53°19'21.38"E), 908 m, 5.6.2016 (N. Kiany); 1♀, (3367), Izadkhast, near gas station, (31°31'29.63"N, 52° 7'43.40"E), 3.9.2015 (M. Kiany); 2♂♂ (#3366), Shiraz, Kaftarak village, near Sardkhaneh (29°34'55.60"N 52°41'03.26"E), 1462 m, 25.3.2016 (N. Kiany); 4♂♂ (#3353), Darab, Hasan Abad Qanat (28°47'43.10"N, 54°18'02.92"E), 1085.5 m, 14.9.2015 (N. Kiany); 1♀ (#3354), Sepidan, Roodbal village (30°06'08.96", 52°01'54.80"E), 1884 m, 11.9.2015 (N. Kiany); 1♀ (#3355), Jahrom, simakaan-ghir Rd, Date gardens (28°28'45.68"N, 53°30'7.71"E), 1097 m, 8.10.2015 (M. Kiany); 1♂, 1♀ (#3356), Izadkhast, shahre makhroobeh, (31°30'38.23"N, 52° 7'58.48"E), 2198 m, 3.9.2015 (N. Kiany); 1♂ (#3357) Farashband-Firoozabad Rd., Khargheh (28°53'42.30"N, 52°22'39.48E), 4.5.2016 (N. Kiany); 2♂♂ (#3360), Khonj, near Eshkaft-e Khan (27°44'45.42"N, 53°21'19.60"E), 560 m, 27.5.2016 (N. Kiany); 2♂♂, 1♀ (#3385), Lamerd Rd, Alamarvdasht, near Aboohana village (27°42' 31"N, 53°2' 42"E), 482 m, 5.5.2016 (N. Kiany); 1♂ (#3359), Eghlid-Sedeh Rd, near Timarjan village (30°27'19.79"N, 52°17'17.03"E), 4.9.2015 (N. Kiany); 1♂ (#3351), Shiraz, near Adabiat (29°37'18.73"N, 52°33'43.85"E), 1534 m, 14.3.2016 (N. Kiany); 2♂♂, 1♀ (#3352), Safashahr, Ghasre Yaghub(30°30'34.50"N, 53°7'50.90"E), 2160 m, 24.8.2015 (N. Kiany, Z. Khazaei); 1♀ (#3358), Shiraz, Ghalat, Shabshotori (29°49'3.97"N, 52°18'8.79"E), 2130 m, 12.8.2015 (N. Kiany); 2♂♂, 1♀ (#3361), Neiriz, Dareye Palangaan (29° 6'23.61"N, 54°20'59.03"E), 1909 m, 17.5.2016 (N. Kiany); 1♀ (#3381), Kazeroon, Qaemie Rd, Dehnovenghelab, Tangekaviri village (29°47'18.13"N 51°34'33.44"E), 816 m, 21.4.2016 (N. Kiany); 1♂, 2♀♀ (#3393), Lar, Lar-Jahrom Rd (27°41'49.50"N, 54°20'15.80"E), 844 m, 6.5.2016 (N. Kiany); 10♂♂ (#3398), Estahbaan, Abshar (29° 6'27.83"N, 54° 1'34.71"), 1940.5 m, 17.5.2016 (N. Kiany) ; 1♂ (#3401), Lamerd, Velayat Blvd (27°20'35.58"N, 53°10'26.46"E), 416.5 m, 6.5.2016 (N. Kiany, M. Kiany).

This species can be distinguished from *T. onustus* by its short VTA and RTA and basal tibia tubercle arrangement on the male palp, and a circular-shaped intromittent orifice which is directed downwards in the epigynum (Marusik & Logunov 1990, 1995).

Habitat. Same as *T. onustus,* this species is quiet common on flowers and were collected by hand, and by using sweeping and beating nets.

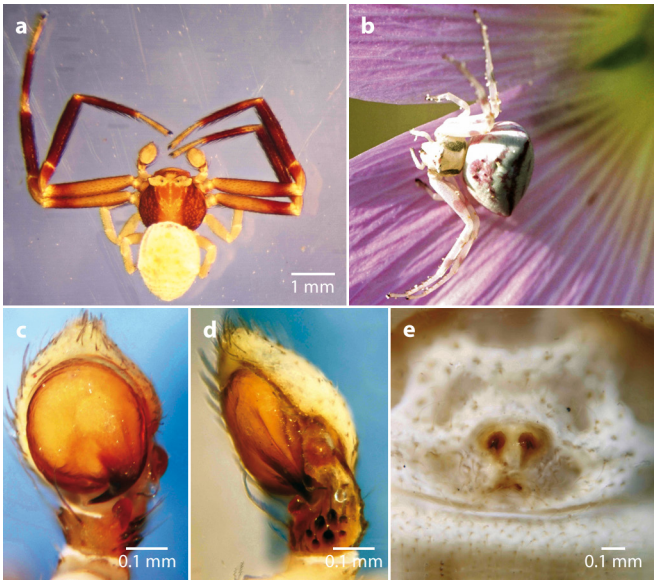


Fig. 9: *Thomisus zyuzini*; **a.** Habitus of male, dorsal view; **b.** Habitus of female, dorsal view; **c.** Male palp, ventral view; **d.** Male palp, retrolateral view; **e.** Epigynum, ventral view

Global distribution. Turkey, Saudi Arabia to Central Asia, Iran.

Distribution in Iran. Alborz, Isfahan, Razavi Khorasan, Fars (new province record).

Genus *Xysticus* C. L. Koch, 1835

***Xysticus abramovi* Marusik & Logunov, 1995** (Fig. 10)

Determination. Marusik & Logunov (1995), Demir et al. (2010).

Material examined. IRAN, Fars Province: 1♂ (#3343), Shiraz, Sadra, Ghasre Sabz (29°46'47.86"N 52°28'57.22"E),

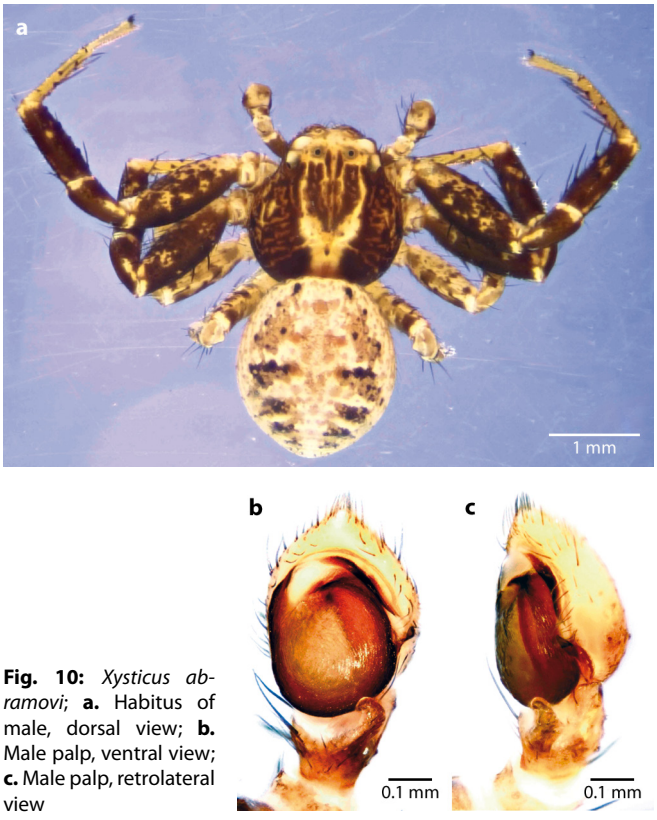


Fig. 10: *Xysticus abramovi*; **a.** Habitus of male, dorsal view; **b.** Male palp, ventral view; **c.** Male palp, retrolateral view

1782 m, 14.9.2015; 1♂ (#3344), Sepidan, Roodbal village (30°06'08.96", 52°01'54.80"E), 1884 m, 14.9. 2015; 1♂ (#3345), Shiraz, Kaftarak village, near Sardkhaneh (29°34'55.60"N, 52°41'03.26"E), 1462 m, 10.10. 2015. All collected by the first author.

This species can be distinguished from other *Xysticus* species by having the characteristic embolic tip which is situated at the backside of the tutaculum and distal part of the tegulum, which is not visible in ventral view, and by the form of the spermathecal structures of the female (Demir et al. 2010).

Habitat. The specimens were found on shrubs and on the ground and were collected by hand.

Global distribution. Tajikistan, Turkey (WSC 2016), Iran (new record).

Distribution in Iran. Fars (new record, southernmost locality across its entire range).

Comments. Identification of the male specimens was based on the figures provided by Demir et al. (2010). Because of minor differences of the specimens in comparison to the figures in the two mentioned references , it is possible that these populations could belong to different species.

***Xysticus kaznakovi* Utochkin, 1968** (Fig. 11)

Determination. Utochkin (1968), Marusik & Logunov (1990), Demir (2015).

Material examined. IRAN, Fars Province: 2♂♂ (#3341), Arjan protected area, Dasht-e Barm, Kotal-e Pirezan (29°32'33.35"N, 51°55'33.84"E), 1728 m, 28.4.2015; 1♂, 1♀ (#3342), Shiraz, Sadra, Ghasre Sabz (29°46'47.86"N 52°28'57.22"E), 1782 m, 31.3.2016; 1♂ (#3340), Mamasani, Noorabad, Payam-e noor University (30° 5'12.85"N, 51°34'39.26"E), 1067 m, 20.4.2016. All collected by the first author.

This species can be distinguished from *X. bicolor* L. Koch, 1867 by its characteristic RTA and the shape of the embolic tip. Females also have characteristic furrowed and reniform spermathecae which separate them from *X. soderbomi* Schenkel, 1936 (see Demir 2015).

Habitat. The specimens were found on the ground and in meadows and were collected by hand.

Global distribution. Macedonia to Central Asia (WSC 2016).

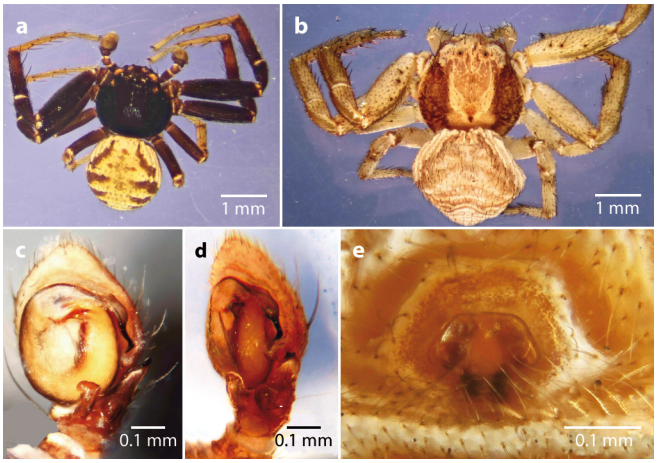


Fig. 11: *Xysticus kaznakovi*; **a.** Habitus of male, dorsal view; **b.** Habitus of female, dorsal view; **c.** Male palp, ventral view; **d.** Male palp, retrolateral view; **e.** Epigynum, ventral view

Distribution in Iran. Razavi Khorasan, Fars (new province record, southernmost known locality across its entire range).

***Xysticus loeffleri* Roewer, 1955** (Fig. 12)

Determination. Charitonov (1969), Marusik & Logunov (1995).

Material examined. IRAN, Fars Province: 6♀♀ (#3405), Shiraz, Kaftarak village, near Sardkhaneh (29°34'55.60"N, 52°41'03.26"E), 1462 m, 25.3.2016 (N. Kiany, M. Kiany), 1♀ (#3351), Shiraz, near Adabiat (29°37'18.73"N, 52°33'43.85"E), 1534 m, 14.3.2016 (N. Kiany, M. Kiany); 2♀♀ (#3406), Kavar-Firoozabad Rd, Gardaneh Mook (29°9'41.60"N, 52°38'6.35"E), 1853 m, 23.3.2016 (M. Kiany); 1♀ (#3408), Kavar-Firoozabad Rd, Mook (29°9'41.60"N, 52°38'6.35"E), 1918 m, 3.5.2016 (N. Kiany); 1♀ (#3410), Shiraz, Kaftarak village, near Sardkhaneh (29°34'55.60"N 52°41'03.26"E), 1462 m, 10.10.2015 (N. Kiany); 2♀♀ (#3412), Mamasani, Noorabad, Payamenoor University (30° 5'12.85"N, 51°34'39.26"E), 1067 m, 20.4.2016 (N. Kiany, Y. Bakhshi).

This species closely resemble *X. tristrami* (O. Pickard-Cambridge, 1872) and can be distinguished by a wider VTA and the shape of the epigynum (Marusik & Logunov 1990).

Habitat. Specimens were found under stones while guarding their eggs or under bushes, and were collected by hand.

Global distribution. Greece, Turkey, Iran, Central Asia.

Distribution in Iran. Gilan, Fars (new province record, southernmost known locality across its entire range).

Comments. In the absence of male specimens this identification should be considered provisional.

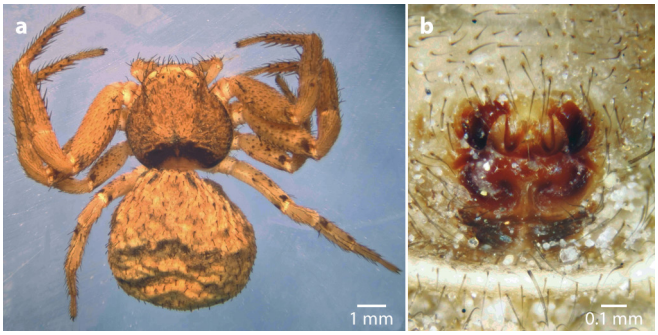


Fig. 12: *Xysticus loeffleri*; **a.** Habitus of female, dorsal view; **b.** Epigynum, ventral view

***Xysticus striatipes* L. Koch, 1870** (Fig. 13)

Determination. Utochkin (1968), Roberts (1998), Mcheidze (2014), Tabrizi et al. (2014).

Material examined. IRAN, Fars Province: 3♂♂, 3♂♂ immature (# 3337), Kohmaresorkhi (29°23'35.83"N, 52°09'40.23"E), 1280.5 m 16.9.2015; 2♂♂ (#3339), Sepidan, Roodbal village (30°06'08.96"N, 52°01'54.80"E), 1884 m, 7.10.2015; 1♀ (#3338), Beyza, Maloosjan gardens (29°51'27.35"N, 52°29'6.32"E), 1723 m, 18.9.2015. All collected by the first author.

This species can be distinguished by its claw-like RTA and embolus with a frizzy tip. The epigynal structure is very characteristic with its longitudinal cylinder.

Habitat. The specimens were found in habitats with no or low vegetation cover and were collected by hand, sweeping and beating nets.

Global distribution. Palaearctic.
Distribution in Iran. Mazandaran, Tehran, Fars (new province record).

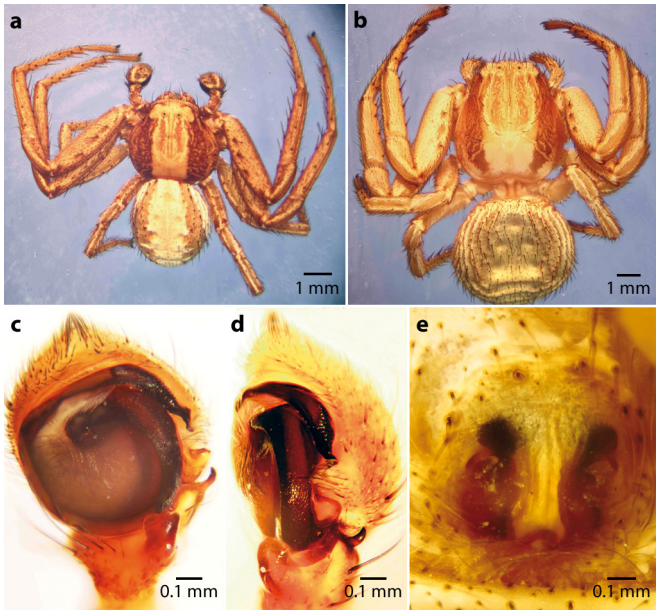


Fig. 13: *Xysticus striatipes*; **a.** Habitus of male, dorsal view; **b.** Habitus of female, dorsal view; **c.** Male palp, ventral view; **d.** Male palp, retrolateral view; **e.** Epigynum, ventral view

***Xysticus tristrami* (O. Pickard-Cambridge, 1872)** (Fig. 14)
Determination. Levy (1976), Dippenaar-Schoeman (1989).
Material examined. IRAN, Fars Province: 1♂ (#3349), Kharameh Rd., Bamoo national park (29°37'57.05", 52°40'54.05"E), 5.4.2016 (M. Kiany); 1♂ (#3350), Shiraz, Sadra, Ghasre Sabz (29°46'47.86"N 52°28'57.22"E), 1782 m, 14.10 2015 (N. Kiany); maturation date: 23.4. 2016, 1♂ (#3400), Farashband-Firoozabad Rd., Khargheh (28°53'42.30"N, 52°22'39.48E) 4.5.2016 (N. Kiany).

This species can be distinguished by its oval-shaped embolus and body setae which are blunt and thick. Females are often confused with *X. ferus* O. Pickard-Cambridge, 1876 and *X. rectilineus* (O. Pickard-Cambridge, 1872), but can be separated by different spermathecal structures (Levy 1976).
Habitat: The specimens were found under stones and were collected by hand.
Global distribution. Crete, Turkey, Saudi Arabia to Central Asia.
Distribution in Iran. Fars.

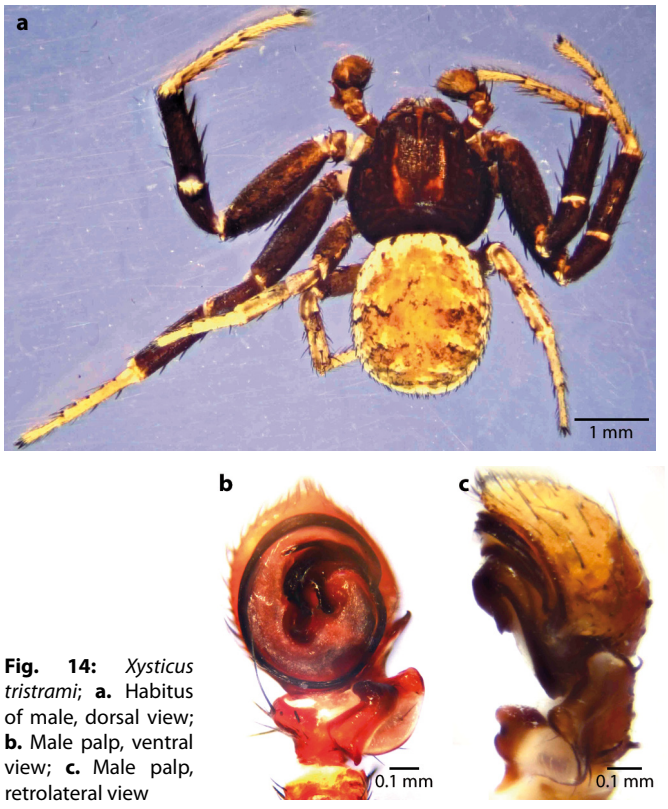


Fig. 14: *Xysticus tristrami*; **a.** Habitus of male, dorsal view; **b.** Male palp, ventral view; **c.** Male palp, retrolateral view

Conclusions

Until recently, 51 species of Thomisidae have been recorded from Iran, but a higher number is still expected (about 60–65) (Zamani et al. 2016b). Only a few studies have been conducted exclusively on this family in Iran during the last decade. For example Mirshamsi et al. (2000) identified five thomisid species in four genera from the Khorasan region, Ono & Martens (2005) based on their expedition to Alborz Mountains in the northern and north-western Iran collected 18 species in nine genera, and Zamani et al. (2014) recorded seven species for Iran, mostly from northern and eastern parts of the country. During the present study, 14 thomisid species were collected with four new records for Iran, increasing the number of known Iranian thomisid species to 55. Because of the seasonal nature of the spider sampling, their camouflage in their natural habitats and our time constraints, it is assumed that further sampling could potentially lead to the discovery of more species in this province. Finding male specimens is practically very difficult outside their mating periods, whereas the biology of crab spiders in Iran has not been studied so far and their phenology is not well-known; partly due to different climatic variabilities within this country.

Acknowledgements
We are grateful toward Dr. Anna Sophia Dippenaar-Schoeman (University of Pretoria, South Africa), and Dr. Yuri M. Marusik (Institute for Biological Problems of the North RAS) for their invaluable comments. We owe special thanks to Fatemeh Ehteshami who helped us to collect specimens.

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Redescription of the poorly known crab spider *Firmicus bivittatus* (Araneae: Thomisidae)

Christo Deltshev

doi: 10.5431/aramit5302

Abstract. *Firmicus bivittatus* Simon, 1895 was described from the Edough Mt, Algeria, based on one male only. Here, a redescription and new illustrations of the species based on the existing type material is presented. The female is figured for the first time.

Keywords: Algeria, France, genital characters, new figures, Spain

Zusammenfassung. Wiederbeschreibung der wenig bekannten Krabbenspinne *Firmicus bivittatus* (Araneae: Thomisidae). *Firmicus bivittatus* Simon, 1895 wurde vom Berg Edough, Algerien, auf Basis eines Männchens beschrieben. Es werden eine Wiederbeschreibung und neue Abbildungen mithilfe des Typenmaterials präsentiert. Das Weibchen wird erstmals abgebildet.

The genus *Firmicus* (Thomisidae) currently comprises 17 species, distributed mainly in Africa, most of them poorly known (WSC 2016). A single species occurs in the territory of Europe: *Firmicus bivittatus* Simon, 1895. This species was initially described by Simon (1895), from the Edough Mt, Algeria, based on one male only. The description is short and lacks illustrations. Lessert (1919: 195, sub *Synaema*) listed the species in his thomisid catalogue of Africa. Later, Simon (1932: 786, fig. 1147) presented again the description of the male, accompanied by a drawing of the male palp in ventral view. A description of the female was also presented, without any illustrations and without data for the locality. The species is mentioned (albeit only in the attached catalogue, Simon 1932: 868) from France, Spain and Algeria. In this contribution *Firmicus bivittatus* is redescribed and illustrated, the female for the first time.

Material and methods

The current study is based on the material (type and additional material) from the Muséum National d'Histoire Naturelle, Paris (MNHN). Male palps and female genitalia were examined and illustrated after they had been dissected from the spiders' bodies. Photographs were taken with a Panasonic DMC-FS62 digital camera mounted on Wild M5A stereomicroscope. Measurements of the legs were taken from the dorsal side. Total length of the body includes the chelicerae. All measurements are in mm. Abbreviations used in text include: AME, anterior median eyes; ALE, anterior lateral eyes; PME, posterior median eyes; PLE, posterior lateral eyes; E, embolus; TA, tegular apophysis; VTA, ventral tibial apophysis; ITA, intermediate tibial apophysis; RTA, retrolateral tibial apophysis; CH, central hood; ST, spermatheca.

Taxonomy

Thomisidae Sundevall, 1833

***Firmicus* Simon, 1895**

***Firmicus bivittatus* Simon, 1895** (Figs 2-19)

Type material. ALGERIA, holotype male, MNHN 10954 (Fig. 1a), Edough Mt, (Annaba pr.).

Other material. SPAIN, 1 female, MNHN 22655 (Fig. 1b), La Granja, (Segovia pr.); 1 male, SPAIN, Avila, Puerto del Pico, 20.V.1991, P. Poot leg. (R. Bosmans in litt.).

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submitted 5.12.2016, accepted 5.1.2017, online 27.1.2017

Diagnosis

Somatic characteristics of *Firmicus bivittatus* correspond to those of the genus *Firmicus*, but the genitalia differ from all other known species of the genus. Morphologically, *Firmicus bivittatus* most resembles *F. dewitzi* Simon, 1899 (see Levy 1973, 1985), but the male is distinguished by the slender embolus, slightly curved apically, the pyramidal tegular apophysis, longer ventral and retrolateral tibial apophyses and shorter but more massive intermediate tibial apophysis; the epygine/vulva differs from that of *F. dewitzi* by a smaller hood, opening anteriorly and clearly visible coiled spermathecae (Figs 5-7, 11-19).

Redescription

Male holotype

Total length 6.38; prosoma length 2.18, width 1.95; sternum length 0.98, width 0.9; clypeus height 0.15; chelicerae length 0.53, width 0.53; opisthosoma length 4.13. Eye sizes and inter-distances: AME 0.05, ALE 0.10, PME 0.025, PLE 0.05, AME-AME 0.25, AME-ALE 0.25, PME-PME 0.33, PME-PLE 0.33 (Fig. 2).

Carapace: Red-brown, unicoloured, with a thin white, marginal line (Fig 3). Chelicerae light-brown. Sternum: smooth, light-brown, shield-shaped with a brown border (Fig. 4). Abdomen: dorsum, grey, with two light-brown longitudinal bands, venter, grey, in the middle, with two white longitudinal bands (Figs 3-4). Legs: anterior pairs, femora, patellae and tibiae, brown, metatarsi and tarsi pale yellow; posterior pairs, pale yellow (Figs 3-4). Leg formula 1234, measurements as in Tab. 1.

Tab. 1. *Firmicus bivittatus*, leg measurements (holotype)

Legs	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
I	2.1	0.98	1.73	1.28	0.98	7.05
II	2.1	0.98	1.73	1.28	0.98	7.05
III	1.5	0.6	0.98	0.6	0.6	4.28
IV	1.43	0.6	0.98	0.6	0.6	4.2

Male palp (Figs 5-7, 14-16): Cymbium rounded, tibia with three apophyses: ventral apophysis well developed, curved in prolateral direction; intermediate apophysis short, but massive, terminally rounded; retrolateral apophysis long, subterminally bent and terminally rounded. Tegular apophysis small, developed as sharp, triangular pyramid. Embolus long and slender, nearly circular, slightly curved at the end.

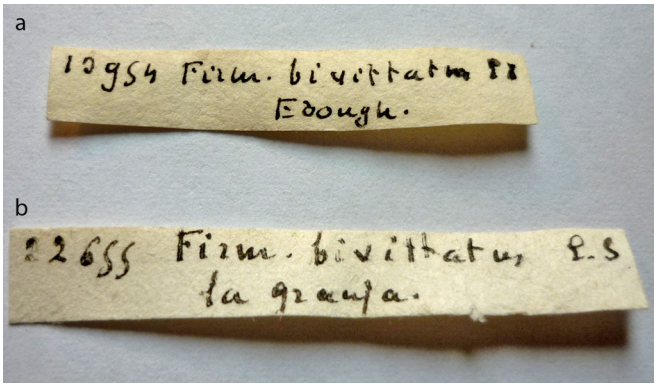


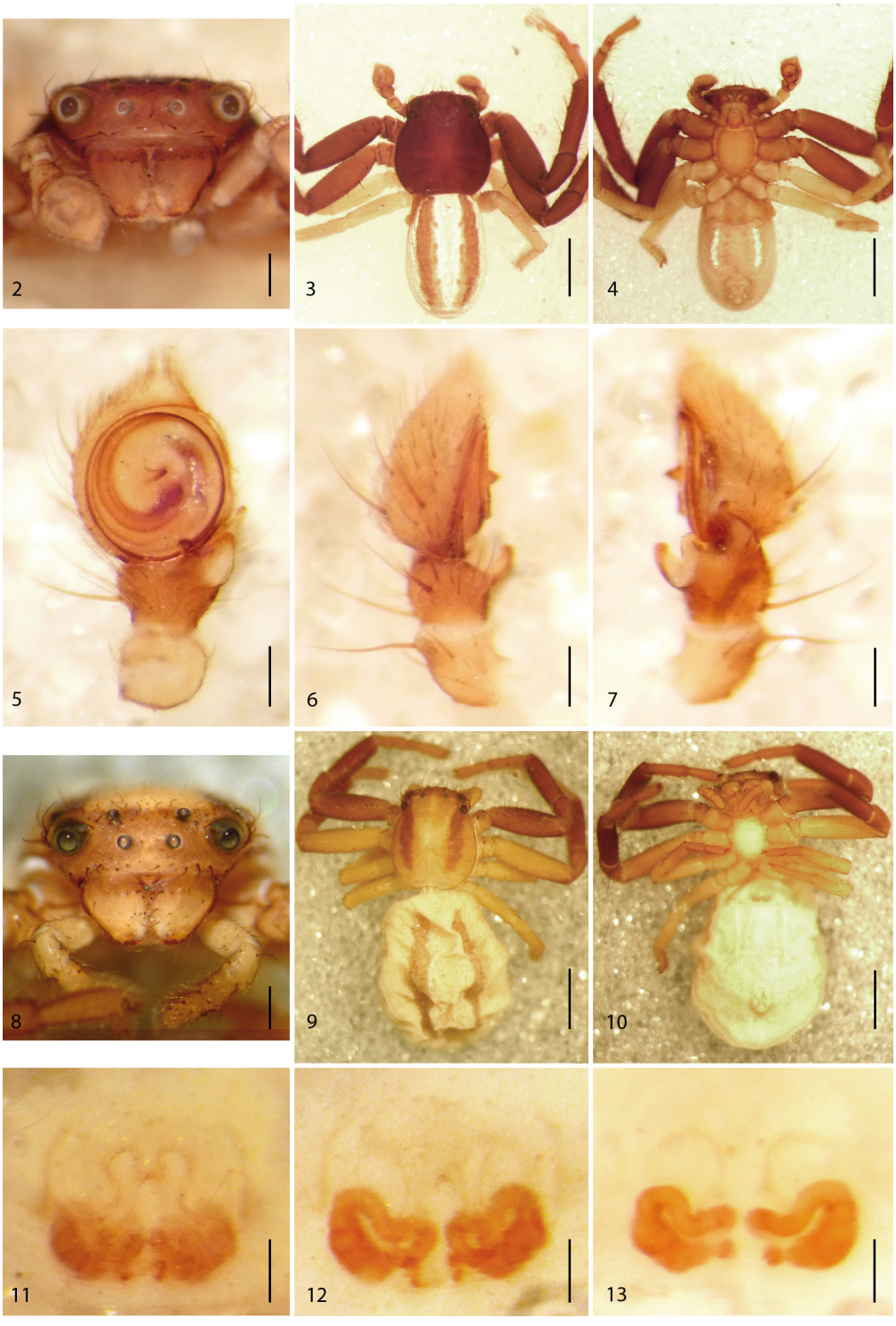
Fig. 1: *Firmicus bivittatus*; **a.** label of male holotype; **b.** label of female

Female

Total length 6.75; prosoma, length 2.25, width 1.88; sternum length 1.13, width 0.9; opisthosoma, length 4.5 (Figs 8-10). All characters as described for the male except as noted.

Carapace, yellowish, with two light-brown longitudinal bands and a thin white, marginal line (Fig. 9). Legs: all characters as described for male except the pale-yellow femora of the second pair of anterior legs. Leg measurements as in Tab. 2.

Epigyne and vulva (Figs. 11-13, 17-19): Epigynal plate almost unpigmented; upper part with small transparent hood, opening anteriorly; spermathecal bends visible through transparent epigynal plate.



Figs 2-13: *Firmicus bivittatus*

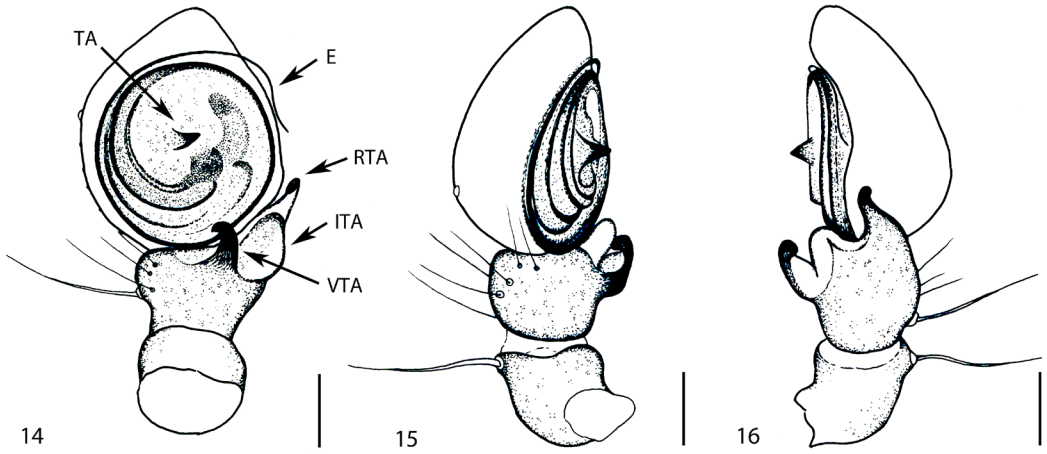
Fig. 2: Male holotype, frontal view, scale: 0.3 mm;
Figs 3-4: Habitus, dorsal and ventral views, scales: 1.0 mm

Figs 5-7: Male palp, ventral, pro- and retrolateral view, scales: 0.4 mm

Fig. 8: Female, frontal view, scale: 0.3 mm;
Figs 9-10: Habitus, dorsal and ventral view, scales: 1.0 mm

Fig. 11: Epigyne, scale: 0.4 mm;
Figs 12-13: Vulva, ventral and dorsal view, scales: 0.4 mm

Figs 14-19: *Firmicus bivittatus*



Figs 14-16: Male palp, ventral, prolateral and retrolateral view, scales: 0.6 mm

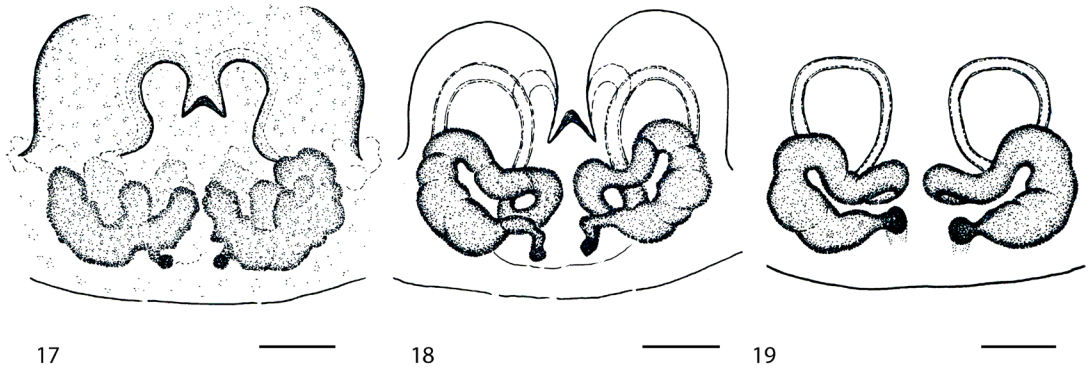


Fig.17: Epigyne, scale: 0.4 mm
Figs 18-19: Vulva, ventral and dorsal view, scales: 0.4 mm

Tab. 2. *Firmicus bivittatus*, leg measurements (female)

Legs	Femur	Patella	Tibia	Metatarsus	Tarsus	Total
I	1.88	1.05	1.43	0.98	0.9	6.24
II	1.88	1.05	1.43	0.98	0.9	6.24
III	1.2	0.68	0.83	0.53	0.53	3.75
IV	1.28	0.68	0.83	0.53	0.53	3.83

Ecology. *Firmicus* spiders are rare. Nothing is known about their natural history, they probably live under stones (Levy 1973, 1985: for *F. dewitzi* Simon, 1899).

Distribution. The most recent information can be found in Jiménez-Valverde et al. (2006), where the species is mentioned near Madrid. The species is hitherto known only from southern France (one locality), central Spain (3 locs.) and north-eastern Algeria (locus typicus, R. Bosmans could not re-collect it there, in litt.).

Acknowledgements
I am obliged to Christine Rollard (MNHN, Paris) for the access to the collection of the Muséum National d'Histoire Naturelle, Paris. I also thank Maria Naumova (Institute of Biodiversity and Ecosystem Research, Sofia) for the help with the computerizing of the photos, Jason Dunlop (Museum für Naturkunde Leibniz Institute for Evolution and Biodiversity Science, Berlin) for the linguistic improvement of the text and Robert Bosmans (Terrestrial Ecology Unit, Gent) and Theo Blick (Senckenberg, Frankfurt am Main) for helpful remarks on the manuscript. This research also received support from the SYNTHESYS Project http://www.synthesys.info financed by European Community Research Infrastructure Action under the FP7 "Capacities" Program.

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Aliens in Europe: updates on the distributions of *Modisimus culicinus* and *Micropholcus fauroti* (Araneae, Pholcidae)

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doi: 10.5431/aramit5303

Abstract. The pholcid spiders *Modisimus culicinus* (Simon, 1893) and *Micropholcus fauroti* (Simon, 1887) are pantropical species that have spread around the world at least several decades ago. Here we present numerous new records for both species, most of which fall into the expected latitudes, i.e. between the Tropics of Cancer and Capricorn (93 % and 87 % of records respectively). However, we also report the first records for *M. culicinus* from Central Europe (Germany and Czech Republic, >50°N) and the first European record for *M. fauroti* from outside of Belgium (Germany). The fact that in both species several specimens have been found at more than one locality suggests that they may already be in the stage of establishment and spreading in Europe. Finally, we present an updated identification key to the genera of Pholcidae in Europe.

Key words: alien, harmless, invasive, pantropical, synanthropic

Zusammenfassung. Aliens in Europa: Zur Verbreitung der Zitterspinnenarten *Modisimus culicinus* und *Micropholcus fauroti* (Araneae, Pholcidae). Die Zitterspinnen *Modisimus culicinus* (Simon, 1893) und *Micropholcus fauroti* (Simon, 1887) sind pantropisch verbreitet und haben sich vermutlich bereits seit Jahrzehnten rund um den Globus etabliert. Wir dokumentieren zahlreiche neue Fundorte für beide Arten, die meisten davon innerhalb der erwarteten Breitengrade, d.h. zwischen dem nördlichen und südlichen Wendekreis (93 bzw. 87 % aller Fundorte). Darüber hinaus dokumentiert diese Arbeit den Erstnachweis von *M. culicinus* für Europa (Deutschland und Tschechische Republik, >50°N) sowie den ersten Europäischen Nachweis von *M. fauroti* außerhalb von Belgien (Deutschland). Die Tatsache, dass von beiden Arten mehrere Individuen an mehr als einem Standort gefunden wurden legt nahe, dass sich beide Arten in Europa bereits in einer Phase der Etablierung und Verbreitung befinden. Zusätzlich wird in dieser Arbeit ein aktualisierter Bestimmungsschlüssel zu den Gattungen der Zitterspinnen in Europa vorgestellt.

Even though invasion biology may suffer from blurry definitions of some of its key terms (Courchamp et al. 2017), there is a wide consensus that invasive alien species (i.e. introduced species with negative biodiversity, social or economic impact) are a major cause of extinction and that they impose enormous costs on agriculture, forestry, fisheries, and human health (Clavero & García-Berthou 2005, Wittenberg & Cock 2001). The causes are manifold, but a study on the impact of various socioeconomic, ecological, and biogeographical variables on the number of invasive alien species identified merchandise import as the most important explanatory variable (Westphal et al. 2008). Given the tremendous increase in real merchandise trade growth over the last decades (a four-fold increase in volume between 1980 and 2011, World Trade Organization 2013), the increasing interest in alien species is timely and justified.

The spider family Pholcidae currently includes some 1500 named species (with an estimated global total of about 4000-5000 species), mostly in tropical and subtropical regions (Huber 2011b, 2014, 2017). Several species in the family have spread over wide geographic areas, and circumstantial evidence suggests that human-mediated transport has been responsible for most if not all transcontinental distribution ranges (e.g., Fürst & Blandenier 1993, Huber 2011a, Huber et al. 2015). In Europe, Pholcidae are among the families with the highest numbers of introduced species, together with the much larger families Theridiidae and Salticidae (Kobelt & Nentwig 2008).

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submitted 3.10.2016, accepted 5.1.2017, online 27.1.2017

However, none of the alien pholcid species in Europe and on other continents seem to cause or to have caused any measurable harm. Most or all seem to prefer human constructions and environments to natural habitats; they may compete against each other (e.g. Van Keer 2007), but none has been shown to replace native species; and none has been shown to harm humans directly by biting. By contrast, synanthropic pholcids could be even beneficial, e.g. by predating on mosquito vectors of dengue virus (Strickman et al. 1997), or (from a scientist's perspective) by serving as readily available model organisms for a wide range of studies (as e.g. in the case of *Pholcus phalangioides*).

Nevertheless, since the consequences of species introductions are often unexpected (and sometimes disastrous) (Wittenberg & Cock 2001), it is probably wise to report and monitor introduced species as early and closely as possible. Only this will allow a reasonable response, ranging from complete eradication to toleration and consideration of the alien species as enrichment to local biodiversity (Walther et al. 2009).

Material and methods

Specimens studied are deposited in the following institutions: AMNH, American Museum of Natural History, New York; CAS, California Academy of Sciences, San Francisco; CVH, personal collection V. Hula, Brno; FSCA, Florida State Collection of Arthropods, Gainesville; IRSB, Institut Royal des Sciences Naturelles de Belgique, Brussels; MCZ, Museum of Comparative Zoology, Cambridge; MHNG, Muséum d'histoire naturelle, Genève; MNHN, Muséum national d'Histoire naturelle, Paris; MRAC, Musée royal de l'Afrique Centrale, Tervuren; RMNH, Netherlands Centre for Biodiversity Naturalis, Leiden; SMF, Forschungsinstitut und Naturmuseum Senckenberg, Frankfurt; ZFMK, Zoologisches Forschungsmuseum Alexander Koenig, Bonn; ZMT, Museum of Zoology, Turku; ZMUC, Zoological Museum, University of Copenhagen, Copenhagen.

Locality coordinates are in round brackets when copied from labels and original publications or when received directly from collectors, in square brackets when originating from some other source (such as online gazetteers, Google Earth, etc.). The distribution maps were generated with ArcMap 10.0.

Results

***Modisimus culicinus* (Simon, 1893)** (Figs 1-3)

Selection of references with diagnostic illustrations. Gertsch & Peck 1992: figs 20-26. Huber 1997a: figs 2-4. Huber 1997b: figs 1-2. Huber 1998a: figs 7e-f. Saaristo 2001: figs 56-60. Tong & Li 2009: figs 13-15, 54-59.

Diagnosis. Small (body length ~1.5 mm) six-eyed pholcid with all eyes close together, globose abdomen, short legs (male leg 1 ~6-8 mm), carapace with median furrow and three pairs of distinctive marks (Figs 1-2).

Natural history. Most records of *M. culicinus* are from buildings where these spiders occupy sheltered spaces near the floor. They build simple irregular webs in which they hang, but when disturbed they do not vibrate but swiftly run away (Huber 1997a). Some aspects of the reproductive biology of this species were published in Huber (1997a, 1997b, 1998a), including details of genital mechanics and evidence for gustatorial courtship.

Distribution. *Modisimus culicinus* originated from the Neotropics (probably Central America or the Caribbean) but is now a pantropical spider, with most records from between the Tropics of Cancer and Capricorn (23.4°N and 23.4°S). The only exceptions so far are the Florida and Massachusetts records in Gertsch & Peck (1992) and the new records below from Czech Republic and Germany (Figs 3, 9). The species is here newly recorded for several countries and overseas municipalities and territories: Cuba, Ecuador, Brazil, Curaçao, Aruba, St. Kitts & Nevis, Saba Island, Germany, Czech Republic, Ascension Island, Angola, Mozambique, Madagascar, Malaysia, Singapore and the Philippines.

New records (all examined by BAH; arranged from West to East). ECUADOR, Galapagos Islands, Isla Floreana [1.276°S, 90.485°W], above "Las Palmas", 21-22.iv.1970 (R. Silberglied), 1♀, MCZ. COSTA RICA, Limón Province, Cahuita, Alby Lodge area (9.735°N, 82.840°W), 20 m a.s.l., 9.viii.2006 (B.A. Huber), 1♀, ZFMK (Ar 15815). CUBA, Camagüey, Sierra de Cubitas, Estación Limones-Tuabaquey, on walls of building (21.591°N, 77.788°W), 100 m a.s.l., 12.iv.2012 (B.A. Huber), 2♂♂ 1♀ 1 juv., ZFMK (Ar 16135). ECUADOR, Napo, 20 km E Puerto Napo, Alinahui (1.000°S, 77.417°W), 450 m a.s.l., i.1994 (V.D. & B. Roth), 2♀♀, CAS. ARUBA, [Arikok National Park, Guadirikiri

Figs 1-2: *Modisimus culicinus* (Simon), females with egg-sacs from Germany and Malaysia (photos BAH)

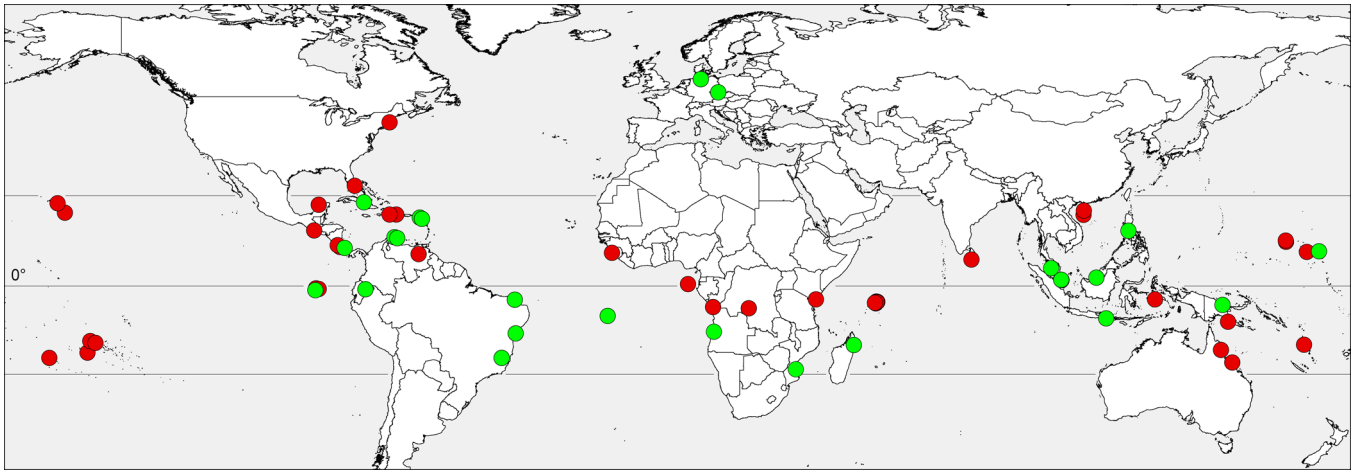


Fig. 3: Known distribution of *Modisimus culicinus* (Simon, 1893). Red [printed: dark grey]: previously published records. Green [printed: light grey]: new records. Latitudes shown: Tropic of Cancer, Equator and Tropic of Capricorn. Sources of previously published records: Beatty et al. (2008), Gertsch & Peck (1992), Huber (1997a, 1998b, 2001), Huber & Benjamin (2005), Huber et al. (2010, 2014), Huber & Kwapong (2013), Huber & Warui (2012), Lessert (1938), Saaristo (2001), Simon (1893), Tong & Li (2009)

Caves], Tunnel of Love [12.482°N, 69.899°W], 12.ii.1985 (P. Strinati, V. Aellen), 2♀♀, MHNG. CURAÇAO, Santa Martha Bay [12.268°N, 69.127°W], 5.vii.1962 (B. Hazlett), 1♂ 1♀, AMNH. NETHERLANDS ANTILLES, Saba Island, Giles Quarter Trail (17.614°N, 63.240°W), sea level, 12.iii.2008 (J. Slowik), 1♂ 1♀, FSCA. SAINT KITTS AND NEVIS, St. Kitts [17.30°N, 62.72°W], 14-22.ix.1966 (A.M. Chickering), 1♂, AMNH. BRAZIL, Bahia, Mata de São João, building (12.462°S, 38.258°W), ~100 m a.s.l., 8.x.2011 (B.A. Huber, A. Pérez-G., M. Alves Dias), 1♀, ZFMK (Ar 16137). Ceará, Fortaleza [3.736°S, 38.527°W], 5.ii.1959 (A.M. Nadler), 1♂ 4♀♀ 1 juv., AMNH. Minas Gerais, Governador Valadares [18.85°S, 41.96°W], roadside, under boards, rocks, 15.x.1981 (L.N. Sorkin, F. Cunha Castanheira), 1♀, AMNH. SAINT HELENA, ASCENSION AND TRISTAN DA CUNHA, Ascension Island [7.94°S, 14.37°W], crater, lava lake, ii.1990 (P. Ashmole), 1♂ 1♀, collection J. Murphy (21816). GERMANY, Hamburg, Zoo Hagenbeck (53.595°N, 9.941°E), 1.iv.2016 (J. Neumann), 1♀ in abs. ethanol, ZFMK (G139). CZECH REPUBLIC, Bohemia, Prague, Zoo, Pavilion Chambal, *Gavialis gangeticus* exposition (50.116°N, 14.408°E), 2.i.2016 (V. Pešan, V. Hula), 2♂♂, ZFMK (Ar 16138); same locality, 3♀♀, 12.viii.2016 and 1♂, 26.ix.2016 (V. Hula), CVH. ANGOLA, Lobito [~12.38°S, 13.56°E], karstic hills, under stones, 30.xii.1948 (A. de Barros Machado, ANG 1264.11), 1♀, SMF. MOZAMBIQUE, Vilankulos, Casa Chibububo (22.021°S, 35.321°E), leaf litter, coastal bush, 12.xii.2007 (C. Haddad, R. Lyle, R. Fourie), 2♂♂ 1♀ 2 juvs, ZFMK (Ar 5238). MADAGASCAR, Analanjirofo Region, Maroantsetra [15.44°S, 49.74°E], in house, vii.1947 (J. Millot), 1♀, MNHN. MALAYSIA, Johor, Johor Bahru, in building (1.470°N, 103.758°E), 16.ii.2015 (B.A. Huber), 1♀ in abs. ethanol, ZFMK (Mal236). Perak, Gunung Lanno [4.52°N, 101.145°E], Gua Selari, 13.xi.2001 (H. Steiner), 1♀, MHNG. SINGAPORE, Upper Selatar Reservoir Park (1.399°N, 103.807°E), 20 m a.s.l., on building, 15.ii.2015 (B.A. Huber, D. Court), 1♂ 1♀, ZFMK (Ar 16140). INDONESIA, Bali, "Uluwatu, Goa Lawah" [8.55°S, 115.47°E?], 7.ii.1988 (V. Aellen, P. Strinati), 1♀, MHNG. PHILIPPINES, Luzon Island, Laguna Province, UP Los Baños campus, 2.5 km ESE Los Baños (14.153°N, 121.234°E), 140 m a.s.l., 26-27.v.2011 (H. Wood et al.), 1♂ in abs. ethanol, CAS (9045404). PAPUA NEW GUINEA, Madang, Baiteta [5.017°S, 145.75°E], "canopy mission, AR26", no further data, 1♂, IRSB. MARSHALL ISLANDS, Maloelap Atoll, Kaven Island [8.898°N, 170.841°E], litter, old thatch, 22.ii.1969 (Sabath), 1♂ 1♀, MCZ (76625). Unidentified locality: "New Guinea, Kurivo", 5.x.1973 (J. Nieminen), 2♂♂, ZMT (AA 3477).

***Micropholcus fauroti* (Simon, 1887)** (Figs 4-8)

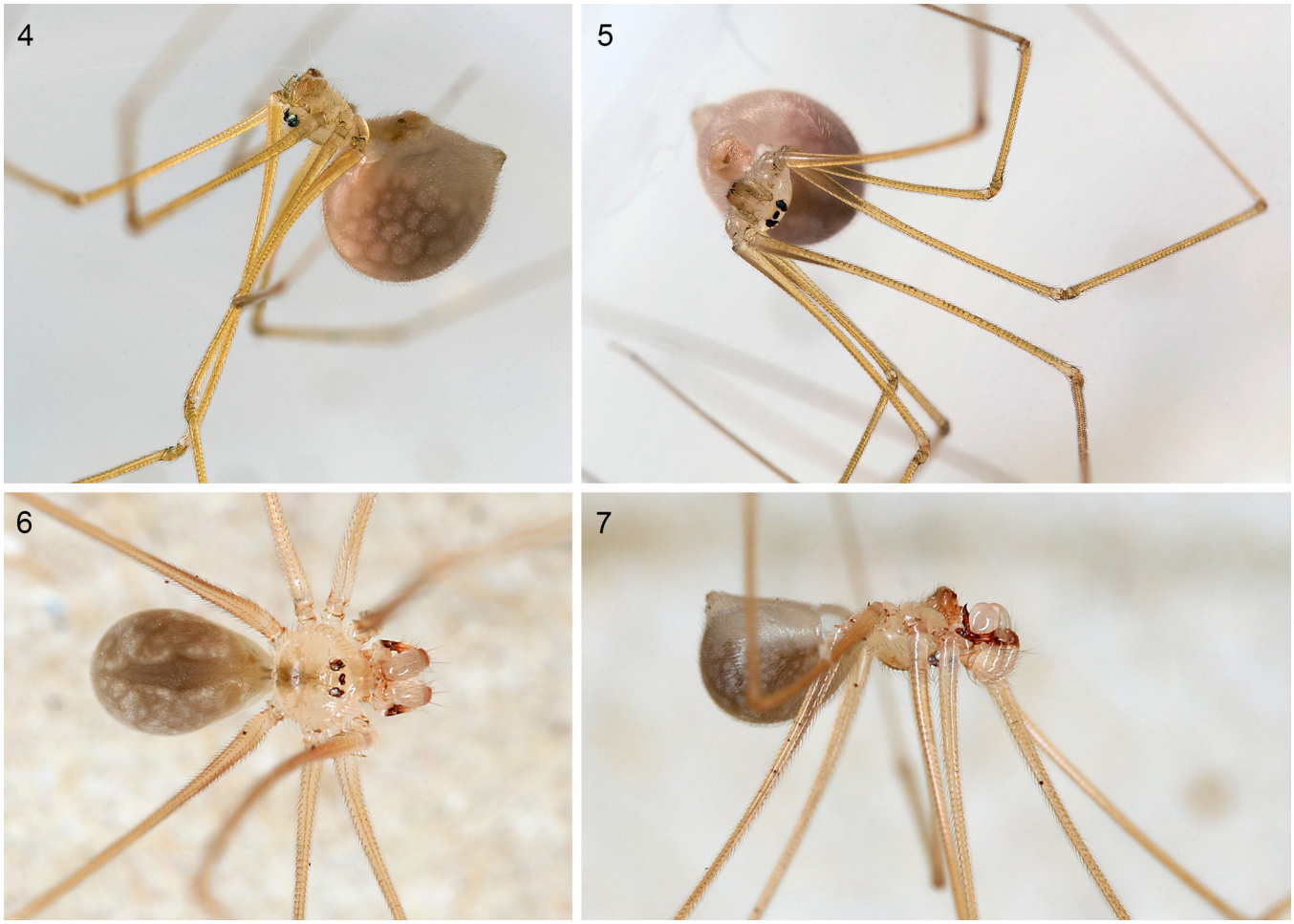
Selection of references with diagnostic illustrations. Millot 1946: figs 2a-b. Deeleman-Reinhold & Prinsen 1987: figs 1-9. Irie 2000: figs 1-4. Saaristo 2001: figs 7-15. Huber 2011a: figs 30-31, 48-49, 83-89.

Diagnosis. Small (body length ~2-3 mm) pale pholcid with eight-eyes, globose abdomen, long legs (male leg 1 ~25 mm), male paracymbium ('procursus') with long dorsal process (Fig. 7), female internal genitalia with internal dark median structure visible through cuticle (Figs 4-5).

Natural history. Most records of *M. fauroti* are from buildings where these spiders build very flimsy webs in corners between walls and between the wall and ceiling. During the day, their bodies are tightly pressed against the substrate, with the prolateral sides of the flexed legs touching the wall. It seems that the biology of this widespread species has never been studied in any detail.

Distribution. *Micropholcus fauroti* is a pantropical spider, with most records from between 25°S and 31°N. The only exceptions so far are some Belgian records (Van Keer & Van Keer 2001, 2004, Van Keer 2007) and the new record below from Germany (Figs 8, 9). The species is here newly recorded for several countries: Germany, Angola, Egypt, Tanzania, United Arab Emirates, Yemen, Mauritius and Taiwan.

New records (all examined by BAH; arranged from West to East). CUBA, Guantanamo, Baracoa (20.358°N, 74.505°W), 25 m a.s.l., in building, 5.iv.2012 (B.A. Huber), 1♂ 5♀♀, ZFMK (Ar 16141). PUERTO RICO, Cayey [18.11°N, 66.17°W], 28.xii.1985 (V. & B. Roth), 3♂♂ 1♀, CAS (9027284). BRAZIL, Acre, Rio Branco, in building (9.973°S, 67.811°W), 155 m a.s.l., 26.x.2016 (B.A. Huber, L.S. Carvalho), 1♂, ZFMK (Ar 17103). Acre, Cruzeiro do Sul, Residencial Samaúma, in building [7.63°S, 72.67°W, 195 m a.s.l.], 6.ix.2016 (E.O. Machado), 1♂ 1♀, ZFMK (Ar 17104). Amazonas, Santarem, in building (2.425°S, 54.787°W), 60 m a.s.l., 18.x.2016 (B.A. Huber, L.S. Carvalho), 1♀, ZFMK (Ar 17102). Pará, Marabá, in building (5.37°S, 49.13°W), 100 m a.s.l., 7.x.2016 (B.A. Huber, L.S. Carvalho), 1♂, ZFMK (Ar 17100). Amapá, Macapá, in building (0.02°N, 51.07°W), 20 m a.s.l., 13.x.2016 (B.A. Huber, L.S. Carvalho) 1♂, ZFMK (Ar 17101). Rio Grande do Norte, Apodi (5.66°S, 37.80°W), 80 m a.s.l., in building, 8.vi.2015 (B.A. Huber, L.S. Carvalho), 2♂♂, ZFMK (Ar 17098-99). GERMANY, Hamburg, Zoo Hagenbeck (53.595°N, 9.941°E), Tropenhaus, 30.i.2015 (A. Grabolle), 1♀ 1 juv. in abs. ethanol, ZFMK (G141); same locality, 1.iv.2016 (J. Neumann), 2♂♂ 4♀♀, ZFMK (2♂♂ 2♀♀ in 80 % ethanol: Ar 16142, 2♀♀ in abs. ethanol: G140). ANGOLA, Malanje Province, Tala Mungongo [9.72°S, 17.23°E], iii.1949 (A. de Barros Machado, ANG 1414.13), 1♀, SMF. EGYPT, Cairo [~30.0°N, 31.2°E] and Alexandria [~31.2°N, 29.9°E], no further data, 3♂♂ 2♀♀, MNHN (AR 10191) (E. Simon collection # 5929 and 5989). UGANDA, locality not specified ("compound house"), 1994 (D. Penney), 1♀, MRAC (219545). TANZANIA, Kigamboni [6.825°S, 39.315°E], 30.v.1952 (Kuipper), 2♂♂ 5♀♀, SMF. Zanzibar [~6.1°S, 39.3°E], no further data, 1♂, MNHN (AR 10190) (E. Simon collection # 3808). YEMEN, Aden [~12.85°N, 45.0°E], [1889, E. Simon], 2♂♂ 3♀♀, MNHN (AR 10196) (E. Simon collection # 10745). "Al Kawd x Ja'ar" [~13.15°N, 45.33°E], 16.i.2001 (A. van Harten), 1♀, ZFMK (Ar 5176). UNITED ARAB EMIRATES, Sharjah (25.35°N, 55.40°E), in house, 29.xi.2004 (F. van Harten), 1♂, ZFMK (Ar 16143). MAURITIUS, Grand Baie [20.014°S, 57.585°E], vi.2008 (S. Huber), 1♂, ZFMK (Ar 16144). INDIA, "Poona et Koukan" [=Pune, 18.5°N, 73.85°E], no further data, 1♂, MNHN (AR 10207) (E. Simon collection # 18686). MALAYSIA, Pulau Pinang, Penang, Teluk Bahang (5.458°N, 100.215°E), 10 m a.s.l., in house, 28.ii.2015 (B.A. Huber), 1♂, ZFMK (Ar 16145). THAILAND, Narathiwat, Hala Bala Wildlife Sanctuary (5.800°N, 101.832°E), in house 140 m a.s.l., 2.iii.2015 (B.A. Huber, B. Petcharad), 1♂ 1♀, ZFMK (Ar 16146). Bangkok [~13.75°N, 100.5°E], 1908 (Collin de Plancy), 2♀♀ 1 juv., MNHN; same locality, 22.i.2013 (H.



Figs 4-7: *Micropholcus fauroti* (Simon), female from Germany, Hamburg (photos AG) and male from Brazil, Macapá (photos BAH)

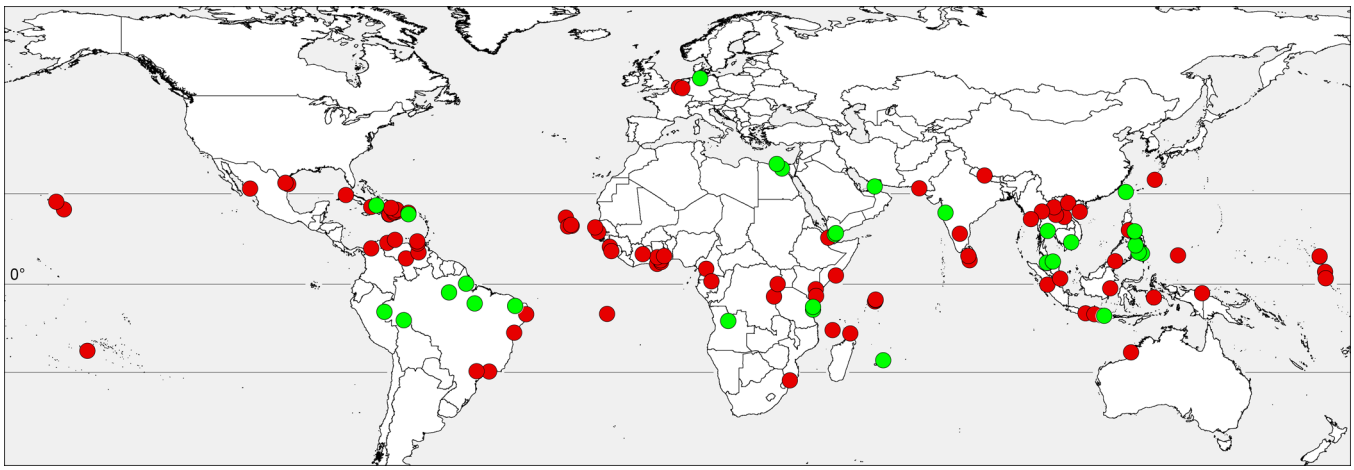


Fig. 8: Known distribution of *Micropholcus fauroti* (Simon, 1887). Red [printed: dark grey]: previously published records. Green [printed: light grey]: new records. Latitudes shown: Tropic of Cancer, Equator and Tropic of Capricorn. Sources of previously published records: Araujo et al. (2005), Beatty et al. (2008), Brazil et al. (2005), Colmenares (2008), Deeleman-Reinhold & Prinsen (1987), Gertsch & Davis (1942), Gertsch & Mulaik (1940), González-Sponga (2004), Huber (2011a), Huber & Kwapong (2013), Huber et al. (2014), Irie (2000), Mello-Leitão (1929), Millot (1941, 1946), Penney (1996), Pérez González (1995), Petrunkevitch (1929), Saaristo (2001), Simon (1887), Song et al. (1999), Thorell (1895), Van Keer (2007), Van Keer & Van Keer (2001, 2004)

Vanuytven), 1♀ 1 juv., ZFMK (Ar 16147). VIETNAM, Ho Chi Minh City [~10.8°N, 106.65°E], no further data, 1♂ 2♀♀, MNHN (AR 10194) (E. Simon collection # 11173). INDONESIA, Bali, Sanur (8.673°S, 115.260°E), 8 m a.s.l., "litter in urban ruderat", 7.vii.2014 (J. Pedersen, A. Schomann), 2♂♂, ZMUC. TAIWAN, Nantou, Lienhuachih (23.918°N, 120.884°E), in building, 700 m a.s.l., 20.vi.2013 (B.A. Huber), 1♂ 1♀ in abs. ethanol, ZFMK (Tai71). PHILIPPINES, Mindanao, Bukidnon Province, Central Mindanao Univ. (7.859°N, 125.051°E), 350 m a.s.l., in building, 10.ii.2014 (B.A. Huber, E. Mondejar), 1♀, ZFMK (Ar 16149). Mindanao, Misamis Occidental Province, Iligan (8.187°N, 124.166°E), 5 m a.s.l., in building, 16.ii.2014 (B.A. Huber), 3♀♀, ZFMK (Ar 16150). Cebu, Moalboal, Panagsama Beach

(9.944°N, 123.368°E), 24/31.iii.2014 (S. Huber), 1♂ 2♀♀, ZFMK (Ar 16151-52). Luzon, Camarines Sur Prov., Naga (13.624°N, 123.188°E), 10 m a.s.l., in building, 23.ii.2014 (B.A. Huber), 2♂♂ 2♀♀ 1 juv., ZFMK (Ar 16153); same data, 1♂ 2♀♀ in abs. ethanol, ZFMK (Phi228).

Updated key to the genera of Pholcidae in Europe

The following key uses the concept of "Europe" in Spiders of Europe (Nentwig et al. 2017), i.e. excluding the Canary Islands and other Atlantic islands close to Africa but including the Asian part of Turkey, Cyprus and the Caucasus states.

1 Six eyes (anterior median eyes absent) 2
- Eight eyes. 4
2 Carapace with median furrow, eye triads on median turret, very high in males . . . . . ***Modisimus***
[Only the introduced *M. culicinus* (Simon, 1893)]
- Carapace without median furrow; eye triads on very low humps 3
3 Male paracymbium ('procursus') with ventral flap; posterior epigynal plate without pockets . . . . . ***Spermophora***
[The Mediterranean *S. senoculata* (Dugès, 1836) and the introduced *S. kerinci* Huber, 2005]
- Male paracymbium ('procursus') without ventral flap; posterior epigynal plate with pair of pockets . . . . . ***Spermophorides***
[Eight nominal species, Mediterranean]
4 Carapace evenly domed, without median furrow or pit 5
- Carapace with median furrow or pit 7
5 Large species (body length >4 mm) with cylindrical abdomen . . . . . ***Pholcus***
[Eleven species, mostly eastern and south-eastern Europe]
- Small species (body length ≤3 mm) with short abdomen (about at high as long) 6
6 Procursus with long dorsal process (Fig. 7), female genitalia without external pockets, with internal semi-circular or bullet-shaped median structure visible through cuticle (Figs 4, 5) . . . . . ***Micropholcus***
[Only the introduced *M. fauroti* (Simon, 1887)]
- Procursus without dorsal process, female genitalia with pair of external pockets, without internal median structure visible through cuticle . . . . . ***Quamtana***
[Two undescribed introduced species, Huber et al. 2015]
7 Small species (body length 3 mm), carapace with median furrow . . . . . ***Psilochorus***
[Only the introduced *P. simoni* (Berland, 1911)]
- Larger (body length 5-10 mm), carapace with median pit 8
8 Abdomen higher than long . . . . . ***Artema***
[The introduced *A. atlanta* Walckenaer, 1837 and an eastern Mediterranean unnamed species]
- Abdomen longer than high 9
9 Legs with many small black spots/lines 10
- Legs without small black spots/lines 11
10 Abdomen pointed dorso-posteriorly, male chelicerae with two pairs of frontal apophyses . . . . . ***Crossopriza***
[Only the introduced *C. lyoni* (Blackwall, 1867)]
- Abdomen rounded dorso-posteriorly, male chelicerae with single pair of frontal apophyses . . . . . ***Holocnemus***
[*H. pluchei* (Scopoli, 1763), *H. hispanicus* Wiehle, 1933 and *H. caudatus* (Dufour, 1820)]
11 Male chelicerae frontally with many modified (club-shaped) hairs . . . . . ***Stygopholcus***
[*S. absoloni* (Kulczyński, 1914), *S. photophilus* Senglet, 1971, *S. skotophilus* Kratochvíl, 1940]

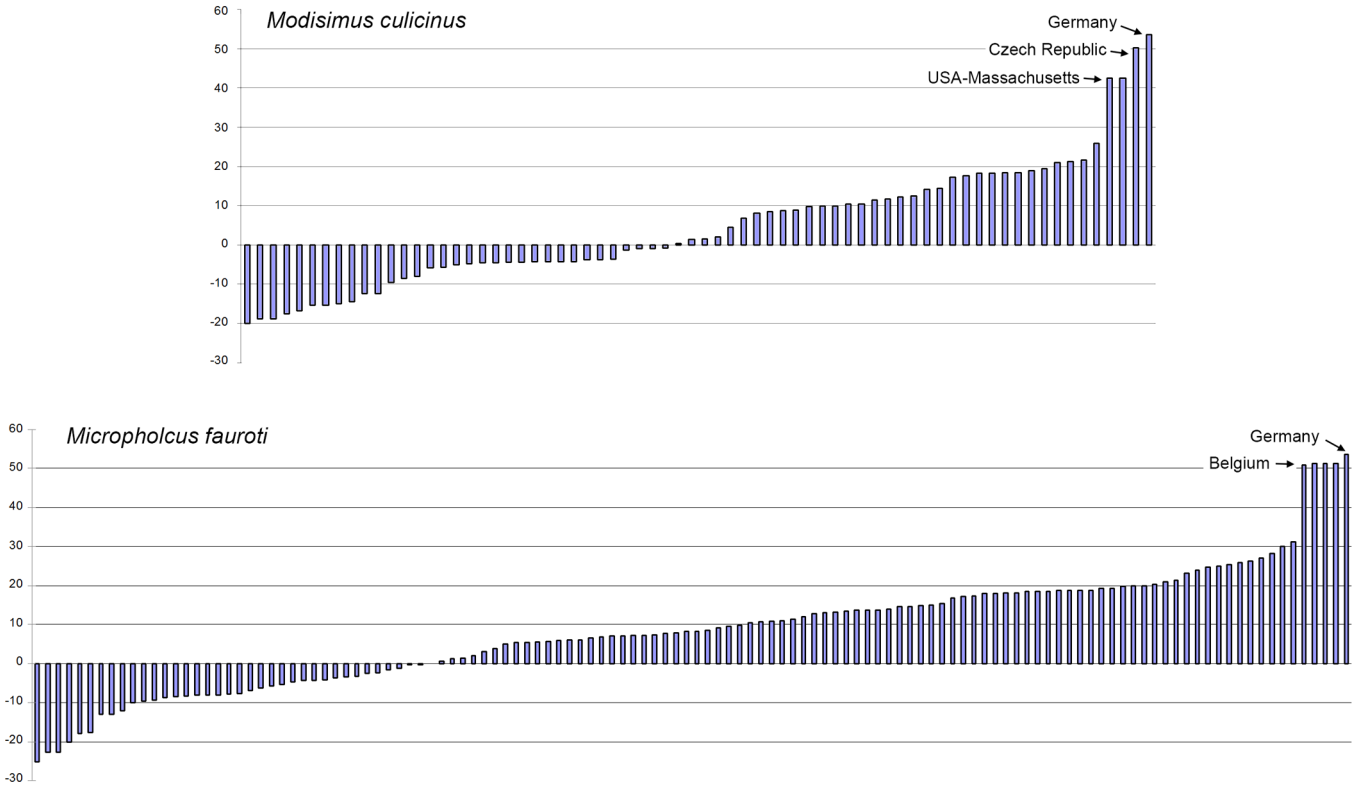


Fig. 9. Latitudes of all records of *Modisimus culicinus* and *Micropholcus fauroti*. Only 'outliers' are labeled.

- Male chelicerae frontally with apophyses provided with 1-3 modified hairs each 12

12 Male femora 1 with ventral spines, epigynum roughly triangular . . . . . ***Hoplopholcus***
[Eight nominal species, mainly Greece and Turkey]

- Male femora 1 without spines, epigynum roughly rectangular . . . . . ***Smeringopus***
[The originally African *S. pallidus* (Blackwall, 1858) has not established in Europe (contra Nentwig 2015). The two known European records (Hasselt 1885, Boettger 1929) may or may not denote this species, and no record has been published since 1929. It is included here because it is pantropical and has reached countries such as Chile, USA and Australia].

Acknowledgements
For the loan or donation of specimens BAH thanks Julia Altmann, Léon Baert, Christa L. Deeleman-Reinhold, Charles E. Griswold, Charles Haddad, Siegfried Huber, Rudy Jocqué, Laura Leibensperger, Norman I. Platnick, Christine Rollard, the late Michael Saaristo, Peter Schwendinger, Jozef Slowik, Lou Sorkin, Antonius van Harten and Herman Vanuytven. Many thanks also to the Prague Zoo for allowing the collection of spiders, and to Koen Van Keer, Theo Blick and an anonymous reviewer for valuable comments on a previous version of the manuscript.

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Arachnids from the greenhouses of the Botanical Garden of the PJ Šafárik University in Košice, Slovakia (Arachnida: Araneae, Opiliones, Palpigradi, Pseudoscorpiones)

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doi: 10.5431/aramit5304

Abstract. This is the first detailed contribution on the arachnid fauna from heated greenhouses in the Botanical Garden of the P.J. Šafárik University in Košice (Slovakia). Over ten years 62 spider taxa in 21 families were found. Two spiders, *Mermessus trilobatus* (Emerton, 1882) and *Hasarius adansoni* (Audouin, 1826), were recorded in Slovakia for the first time. Another interesting record was the cellar spider *Hoplopholcus* sp. and a new locality for the exotic spiders *Coleosoma floridanum* Banks, 1900 and *Triaeris stenaspis* Simon, 1891 was discovered. Additionally, a short survey of other arachnids (except Acari) was done. A single specimen of a provisionally identifiable palpigrade species (cf. *Eukoenenia florenciae*), one harvestmen species, *Opilio canestrinii* (Thorell, 1876), and four pseudoscorpion species were recorded. The rare pseudoscorpion species *Chthonius ressli* Beier, 1956 was collected for the second time in Slovakia.

Keywords: alien species, artificial ecosystems, faunistics, introduced species, new record

Zusammenfassung. Spinnentiere aus Warmhäusern des Botanischen Gartens der PJ Šafárik Universität in Košice, Slowakei (Arachnida: Araneae, Opiliones, Palpigradi, Pseudoscorpiones). Hiermit wird der erste umfangreiche Beitrag zur Spinnentierfauna des Botanischen Gartens der P.J. Šafárik Universität in Košice (Slowakei) präsentiert. Während zehn Jahren wurden 62 Spinnentaxa aus 21 Familien nachgewiesen. Zwei Spinnenarten, *Mermessus trilobatus* (Emerton, 1882) und *Hasarius adansoni* (Audouin, 1826), werden erstmals für die Slowakei gemeldet. Weiterer bemerkenswerte Nachweise sind die Kellerspinne *Hoplopholcus* sp. und ein neuer Fundort der exotischen Spinnenarten *Coleosoma floridanum* Banks, 1900 und *Triaeris stenaspis* Simon, 1891. Weiterhin wurden die übrigen Spinnentiere (ohne Milben) erfasst. Ein Einzelexemplar einer nicht sicher bestimmbaren Palpigradenart (cf. *Eukoenenia florenciae*), eine Weberknechtart, *Opilio canestrinii* (Thorell, 1876) sowie vier Pseudoskorpionarten wurden gefangen. Die seltene Pseudoskorpionart *Chthonius ressli* Beier, 1956 wird das zweite Mal für die Slowakei gemeldet.

Greenhouses, with relatively stable temperature and humidity conditions, represent a suitable environment for a variety of different invertebrates. Depending on the cultivated plants, size of the heated space, type of management and other factors, more or less complex artificial ecosystems may be formed. Common synanthropic species can be found as well as some outdoor species occasionally entering the greenhouse, and some exotic tropical and subtropical species introduced with plants and substrates from remote sources (Kielhorn 2008).

Only a little information has been published about arachnids in greenhouses in Slovakia so far. Within a concise survey of invertebrates from Bratislava greenhouses Krumpál et al. (1997) summarized six different spider taxa on the basis of older samples from the years 1972 and 1976: *Pholcus opilionoides* (Schrank, 1781), *Parasteatoda tepidariorum* (C. L. Koch, 1841), *Agelena* sp., *Amaurobius ferox* (Walckenaer, 1830), *Berlandina cinerea* (Menge, 1872) and *Pseudicius encarpatus* (Walckenaer, 1802). One pseudoscorpion species, *Lamprochernes chyzeri* (Tömösváry, 1882) was found by Krumpál et al. (1997) in greenhouses as well. Recently the research on artificial ecosystems intensified, providing new information about alien species living in Slovakia. Individual records of spider species new to the Slovak arachnofauna were published: *Coleosoma floridanum* Banks, 1900 and *Scytodes fusca* Walckenaer, 1837 from greenhouses in Bratislava (Šestáková et al. 2013, 2014) and *Uloborus plumipes* Lucas, 1846 from Košice (Suvák 2013). New for the fauna of Slovakia were also the palpigrade *Eukoenenia florenciae* (Rucker, 1903) and the schizomid *Stenochrus portoricensis* Chamberlin, 1922 from greenhouses in Bratislava (Christian & Christophoryová 2013, Christophoryová et al. 2013). No harvestmen records have been published from any botanical garden in Slovakia so far.

The aim of this paper is to present data from collections during a ten-year research project in heated greenhouses of the Botanical Garden of P.J. Šafárik University in Košice. The research focused mainly on spiders as potential predators of pests in the greenhouses. Additionally, a short survey of other arachnids (except Acari) was done. The presented data includes four arachnid orders, two first and three second records for Slovakia.

Material and methods

The greenhouses of the Botanical Garden of the Pavol Jozef Šafárik University in Košice (herein BG PJŠU, 48.735°N, 21.238°E, Fig. 1) were built in 1958. Taking into account only heated rooms, it is a system of interconnected greenhouses (C1–3, G1–7, L) and separated ones (S1–4). Their total area is 2800 m^2. Heights of individual greenhouses range from 3 to 12 m and the total volume of these greenhouses is 13350 m^3. Temperature and humidity values were measured using 11 sensors in three main greenhouses from October 2014 to January 2015. Average humidity was about 64 % (min. 23 %, max. 94 %). Average temperature was about 20 °C (min. 12 °C, max. 34 °C). Occasionally some extremes outside these ranges could take place (seasonally and/or in greenhouses without sensors). Temperature is usually regulated separately in each greenhouse according to vegetation requirements (e.g. highest temperatures were measured in greenhouses with tropical plants during the whole year and the lowest values in greenhouses with citrus plants, especially in winter).

Several collecting methods were used to obtain data on the arachnofauna in greenhouses of the BG PJŠU in Košice:

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submitted 27.7.2016, accepted 13.1.2017, online 27.1.2017

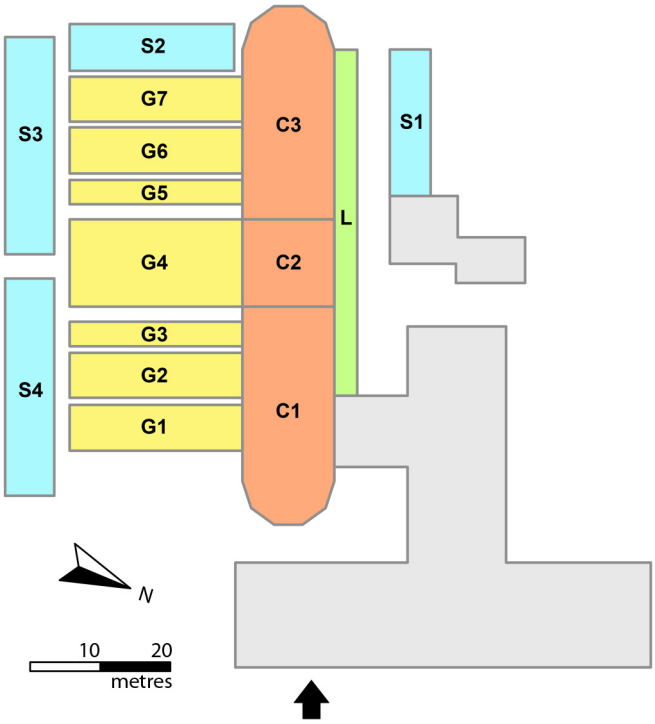

Fig. 1: Plan of the greenhouses of the Botanical garden of the PJ Šafárik University in Košice. The arrow points to the entrance. C1 – 1st connecting greenhouse; C2 – 2nd connecting greenhouse; C3 – 3rd connecting greenhouse; G1 – anthurium greenhouse; G2 – orchid greenhouse; G3 – cold greenhouse; G4 – Victoria greenhouse; G5 – reproduction greenhouse; G6 – citrus greenhouse; G7 – greenhouse with succulents; L – complex of lateral small greenhouses; S1 – separate greenhouse with orchids; S2 – separate greenhouse with succulents; S3 – western separate greenhouse with succulents; S4 – eastern separate greenhouse with various potted plants.

1. Photo-monitoring of spiders during the study of biological control (2005–2016). Photos of live specimens were taken by M. Suvák with a digital camera (Canon 20D) and macro lens (Canon MP–E65). Species with uncertain identification were omitted from the results. Some specimens were collected for proper identification.
2. Ethanol pitfall traps exposed for short periods (1–2 weeks) in winter or early spring season in selected greenhouses in the years 2007, 2012–2016 (leg. M. Suvák).
3. Collecting by hand. The samples were collected in 2011, 2013–2015 (leg. M. Suvák).
4. Extraction from soil samples or samples of dead wood using Tullgren funnels (leg. P. Fenďa, K. Krajčovičová, A. Mock).

Spiders and harvestmen were stored in 70 % alcohol and deposited in the Western Slovakia Museum, Trnava. The majority of examined pseudoscorpion specimens were mounted as permanent slide mounts using Liquido de Swann mounting medium. Two specimens of *Chthonius tetrachelatus* are deposited in 70 % ethanol. The pseudoscorpion material is deposited in the zoological collections of the Comenius University, Bratislava.

Microphotos were made using the EOS Utility software and a digital camera (Canon EOS 100D and 1000D) connected to a stereomicroscope (Intraco Micro STM 823 5410 and Zeiss Stemi 2000-C). Measurements were taken from photographs using the AxioVision 40LE application (v. 4.6). These photographs were made using a Leica ICC50 camera connected to a Leica DM1000 stereomicroscope using LAS EZ 1.8.0 software. Figures were drawn using a Leica drawing tube.

Identification was made according to Nentwig et al. (2016), Gruber (1984) and Christophoryová et al. (2011). Nomenclature follows the World Spider Catalog (2016), Gruber (1984) and Harvey (2013).

Results and discussion

Qualitatively, most of the species recorded in the greenhouses are native for the Slovakian fauna. Synanthropic and alien species were the most abundant, especially among the spiders.

Spiders (Araneae)

During the research 62 different taxa from 21 families were recorded in total. Of these, 47 taxa from 19 families (>590 ex.) were photographed as living individuals, 45 taxa from 18 families (188 ex.) were collected individually and 7 taxa from 6 families (34 ex.) were collected using pitfall traps (Tab. 1). Two species, *Mermessus trilobatus* and *Hasarius adansoni*, are new to the fauna of Slovakia. The spiders *Coleosoma floridanum* and *Triaeris stenaspis* represent the second Slovakian records. The finding of a male of *Uloborus plumipes* confirmed sexual activity for this species. The dominant species, *Parasteatoda tepidariorum*, was abundantly observed in almost every room of the botanical garden. Other very common spiders were *Pholcus phalangioides*, *Steatoda triangulosa*, *Parasteatoda tabulata*, *Sitticus pubescens*, *Tegenaria* cf. *domestica*, *Uloborus plumipes*, *Agelena labyrinthica* and *Hasarius adansoni*. The goblin spider *Triaeris stenaspis* was dominant in pitfall traps. The first records of two introduced species and several interesting species are discussed in detail.

Linyphiidae

Mermessus trilobatus (Emerton, 1882)

Material examined. 1♀ – under a log, G1, 2.6.2014; 1♂ – under a sheet behind a radiator, S4, 13.2.2015.

This small inconspicuous linyphiid can be easily identified by its genitalia (Figs 2, 3). For a detailed description of the species see Millidge (1987). The epigyne of the collected

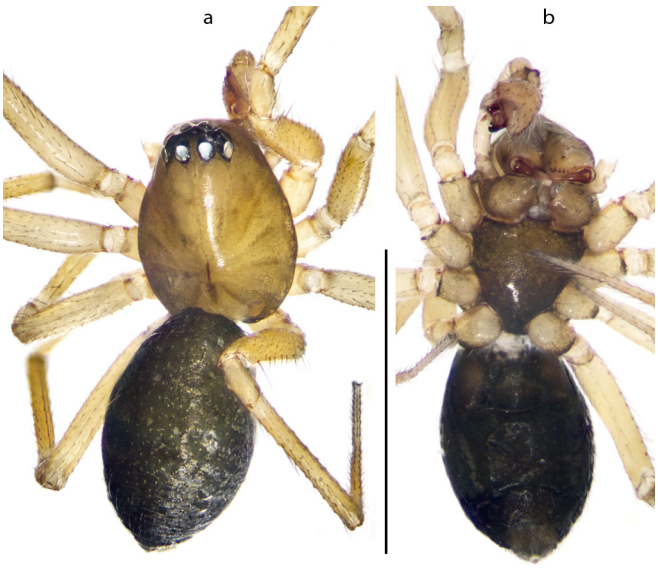

Fig. 2: Habitus of male *Mermessus trilobatus* from Slovakia; **a.** dorsal view; **b.** ventral view; scale: 1 mm

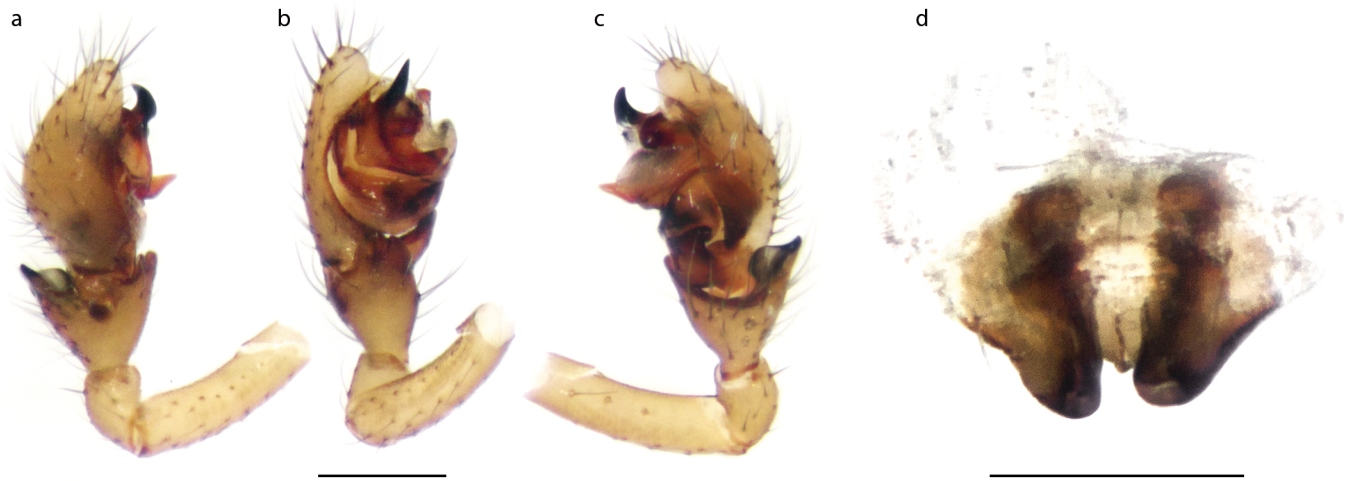

Fig. 3: Genitalia of *Mermessus trilobatus* from Slovakia; **a–c.** male left palp: **a.** retrolateral view; **b.** ventral view; **c.** prolateral view. **d.** epigyne; scales: 0.2 mm

female was covered by a huge globular plug, which pointed to sexual activity. The plug gives the epigyne a different appearance, thus its removal is essential for proper identification. *Mermessus trilobatus* is a Nearctic species found throughout North America, and is also recorded in the Panamanian region in Veracruz and Chiapas in Mexico (Millidge 1987, Ibarra-Núñez 2011). The first record from Europe came from Germany in 1982 (Dumpert & Platen 1985). Nowadays *M. trilobatus* has become established in natural habitats and is expanding its range. High colonization ability may be related to ballooning (Blander 2009). The species is usually collected in open habitats (Nentwig & Kobelt 2010). Thus its finding inside a greenhouse is untypical, and it should also be present in the garden outside the greenhouses.

Salticidae

Hasarius adansoni (Audouin, 1826)

Material examined. 1♂ – on the wall, G6, 5.6.2014; 1♂ – on the wall, C2, 12.2.2015; 1♀ – pitfall trap, G4, 19.2. – 5.3.2015; 1 subad. ♀ – pitfall trap, C2, 9. – 16.3.2016.

Males (Fig. 4) are easily distinguished by the dark brown coloration contrasting with orange hairs around the eyes and white markings on the palps, carapace and abdomen. Females (Fig. 5) are less distinct without a specific pattern, only a slightly paler broad band on the head region is visible. Both sexes can be easily identified by their genitalia (Figs 6, 7). Adanson's House Jumper is an attractive cosmopolitan jumping spider probably originating from Africa, introduced into many countries around the world especially into greenhouses (Metzner 2015). Males were observed quite regularly on the walls inside the greenhouses and also in the building. Only one adult female was caught using pitfall traps. In 2016 several females and juveniles were observed, which points to a stable population here in the BG PJŠU. *Hasarius adansoni* probably could not survive outside heated buildings. Howe-

Fig. 5: Habitus of female *Hasarius adansoni* from Slovakia; **a.** dorsal view; **b.** ventral view; scale: 5 mm

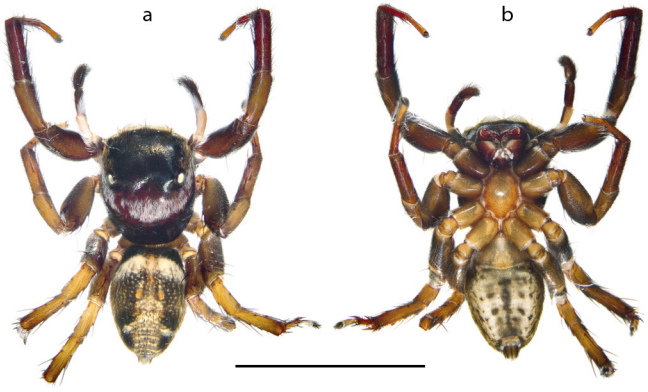

Fig. 4: Habitus of male *Hasarius adansoni* from Slovakia; **a.** dorsal view; **b.** ventral view; scale: 5 mm

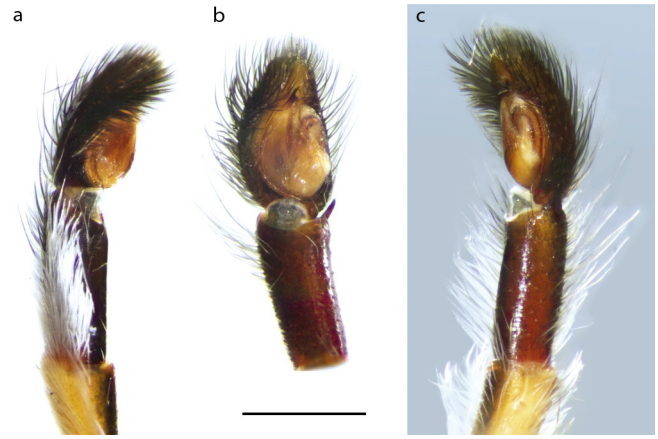

Fig. 6: Male left palp of *Hasarius adansoni* from Slovakia; **a.** retrolateral view; **b.** ventral view; **c.** prolateral view; scale: 0.5 mm

Fig. 7: Cleared epigyne of *Hasarius adansoni* from Slovakia; scale: 0.5mm

ver, it has a potential to become a synanthropic spider distributed via plants in Slovakia.

Pholcidae

Hoplopholcus sp.

Material examined. 1 subad. ♂ – on the wall behind a radiator, S4, 13.2.2014.

In Slovakia only one species of this genus was recorded, *H. forskali* (Thorell, 1871), which looks very similar to the collected specimen (Fig. 8). The cavernicolous species *H. forskali* is typical for the Balkan fauna and Eastern Europe, and was also recorded in Asia and Turkmenistan. The expansion to the north should be restricted by temperature (Kenyeres & Szinetár 2003). In Slovakia it is known from a single record in Tekovské Lužany (Dudich 1933). The type specimen originated from Hungary (Thorell 1871), but it seems not to be native there, because of its preference for synanthropic habitats such as cellars, basements and toilets (Loksa 1969, Szinetar et al. 1999, Korsós et al. 2006). Although a subadult male collected in the botanical garden strongly resembles *H. forskali* (Thorell, 1871), it could be any species introduced to the garden via plants or soil (Huber pers. comm.). Unfortunately, no more specimens were found up to the present.

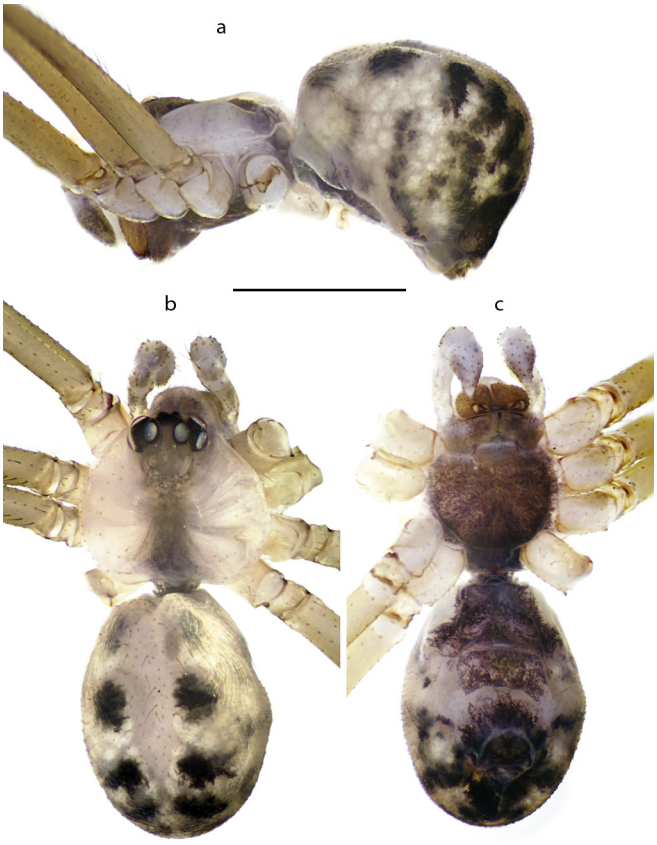

Fig. 8: Habitus of subadult male *Hoplopholcus* sp. from Slovakia; **a.** lateral view; **b.** dorsal view; **c.** ventral view; scale 1 mm

Oonopidae

Triaeris stenaspis Simon, 1891

Material examined. 2♀♀, 1 juv. – pitfall trap, G1, 2. – 5.3.2007; 2 juv. – pitfall trap, G4, 20. – 27.3.2012; 1 juv. – pitfall trap, C1, 20. – 27.3.2012; 2 juv. – pitfall trap, G1, 20. – 27.3.2012; 6♀♀, 3 juv. – pitfall trap, G4, 10.1. – 1.2.2013; 1♀ – under the piece of wood, G4, 30.10.2013; 1♀ – under the piece of wood, C1, 8.8.2014; 2♀♀ – pitfall trap, G4, 19.2. – 5.3.2015; 1 subad. ♀ – pitfall trap, C1, 9. – 16.3.2016; 1 subad. ♀ – pitfall trap, G4, 9. – 16.3.2016.

This pantropical orange goblin spider is a typical epigeic species in greenhouses. Due to its small size (<2 mm) and parthenogenetic reproduction, it has been introduced with great success via soil to botanical gardens all over Europe (Korenko et al. 2009). Its origin is questionable. According to morphologically similar species *T. stenaspis* should be native also to Western Africa, although it was described from specimens collected in the Caribbean (Platnick et al. 2012). The male of this species is still undiscovered (World Spider Catalog 2016). The first record from Slovakia is known from the greenhouse of the botanical garden in Bratislava (Miller & Žitňanská 1976) and from that time on it became well-established there (Šestáková, pers. observation). In the BG PJŠU it has a stable population, thus the second locality in Slovakia for this species was confirmed.

Uloboridae

Uloborus plumipes Lucas, 1846

Material examined. 1♀ – on the wall, C3, 26.5.2014; 1 ♀, 1 juv. – on the wall, L, 5.6.2014; 1 ♀ – on the wall, G6, 5.6.2014; 2 ♀ – on the wall and under the table, S1, 26.6.2014; 1 ♀ – on *Ficus* sp., G3, 1.7.2014; 1 ♀ – on a table between flowerpots, G5, 11.7.2014; 1♂ – on *Lycopersicon esculentum*, S4, 15.8.2014.

Uloborus plumipes, known as the "garden centre spider", is a pantropical species originating from Central and West Africa. It is commonly distributed via plants to garden and shopping centres (e.g. Rozwałka et al. 2013, Šich 2014). The first and only published record from Slovakia was reported from the BG PJŠU (Suvák 2013). Since then it has become well-established in its greenhouses and finally one adult male was recorded confirming sexual activity (Fig. 9). This spider

Fig. 9: Male of *Uloborus plumipes* from Slovakia

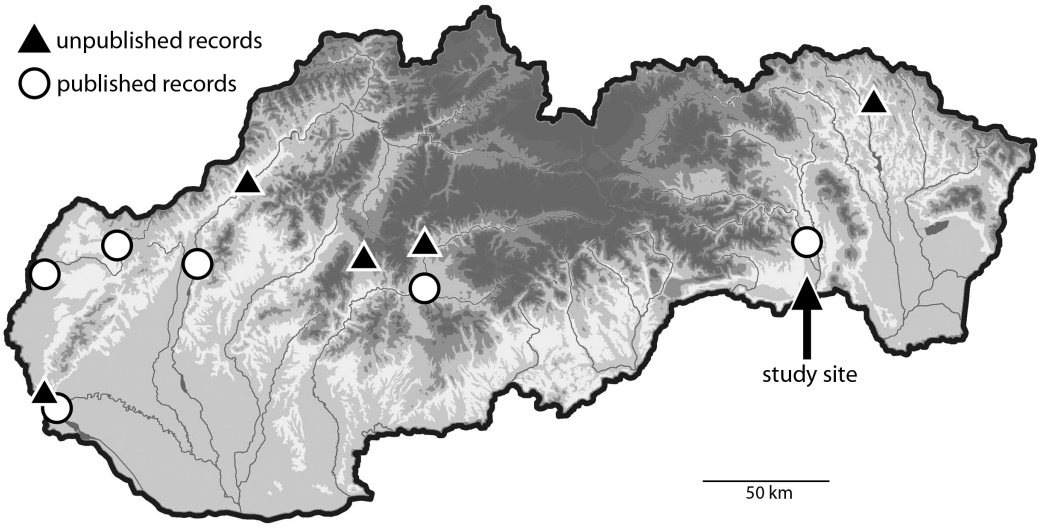

Fig. 10: Distribution of *Opilio canestrinii* in Slovakia based on published records (Klimeš 1999, Mašán & Mihál 2007, Stašiov et al. 2010), the present study and unpublished records (based on photos, http://www.fotonet.sk)

should be present in every florist's shop with imported plants in Slovakia, but was probably overlooked due to its small size (3–6 mm) and frequent showering of plants in garden centres. Moreover, dealers are not willing to talk about invasive species in their shops. However, some females were collected in a hypermarket in the section with plants and in garden centres of DIY markets (Šestáková, pers. observation). Although *U. plumipes* is considered as native in Europe occurring in the open land in southern regions (Nentwig et al. 2016), it is listed in several other countries as alien species (e.g. DAISIE 2008), because it can survive there only in buildings with stable warmer climate. In Slovakia, it was recorded exclusively in heated buildings, thus it is not native to our country.

Harvestmen (Opiliones)

Only one harvestman species (4 ex.) native to our country was collected inside greenhouses (Tab. 1). We presume that more species could be found there.

Phalangiidae

Opilio canestrinii (Thorell, 1876)

Material examined. 1 subad. ♀ – on the wall under a table, G2, 25.6.2014; 2 subad. ♀♀ – on the wall, G1, 2.7.2014; 1♂ – on a flowerpot, G5, 11.7.2014.

Opilio canestrinii is a Mediterranean species native to Italy, adjacent islands and North Africa (Gruber 1984, 1988). The history of its distribution in Europe is obscure due to frequent misidentification, so the first official record in Central Europe was assigned to the 1960s in Austria (Gruber 1984). In Slovakia it was reported for the first time from the western region by Klimeš (1999), who presumed its expansion. Nowadays *Opilio canestrinii* is established in Slovakia and is considered a hemisynanthropic species with an invasive character occurring in urban and rural areas, and found on walls of buildings and on trees (Mašán & Mihál 2007, Stašiov et al. 2010). It could be introduced as eggs in soil or as live specimens among plants (Mašán & Mihál 2007). The easternmost published record was known from Central Slovakia (Stašiov et al. 2010), so our finding expands its range to the eastern region. Since the species can be identified from photographs, we provide a distribution map comparing published and unpublished records based on photographs to show its spreading (Fig. 10).

Microwhip scorpions (Palpigradi)

Material examined. 1 ex. – pitfall trap, C1, 9. – 16.3.2016.

Only one damaged specimen of a palpigrade was collected using pitfall traps. It very likely belongs to the species *Eukoenenia florenciae*, which was found in Bratislava (Christian & Christophoryová 2013), but for proper identification it is necessary to find more specimens. Collecting palpigrades is complicated, for example only four specimens of *E. florenciae* were collected in Bratislava (Christian & Christophoryová 2013). Since the soil samples were not separated immediately after collection, palpigrades could die before extraction. Although the examination of the soil close to the pitfall trap was unsuccessful, in our opinion a small population may live in the greenhouses in the BG PJŠU.

Pseudoscorpions (Pseudoscorpiones)

Altogether 22 specimens of four pseudoscorpion species from three families were identified (Tab. 1), but no alien species was found. Two species were recorded from the family Chthoniidae; one species was identified from each of the families Neobisiidae and Chernetidae. The most abundant species was *Chthonius tetrachelatus*.

Chthoniidae

Chthonius* (*Chthonius*) *ressli Beier, 1956

Material examined. 3♂♂, 3♀♀, 1 tritonymph – extraction of soil sample collected under old trees, C3, 23.4.2013.

The type locality of *C. ressli*, Purgstall, is located in the neighbouring country of Austria. It was collected under stones near a train station (Beier 1956). The species is quite rare, only a few records are known so far: Austria (Beier 1956), Italy – in mole nests and under stones (Inzaghi 1981), France – under stones (Judson 1990), the Czech Republic – in leaf litter (Šťáhlavský 2006) and Hungary – in caves (Novák & Kutasi 2014). In Slovakia, one specimen was collected in Klenbová Cave in the Čierna hora Mts. and was identified as *Chthonius* cf. *ressli* (Mock et al. 2004, 2005) and needs to be confirmed in the future. Recently, several specimens of *C. ressli* were found in compost heaps in Slovakia and the identification was checked by Dr. Giulio Gardini (Kaňuchová et al. 2015). The current records in the greenhouse in the BG PJŠU Košice confirmed the occurrence of this rare species in Slovakia.

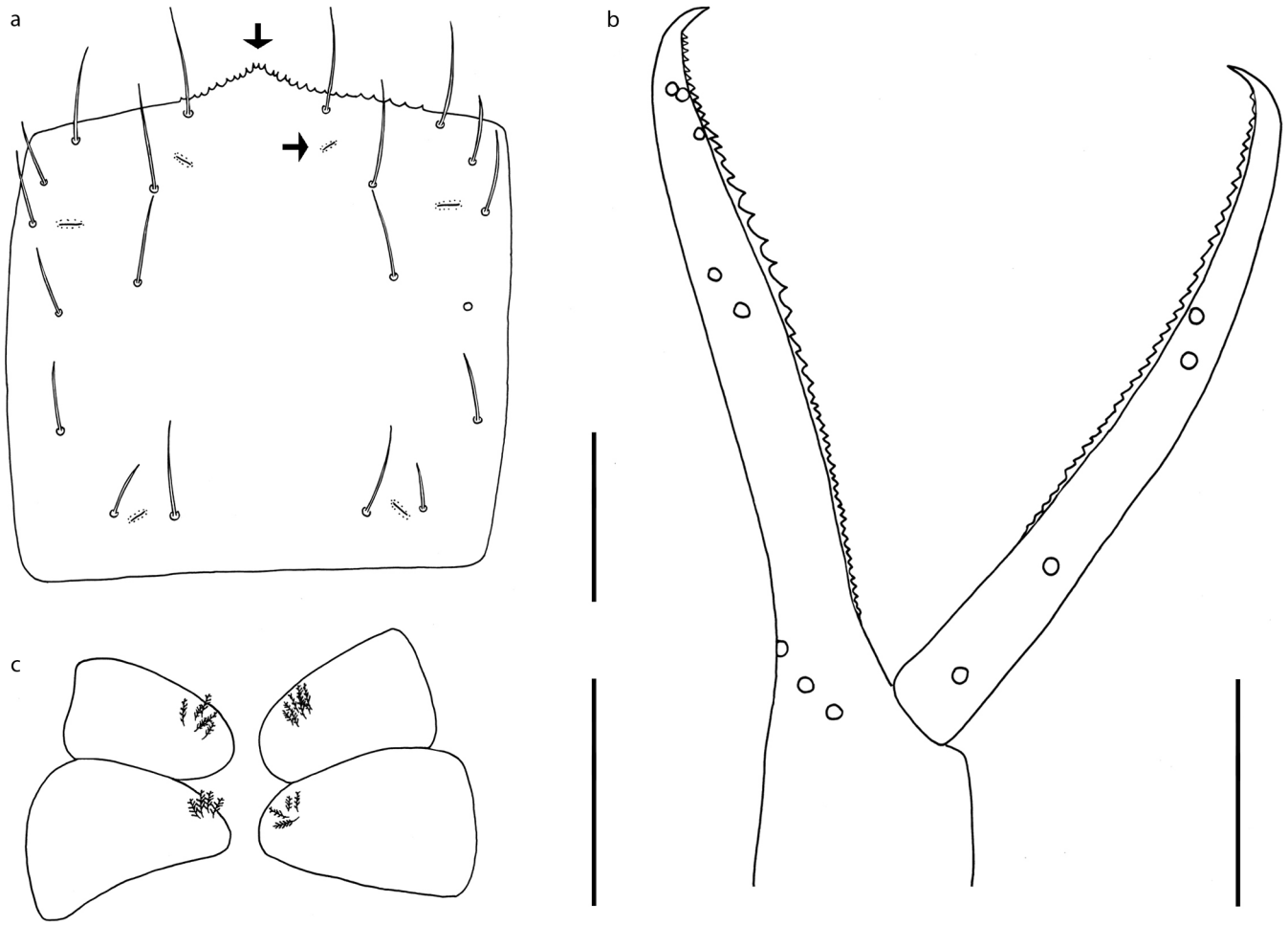

Fig. 11: Male of *Chthonius ressli*; **a.** carapace, arrows point to epistome and lyrifissure; **b.** chelal fingers; **c.** pedal coxae II and III with coxal spines; scales: 0.1 mm

Description

Carapace (Fig. 11a): approximately as long as broad, smooth, with conspicuous and distinctly serrated epistome on its anterior margin; no eyes or eyespots present; chaetotaxy of carapace: 20 thick setae, anterior margin with 4 and posterior margin with 2 macrosetae and 2 microsetae, no microchaetae present; 3 pairs of slit-like lyrifissures present on carapace. Chelicerae: relatively large and strongly sclerotized, 6 setae on cheliceral hand, one on movable cheliceral finger; movable cheliceral finger with spinneret: well-developed in females as tubercle, less markedly in males; 11–12 teeth situated on fixed cheliceral finger (♀♀: 11–12, ♂: 11), 2 of them distinctly larger; 9–12 teeth on movable cheliceral finger (♀♀: 11–12, ♂: 9), the first one larger, isolated subdistal tooth on movable cheliceral finger present; cheliceral rallum with 10 blades. Palps (Fig. 11b): smooth, chelal hand without any depression dorsally, distinctly bulbous, in lateral view the dorsum is not level with the finger but clearly rounded; chelal fingers of approximately equal length, movable chelal finger slightly shorter than fixed finger, with normal number of trichobothria (8 on fixed chelal finger and 4 on movable chelal finger); fixed chelal finger with 42–49 contiguous teeth (♀♀: 42–43, ♂: 49); movable chelal finger with 32–36 teeth (♀♀: 32–36, ♂: 36). Coxae II with 6–8 and 7–8 coxal spines (♀♀: 7–8 and 7–8, ♂: 6 and 8) and coxae III with 3–4 coxal spines (♀♀: 3–4 and 3–4, ♂: 4 and 4) (Fig. 11c); long tactile seta on metatarsus and arsus IV present and situated in basal third of the segments. Tergites I–IV bearing 4 setae; tergites V–IX 6 setae (one ♀ with 5 setae on tergite IX), tergite X 4 setae. Sternites IV bearing 11–12 setae (♀♀: 11, ♂: 12), sternite V 7–8 setae (♀♀: 7, ♂: 8), sternite VI–IX 6 setae and sternite X 7–8 setae (♀♀: 7, ♂: 8). Female genital operculum anteriorly with 8–9 setae and 2 lyrifissures, genital operculum posteriorly with 12 setae and 2 lyrifissures. Male genital operculum anteriorly with 7 setae and 2 lyrifissures, genital operculum posteriorly with 8 setae, 3+3 microsetae and 2 lyrifissures.

Both sexes of the species were measured; all data are summarized in Tab. 2. Two males and some characters of the described specimens were not measured or scored, because the specimens were damaged during the collection or preparation.

Remarks on description. Most of the characters correspond with the known descriptions of the species (Beier 1956, Inzaghi 1981, Judson 1990, Novák & Kutasi 2014). In some of them, eyes were present on *C. ressli* specimens (Inzaghi 1981, Judson 1990, Novák & Kutasi 2014). All specimens from the BG PJŠU had no eyes or eyespots, which corresponds with the description of Beier (1956). Compared to the Slovak specimens, Novák & Kutasi (2014) noticed different setae numbers on tergite X (8 setae) and sternite X (6 setae) on the Hungarian specimens.

Chthonius* (*Ephippiochthonius*) *tetrachelatus (Preyssler, 1790)

Material examined. 1 deutonymph – extraction of dead wood and peat, C2, 9.5.2012; 1♂ – pitfall trap, on a table with

Tab. 1: List of arachnids recorded in the greenhouses of the Botanical Garden in Košice. Abbreviations: * – species recorded in Slovakia for the first time; ** – species recorded in Slovakia for the second time; A – alien species in Slovakia; dn – deutonymph; EX – extraction of material; HC – hand collection; j – juvenile; N – native species in Slovakia; P – photo-monitoring, species which were not collected only photographed; PT – pitfall traps; s – subadult; S – synanthropic species in Slovakia; tn – tritonymph

Order/Family/Species		Status	Methods of collection			
			EX	HC	P	PT
ARANEAE						
Agelenidae						
1	*Agelena labyrinthica* (Clerck, 1757)	N		1♀, 2s♂, 2s♀, 1j	1s♂, 32j	
2	*Tegenaria* cf. *domestica* (Clerck, 1757)	S		1s♂, 5s♀, 5j	2s♀, 2j	
3	*Tegenaria ferruginea* (Panzer, 1804)	N/S		1s♂, 1s♀	1♂, 1s♀	
Amaurobiidae						
4	*Amaurobius ferox* (Walckenaer, 1830)	N/S		1s♂, 3s♀, 1j	1s♀	
Anyphaenidae						
5	*Anyphaena accentuata* (Walckenaer, 1802)	N		1s♀	4♀♀, 4s♀, 4j	
Araneidae						
6	*Araneus angulatus* Clerck, 1757	N		1j		
7	*Araneus diadematus* Clerck, 1757	N		3j	2s♂, 6s♀, 2j	
8	*Araniella* sp.	N			2s♂	
9	*Mangora acalypha* (Walckenaer, 1802)	N		1♂, 1♀	2♀♀, 1s♂, 1s♀, 7j	
10	*Nuctenea umbratica* (Clerck, 1757)	N		2s♀, 3j	2♀♀, 1s♀, 4j	
11	*Zilla diodia* (Walckenaer, 1802)	N		2♀♀	1s♂, 3s♀	
Clubionidae						
12	*Clubiona* sp.				1s♀	
Dictynidae						
13	*Dictyna* sp.				1♀	
14	*Nigma flavescens* (Walckenaer, 1830)	N			1♂, 1♀	
Dysderidae						
15	*Dysdera hungarica* Kulczyński, 1897	N/S		1♀, 1s♀		1♂
	Dysdera sp.					1j
Eutichuridae						
16	*Cheiracanthium mildei* L. Koch, 1864	N/S		1♀, 1s♀, 1j	2s♀	
Gnaphosidae						
17	*Trachyzelotes pedestris* (C. L. Koch, 1837)	N				1♂, 1j
18	*Zelotes apricorum* (L. Koch, 1876)	N		1♀		
Linyphiidae						
19	*Agyneta rurestris* (C. L. Koch, 1836)	N		1♂	1♂	
20	*Lepthyphantes leprosus* (Ohlert, 1865)	N		1♂, 2♀♀, 1s♀	1♂, 2♀♀, 1s♀, 2j	
21	*Lepthyphantes* cf. *minutus* (Blackwall, 1833)	N		1s♀		
22	*Linyphia tenuipalpis* Simon, 1884	N		1s♂		
23	*Linyphia triangularis* (Clerck, 1757)	N		1s♂, 1j		
24	* *Mermessus trilobatus* (Emerton, 1882)	A		1♂, 1♀		
25	*Oedothorax retusus* (Westring, 1851)	N			1♀	1♀
26	*Palliduphantes pillichi* (Kulczyński, 1915)	N		1♀		
27	*Tenuiphantes flavipes* (Blackwall, 1854)	N		1s♀	1♂, 2♀♀	1♀
	Tenuiphantes sp.					1s♂, 2j
Lycosidae						
28	*Pardosa amentata* (Clerck, 1757)	N		1s♀	1j	
29	*Pardosa* sp. (*monticola* group)				2s♂, 2s♀	
	Pardosa sp.				2j	
30	*Piratula hygrophila* (Thorell, 1872)	N		1♀		
Mimetidae						
31	*Ero aphana* (Walckenaer, 1802)	N		1s♂, 1j	1♀, 5s♀, 2j	
Oonopidae						
32	** *Triaeris stenaspis* Simon, 1891	A		2♀♀	3♀♀	10♀♀, 2s♀, 8j
Philodromidae						
33	*Philodromus margaritatus* (Clerck, 1757)	N		1j		
34	*Philodromus* cf. *dispar* Walckenaer, 1826	N		1j	2s♂, 1s♀	
35	*Philodromus* sp. (*aureolus* group)			1j	1s♀	

Order/Family/Species		Status	Methods of collection			
			EX	HC	P	PT
Pholcidae						
36	*Hoplopholcus* sp.			1s♂		
37	*Pholcus opilionoides* (Schrank, 1781)	N/S		2♂♂, 3♀♀, 1s♂	1♂, 2♀♀	
38	*Pholcus phalangioides* (Fuesslin, 1775)	S		4♂♂, 2♀♀, 2s♂, 3s♀, 5j	3♂♂, 15♀♀, 17s♀, 5j	
Pisauridae						
39	*Pisaura mirabilis* (Clerck, 1757)	N			1♂, 2♀♀, 2s♂, 7s♀, 2j	
Salticidae						
40	*Ballus chalybeius* (Walckenaer, 1802)	N			1s♂, 3s♀	
41	*Evarcha arcuata* (Clerck, 1757)	N			3♂♂	
42	* *Hasarius adansoni* (Audouin, 1826)	A		2♂	5♂♂, 3j	1♀, 1s♀
43	*Marpissa muscosa* (Clerck, 1757)	N		1♂		
44	*Salticus scenicus* (Clerck, 1757)	N/S		1♀		
45	*Sitticus pubescens* (Fabricius, 1775)	N/S		1♂, 8♀♀, 4j	1♂, 1♀, 4s♂, 6s♀, 14j	
Tetragnathidae						
46	*Metellina merianae* (Scopoli, 1763)	N		1s♀	2s♂, 6s♀, 3j	
47	*Tetragnatha* sp.				3s♀, 1j	
Theridiidae						
48	** *Coleosoma floridanum* Banks, 1900	A		1♂, 1♀	6♂♂, 13♀♀, 5s♂, 3s♀, 4j	1j
49	*Dipoena melanogaster* (C. L. Koch, 1837)	N		1s♂	1s♂	
50	*Enoplognatha ovata* (Clerck, 1757)	N			2♂♂, 3♀♀, 1s♂, 1s♀, 3j	
51	*Neottiura bimaculata* (Linnaeus, 1767)	N		1♂♂	6♂♂, 2♀♀, 1s♂, 1s♀, 5j	
52	*Parasteatoda tabulata* (Levi, 1980)	N/S		1♂♂, 2♀♀, 4s♂, 2s♀, 2j	1♂, 2♀♀, 3s♂, 7s♀, 13j	
53	*Parasteatoda tepidariorum* (C. L. Koch, 1841)	S		1♂♂, 10♀♀, 5s♂, 8s♀, 3j	16♂♂, 23♀♀, 8s♂, 41s♀, 36j	
	Parasteatoda sp. [*tepidariorum / tabulata*]			8j	1♀, 6s♂, 4s♀, 61j	2j
54	*Phylloneta* sp.				1♀	
55	*Steatoda bipunctata* (Linnaeus, 1758)	N/S			1♀	
56	*Steatoda triangulosa* (Walckenaer, 1802)	S		4♀♀, 2s♀, 8j	4♀♀, 3s♀, 2j	
57	*Theridion varians* Hahn, 1833	N		5♀♀, 2s♂	2♂♂, 11♀♀, 14s♂, 17s♀, 18j	
Thomisidae						
58	*Diaea dorsata* (Fabricius, 1777)	N			1s♀, 1j	
59	*Misumena vatia* (Clerck, 1757)	N			1♀, 1s♀	
60	*Tmarus piger* (Walckenaer, 1802)	N			2s♀	
61	*Xysticus ulmi* (Hahn, 1831)	N		1j		
	Xysticus sp. [damaged]				1j	
Uloboridae						
62	*Uloborus plumipes* Lucas, 1846	A		1♂, 7♀♀, 1j	2j	
OPILIONES						
Phalangiidae						
1	*Opilio canestrinii* (Thorell, 1876)	N/S		1♂, 3s♀		
PALPIGRADI						
Eukoeniidae						
1	cf. *Eukoenenia florenciae* [damaged]	A?				1
PSEUDOSCORPIONES						
Chthoniidae						
1	** *Chthonius ressli* Beier, 1956	N	3♂♂, 3♀♀, 1tn			
2	*Chthonius tetrachelatus* (Preyssler, 1790)	N	2♂♂, 1♀, 1tn, 4dn	1♂		2♂♂, 1♀
Neobisiidae						
3	*Neobisium carcinoides* (Hermann, 1804)	N	1tn, 1dn			
Chernetidae						
4	*Lamprochernes* sp. [see text]	N	1♂			
Total number of different taxa			**4 spp.**	**47 spp.**	**47 spp.**	**9 spp.**
Total number of specimens			**18 ex.**	**193 ex.**	**599 ex.**	**38 ex.**

fern, C2, 20. – 27.3.2013; 1 tritonymph – soil sample extraction, G6, 23.4.2013; 3 deutonymphs – extraction of soil sample collected under old trees, C3, 23.4.2013; 1 ♂ – extraction of soil sample collected under old trees, C1, 23.4.2013; 1♀ – extraction of soil sample collected under old trees, unspecified greenhouse, 23.4.2013; 1♂ – extraction of soil sample,

Tab. 2: Morphometric data for females and male of *Chthonius ressli* (measurements in mm)

Characteristics	♀	♀	♀	♂
Body				
length	1.02	1.28	1.07	0.93
Carapace				
length	0.34	0.34	0.34	0.31
width	0.37	0.39	0.40	0.29
length/width ratio	0.92	0.87	0.85	1.07
Chelicera				
length	0.30	0.30	0.30	0.25
width	0.16	0.15	0.15	0.13
length/width ratio	1.88	2.00	2.00	1.92
Cheliceral movable finger, length	0.15	0.15	0.15	0.13
Palpal trochanter				
length	0.14	0.14	0.14	0.12
width	0.08	0.08	0.09	0.07
length/width ratio	1.75	1.75	1.56	1.71
Palpal femur				
length	0.36	0.36	0.36	0.32
width	0.08	0.08	0.08	0.06
length/width ratio	4.50	4.50	4.50	5.33
Palpal patella				
length	0.17	0.16	0.17	0.15
width	0.09	0.08	0.09	0.07
length/width ratio	1.89	2.00	1.89	2.14
Palpal hand				
length	0.19	0.20	0.20	0.17
width	0.12	0.12	0.12	0.09
length/width ratio	1.58	1.67	1.67	1.89
Palpal finger				
length	0.35	0.35	0.37	0.31
Palpal chela				
length	0.56	0.57	0.56	0.49
length/palpal hand width	4.67	4.75	4.67	5.44
Leg I trochanter				
length	0.08	0.08	0.08	0.07
width	0.07	0.06	0.06	0.06
length/width ratio	1.14	1.33	1.33	1.17
Leg I femur				
length	0.18	0.18	0.19	0.17
width	0.04	0.04	0.04	0.03
length/width ratio	4.50	4.50	4.75	5.67
Leg I patella				
length	0.09		0.09	0.08
width	0.04	0.04	0.04	0.04
length/width ratio			2.25	2.00
Leg I tibia				
length	0.12	0.11	0.10	0.11
width	0.03	0.03	0.03	0.03
length/width ratio	4.00	3.67	3.33	3.67
Leg I tarsus				
length	0.21	0.22	0.21	0.21
width	0.03	0.03	0.03	0.03
length/width ratio	7.00	7.33	7.00	7.00
Leg IV femoropatella				
length	0.28	0.30	0.25	0.27
width	0.09	0.11	0.09	0.09
length/width ratio	3.11	2.73	2.78	3.00
Leg IV tibia				
length	0.20	0.18		0.16
width	0.05	0.05		0.04
length/width ratio	4.00	3.60		4.00
Leg IV tarsus I				
length	0.11	0.10		0.09
width	0.04	0.04		0.03
length/width ratio	2.75	2.50		3.00
Leg IV tarsus II				
length	0.20	0.20		0.19
width	0.03	0.03		0.03
length/width ratio	6.67	6.67		6.33

C3, 25.10.2013; 1♂ – individual collecting under a table, G5, 11.7.2014; 1♂, 1♀ – pitfall trap, G6, 19.2. – 5.3.2015.

Pickard-Cambridge (1906) listed *C. tetrachelatus* among the species found in the Royal Botanic Gardens, Kew in London without specifying a habitat or number of specimens. Van der Hammen (1969) found the species in greenhouses in botanical gardens in the Netherlands. In Slovakia, it is the most common species of the family Chthoniidae and is considered to be eurytopic (Christophoryová 2013). The finding of *C. tetrachelatus* in greenhouses represents a new habitat type for the species in Slovakia.

Neobisiidae

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

Material examined. 1 tritonymph, 1 deutonymph – extraction of soil sample collected under old trees, C3, 23.4.2013.

Pickard-Cambridge (1906) listed *N. carcinoides* among the species found in the Royal Botanic Gardens, Kew in London without specifying a habitat or number of specimens. In Slovakia, it is the most common species of the family Neobisiidae and it is considered to be eurytopic (Christophoryová 2013). The species *N. carcinoides* was recorded for the first time in greenhouses in Slovakia.

Chernetidae

***Lamprochernes* sp.** Tömösváry, 1882

Material examined. 1♂ – extraction of soil sample, C3, 25.10.2013.

Until now, *L. chyzeri* and *L. nodosus* (Schrank, 1803) were known from Slovakia (Christophoryová et al. 2012), but the majority of characters used to distinguish these species overlap each other (Christophoryová et al. 2011). Therefore, we did not identify this specimen at species level. The collected specimen is currently used in a detailed molecular and taxonomic analysis. Before the present study, Krumpál et al. (1997) recorded one male of *L. chyzeri* from a greenhouse in the Botanical Garden in Bratislava, Slovakia.

Acknowledgements

We are grateful to all collectors mentioned in this paper. Special thanks belong to Dr. Bernhard A. Huber who verified *Hoplopholcus* sp. and Dr. Giulio Gardini for checking and confirming the identification of *Chthonius ressli*. We would like to thank Alica Christophory for technical assistance with the pseudoscorpion figure. The project was financially supported by VEGA 1/0191/15.

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Erstnachweis von *Oxyopes lineatus* in Deutschland und faunistisch-taxonomische Anmerkungen zu weiteren besonderen Arten aus Baden-Württemberg (Araneae: Lycosidae, Oxyopidae, Salticidae, Thomisidae, Trachelidae)

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doi: 10.5431/aramit5305

Abstract. First record of *Oxyopes lineatus* in Germany and comments on further interesting species from Baden-Württemberg (Araneae: Lycosidae, Oxyopidae, Salticidae, Thomisidae, Trachelidae). The first record of the oxyopid spider *Oxyopes lineatus* Latreille, 1806 in Germany is presented together with information on the place of discovery, current distribution and taxonomy. Other interesting spider records from Baden-Württemberg (Germany) in the collection of the Natural History Museum Karlsruhe are presented and discussed. *Runcinia grammica* (C. L. Koch, 1837) and *Paratrachelas maculatus* (Thorell, 1875) are reported for the first time for Baden-Württemberg; a record of *Thanatus arenarius* L. Koch, 1872 is the first rediscovery of this species here for over 100 years. The following taxonomical changes, which were proposed by Simon but not followed in the World Spider Catalog, are confirmed: *Sphasus lineatus* C. L. Koch, 1836 (misidentification) and *Sphasus lineatus* Blackwall, 1861 (misidentification) = *Oxyopes heterophthalmus* (Latreille, 1804).

Keywords: faunistics, inland dune, new records, open land, ruderal sites, spider

Zusammenfassung. Der Erstnachweis der Luchsspinne *Oxyopes lineatus* Latreille, 1806 für Deutschland wird zusammen mit weiteren interessanten Nachweisen aus Baden-Württemberg präsentiert. Dabei stellen die Funde von *Runcinia grammica* (C. L. Koch, 1837) und *Paratrachelas maculatus* (Thorell, 1875) Erstnachweise für Baden-Württemberg dar, ein Nachweis von *Thanatus arenarius* L. Koch, 1872 die Wiederentdeckung der Art nach über 100 Jahren. Zu jeder Art werden Angaben zum Fundort, zur Verbreitung und teilweise zur Taxonomie gemacht. Folgende bereits durch Simon erfolgte, aber nicht in den World Spider Catalog übernommene Korrekturen werden bestätigt: *Sphasus lineatus* C. L. Koch, 1836 (Fehlbestimmung) und *Sphasus lineatus* Blackwall, 1861 (Fehlbestimmung) = *Oxyopes heterophthalmus* (Latreille, 1804).

Die Spinnenfauna Deutschlands kann als sehr gut erfasst betrachtet werden und blickt mit Philipp Bertkau, Friedrich Wilhelm Bösenberg, Carl Ludwig Koch und Ludwig Koch, Anton Menge und Hermann Wiehle, um nur einige zu nennen, auf eine lange Tradition der taxonomischen und faunistischen Bearbeitung zurück. Die aktuelle Checkliste der Webspinnen Deutschlands listet 992 bodenständige Taxa (Blick et al. 2016). Im Vergleich dazu nannten Platen et al. (1995) noch 956 Taxa. Die in den zwei Jahrzehnten zwischen diesen beiden Publikationen dazugekommenen Arten entstammen vor allem einer verbesserten Bearbeitung der alpinen Lebensräume (z.B. Muster 1999, Muster & Leipold 1999), dazu kommen einige Neu- und Wiederbeschreibungen mit entsprechenden Anschlussfunden im Bundesgebiet (vgl. hierzu die Zusammenstellungen in Blick et al. 2016). Auch inzwischen etablierte Neobiota tragen, wenn auch nur in vergleichsweise geringer Zahl, in Deutschland zu einer Erhöhung der Zahl der Arten bzw. Taxa seit 1995 bei. Für die Schweiz liegen ähnliche Ergebnisse vor (Hänggi 2003, Hänggi & Stäubli 2012), wobei auch dort die Bearbeitung des Alpenraums in den letzten Jahren am regelmäßigsten Neunachweise geliefert hat. Weiterhin wurden in den letzten drei Jahrzehnten in Deutschland immer wieder Nachweise von im Mittelmeerraum beheimateten Arten verzeichnet (z.B. Jäger 1995, Schäfer & Deepen-Wieczorek 2014, Schäfer & Krumm 2015). Die inzwischen etablierte *Zoropsis spinimana* (Dufour, 1820) ist wohl der bekannteste Vertreter (Hänggi & Bolzern 2006, Arachnologische Gesellschaft 2016). Einige, in der Regel die selteneren der heimischen wärmeliebenden Arten, sind in der Roten Liste als gefährdet eingestuft (Blick et al. 2016). Deren bevorzugte Habitate, meist extensiv bewirtschaftete Halboffen- oder Offenlandhabitate der Kulturlandschaft (z.B. Magerrasen, Wacholderheiden oder Heideflächen), sind entweder durch Intensivierung der landwirtschaftlichen Nutzung, Aufforstung oder Verbuschung nach Aufgabe der Bewirtschaftung verschwunden bzw. zurückgegangen. Daher sind (belegte und publizierte) Nachweise von Arten dieser beiden Kategorien von besonderem Interesse. So können Ausbreitungstendenzen und eventuelle Arealgrenzen dokumentiert sowie der Gefährdungsstatus heimischer Arten beurteilt werden. Wir präsentieren hier eine Reihe von Nachweisen aus diesen beiden Kategorien, die von besonderer regionaler oder überregionaler Bedeutung für die Faunistik der Spinnen Mitteleuropas sind. Bei einer Art (*Oxyopes lineatus* Latreille, 1806) handelt es sich um den Erstnachweis für Deutschland. Die Fundorte wurden nach dem EUNIS-System der Biotoptypen klassifiziert, um Vergleichbarkeit auf europäischer Ebene zu gewährleisten (siehe auch Moss 2008). Funddaten eventuell gesammelter Begleitarten, z.B. aus Bodenfallen, wurden bereits an den Atlas der Spinnentiere Europas (Arachnologische Gesellschaft 2016) weitergeleitet.

Material und Methoden

Das Material entstammt unter anderem einer Sammelexkursion des SMNK bei Weil am Rhein, Sammelexkursionen des Erstautors sowie Barberfallenfängen zur Untersuchung der Laufkäfergemeinschaften am NSG Badberg aus dem Jahr 2005 (Ingmar Harry, ABL Freiburg). Die Spinnenbeifänge daraus wurden im Karlsruher Museum abgegeben. Lebend- und Habitataufnahmen wurden mit einer Nikon D7000 und Objektiv Nikkor 105 mm gemacht. Präparat- und Genitalaufnahmen wurden unter Verwendung der Software Automontage© (Syncroscopy, Cambridge, UK) mit einer Leica DFC 495 Digitalkamera, angeschlossen an ein Leica Z6 APO (Leica Microsystems, Wetzlar, Deutschland), angefertigt. Zeichnungen wurden anhand von Fotografien ange-

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eingereicht 2.1.2017, angenommen 8.2.2017, online 17.2.2017

Abb. 1: *Oxyopes lineatus* (SMNK-ARA 12562), Weibchen, lebend
Fig. 1: *Oxyopes lineatus* (SMNK-ARA 12562), female, living specimen

Abb. 2: *Oxyopes lineatus* (SMNK-ARA 12562), Weibchen dorsal
Fig. 2: *Oxyopes lineatus* (SMNK-ARA 12562), female dorsal

fertigt. Vulvenpräparate wurden mit Nelkenöl geklärt. Die Nomenklatur folgt dem World Spider Catalog (2016). Alle Individuen sind in der Arachnologischen Sammlung des Staatlichen Museums für Naturkunde Karlsruhe (SMNK-ARA) hinterlegt (https://www.binhum.net).

Ergebnisse

***Oxyopes lineatus* Latreille, 1806** (Abb. 1-4)

Material. DEUTSCHLAND, Baden-Württemberg, Weil am Rhein, Ruderalfläche am Güterbahnhof (EUNIS-Code E5.1 und G5.6), 47°35‘23.3“N 7°36‘13.9, 2♀♀ (SMNK-ARA 12562), auf Buddleja, Klopfschirm, 31.08.2016, leg. T. Bauer & H. Höfer. FRANKREICH, Midi-Pyrénées, Verrières, 44°11‘01.5“N 3°04‘36.1“E, 1 ♂ (SMNK-ARA 10490), trokkener Hang mit niedriger Ruderalvegetation, Handfang, 07.06.2013, leg. H. Höfer.

Determination. Zeichnungen der Epigyne und Vulva finden sich in Weiss (1989), Barrientos (1984) und in Roberts (1995).

Verbreitung. *Oxyopes lineatus* ist eine paläarktisch verbreitete Art (World Spider Catalog 2016), für die bisher kein Nachweis aus Deutschland vorlag (Blick et al. 2016, Arachnologische Gesellschaft 2016). Die nördlichsten Nachweisorte in Mitteleuropa liegen in Belgien (Bosmans 2009). Die Art wird von Le Peru (2007) für die an Deutschland grenzenden französischen Departements Moselle und Bas-Rhin gelistet, so dass ein Nachweis im Grenzgebiet durchaus zu erwarten war. Für die Schweiz liegen die nördlichsten Nachweise nach

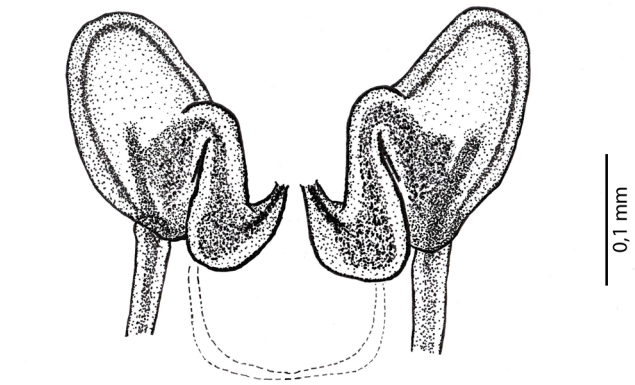

Abb. 3: *Oxyopes lineatus* (SMNK-ARA 12562), Vulva dorsal, Variationen
Fig. 3: *Oxyopes lineatus* (SMNK-ARA 12562), vulva dorsal, variations

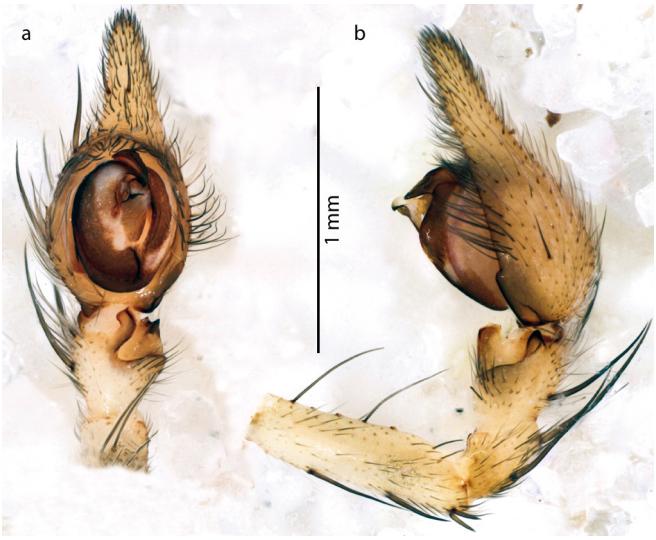

Abb. 4/Fig. 4: *Oxyopes lineatus* (SMNK-ARA 10490), Pedipalpus; **a.** ventral, **b.** retrolateral

Maurer & Hänggi (1990) in den Kantonen Neuchâtel und Fribourg. Es ist davon auszugehen, dass die Art nur im äußersten Südwesten Deutschlands sowie nahe an den Grenzen zu Frankreich und eventuell zu Belgien vorkommt.

Fundort. Bei dem Fundort in Weil am Rhein handelt es sich um eine wärmegetönte Ruderalfläche im Areal des aktiven Güterbahnhofs mit viel skelettreichem Offenboden und jungem Aufwuchs (Abb. 5), bestehend sowohl aus Neophyten (z.B. *Buddleja davidii*) und heimischen Sträuchern und Bäumen (vornehmlich *Populus tremula*, *Rosa* sp.), andere Bereiche werden von Hochstaudenfluren und Gräsern dominiert. Unterschiedliche anthropogen eingebrachte Substrate (Kies, Schotter, Erdaufschüttungen) schaffen ein kleinräumiges Mosaik unterschiedlichster Oberflächen. Auffallend während der Besammlung war eine hohe Populationsdichte der Gottesanbeterin *Mantis religiosa*. Weitere interessante Spinnennachweise von diesem Standort sind *Neottiura suaveolens* (Simon, 1880), *Steatoda albomaculata* (De Geer, 1778), *Sitticus penicillatus* (Simon, 1875), *Cicurina japonica* (Simon, 1886) sowie der unten beschriebene Nachweis von *Runcinia grammica* (C. L. Koch, 1837). Zum Teil wurden diese Arten auch schon in der Untersuchung von Brenneisen & Hänggi (2006) bzw. von Wunderlich & Hänggi (2005) auf Flächen des alten Rangierbahnhofs Basel nachgewiesen, einem direkt angrenzenden Areal auf der Schweizer Seite mit ähnlicher Habitatstruktur und Vegetationsausprägung. Die Nachweisdaten von *C. japonica* in Weil am Rhein werden gesondert (Bauer & Jäger in Vorb.) veröffentlicht.

In offenen bis halboffenen Habitaten kommt *O. lineatus* auch im Mittelmeerraum vor (Bauer, unpubl. Beobachtung). Eine Nachsuche in ähnlichen Habitaten an der Grenze zu Frankreich dürfte weitere Nachweise der Art erbringen.

Taxonomie. Die Beschreibungen von *O. lineatus* (sub. *Sphasus lineatus*) in Koch (1836) und Blackwall (1861) (s. World Spider Catalog 2016 unter *O. lineatus*) beziehen sich auf *Oxyopes heterophthalmus* (Latreille, 1804), was leicht anhand der auffälligen Patellarapophyse der Männchen und der Färbung der bei den jeweiligen Autoren dargestellten Geschlechter nachvollzogen werden kann. Dies fiel schon Simon (1876: 220) auf, der *Sphasus lineatus* sensu C. L. Koch, 1836 und *Sphasus lineatus* sensu Blackwall, 1861 unter der Art *O. heterophthalmus* listete. Daher gilt: *Sphasus lineatus* C. L. Koch, 1836 (Fehlbestimmung) und *Sphasus lineatus* Blackwall, 1861 (Fehlbestimmung) = *Oxyopes heterophthalmus* (Latreille, 1804) (Simon 1876: 220).

Die Überprüfung des Status der nahe verwandten Art *Oxyopes nigripalpis* Kulczyński, 1891 ist kompliziert. Höchstwahrscheinlich handelt es sich bei den in Brignoli (1977) und Barrientos (1984) abgebildeten männlichen Exemplaren (und eventuell auch den Weibchen) um Exemplare von *Oxyopes lineatus occidentalis* Kulczyński, 1907. Die entsprechenden Zeichnungen lassen im Vergleich mit den Abbildungen in der Erstbeschreibung (Kulczyński 1907: Abb. 4) kaum Zweifel an ihrer Identität und haben wenig gemein mit der tief eingeschnittenen Tibialgrube von *O. nigripalpis* (Kulczyński 1907:

Abb. 5: Lebensraum (Ruderalflur) von *Oxyopes lineatus* und *Runcinia grammica* in Weil am Rhein
Fig. 5: Habitat (ruderalized area) of *Oxyopes lineatus* and *Runcinia grammica* in Weil am Rhein

Abb. 3, Weiss 1989: Abb. 6). Eventuell kam diese Verwechslung dadurch zustande, dass entsprechende diagnostische Merkmale nicht in der Erstbeschreibung von *O. nigripalpis* (Chyzer & Kulczyński 1891), sondern von Kulczyński (1907) publiziert wurden und Simon (1937) den Namen *O. nigripalpis* für die von ihm (Simon 1876: 218) als „variété" von *Oxyopes lineatus* bezeichneten Tiere nutzte, obwohl Kulczyński explizit die Unterart *occidentalis* für diese eingeführt hatte. Es erscheint beim derzeitigen Wissensstand als wahrscheinlich, dass auch *O. lineatus occidentalis* eine valide Art darstellt, die bisher übersehen wurde. Weiss (1989) deutete dieses Problem schon an, da er explizit seine *O. nigripalpis*-Exemplare aus Rumänien als genital nicht übereinstimmend mit den Zeichnungen von Brignoli und Barrientos beschrieb. Eine Revision der Artengruppe scheint dringend notwendig (Bauer et al. in Vorb.).

***Alopecosa sulzeri* (Pavesi, 1873)**
Material. DEUTSCHLAND, Baden-Württemberg, NSG Badberg, Kaiserstuhl, 25♂♂, 1♀ (SMNK-ARA 05024-05032), Halbtrockenrasen (EUNIS-Code E1.23), Bodenfallen, 12.05.-13.06.2005, leg. I. Harry, det. H. Höfer & T. Bauer.
Determination. Lugetti & Tongiorgi (1969)
Faunistik. *Alopecosa sulzeri* ist eine in Deutschland nur vereinzelt und oftmals in großen Zeitabständen nachgewiesene Wolfspinnenart (Arachnologische Gesellschaft 2016). Ihr Verbreitungsschwerpunkt liegt im südöstlichen Europa. So listen Morano et al. (2014) und Le Peru (2007) nur einen Nachweis der Art für Spanien bzw. Frankreich, in den Niederlanden, Belgien und Großbritannien wurde die Art bisher nicht nachgewiesen. Eventuell vorhandenes Material aus Spanien und Frankreich sollte daher nachbestimmt werden. Dahl & Dahl (1927) beschreiben die Art hingegen als häufig in Italien, Ungarn und Südrussland.

***Paratrachelas maculatus* (Thorell, 1875)**
Material. DEUTSCHLAND, Baden-Württemberg, Stuttgart, Naturschutzgebiet Weidach-Zettachwald, 48°42'19.4"N 9°11'56.8"E, 1♀ (SMNK-ARA 12457), am Boden einer artenreichen Hecke neben einer Streuobstwiese (EUNIS-Code FA.3), Handfang, 26.09.2014, leg. T. Bauer; Schwetzingen, Konversionsliegenschaft „Tompkins Barracks", ehemaliges Kasernengelände (EUNIS-Code E1) 49°24'13.2"N 8°34'12.9"E, 1♀, Bodenfalle, 3.10.-15.10.2016, leg. A. Malten, det. T. Blick.
Determination. Die Bestimmung erfolgte nach Mikhailov (1987) und Kovblyuk & Nadolny (2009). Dem ersten Autor lag Typenmaterial vor.
Faunistik. Beschrieben von der Krim (Thorell 1875) und unter *Trachelas flavipes* Koch, 1882 von Mallorca (Bosselaers et al. 2009), erweitert sich das Nachweisgebiet der Art seit einigen Jahren. 2011 wurde sie erstmals in Deutschland gefunden (Bauer & Grabolle 2012). Der hier beschriebene Nachweis aus Stuttgart ist der dritte aus Deutschland und der erste aus einem nicht-urbanen Habitat. Dennoch kann auch dieses Tier eingeschleppt worden sein. In der Nähe des Fundorts stehen junge Obstbäume, die teilweise im selben Jahr gepflanzt wurden. Daher kann eine Verschleppung über Baumschulmaterial, wie schon in Bauer & Grabolle (2012) vermutet, nicht ausgeschlossen werden. Der Fund in Schwetzingen erfolgte am Rand eines ehemaligen Kasernengeländes. Auch hier erscheint eine Verschleppung als durchaus möglich, bleibt aber spekulativ. Erwähnenswert sind zudem die relativ späten Fundzeitpunkte Ende September und im Oktober. Kovblyuk & Nadolny (2009) beschreiben *P. maculatus* als eine im Herbst und Winter adulte Art. Beide Funde fallen wie die in Bauer & Grabolle (2012) beschriebenen ebenfalls in diesen Zeitraum. Weitere Funde der Art sollten unbedingt zusammen mit genauen Angaben zum Fundort publiziert werden, um eine Ausbreitung der Art dokumentieren zu können.

***Runcinia grammica* (C. L. Koch, 1837)** (Abb. 6-8)
Material. DEUTSCHLAND, Baden-Württemberg, Weil am Rhein, Ruderalfläche am Güterbahnhof (EUNIS-Code E5.1 und G5.6), 47°35'23.3"N 7°36'13.9, 1♀ (SMNK-ARA 12570), Klopfschirm, 31.08.2016, leg. T. Bauer & H. Höfer.
Determination. *R. grammica* kann von den in Deutschland heimischen Arten, insbesondere von *Misumena vatia*, schon im Feld durch ihren länglichen Hinterleib unterschieden werden (Abb. 6, 7). Die Bestimmung erfolgte nach Roberts (1998).

Abb. 6: *Runcinia grammica* (SMNK-ARA 12570), Weibchen, lebend
Fig. 6: *Runcinia grammica* (SMNK-ARA 12570), female, living specimen

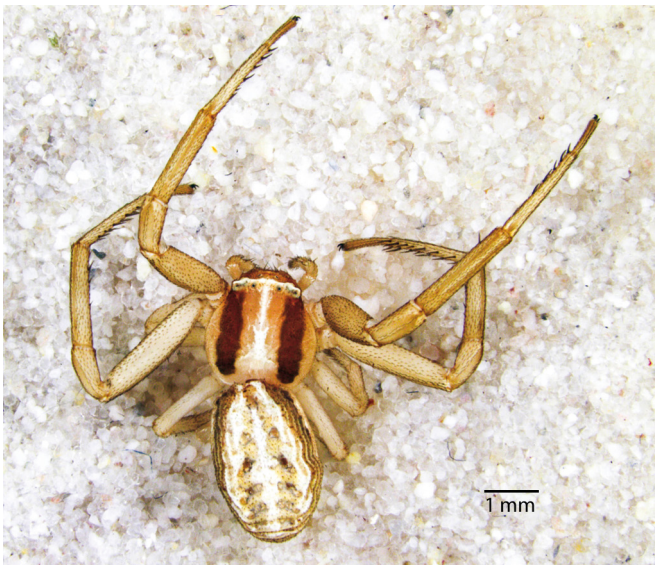

Abb. 7: *Runcinia grammica*, (SMNK-ARA 12570), Weibchen dorsal
Fig. 7: *Runcinia grammica*, (SMNK-ARA 12570), female dorsal

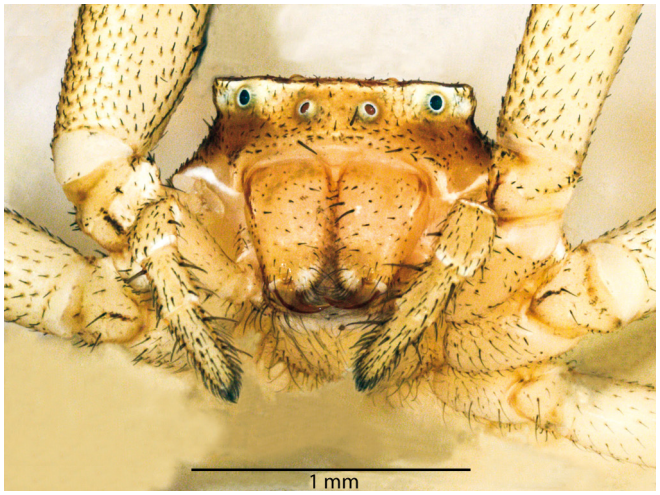

Abb. 8: *Runcinia grammica*, (SMNK-ARA 12570), Weibchen frontal
Fig. 8: *Runcinia grammica*, (SMNK-ARA 12570), female frontal

Faunistik. *Runcinia grammica* scheint sehr weit verbreitet zu sein. Es liegen sowohl Nachweise aus weiten Teilen der Paläarktis (World Spider Catalog 2016) als auch aus Südafrika vor (Dippenaar-Schoeman 1983). Auch dieser Nachweis stammt von der oben beschriebenen Ruderalfläche in Weil am Rhein und zeigt das Potential solcher Habitate für das Vorkommen seltener thermophiler Arten. In Deutschland gibt es bisher nur Nachweise von drei Messtischquadranten aus Ost- und Mitteldeutschland (Barndt 2008, Arachnologische Gesellschaft 2016). Das Material dieser Nachweise sollte überprüft und abgebildet werden, da die Art bisher weder in Polen, Tschechien noch in Österreich nachgewiesen wurde.

***Saitis barbipes* (Simon, 1868)**
Material. DEUTSCHLAND, Baden-Württemberg, Karlsruhe, SMNK-Gebäude (EUNIS-Code J1.1), 1♂ (SMNK-ARA 00396), 26.04.1991 1♂ (SMNK-ARA 12420) 08.09.1992, leg. L. Beck, det. T. Bauer & Franziska Meyer; Hessen, Frankfurt, Palmengarten, Tropicarium, 1♀, unter Stein, 22.07.2012, leg. et det. Stefan Rehfeldt, vid. Peter Jäger.
Determination. Die Bestimmung erfolgte nach Metzner (1999). Männchen der Art lassen sich in Mitteleuropa schon anhand des auffällig gefärbten und vergrößerten dritten Beinpaares leicht von allen anderen Springspinnenarten unterscheiden.
Faunistik. Diese mediterrane Art wurde bereits mehrmals nach Deutschland eingeschleppt, es konnten sich aber bisher laut Literatur keine Populationen bilden (Blick et al. 2016). Schon Bösenberg (1903) meldete diese Art vor über 100 Jahren aus Deutschland („Rheinprovinz"). Auch bei den vorliegenden Funden ist denkbar, dass es sich um verschleppte Exemplare aus dem Mittelmeerraum handelt, da Mitarbeiter des Museums in diesem Zeitraum regelmäßig Exkursionen nach Südfrankreich durchgeführt hatten. Auf den Verbreitungskarten der Arachnologischen Gesellschaft sind bisher erst vier Nachweise der Art aufgeführt (Arachnologische Gesellschaft 2016), ein fünfter gelang vor kurzem in Gernsbach, Nordschwarzwald (http://forum.spinnen-forum.de/index.php?topic=22191.0). Der auf den Karten verzeichnete Fund aus Frankfurt stammt aus den Gewächshäusern des Palmengartens. Eine Nachsuche am Fundort erbrachte nun Anfang 2017 einen weiteren Nachweis der Art (J. Neumann, Mitteilung auf spinnen-forum.de). Daher ist davon auszugehen, dass an diesem Fundort inzwischen eine etablierte Population der Art existiert.

***Sitticus zimmermanni* (Simon, 1877)**
Material. DEUTSCHLAND, Baden-Württemberg, NSG Sandheiden und Dünen bei Sandweier und Iffezheim, in flechten- und moosreichem Silbergras-Sandrasen mit z.T. durch Befahren mit Motocrossrädern vegetationsfreien Stellen (EUNIS-Code E1.9), 48°49'32.9"N 8°11'34.8"E, 1♂ (SMNK-ARA 07781), Bodenfalle, 01.-16.05.2011, leg. V. Hemm & H. Höfer, det. H. Höfer & T. Bauer
Determination. Kronestedt & Logunov (2003)
Taxonomie und Faunistik. Erst Kronestedt & Logunov (2003) grenzten diese Art von der vorher als Synonym betrachteten *Sitticus atricapillus* (Simon, 1882) durch Untersuchung von Typenmaterial ab. *S. zimmermanni* wurde bisher vor allem an xerothermen Standorten unter 400 m ü. NN, mehrheitlich mit sandigem Untergrund, gefunden (Kronestedt & Logunov 2003). Dabei reicht die Spannweite der Habitate von kontinentalen Birken- und Kiefernwäldern über aufgelassene Braunkohletagebauflächen (Logunov & Marusik 2000) bis zu der Fläche in Sandweier, bei der es sich um eine durch Landschaftspflegemaßnahmen offengehaltene und seit 2011 geschützte Binnendüne im Oberrheingraben handelt. *S. atricapillus* hingegen ist nach Kronestedt & Logunov (2003) eine Gebirgsart, die in Bulgarien noch in 2400 m Höhe gefunden wurde (siehe dort gelistetes Material). Daher sollten Nachweise aus höheren Lagen, die noch unter *S. zimmermanni* gelistet sind, überprüft werden. Die reinen Textangaben zu *S. zimmermanni* in Heimer & Nentwig (1991: 520) beziehen sich zumindest auf *S. atricapillus:* „[…] Gebirgsart, nur vereinzelt an sehr trockenen Waldrändern des Mittelgebirges […]". Die Abbildungen des Pedipalpus und der Epigyne sowie der Vulva sind Nachdrucke der Abbildungen 75 bzw. 69 und 71 aus Prószyński (1980), welche von Kronestedt & Logunov (2003: 882) dagegen *S. zimmermanni* zugeordnet werden. Diese Kombination von Habitatangaben von *S. atricapillus* in Kombination mit Zeichnungen der Genitalien von S. *zimmermanni* kann bei einer Bestimmung von Individuen der ersten Art daher leicht zu einer falschen Identifizierung führen. Überprüfenswert erscheint zudem der Nachweis von *S. zimmermanni* von Hu & Wu (1989) aus Westchina aufgrund der nicht ganz eindeutigen Vulvazeichnung (Abb. 305.8; weit voneinander entfernt liegende Einführgänge, abweichende Spermathekenform) und dem über 500 m ü. NN liegenden Fundort in einem ansonsten sehr gebirgigen Gebiet.

Der hier besprochene Nachweis steht in Deutschland und den angrenzenden Ländern recht isoliert da, auch wenn er für die Sandhabitate in der nördlichen Rheinebene zu erwarten war. Allerdings wurde die Art bisher nicht in den Sandhausener Dünen nachgewiesen, weder in der umfangreichen Untersuchung (ca. 20 Bodenfallen in den Jahren 1990-1992) von Leist (1994), noch von Hemm & Höfer mit 9 Bodenfallen im Jahr 2011. Auch im NSG Alter Flugplatz Karlsruhe wurden in mehreren Untersuchungen nur *Sitticus saltator* (O. P.-Cambridge, 1868) und *S. distinguendus* (Simon, 1868) gefangen (s. Hemm et al. 2012). Weitere Nachweise stammen ebenfalls aus dem Rheingraben, jedoch wesentlich weiter südlich aus der Freiburger Umgebung (z.B. Metzner

1999, Kobel-Lamparski et al. 1993) und zahlreich aus Ostdeutschland (Arachnologische Gesellschaft 2016). Aus der Schweiz liegen Nachweise vom Genfersee vor (Kronestedt & Logunov 2003). Im nördlichen Baden-Württemberg wurde die Art bisher nicht nachgewiesen. Unter Umständen erreicht die Art ihre nordwestliche Verbreitungsgrenze in Deutschland, da bisher keine Nachweise aus Frankreich, Belgien oder den Niederlanden vorliegen (Nentwig et al. 2016). Insbesondere nahe der Grenze zu Deutschland sind in Frankreich in entsprechenden Habitaten Nachweise jedoch durchaus zu erwarten.

***Thanatus arenarius* L. Koch, 1872** (Abb. 9-14)
Material. DEUTSCHLAND, Baden-Württemberg, NSG Badberg, Halbtrockenrasen (EUNIS-Code E1.23), Bodenfallen, 5♂♂ (SMNK-ARA 04788-04791, 04793), 1♀ (SMNK-ARA 05093), 12.05.-13.06.2005, leg. I. Harry, det. Tobias Bauer & Franziska Meyer.

Abb. 9: *Thanatus arenarius* (SMNK-ARA 05093), Weibchen dorsal
Fig. 9: *Thanatus arenarius* (SMNK-ARA 05093), female dorsal

Abb. 10: *Thanatus arenarius* (SMNK-ARA 04790), Männchen dorsal
Fig. 10: *Thanatus arenarius* (SMNK-ARA 04790), male dorsal

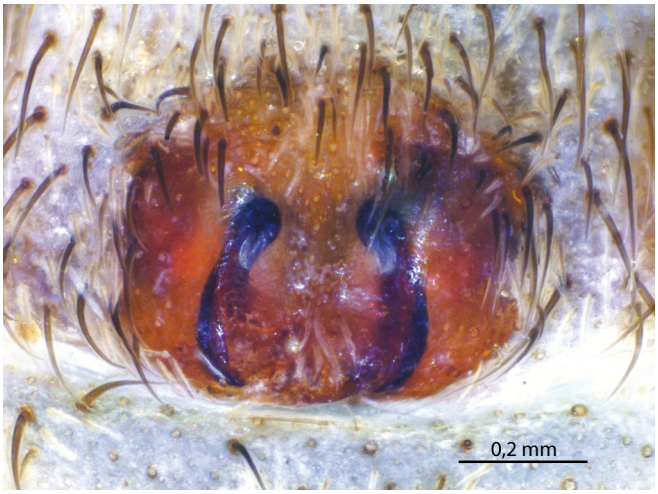

Abb./Fig. 11: *Thanatus arenarius* (SMNK-ARA 05093), Epigyne

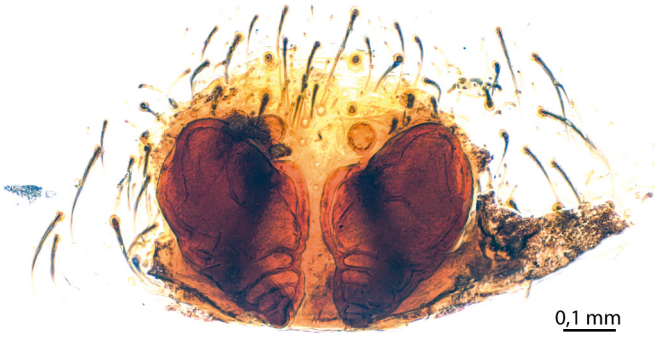

Abb./Fig. 12: *Thanatus arenarius* (SMNK-ARA 05093), Vulva

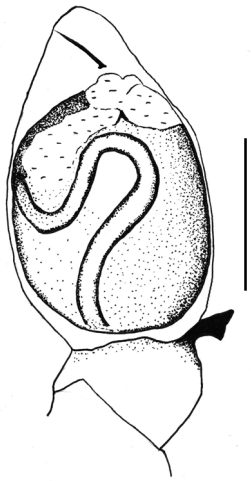

Abb./Fig. 13: *Thanatus arenarius* (SMNK-ARA 04790), Pedipalpus ventral (scale line = 0.5 mm)

Determination. Logunov (1996), Kastrygina & Kovblyuk (2013) und Szita & Samu (2000) beschreiben und illustrieren diese Art ausführlich. Das wichtigste Merkmal für die Bestimmung der Männchen, die auffällig breite, leicht eingedrehte und apikal gespaltene Tibialapophyse wurde bereits von L. Koch (in Thorell 1872: 269) beschrieben: "The tibial joint […] has, at its apex, on the outer side, a process directed outwards, curved somewhat upwards, dilated at the extremity, and there broadly and obliquely truncated." Bei der Bestimmung anhand dieses Merkmals ist darauf zu achten, dass bei Erschlaffung des Tibialgelenks die Apophyse nicht mehr direkt am Palpus ansitzt (vgl. Abb. 13-14). in diesem Fall erscheint der nach oben abgespaltene Teil im apikalen Bereich dornenförmig. Männchen aus Bodenfallen sind oftmals in diesem Zustand.

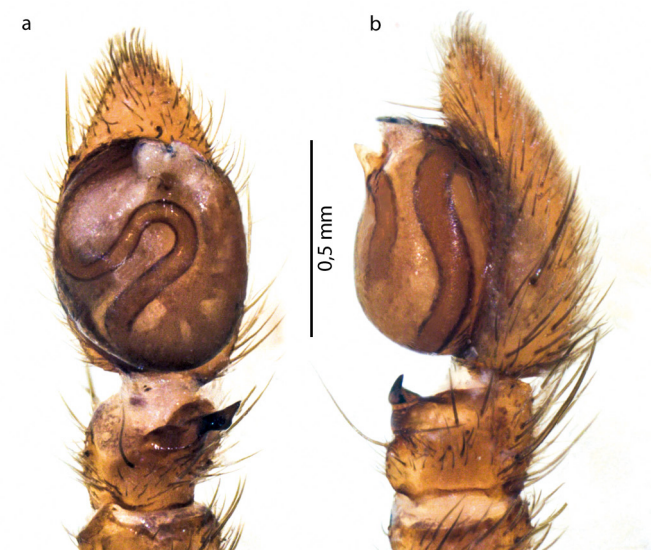

Abb. 14: *Thanatus arenarius* (SMNK-ARA 04789), Pedipalpus. Tibia waagerecht ausgerichtet; **a.** ventral, **b.** retrolateral
Fig. 14: *Thanatus arenarius* (SMNK-ARA 04789), Pedipalpus with horizontally arranged tibia; **a.** ventral, **b.** retrolateral

Faunistik. *Thanatus arenarius* ist in Europa von Spanien und Griechenland bis nach Norwegen verbreitet (Farlund 2016), zeigt aber gleichzeitig auffällige Nachweislücken in der Schweiz, Großbritannien und den Niederlanden (Nentwig et al. 2016). Die Art bevorzugt steppenartige Gebiete und kommt auch auf Salzflächen vor (Logunov 1996). In Deutschland liegt der Nachweisschwerpunkt in Ostdeutschland. Der einzige Nachweis aus Baden-Württemberg ist über 100 Jahre alt und stammt von Bösenberg (1902) aus der Nähe von Pforzheim. Nachweise aus Bayern stammen von Bauchhenss (1995) und Koch (1877). Bei den Nachweisen vom NSG Badberg handelt es sich eventuell um die einzige existierende Population in Baden-Württemberg. Interessant ist in diesem Zusammenhang ein sympatrisches Vorkommen von *Thanatus formicinus* (Clerck, 1757) am Standort. Langjährige Untersuchungen potentiell geeigneter Habitate im nördlichen Baden-Württemberg mit ähnlicher, steppenartiger Ausprägung erbrachten keine Nachweise dieser Art (z.B. Leist 1994, Hemm et al. 2012), auch liegen bisher keine Nachweise von der Schwäbischen Alb vor, wie der Nachweiskarte zu entnehmen ist. Da die Nachweise aus einem Naturschutzgebiet stammen, ist derzeit davon auszugehen, dass zumindest am Badberg die Art in Baden-Württemberg nicht gefährdet sein sollte.

Diskussion

Krehenwinkel & Tautz (2013) haben für *Argiope bruennichi* (Scopoli, 1772) gezeigt, wie komplex die Mechanismen hinter einer Arealausausbreitung in Zusammenhang mit dem Klimawandel sein können. Angesichts offensichtlicher Verschleppungen kann daher bei ursprünglich mediterranen Arten nicht pauschal davon ausgegangen werden, dass hinter Nachweisen in nördlicheren Gebieten eine Arealausweitung aufgrund höherer Durchschnittstemperaturen in Mitteleuropa vorliegt. Anthropogene Faktoren wie z.B. wiederholte Verschleppungen und frostfreie Bereiche in städtischen Gebieten spielen wahrscheinlich eine nicht zu unterschätzende Rolle bei der Ausbreitung verschiedener Arten. Bei heimischen Arten xerothermer Standorte muss auf der anderen Seite trotz fehlender Langzeitstudien davon ausgegangen werden, dass die Populationen seit einigen Jahrzehnten mit dem Verlust ihrer bevorzugten Habitate zurückgegangen sind (Blick et al. 2016). Zur Klärung solcher Fragen existiert leider immer noch ein erhebliches Defizit an mit entsprechenden Daten zu den Habitaten versehenen Nachweisen aus systematischen Aufnahmen. Besonders deutlich wird das am Beispiel der Nachweissituation von *T. arenarius*. Es wäre durchaus denkbar, dass die Art in der Nähe von Pforzheim aktuell immer noch vorkommt, da geeignete Habitate vorhanden zu sein scheinen (u.a. NSG Mangerwiese-Wotanseiche). Jedoch stammt immer noch der größte Teil der Nachweise aus diesem TK (7118) von Bösenberg (Arachnologische Gesellschaft 2016). Die hier präsentierten Nachweise liefern in diesem Kontext wichtige Beiträge zur Kenntnis der aktuellen Verbreitung und Habitatpräferenz. Gerade regional stark bedrohte und sehr seltene Arten wie *T. arenarius* oder *S. zimmermanni* sollten jedoch zur Zielgruppe naturschutzfachlicher Bemühungen gehören und in ein Langzeitmonitoring von Schutzgebieten miteinbezogen werden. Hier wäre eine bessere Zusammenarbeit von naturschutzfachlicher Verwaltung und Arachnologen wünschenswert. Die derzeit erfolgende Erstellung einer Referenzdatenbank für DNA-Barcodes der deutschen Spinnenarten (Astrin et al. 2016) kann hier bei der sicheren Bestimmung, z. B. auch juveniler Exemplare, hilfreich sein und könnte als Anreiz dienen, regelmäßige Monitoringaufnahmen durch Nicht-Spezialisten für einzelne Arten (wie z.B. *T. arenarius* am Badberg) durchzuführen. Bei *O. lineatus* und *R. grammica* ist hingegen davon auszugehen, dass die grenznahen Populationen seit längerem bestehen und schlicht übersehen wurden. Zukünftige Aufsammlungen in ähnlichen Habitaten an der Grenze zu Frankreich und der Schweiz könnten mehr Klarheit in die Bestandssituation beider Arten bringen.

Danksagung

Wir danken besonders Ingmar Harry (Freiburg) für das Überlassen seiner Spinnen-Beifänge vom Badberg und Weil am Rhein sowie Franziska Meyer (Karlsruhe) für ihre Bestimmungsarbeit. Peter Jäger (Frankfurt) danken wir für die Bestimmung des *S. barbipes*-Nachweises aus dem Palmengarten Frankfurt und Stefan Rehfeldt für die Weitergabe des Exemplars, genauso wie Andreas Malten (Dreieich) für die Übermittlung seiner *P. maculatus*-Nachweisdaten und Theo Blick für die Bestimmung des Tieres. Ein spezieller Dank geht an Rainer Breitling (Manchester, Großbritannien) für die interessanten Diskussionen und Hinweise rund um die die Gattung *Oxyopes*. Ebenso danken wir den beiden Reviewern Ambros Hänggi und Dieter Nährig sowie der Schriftleitung der AraGes für die kritische Durchsicht und die vielen wertvollen Hinweise, welche das Manuskript nochmals deutlich verbessert haben. Des Weiteren wollen wir dem gesamten Team des World Spider Catalog (Bern, Schweiz) danken, ohne dessen inzwischen fast vollständige Literaturdatenbank zur Taxonomie die Recherchen zu diesem Artikel wesentlich mehr Zeit in Anspruch genommen hätten.

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Rhacochelifer disjunctus (Pseudoscorpiones: Cheliferidae) new to the fauna of Slovakia

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doi: 10.5431/aramit5306

Abstract. An illustrated description of *Rhacochelifer disjunctus* (L. Koch, 1873) collected in Slovakia is presented. One female was found phoretic on Lepidoptera in a Malaise trap. Another 37 specimens, including both sexes, tritonymphs and a protonymph, collected in the 1950s were deposited in the Natural History Museum in Prague, Czech Republic and identified as well. The discoveries of *R. disjunctus* specimens at five localities within Slovakia represent the first records of the species for this country.

Keywords: Malaise trap, morphometric analysis, new record, phoresy, pseudoscorpion, taxonomy

Zusammenfassung. *Rhacochelifer disjunctus* (Pseudoscorpiones: Cheliferidae) neu für die Fauna der Slowakei. Eine illustrierte Beschreibung von in der Slowakei gesammelten *Rhacochelifer disjunctus* (L. Koch, 1873) wird präsentiert. Ein auf einem Schmetterling phoresierendes Weibchen wurde in einer Malaise-Falle gefunden. Weiterhin wurden 37 Individuen beider Geschlechter, Tritonymphen und eine Protonymphe identifiziert, die in den 1950er Jahren gesammelt und im Naturhistorischen Museum in Prag (Tschechische Republik) hinterlegt wurden. Der Nachweis von *R. disjunctus* an fünf Orten in der Slowakei stellt den Erstnachweis der Art für das Land dar.

A total of 35 species and five subspecies are recognized within the genus *Rhacochelifer* Beier, 1932, distributed in Africa, Asia and chiefly in southern Europe (Harvey 2013). The genus *Rhacochelifer* is characterized by the presence of a dentate subterminal seta on the tarsi and absence of lateral spurs on the posterior tergite's margin; by modified and stout tarsi of the anterior legs and the presence of coxal sacs on coxae IV in males; and the presence of one median cribriform plate in females (Beier 1932a, 1963).

Rhacochelifer disjunctus was described as *Chelifer disjunctus* (Koch, 1873) from the Pyrenees, southern France (Koch 1873). Heurtault (1980) indicated as its type locality "Mont Lubéron, Vaucluse", which was confirmed by Judson (1997) in comments to his designation of a lectotype female of the species. Beier (1963) indicated a distribution in the western Mediterranean region: Italy, southern France and Spain, but Simon (1898) already mentioned a record of the species from Portugal. Daday (1889) published the occurrence of the species from Azerbaijan, but no recent confirmation of this record is available. Beier (1932b) mentioned Morocco as well, which came from Ellingsen`s (1910) misidentification of *R. maculatus* (L. Koch, 1873). The incorrect presence of *R. disjunctus* in Morocco appeared later in other publications (Roewer 1937, Vachon 1940a, Marcuzzi et al. 1971, Callaini 1988), as well as in the world pseudoscorpion catalogue (Harvey 2013), despite of the fact that Harvey (2013) pointed out the misidentification by Ellingsen (1910).

Until now *R. disjunctus* was found under the bark of citrus, *Platanus* and pine trees (Koch 1873, Simon 1879, Navás 1918). Weygoldt (1969, 1971) collected specimens in sand dunes in southern France and described the mating dance and the embryonic development of this species.

The aim of this paper is not only to report new localities within the known distribution of *R. disjunctus*, but also to provide complete morphological data including illustrations of the specimens found in Slovakia.

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submitted 11.8.2016, accepted 8.2.2017, online 17.2.2017

Material and methods

All specimens recorded in this paper were found in Slovakia (Fig. 1). One female was found phoretic on *Eupithecia* sp. (Lepidoptera, Geometridae) (det. M. Kulfan), which was caught immediately after flying into a Malaise trap in Harmónia on 21 May 2014 (48°22'58.69"N, 17°17'02.32"E; leg. E. Stloukal) (Fig. 2). The following specimens are stored in the F. Miller Collection housed in the Natural History Museum (NHM) in Prague, Czech Republic: 3♀♀, Kľak Village, Žarnovica, May 1957 (48°35'00.60"N, 18°38'36.83"E, leg. F. Miller; inventory number P6A 6386); 12♂♂, 8♀♀, 3 tritonymphs, 1 protonymph, Kľak, Muránska planina Mountains, 25 March 1958 (48°46'45.69"N, 19°58'03.43"E, leg. F. Miller; P6A 6387); 5♂♂, 2♀♀ Richnava, 30 July 1959 (48°55'33.78"N, 20°55'28.54"E, leg. F. Miller; P6A 6388); 2♂♂, 1♀, Banská Štiavnica, 13 May of an unknown year (48°27'10.76"N, 18°54'40.63"E, leg. F. Miller; P6A 6389). The coordinates of F. Miller's sampling localities are approximate and indicate a location within the territory of Slovakia. Dr. Miller did not mention the habitat or sampling method of his collected specimens but he noted "pines" on locality labels from the years 1957 and 1959.

The specimen found in Harmonia was mounted as a permanent slide mount in Swann's fluid. For identification, the palp, legs I and leg IV were removed from the specimen from the left side of the body. The specimens from the NHM in Prague are deposited in ethanol. Described individuals were mounted as temporary slide mounts without preparation, using lactic acid for clearing. Specimens were photographed

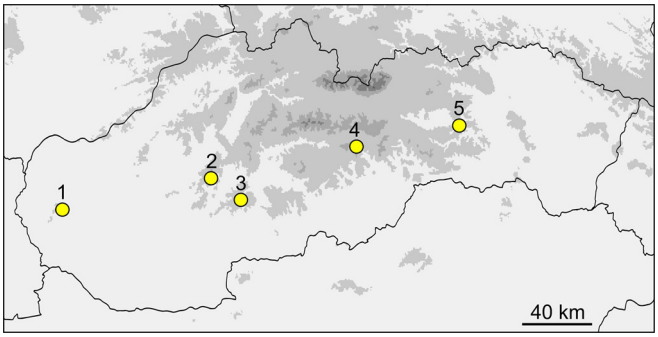

Fig. 1: Records of *Rhacochelifer disjunctus* in Slovakia: **1** Harmónia; **2** Kľak Village, Žarnovica; **3** Banská Štiavnica; **4** Kľak, Muránska planina Mountains; **5** Richnava

Fig. 2: Female of *Rhacochelifer disjunctus* phoretic on *Eupithecia* sp., Lepidoptera. Scale: 1 mm

Fig. 3: Male of *Rhacochelifer disjunctus*. Scale: 1 mm

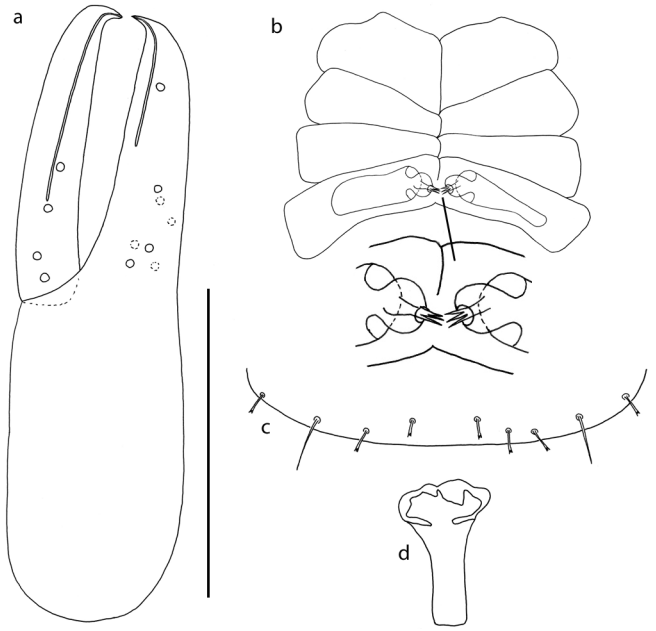

Fig. 4: *Rhacochelifer disjunctus*; **a.** palpal chela with trichobothrial pattern, female; **b.** coxae with developed coxal sacks (inset amplified), male; **c.** tergite XI with short tactile setae, female; **d.** spermatheca, female. Scale for **a**: 0.5 mm

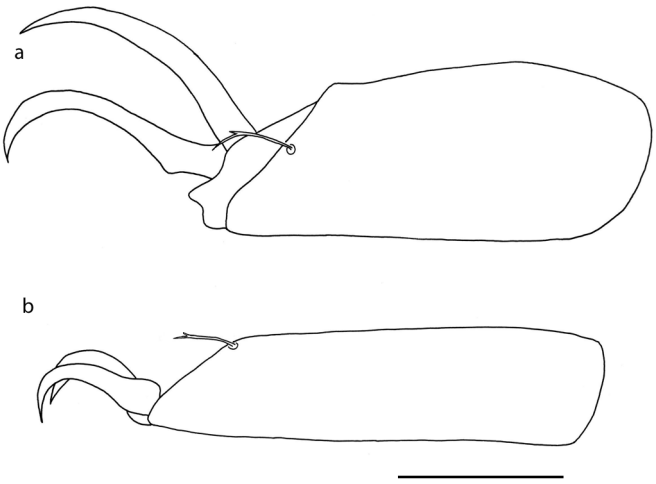

Fig. 5: *Rhacochelifer disjunctus* – tarsi of leg I with a position of subterminal seta; **a.** male, **b.** female. Scale: 0.1 mm

using a Leica DM1000 compound microscope with a ICC50 Camera Module (LAS EZ application, 1.8.0). Measurements were taken from photographs using the AxioVision 40LE application (v. 4.5). Figs 4 and 5 were drawn using a Leica drawing tube. The material is deposited in the zoological collections of the Comenius University in Bratislava and the NHM in Prague.

Results and discussion

***Rhacochelifer disjunctus* (L. Koch, 1873)**

Material. 3♀♀ – SLOVAKIA, Kľak Village, Žarnovica; 1♀, 1♂ – Kľak, Muránska planina Mountains; 2♀♀, 2♂♂ – Richnava; 1♀, 2♂♂ – Banská Štiavnica; 1♀ – Harmónia.

Description of males and females

Abdominal tergites and sternites divided. Short clavate setae present on carapace and tergites; acuminate setae present on sternites. Two narrow transverse furrows and one pair of eyes present on carapace; carapace densely granulated and without epistome. Chelicerae small, slightly sclerotized (Fig. 3); cheliceral hand with five setae, one seta present on cheliceral movable finger; galea well-developed with six–seven terminal rami; rallum with three setae; serrula exterior with 19 blades. Palps slender, femur extends abruptly from pedicel (Fig. 3); chelal fingers clearly shorter than hand; venom apparatus developed in both chelal fingers (Fig. 4a); 12 trichobothria (eight on fixed and four on movable chelal finger) present on chelal fingers (Fig. 4a).

Males (Tab. 1, Figs 3, 4b, 5a)

Carapace. Setae number on carapace highly variable, total setae number of 58–67, 28–36 of them situated in front of anterior transverse furrow, 17–24 setae on medial disk, 10–12 setae on posterior carapace margin; two lyrifissures present in

front of anterior transverse furrow, 4–7 lyrifissures situated on posterior carapace margin.
Palps. 32–34 teeth situated on fixed chelal finger, 34–38 teeth situated on movable chelal finger.
Legs. Coxae IV with developed coxal sacks extending to 2/3 of coxal length, atrium present in each coxal sac (Fig. 4b). Male tarsi of legs I slender, anterior end obtuse-angled, and slightly concave (Fig. 5a); claws on tarsi of legs I asymmetric, the longer one without accessory tooth (Fig. 5a); subterminal seta on tarsi dentate (Fig. 5a). Tarsi of legs IV without tactile seta, short pseudotactile seta present.
Tergites. I: left hemitergite 6–7 + right hemitergite 6–8 setae; II: 7 + 6–8; III: 6–7 + 5–7; IV: 5–8 + 7; IV: 7–8 + 7–9; V: 7–10 + 7–9; VI: 7–10 + 8–9; VII: 6–8 + 7–10; VIII: 7–9 + 7–9; IX: 7–8 + 7–8; XI: 2–4 + 3–4 with one pair of short acuminate tactile setae.
Sternites. IV: left hemisternite 4–5 + right hemisternite 4–7; V: 6–7 + 5–8; VI: 5–7 + 6–7; VII: 6–8 + 6–7; VIII: 5–6 + 5–7; IX: 4–6 + 5–6; X: 4–6 + 5–6; XI: 2–4 + 2–4 with one pair of short acuminate tactile setae. Anterior genital operculum with 36–44 acuminate setae and without lyrifissures. Posterior genital operculum with 13–18 acuminate setae and 4–11 lyrifissures.

Females (Tab. 1, Figs 2; 4a, c, d; 5b)
Carapace. Setae number on carapace highly variable, total setae number of 59–73, 30–37 of them situated in front of anterior transverse furrow, 19–28 setae on medial disk, 9–12 setae on posterior carapace margin; two lyrifissures present in front of anterior transverse furrow, 4–6 lyrifissures situated on posterior margin.
Palps. 32–36 teeth situated on fixed chelal finger, 34–40 teeth situated on movable chelal finger.
Legs. Tarsi of legs I without modifications (Fig. 5b); subterminal seta on tarsi dentate (Fig. 5b). Tarsi of legs IV without tactile seta, short pseudotactile seta present.
Tergites. I: left hemitergite 6–7 + right hemitergite 6–8 setae; II: 6–8 + 6–8; III: 6–8 + 5–8; IV: 6–8 + 6–8; V: 7–8 + 7–8; VI: 8 + 7–8; VII: 7–9 + 7–11; VIII: 8–9 + 8–10; IX: 7–9 + 7–9; X: 6–9 + 6–8; XI 3–4 + 3–4 with one pair of short acuminate tactile setae (Fig. 4c).
Sternites. IV: left hemisternite 4–7 + right hemisternite 4–7 setae; V: 5–6 + 5–7; VI, VII, VIII: 5–7 + 5–7; IX: 5–8 + 4–7; X: 4–7 + 4–6; XI 2–3 + 2–3 with one pair of short acuminate tactile setae. Spermatheca foliate, resembling those of *R. corcyrensis* (Beier, 1930) or *R. maculatus* (L. Koch, 1973) (Mahnert 1977), but it seems different from the more elongate spermatheca of the lectotype of *R. disjunctus* (M. Judson, pers. comm.), but no data are available on shape variation of this organ depending on clearing methods (Fig. 4d). Anterior genital operculum with 13–18 setae and two lyrifissures; posterior genital operculum with 7–10 setae and 2–5 lyrifissures.

Measurements (♂♂/♀♀): see Tab. 1.

Remarks
Two *Rhacochelifer* species, *R. peculiaris* (L. Koch, 1873) and *R. quadrimaculatus* (Tömösváry, 1882), were previously reported from Slovakia (Tömösváry 1882, Verner 1960). Tömösváry (1882) found both species under tree bark at the locality of Humenné, whereby it should be mentioned that for *R. quadrimaculatus* Humenné represents the type locality (Tömösváry 1882). Later Verner (1960) recorded one specimen of *R. quadrimaculatus* under oak bark in the Kováčovské kopce hills. Unfortunately, no *Rhacochelifer* specimens recorded from Slovakia are found in older collections. The building of the Hungarian Natural History Museum, together with the zoological collections, burned down in 1956 and many type specimens were destroyed. The curator of the arachnid collection suspects that part of Tömösváry`s collection was among this lost material (L. Dányi, pers. comm.). Moreover, no *Rhacochelifer* specimens were found in the collections of Dr. Verner in Charles University in Prague, Czech Republic (F. Šťáhlavský, pers. comm.). These facts lead us to conclude that the occurrence of both species cannot be verified in Slovakia, or even the existence of *R. quadrimaculatus* at all. According to the published data we suggest a synonymy between *R. quadrimaculatus* and *R. corcyrensis* (Beier, 1930), which have similar foretarsi quite different from that of *R. disjunctus*/*pecularis*. The original description clearly indicates the shape of the male foretarsus, and also Beier (1963) placed *R. quadrimaculatus* very close to *R. corcyrensis*. On the other hand, confusion between *R. peculiaris* and *R. disjunctus* cannot be excluded, since the two species are morphologically close and sometimes not easy to distinguish. Beier (1963: 295) separated the two species by the proportions and morphology of the male tarsus I: 2.7 times longer than deep and slightly concave anteriorly in *R. disjunctus* and 2.3 times and straight (not concave) anteriorly in *R. peculiaris.* Furthermore, figures 296 and 297 were interchanged during printing, i.e. Fig. 297 (Beier 1963: 294) represents *R. disjunctus* and vice versa (M. Beier, pers. comm. to VM). The proportions of the male tarsus I measured in our collections lie between the values indicated for the two species, the slightly concave anterior margin of male tarsus I led us to place the specimens as *R. disjunctus*. But the affinities/differences between the two species still need to be defined properly, since differences seem to exist in the shape of spermatheca (Mahnert 1977). Problems concerning taxonomy of Mediterranean species of the genus *Rhacochelifer* are complicated and it would be benefitial if they were subject to revision by taxonomists in the future.

Pseudoscorpions have the ability to attach themselves to a variety of generally more mobile animals, in most cases arthropods (Poinar 1998). In the genus *Rhacochelifer* only a few records of phoresy were known until now. Vachon (1940b) recorded phoresy of *R. similis* Beier, 1932 on *Lonchaea laticornis* Meigen, 1826 (Diptera). Another record was published by Vachon (1953), who observed *R. maculatus* (L. Koch, 1873) on *Sterrha aversata* (Linnaeus, 1758) (Lepidoptera). The current finding of phoretic *R. disjunctus* could explain the species distribution in Slovakia. The localities listed in the present paper represent the northernmost known occurrence of *R. disjunctus*.

Acknowledgements
We are grateful to Eduard Stloukal for collecting the pseudoscorpion used in the paper and Miroslav Kulfan for identification of Lepidoptera. We would like to express our thanks to our colleagues František Šťáhlavský and Petr Dolejš for calling attention to material deposited in the Natural History Museum in Prague, as well as to Christoph Hörweg for his help with literature. Sincere thanks to Mark L.I. Judson for his information on the lectotype of *Rhacochelifer disjunctus*.

Tab. 1: Morphometric data for both sexes of *Rhacochelifer disjunctus*; Abbreviations: n – number of measured specimens, Min–Max (Mean±SD) – mean values of the measured characters ± standard deviation, all measurements in mm

Characters	♀ n = 8 Min–Max (Mean±SD)	♂ n = 5 Min–Max (Mean±SD)
Body		
Length	1.84 – 2.60 (2.28±0.25)	1.77–2.10 (1.95±0.13)
Carapace		
Length	0.65–0.74 (0.69±0.03)	0.63–0.69 (0.65±0.02)
Anterior margin width	0.38–0.45 (0.42±0.03)	0.39–0.45 (0.42±0.03)
Posterior margin width	0.75–0.85 (0.80±0.03)	0.78–0.83 (0.81±0.03)
Length/posterior margin width ratio	0.83–0.89 (0.87±0.02)	0.76–0.85 (0.81±0.04)
Chelicera		
Length	0.20–0.23 (0.22±0.01)	0.21–0.22 (0.21±0.01)
Width	0.10–0.12 (0.11±0.01)	0.10–0.11 (0.11±0.00)
Length/width ratio	1.92–2.00 (1.96±0.04)	1.91–2.10 (1.98±0.08)
Movable finger length	0.15–0.17 (0.16±0.01)	0.16–0.16 (0.16±0.00)
Palp		
Trochanter length	0.32–0.35 (0.33±0.01)	0.30–0.33 (0.32±0.01)
Trochanter width	0.17–0.20 (0.18±0.01)	0.17–0.19 (0.18±0.01)
Trochanter length/width ratio	1.68–1.89 (1.81±0.08)	1.68–1.83 (1.77±0.05)
Femur length	0.61–0.67 (0.63±0.02)	0.58–0.63 (0.62±0.02)
Femur width	0.16–0.19 (0.18±0.01)	0.17–0.18 (0.17±0.01)
Femur length/width ratio	3.26–3.81 (3.51±0.21)	3.41–3.71 (3.54±0.13)
Patella length	0.53–0.57 (0.55±0.01)	0.52–0.56 (0.54±0.02)
Patella width	0.21–0.23 (0.22±0.01)	0.20–0.22 (0.21±0.01)
Patella length/width ratio	2.41–2.71 (2.53±0.10)	2.45–2.67 (2.56±0.10)
Hand with pedicel length	0.55–0.60 (0.58±0.02)	0.47–0.60 (0.54±0.05)
Hand width	0.29–0.32 (0.30±0.01)	0.28–0.31 (0.29±0.01)
Hand length/width ratio	1.81–2.00 (1.93±0.06)	1.68–1.97 (1.85±0.13)
Movable finger length	0.43–0.49 (0.47±0.02)	0.40–0.49 (0.45±0.03)
Chela length	0.97–1.05 (0.99±0.03)	0.95–1.01 (0.97±0.02)
Chela length/hand width ratio	3.16–3.39 (3.30±0.08)	3.13–3.46 (3.33±0.13)
Leg I		
Trochanter length	0.14–0.18 (0.15±0.01)	0.13–0.15 (0.14±0.01)
Trochanter width	0.11–0.12 (0.11±0.00)	0.11–0.12 (0.12±0.01)
Trochanter length/width ratio	1.25–1.64 (1.37±0.13)	1.17–1.27 (1.22±0.55)
Femur length	0.20–0.22 (0.21±0.01)	0.19–0.23 (0.22±0.02)
Femur width	0.12–0.12 (0.12±0.00)	0.11–0.13 (0.12±0.01)
Femur length/width ratio	1.67–1.83 (1.73±0.06)	1.73–1.92 (1.79±0.07)
Patella length	0.25–0.29 (0.27±0.01)	0.23–0.28 (0.25±0.02)
Patella width	0.10–0.11 (0.10±0.01)	0.09–0.11 (0.10±0.01)
Patella length/width ratio	2.50–2.80 (2.60±0.09)	2.50–2.89 (2.65±0.17)
Tibia length	0.25–0.27 (0.26±0.01)	0.23–0.27 (0.25±0.02)
Tibia width	0.09–0.10 (0.10±0.01)	0.11–0.12 (0.11±0.01)
Tibia length/width ratio	2.60–2.89 (2.74±0.09)	2.09–2.36 (2.23±0.10)
Tarsus length	0.23–0.29 (0.25±0.02)	0.21–0.28 (0.24±0.03)
Tarsus width	0.07–0.08 (0.07±0.01)	0.09–0.12 (0.10±0.01)
Tarsus length/width ratio	3.13–3.86 (3.45±0.26)	2.10–2.56 (2.35±0.18)
Leg IV		
Trochanter length	0.18–0.27 (0.24±0.03)	0.21–0.24 (0.22±0.01)
Trochanter width	0.12–0.15 (0.13±0.01)	0.12–0.13 (0.13±0.00)
Trochanter length/width ratio	1.50–1.93 (1.77±0.15)	1.62–1.85 (1.75±0.08)
Femoropatella length	0.40–0.54 (0.50±0.05)	0.48–0.51 (0.49±0.01)
Femoropatella width	0.14–0.18 (0.17±0.01)	0.14–0.16 (0.15±0.01)
Femoropatella length/width ratio	2.67–3.50 (3.04±0.27)	3.00–3.64 (3.22±0.25)
Tibia length	0.33–0.43 (0.39±0.03)	0.33–0.38 (0.36±0.02)
Tibia width	0.10–0.12 (0.11±0.01)	0.10–0.11 (0.10±0.00)
Tibia length/width ratio	3.18–3.90 (3.57±0.24)	3.00–3.80 (3.58±0.33)
Tarsus length	0.26–0.32 (0.29±0.02)	0.27–0.30 (0.28±0.01)
Tarsus width	0.08–0.09 (0.08±0.00)	0.07–0.08 (0.07±0.01)
Tarsus length/width ratio	3.25–3.75 (3.50±0.15)	3.63–3.86 (3.79±0.10)

Technical assistance with figures by our colleagues Daniel Jablonski and Daniel Gruľa is also appreciated. We would like to thank reviewers Giulio Gardini and František Šťáhlavský for all their corrections and comments that improved the manuscript. The study was financially supported by the project VEGA 1/0191/15.

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Seltene Spinnen und Weberknechte auf ehemaligen Truppenübungsplätzen in Mecklenburg-Vorpommern (Arachnida: Araneae, Opiliones)

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doi: 10.5431/aramit5307

Abstract. Rare spiders and harvestmen from abandoned military training areas in Mecklenburg-Western Pomerania , Germany (Arachnida: Araneae, Opiliones). The second records of *Evarcha laetabunda* and *Philaeus chrysops* for Mecklenburg-Western Pomerania were made during four field excursions. The formerly regional extinct or lost species *Harpactea hombergi* was rediscovered. Additionally notes concerning some other rare species are given.

Keywords: *Agyneta fuscipalpa, Evarcha laetabunda, Harpactea hombergi, Lasaeola tristis, Peponocranium ludicrum*, *Philaeus chrysops, Rhysodromus histrio*

Zusammenfassung. Während vier Feldexkursionen wurden Zweitnachweise von *Evarcha laetabunda* und *Philaeus chrysops* für Mecklenburg-Vorpommern erbracht. Die im Bundesland als ausgestorben oder verschollen eingestufte Art *Harpactea hombergi* wurde wiederentdeckt. Anmerkungen zu anderen seltenen Arten werden vorgelegt.

Im Rahmen des durch das Bundesministerium für Bildung und Forschung geförderte Projekt German Barcode of Life (GBOL) sollen bundesweit für genetisches Barcoding Proben aller Arten Deutschlands erfasst werden. Der Autor bearbeitet in diesem Projekt Spinnen und Weberknechte. Seit Projektbeginn (2011) wurden deutschlandweit 63 % der als in Deutschland heimisch eingestuften Arachniden erfasst (GBOL 2016). Die hier vorliegenden Untersuchungen sollen den Erfassungsstand für Mecklenburg-Vorpommern komplettieren. Das Erfassungsergebnis konnte durch die Hinzunahme der Methode des Vegetationssaugens verbessert werden, weil mit dieser Methode bisher nicht erfasste Arten nachgewiesen werden konnten.

Methode

Insgesamt wurden vier Sammel-Exkursionen in zwei ehemalige Truppenübungsplätze Mecklenburg-Vorpommerns unternommen. Im Juni 2015 nach Lübtheen und im April, Mai und Oktober 2016 auf den ehemaligen Standortübungsplatz Stern-Buchholz, an der südlichen Stadtgrenze der Landeshauptstadt Schwerin.

Neben den etablierten Methoden Handaufsammlung, Klopfen, Keschern und Sieben (Laubstreu und Moospolster) kam ein Vegetationssauger zum Einsatz. Das ist ein handelsüblicher Laubsauger mit Viertaktmotor in dessen Ansaugstutzen ein Fangfilter alles aufnimmt, das eingesogen wird; eingesogene Tiere sind damit in eingesogenem Streumaterial eingebettet. Sie werden anschließend ausgesiebt und mittels Exhaustor ausgelesen. Durch Auftupfen des Vegetationssaugers auf die bodennahe Vegetation werden beim Saugen Tiere aufgenommen, welche an der Basis der Pflanzen oder im bodennahen Bereichen zwischen Gebüsch und am Rand von Baumstämmen leben, wo sie mit dem Streifkescher unerreichbar sind. Damit dringt diese Exkursionsmethode in den Erfassungsbereich von Bodenfallen vor. Der Sauger ist im Gegensatz zu Bodenfallen nicht auf die Laufaktivität der Tiere angewiesen. Er stellt somit auch eine geeignete Ergänzungsmethode für mit Bodenfallen beprobte Areale dar (Wilson 2016).

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eingereicht 2.1.2017, angenommen 25.2.2017, online 11.3.2017

Gesammelte Tiere wurden in 70 %igen vergällten Alkohol (verdünnter Brennspiritus) überführt und konserviert. Unmittelbar in den Tagen nach den Exkursionen wurden die Tiere bestimmt und solche, die im Rahmen des GBOL-Projektes an das ZFMK weiter gegeben wurden, anschließend in 99 %igen unvergällten Alkohol überführt. Das so gewonnene Material erwies sich als geeignet für die DNA-Bestimmung.

Belegexemplare (soweit Coll. angegeben), befinden sich in der Sammlung des zoologischen Forschungsmuseums Alexander König (ZFMK) in Bonn und wurden dort im Rahmen des Projektes GBOL für das Barcoding verwendet. Im Einzelfall sind daher auch bestimmbare Jungtiere in die Sammlung aufgenommen wurden. Weitere Belegexemplare liegen in der Sammlung des Staatlichen Museums für Naturkunde Karlsruhe (SNMK-ARA).

Häufigkeitsangaben und Gefährdungsgrade in den Überschriften und Auswertungen beziehen sich auf die Rote Liste der Spinnen Mecklenburg-Vorpommerns (Martin 2012); Abkürzungen der Bestandskategorien: h häufig, mh mittelhäufig, s selten, ss sehr selten, es extrem selten, ex ausgestorben oder verschollen; Abkürzungen der Gefährdungskategorie: * ungefährdet, 3 gefährdet, R extrem selten, G Gefährdung unbekannten Ausmaßes, 0 ausgestorben oder verschollen. Eine Rote Liste der Weberknechte existiert für Mecklenburg-Vorpommern nicht, weshalb bei diesen Gefährdungsangaben fehlen. Die vollständige Artenliste des Standortes Lübtheen befindet sich in Tabelle 1, die des Standortes Stern-Buchholz in Tabelle 2.

Im Text angegebene Koordinaten beziehen sich auf das Kartendatum WGS84.

Untersuchungsgebiet

Der auf dem Messtischblatt TK 2635 gelegene ehemalige Truppenübungsplatz bei Lübtheen wurde bis Ende Oktober 2013 von der Bundeswehr genutzt. Auf dem etwa 6200 ha großen Gelände finden sich Wald und ausgedehnte Heide- und Sanddünenflächen. Es befindet sich im Eigentum des Bundesamtes für Immobilienbetreuung (BIMA). Seit Juni 2015 gehört es zum Nationalen Kulturerbe; in Teilen des Gebiets ist wegen der Kampfmittelbelastung das Betreten verboten.

Der Autor hatte am 15.8.2015 Gelegenheit an einer Exkursion in dieses Gebiet teilzunehmen. Alle für dieses Gebiet

Abb. 1: Luftbild Lübtheen. Quelle: Google maps
Fig. 1: Aerial photo of Lübtheen. Source: Google maps

Abb. 2: Luftbild Stern-Buchholz. Quelle: Google maps
Fig. 2: Aerial photo of Stern-Buchholz. Source: Google maps

genannten Nachweise (ausgenommen Nachweise dritter) beziehen sich auf dieses Datum.

Es wurde neben der großen Heide- und Dünenfläche (53,28636°N/11,22505°O, Radius 900 m) auch eine im Wald eingebettete kleine Grasheidefäche untersucht (53,284150°N/11,238091°O, Radius 50 m); beide liegen im Messtischblatt TK 2733 (Abb. 1). Die Nachweise beider Flächen werden zusammengefasst (Tab. 1).

Der ehemalige Standortübungsplatz Stern-Buchholz liegt im südlichen Stadtteil „Göhrener Tannen" der Landeshauptstadt Schwerin und blickt auf eine lange Nutzungsgeschichte von der Reichswehr, sowjetischen Truppenteilen, der Nationalen Volksarmee und der Bundeswehr zurück (Bundesdrucksache 1997).

2007 wurde die militärische Nutzung aufgegeben. Die BIMA hat inzwischen Teile des Areals verkauft. Ein Teil des Geländes wird heute als Gewerbeflächen genutzt, andere Teile sind als Landschafts- und Naturschutzgebiete vorgesehen. Das Gesamtareal besteht aus waldartigen Gehölzbeständen, ehemaligen Kasernenanlagen und Trockenbiotopkomplexen, wie etwa Heiden (Stadt Schwerin 2013).

Die Koordinaten des Fundortes lauten 53,55146°N/11,448399°O bei einem Erfassungsradius von ca. 280 m (Abb. 2). Besammelt wurde das reine Heidegebiet sowie der Gehölzstreifen zwischen Heide und der Landesstraße L72. Das Gebiet liegt im Messtischblatt TK 2434.

Ergebnisse und Diskussion

Hervorzuhebende Nachweise vom ehemaligen Truppenübungsplatz Lübtheen:

Spinnen (Araneae)

***Dendryphantes rudis* (Sundevall, 1833) (Salticidae) es, G**

Es wurden 4♀♀ und 2♂♂ von Kiefernzweigen in der Heide geklopft, Coll. ZFMK-TIS-2558968. Es gibt Anzeichen dafür, dass sich diese Art im Norden ausbreitet. Nach ersten Funden vom Ostufer der Müritz aus den Jahren 1976/77 (Martin 1983) konnte die Art für Mecklenburg-Vorpommern erst 2015 mit zahlreichen Funden aus dem NSG „Marienfließ" (Martin & Steinhäuser 2016) bestätigt werden. Für Schleswig-Holstein hat sich die Nachweisdichte nach dem Erstnachweis 2007 (Lemke 2008) auf mittlerweile fünf Standorte erhöht. 2016 gab es eine erste Meldung über ein Vorkommen in Großbritannien (Hunter 2016) auf Schwarzkiefer in einem städtischen Park in Liverpool; bei diesem Fund scheint jedoch noch fraglich zu sein, ob es sich um ein etabliertes Vorkommen handelt. Wie auch beim Nachweis in Lübtheen ist die Art auch im NSG „Marienfließ" sowie in Schleswig-Holstein vorzugsweise an eher trockenen Standorten auf Kiefernzweigen zu finden. Der Fund dieser für Mecklenburg-Vorpommern als extrem selten und gefährdet eingestufte Art (Martin 2012) kommt daher eine besondere Bedeutung zu.

***Philaeus chrysops* (Poda, 1761) (Salticidae)**

(bei Martin 2012 noch nicht gelistet)

Ein juveniles Tier wurde im der Dünenheide von Kieferzweigen geklopft (Coll. ZFMK-TIS-2558979). Der Erstnachweis für Mecklenburg-Vorpommern stammt ebenfalls aus diesem Gebiet: leg. Christian Winkler, 1♂ per Fotonachweis vom 25.05.2014 (Martin 2014).

***Rhysodromus histrio* (Latreille, 1819) (Philodromidae), Syn. *Philodromus histrio* es, R**

Es wurden sechs Jungtiere auf niedriger Vegetation in der Heidevegetation gekeschert (Coll. ZFMK-TIS-2558977). Es ist bisher der einzige Nachweis dieser Art im gesamten GBOL-Projekt (GBOL 2016). 2011 wurde die Art mit einem einzigen Exemplar erstmals für Mecklenburg-Vorpommern im Graudünenbereich einer Küstenheide auf Hiddensee nachgewiesen (Buchholz & Schirmel 2011). Am 9.5.2012 erfolgte der Nachweis eines adulten Männchens in der Grabower Heide (leg. K. Rudnick) (Martin 2013). Im NSG Marienfließ wurde diese Art relativ häufig ebenfalls durch Streifkescherfänge vorwiegend auf *Calluna*-Heide erfasst (Martin in litt.).

Weberknechte (Opiliones)

Jeweils ein Exemplar (ohne Geschlechtsbestimmung) habituell bestimmt: *Lacinius dentiger* (C. L. Koch, 1847) geklopft von Kiefernzweigen in der Heide (Coll. ZFMK-TIS-2558975) und *Lacinius horridus* (Panzer, 1794) (Coll. ZFMK-TIS-2558971) im Grenzbereich zwischen Grasvegetation und offenem Sand (Dünenweg) am Boden

Tab. 1: Artenliste von Lübtheen/Species list from Lübtheen
Anzahl: j = Juvenile, i = Individuum ohne Geschechtsbestimmung; **RL** = Rote Liste (Kategorie s. Methoden); **Methoden:** HF = Handfang, GS = Gesiebe, KS = Klopfschirm, SK = Streifkescher, VS = Vegetationssauger; **Biotope:** Hei = Heide, Mwa = Mischwald; **Subbiotope:** bnV = bodennahe Vegetation, nV = niedrige Vegetation (z. B. Krautschicht), Lstr = Laubstreu, MoPo = Moospolster, uSt = unter Steinen, uTH = unter liegendem Totholz, Bd = am Boden, KZ = auf Kiefernzweigen

Taxon	Datum	Anzahl	Sammlung	RL	Methoden	Biotope	Subbiotope
Araneidae							
Aculepeira ceropegia (Walckenaer, 1802)	15.08.2015	6j		s, *	SK, VS	Hei	nV, bnV
Agalenatea redii (Scopoli, 1763)	15.08.2015	3j		mh, *	SK, VS	Hei	nV, bnV
Araneus diadematus Clerck, 1757	15.08.2015	1♀ 21♂♂	ZFMK-TIS-2559044	sh, *	SK	Hei	nV
Araneus quadratus Clerck, 1757	15.08.2015	1♀ 1♂	ZFMK-TIS-2559045	h, *	SK	Hei	nV
Argiope bruennichi (Scopoli, 1772)	15.08.2015	1♀ 2♂♂		sh, *	SK	Hei	nV
Mangora acalypha (Walckenaer, 1802)	15.08.2015	1♀ 7j		h, *	SK, VS	Hei	nV, bnV
Neoscona adianta (Walckenaer, 1802)	15.08.2015	4♀♀ 2♂♂		mh, *	SK, VS	Hei	nV, bnV
Eresidae							
Eresus kollari Rossi, 1846	15.08.2015	1♀ 1♂	ZFMK-TIS-2558970	ss, 3	HF	Hei	Bd
Gnaphosidae							
Zelotes longipes (L. Koch, 1866)	15.08.2015	1♀	ZFMK-TIS-2558967	mh, *	HF	Hei	Bd
Linyphiidae							
Agyneta rurestris (C. L. Koch, 1836)	15.08.2015	1♀	ZFMK-TIS-2558974	h, *	VS	Hei	bnV
Bathyphantes gracilis (Blackwall, 1841)	15.08.2015	1♀		h, *	VS	Hei	bnV
Linyphia triangularis (Clerck, 1757)	15.08.2015	2♀♀ 1♂ 1j	ZFMK-TIS-2558966	h, *	SK	Hei	nV
Metopobactrus prominulus (O. P.-Cambridge, 1872)	15.08.2015	1♀	ZFMK-TIS-2558972	s, V	VS	Hei	bnV
Tenuiphantes mengei (Kulczyński, 1887)	15.08.2015	1♀	ZFMK-TIS-2558973	mh, *	VS	Hei	bnV
Lycosidae							
Pardosa palustris (Linnaeus, 1758)	15.08.2015	1♀	ZFMK-TIS-2558969	h, *	HF	Hei	Bd
Mimetidae							
Ero aphana (Walckenaer, 1802)	15.08.2015	1♀	ZFMK-TIS-2558965	ss, *	SK	Hei	nV
Philodromidae							
Rhysodromus histrio (Latreille, 1819)	15.08.2015	6j	ZFMK-TIS-2558977	es, R	SK	Hei	nV
Pisauridae							
Pisaura mirabilis (Clerck, 1757)	15.08.2015	2j		sh, *	SK	Hei	nV
Salticidae							
Dendryphantes rudis (Sundevall, 1833)	15.08.2015	4♀♀ 2♂	ZFMK-TIS-2558968	es, G	KS, SK	Hei	KZ
Evarcha arcuata (Clerck, 1757)	15.08.2015	2♂♂	ZFMK-TIS-2558978	s, *	VS	Hei	bnV
Heliophanus flavipes (Hahn, 1832)	15.08.2015	1♀	ZFMK-TIS-2559046	s, *	SK	Hei	nV
Marpissa muscosa (Clerck, 1757)	15.08.2015	2♀♀ 1♂ 1j		s, *	HF, KS	Hei	nV, KZ
Pellenes tripunctatus (Walckenaer, 1802)	15.08.2015	3j		s, G	VS	Hei	bnV
Philaeus chrysops (Poda, 1761)	15.08.2015	1j	ZFMK-TIS-2558979	neu	KS	Hei	KZ
Segestriidae							
Segestria senoculata (Linnaeus, 1758)	15.08.2015	1♀	ZFMK-TIS-2558976		HF	Hei	uTH
Tetragnathidae				s, *			
Tetragnatha obtusa C. L. Koch, 1837	15.08.2015	1j		ss, G	KS	Hei	KZ
Theridiidae							
Theridion pinastri L. Koch, 1872	15.08.2015	1♀		s, *	KS	Hei	KZ
Thomisidae							
Xysticus striatipes L. Koch, 1870	15.08.2015	6♂♂	ZFMK-TIS-2558964	s, G	SK	Hei	nV
Opiliones: Phalangiidae							
Lacinius dentiger (C. L. Koch, 1847)	15.08.2015	1i	ZFMK-TIS-2558971		KS	Hei	KZ
Lacinius horridus (Panzer, 1794)	15.08.2015	1i	ZFMK-TIS-2558975		HF	Hei	Bd
Phalangium opilio Linnaeus, 1758	15.08.2015	1i			HF	Hei	

laufend von Hand gefangen. Diese thermophile Art liebt trockene, warme und unbeschattete Habitate (Martens 1978).

Hervorzuhebende Nachweise vom ehemaligen Standortübungsplatz Stern-Buchholz:

Spinnen (Araneae)

***Agyneta fuscipalpa* (C. L. Koch, 1836) es, R**

1♂ wurde am 17.4.2016 in bodennaher Vegetation der offenen Heidefläche mittels Vegetationssaugers nachgewiesen (ZFMK-TIS 2569785). Diese in Mecklenburg-Vorpommern extrem seltene Art wurde bislang erst auf drei Messtischblät-

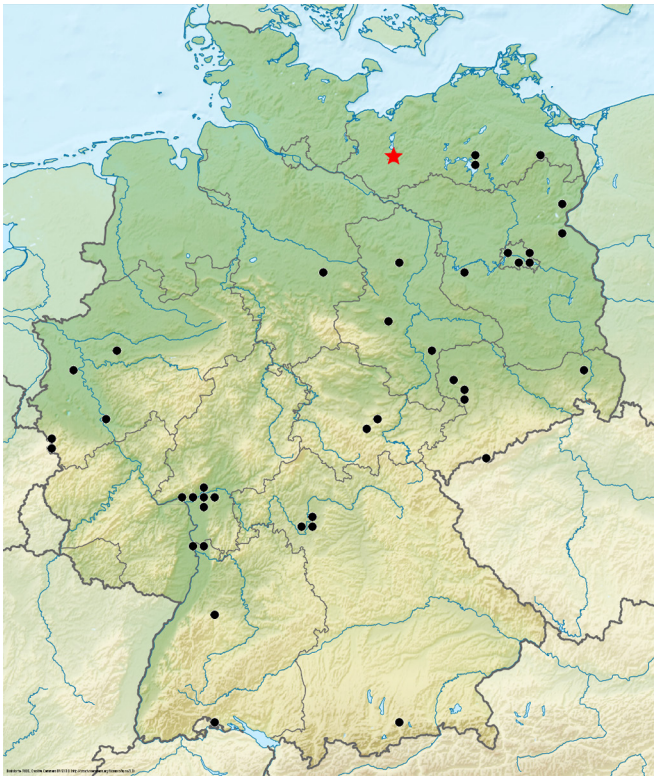

Abb. 3: Verbreitungskarte von *Agyneta fuscipalpa* in Deutschland (Arachnologische Gesellschaft 2016)
Fig. 3: Distribution map of *Agyneta fuscipalpa* in Germany (Arachnologische Gesellschaft 2016)

tern im östlichen Landesteil nachgewiesen. Der vorliegende Nachweis markiert den bisher westlichsten Fundort dieser Art in Mecklenburg-Vorpommern (Abb. 3). In Schleswig-Holstein ist *A. fuscipalpa* als ausgestorben/verschollen eingestuft (Lemke et al. 2013).

***Evarcha laetabunda* (C. L. Koch, 1846)**
(Zweiter Nachweis seit 2014)
Nachweis mittels Vegetationssaugers in *Calluna*-Heide in bodennaher Vegetation (1♀, Coll. ZFMK-TIS-2572590). Der Erstnachweis gelang 2014 in Leisterföhrde (Martin 2014) ebenfalls in *Calluna*-Heide. Dieser Fundort befindet sich nur knapp 5 km Luftlinie entfernt von einem Fundort in Schleswig-Holstein (kleinräumige *Calluna*-Heide bei Segrahn, 1♀ am 12.9.2015, bodennahe Vegetation, leg. Lemke).

***Harpactea hombergi* (Scopoli, 1763) ex, 0**
Im Gehölzstreifen (Mischwald) zwischen Heide und der Landesstraße L72 wurde am 17.4.2016 ein Individuum dieser Art unter Rinde stehenden Totholzes mit der Hand gefangen (1♀, ZFMK-TIS 2569782). Dieser Nachweis ist bedeutend, um den tatsächlichen Bestand dieser in Mecklenburg-Vorpommern anscheinend extrem selten nachgewiesenen Art richtig einordnen zu können. Nach aktueller Roter Liste gilt diese Art als ausgestorben/verschollen (Martin 2012). Der bis dahin einzige Nachweis stammt von der Insel Rügen (Wieser 1967).

***Lasaeola tristis* (Hahn, 11833) es, R**
Es wurde 1♂ mittels Vegetationssauger in der Heidefläche nachgewiesen (Coll. ZFMK-TIS 2572587). Diese Art tritt in nahezu ganz Europa auf. Sie fehlt nur in wenigen Ländern (Albanien, Bosnien-Herzegowina, Montenegro, Serbien, Griechenland und Moldawien) (Wiki der AraGes 2016), in welchen *L. tristis* aufgrund ihrer weiten europäischen Verbreitung jedoch auch zu vermuten ist. In Schleswig-Holstein wurde diese Art erstmals 2005 nachgewiesen (Lemke 2008). Für Mecklenburg-Vorpommern liegen bislang sechs Nachweise vor (alle Coll. D. Martin), für Schleswig-Holstein liegen drei

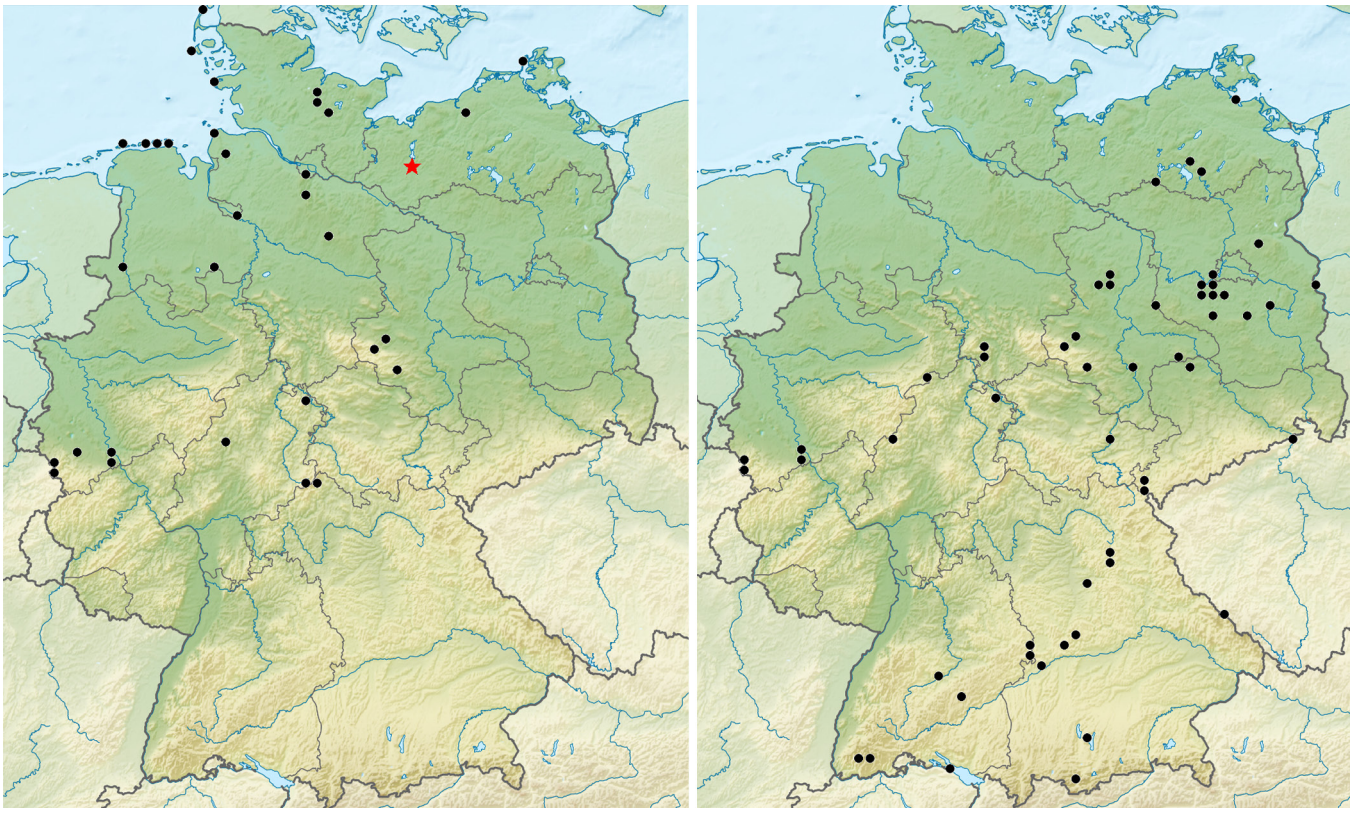

Abb. 4: Verbreitungskarte von *Peponocranium ludicrum* (links) und *P. orbiculatum* (rechts) in Deutschland (Arachnologische Gesellschaft 2016)
Fig. 4: Distribution map of *Peponocranium ludicrum* (left) and *P. orbiculatum* (right) in Germany (Arachnologische Gesellschaft 2016)

Tab. 2: Artenliste von Stern-Buchholz (Schwerin)/Species list from Stern-Buchholz (Schwerin)
Anzahl: j = Juvenile, i = Individuum ohne Geschechtsbestimmung; **RL** = Rote Liste (Kategorie s. Methoden); **Methoden:** HF = Handfang, GS = Gesiebe, KS = Klopfschirm, SK = Streifkescher, VS = Vegetationssauger; **Biotope:** Hei = Heide, Mwa = Mischwald; **Subbiotope:** bnV = bodennahe Vegetation, nV = niedrige Vegetation (z. B. Krautschicht), Lstr = Laubstreu, MoPo = Moospolster, uSt = unter Steinen, uTH = unter liegendem Totholz, Bd = am Boden, KZ = auf Kiefernzweigen

Taxon	Datum	Anzahl	Sammlung	RL	Methoden	Biotope	Subbiotop
Araneidae							
Aculepeira ceropegia (Walckenaer, 1802)	17.04.2016	1j	ZFMK-TIS 2569793	s, *	VS	Hei	nV
Agalenatea redii (Scopoli, 1763)	17.04.2016	1j	ZFMK-TIS 2569794	mh, *	VS	Hei	nV
Cercidia prominens (Westring, 1851)	12.05.2016	2♀♀	ZFMK-TIS 2572591	s,V	VS	Hei	bnV
Cercidia prominens (Westring, 1851)	21.10.2016	1♂	SMNK-ARA-13064	s,V	VS	Hei	bnV
Hypsosinga albovittata (Westring, 1851)	12.05.2016	1♀ 2♂♂	ZFMK-TIS 2572589	ss,*	VS	Hei	bnV
Mangora acalypha (Walckenaer, 1802)	17.04.2016	3j		h,*	VS	Hei	bnV
Mangora acalypha (Walckenaer, 1802)	12.05.2016	3♂♂ 4j		h,*	VS	Mwa/Hei	bnV
Agelenidae							
Agelena labyrinthica (Clerck, 1757)	12.05.2016	1j		s,*	HF	Hei	uSt
Anyphaenidae							
Anyphaena accentuata (Walckenaer, 1802)	17.04.2016	2j		s, *	GS	Mwa	Lstr
Clubionidae							
Clubiona subtilis L. Koch, 1867	17.04.2016	1♂		s, *	VS	Hei	bnV
Clubiona subtilis L. Koch, 1867	12.05.2016	2♀♀ 2♂♂		s, *	VS	Mwa	bnV
Clubiona terrestris Westring, 1851	17.04.2016	3♀♀		mh, *	GS	Mwa	Lstr
Dictynidae							
Dictyna arundinacea (Linnaeus, 1758)	12.05.2016	3♀♀ 1♂	ZFMK-TIS2572588	s,*	VS	Hei	bnV/nV
Dysderidae							
Harpactea hombergi (Scopoli, 1763)	17.04.2016	1♀	ZFMK-TIS 2569782	ex, 0	HF	MWa	Totholz
Gnaphosidae							
Micaria pulicaria (Sundevall, 1831)	17.04.2016	1♀	ZFMK-TIS 2569778	h,*	GS	Mwa	MoPo
Zelotes clivicola (L. Koch, 1870)	17.04.2016	1♂	ZFMK-TIS 2569780	s,*	GS	Mwa	MoPo
Hahniidae							
Hahnia helveola Simon, 1875	17.04.2016	1♀	ZFMK-TIS 2569773	s,V	GS	Mwa	MoPo
Hahnia pusilla C. L. Koch, 1841	17.04.2016	1♀ 2♂♂	ZFMK-TIS 2569744	s,V	GS	Mwa	MoPo
Linyphiidae							
Agyneta affinis (Kulczyński, 1898)	17.04.2016	2♂♂	ZFMK-TIS 2569786	s,*	VS	Hei	bnV
Agyneta affinis (Kulczyński, 1898)	12.05.2016	7♀♀ 5♂♂		s,*	VS	Hei	bnV
Agyneta fuscipalpa (C. L. Koch, 1836)	17.04.2016	1♂	ZFMK-TIS 2569785	es,R	VS	Hei	bnV
Agyneta rurestris (C. L. Koch, 1836)	21.10.2016	3♀♀ 2♂♂	SMNK-ARA-13066	h,*	VS	Hei	bnV
Anguliphantes angulipalpis (Westring, 1851)	17.04.2016	1♀		s, V	GS	Mwa	Lstr
Anguliphantes angulipalpis (Westring, 1851)	12.05.2016	1♀	ZFMK-TIS 2572582	s, V	VS	Mwa	bnV
Centromerita concinna (Thorell, 1875)	17.04.2016	1♀	ZFMK-TIS 2569784	s, *	VS	Hei	bnV
Centromerita concinna (Thorell, 1875)	21.10.2016	8♀♀ 4♂♂	SMNK-ARA-13068	s, *	VS	Hei	bnV
Centromerus dilutus (O. P.-Cambridge, 1875)	17.04.2016	1♀	ZFMK-TIS 2569776	ss, *	GS	Mwa	MoPo
Ceratinella brevis (Wider, 1834)	17.04.2016	1♂		mh, *	GS	Mwa	MoPo
Cnephalocotes obscurus (Blackwall, 1834)	17.04.2016	1♀	ZFMK-TIS 2569790	ss,*	VS	Hei	bnV
Dismodicus bifrons (Blackwall, 1841)	12.05.2016	3♀♀ 3♂♂		mh,*	VS	Mwa	bnV
Erigone atra Blackwall, 1833	17.04.2016	1♀		sh,*	VS	Hei	bnV
Metopobactrus prominulus (O. P.-Cambridge, 1872)	12.05.2016	1♂	ZFMK-TIS 2572586	s,V	VS	Hei	bnV
Microlinyphia pusilla (Sundevall, 1830)	12.05.2016	10♀♀ 2♂♂		mh,*	VS	Hei	bnV
Microneta viaria (Blackwall, 1841)	17.04.2016	7♀♀ 4♂♂	ZFMK-TIS 2569769	mh,*	GS	Mwa	Lstr
Minyriolus pusillus (Wider, 1834)	17.04.2016	1♂	ZFMK-TIS 2569770	s,V	GS	Mwa	Lstr
Neriene clathrata (Sundevall, 1830)	12.05.2016	3♀♀		mh,*	VS	Mwa	bnV
Pelecopsis parallela (Wider, 1834)	17.04.2016	1♀	ZFMK-TIS 2569789	mh,*	VS	Hei	bnV
Pelecopsis parallela (Wider, 1834)	12.05.2016	1♀		mh,*	VS	Hei	bnV
Pelecopsis parallela (Wider, 1834)	21.10.2016	1♂	SMNK-ARA-13065	mh,*	VS	Hei	bnV
Peponocranium ludicrum (O. P.-Cambridge, 1861)	17.04.2016	3♂♂	ZFMK-TIS 2569787	es, R	VS	Hei	bnV
Peponocranium ludicrum (O. P.-Cambridge, 1861)	12.05.2016	7♀♀ 2♂♂		es, R	VS	Hei	bnV
Pocadicnemis pumila (Blackwall, 1841)	12.05.2016	2♂♂		s,V	VS	Hei	bnV
Stemonyphantes lineatus (Linnaeus, 1758)	21.10.2016	1♀	SMNK-ARA-13071	mh,*	VS	Hei	bnV
Tapinocyba insecta (L. Koch, 1869)	17.04.2016	1♂	ZFMK-TIS 2569771	mh,*	GS	Mwa	Lstr

Taxon	Datum	Anzahl	Sammlung	RL	Metho-den	Biotope	Subbiotop
Tenuiphantes flavipes (Blackwall, 1854)	17.04.2016	1♀ 1♂		mh,*	GS	Mwa	Lstr
Tenuiphantes flavipes (Blackwall, 1854)	21.10.2016	1♀ 1♂	SMNK-ARA-13067	mh,*	VS	Hei	bnV
Tenuiphantes mengei (Kulczyński, 1887)	12.05.2016	1♀ 1♂		mh,*	VS	Mwa	bnV
Tenuiphantes mengei (Kulczyński, 1887)	21.10.2016	2♀♀	SMNK-ARA-13069	mh,*	VS	Hei	bnV
Tenuiphantes tenuis (Blackwall, 1852)	12.05.2016	1♂		mh,*	VS	Mwa	bnV
Tenuiphantes tenuis (Blackwall, 1852)	21.10.2016	2♀♀	SMNK-ARA-13070	h,*	VS	Hei	bnV
Walckenaeria antica (Wider, 1834)	21.10.2016	1♂	ZFMK-TIS-2588255	s,3	VS	Hei	bnV
Walckenaeria cucullata (C. L. Koch, 1836)	17.04.2016	1♀	ZFMK-TIS 2569779	s,V	GS	Mwa	MoPo
Lycosidae							
Alopecosa cuneata (Clerck, 1757)	17.04.2016	1♀	ZFMK-TIS 2569791	h, *	VS	Hei	bnV
Alopecosa cuneata (Clerck, 1757)	12.05.2016	1♂		h, *	VS	Hei	bnV
Pardosa agrestis (Westring, 1861)	12.05.2016	1♀ 9♂♂		mh,*	VS	Hei	bnV
Pardosa lugubris s.str. (Walckenaer 1802)	12.05.2016	1♂		ss,*	VS	Mwa	bnV
Pardosa monticola (Clerck, 1757)	17.04.2016	1♂	ZFMK-TIS 2569792	s, V	VS	Hei	bnV
Pardosa pullata (Clerck, 1757)	17.04.2016	2♂♂		h,*	VS	Hei	bnV
Pardosa pullata (Clerck, 1757)	12.05.2016	2♂♂		h,*	VS	Hei	bnV
Pardosa saltans Töpfer-Hofmann, 2000	12.05.2016	1♂		ss,*	VS	Mwa	bnV
Xerolycosa miniata (C. L. Koch, 1834)	12.05.2016	1♀	ZFMK-TIS 2572593	mh,*	HF	Hei	uSt
Philodromidae							
Tibellus oblongus (Walckenaer, 1802)	12.05.2016	1♂		mh,*	VS	Hei	bnV
Pisauridae							
Pisaura mirabilis (Clerck, 1757)	17.04.2016	1j		sh,*	GS	Mwa	MoPo
Phrurolithidae							
Phrurolithus festivus (C. L. Koch, 1835)	12.05.2016	1♀ 1j		mh,*	VS	Hei	bnV
Salticidae							
Euophrys frontalis (Walckenaer, 1802)	17.04.2016	1♀ 6j	ZFMK-TIS 2569775	s,V	GS	Mwa	Lstr/ MoPo
Euophrys frontalis (Walckenaer, 1802)	12.05.2016	1♂		s,V	VS	Hei	bnV
Evarcha laetabunda (C. L. Koch, 1846)	12.05.2016	1♀	ZFMK-TIS 2572590	n	VS	Hei	bnV
Heliophanus auratus C. L. Koch, 1835	12.05.2016	1♂	ZFMK-TIS 2572592	ss,*	VS	Hei	bnV
Heliophanus flavipes (Hahn, 1832)	12.05.2016	2♂♂	ZFMK-TIS 2572585	s,*	VS	Hei	bnV
Neon reticulatus (Blackwall, 1853)	17.04.2016	2j		s,V	GS	Mwa	MoPo
Phlegra fasciata (Hahn, 1826)	12.05.2016	1♀ 1j	ZFMK-TIS 2572583	s,G	VS	Hei	bnV
Segestriidae							
Segestria senoculata (Linnaeus, 1758)	17.04.2016	1j	ZFMK-TIS 2569783	s,*	VS	Hei	bnV
Tetragnathidae							
Metellina mengei (Blackwall, 1870)	17.04.2016	1♀ 1♂		mh,*	GS	Mwa	Lstr
Metellina mengei (Blackwall, 1870)	12.05.2016	2♂♂		mh,*	VS	Mwa	bnV
Pachygnatha degeeri Sundevall, 1830	12.05.2016	3♂♂		sh,*	VS	Hei	bnV
Theridiidae							
Episinus angulatus (Blackwall, 1836)	12.05.2016	1♀ 1♂		s,3	VS	Mwa	bnV
Euryopis flavomaculata (C. L. Koch, 1836)	17.04.2016	1j	ZFMK-TIS 2569777	s,*	GS	Mwa	MoPo
Lasaeola tristis (Hahn, 1833)	12.05.2016	1♂	ZFMK-TIS 2572587	es,R	VS	Hei	bnV
Neottiura bimaculata (Linnaeus, 1767)	12.05.2016	10j		h,*	VS	Mwa/Hei	bnV
Simitidion simile (C. L. Koch, 1836)	12.05.2016	2♂♂	ZFMK-TIS 2572584	s,*	VS	Hei	bnV
Thomisidae							
Xysticus cristatus (Clerck, 1757)	12.05.2016	1♀ 2♂♂		sh,*	VS	Hei	bnV
Miturgidae							
Zora spinimana (Sundevall, 1833)	17.04.2016	1♀	ZFMK-TIS 2569772	mh,*	GS	Mwa	Lstr

Nachweise in der Nähe der Landesgrenze zu Mecklenburg-Vorpommern vor. Es ist anzunehmen, dass *L. tristis* in Mecklenburg-Vorpommern zwar selten aber weit verbreitet ist.

***Peponocranium ludicrum* (O. P.-Cambridge, 1861) es, R**
Am 17.4.2016 wurden 3♂♂ (Coll. ZFMK-TIS 2569787) und 7♀♀ & 2♂♂ am 12.05.2016 auf bodennaher Vegetation der offenen Heidefläche nachgewiesen. Methode war immer der Vegetationssauger. *P. ludicrum* bevorzugt eher feuchtere *Calluna*-Heide (Schultz 1992) und war noch in der ersten Roten-Liste Mecklenburg-Vorpommerns als ausgestorben/verschollen eingestuft (Martin 1993). Diese Art wurde zwischen 2008 und 2009 in einer Vielzahl von Habitaten einer Küstendünenheide auf der Ostseeinsel Hiddensee mittels

Bodenfallen nachgewiesen, wobei sie am zahlreichsten in *Calluna*-Heide mit 161 von insgesamt 169 Individuen auftrat (Buchholz & Schirmel 2011). Vorher gab es nur einen einzigen Nachweis bei Rostock (Rabeler 1931). Der vorliegende Nachweis ist der bislang einzige im gesamten GBOL-Projekt (GBOL 2016). Nach Martin (in litt.) könnte *P. ludicrum* mehr nordwestlich (atlantisch) verbreitet sein, während *P. orbiculatum* ein mehr südöstliches, kontinental geprägtes Verbreitungsgebiet hat (Abb. 4).

Danksagung

Ich danke Christian Winkler, dass er es mir im Jahr 2015 ermöglichte, an einer Exkursion zum ehemaligen Standortübungsplatz bei Lübtheen teilzunehmen. Weiterer Dank gebührt Dieter Martin für die Durchsicht des Manuskriptes und hilfreichen Hinweisen vor dessen Abgabe. Tobias Bauer danke ich für die zeitnahe Einarbeitung eines Teils der Nachweise in die arachnologische Sammlung am Staatlichen Naturkundemuseum Karlsruhe sowie für Hinweise auf Fehlbestimmungen. Ebenso danke ich der Schriftleitung der Arachnologischen Mitteilungen für die sehr freundliche Unterstützung.

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Description of the unknown male of *Ozyptila tenerifensis* (Araneae: Thomisidae)

Jørgen Lissner

doi: 10.5431/aramit5308

Abstract. The unknown male of *Ozyptila tenerifensis* Wunderlich, 1992, an endemic species to Tenerife is described. This species is rarely collected and seems restricted to litter of understory broadleaf bushes in the Canary pine forest zone.

Keywords: Canary Islands, spider, taxonomy, Tenerife

Zusammenfassung. Erstbeschreibung des Männchens von *Ozyptila tenerifensis* (Araneae: Thomisidae). Das unbekannte Männchen von *Ozyptila tenerifensis* Wunderlich, 1992, ein Endemit von Tenerifa, wird beschrieben. Die Art wurde selten gefangen und scheint auf die Laubstreu von Büschen im Unterwuchs der Kanarienkiefer-Zone beschränkt zu sein.

Ozyptila tenerifensis Wunderlich, 1992 is the only *Ozyptila* species known from Tenerife. Just one other species, *O. atlantica* Denis, 1963, has been recorded in the Canary Islands and so far only from the island of Lanzarote (Schmidt 1980, Wunderlich 1992). This species was originally described from the Savage Islands (Denis 1963) situated 165 km to the north of the Canary Islands and is still only known from the female. In this study the hitherto unknown male of *O. tenerifensis* is described and data on its habitat and phenology is presented.

Material and methods

The spiders were collected by sifting leaf litter in a tray. Illustrations were created from photos of selected features using a Leica M205 A stereomicroscope fitted with Leica DFC450 digital camera connected to a computer with Leica Application Suite software, Zerene Stacker software and the vector graphics editor Inkscape.

Abbreviations

TL = total length
PL = prosoma length
PW = prosoma width
OL = opisthosoma length
CJL = Collection Jørgen Lissner
DZUL = Department of Animal Biology, Edaphology and Geology, University of La Laguna, Tenerife, Spain
NHMD = Natural History Museum of Denmark

Results

Taxonomy

***Ozyptila tenerifensis* Wunderlich 1992**: 494, f. 790-792 (Figs 1-4)

New material examined. SPAIN, Canary Islands, Tenerife, Las Raices (El Rosario) (N28°25'31", W16°22'38"), pine forest (1075 m), 3.IX.2015, 3♀♀ 2♂♂ 1 juvenile (two males and one female were collected as subadults and matured in captivity mid-late October 2015), leg. Lissner (CJL: 10931). The male used for illustrations of the male palpal organs is deposited at NHMD; Pinar de Taucho (Adeje) (N28° 9'28" W 16°41'51"), pine forest (1300 m), 14.IV.2007, 1♀, leg. Nuria Macías-Hernández (Coll. DZUL-34306).

Fig. 1: *Ozyptila tenerifensis* Wunderlich, 1992, male

Fig. 2: *Ozyptila tenerifensis* Wunderlich, 1992, female

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submitted 3.1.2017, accepted 26.2.2017, online 11.3.2017

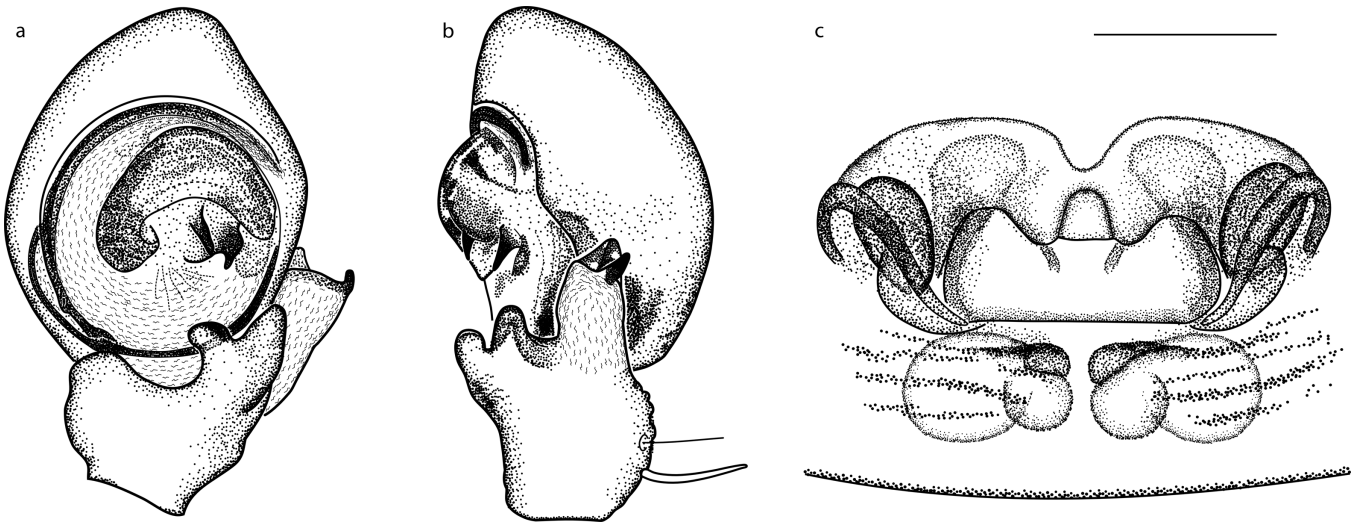

Fig. 3: *Ozyptila tenerifensis* Wunderlich, 1992: **a.** male palp in ventral view; **b.** in retrolateral view; **c.** epigyne in ventral view. Scale bars a, b: 0.2 mm, c: 0.13 mm

Diagnosis. The male is separated from male congeners by the mitten-shaped ventral apophysis and the broad whitish retrolateral apohysis of the palpal tibia. It differs from the morphologically similar *Ozyptila pauxilla* (Simon, 1870) distributed in the Western Mediterranean (World Spider Catalog 2017) by the straight and tooth-like process close to tip of the retrolateral apophysis, this process is relatively long and curved in *O. pauxilla*. Also the shape of the tegular apohysis is characteristic, terminating in two blackish tooth-like processes of which the medial one points towards the retrolateral apophysis. In *O. pauxilla* both these teeth point posteriad. Patella and tibia of legs I and II are blackish in males of *O. tenerifensis* while pale in *O. pauxilla*. The female differs from female congeners by the shape of the epigyne and its colouration. *O. tenerifensis* has a short, truncated hood, this structure is longer and rounded apically in *O. pauxilla*. The legs of females are clearly annulated with dark brown in *O. tenerifensis* in contrast to the uniformly light brown legs of *O. pauxilla*. The epigyne of the second Canarian *Ozyptila* species, *O. atlantica*, is with a forked hood according to illustration by Denis (1963), thus very different from the very short, truncated hood of *O. tenerifensis*. The two species are also separable by the shape of the clavate hairs at the centre of the opisthosoma. These hairs are relatively thicker distally in *O. atlantica* (length-to-width ratio (L/W) ≈ 2.1) than in *O. tenerifensis* (L/W ≈ 5.8), compare Figs 788 and 790 in Wunderlich (1992).

Description

Male

Measurements (n=2). TL: 2.64, 2.92; PL: 1.22, 1.31; PW: 1.23, 1.29.

Habitus. Habitus of live specimen as in Fig. 1. Prosoma black except for a yellow-brown spot at fovea, yellow-brown eye tubercles and a narrow, whitish rim along the lateral edges of the carapace. Coxae yellow-brown, femora black, patellae and tibia of legs I and II nearly black, those of legs III and IV less black or annulated. Metatarsi and tarsi yellow-brown. Abdomen brown with irregular black pattern enclosing a lanceolate

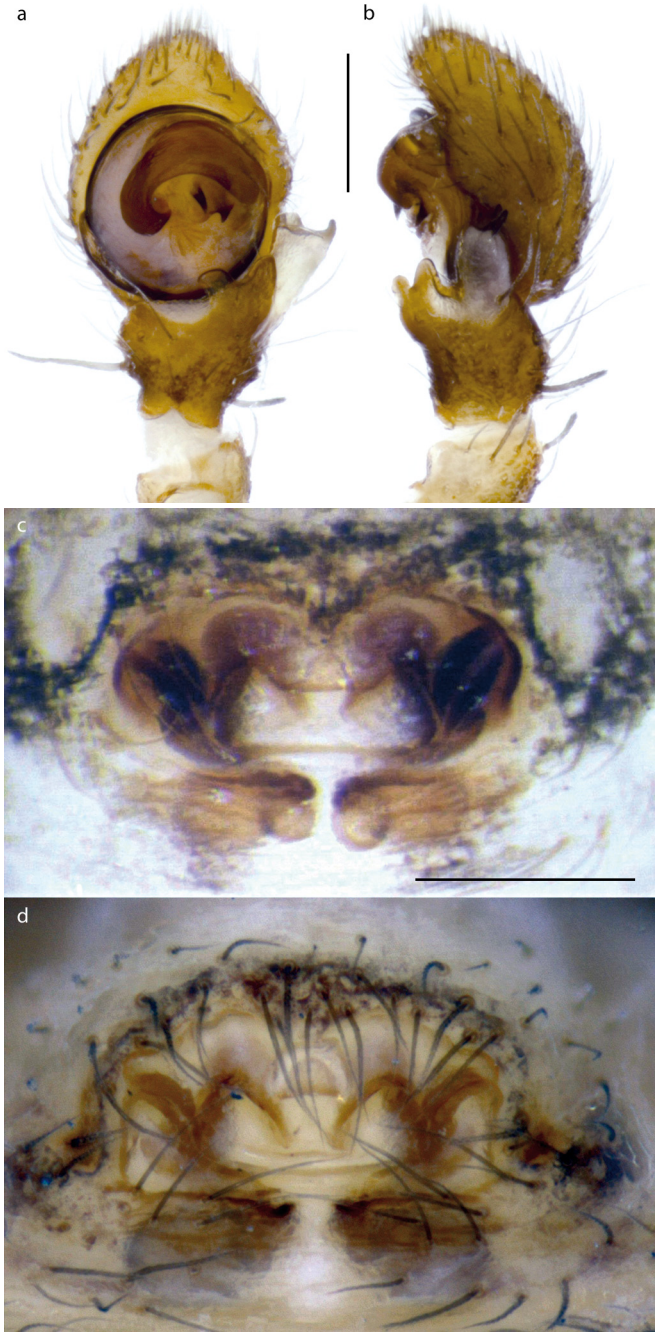

Fig. 4: *Ozyptila tenerifensis* Wunderlich, 1992, photographs: **a.** male palp in ventral view; **b.** same in retrolateral view; **c.** epigyne in ventral view, older female; **d.** same, freshly moulted female. Scale bars a-d: 0.2 mm

Fig. 5: Habitat of *Ozyptila tenerifensis* Wunderlich, 1992. Specimens were found in leaf litter of the fire tree in Canary pine forest at Las Raices, Tenerife.

cardiac mark. With small white dots along edges and at sides. Shape of prosoma and configuration of eyes are typical of *Ozyptila*. Legs short, stout. Leg spination as described for the female in Wunderlich (1992). Abdomen truncated anteriorly, broad posteriorly with wrinkled sides and rear. Carapace and dorsum of abdomen with dense cover of blunt or narrowly clavate setae, in older specimens most setae have fallen off. Male palp. Femur, patella and tibia with clavate hairs. Tibia with ventral and retrolateral tibial apophyses (Figs 3a, b; 4a, b). Ventral apophysis mitten-shaped, arising retrolaterad on segment and is broad with two rounded processes. Retrolateral apophysis broad, whitish, except for two small processes apically, one of which is tooth-like (black in one specimen, grey-brown in a second), the second process is a lightly sclerotized triangular plate. Basal tegular ridge smoothly rounded and without teeth. Tegulum with an acute tooth near the middle. A second hooked tooth with a broad base is situated more retrolaterally (Figs 3a, 4a). The points of the two teeth are oriented approximately 45° to each other when seen in ventral view. Cymbium egg-shaped in dorsal view, densely clothed with fine hairs, a few small spines of varying sizes are present along prolateral edge. Embolus filiform and curved along the rim of the cymbium. Apex of embolus comes to a very fine, nearly straight tip and is protected by a membranous structure.

Female

The description here is supplemental to the one provided by Wunderlich (1992).

Measurements (n=3) TL: 3.21-3.85, PL: 1.32-1.45, PW: 1.41-1.47.

Habitus. Habitus of live specimen as in Fig. 2. As male but paler with the black markings replaced by dark brown markings of a lesser extent. Legs more uniformly annulated than in male. Epigyne. The epigyne is illustrated in Fig. 3c and photos are presented in Figs 4c-d. The illustration is based on an older female collected at Pinar de Taucho (Fig. 4c). Rather indistinct transverse wrinkles are seen in posterior half. Hood short, broadly truncated. Epigynes varies in transparency and the structures of the vulva in the posterior part are difficult to discern in some specimens. An illustration of the vulva is available in Wunderlich (1992).

Habitat and phenology

Specimens of *Ozyptila tenerifensis* were found at the type locality of Las Raices, in leaf litter of the fire tree (*Myrica faya*) growing scattered in the understory of Canary pine (*Pinus canariensis*) forest (Fig. 5). The fire tree grows rather commonly on nitrogen-poor sites such as young lava flows and open-canopy forest ecosystems in the mesic fayal-brezal zone (500-1500 m) and the xeric pine forest zone (1000-2000 m). No *Ozyptila* specimens could be found in areas of the forest floor with litter consisting of pine needles only. Two subadult males collected in September both matured in October in captivity. Adult females have been found in September and one subadult collected in September matured in October in captivity. Wunderlich (1992) collected a female in a Barber trap operated between April and June. The maturity period probably extends from September to October with females persisting at least until April. However, more material needs to be collected before more detailed conclusions can be made on phenology.

Distribution

Endemic to Tenerife. Known only from two localities: Taucho (Adeje) 1300 m in the south and Las Raices (El Rosario) 1075 m in the north. The two localities are separated by approximately 45 km. Pine forests cover large expanses of land in the mountains of Tenerife and the species may not be as uncommon as present data suggests.

Acknowledgements

I wish to thank Pedro Oromí, DZUL, for providing material of *O. tenerifensis*. Nikolaj Scharff is thanked for permission to use the Leica equipment at NHMD, University of Copenhagen. Miguel Arnedo, Carmen Urones and Paolo Pantini are thanked for helpful comments on the manuscript.

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Two species of the genus *Neobisium* (Pseudoscorpiones: Neobisiidae) from western Iran

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doi: 10.5431/aramit5309

Abstract. Records of two epigean species of *Neobisium*, *N.* (*N.*) *alticola* Beier, 1973 and *N.* (*N.*) *validum* (L. Koch, 1873) are presented for western Iran. *N.* (*N.*) *alticola*, including all nymphal stages, and males of *N.* (*N.*) *validum* are redescribed and illustrated.

Keywords: Arachnida, Middle East, pseudoscorpions, taxonomy

Zusammenfassung. Zwei *Neobisium*-Arten (Pseudoscorpiones: Neobisiidae) aus dem West-Iran. Nachweise zweier *Neobisium*-Arten, *N.* (*N.*) *alticola* Beier, 1973 und *N.* (*N.*) *validum* (L. Koch, 1873), aus dem West-Iran werden vorgestellt. *N.* (*N.*) *alticola*, einschließlich aller Nymphenstadien, und Männchen von *N.* (*N.*) *validum* werden wiederbeschrieben und abgebildet.

Ten species of the family Neobisiidae Chamberlin, 1930 have been reported from Iran (Harvey 2013). Of these, four are attributed to the subgenus *Neobisium* (*Neobisium*) Chamberlin, 1930: *N.* (*N.*) *validum* (L. Koch, 1873), from Mazandaran and Fars Provinces, *N.* (*N.*) *fuscimanum* (C.L. Koch, 1843), from Mazandaran Province, *N.* (*N.*) *erythrodactylum* (L. Koch, 1873), from Tehran and Mazandaran Provinces, and *N.* (*N.*) *alticola* Beier, 1973, from Eastern Azerbaijan Province (Beier 1951, 1971, Schawaller 1983a).

Two of these species, *N.* (*N.*) *alticola* and *N.* (*N.*) *validum* were recently collected from western Iran. The original description of *N.* (*N.*) *alticola* is rather incomplete and lacks figures apart from illustration of the pedipalp (Beier 1973). Similarity, Dashdamirov & Schawaller (1992a, 1992b) only illustrated the pedipalp of *N.* (*N.*) *alticola* in dorsal view. Therefore, this contribution presents a detailed redescription and numerous standard illustrations of this species in addition to short descriptions of its nymphal stages. Additionally, the males of *N.* (*N.*) *validum* are redescribed from a new provincial record.

Material and methods

The specimens examined for this study are lodged in the collection of the Acarology Laboratory, Islamic Azad University of Arak (IAUA), Iran. The morphological terminology and mensuration follow Chamberlin (1931), Harvey (1992), Harvey et al. (2012), Judson (2007) and Zaragoza (2008). The studied specimens were mounted on microscope slides in Hoyer's medium, studied with an Olympus BH-2 compound microscope and illustrated with an attached drawing tube. Measurements were taken at the highest possible magnification using an ocular graticule.

Abbreviations. L = length, W = width, D = depth
Trichobothriotaxy. eb = external basal, esb = external sub-basal, est = external sub-terminal, et = external terminal, ib = internal basal, isb = internal sub-basal, ist = internal sub-terminal, it = internal terminal
Chaetotaxy. Em = external microseta, Im = internal microseta, Mm = medial microseta, TS = tactile seta

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submitted 11.12.2016, accepted 12.3.2017, online 6.4.2017

Systematics

Family Neobisiidae Chamberlin, 1930
Subfamily Neobisiinae Chamberlin, 1930
Genus *Neobisium* Chamberlin, 1930
Subgenus *Neobisium* Chamberlin, 1930
***Neobisium* (*Neobisium*) *alticola* Beier, 1973** (Figs 1-21)
Neobisium (*Neobisium*) *alticola* Beier 1973: 226-227, fig. 1

Material examined. IRAN. 2♀♀, 1 tritonymph, under stone, Borujerd, 33°55'06"N, 48°50'27"E, altitude 1600 m, Lorestan Province, 2 July 2016, coll. M. Zamani (IAUA); 1♀, 1 tritonymph, 1 deutonymph, 1 protonymph, in litter, Dorood, 33°19'42"N, 48°52'41"E, altitude 1560 m, Lorestan Province, Iran, 16 July 2016, coll. M. Zamani (IAUA).

Redescription

Female

Carapace. Reddish brown, entirely smooth, 0.98–1.07 x longer than broad, with 2 pairs of corneate eyes, anterior eyes larger than posterior pairs, with 24–26 setae, anterior margin with 4-6 setae, preocular setae absent, 1 seta situated between eyes on each side, posterior margin with 7–8 setae (Fig. 1), setae long and acute, transverse furrows absent, epistome large, triangular and apically rounded (Fig. 1), each anterolateral corner with a protuberance, with 6 microlyrifissures, one pair situated in ocular zone and two pairs located on posterior margin.
Tergites. Brown, lighter in colour than carapace, smooth, all setae simple and acute, uniseriate, X with 2 and XI with 4 long tactile setae, anal cone with two pairs of short setae, chaetotaxy: 7: 8: 10: 12: 12: 12: 11: 12: 12: 2T1T2: T2T1T2T: 2.
Sternites. II–III yellowish brown, others brown, slightly lighter in colour than tergites, entirely smooth, IV–V divided, genital area with 7–8 microsetae on anterior operculum, 13–15 setae on posterior operculum (Fig. 2), with one large median and two small, elongate lateral cribriform plates, anterior spiracles with 4, posterior spiracles with 3 short suprastigmal setae, all setae acute and simple, uniseriate, X–XI with two long tactile setae, chaetotaxy: 7–8: (4)13–15(4): (3)10(3): 15: 15–16: 14: 16–17: 16–17: 5T1T6: 1T3T1: 2.
Pleural membrane. Coarsely granulate
Chelicera. Brown, hand with 7 acuminate setae (Fig. 3), galea knob-like, hyaline (Fig. 4), galeal seta situated sub-medially, at same level as last tooth on movable finger, fixed finger with 14–15 teeth, distal teeth small and rounded, median teeth acute, irregular in size, distal teeth small, acute and close-set,

movable finger with 7 teeth, serrula interior with 19–21 and serrula exterior with 25–27 blades, rallum with 8 blades, 2 distal blades long and denticulate, other 6 blades simple, smooth and acuminate, 2–3 proximalmost blades smallest (Fig. 4).

Pedipalps. Reddish brown, slightly darker in colour than carapace, entirely smooth (Figs 8-9), coxa with 11–13 setae, manducatory process with 5 long, acuminate setae, plus 6-8 additional setae, retrolateral face of trochanter with 3 stout and short setae, trochanter L/W 2.00–2.18, femur with short pedicel, 1 micro-protuberance in basal third of retrolateral margin, basal half of prolateral margin irregular, setae on prolateral side longer than setae on retrolateral side, with 2–3 long setae without enlarged alveoli situated sub-medially (Fig. 9), L/W 3.71–3.81, patella with short, stout pedicel [L=0.20 mm], patella distinctly shorter and wider than femur, with 3 lyrifissures situated basally, L/W 2.69–2.91, chela (with pedicel) L/W 3.59–3.72, chela (without pedicel) L/W 3.38–3.48, chelal setae simple and acute, movable finger 1.17–1.20 times longer than hand (with pedicel), chelal hand with slightly curved sides, fixed finger with 8 and movable finger with 4 trichobothria (Figs 8-9), fixed finger with trichobothria et, it and est aggregated in distal third, it located at same level as et, ist medial, isb on retrolateral face, ib at same level as isb, eb and esb located sub–basally, movable finger with trichobothrium st situated closer to t than to sb, sb in the middle between st and b, distance b–sb longer than t–st, dense, short sensory setae retrolaterally along fixed finger, basal half of fixed finger with 7 dorsal sensory setae (Em=2, Mm=4, Im=1), basal half of movable finger with 5–6 retrolateral sensory setae, prolateral face of chelal hand with 4-5 long setae situated at base of fixed finger (Fig. 10), fixed finger with 54–58 contiguous, retroconical teeth, basal teeth smaller, reaching to level of trichobothrium ib, movable finger with 46–50 small, contiguous teeth, not reaching to level of trichobothrium b, nodus ramosus only present in fixed chelal finger and situated distinctly distal to et (Fig. 11).

Legs. Brown, smooth, coxa I with long, sclerotized, triangular, apically rounded anterolateral process (Fig. 5), coxal chaetotaxy: 8–9:8–10:7:10–11, sub–terminal setae bifid, longer branch denticulate (Fig. 6), claws simple, arolia simple and shorter than claws. Leg I: femur L/D 4.00–4.80, patella L/D 2.27–2.42, femur 1.54–1.60x longer than patella, tibia L/D 3.22–3.89, metatarsus L/D 2.57–2.85, tarsus L/D 4.00–4.28. Leg IV (Fig. 7): femur L/D 1.50–1.70, patella L/D 1.87–2.00, femur + patella L/D 3.22–3.48, tibia with a moderately long tactile seta situated medially (TS=0.47–0.50), L/D 4.92–5.07, metatarsus with one tactile seta situated basally (TS=0.11–0.14), L/D 3.00–3.33, tarsus with a tactile seta situated proximal to middle (TS=0.36–0.43), L/D 5.00–5.43.

Dimensions (in mm). Carapace: 0.75–0.76/0.70–0.76. Pedipalp: trochanter 0.40–0.48/0.20–0.22, femur 0.75–0.80/0.20–0.21, patella 0.62–0.67/0.23–0.24, chela (with pedicel) 1.36–1.45/0.37–0.39, chela (without pedicel) 1.29–1.32, hand (with pedicel) L.0.68–0.72, movable finger L. 0.80–0.86. Leg I: femur 0.40–0.48/0.10, patella 0.25–0.31/0.11–0.13, tibia 0.29–0.35/0.09, metatarsus 0.17–0.20/0.06–0.07, tarsus 0.27–0.30/0.07. Leg IV: femur 0.34–0.37/0.20–0.24, patella 0.40–0.45/0.20–0.24, femur + patella 0.74–0.81, tibia 0.60–0.66/0.12–0.13, metatarsus 0.24–0.30/0.08–0.09, tarsus 0.38–0.41/0.07–0.08.

Short descriptions of nymphs

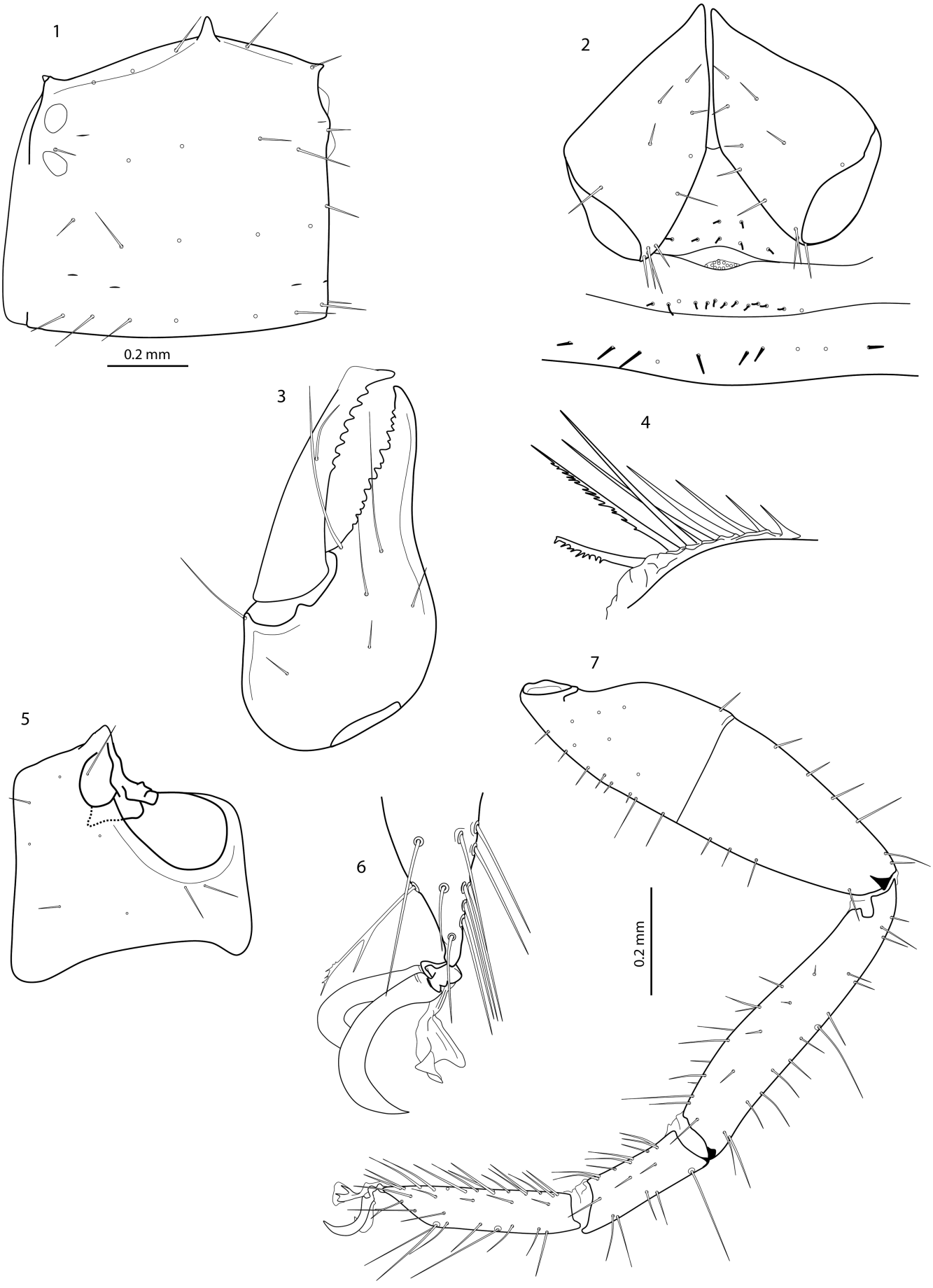
Tritonymph. Weakly sclerotized, opisthosoma and legs yellowish brown, carapace and chelicerae brown, pedipalps brown (in one specimen more sclerotized and reddish brown). Carapace: 1.19–1.32 times wider than long, small, blunt-tipped epistome present (Fig. 12), with two pairs of eyes, six microlyrifissures, chaetotaxy (Fig. 12): 4:6:6:8–10. Chelicera: hand with 6 setae, rallum with 7 blades, galea knob-liked. Pedipalp: entirely smooth (Figs 13-14), dorsal ridge of trochanter with 2 stout setae, trochanter L/W 1.94–2.67, femur L/W 3.59–3.67, patella L/W 2.22–2.30, chela (with pedicel) L/W 3.77–3.82, chela (without pedicel) L/W 3.54–3.57, hand (with pedicel) 1.73–1.75, movable finger longer than hand (with pedicel), fixed finger with 7 and movable finger with 3 trichobothria (Fig. 14), fixed finger with trichobothrium ist at same level as st, isb absent, movable finger with trichobothrium st slightly closer to t than to b, sb absent, nodus ramosus situated distal to et on fixed chelal finger, basal half of fixed finger with 6 dorsal sensory setae (Em = 2, Mm = 4, Im = 0), fixed chelal finger with 47–48 and movable finger with 39–43 teeth. Legs: coxal setae 6:5–6:6:7–9, tibia, metatarsus and tarsus IV with a long tactile seta (tibia IV of one specimen without tactile seta).

Dimensions (in mm). Carapace: 0.50–0.52/0.62–0.66. Pedipalp: trochanter 0.31–0.32/0.12–0.16, femur 0.55–0.61/0.15–0.17, patella 0.40–0.46/0.18–0.20, chela (with pedicel) 0.98–1.07/0.26–0.28, chela (without pedicel) 0.92–1.00, hand (with pedicel) L.0.45–0.49, movable finger L. 0.58–0.63.

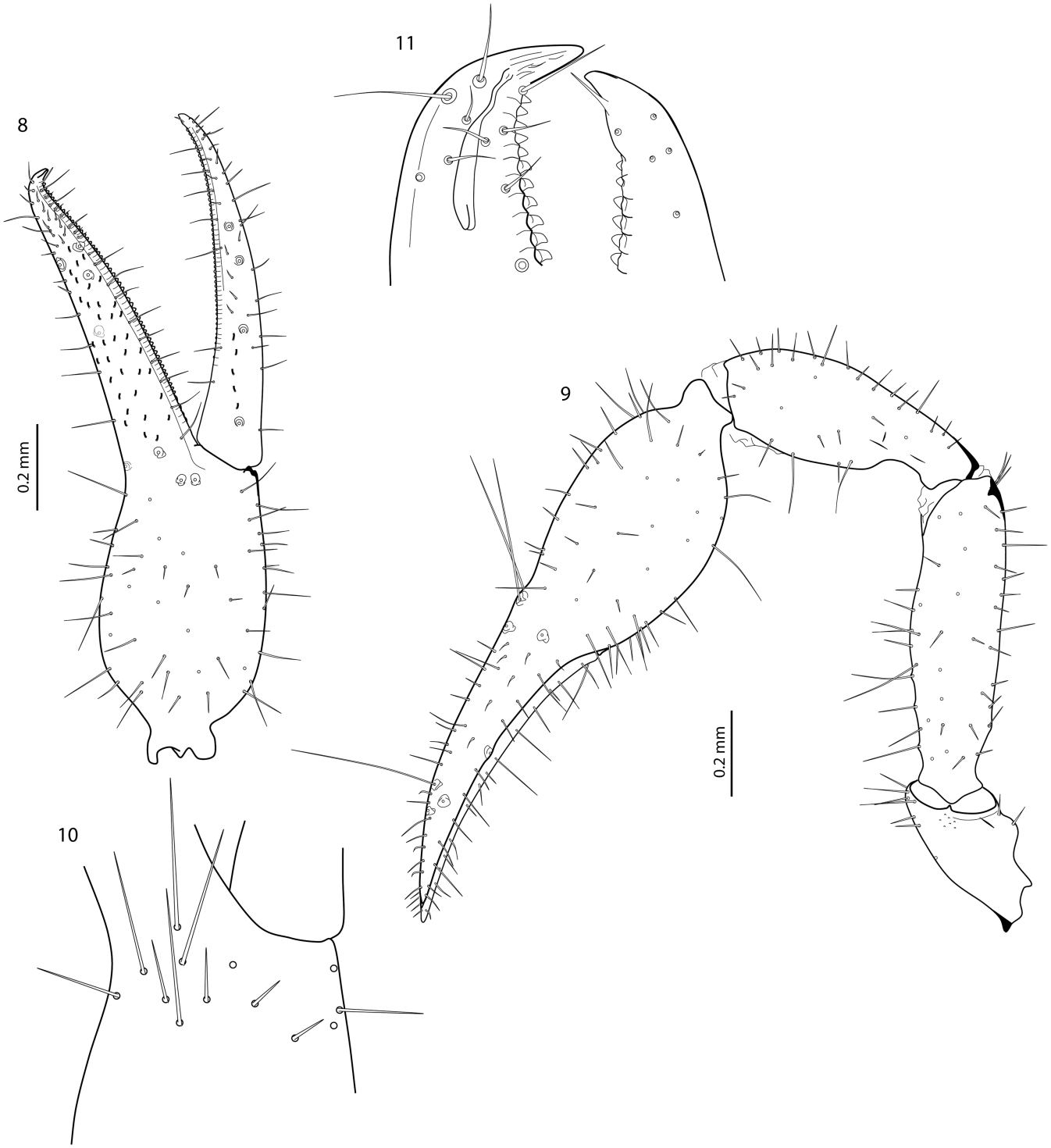
Deutonymph. Weakly sclerotized, opisthosoma, legs, carapace and chelicerae yellowish brown, pedipalps light brown, chela slightly darker than basal segments. Carapace: slightly shorter than broad, L/W 0.95, blunt-tipped epistome present (Fig. 15), with two pairs of eyes, six microlyrifissures, chaetotaxy (Fig. 15): 4:6:6:6. Chelicera: hand with 5 setae, rallum with 6 blades, galea knob–liked. Pedipalp: entirely smooth (Figs 16-17), retrolateral face of trochanter with 1 stout seta, trochanter L/W 1.83, femur L/W 3.17, patella L/W 2.23, chela (with pedicel) L/W 3.52, chela (without pedicel) L/W 3.21, hand (with pedicel) L/W 1.63, movable finger longer than hand (with pedicel), fixed finger with 6 and movable finger with 2 trichobothria (Fig. 17), fixed finger lacking trichobothria isb and esb, movable finger with trichobothrium t situated at the same level as it, st and sb absent, nodus ramosus situated distal to et in fixed chelal finger, basal half of fixed finger with 3 dorsal sensory setae (Em=0, Mm=3, Im=0), fixed chelal finger with 36 and movable finger with 30 teeth. Legs: coxal setae 5:5:4:4, tibia, metatarsus and tarsus IV each with a long tactile seta.

Dimensions (in mm). Carapace: 0.38/0.40. Pedipalp: trochanter 0.22/0.12, femur 0.38/0.12, patella 0.29/0.13, chela (with pedicel) 0.67/0.19, chela (without pedicel) 0.61, hand (with pedicel) L. 0.31, movable finger L. 0.39.

Protonymph. Weakly sclerotized, opisthosoma, legs, carapace and chelicerae yellowish brown, basal segments of pedipalps pale brown, chela light brown. Carapace: slightly wider than long, L/W 0.91, blunt-tipped epistome present (Fig. 18), with two pairs of eyes, with 4 microlyrifissures, chaetotaxy (Fig. 18): 4:6:4:4. Chelicera: hand with 4 setae, rallum with 5 blades, galea knob–liked. Pedipalp: entirely smooth (Figs 19-20),



Figs 1-7: *Neobisium* (*Neobisium*) *alticola* Beier, 1973 ♀; **1.** carapace, dorsolateral view, **2.** coxae IV and sternites II-IV), **3.** chelicera, ventral view (serrulae omitted), **4.** rallum (distal blade broken), **5.** left coxa I, ventral view, **6.** tip of left tarsus IV, claws and arolium, **7.** right leg IV (trochanter omitted)



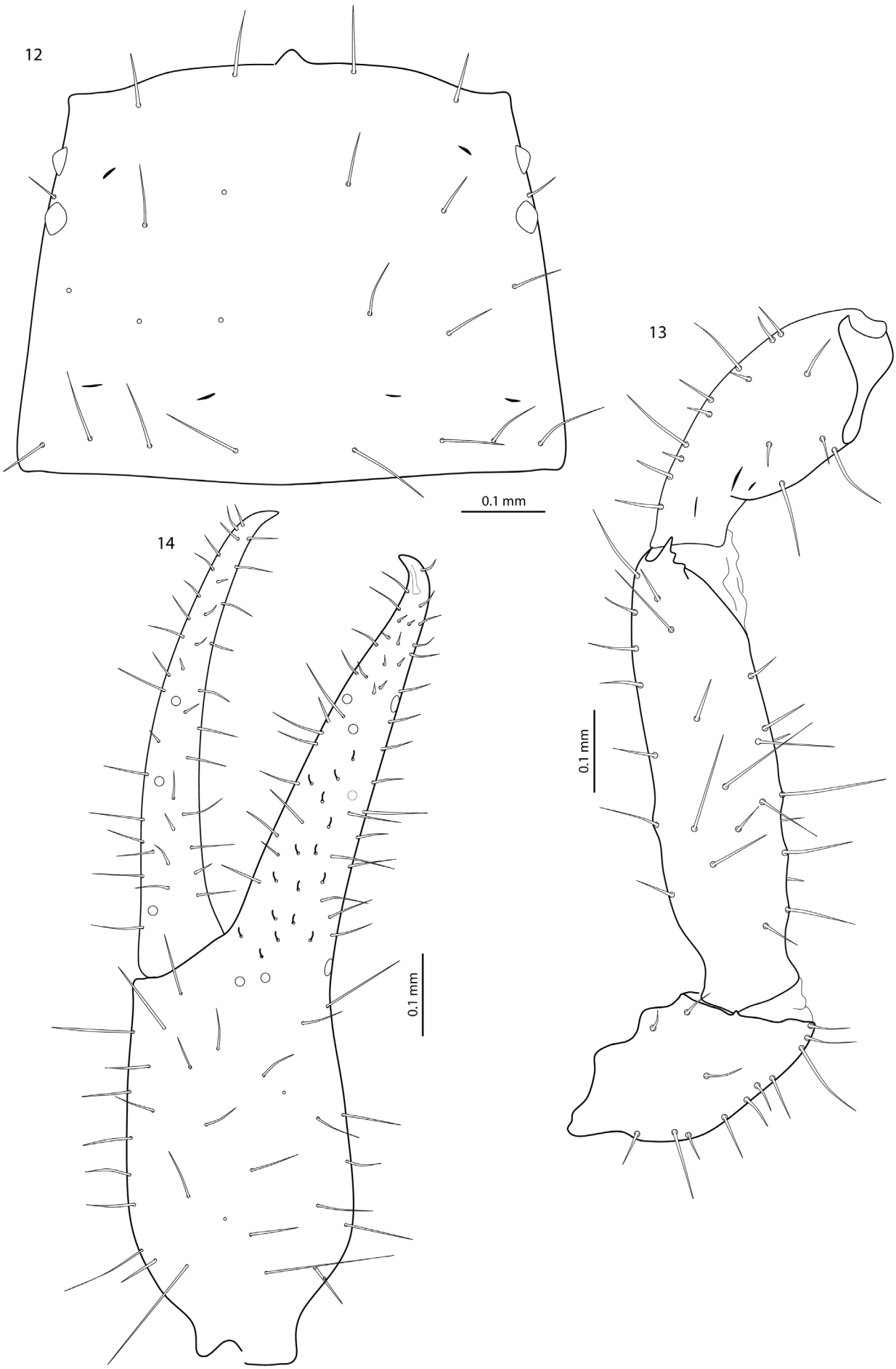
Figs 8-11: *Neobisium* (*Neobisium*) *alticola* Beier, 1973♀; **8.** right chela, lateral view, **9.** pedipalp, dorsal view, **10.** distal part of chelal hand and bases of fingers, ventrolateral view, **11.** tip of chelal fingers, lateral view

retrolateral face of trochanter without stout seta, trochanter L/W 1.87, femur L/W 2.78, patella L/W 1.30, chela (with pedicel) L/W 3.43, chela (without pedicel) L/W 3.21, hand (with pedicel) L/W 1.64, movable finger longer than hand (with pedicel), fixed finger with 3 and movable finger with 1 trichobothria (Fig. 20), fixed finger lacking trichobothria isb, ib, it, est and esb, movable finger with trichobothrium t situated basally, nodus ramosus situated distal to et in fixed chelal finger, basal half of fixed finger without dorsal sensory setae, fixed chelal finger with 36 and movable chelal finger with 30 teeth. Legs: all coxae with one seta, tibia, metatarsus and tarsus IV each with a tactile seta.

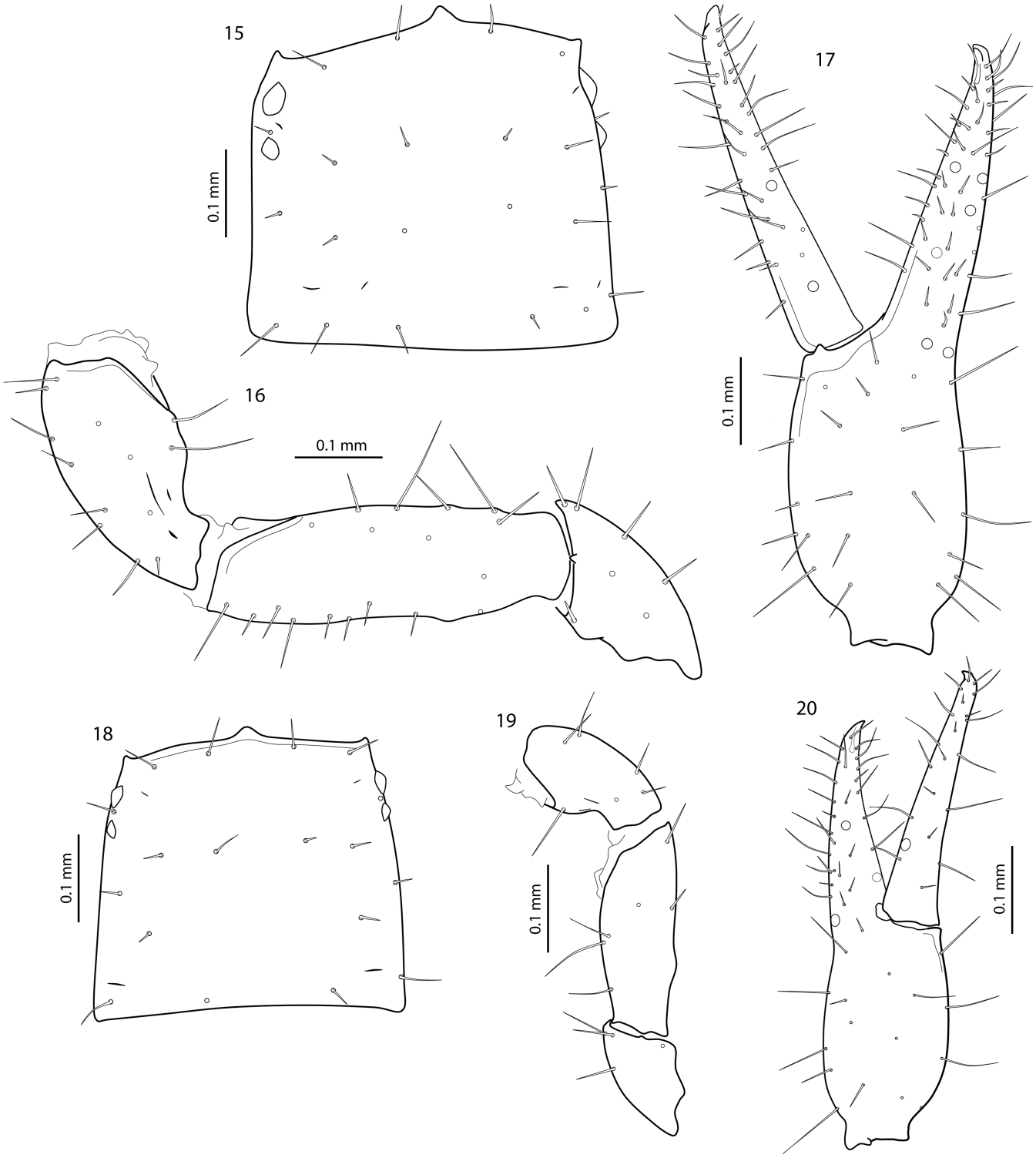
Dimensions (in mm). Carapace: 0.30/0.33. Pedipalp: trochanter 0.15/0.08, femur 0.25/0.09, patella 0.13/0.10, chela (with pedicel) 0.48/0.14, chela (without pedicel) 0.45, hand (with pedicel) L. 0.23, movable finger L. 0.28.

Remarks

Neobisium (*Neobisium*) *alticola* Beier, 1973 was originally described from specimens collected in Turkey, and has been since



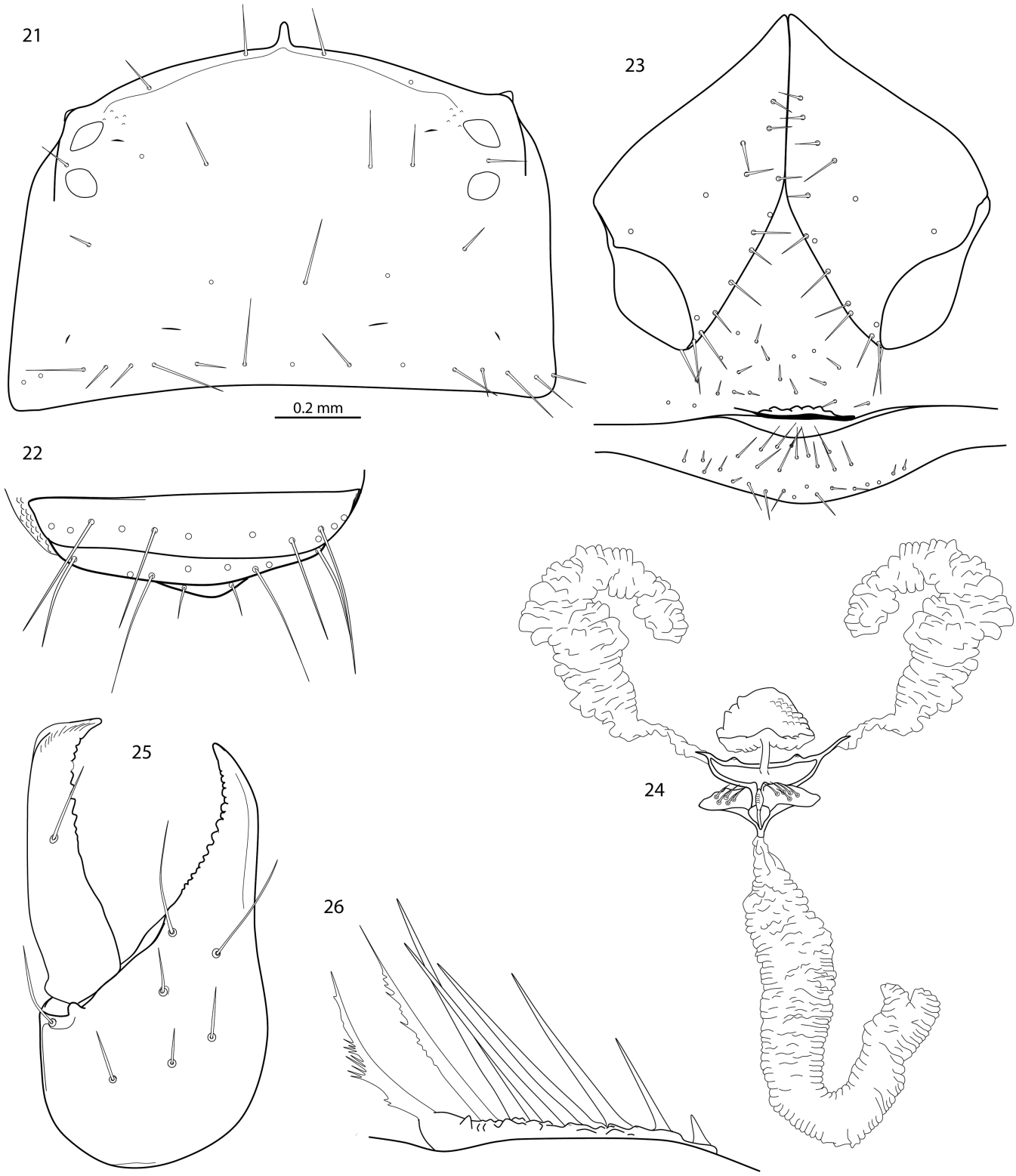
Figs 12-14: *Neobisium* (*Neobisium*) *alticola* Beier, 1973 tritonymph; **12.** carapace, dorsal view, **13.** pedipalp minus chela, dorsal view, **14.** left chela, lateral view (teeth omitted)



Figs 15-20: *Neobisium* (*Neobisium*) *alticola* Beier, 1973; **15-17** deutonymph, **18-20** protonymph; **15.** carapace, dorsal view, **16.** pedipalp minus chela, dorsal view, **17.** left chela, lateral view (teeth omitted), **18.** carapace, dorsal view, **19.** pedipalp minus chela, dorsal view, **20.** right chela, ventrolateral view (teeth omitted).

reported from Iran and Azerbaijan (Schawaller 1983a, Dashdamirov & Schawaller 1992a, 1992b). It was first recorded from Iran by Schawaller (1983a) in the north-west. The newly collected specimens from Iran are similar to the type of *N.* (*N.*) *alticola*, e.g., in the Iranian females, there are 7-8 setae on the posterior margin of the carapace (6-10 in the types), the pedipalpal femur size is 0.75-0.80/0.20-0.21mm (0.80/0.20 mm for the type), and the fixed chelal finger bears 54-58 teeth (60 in the type). In addition, the trichobothrial pattern is very similar, with trichobothrium it being situated at approximately the same level as et, and ist located in the middle of the fixed finger (see Beier 1973: Fig. 1). The only notable difference between the Iranian specimens and the types is the presence of a median tactile seta on tibia IV of the Iranian females which was not described for the types by Beier (1973).

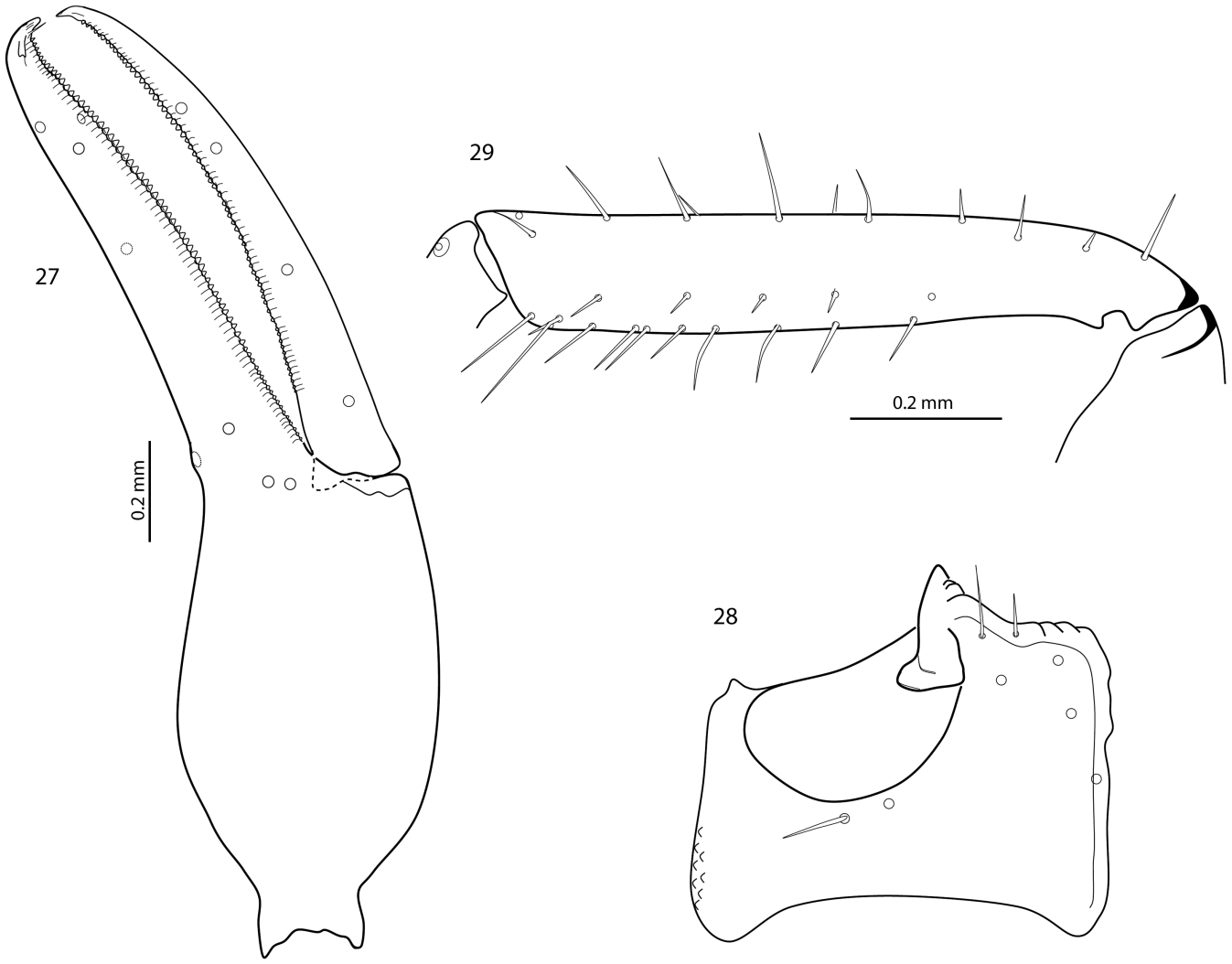
Neobisium (*N.*) *alticola* resembles *N.* (*N.*) *validum* (L. Koch, 1873), which is distributed around the Middle East, central Asia and eastern Europe (Harvey 2013). They can be



Figs 21-26: *Neobisium* (*Neobisium*) *validum* (L. Koch, 1873) ♂; **21.** carapace, dorsal view, **22.** tergites X-XI, dorsal view, **23.** coxae IV and genital opercula, **24.** genitalia, **25.** chelicera, dorsal view, **26.** rallum

differentiated by the following characters: in *N.* (*N.*) *validum*, the chelal hand is more rounded in dorsal view, the chelal teeth are greater in number, trichobothrium et is situated distinctly proximal to it, and ist is situated proximal to the middle of the fixed finger (see Beier 1949: Fig. 8, Beier 1963: Fig. 98, Ćurčić 1984: Fig. 13, Dashdamirov & Schawaller 1992a: Fig. 30, Dashdamirov & Schawaller 1992b: Fig. 7r, Schawaller & Dashdamirov 1988: Figs 29-30).

Because of the presence of only a small number of nymphs and because of the absence of males, only limited comparison with the development of other *Neobisium* species can be made. Nonetheless, the sequence of the appearance of individual trichobothria on the chelal fingers, the rallar blades and the setae on the cheliceral hand during development resemble those documented for the other *Neobisium* species (e.g. Gabbutt 1965, Gabbutt & Vachon 1965).



Figs 27-29. *Neobisium* (*Neobisium*) *validum* (L. Koch, 1873), ♂; **27.** right chela, lateral view (setae omitted), **28.** right coxa I, ventral view, **29.** left tibia IV

***Neobisium* (*Neobisium*) *validum* (L. Koch, 1873)**
(Figs 22-29)
Obisium validum L. Koch, 1873: 56-57

Material examined. IRAN. 3♂♂ under stone, Firooz-Abad, 33°42'35"N, 45°48'06"E, altitude 2000 m, Kermanshah Province, 18 May 2013, coll. M. Kahrarian (IAUA).

Redescription
Male
Carapace. Mostly smooth, a few minute granules present beside anterior eyes (Fig. 21), 1.35–1.37x wider than long (in flattened specimens), with 2 pairs of corneate eye, 30–31 setae, chaetotaxy: 4:6:5–6:14–16.
Tergites. Undivided, smooth, all setae simple and acute, uniseriate, X–XI each with four long tactile setae (Fig. 22), anal cone with two pairs of short setae, chaetotaxy: 12–13: 12: 12: 12: 11: 13: 12: 12: 10–11: 2T1T2T1T2: T1T2T1T: 2.
Sternites. Entirely smooth, IV–VI with median suture line, anterior operculum with 19 setae, posterior operculum with 12 long anterior setae and 17 short setae (fig. 23), genital organ with long lateral and median genital sacs, 5 pairs of glandular setae (Fig. 24), anterior spiracles with 5 and posterior spiracles with 4 suprastigmal setae, uniseriate, X with two and XI with four long tactile setae, chaetotaxy: 19: (5)29(5): (4)13(4): 18: 13: 12: 12: 12: 4T1T4: T2T2T2T: 2.
Pleural membrane. Coarsely granulate
Chelicera. Brown, hand with 7 acuminate setae (Fig. 25), galea knob-like, galeal seta situated medially, fixed finger with 15 and movable finger with 7 teeth, serrula interior with 25 and serrula exterior with 29 blades, rallum with 8 blades (Fig. 26).
Pedipalps. Trochanter L/W 2.17–2.21, femur L/W 4.43–4.61, patella with 3 lyrifissures situated basally, L/W 2.56–2.57, chela (with pedicel) L/W 3.58–3.61, chela (without pedicel) L/W 3.39–3.42, movable finger 1.14–1.16 times longer than hand (with pedicel), fixed finger with 8 and movable finger with 4 trichobothria (Fig. 27), fixed finger with trichobothrium it situated slightly distal to et, ist located slightly distal to middle, basal half of fixed finger with 17-27 dorsal sensory setae (Em=10-15, Mm=5-9, Im=2-3), fixed finger with 68–71 retroconical and contiguous teeth, basal teeth smaller, reaching to level of trichobothrium ib, movable finger with 60–66 small and contiguous teeth, not reaching to level of trichobothrium b, nodus ramosus only present in fixed chelal finger and situated distinctly distal to et.
Legs. Brown, smooth, coxa I with long, triangular, sclerotized and apically pointed anterolateral process (Fig. 28), coxal

chaetotaxy: 8:6:6:16. Leg I: femur L/D 5.16–5.54, patella L/D 3.07–3.50, femur 1.45–1.60x longer than patella, tibia L/D 5.11–5.50, metatarsus L/D 4.00–4.67, tarsus L/D 4.85–4.86. Leg IV: femur L/D 1.83–1.89, patella L/D 2.14–2.17, femur + patella L/D 3.96–4.11, tibia without tactile seta (fig. 29), L/D 6.00–6.13, metatarsus with one tactile seta situated basally (TS=0.13), L/D 4.30–4.40, tarsus with a tactile setae situated proximal to middle (TS=0.40), L/D 5.50–5.89.

Dimensions (in mm). ♂ Carapace: 0.85–0.89/1.15–1.19. Pedipalp: trochanter 0.62–0.65/0.28–0.30, femur 1.20–1.24/0.26–0.28, patella 0.90–0.92/0.35–0.36, chela (with pedicel) 1.90–1.95/0.53–0.54, chela (without pedicel) 1.78–1.85, hand (with pedicel) L.0.97–1.00, movable finger L. 1.11–1.16. Leg I: femur 0.61–0.62/0.11–0.12, patella 0.40–0.42/0.12–0.13, tibia 0.44–0.46/0.08–0.09, metatarsus 0.28/0.06–0.07, tarsus 0.34/0.07. Leg IV: femur 0.53–0.55/0.28–0.30, patella 0.62–0.65/0.29–0.30, femur + patella 1.15–1.20, tibia 0.90–0.92/0.15, metatarsus 0.43–0.44/0.10, tarsus 0.53–0.55/0.09–0.10.

Remarks

Neobisium (*N.*) *validum* was previously reported from Mazandaran Province in northern Iran by Beier (1951) and Schawaller (1983a), and from Fars Province in southern Iran by Beier (1971). The species *Neobisium* (*N.*) *caucasicum* (Beier, 1932) from Armenia, *N.* (*N.*) *turcicum* Beier, 1949 from Turkey and *N.* (*N.*) *baniskhevii* Kobakhidze, 1960 from Georgia were synonymized with *N.* (*N.*) *validum* by Schawaller (1983b). In addition, Dashdamirov & Schawaller (1992a) synonymized *N.* (*N.*) *zhiltovae* Ćurčić, 1984 from Turkmenistan with *N.* (*N.*) *validum*.

On the basis of the carapacal chaetotaxy (see Dashdamirov & Schawaller 1992a: Fig. 29), trichobothriotaxy (see Ćurčić 1984: Fig. 13), pedipalpal shape (see Dashdamirov and Schawaller 1992a: Figs 30-31, Schawaller & Dashdamirov 1988: Fig. 28), the entirely smooth pedipalp, the pedipalpal size and the numbers of chelal teeth, the males found in Iran are very similar to the female from Turkmenistan described by Ćurčić (1984). For example, there are 29 setae on the carapace of the female from Turkmenistan, 13 of which are situated on the posterior margin. Also, the size of the pedipalpal femur is 1.23/0.28 mm, and the chela is 2.16/0.63 mm for the Turkmen material (Ćurčić 1984). The only observable difference is the absence of a tactile seta on tibia IV of the males from Iran, which is present in the specimen collected from Turkmenistan (see Ćurčić 1984: Fig. 15).

Acknowledgements

The authors are grateful to Dr. Mark S. Harvey and an anonymous referee for reviewing the manuscript and providing helpful comments and to Mr. Mahmoud Nassirkhani for his assistance.

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Ein Beitrag zur Springspinnenfauna Spaniens mit drei Erstnachweisen für die Balearen (Araneae, Salticidae)

Michael Schäfer & Ernst Klimsa

doi: 10.5431/aramit5310

Abstract. A contribution to the salticid fauna of Spain with three first records for the Balearic Islands (Araneae, Salticidae). In the course of several collection trips on the Spanish mainland and Mallorca, 18 species of jumping spiders were recorded, including three species discovered for the first time in the Balearic Islands: *Hasarius adansoni* (Audouin, 1826), *Heliophanus ramosus* Wesołowska, 1986 and *Thyene imperialis* (Rossi, 1846). In addition, the first European record of *Heliophanus stylifer* Simon, 1878 is corrected: it refers to a misidentified female of *Heliophanus ramosus* Wesołowska, 1986; accordingly, *H. stylifer* has to be removed from the European checklist.

Keywords: distribution, Europe, faunistics, spider

Zusammenfassung. Während mehrerer Exkursionen auf dem spanischen Festland und der Baleareninsel Mallorca wurden 18 Springspinnenarten nachgewiesen, darunter mit *Hasarius adansoni* (Audouin, 1826), *Heliophanus ramosus* Wesołowska, 1986 und *Thyene imperialis* (Rossi, 1846) drei Arten erstmalig für die Balearen. Außerdem wird der europäische Erstnachweis von *Heliophanus stylifer* Simon, 1878 zu *Heliophanus ramosus* Wesołowska, 1986 korrigiert; *H. stylifer* muss dementsprechend von der europäischen Artenliste entfernt werden.

Während mehrerer Exkursionen auf dem spanischen Festland sowie der Baleareninsel Mallorca wurden zwischen 2013 und 2016 insgesamt 35 Springspinnen aus 18 Arten bzw. 14 Gattungen gesammelt.

Material und Methoden

Das Material stammt größtenteils vom Zweitautor. Die Bestimmung der Tiere erfolgte durch den Erstautor. Einige Tiere wurden als Jungtiere gesammelt und später zur Reifehäutung gebracht. In diesen Fällen wird das Datum der Reifehäutung separat angegeben.

Alle Tiere wurden als Belege in 70 % Ethanol konserviert und in der Sammlung des Erstautors archiviert. Sämtliche Fotos entstanden mit Canon Spiegelreflex-Kameras (EOS 50D/EOS 5D Mark IV). Dabei wurde für die Lebendfotos ein Canon MP-E 65mm Lupenobjektiv verwendet. Für die Aufnahmen der Genitalpräparate kamen die Kameras direkt montiert am Fototubus eines Motic SMZ-168 TP Stereomikroskops zum Einsatz.

Ergebnisse

***Aelurillus luctuosus* (Lucas, 1846)**

SPANIEN, Mallorca, Halbinsel Alcudia, 39.861001°N 3.161408°E, 79 m ü. NN, steiniger Hang an wasserarmen Bach, 04.11.2016: 1♂; Andalusien, bei San José, 36.800099°N 2.068603°W, 20 m ü. NN, steinige Ruderalfläche, fast kein Bewuchs, 26.03.2016: 1♂; Andalusien, bei Malaga, 36.776129°N 4.487631°W, 192 m ü. NN, ausgetrocknetes Bachbett, am Rand einer Wiese, 30.03.2016: 1♀.

Bestimmung. Azarkina & Logunov (2006), Metzner (1999)

Verbreitung. Mediterran bis Turkmenistan (World Spider Catalog 2017)

***Cyrba algerina* (Lucas, 1846)**

SPANIEN, Mallorca, bei Camp de Mar, 39.538260°N 2.426812°E, 40 m ü. NN, Küsten-Macchie, unter Stein, 30.10.2013: 1♂; Mallorca, am Col de ses Ànimes, 39.600073°N 2.363756°E, 350 m ü. NN, trockener Feldweg, unter Stein, 26.12.2013: 1♂; Andalusien, bei San José, 36.800099°N 2.068603°W, 20 m ü. NN, vegetationsarme Fläche, unter Stein, 26.03.2016: 1♂.

Bestimmung. Metzner (1999)

Verbreitung. Kanarische Inseln bis Zentralasien (World Spider Catalog 2017)

***Euophrys gambosa* (Simon, 1868)**

SPANIEN, Andalusien, bei San José, 36.741993°N 2.127205°W, 9 m ü. NN, steinige Ruderalfläche, fast kein Bewuchs, 28.03.2016: 1♀, 10.04.2016: 1 Eikokon (in Gefangenschaft) – Reifehäutung 13.07.2016: 1♂.

Bestimmung. Metzner (1999), Prószyński (2003)

Verbreitung. Mittelmeerraum (World Spider Catalog 2017), gemäß Morano et al. (2014) neu für Andalusien

***Evarcha jucunda* (Lucas, 1846)**

SPANIEN, Mallorca, Can Picafort, 39.772016°N 3.144079°E, 4 m ü. NN, Tisch im Hotelgarten, 01.11.2016: 1♂.

Bestimmung. Logunov (2015), Metzner (1999)

Verbreitung. Mittelmeerraum, eingeführt in Belgien und Deutschland (World Spider Catalog 2017)

***Hasarius adansoni* (Audouin, 1826)**

SPANIEN, Mallorca, Peguera, 39.538975°N 2.450761°E, 13 m ü. NN, Hotelmauer, 01.11.2015: 1♂.

Bestimmung. Metzner (1999)

Verbreitung. Kosmopolitisch (World Spider Catalog 2017), gemäß Morano et al. (2014) neu für die Balearen

***Heliophanus agricola* Wesołowska, 1986** (Abb. 1-4)

SPANIEN, Andalusien, bei San José, 36.802635°N 2.080044°W, 35 m ü. NN, Feldweg an Campingplatzrand, relativ viel Pflanzenbewuchs, 27.03.2016: 2♂, 1♀, 2juv – Reifehäutung 24.06.2016: 1♀, 28.06.2016: 1♂, 21.05.2016: 1 Eikokon (in Gefangenschaft) – Reifehäutung 22.09.2016: 1♀, 22.09.2016: 1♀, 25.09.2016: 1♀, 25.09.2016: 1♀, 22.10.2016: 1♂.

Bestimmung. Logunov (2015), Wesołowska (1986)

Verbreitung. Algerien, Spanien (World Spider Catalog 2017)

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eingereicht 29.1.2017, angenommen 12.3.2016, online 6.4.2016

Abb. 1: *Heliophanus agricola,* Weibchen, Dorsalansicht
Fig. 1: *Heliophanus agricola*, females, dorsal habitus

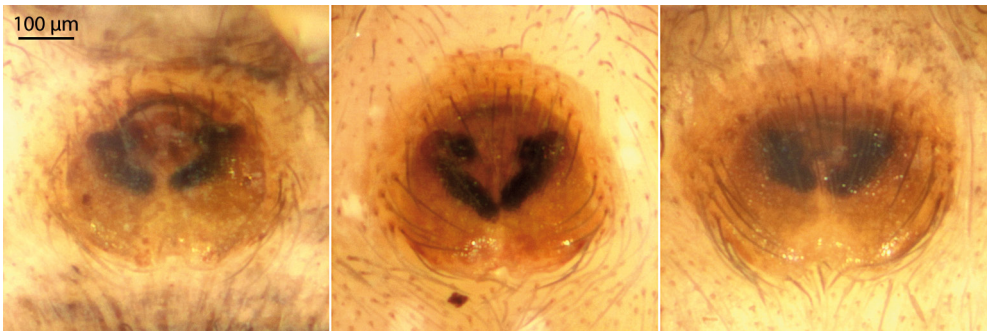

Abb. 2: *Heliophanus agricola*, Weibchen, Epigyne
Fig. 2: *Heliophanus agricola*, females, epigyne

Abb. 3: *Heliophanus agricola*, Männchen, Dorsalansicht
Fig. 3: *Heliophanus agricola*, male, dorsal habitus

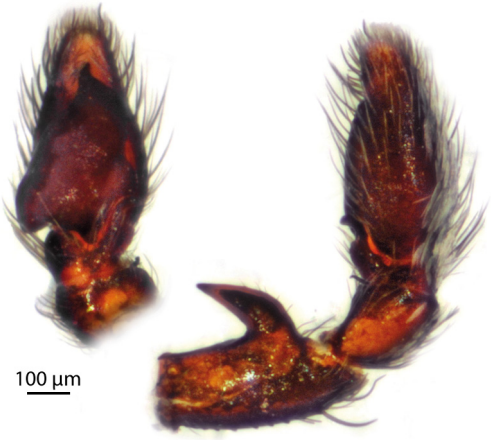

Abb. 4: *Heliophanus agricola*, Männchen, linker Pedipalpus
Fig. 4: *Heliophanus agricola*, male, left palp

Im Gegensatz zur Erstbeschreibung durch Wesołowska (1986) zeigen die gesammelten und nachgezüchteten Weibchen der Art (Abb. 1-2) eine auffällige Variabilität in Färbung und Musterung (Abb. 1). Dabei zeigen sich alle Abstufungen von ungemustert – ockerfarben bis dunkelbraun mit deutlicher Fleckenzeichnung. Diese Variationsbreite ist selbst bei den weiblichen Nachkommen ein und desselben Muttertieres vorhanden. Im Gegensatz dazu ist der Habitus aller gesammelten und nachgezüchteten Männchen (Abb. 3-4) nahezu identisch.

***Heliophanus apiatus* Simon, 1868**
SPANIEN, Mallorca, La Trapa, 39.591986°N 2.355613°E, 101 m ü. NN, auf Steinen im Wald, 01.11.2015: 1♀.

Bestimmung. Wesołowska (1986)
Verbreitung. Portugal bis Italien (World Spider Catalog 2017)

***Heliophanus kochii* Simon, 1868**
SPANIEN, Andalusien, bei Malaga, 36.776472°N 4.488802°W, 184 m ü. NN, Flussufer, in niedrigem Pflanzenbewuchs, 31.03.2016: 1♂.
Bestimmung. Wesołowska (1986).
Verbreitung. Paläarktis, USA (eingeführt) (World Spider Catalog 2017)

***Heliophanus ramosus* Wesołowska, 1986** (Abb. 5-6)
SPANIEN, Mallorca, Albufera, 39.78507°N 3.129383°E,

Abb. 5: *Heliophanus ramosus*, Männchen, Dorsalansicht
Fig. 5: *Heliophanus ramosus*, male, dorsal habitus

Abb. 6: *Heliophanus ramosus*, Männchen, Frontalansicht
Fig. 6: *Heliophanus ramosus*, male, frontal habitus

6 m ü. N, Feuchtfläche in Dünenkiefernwald, 24.03.2014: 1♀; Mallorca,Alcudia,39.819164°N3.110487°E,0mü.NN,Strauch in Ruderalfläche am Es Lac Gran, 03.11.2016: 1♂.
Weiteres Material. PORTUGAL, Algarve, Südwestspitze, 37.049981°N 8.954842°W, 71 m ü. NN, Altdüne, 27.04.2012: 1♂.

Abb. 7: *Heliophanus ramosus*, Männchen, linker Pedipalpus
Fig. 7: *Heliophanus ramosus*, male, left palp

Bestimmung. Logunov (2015), Wesołowska (1986)
Verbreitung. Algerien, Spanien (World Spider Catalog 2017), gemäß Morano et al. (2014) neu für die Balearen

Das hier aufgeführte weibliche Tier wurde vom Erstautor in einer vorherigen Arbeit (Schäfer 2015) zu *Heliophanus stylifer* Simon, 1878 gestellt. Diese Bestimmung und der damit verbundene Erstnachweis der Art für Europa werden hiermit revidiert.

Zum damaligen Zeitpunkt war lediglich das Männchen von *H. ramosus* beschrieben und damit die große Ähnlichkeit der weiblichen Genitalstrukturen von *H. stylifer* und *H. ramosus* noch unbekannt. Bis zur Erstbeschreibung des Weibchens von *H. ramosus* durch Logunov (2015) war eine Fehlinterpretation des Materials als *H. stylifer* unvermeidbar, zumal damals lediglich ein einzelnes Weibchen vom Fundort zur Verfügung stand. Erst die Beschreibung durch Logunov (2015) und der hier aufgeführte Nachweis eines eindeutig als *H. ramosus* bestimmbaren Männchens, welches ca. 4 Kilometer vom Fundort des Weibchens entfernt gesammelt wurde, machen nun eine Uminterpretation des damaligen Fundes möglich.

Im Gegensatz zu den sehr ähnlichen weiblichen Genitalstrukturen (Logunov 2015) von *H. stylifer* und *H. ramosus* sind die Männchen beider Arten schon auf den ersten Blick eindeutig anhand der Form der Femurapophyse des Pedipalpus voneinander zu trennen (Logunov 2015, Wesołowska 1986). Während die Femurapophyse bei *H. ramosus* tief gegabelt ist (Abb. 7), weist sie bei *H. stylifer* lediglich eine winzige Teilung an der Spitze auf.

Für *Heliophanus ramosus* existieren bisher Nachweise für Algerien und das spanische Festland (World Spider Catalog 2017) sowie ein noch nicht publizierter Nachweis für Portugal aus dem Jahre 2012 (s. weiteres Material). Für die Balearen ist diese Art als neu zu werten.

Da *H. ramosus* innerhalb mehrerer Jahre auf Mallorca nachgewiesen wurde, kann von einer etablierten Population ausgegangen werden.

***Icius hamatus* (C. L. Koch, 1846)**
SPANIEN, Andalusien, bei Malaga, 36.834713°N 4.524301°W, 194 m ü. NN, Flussufer, in niedrigem Pflanzenbewuchs, 31.03.2016: 1juv – Reifehäutung 07.05.2016: 1♂.
Bestimmung. Alicata & Cantarella (1994), Metzner (1999)
Verbreitung. Paläarktis (World Spider Catalog 2017)

***Menemerus semilimbatus* (Hahn, 1829)**
SPANIEN, Mallorca, Colonia St. Jordi, 39.313289°N 3.004773°E, 0 m ü. NN, auf Felsen direkt am Meer, 29.10.2013: 1♂, 1♀; Andalusien, bei Las Negras, 36.903560°N 1.980037°W, 17 m ü. NN, Wohnsiedlung, Gartenrand, 29.03.2016: 1♀; Andalusien, bei Malaga, 36.835402°N 4.524365°W, 202 m ü. NN, Feldsteine, Nähe Flussufer, 31.03.2016: 1♂.
Bestimmung. Metzner (1999)
Verbreitung. Kanarische Inseln bis Aserbaidschan, Iran; eingeschleppt in Chile, Argentinien und den USA (World Spider Catalog 2017)

***Menemerus taeniatus* (L. Koch, 1867)**
SPANIEN, Mallorca, Naturpark s'Albufera, 39.797349°N 3.105052°E, 1 m ü. NN, Holzgeländer, 28.10.2013: 1♂, 1♀;

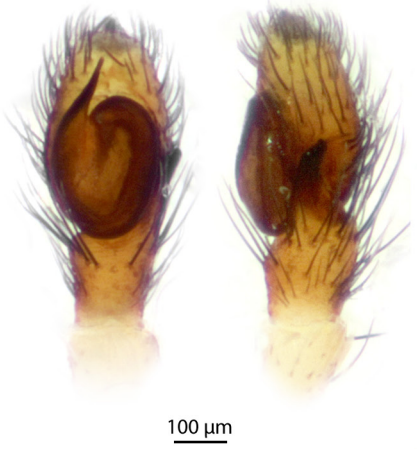

Abb. 8: *Neaetha membrosa*, Männchen aus Spanien, linker Pedipalpus
Fig. 8: *Neaetha membrosa*, male from Spain, left palp

Abb. 9: *Neaetha absheronica*, Männchen aus Griechenland, linker Pedipalpus
Fig. 9: *Neaetha absheronica*, male from Greece, left palp

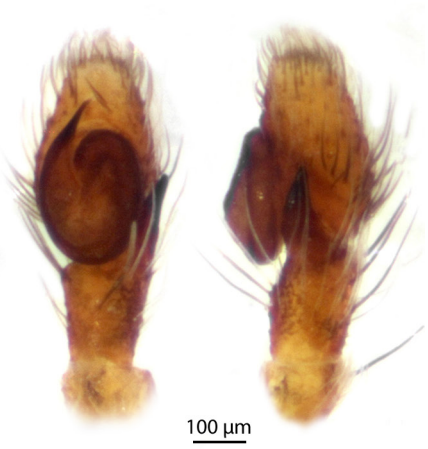

Abb. 10: *Neaetha* sp., Männchen von der Insel Elba, linker Pedipalpus
Fig. 10: *Neaetha* sp., male from Elba Island, left palp

Mallorca, La Trapa, 39.589003°N 2.363576°E, 108 m ü. NN, Holzgeländer, 01.11.2015: 1♀.
Bestimmung. Metzner (1999)
Verbreitung. Mediterran bis Kasachstan, Argentinien (World Spider Catalog 2017)

***Neaetha membrosa* (Simon, 1868)** (Abb. 8)
SPANIEN, Andalusien, bei Las Negras, 36.896810°N 2.001623°W, 67 m ü. NN, wasserarmer kleiner Bach, niedrige Vegetation, 29.03.2016: 1♂, 1♀.
Vergleichsmaterial. *Neaetha absheronica* Logunov & Guseinov, 2002: GRIECHENLAND, Halbinsel Igoumenitsa, 39.51667°N 20.18333°E, 6 m ü. NN, Strand und felsige Phrygana, 14.05.2010: 1♂. *Neaetha* sp.: ITALIEN, Elba, Südhang des Monte Capanne, 42.7513°N 10.16613°E, 272 m ü. NN, Macchie, am Boden, 05.05.2013: 1♂.
Bestimmung. Lecigne (2016), Logunov & Guseinov (2002)
Verbreitung. Mittelmeergebiet, Deutschland (World Spider Catalog 2017)

Logunov & Guseinov (2002) trennten die ursprünglich von Simon (1868) beschriebene Art *Neaetha membrosa* anhand differierender Genitalmerkmale (Abb. 8-9) bei zwei Gruppen von Männchen in verschiedene Arten auf. Die Autoren gehen in ihrer Arbeit außerdem davon aus, dass die Nachweise von *N. membrosa* aus dem östlichen Mittelmeerraum – laut Logunov (2015) einschließlich aller griechischen Nachweise in Bosmans & Chatzaki (2005) – höchstwahrscheinlich die neu beschriebene Art *N. absheronica* (Abb. 9) betreffen, während sich die Verbreitung der eigentlichen *N. membrosa* lediglich auf Frankreich und Italien beschränkt, die Art also den westlichen Mittelmeerraum besiedelt. Spätere Nachweise (Marusik et al. 2005, Fišer & Azarkina 2005, Van Keer et al. 2010, Coşar et al. 2014, Logunov 2015) beider Arten, einschließlich der Erstbeschreibung des Weibchens von *N. absheronica* aus Kreta durch Lecigne (2016) stützen diese Annahme. Auch Nachweise aus Deutschland (C. Gack 1974 in Arachnologische Gesellschaft 2017, vid. M. Schäfer) und der Schweiz (Hänggi et al. 2014, Hänggi in litt.) können als *N. membrosa* s.str. bestätigt werden. Der oben gemeldete Fund von *N. membrosa* s.str. aus Spanien fügt sich nahtlos in das Bild der Ost-West-Trennung der Verbreitungsareale beider Arten ein. Ein weiterer deutscher Nachweis (Wunderlich 1995) konnte leider nicht überprüft werden, da das Material momentan nicht auffindbar ist (J. Wunderlich bzw. J. Altmann in litt.).

Möglicherweise kommt in Europa noch eine weitere, bisher unbenannte Art der Gattung, vor, deren Männchen genitalmorphologisch zwischen beiden oben genannten Arten stehen. Schon Logunov (1996) beschrieb diese Art anhand eines Männchens aus Algerien, gab ihr jedoch keinen Namen, da es einige valide *Neaetha*-Arten gibt, von denen nur die Weibchen beschrieben sind und ihm eine eindeutige Art-Zuordnung mangels zugehörigen Weibchens zu diesem Zeitpunkt nicht möglich war. Auch dem Erstautor liegt ein derartiges „weibchenloses" Männchen dieser potenziell neuen Art von der Insel Elba vor, dessen Palpus (Abb. 10) hier der Vollständigkeit halber zu Vergleichszwecken ebenfalls gezeigt wird. Man erkennt deutlich die von Logunov als Abgrenzung zu *N. membrosa* beschriebene zugespitzte Tibialapophyse des Palpus (Logunov 1996: 525, figs 16-17).

***Pellenes brevis* (Simon, 1868)**
SPANIEN, Andalusien, bei San José, 36.801623°N 2.068682°W, 14 m ü. NN, steinige Ruderalfläche, fast kein Bewuchs, 27.03.2016: 1♂.
Bestimmung. Logunov et al. (1999), Metzner (1999)
Verbreitung. Spanien, Frankreich, Italien, Deutschland, Mazedonien, Rhodos, Türkei, Zypern, Iran (World Spider Catalog 2017), gemäß Morano et al. (2014) neu für Andalusien

***Philaeus chrysops* (Poda, 1761)**
SPANIEN, Andalusien, bei Malaga, 36.827629°N 4.512119°W, 199 m ü. NN, Flussufer, 31.03.2016: 1juv – Reifehäutung 15.05.2016: 1♀; Andalusien, bei Malaga, 36.826068°N 4.517059°W, 180 m ü. NN, Flussufer, 02.04.2016: 1juv – Reifehäutung 09.05.2016: 1♀.
Bestimmung. Metzner (1999)
Verbreitung. Paläarktis (World Spider Catalog 2017)

***Phlegra bresnieri* (Lucas, 1846)**
SPANIEN, Andalusien, bei Malaga, 36.826068°N 4.517059°W, 180 m ü. NN, Flussufer, 02.04.2016: 1♂.
Bestimmung. Metzner (1999)
Verbreitung. Südeuropa bis Aserbaidschan, Iran, Afrika (World Spider Catalog 2017)

***Salticus propinquus* Lucas, 1846**
SPANIEN, Andalusien, bei Las Negras, 36.886171°N 2.006044°W, 26 m ü. NN, wasserarmer kleiner Bach, niedrige Vegetation, 29.03.2016: 1♀.
Bestimmung. Metzner (1999), Prószyński (2003)
Verbreitung. Mittelmeergebiet (World Spider Catalog 2017)

***Thyene imperialis* (Rossi, 1846)**
SPANIEN, Mallorca, Val de Bocquer, 39.925582°N 3.091355°E, 89 m ü. NN, auf Strauch in Macchie, 30.10.2013: 1♀; Andalusien, bei San José, 36.802635°N 2.080044°W, 35 m ü. NN, Feldweg an Campingplatzrand, relativ viel Pflanzenbewuchs, 27.03.2016: 1♀.
Bestimmung. Metzner (1999)
Verbreitung. Alte Welt (World Spider Catalog 2017), gemäß Morano et al. (2014) neu für die Balearen

Diskussion

Wie schon im letzten kleinen Beitrag zur Springspinnenfauna der Balearen (Schäfer 2015) zeigt sich auch hier wieder, dass die Inselgruppe hinsichtlich Nachweisen innerhalb dieser Spinnenfamilie deutliche Defizite aufweist. Anders wäre es nicht zu erklären, dass selbst Arten, wie *Thyene imperialis*, die im gesamten Mittelmeerraum weit verbreitet sind, oder der Kosmopolit *Hasarius adansoni* bisher für Mallorca nicht nachgewiesen wurden. Der Nachweis von *Heliophanus stylifer* durch Schäfer (2015) wird mithilfe des Fundes eines Männchens zu *H. ramosus* korrigiert. Die Inventarliste der Salticiden-Fauna der Balearen erhöht sich mit der vorliegenden Arbeit von 24 (Schäfer 2015) auf 26 Arten.

Aber auch die Nachweise vom spanischen Festland, die gleichzeitig den größten Anteil an dieser Arbeit ausmachen, erbringen neue Kenntnisse zur Springspinnenfauna Spaniens – selbst wenn sich keine Erstnachweise für das Land darunter befinden, so konnten zumindest *Euophrys gambosa* und *Pellenes brevis* gemäß Morano et al. (2014) für die andalusische Fauna erstmalig nachgewiesen werden.

Darüber hinaus wurde der Kenntnisstand in Sachen Verbreitung des Artenpaars *N. membrosa*/*N. absheronica* nach ihrer Auftrennung durch Logunov & Guseinov (2002) erweitert und Lücken in den Verbreitungskarten weiterer Arten geschlossen. Dass dabei, wie im Falle von *Heliophanus agricola*, zusätzlich auch Erkenntnisgewinne hinsichtlich der Variabilität einzelner Arten beigesteuert werden konnten, sollte dazu animieren, auch schon vermeintlich gut dokumentierten Arten Beachtung zu schenken.

Danksagung
Unser herzlicher Dank gilt Theo Blick für die Unterstützung bei der Erstellung dieses Manuskripts. Außerdem möchten wir uns bei Claudia Gack für die Überlassung ihres *Neaetha membrosa*-Materials danken. Unser Dank gilt auch Rainer Breitling für die Übersetzung der Zusammenfassung ins Englische.

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New records of pseudoscorpions (Arachnida: Pseudoscorpiones) associated with animals and human habitats in Slovakia and the Czech Republic

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doi: 10.5431/aramit5311

Abstract. New data on pseudoscorpions associated with animals (birds, mammals, ants and true flies) and human habitats (synanthropic species) are presented. The collecting was carried out at 35 localities in Slovakia and the Czech Republic in different periods between 1989 and 2016. Altogether 149 nests of nine bird species, one mole nest, 14 nests of three rodent species, one lagomorph nest and four combined bird-rodent nests were examined. Five families were found, of which the Chernetidae was ranked first, with eight taxa and 770 specimens. Nine taxa were extracted from bird nests, from them *Neobisium carcinoides* (Hermann, 1804) and *Dendrochernes cyrneus* (L. Koch, 1873) were recorded only in this habitat type. Five species were found in mammal nests, *Neobisium sylvaticum* (C.L. Koch, 1835) and *Lasiochernes pilosus* (Ellingsen, 1910) were present only in this habitat type. Two species were collected in combined bird-mammal nests and two taxa were phoretic. *Cheiridium museorum* (Leach, 1817) was recorded only in synanthropic habitats and two quite rare species *Microbisium suecicum* Lohmander, 1945 and *Chernes vicinus* (Beier, 1932) were extracted only from anthills of *Formica rufibarbis* Fabricius, 1793. Five species were found for the first time in anthills in Slovakia. The current paper brings the first concrete faunistic data about the species *Chernes vicinus* from Slovakia and the second known locality of *Microbisium suecicum* in Slovakia. The phoresy of *Allochernes peregrinus* Lohmander, 1939 on true fly was recorded for the first time in Slovakia.

Keywords: anthill, bird nest, mammals, phoresy, synanthropic species, true flies

Zusammenfassung. Neue Funde von Pseudoskorpionen (Arachnida: Pseudoscorpiones), vergesellschaftet mit Tieren und in synanthropen Habitaten, in der Slowakei und in der Tschechischen Republik. Neue Funde von Pseudoskorpionen, die mit Tieren (Vögeln, Säugern, Ameisen, Fliegen) und mit anthropogenen Habitaten (synanthrope Arten) vergesellschaftet sind, werden vorgestellt. Es wurde an 35 Orten in der Slowakei und in der Tschechischen Republik in verschiedenen Zeiträumen zwischen 1989 und 2016 gesammelt. Insgesamt wurden 149 Nester von neun Vogelarten, ein Maulwurfsbau, 14 Bauten von drei Nagetierarten, ein Kaninchenbau und vier kombinierte Vogel-Nagel-Nester untersucht. Es wurden fünf Pseudoskorpionfamilien nachgewiesen, am häufigsten die Chernetidae mit acht Taxa und 770 Individuen. Neun Taxa wurden aus Vogelnestern extrahiert, *Neobisium carcinoides* (Hermann, 1804) und *Dendrochernes cyrneus* (L. Koch, 1873) wurden ausschließlich in diesem Habitat gefunden. In Säugerbauten wurden fünf Arten nachgewiesen, *Neobisium sylvaticum* (C.L. Koch, 1835) und *Lasiochernes pilosus* (Ellingsen, 1910) ausschließlich dort. Zwei Arten wurden in kombinierten Vogel-Nagel-Nestern gefangen und zwei Arten waren phoretisch. *Cheiridium museorum* (Leach, 1817) wurde ausschließlich im synanthropen Bereich und zwei sehr seltene Arten, *Microbisium suecicum* Lohmander, 1945 und *Chernes vicinus* (Beier, 1932), wurden aus Ameisenhügeln von *Formica rufibarbis* Fabricius, 1793 extrahiert. Insgesamt wurden fünf Arten erstmals in der Slowakei in Ameisenhügeln gefangen. Der vorliegende Beitrag enthält die ersten genauen Daten von *Chernes vicinus* und den zweiten Fundort von *Microbisium suecicum* in der Slowakei. *Allochernes peregrinus* Lohmander, 1939 wurde in der Slowakei erstmals phoretisch (an einer Fliege) erfasst.

Bird nests offer shelter and suitable conditions for reproduction of pseudoscorpions (Jones 1975, Christophoryová et al. 2011a). Based on small quantities of collected specimens, some authors considered the occurrence of pseudoscorpions in nests as random, without any specific relation to this habitat (Beier 1948, Cyprich et al. 1992, Krištofík et al. 1994, 1995, 1996, 2003, 2005). On the contrary, other authors assumed that pseudoscorpions have a specific relationship to the nest environment or the hosts (Ressl & Beier 1958, Krumpál & Cyprich 1988, Krumpál et al. 2001, Christophoryová 2010, Turienzo et al. 2010, Christophoryová et al. 2011a). Recently, Turienzo et al. (2010) elaborated a compilation of pseudoscorpion data from bird nests and they recorded 14 families with 85 species worldwide. In Slovakia, several detailed studies on pseudoscorpion occurrence in the bird nests have been published. Krumpál & Cyprich (1988) examined 162 bird nests and found more than 900 pseudoscorpion specimens. Christophoryová (2010) recorded 118 pseudoscorpions of eight species from bird nests. Christophoryová et al. (2011a) studied the association of pseudoscorpions with bird nests on the basis of an analysis of 480 specimens. *Larca lata* (Hansen, 1884) was firstly recorded for the fauna of Slovakia from a tree hollow containing a nest of *Strix aluco* Linnaeus, 1758 (Christophoryová et al. 2011b). Krajčovičová et al. (2015) found three species in open nests of *Turdus merula* Linnaeus, 1758 and *T. philomelos* Brehm, 1831 in Slovakia.

Many pseudoscorpion species are presumed to be associated with mammals, they occur predominantly in Africa, Asia and Australia (Beier 1948). In Europe, species from the genus *Lasiochernes* Beier, 1932 were found in caves probably related to bat guano and in mammal nests (Beier 1948, 1963). *Lasiochernes pilosus* (Ellingsen, 1910) inhabits nests of the mole *Talpa europaea* Linnaeus, 1758 in Slovakia (Krumpálová & Krumpál 1993). Another three species, *Chelifer cancroides* (Linnaeus, 1758), *Dinocheirus panzeri* (C. L. Koch, 1837) and *Allochernes wideri* (C.L. Koch, 1843), were recorded in mammal nests in Slovakia, but they occurred accidentally in this habitat type (Christophoryová 2010).

Besides birds and mammals, pseudoscorpions colonize nests of social insects, mainly termites, ants and bees (Beier 1948, 1963, Weygoldt 1969). Beier (1948) recorded 21 myrmecophilous pseudoscorpion species from anthills. Several faunistic data about pseudoscorpions from anthills from neighbouring countries have been published, from Austria (Ressl & Beier 1958, Ressl 1974), the Czech Republic (Šťáhlavský 2001), Poland (Rafalski 1967) and Germany (Drogla & Lippold 2004). In Slovakia, Jászayová et al. (2015) published the first records of pseudoscorpions in nests of *Formica polyctena* Förster, 1850.

Phoresy represents a generally known phenomenon in certain pseudoscorpion groups (Beier 1948, Kaisila 1949). Poinar et al. (1998) reviewed phoresy in pseudoscorpions and

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submitted 15.8.2016, accepted 13.3.2017, online 6.4.2017

listed ten pseudoscorpion families associated with at least 44 insect families and three arachnid families in the world. In Slovakia, two specimens of *Lamprochernes nodosus* (Schrank, 1803) were found phoretic on flies – on a male of *Hydrotaea similis* Meade, 1887 and on a male of *Lucilia caesar* (Linnaeus, 1758) (Mašán & Krištofík 1992). Christophoryová et al. (2011c) recorded one male of *L. chyzeri* (Tömösváry, 1882) from Slovakia attached to the leg of a true fly.

A number of pseudoscorpions are synanthropic; they inhabit buildings, barns or could be found in old libraries (Weygoldt 1969). In Slovakia, only pseudoscorpions from bird nests in synanthropic habitats were collected (Krumpál & Cyprich 1988, Christophoryová et al. 2011a).

The aim of this study was to identify pseudoscorpion species associated with animals (birds, mammals, ants and true flies) and human habitats (synanthropic species) in Slovakia and the Czech Republic.

Material and methods

Pseudoscorpions were collected over 23 years (1989–1991, 1996–2007 and 2009–2016) at 35 localities in the Czech Republic and in Slovakia (Fig. 1, Tab. 1). Altogether, 149 nests of nine bird species (one not identified), one mole nest, 14 nests of three rodent species, one lagomorph nest and four combined bird-rodent nests were examined (Tab. 2). The majority of bird nests were collected immediately after the fledging of chicks; some nests were collected during the winter or early in the spring. All bird and mammal nests were packed into plastic bags and extracted in Tullgren funnels. The collected bird and mammal nests were divided into seven categories according to the build type and their particular location in the environment, as in Christophoryová et al. (2011a) (Tab. 2). Pseudoscorpions were also extracted from samples from winter nests of two ant species (Tab. 3) and found phoretic on true flies (Diptera, species not identified). Several specimens were individually collected in flats and family houses.

Some specimens were mounted as permanent slide mounts using Liquide de Swann mounting medium. Some were studied as temporary slide mounts using lactic acid and afterward preserved in 70 % ethanol. Photographs were made using EOS Utility software and a digital camera (Canon EOS 1100D) connected to a Zeiss Stemi 2000-C stereomicroscope and using a Leica ICC50 camera connected to a Leica DM1000 stereomicroscope using LAS EZ 1.8.0 software. Pseudoscorpions were identified using the key by Christophoryová et al. (2011d). The identification of *Chthonius te-*

Tab. 1: List of localities. Abbreviations: CZ – Czech Republic, E – longitude, N – latitude, NR – Nature Reserve, SK – Slovakia

Code	Country	Locality	N	E	a.s.l. (m)	Environment
1	SK	Borinka	48°15'44"	17°05'10"	307	forest-meadow ecotone
2	SK	Bratislava	48°09'10.57"	17°07'27.36"	140	flat in inner city
3	SK	Bratislava	48°09'27"	17°09'46"	138	flat in inner city
4	SK	Bratislava	48°10'56"	17°02'39"	202	flat in inner city
5	SK	Bratislava, Selendorf	48°10'29.31"	17°04'15.07"	195	oak-hornbeam forest fragment
6	SK	Bratislava, Zoological garden	48°09'36.86"	17°04'20.64"	180	horse stable
7	SK	Bratislava, Železná studnička	48°11'25"	17°04'56"	240	oak-hornbeam forest
8	CZ	Břeclav	48°43'53.89"	16°48'52.33"	203	oak-hornbeam forest
9	CZ	Břeclav	48°44'04.74"	16°49'14.04"	211	oak-hornbeam forest
10	CZ	Břeclav	48°44'10.56"	16°49'14.82"	197	oak-hornbeam forest
11	CZ	Břeclav	48°44'16.14"	16°49'58.10"	180	oak-hornbeam forest
12	CZ	Břeclav	48°44'18.12"	16°49'51.18"	183	oak-hornbeam forest
13	CZ	Břeclav	48°44'18.18"	16°49'43.50"	178	oak-hornbeam forest
14	SK	Chotuč	49°04'17.92"	18°10'14.05"	629	beech forest
15	SK	Devínske jazero	48°15'44"	16°57'52"	140	family house garden
16	SK	Devínske jazero	48°15'44"	16°57'52"	140	family house
17	SK	Duplín	49°14'	21°37'	211	oak-hornbeam forest edge
18	SK	Dvorčiansky les	48°16'14.77"	18°06'52.75"	135	oak forest
19	SK	Gajary	48°28'04.85"	16°53'35.81"	147	grove
20	SK	Horné Orešany	48°28'58.08"	17°26'39.84"	216	oak-hornbeam forest
21	SK	Hubová	49°07'01"	19°11'28"	460	family house
22	SK	Imeľ	47°54'18"	18°08'09"	110	forest
23	SK	Kaňapka	48°42'39.82"	21°21'37.23"	227	allotted garden
24	SK	Kľak	48°34'53.91"	18°38'32.34"	600	family house
25	SK	Lakšárska Nová Ves	48°34'56.85"	17°10'34.55"	217	pine-forest
26	SK	Malá Fatra, Veľký Kriváň	49°11'27.36"	19°02'07.32"	1541	meadow between dwarf pine
27	SK	Nána	47°48'56.33"	18°41'35.07"	107	rural living zone
28	SK	NR Dunajské trstiny, Veľké Kosihy	47°46'01.18"	17°52'00.28"	108	forester's lodge
29	SK	NR Šúr, Biologická stanica	48°13'40.08"	17°12'20.88"	131	oak forest
30	SK	NR Šúr, Jelšový les	48°13'55.62"	17°12'31.80"	131	alder forest
31	SK	NR Šúr, Panónsky háj	48°13'21.54"	17°13'07.25"	135	oak-hornbeam forest
32	SK	Obid	47°46'40.33"	18°38'45.87"	116	rural living zone
33	SK	Snilovské sedlo	49°11'40.26"	19°02'24.18"	1434	meadow saddleback
34	SK	Stropkov	49°12'	21°40'	264	woodland near pasture
35	SK	Vozokany	48°06'02.46"	17°41'09.67"	117	family house

Tab. 2: List of bird and mammal hosts. Abbreviations: LC – locality code, see Tab. 1; NC – nest category: A – nest in hollow, B – nest in box, C – nest in the ground, D – open nest on the ground, E – open nest in vegetation, F – open nest in tree and shrub, G – nest in synanthropic habitat; N – number of nests

LC	Host	NC	N
1	*Talpa europaea* Linnaeus, 1758	C	1
6	*Hirundo rustica* Linnaeus, 1758	G	1
7	*Troglodytes troglodytes* Linnaeus, 1758	A	3
7	*Motacilla cinerea* Tunstall, 1771	D	1
7	*Turdus merula* Linnaeus, 1758	F	1
8	*Sitta europaea* Linnaeus, 1758, *Apodemus flavicollis* (Melchior, 1834)	B	1
9	*Parus major* Linnaeus, 1758, *A. flavicollis*	B	1
10	*Ficedula albicollis* (Temminck, 1815)	B	1
11	*F. albicollis*, *A. flavicollis*	B	1
12	*F. albicollis*, *A. flavicollis*	B	1
13	*F. albicollis*	B	1
14	*A. flavicollis*	B	1
17	*Micromys minutus* (Pallas, 1771)	E	5
17	*Muscardinus avellanarius* Linnaeus, 1758	E	5
18	*Parus major* Linnaeus, 1758	B	1
22	Bird nests, hosts not identified	F	2
23	*Oryctolagus cuniculus* f. *domesticus*	B	1
26	*Anthus spinoletta* (Linnaeus, 1758)	D	1
27	*Ciconia ciconia* (Linnaeus, 1758)	G	1
29	*Passer montanus* (Linnaeus, 1758)	B	22
30	*P. montanus*	B	58
32	*C. ciconia*	G	1
33	*A. spinoletta*	D	1
34	*M. minutus*	E	3

Tab. 3: List of ant hosts. Abbreviations: LC – locality code, see Tab. 1; N – number of anthills

LC	Host	N
5	*Formica rufa* Linnaeus, 1761	1
19	*Formica rufibarbis* Fabricius, 1793	1
20	*F. rufa*	1
25	*F. rufa*	1
31	*F. rufa*	1

trachelatus (Preyssler, 1790) was checked and confirmed by Dr. Giulio Gardini (Italy). Nomenclature for all taxa follows Harvey (2013). The material is deposited in the zoological collections of Department of Zoology, Comenius University in Bratislava, Slovakia.

Results

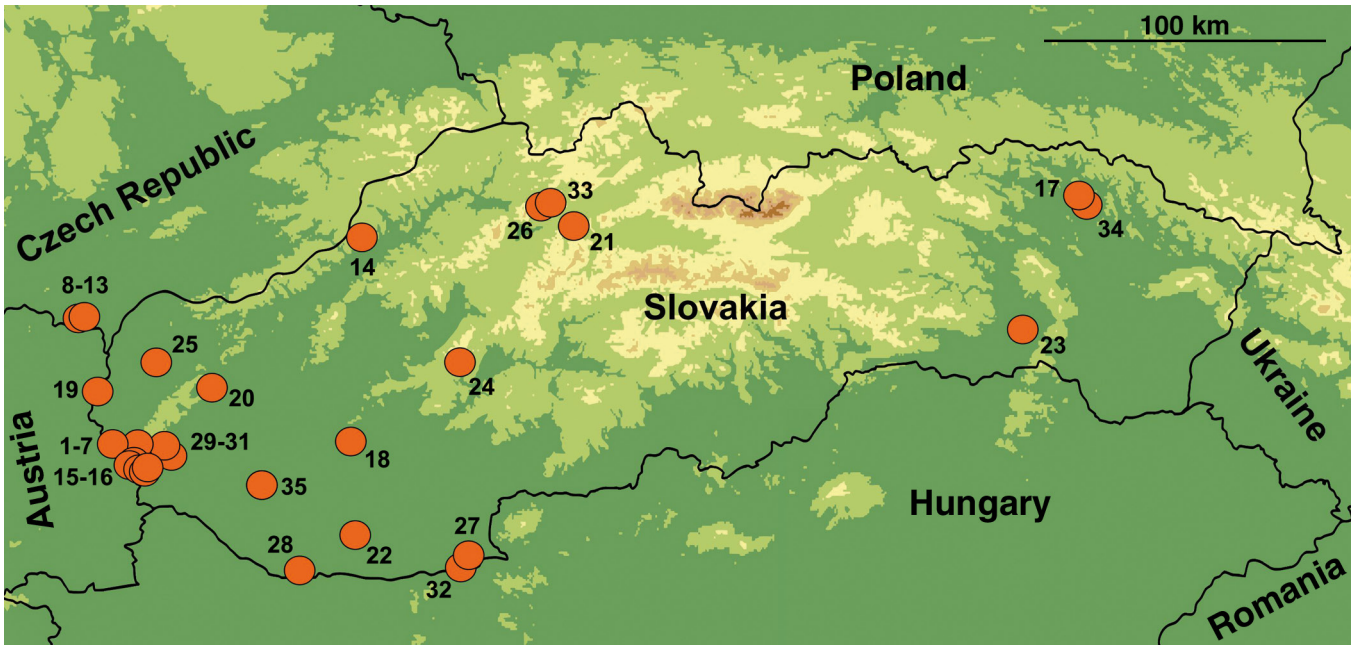
Altogether 872 specimens belonging to 15 taxa were identified (Tab. 4). The specimens of *Lamprochernes* spp. were identified only to genus level. Five families were found, of which the Chernetidae was ranked first, with eight taxa and 770 specimens. Only one species was identified from each of the families Chthoniidae and Cheiridiidae (Tab. 4). Most specimens belong to the species *Allochernes wideri*; single specimens were recorded from the species *Microbisium suecicum*, *Chernes vicinus* and *A. peregrinus* (Tab. 4).

From bird nests 191 specimens were extracted (Tab. 5). The largest numbers of pseudoscorpion species were collected in nests situated in boxes. During the present study *Neobisium carcinoides* and *Dendrochernes cyrneus* were recorded only in this habitat type. Only *C. tetrachelatus* was found in nests in hollows (Tab. 5). Five species were recorded in mammal nests; *N. sylvaticum* and *L. pilosus* were present only in this habitat type (Tab. 4). Two species were collected in combined bird-mammal nests and two taxa were phoretic (Tab. 4). Only one female of *A. peregrinus* was recorded during the study and was phoretic on a true fly. *C. museorum* was recorded only in synanthropic habitats and two quite rare species *M. suecicum* and *C. vicinus* were extracted only from a *Formica rufibarbis* anthill (Tab. 4).

List of recorded taxa

The list of recorded taxa is given below with locality code (see Tab. 1), date, sample type, number of developmental stages (♀: female, ♂: male, A: adult without sex determination, T: tritonymph, D: deutonymph, P: protonymph) and collector name.

Fig. 1: Studied localities in the Czech Republic and Slovakia. For locality code see Tab. 1



Tab. 4: Pseudoscorpions associated with animals and human habitats. Abbreviations: BN – bird nest, MN – mammal nest, BMN – combined bird and mammal nest, AH – anthill, PH – phoresy, SY – synanthropic habitat

Taxa	BN	MN	BMN	AH	PH	SY	Σ
Chthoniidae							
Chthonius tetrachelatus	9	.	.	1	.	.	10
Neobisiidae							
Microbisium suecicum	.	.	.	1	.	.	1
Neobisium carcinoides	3	.	.	.	.	.	3
Neobisium sylvaticum	.	10	.	.	.	.	10
Cheiridiidae							
Cheiridium museorum	.	.	.	.	.	15	15
Cheliferidae							
Chelifer cancroides	13	.	3	.	.	8	24
Dactylochelifer latreillii	33	6	.	.	.	.	39
Chernetidae							
Chernes hahnii	16	.	.	93	.	.	109
Chernes vicinus	.	.	.	1	.	.	1
Dendrochernes cyrneus	91	.	.	.	.	.	91
Allochernes peregrinus	.	.	.	.	1	.	1
Allochernes wideri	21	3	5	462	.	.	491
Lamprochernes spp.	4	.	.	.	3	.	7
Lasiochernes pilosus	.	63	.	.	.	.	63
Pselaphochernes scorpioides	1	1	.	5	.	.	7
Σ	**191**	**83**	**8**	**563**	**4**	**23**	**872**

Tab. 5: Abundance of pseudoscorpions in bird nest categories. For nest categories (NC) see Tab. 2. Abbreviations: *Ct – Chthonius tetrachelatus*, *Nc – Neobisium carcinoides*, *Cc – Chelifer cancroides*, *Dl – Dactylochelifer latreillii*, *Ch – Chernes hahnii*, *Dc – Dendrochernes cyrneus*, *Aw – Allochernes wideri*, *Lsp – Lamprochernes* sp., *Ps – Pselaphochernes scorpioides*

NC	Host/ Taxon	*Ct*	*Nc*	*Cc*	*Dl*	*Ch*	*Dc*	*Aw*	*Lsp*	*Ps*	Σ
A	*Troglodytes troglodytes*	4	.	.	.	.	.	.	.	.	4
B	*Ficedula albicollis*	.	.	3	.	2	.	.	.	.	5
	Parus major	.	.	.	.	.	.	2	.	.	2
	Passer montanus	.	.	1	18	14	91	19	.	1	144
D	*Anthus spinoletta*	.	3	.	.	.	.	.	.	.	3
	Motacilla cinerea	1	.	.	.	.	.	.	.	.	1
F	*Turdus merula*	4	.	.	.	.	.	.	.	.	4
	unidentified	.	.	.	15	.	.	.	.	.	15
G	*Ciconia ciconia*	.	.	.	.	.	.	.	4	.	4
	Hirundo rustica	.	.	9	.	.	.	.	.	.	9
Σ		**9**	**3**	**13**	**33**	**16**	**91**	**21**	**4**	**1**	**191**

Chthoniidae Daday, 1888

***Chthonius* (*Ephippiochthonius*) *tetrachelatus* (Preyssler, 1790)** (Fig. 2a)

Bird nest: 7: 27.06.1989, *M. cinerea*, 1♀, leg. J. Krištofík; 25.06.1990, *T. troglodytes*, 1♀, leg. J. Krištofík; 25.06.1990, *T. merula*, 2♀♀, 2♂♂, leg. J. Krištofík; 25.07.1990, *T. troglodytes*, 1♀, leg. J. Krištofík; 23.07.1991, *T. troglodytes*, 1♀, 1♂, leg. J. Krištofík.

Anthill: 5: 16.01.2015, *F. rufa*, 1♂, leg. O. Majzlan.

Neobisiidae Chamberlin, 1930

***Microbisium suecicum* Lohmander, 1945** (Fig. 2b)

Anthill: 19: 27.02.2015, *F. rufibarbis*, 1♀, leg. O. Majzlan.

***Neobisium* (*Neobisium*) *carcinoides* (Hermann, 1804)** (Fig. 2e)

Bird nest: 26: 13.10.2010, *A. spinoletta*, 2D, leg. M. Baláž; **33:** 06.07.2009, *A. spinoletta*, 1T, leg. M. Baláž.

***Neobisium* (*Neobisium*) *sylvaticum* (C.L. Koch, 1835)** (Figs 2c, 2d)

Mammal nest: 17: 15.05.2010, *M. minutus*, 1♂, leg. A. Čanády; 30.10.2010, *M. minutus*, 1♀, leg. A. Čanády; 21.07.2011, *M. minutus*, 1D, leg. A. Čanády; 24.08.2011, *M. avellanarius*, 1T, leg. A. Čanády; 16.09.2011, *M. avellanarius*, 1T, leg. A. Čanády; 19.11.2011, *M. avellanarius*, 1♀, 1T, leg. A. Čanády; 03.06.2012, *M. minutus*, 1♂, leg. A. Čanády; **34:** 15.05.2010, *M. minutus*, 2♂♂, leg. A. Čanády.

Cheiridiidae Hansen, 1894

***Cheiridium museorum* (Leach, 1817)** (Fig. 2f)

Synanthropic habitat: 21: February 2014, interior, 1♂, leg. M. Baláž; **24:** 1.7.2012, under the statuette, 7♀♀, 6♂♂, 1A, leg. Z. Kosejová.

Cheliferidae Risso, 1827

***Chelifer cancroides* (Linnaeus, 1758)** (Fig. 3a)

Bird nest: 6: 26.08.2010, *H. rustica*, 1♀, 1♂, 1T, 6P, leg. J. Jamriška, R. Zamec; **13:** 14.03.2009, *F. albicollis*, 3♂♂, leg. P. Berka, J. Jamriška, J. Plachý; **30:** 01.06.2001, *P. montanus*, 1T, leg. P. Puchala, K. Sobeková.

Bird-mammal nest: 8: 14.03.2009, *S. europaea* and *A. flavicollis*, 3D, leg. P. Berka, J. Jamriška, J. Plachý.

Synanthropic habitat: 2: 02.03.2013, dead on window parapet, 1♂, leg. B. Lipták; **3:** 18.09.2012, interior, 1♀, 2♂♂, 2T, leg. M. Semelbauer; **4:** 29.05.2013, interior, 1♂, leg. B. Mangová; **16:** 09.06.2013, on the human body, 1♀, leg. V. Stloukalová.

***Dactylochelifer latreillii* (Leach, 1817)** (Fig. 3b)

Bird nest: 22: 16.01.2010, unidentified species, 1♀, 1♂, 6T, 7D, leg. H. Imrichová; **29:** 27.05.2001, *P. montanus*, 1D, leg. P. Puchala, K. Sobeková; 26.06.2001, *P. montanus*, 1T, leg. Z. Országhová, K. Sobeková; 20.08.2003, *P. montanus*, 1T, leg. P. Puchala, K. Sobeková; 19.05.2004, *P. montanus*, 1T, leg. V. Jánošková, K. Sobeková; 06.10.2009, *P. montanus*, 1T, leg. D. Cyprich; **30:** 08.03.2000, *P. montanus*, 1♂, leg. V. Jánošková, K. Sobeková; 22.05.2000, *P. montanus*, 1D, leg. Z. Országhová, K. Sobeková; 04.06.2001, *P. montanus*, 1T, leg. V. Jánošková, K. Sobeková; 22.07.2001, *P. montanus*, 1T, leg. K. Sobeková; 21.06.2002, *P. montanus*, 1T, leg. Z. Országhová, K. Sobeková; 28.07.2004, *P. montanus*, 1♂, 1P, leg. P. Puchala, K. Sobeková; 27.06.2006, *P. montanus*, 1T, leg. K. Sobeková; 01.07.2006, *P. montanus*, 1T, leg. K. Sobeková; 04.07.2006, *P. montanus*, 1♂, 1D, leg. K. Sobeková; 06.10.2009, *P. montanus*, 1♀, 1♂, leg. D. Cyprich.

Mammal nest: 17: 17.05.2010, *M. minutus*, 1♂, leg. A. Čanády; 30.10.2010, *M. minutus*, 1♀, leg. A. Čanády; 26.08.2011, *M. avellanarius*, 2♂♂, 1D, leg. A. Čanády; **34:** 15.05.2010, *M. minutus*, 1♂, leg. A. Čanády.

Chernetidae Menge, 1855

***Chernes hahnii* (C.L. Koch, 1839)** (Figs 3c, 3d)

Bird nest: 10: 14.03.2009, *F. albicollis*, 2T, leg. P. Berka, J. Jamriška, J. Plachý; **29:** 23.07.1996, *P. montanus*, 1♂, 1T, leg. K. Sobeková; 08.03.2000, *P. montanus*, 1♀, leg. Z. Országhová, K. Sobeková; 25.05.2000, *P. montanus*, 1T, leg. Z. Országhová, P. Puchala; **30:** 11.06.1997, *P. montanus*, 1♂, leg. K. Sobeková; 02.07.1997, *P. montanus*, 1♀, leg. Z. Országhová, P. Puchala; 24.05.1998, *P. montanus*, 1♂, leg. P. Puchala, K. Sobeková; 16.06.1999, *P. montanus*, 2♀♀, 1D, leg. K. Sobeková; 24.05.2000, *P. montanus*, 1♀, leg. P. Puchala, K. Sobeko-

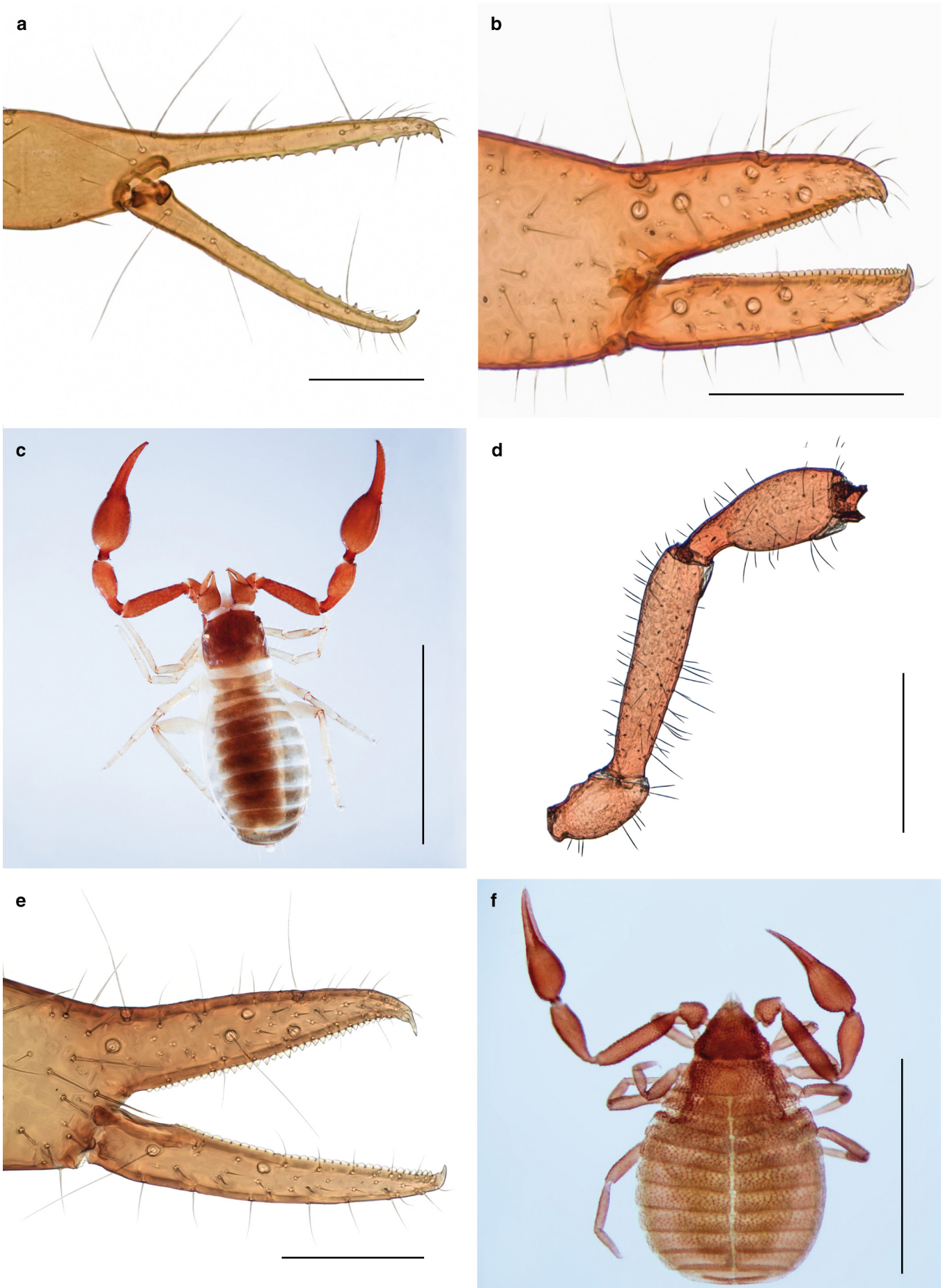


Fig. 2: Recorded pseudoscorpions and their main taxonomic characters from the families of Chthoniidae, Neobisiidae and Cheiridiidae. **a.** Chelal fingers of *Chthonius tetrachelatus* adult, scale: 0.2 mm. **b.** Chelal fingers of *Microbisium suecicum* adult, scale: 0.2 mm. **c.** *Neobisium sylvaticum* adult, scale: 3 mm. **d.** Palpal segments of *N. sylvaticum* adult, scale: 1 mm. **e.** Chelal fingers of *Neobisium carcinoides* deutonymph, scale: 0.2 mm. **f.** Adult of *Cheiridium museorum*, scale: 1 mm

vá; 20.05.2002, *P. montanus*, 1♂, leg. P. Puchala, K. Sobeková; 21.06.2002, *P. montanus*, 1D, leg. Z. Országhová, K. Sobeková; 04.07.2006, *P. montanus*, 1T, leg. P. Puchala, K. Sobeková. **Anthill: 5:** 16.01.2015, *F. rufa*, 1♀, 1♂, leg. O. Majzlan; **19:** 27.02.2015, *F. rufibarbis*, 7♀♀, 3♂♂, leg. O. Majzlan; **20:** 08.01.2015, *F. rufa*, 13♀♀, 29♂♂, 20T, 11D, 8P, leg. P. Fenďa, K. Hrúzová.

***Chernes vicinus* (Beier, 1932)** (Fig. 3e)
Anthill: 19: 27.02.2015, *F. rufibarbis*, 1♂, leg. O. Majzlan.

***Dendrochernes cyrneus* (L. Koch, 1873)** (Fig. 4a)
Bird nest: 29: 05.07.1996, *P. montanus*, 1T, leg. Z. Országhová, K. Sobeková; 14.08.1996, *P. montanus*, 1♀, leg. P. Puchala, K. Sobeková; 26.08.1997, *P. montanus*, 1D, leg. Z. Országhová, M. Šuplatová; 01.03.2000, *P. montanus*, 1D, leg. P. Puchala, K. Sobeková; 22.05.2000, *P. montanus*, 2♀♀, leg. P. Puchala, K. Sobeková; 02.06.2001, *P. montanus*, 2♀♀, leg. P. Puchala, K. Sobeková; 04.07.2001, *P. montanus*, 2T, leg. P. Puchala, K. Sobeková; 23.05.2002, *P. montanus*, 1♀, leg. P. Puchala, K. Sobeková; 02.06.2002, *P. montanus*, 1♀, leg. P. Puchala, K. Sobeková; 17.07.2002, *P. montanus*, 1♂, leg. P. Puchala, K. Sobeková; 24.06.2005, *P. montanus*, 1♀, leg. K. Sobeková; 21.05.2006, *P. montanus*, 1♀, leg. K. Sobeková; 25.05.2006, *P. montanus*, 1♂, leg. K. Sobeková; 26.03.2010, *P. montanus*, 1P, leg. D. Cyprich; **30:** 08.07.1996, *P. montanus*, 1T, leg. P. Puchala, K. Sobeková; 14.08.1996, *P. montanus*, 1♀, 1♂, 3D, leg. Z. Országhová, K. Sobeková; 11.06.1997, *P. montanus*, 1♂, leg. K. Sobeková; 02.07.1997, *P. montanus*, 1♀, 3T, leg. Z. Országhová, P. Puchala; 12.08.1997, *P. montanus*, 3D, 2P, leg. Z. Országhová, P. Puchala; 01.03.2000, *P. montanus*, 1T, 1P, leg. Z. Országhová, K. Sobeková; 01.07.2000, *P. montanus*, 1T, leg. Z. Országhová, P. Puchala; 28.05.2001, *P. montanus*, 1♀, leg. Z. Országhová, K. Sobeková; 30.05.2001, *P. montanus*, 1D, leg. Z. Országhová, K. Sobeková; 02.07.2001, *P. montanus*, 1♂, leg. P. Puchala, K. Sobeková; 09.07.2001, *P. montanus*, 1♂, leg. K. Sobeková; 10.07.2001, *P. montanus*, 1T, leg. P. Puchala, K. Sobeková; 22.07.2001, *P. montanus*, 2T, leg. K. Sobeková; 21.08.2001, *P. montanus*, 1♂, leg. Z. Országhová, K. Sobeková; 20.05.2002, *P. montanus*, 1D, leg. Z. Országhová, P. Puchala; 20.06.2002, *P. montanus*, 1♀, leg. Z. Országhová, K. Sobeková; 01.07.2002, *P. montanus*, 1♂, leg. V. Jánošková, P. Puchala, K. Sobeková; 17.07.2002, *P. montanus*, 1♂, leg. P. Puchala, K. Sobeková; 19.09.2002, *P. montanus*, 1♀, leg. P. Puchala, K. Sobeková; 20.03.2003, *P. montanus*, 1T, leg. Z. Országhová, P. Puchala; 21.05.2003, *P. montanus*, 1♀, leg. K. Sobeková; 22.05.2003, *P. montanus*, 1♀, 14P, leg. Z. Országhová, K. Sobeková; 18.06.2004, *P. montanus*, 2♀♀, 6P, leg. P. Puchala, K. Sobeková; 28.07.2004, *P. montanus*, 1♀, 1P, leg. P. Puchala, K. Sobeková; 03.07.2005, *P. montanus*, 1♀, 1♂, leg. K. Sobeková; 24.07.2005, *P. montanus*, 1♀, leg. K. Sobeková; 31.07.2005, *P. montanus*, 2♀♀, 1♂, leg. K. Sobeková; 23.05.2006, *P. montanus*, 1♀, leg. K. Sobeková; 26.05.2006, *P. montanus*, 1♀, leg. K. Sobeková; 01.07.2006, *P. montanus*, 1♀, 2♂♂, 3P, leg. K. Sobeková; 04.07.2006, *P. montanus*, 1♀, leg. K. Sobeková.

***Allochernes peregrinus* Lohmander, 1939** (Figs 3f, 5a, 5b)
Phoresy: 15: 29.05.2013, phoretic on Diptera, 1♀, leg. E. Stloukal, V. Stloukalová.

***Allochernes wideri* (C.L. Koch, 1843)** (Figs 4c, 4d)
Bird nest: 18: 06.03.2012, *P. major*, 2♀♀, leg. Z. Krumpálová; **29:** 23.07.1996, *P. montanus*, 2♂♂, leg. K. Sobeková; 24.06.2005, *P. montanus*, 1♂, leg. K. Sobeková; **30:** 15.07.1997, *P. montanus*, 1♀, leg. Z. Országhová, K. Sobeková; 01.03.2000, *P. montanus*, 1♀, leg. P. Puchala, K. Sobeková; 08.07.2001, *P. montanus*, 1T, leg. Z. Országhová, K. Sobeková; 27.06.2002, *P. montanus*, 1♀, leg. P. Puchala, K. Sobeková; 30.06.2002, *P. montanus*, 1♀, leg. P. Puchala, K. Sobeková; 22.06.2003, *P. montanus*, 2♀♀, leg. P. Puchala, K. Sobeková; 16.05.2004, *P. montanus*, 1♀, leg. P. Puchala, K. Sobeková; 28.07.2004, *P. montanus*, 1♂, leg. P. Puchala, K. Sobeková; 27.07.2005, *P. montanus*, 1♀, leg. K. Sobeková; 01.07.2006, *P. montanus*, 2♀♀, leg. K. Sobeková; 04.07.2006, *P. montanus*, 3♀♀, leg. K. Sobeková; 21.07.2006, *P. montanus*, 1♂, leg. K. Sobeková.
Mammal nest: 14: 28.10.2009, *A. flavicollis*, 1♀, 2T, leg. M. Filípek, J. Plachý.
Bird-mammal nest: 9: 14.03.2009, *P. major* and *A. flavicollis*, 2♂♂, leg. P. Berka, J. Jamriška, J. Plachý; **11:** 14.03.2009, *F. albicollis* and *A. flavicollis*, 1♀, leg. P. Berka, J. Jamriška, J. Plachý; **12:** 14.03.2009, *F. albicollis* and *A. flavicollis*, 2♀♀, leg. P. Berka, J. Jamriška, J. Plachý.
Anthill: 19: 27.02.2015, *F. rufibarbis*, 1♀, leg. O. Majzlan; **20:** 08.01.2015, *F. rufa*, 60♀♀, 44♂♂, 111T, 80D, 35P, leg. P. Fenďa, K. Hrúzová; **25:** 15.01.2015, *F. rufa*, 46♀♀, 23♂♂, 10T, 10D, 1P, leg. M. Holecová; **31:** 22.01.2016, *F. rufa*, 9♀♀, 5♂♂, 9T, 9D, 9P, leg. P. Fenďa, A. Purkart.

***Lamprochernes* spp.** (Fig. 4e)
Bird nest: 27: 29.06.2009, *C. ciconia*, 1♂, leg. V. Hošek; **32:** 29.06.2009, *C. ciconia*, 2♀♀, 1♂, leg. V. Hošek.
Phoresy: 28: 18.07.2013, phoretic on Diptera, 1♀, leg. V. Hulejová-Sládkovičová, P. Miklós, D. Žiak; **35:** 04.08.2007, phoretic on Diptera, 2♀♀, leg. E. Énekesová.

***Lasiochernes pilosus* (Ellingsen, 1910)** (Fig. 4b)
Mammal nest: 1: 20.01.1990, *T. europaea*, 1T, 50D, 12P, leg. O. Majzlan.

***Pselaphochernes scorpioides* (Hermann, 1804)** (Fig. 4f)
Bird nest: 30: 31.05.2001, *P. montanus*, 1♀, leg. P. Puchala, K. Sobeková.
Mammal nest: 23: 01.05.2013, *O. cuniculus* f. *domesticus*, 1D, leg. P. Ľuptáčik.
Anthill: 5: 16.01.2015, *F. rufa*, 1♀, 1♂, leg. O. Majzlan; **19:** 27.02.2015, *F. rufibarbis*, 1♀, 1♂, leg. O. Majzlan; **20:** 08.01.2015, *F. rufa*, 1♀, leg. P. Fenďa, K. Hrúzová.

Discussion
Christophoryová et al. (2011a) classified 22 Central European pseudoscorpion species (including previously published resources) as nidixenous and nidiphilous species, according to their association with bird nests. Fourteen species were classified as nidixenous. They occur accidentally in bird nests and their nymphal stages are present only sporadically (Christophoryová 2011a). During the current research, three taxa were found from this category: *C. tetrachelatus*, *N. carcinoides* and species of the genus *Lamprochernes*. They were present in nests as adults. *Neobisium carcinoides* was present as nymphal stages, but they were found in the nest situated on the ground. The species is considered to be eurytopic, mainly epigeic, present in the nests accidentally and in low numbers (Krumpál & Cyprich 1988, Fenďa et al. 1998, Christophoryová et al. 2011a). Species of the genus *Lamprochernes* as well as *C. tetrachelatus*

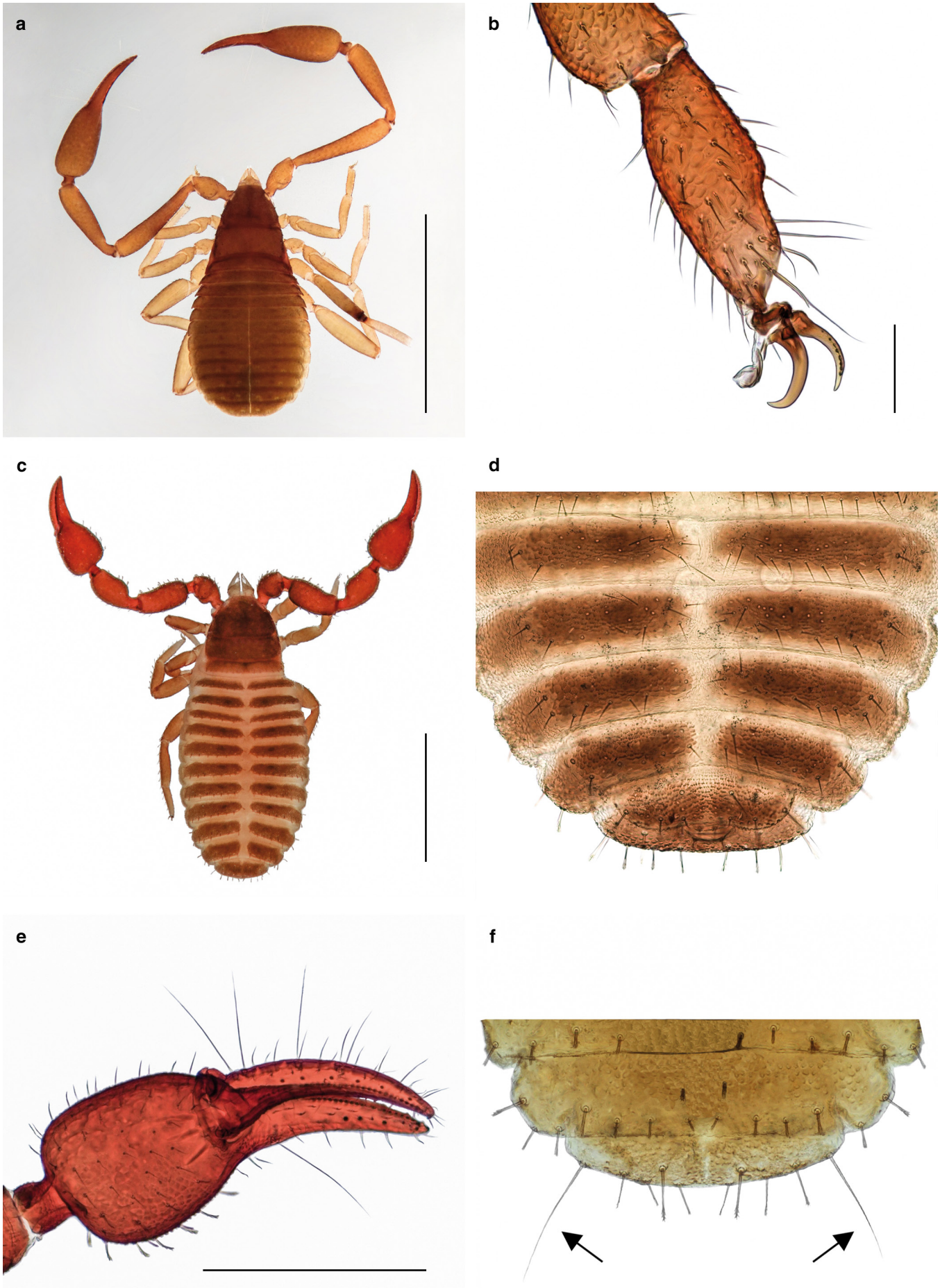


Fig. 3: Recorded pseudoscorpions and their main taxonomic characters from the families of Cheliferidae and Chernetidae. **a.** Adult of *Chelifer cancroides*, scale: 3 mm. **b.** Male tarsus of leg I of *Dactylochelifer latreillii*, scale: 0.1 mm. **c.** Adult of *Chernes hahnii*, scale: 1 mm. **d.** Tergite XI of *C. hahnii* adult. **e.** Palpal chela of *Chernes vicinus* adult, scale: 0.5 mm. **f.** Tergite XI of *Allochernes peregrinus* adult, arrows point to tactile setae

were found in bird nests occasionally (Krumpál & Cyprich 1988, Krištofík et al. 1995, 1996, Fenďa et al. 1998, Christophoryová 2010, Turienzo et al. 2010, Christophoryová et al. 2011a, Krajčovičová et al. 2015).

Pseudoscorpions from the category of nidiphilous species were also collected. They occur regularly in bird nests, are also present as nymphal stages and seem to prefer bird nests situated in certain habitats, as mentioned in the classification by Christophoryová et al. (2011b). *Chelifer cancroides* prefers bird nests situated in synanthropic habitats (Ressl & Beier 1958, Jones 1975, Krumpál & Cyprich 1988, Cyprich et al. 1992, Christophoryová 2010, Turienzo et al. 2010, Christophoryová et al. 2011a); during the present study, the majority of specimens were collected in a barn swallow nest in a horse stable. *Allochernes wideri* occurs in hollow nests and nests situated in boxes (Krumpál & Cyprich 1988, Christophoryová et al. 2011a, Krajčovičová et al. 2015), the recorded specimens were found in boxes with nests of the great tit and the Eurasian tree sparrow. According to Christophoryová et al. (2011a) *D. cyrneus* occurs regularly with all nymphal stages in hollow nests and in the Eurasian tree sparrow nest boxes. In nests in Slovakia, the species was found only in flooded forest and alder forest in the Šúr National Reserve (Krumpál & Cyprich 1987, Christophoryová et al. 2011a). All examined specimens in our study were collected at the same locality and hosts, and the species was present as all developmental stages. *Dactylochelifer latreillii* and *C. hahnii* live in open and hollow nests in the trees and shrubs (Krumpál & Cyprich 1988, Krištofík et al. 1993, 1996, Krumpál et al. 2001, Christophoryová 2010, Christophoryová et al. 2011a, Krajčovičová et al. 2015). Records of both species from the current study correspond with the ecological requirements of the species. *Pselaphochernes scorpioides* was characterized as a nidiphilous species that occurred in nests with decomposed substrate and was found in the hollow nests of the hoopoe and wood nuthatch (Christophoryová et al. 2011a). We did not confirm this categorization; only one specimen was collected from a Eurasian tree sparrow nest in box.

Beier (1948) mentioned that typical inhabitations of this habitat type could live in mammal nests. In Slovakia, we have the example of *L. pilosus* which was recorded during our research. Krumpálová & Krumpál (1993) extracted this species from a mole nest for the first time from Slovakia (at Borinka, the same locality as in the present paper). Most interestingly, two *L. pilosus* females were sifted from leaf litter in the Šúr Nature reserve (Christophoryová & Krumpál 2010). *Neobisium sylvaticum* was recorded during the study in nests of the hazel dormouse and the Eurasian harvest mouse situated in the vegetation. The species has previously been reported as able to climb on herbs and shrubs, even on tree trunks (Rafalski 1967, Krajčovičová & Christophoryová 2014). *Allochernes wideri* and *D. latreillii* were present in rodent nests during our research and the synanthropic species *C. cancroides* in a rabbit hutch. Christophoryová (2010) recorded *C. cancroides*, *D. panzeri* and *A. wideri* in mammal nests and characterized them as occasionally occurring in mammal nests, which corresponded with our obtained data.

Pseudoscorpions live in anthills because of suitable temperature within the nests and their ability to feed on other animals living there (Beier 1948, Weygoldt 1969). Six species were collected from anthills during the current research; of these only *P. scorpioides* was found in an anthill in Slovakia before (Jászayová et al. 2015). Beier (1948) recorded eight species from anthills of *F. rufa*, common species were *A. wideri* and *P. scorpioides*. Both species were also recorded from anthills by Drogla & Lippold (2004). More interesting were the records of *M. suecicum* and *C. vicinus* from a *F. rufibarbis* anthill. The occurrence of both species in anthills was known before (Drogla & Lippold 2004). Until now, the occurrence of *C. vicinus* was mentioned in two papers from Slovakia (Krumpál & Cyprich 1988, Krumpál et al. 2001) from bird nests without concrete faunistic data; the current paper describes the first one. *Microbisium suecicum* was found only once in Slovakia, sieved from leaf litter and clumps in the Cerová vrchovina upland (Christophoryová 2009).

During the current research, species from the genus *Lamprochernes* and *A. peregrinus* were found phoretic on true flies. The phoresy of the genus *Lamprochernes* is quite known (Beier 1948, Mašán & Krištofík 1992, Poinar et al. 1998, Christophoryová et al. 2011c). *Allochernes peregrinus* was described by Lohmander (1939) from Sweden based on one phoretic female attached to the leg of a fly *Delia floralis* (Fallén, 1824) (syn. *Hylemyia floralis*). In Germany, several specimens were found phoretic on the harvestmen *Opilio canestrinii* (Thorell, 1876), *Leiobunum rupestre* (Herbst, 1799) and *L. rotundum* (Latreille, 1798) (Drogla & Lippold 2004). In Slovakia, *A. peregrinus* was found until now in leaf litter, under stones, in anthills and in Malaise traps (Krumpálová & Krumpál 1993, Christophoryová & Krumpál 2010, Christophoryová 2013, Jászayová et al. 2015).

The occurrence of *C. museorum* and *C. cancroides* in synanthropic habitats represents a well-known, worldwide phenomenon (Beier 1963, Weygoldt 1969, Drogla & Lippold 2004). In Slovakia, both of them are recorded from bird nests in synanthropic habitats (Krumpál & Cyprich 1988, Christophoryová et al. 2011a).

Acknowledgements
We would like to express our gratitude to all our colleagues for collecting pseudoscorpions used in this study and Giulio Gardini for his confirmation of the identification of *C. tetrachelatus*. We would like to thank Daniel Jablonski for technical assistance with the map and Volker Mahnert and one anonymous reviewer for all corrections and suggestions that improved our paper. The study was financially supported by VEGA 1/0191/15.

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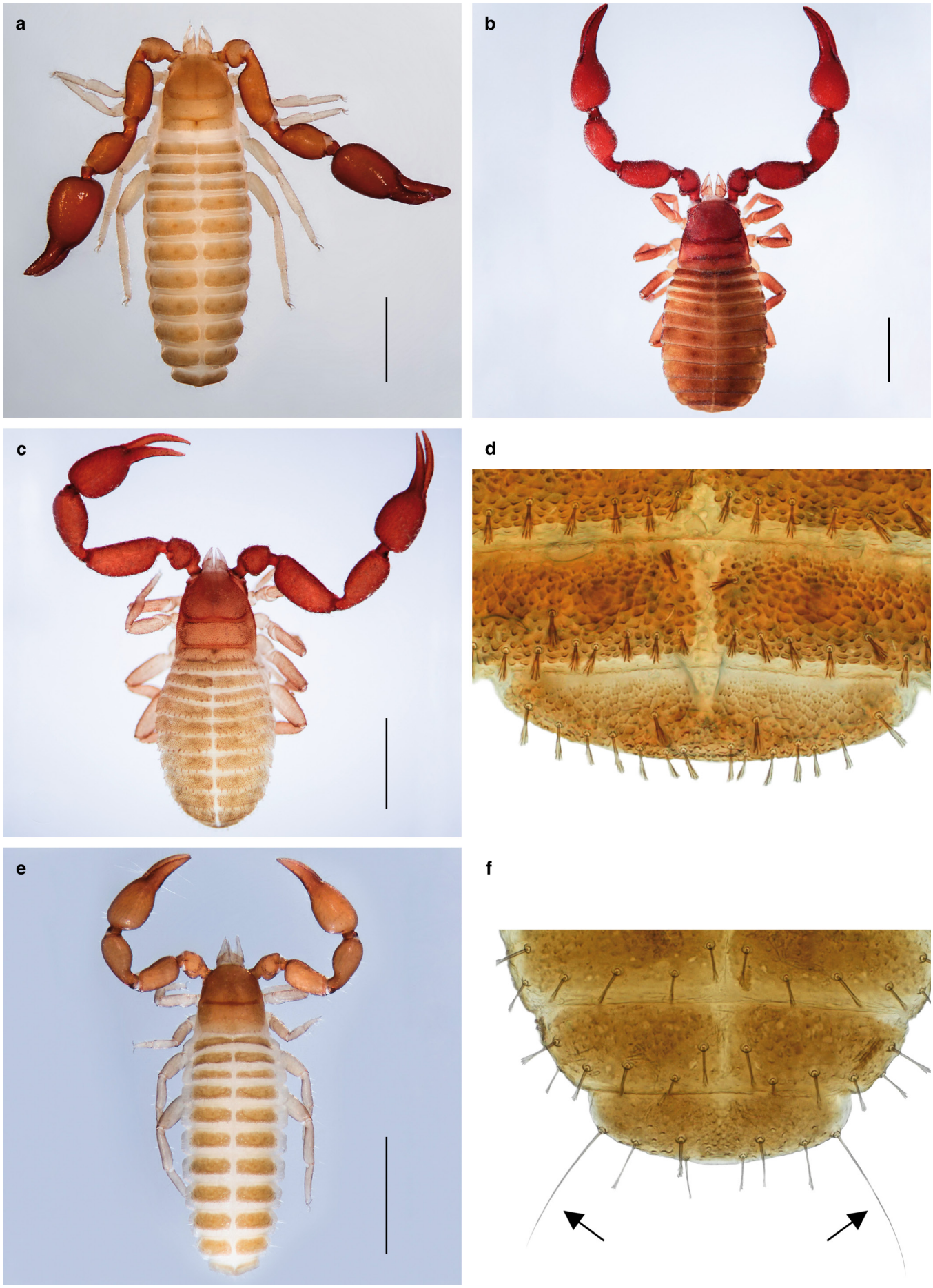

Fig. 4: Recorded pseudoscorpions and their main taxonomic characters from the family of Chernetidae. **a.** *Dendrochernes cyrneus* adult. **b.** *Lasiochernes pilosus* adult. **c.** *Allochernes wideri* adult. **d.** Tergite XI of *A. wideri* adult. **e.** *Lamprochernes* sp. adult. **f.** Tergite XI of *Pselaphochernes scorpioides* adult, arrows point to tactile setae. Scales: 1mm

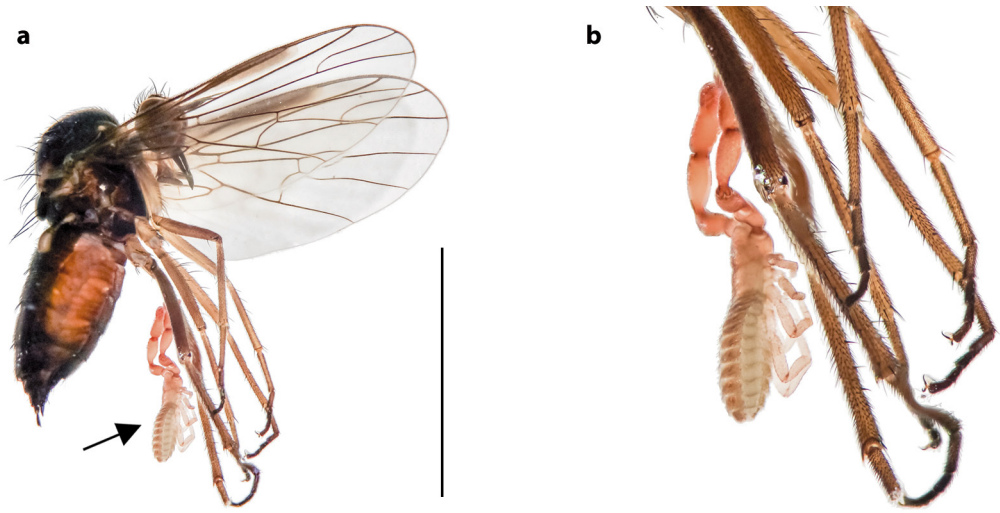

Fig. 5: *Allochernes peregrinus* phoretic on true fly. **a.** Arrow points to pseudoscorpion. **b.** Detail of attached pseudoscorpion. Scale for **a:** 5 mm.

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Arachnologische Gesellschaft

Arachnologische Mitteilungen
Arachnology Letters

Heft / Volume 53 Karlsruhe, April 2017

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ISSN 1018-4171 (Druck), 2199-7233 (Online) www.AraGes.de/aramit