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New data on introduced and rare synanthropic spider species (Arachnida: Araneae) in Poland (II)

SUMMARY

Over the last decades, a large number of introduced spider species (Araneae) has been noted in Europe. Some of these newcomers have been introduced incidentally. However, the others develop permanent populations, for example in greenhouses or botanical gardens, and become synanthropic species. Introduction and synanthropization of new spider species also occurs in Poland. New records presented herein extend the list of introduced arachnofauna by seven species: *Aphantaulax trifasciata*, *Cheiracanthium furculatum*, *Cyrtophora citricola*, *Olios argelasius*, *Nurscia albomaculata*, *Phoneutria boliviensis* and *Triaeris stenaspis*. In addition, new posts of rarely reported so far in Poland synanthropic spiders such as: *Amaurobius ferox*, *A. similis*, *Cheiracanthium mildei*, *Hasarius adansoni*, *Holocnemus pluchei*, *Nesticella mogera*, *Psilochorus simoni*, *Pseudeuophrys lanigera*, *Scytodes thoracica* and *Uloborus plumipes* are presented. The data complement the deployment of these species in Poland as well as indicate their potential expansion routes.

Keywords: Araneae, synanthropic spiders, introduced and alien species.

STRESZCZENIE

W Europie Środkowej, w tym także w Polsce, w ciągu ostatnich dekad zanotowano szereg gatunków pająków (Araneae) pochodzących z innych kontynentów, które zostały introdukowane. Również część gatunków pochodzących z południowej części Europy, wskutek naturalnej ekspansji poszerza swój zasięg w kierunku północnym, często zasiedlając biotopy synantropijne, jako przyczółki swojej ekspansji. Autorzy w pracy przedstawiają informację o stwierdzeniu

w Polsce po raz pierwszy takich gatunków jak: *Aphantulax trifasciata*, *Cheiracanthium furculatum*, *Cyrtophora citricola*, *Nurscia albomaculata*, *Olios argelasius*, *Phoneutria nigriventer* i *Triaeris stenaspis*. Oprócz tych gatunków omówiono nowe stanowiska sporadycznie lub rzadko dotychczas wykazywanych na terenie Polski pajaków synantropijnych takich jak: *Amaurobius ferox*, *Amaurobius similis*, *Cheiracanthium mildei*, *Hasarius adansoni*, *Holocnemus pluchei*, *Icius hamatus*, *Mermessus trilobatus*, *Nesticella mogera*, *Psilochorus simoni*, *Pseudeuophrys lanigera*, *Scytodes thoracica*, *Sosticus loricatus* i *Uloborus plumipes*. Przedstawione dane uzupełniają stan poznania rozmieszczenia tych gatunków w Polsce o nowe lokalizacje oraz wskazują drogi potencjalnej ekspansji. Wykazano także, że *Holocnemus pluchei* i *Triaeris stenaspis* posiadają w Polsce duże, rozmnażające się i trwałe populacje.

Słowa kluczowe: Araneae, pająki synantropijne, gatunki obce i introdukowane.

INTRODUCTION

Recently, an increasing number of introduced spider species is observed in Western and Central Europe (68). This phenomenon is favoured by growing international and intercontinental transport (47, 68, 70). Many of these exotic spiders, are represented only by solitary specimens incidentally introduced and recorded outside their natural area of occurrence, e.g. *Badumna longinqua* (46), *Latrodectus mactans* (38) or *Phoneutria boliviensis* (39). However, some introduced species become synanthropic and inhabit niche microhabitats, e.g. greenhouses. In a large part of Europe, exotic species such as *Hasarius adansoni*, *Nesticella mogera* and *Uloborus plumipes* have established permanently in greenhouses of botanical gardens or horticultural holdings (42, 83). Moreover, some South European species as *Holocnemus pluchei* and *Scytodes thoracica* have extended their range to the North or East Europe (69). Thus, as a result of natural expansion or introduction, they become representatives of the synanthropic arachnofauna of Central Europe. In this study, the data on new records of introduced species of spiders in Poland are presented. Additionally, new localities of several rare, synanthropic and invasive species are provided.

LIST OF ABBREVIATIONS

Following abbreviations of the names are used in the text: RR – Robert Rozwałka, TR – Tomasz Rutkowski, PBB – Paweł Bielak-Bielecki, UPH – Siedlce University of Natural Sciences and Humanities, AR Wrocław – Wrocław University of Environmental and Life Sciences.

SPECIES NEW TO THE POLISH FAUNA

Family: Araneidae

Cyrtophora citricola (FORSSKÅL, 1775)

Lublin-Felin [FB 17], Witosa Str., large garden-building center, on the *Euphorbia* spp. (import from Netherlands), 31.10.2014 – 1 juv. (cult.); 04.11.2014 – 1♂, leg., PBB, det. RR.

This species is very commonly widespread in tropical and subtropical parts of Asia, Africa and Australia. It also occurs in the Middle East, Southern Europe and in the Canary Islands (26, 61, 105, 106), and it was introduced into the Caribbean and both Americas (2, 60, 98, 105). This is a social species; sometimes sharing large nets built by few hundred individuals but frequently occurs also individually (24, 28, 58). It inhabits mostly dry environments (5, 41, 61). In the region of the Adriatic Sea and the Canary Islands specimens are often observed on the opuntias, agaves and other succulent plants growing on ruderal or synanthropic areas (obs. TR et RR). Figure 1a shows the male palp of *C. citricola*.

Family: Ctenidae

***Phoneutria boliviensis* (F. O. PICKARD-CAMBRIDGE, 1897)**

Milicz [XT 51], Trzebnicka Str., in discount store, in bananas (import from Columbia), 15.12.2014 – 1♀ with egg cocoon, leg. unknown, det. RR.

The species is widely distributed in South and Central America, known as “banana spider”, although this colloquial term is also applicable to other spider species (e.g., *Phoneutria* spp., *Heteropoda* spp.), several times introduced into North America (34, 97). It inhabits different forest environments and scrubs, often near buildings and orchards, banana plants and fruit trees (34). In Europe, it has been recorded in Germany (39), as in this case, in the transport of bananas from South America. A study on the composition of the venom of *P. boliviensis* showed great similarities to the venom of other species from the genus *Phoneutria* (27), therefore it must be regarded as potentially dangerous for human health.

Family: Eutichuridae

***Cheiracanthium furculatum* KARSCH, 1879**

Lublin-Felin [FB 17], Witosa Str., hypermarket, in black grape fruit imported from Morocco, 29.06.2015 – 1sub♂ (cult. – ♂); 01.07.2015 – 1sub♀ (cult. – ♀); 02.07.2015 – 1♀; 09.07.2015 – 1 juv.; 14.07.2015 – 1♂; 15.07.2015 – 1♀ with cocoon (after 11 days of incubation 106 young spiders came out); 10.07.2016 – 1 juv., 21.07.2016 – 1 juv., leg. et det. RR, cult. PBB.

Note: in breeding this species shows an aggressive behaviour.

The species is widespread mostly in the southern part of Africa, where it occurs in a variety of open and synanthropic biotopes (63). It has been recorded recently in Europe, in Belgium (14) and in Germany (3). In both cases, the speci-

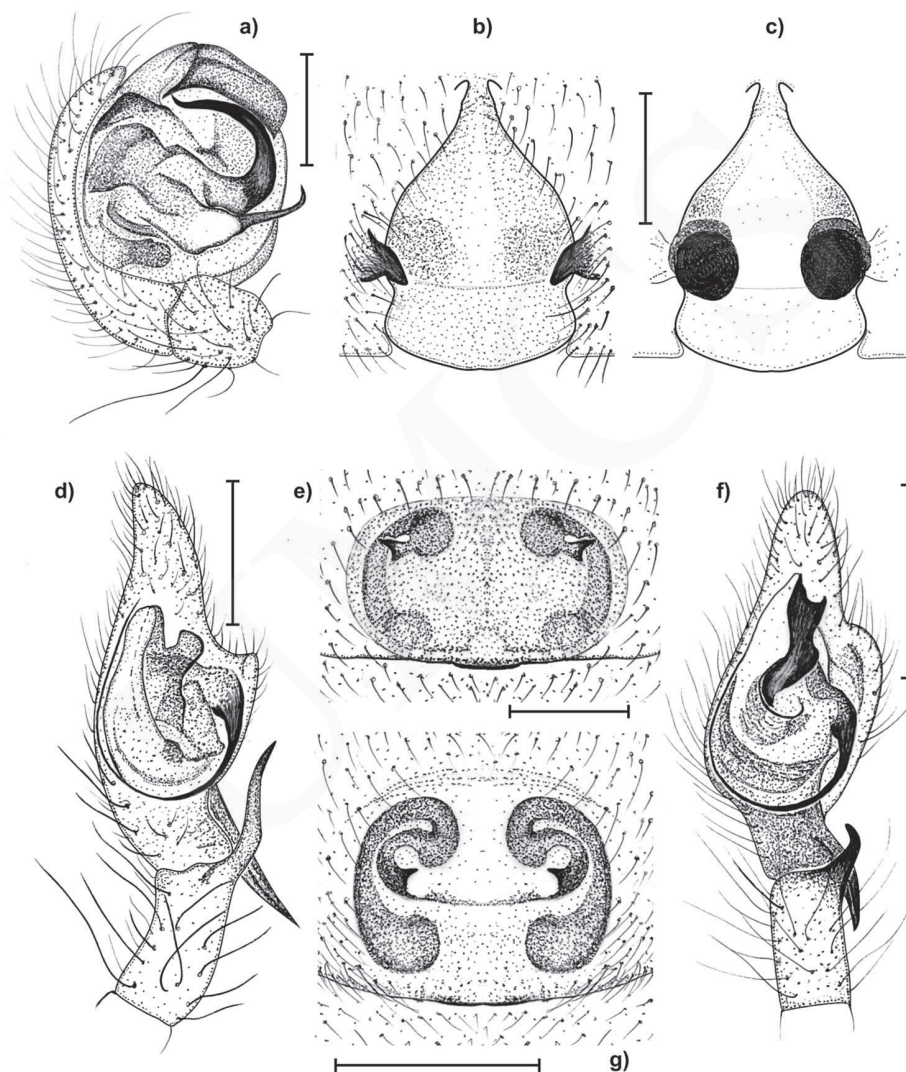


Figure 1. *Cyrtophora citricola*: male palp medial view – 1a; *Phoneutria boliviensis*: epigyne – 1b, and vulva dorsal – 1c; *Cheiracanthium furculatum*: male palp ventral – 1d, and epigyne – 1e; *Cheiracanthium mildei*: male palp ventral – 1f, and epigyne – 1g. Scale bar: 1a – 0.2 mm, 1b-c – 1.0 mm; 1d-g – 0.5 mm.

mens of *C. furculatum* were found in grapes imported from South Africa (14) and Morocco (3).

The specimens collected in Lublin confirm the observations of Bosselaers (14) and Bayer (3), that this species arrived in Europe with shipments of fruits, especially grapes. The scale of this import is probably quite large, because together

with the collected specimens there were reported several empty cocoons and exuviae of spiders of the genus *Cheiracanthium* C.L. KOCH, 1839, which probably belonged to the representatives of *C. furculatum*. The climatic conditions in Central and Western Europe rather exclude an acclimatization of *C. furculatum* in the wild, but it is likely that this species may be settling in the south of the continent.

Family: Gnaphosidae

***Aphantaulax trifasciata* (O. P.-CAMBRIDGE, 1872)**

Lublin-Felin [FB 17], Witosa Str., hypermarket, in pomegranate (import from Turkey), 20.11.2014 – 2 juv. (cult.), leg. PBB, det. RR.

The species is widespread in Southern and South-Eastern Europe, the Middle East and North Africa. It occurs both on the herbaceous plants and under stones in a variety of warm environments (31, 69). Often inhabits orchards of pomegranates, olives and citrus fruits (69, 73), which explains how the two juveniles were introduced to Poland.

Family: Oonopidae

***Triaeris stenaspis* SIMON, 1891**

Łańcut [EA 84], Orchid House of Castle Museum in Łańcut, under stone in greenhouse, 05.06.2015 – 1♀; 17.08.2015 – 12♀♀, 5 juv. and some ex. obs.; leg. et det. RR.

This species is widely distributed across the pantropical belt (77). On the base of a distribution of other species of the genus *Triaeris* SIMON, 1891, it is likely that it originated in East Africa or India. According to Nentwig et al. (69) and Nentwig (68), its homeland is Central America. From tropics it was introduced into the greenhouses of the botanical gardens and similar locations in France, Germany (42, 44, 92), Finland (69), Czech Republic (50) and in Slovakia (49, 51). Probably, the only introduced spider in Europe reproducing itself exclusively by parthenogenesis (49, 51).

Family: Sparassidae

***Olios argelasius* (WALCKENAER, 1805)**

Łódź-Widzew [DC 03], Rokicińska Str., in warehouse (in transport from Italy), 17.07.2015 – 1♀, doc. phot. anonymous, det. RR.

This middle sized species occurs in several countries of the Mediterranean basin. It is usually found on the warm, scantily covered areas, often in citrus orchards, vineyards, etc. (5, 69). So far, no cases of its introduction into Central Europe have been reported.

Family: Titanoecidae

***Nurscia albomaculata* (LUCAS, 1846)**

Lublin-Felin [UTM FB 17], Witosa Str., hypermarket, in pomegranate imported from Greece, 13.11.2014 – 1 juv. (cult.), leg. Ł. Dawidowicz, det. RR; 15.11.2014 – 1 juv. (cult.), leg. et det. RR.

The species is listed from the Iberian Peninsula, through whole Southern Europe, Turkey, Middle East, the Caucasus to Central Asia. It is also recorded in Egypt (25, 69, 72, 101, 105). Like other spiders from the family Titanoecidae, it occurs under stones and among low plants in dry areas of high insolation (69, 101). El-Hennawy (25) also reports that *N. albomaculata* was numerous on arable lands and in greenhouses, which indicates a potential synanthropization of this species.

Both juveniles were collected in the leaf stalks of pomegranates, which is slightly unusual place for this species, because it occurs mainly under stones in a variety of warm, dry, rocky habitats (69). In Turkey, it was recorded from the orchards of pomegranates (73) so importing along with these fruits seems to be likely.

NEW DATA ON SOME RARE SYNANTHROPIC SPIDERS SPECIES IN POLAND

Family: Amaurobidae

***Amaurobius ferox* (WALCKENAER, 1830)**

Czarnków [XU 06], under stones on old railway line, 17.10.2012 – 1♂, 4 juv., leg. et det. TR.

Kalisz [BC 93], undergrounds of old factory, 25.01.2013 – 1♀, leg. et det. TR.

Kostrzyn distr. Gorzów [VU 72], ruins of the Old Town, on the walls, 25.10.2013 – several specimens observed, TR.

Kraków [DA 24], Mikołaja Kopernika 27 Str., Botanical Garden of Jagiellonian University, under stones, between roots and in similar places in glass-houses, 30–31.05.2015 – 3♀♀, 11 juv., and several specimens observed, leg., det. et obs. RR.

Łańcut [EA 84], Orchid House of Castle Museum in Łańcut, under a stone and under flower pots in glasshouses, 05.06.2015 – 1♀, 6 juv., leg. et det. RR; 18.08.2015 – several specimens observed, RR.

Słonek distr. Sulęcín [VU 82], cellars of abandoned house, 05.11.2012 – 1♂, leg. et det. TR.

Twardogóra [XS 79], brick tunnel under railway line, 06.01.2016 – 1♂, leg. et det. TR.

Warszawa [EC 08], Aleje Ujazdowskie 4 Str., Botanical Garden, under a stone in glasshouses, 29.01.2015 – 1♂, 2♀, 12 juv., leg. et det. RR.

This spider is widespread in Central and Southern Europe (69) and also was introduced into North America (59). It inhabits mainly anthropogenic habitats, caves, crevices, spaces under rocks, caves, cellars and similar environments (1, 69, 86).

In Poland it is known from sites located in the western and central parts of the country (78), to the East it becomes rare (Fig. 2). The alleged presence in the High Tatras (78, 93, 99) is certainly a mistake, as it has been highlighted already by Kulczyński (56).

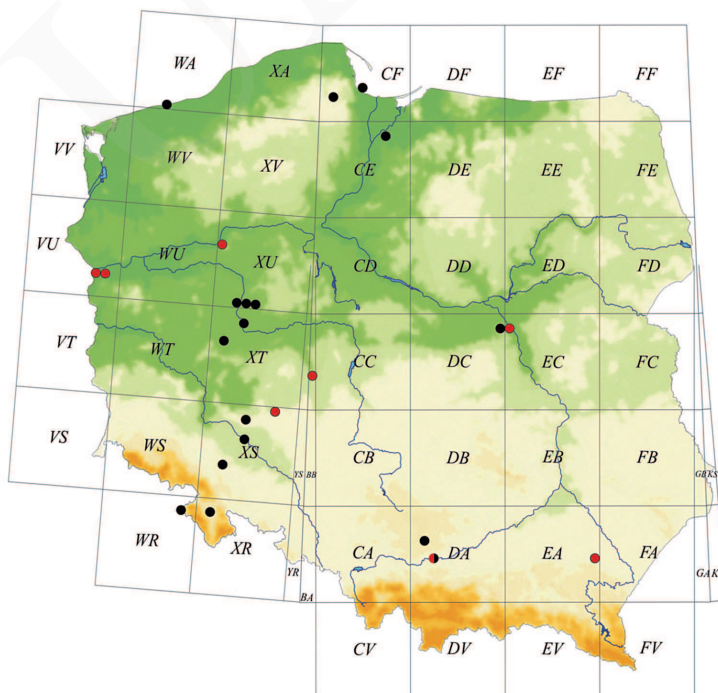


Figure 2. Distribution of *Amaurobius ferox* in Poland: black points – literature data, red points – new data, red-black points – confirmed data.

***Amaurobius similis* (BLACKWALL, 1861)**

Gorzów [WU 14], Walczaka Str., ruins of the old brewery, on the wall, 19.01.2016 – 1♀, leg. et det. TR.

Kołobrzeg [WA 30], Budowlanych Str., on the wall, 21.01.2016 – 1♀, leg. et det. TR.

Kostrzyn distr. Gorzów [VU 72], ruins of the Old Town, on the wall, 25.10.2013 – 1♂, leg. et det. TR.

Koszalin [WA 70], Batalionów Chłopskich Str., in the cellar, 10.02.2014 – 1♂, 1♀, 1 juv., leg. et det. TR.

Wrocław [XS 46], Zaporoska Str., in the cellar, 05.09.2009 – 1 juv., leg. PBB, det. RR.

Wrocław [XS 46], Zoological Garden, in the cellar in terrarium, 27.09.2009 – 6 juv., leg. PBB, det. RR.

This western European species was introduced to North America (33, 74, 59) and New Zealand (29). In Western Europe *Amaurobius similis* is a widespread species. It occurs both in natural and anthropogenic environments – under rocks in the woods, under the protruding bark of trees, in the ruins, the basements, crevices in the walls, cellars, etc. (33, 69). In Central Europe it is rare and noted only in synanthropic habitats (69).

In Poland *A. similis* is a rare species, reliably reported from Warsaw (90), Kołobrzeg, Rogalin and Malbork (19, 21, 22). Information from the Dahl (17) and Jeschke (40) with sites of *A. similis* in Lower Silesia was questioned in the past (19, 78, 90, 91). However, new sites presented in this work, seem to prove these data (Fig. 3).

Notes: Nentwig (68) and Nentwig et al. (69) described *A. similis* as a species of North American origin, brought over to Europe. However, American authors (59, 74) consider it as an European species, introduced into the USA and Canada. The European origin of *A. similis* is indicated by the lack of morphologically related species in North America, with their simultaneous presence in Europe, e.g. *A. obtusus* L. KOCH, 1868, *A. fenestralis* (STRÖM, 1768).

Family: Eutichuridae***Cheiracanthium mildei* L. KOCH, 1864**

Lublin-Bronowice [FB 17], Grabskiego Str. discount store, in pomegranate (import from Turkey) 18.11.2014 – 1 juv.; in pomegranate (import from Spain); 14.10.2015 – 1 juv., (cult. – ♂), leg. et det. RR.

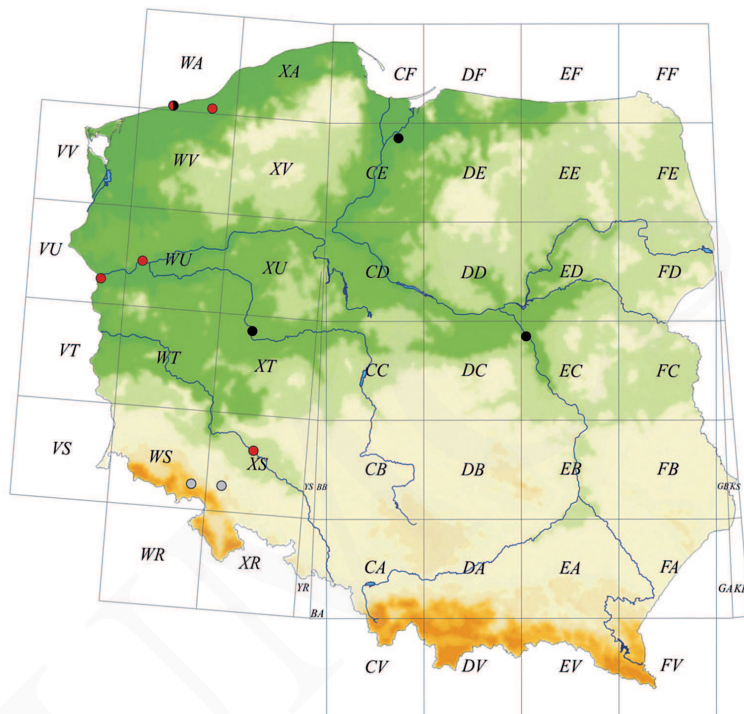


Figure 3. Distribution of *Amaurobius similis* in Poland: black points – literature data, red points – new data, red-black points – confirmed data, grey points – probable data known from the literature.

Lublin-Felin [FB 17], Witosa Str., hypermarket, in pomegranate (import from Greece), 26.11.2014 – 1 ♀, leg. Ł. Dawidowicz, det. RR; 10.12.2014 – 1 ♀, 1 juv., leg. Ł. Dawidowicz, det. RR, in pomegranate (import unknown); 08.11.2014 – 1 ♂, leg et det. RR; in pomegranate (import from Greece); 12.11.2014 – 1 ♂, 2 juv., leg et det. RR; 21.12.2014 – 1 ♀ (with remains of cocoon) and some juv., leg et det. RR; in grapes (import from Italy); 21.11.2015 – remains of ♀, leg. et det. RR; in pomegranate (import from Turkey), 29.10.2016 – 2 juv. (cult. – 1 ♂ and 1 ♀), leg. et det. RR,

Lublin-Węglin Południowy (Węglin South) [FB 07], Orkana Str., hypermarket, in pomegranate (import from Turkey); 02.01.2014 – 1 juv., leg. et det. RR.

Lublin-Felin [FB 17], Zygmunt Augusta Str., on the wall inside a house (probability specimen brought from purchased grapes) – 1 juv. (cult. – ♂), leg. et det. RR¹.

¹ In addition to above mentioned specimens of *Ch. mildei*, in pomegranates and grapes unidentified remnants of several dead specimens, exuviae and very young spiders belonging to genus *Cheiracanthium* likely representing *Ch. mildei* have been found.

This Mediterranean species was also introduced into the New World (105). In Southern Europe and the Middle East it is very common and frequent in orchards, vineyards, gardens (13, 65, 66, 93, 107). In Central and Western Europe it is still fairly rare, though increasingly more often recorded, usually in gardens and inner-city parks. It is an invasive species (32, 36, 64, 67, 96, 107).

The presence of *C. mildei* in Poland was recently reported on the basis of a single juvenile individual found in pomegranate (83). A number of further findings, suggests that the scale of import of this species with fruit to Poland and presumably to other countries of Central Europe is significant. Findings of females, cocoons and juveniles of *C. mildei* in imported fruits suggest the possibility of a sustained acclimatization, e.g. in heated all year round fruit ripening depots or storage buildings. This is also one of the few spider species found in Central Europe, whose bites can cause clinical symptoms in humans in the form of nausea and vomiting (69).

Family: Gnaphosidae

***Sosticus loricatus* (L. KOCH, 1866)**

Dębno [VU 74], Kosynierów Str., found dead in the barn, 26.06.2014 – 1♀, leg. et det. TR.

In addition, other locations on the basis of unpublished notes of Prof. W. Staręga:

Ostrołęka [ED 38] buildings, (no further details), det. W. Staręga.

Siedlce [EC 88], buildings, (no further details), det. W. Staręga.

Sompolno [CD 30], (no further details), leg. H. Pruska, det. A. Dziabaszewski.

In Poland reported from Kraków (48, 55, 71), Warsaw (89), Głuchołazy (103, 104), Gomunice near Radomsko (90), Goniądz (57) and Zakopane on the basis of notes of W. Kulczyński (78).

Notes: An occurrence of *S. loricatus* in Warsaw reported by Taczanowski (94) and repeatedly cited (54, 75, 78, 91) is a mistake. Taczanowski's comment (1866: p. 3; as *Drassus fuscus*) "common in Warsaw, under bark, leaves, etc." clearly indicates a species from the genus *Scotophaeus* or *Haplodrassus*. Also the information by Sanocka-Wołoszyn (85), about the presence of *S. loricatus* in a cave in the vicinity of Chęciny (Świętokrzyskie Mountains), is highly questionable.

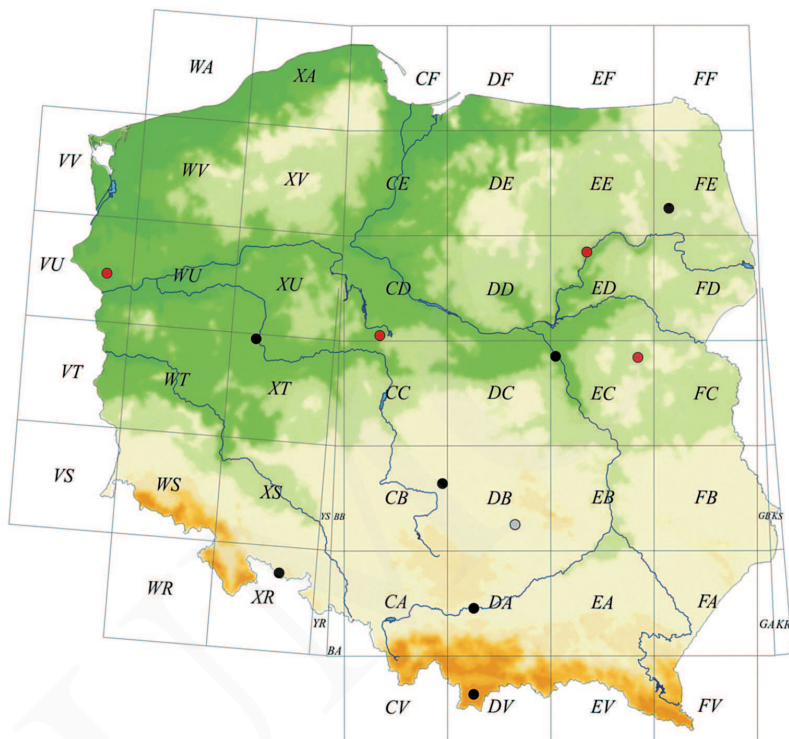


Figure 4. Distribution of *Sosticus loricatus* in Poland: black points – literature data, red points – new data, grey points – probable data known from the literature.

Family: Linyphiidae

Mermessus trilobatus (EMERTON, 1882)

Bolestraszyce, distr. Przemyśl [FA 32], Arboretum, on the swamp plants, hand collected, 06.06.2015 – 1♂, leg. et det. RR.

Bydgoszcz-Fordon [CD 09], surroundings Traktorzystów Str., psammophilous grassland, sieved from the litter of restharrow, 04.01.2015 – 1♂, leg. et det. TR.

Bydgoszcz-Otorowo [CD 08], meadow near river, in the mosses, 27.02.2016 – 1♂, 1♀, leg. et det. TR.

Czarnków [XU 06] xerothermic grassland, pitfall traps, 7.09–18.09.2013 – 1♀, leg. P. Sienkiewicz, det. RR.

Czarnowska Górka in Ujście Warty National Park [VU 82], dune, pitfall traps, 06–23.03.2014 – 1♂, leg. et det. TR.

Czarnowska Górka in Ujście Warty National Park [VU 82], dune, sieved from Grey Hair-grass, 26.12.2014 – 1♂, leg. et det. TR.

Dalewo distr. Śrem [XT 36], rye fields, biocenometer, 14.07.2014 – 1 ex., leg. J. Konik, det. M. Oleszczuk.

Dalewo distr. Śrem [XT 36], woodlots between fields, biocenometer, 06.03.2013, 03.12.2013, 16.09.2014, 28.11.2014, 9.03.2015 – total 24 exx., leg. J. Konik, det. M. Oleszczuk.

Dobra Nadzieja distr. Pleszew [XT 94], old gravel pit, sieved from Scots pine litter, 27.02.2015 – 2♀♀, leg. et det. TR.

Gąsienicowa Valley in Tatra National Park [DV 25], around Litworowe Stawki (ca 1,700 m a.s.l.), under a stone, hand collected, 07.07.2013 – 1♀, leg. et det. RR.

Gołuchów distr. Pleszew [YT 04], meadow in the park, pitfall traps, 16–21.07.2015 – 1♂, leg. P. Żurawlew, det. TR.

Gotówka distr. Chełm [FB 77], meadows, pitfall traps, 31.07–20.08.2013 – 1♂, mat. of UPH Siedlce, det. RR.

Kamień Śląski distr. Krapkowice [BB 90], shrubs on meadow edge, sieved from the hawthorn litter, 23.09.2015 – 1♀, leg. et det. TR.

Koczów distr. Chełm [FB 85], meadows, pitfall traps, 09–31.07.2013 – 1♂, mat. of UPH Siedlce, det. RR.

Kraków [DA 24], Botanic Garden of the Jagiellonian University under a stone near a pond, hand collected, 31.05.2015 – 1♂, leg. et det. RR.

Leszczany distr. Chełm [FB 85], meadows, pitfall traps, 03–30.07.2014 – 1♂, mat. of UPH Siedlce, det. RR.

Lisówki distr. Poznań [XT 19], xerothermic grassland, pitfall traps, 18–30.04.2013 – 1♂; 14.06–03.07.2013 – 1♂, leg. et det. TR.

Lisówki distr. Poznań [XT 19], young Scots pine forest, pitfall traps, 13.03–18.04.2013 – 1♀, leg. et det. TR.

Lublin-Sławin [FB 08], Botanic Garden, on the table in the cafeteria (aeronauc specimens), 03.05.2015 – 1♀, leg. et det. RR.

Lublin-Sławin [FB 08], on insectivorous plants (*Sarracenia* spp.) imported from Piaseczno [DC 96] near Warsaw, 03.10.2015 – 1♂, 2♀♀, 2 juv.; leg. et det. RR.

Lublin-Zemborzyce [FB 07], rushes near the Bystrzyca River, entomological scooper, 10.06.2014 – 1♂, leg. et det. RR.

Lubowierz distr. Włodawa [FC 60], meadows, pitfall traps, 20–30.06.2014 – 1♂, mat. of UPH Siedlce, det. RR.

Łęgi Głogowskie Reserve [WT 72], meadows, pitfall traps, 19.07–08.08.2014 – 1♂, leg. P. Sienkiewicz, det. RR.

Mała Wieś Dolna distr. Zgorzelec [WS 06], in the field, under stones on the base of wind turbine, hand collected, 14.05.2015 – 1♀, leg. et det. TR.

Mosina near Poznań [XT 29], xerothermic grassland, postindustrial area, pitfall traps, 24.04–08.05.2015 – 1♂; 22.05–11.06.2015 – 1♂, leg. et det. TR.

Mosina [XT 29], xerothermic grassland, abandoned allotment gardens, pitfall traps, 08–12.05.2015 – 1♂; 22.05–11.06.2015 – 1♂, leg. et det. TR.

Mosina [XT 29], old railway line, pitfall traps, 24.04–08.05.2015 – 3♂♂; under stones, hand collected, 24.04.2015 – 1♂, leg. et det. TR.

Nieszkwice distr. Wołów [XS 19], complex of old gravel pits, sandy grassland, pitfall traps, 01–15.06.2013 – 1♂; 15.06–01.07.2013 – 1♂, leg. et det. TR.

Osiniec distr. Czarnków/Trzcianka [XU 07], xerothermic grassland, pitfall traps, 20.04–07.05.2013 – 1♀, leg. G. Wojtaszyn, det. TR.

Pegów distr. Trzebnica [XS 37], agrocenosis, pitfall traps: 13–27.08.2013 – 2sub♂, mat. of AR Wrocław, det. RR; entomological scooper: 27.08.2013 – 2 juv.; 11.09.2013 – 1♂; 26.09.2013 – 1♀, mat. of AR Wrocław, det. RR.

Pierusza distr. Wołów [XS 29], xerothermic grassland localised on south exposed slope, pitfall traps, 01–15.06.2013 – 1♂, 1♀, leg. et det. TR.

Pierusza distr. Wołów [XS 29], mosaic complex of small gravel pits and sandy grassland, pitfall traps, 15.06–01.07.2013 – 1♂, leg. et det. TR.

Plewiska distr. Poznań [XU 20], in the garden, 28.03.2016 – 1♂, leg. Sz. Konwerski, det. TR.

Poznań-Junikowo [XU 20], dune, sieved from the litter of young Scots pine, 09.01.2015 – 4♀♀, leg. et det. TR.

Skwierzyna [WU 22], clearing under the power line, covered with heather and lichens, pitfall traps, 02–10.07.2012 – 1♂, leg. et det. TR.

Stary Załom Reserve [WU 78], extensive meadows, pitfall traps, 28.06–4.08.2012 – 1♂; 20.05–28.06.2013 – 1♂, 1♀, leg. P. Sienkiewicz, det. RR.

Sulików distr. Zgorzelec [WS 05], beech forest, pitfall traps, 19–30.06.2015 – 1♂, leg. et det. TR.

Szklarka Przygodzicka distr. Ostrzeszów [XT 90], dry Scots pine forest, pitfall traps, 24.07–05.08.2012 – 1♂, leg. et det. TR.

Szostaki distr. Biała Podlaska [FC 74], meadows, pitfall traps, 15–25.05.2015 – 1♂; 16–29.06.2015 – 1♂; mat. of UPH Siedlce, det. RR.

Trzcianica Wołowska distr. Wołów [XT 20], complex of old gravel pits, sandy grassland, pitfall traps, 18–31.05.2013 – 1♂, leg. et det. TR.

Ustka [XA 14], grey dune, in grasses, hand collected, 06.05.2015 – 1♀, leg. et det. TR.

Widnica distr. Miechów [DA 38] xerothermic grasslands, pitfall traps, 28.03–24.04.2015 – 1♂, leg. et det. M. Oleszczuk.

Wilków distr. Głogów [WT 82], embankment, pitfall traps, 20.07–07.08.2014 – 1♂; extensive meadow, pitfall traps, 20.07–07.08.2014 – 1♂, 1♀; sedge meadow, pitfall traps, 20.07–07.08.2014 – 1♂, leg. P. Sienkiewicz, det. RR.

Wińsko distr. Wołów [XT 10], mosaic complex of old gravel pits and xerothermic grassland, pitfall traps, 18–31.05.2013 – 1♂; 31.05–15.06.2013 – 1♂; 10–24.07.2013 – 1♂, leg. et det. TR.

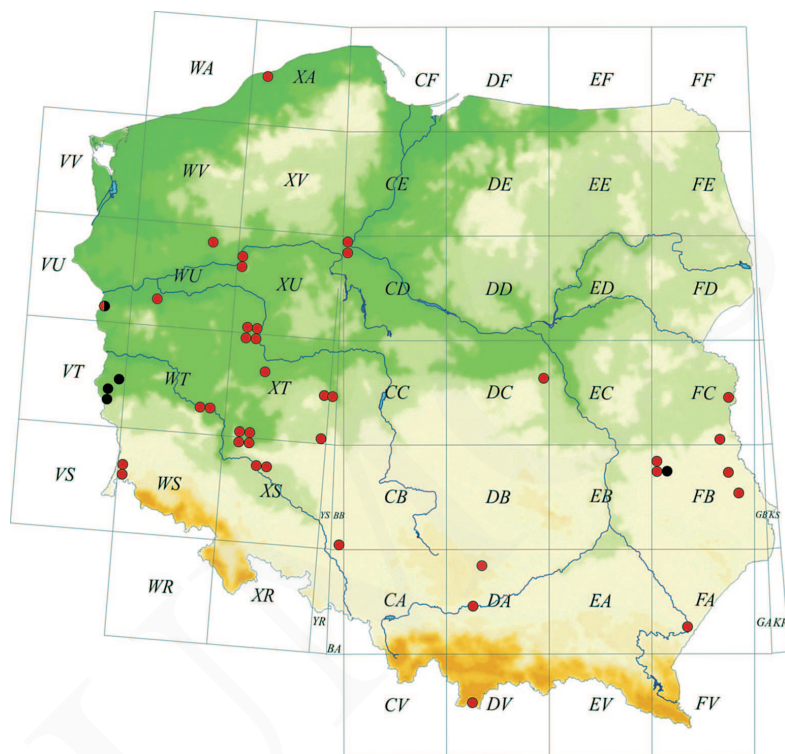


Figure 5. Distribution of *Mermessus trilobatus* in Poland: black points – literature data, red points – new data, red-black points – confirmed data.

Wrocław-Pawłowice [XS 47], agrocenosis, pitfall traps, 29.05–9.06.2011 – 1 sub♂; mat. of AR Wrocław, det. RR.

Zakrzewo distr. Poznań [XU 10], clearing under the power line, sieved from the grasses, 05.03.2016 – 1♂, 1♀, leg. et det. TR.

Spider species native to North America, introduced in the second half of the 20th century to Europe and now colonized most of the countries of Western and Central Europe (69, 83). In Poland, until now, rarely found (82, 83) but presented materials indicate that this expansive species of spider has been already widespread (Fig. 5).

Family: Nesticidae

***Nesticella mogera* (YAGINUMA, 1972)**

Warszawa [EC 08], Aleje Ujazdowskie 4 Str., Botanical Garden, under stones and under flower pots in glasshouses, 29.01.2015 – 1♂, 3♀♀, 2 juv., leg. et det. RR;

Łańcut [EA 84], Orchid House of Castle Museum in Łańcut, under flower pots, 05.06.2015 – 1♀, 1 juv., 17.08.2015 – 1♀, 3 juv., and remains of ♂ in nets of *Parasteatoda* spp. leg. et det. RR.

Tropical species originated in South-East Asia and introduced to Europe. It inhabits the spaces under rocks, pieces of wood or flower pots in damp and warm greenhouses of botanical gardens, zoos, etc. locations (10, 43, 83). It is known so far from few sites in England (88), Germany (43, 45), Poland (10, 83) and Hungary (76). New findings presented in this study, indicate that *Nesticella mogera* is wider distributed in Poland, and probably also in Europe.

Family: Pholcidae

***Holocnemus pluchei* (SCOPOLI, 1763)**

Bydgoszcz [CD 08], Fabryczna Str., on the ornamental plants in large building-garden hypermarket, 06.12.2014 – 2♀♀, 5 juv. and numerous specimens observed during several visits in 2015; leg., det. et obs. TR.

Southern European species is widespread in the Mediterranean basin, where it occurs both in the wild and synanthropic habitat. In last decades clearly in expansion, as evidenced by expanding range and increasing number of findings in Western and Central Europe (32, 52, 69, 79, 92). In Poland reported from Lublin only (84), but there it did not produce a permanent population (Rozwałka, unpubl.). Presented observations from Bydgoszcz give a proof that *H. pluchei* has been established permanently in Poland.

***Psilochorus simoni* (BERLAND, 1911)**

Kielce-Bukówka [DB 73], Wojska Polskiego Str., in the house and in the cellar, 02.08.2015 – 1♀, doc. phot. W. Sikora, and several specimens observed and photographed in the next few days. det. RR.

Plewiska distr. Poznań [XU 20], inside the house, 05.10.2015 – 1♀, leg. Sz. Konwerski, det. TR.

Warszawa [EC 08], Aleje Ujazdowskie 4 Str., Botanical Garden, under stones in glasshouses, 29.01.2015 – 1 juv.; leg. et det. RR.

A widely distributed but quite rare synanthrope, known from a few posts in Europe, Turkey, Iran and western regions of the U.S. (4, 6, 7, 16, 87). It has been found mostly in warm (10–18°C) cellars, wine and cheese ripening depots, etc. locations, where it lives under the boards, boxes (16, 30, 33, 35, 87). In places of its presence, *Psilochorus simoni* often develops very numerous populations (9, 7,

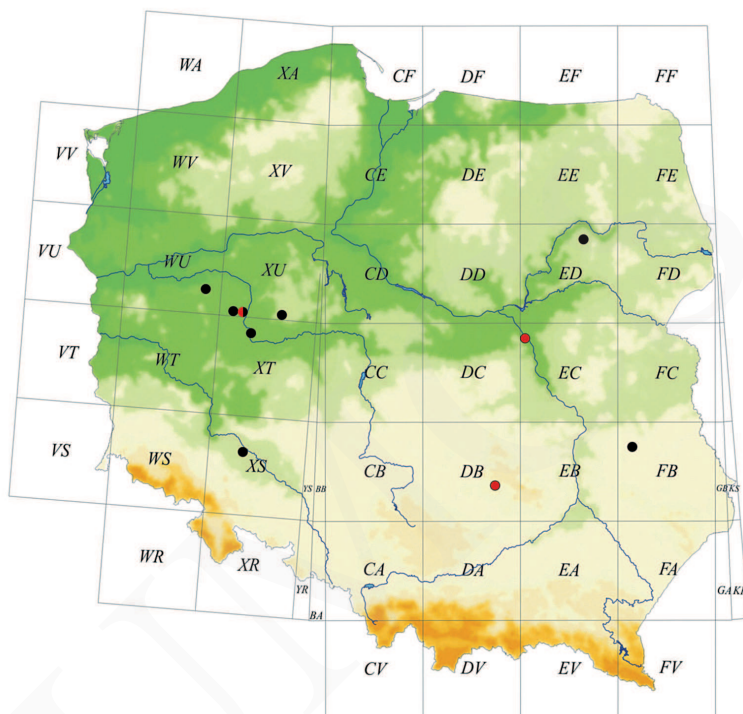


Figure 6. Distribution of *Psilochorus simoni* in Poland: black points – literature data, red points – new data, red-black points – confirmed data.

18, 23, 35, 83), but it is rarely found, perhaps because of the small size of the body. In Poland it was known from the 10 sites (83), and the subsequent records suggest that the species is gradually becoming increasingly common.

Family: Salticidae

Hasarius adansoni (AUDOUIN, 1826)

Dąbrówka distr. Poznań [XU 10], hypermarket, on ornamental plants (*Phalenopsis* hybr.) from Polish ornamental flowers farm (Warszawa, Krakowska Avenue, UTM: DC98); 23–24.07.2015 – 8 juv., leg. TR, det. RR.

Lublin-Węglin Południowy [FB 07], Zwycięska Str., large building-garden hypermarket, on ornamental plants (*Phalenopsis* hybr.), 26.09.2015 – 1♀, leg. PBB, det. RR.

Lublin-Bronowice [FB 17], Chemiczna Str., large building-garden hypermarket, on ornamental plants (*Phalenopsis* hybr.), 26.09.2015 – 1♀, leg. PBB, det. RR.

Lublin-Bronowice [FB 17], Witosa Str., supermarket, on ornamental plants (*Phalenopsis* hybr.), 19.07.2014 – 1 juv., leg. PBB, det. RR.

Pantropical species (69, 105), uncommon in Europe, mainly occurs in greenhouses, botanical gardens or large horticultural holdings (11, 32, 36, 37, 42, 44, 83). For years known in Poland only from the Palm House in Poznań and from solitary specimens incidentally introduced with flowers from Western Europe (20, 80, 83). Recently, permanent and numerous populations were reported (83), similarly to presented data. The existence of populations of *H. adansoni* in national horticultural farms provides a steady supply of individuals of this species to a variety of shops selling potted plants, without the participation of individuals from import and creates the possibility of further and more rapid expansion.

***Icius hamatus* (C.L. KOCH, 1846)**

Lublin-Bronowice [FB 17], Grabskiego Str., discount store, in pomegranate (import from Greece), 22.11.2014 – remains of 1♀ with cocoon and 2 juv., leg. et det. RR; in pomegranate (import from Spain), 21.10.2015 – 1 juv. (cult.), leg. Ł. Dawidowicz, det. RR.

Lublin-Felin [FB 17], Witosa Str., supermarket, in persimmon fruit, 31.10.2014 – 1 juv. (cult. – ♀); in pomegranate (import from Italy), 21.12.2014 – 1 ♂; in pomegranate (import from Turkey), 29.10.2016 – 1♀, 2 juv.; in pomegranate (import from Turkey), 30.10.2016 – 2♀♀; in pomegranate (import from Turkey), in pomegranate (import from Turkey), 4.11.2016 – remains of 1♀ with cocoon and some juv., all leg. et det. RR.

Lublin-Czechów Południowy [FB 08], Chodźki Str., supermarket, in persimmon fruit (import from Spain), 07.01.2017 – 1♂, leg et det. PBB.

Sosnowiec-Śródula [CA 67], discount store, in pomegranate, 29.01.2017 – 1♀ with over 100 juv., leg. K. Gruba, det. RR.

Species common in the Mediterranean area, where it inhabits orchards and gardens (69). Introduced occasionally with fruits to Central Europe (95). In Poland reported only from Wrocław (95), although the present results from Lublin indicate that it is probably a spider quite often introduced.

***Pseudeuophrys lanigera* (SIMON, 1871)**

Ostromecko distr. Bydgoszcz [CD 19], on the wall of the palace, 03.06.2013 – 1♀, leg. et det. TR.

Spider reported from Central, Western and Southern Europe (with exception of the Balkans and Turkey), southern Russia and Georgia (69). In the South-Western Europe and the Caucasus, found in various warm rocky environments (15, 62). In the western and central part of the continent it is synanthropic, inhabiting well sun-heated walls and roofs of buildings, sometimes even entering into their interiors (5, 32, 33, 69). The species is common in Western Europe, but in Central Europe is rare. In the recent years expansion of *P. lanigera* is observed (12, 92, 102).

Despite the expansion, in Poland *Pseudeuophrys lanigera* is still very rare synanthropic species, previously reported only from Wrocław (100) and Sady near Poznań (83).

Family: Scytodidae

***Scytodes thoracica* (LATREILLE, 1802)**

Lublin-Felin [UTM FB 17], Witosa Str., hypermarket, in pomegranate, imported from Greece, 22.11.2014 – 1 juv. (cult. – ♂), leg. et det. RR.

Kraków [DA 24], Mikołaja Kopernika 27 Str., Botanical Garden of Jagiellonian University, on the brick wall, 01.05.2015 – 1 juv., leg. et det. RR.

Poznań [UTM: XU 20], Polna Str., inside hospital, 01.07.2014 – 1♀, leg. D. Wiewióra, det. TR.

Zielona Góra [WT 35], on the house wall, 12.09.2014 – 1♀, leg. R. Orzechowski, ver. RR.

This species is native to the Mediterranean region but now becomes cosmopolitan as a result of the numerous introductions (69, 105). Recently, its range is clearly expanding to the North and the North-East of Europe. An increasing number of known sites in Germany (92) or Poland (53, 83, this data) is an evidence of its spread occurrence. Data from Silesia without closer localization (8, 101), not marked in Figure 7.

Finding of this species in imported pomegranate fruits may indicate a potential way in which this spider can travel from the south of the continent to Central Europe.

Family: Uloboridae

***Uloborus plumipes* LUCAS, 1846**

Bydgoszcz [CD 08], Fabryczna Str., on the ornamental plants in large building-garden hypermarket, 06.12.2014, several specimens observed, det. TR.

Bydgoszcz [CD 09], Skarżyńskiego Str., on the ornamental plants in large hypermarket, 13.03.2013 – 1♀, leg. et det. TR.

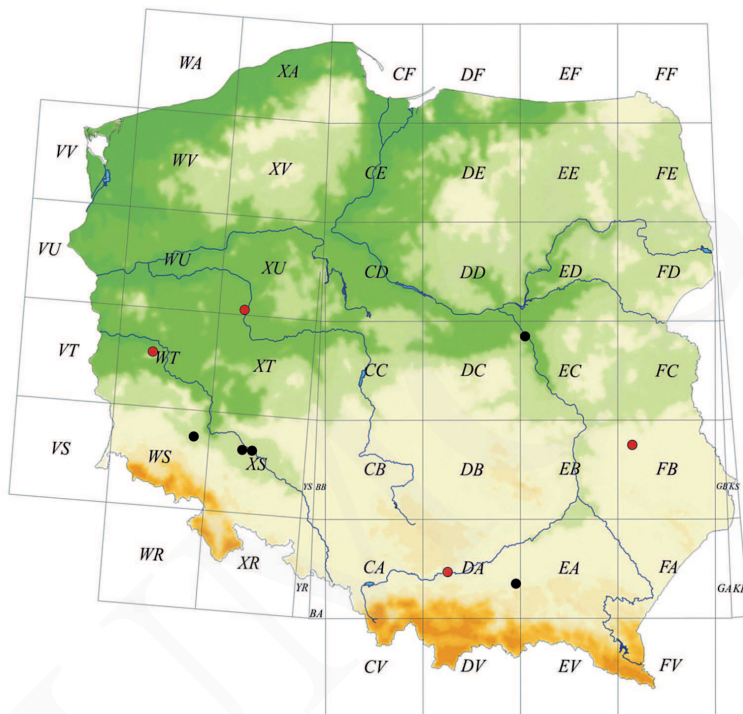


Figure 7. Distribution of *Scytodes thoracica* in Poland: black points – literature data, red points – new data.

Bydgoszcz-Mysłęcinek [CD 09], Zoological Garden, inside terrarium, on the plants, 02.05.2016 – 1 ex. obs. TR.

Płuszowice-Kolonia [EB 98], garden center, 04.05.2016 – 1 ♀ and several specimens observed, leg. et obs. RR

Rzeszów [EA 74], Emilii Plater Str., garden center, on the plants, on the racks, etc. 18.03.2016 – 1 ♀, and several specimens observed, leg et obs. RR.

Warszawa [EC 08]; Aleje Ujazdowskie Str., Botanical Garden, in glasshouses, 29.01.2015 – 1 ♀, leg. et det. RR.

Zabrze [CA 47], M. Curie-Skłodowskiej Str., in small flower shop, 20.07.2015 – 1 cocoon; obs. RR.

Species from West and Central Africa, currently spread over almost the entire pantropical area and partially in moderate climate (69, 105). In Poland creates large populations in greenhouses of big horticultural holdings (83). It also occurs in small populations in large garden centres or potted flowers wholesalers. Individual specimens are transported to the flower shops and then they are often moved to homes (81).

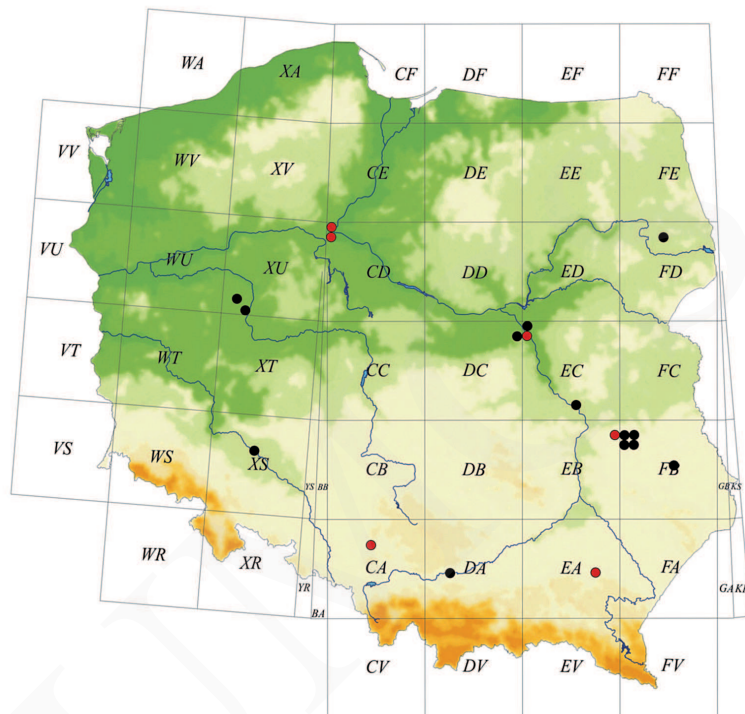


Figure 8. Distribution of *Uloborus plumipes* in Poland: black points – literature data, red points – new data.

DISCUSSION

The new findings, presented in this study, extend the list of the Polish synanthropic araneofauna by seven species: *Aphantulax trifasciata*, *Cheiracanthium furculatum*, *Cyrtophora citricola*, *Nurscia albomaculata*, *Olios argelasius*, *Phonetreria nigriventer*, and *Triaeris stenaspis*. These species should be considered as occasionally introduced, with the exception of *T. stenaspis*, for which a stable, permanent population has been detected. Furthermore, our study provides data on new locations in Poland for *Amaurobius ferox*, *A. similis*, *Cheiracanthium mildei*, *Hasarius adansoni*, *Holocnemus pluchei*, *Icius hamatus*, *Mermessus trilobatus*, *Nesticella mogera*, *Psilochorus simoni*, *Pseudeuophrys lanigera*, *Scytodes thoracica*, *Sosticus loricatus*, and *Uloborus plumipes*, and indicate routes for a potential expansion of these spiders. The majority of mentioned above spiders are synanthropic species (*Amaurobius similis*, *Psilochorus simoni*) or hemisynanthropic species (*Amaurobius ferox*, *Scytodes thoracica*, and *Sosticus loricatus*). They are well known and have been established in Poland for a long time, though they are still rather rare component of Polish araneofauna. In contrast,

Mermessus trilobatus – the species, initially recorded in Poland as introduced with potted plants (82), was soon found in several natural locations (83). Currently, it quickly colonized most of the territory of Poland and is commonly recorded in a variety of natural environments, up to high-altitude grasslands in the Tatra Mountains. The other listed species are occasionally introduced with fruits (*Cheiracanthium mildei*, *Icius hamatus*) or with potted plants (*Holocnemus pluchei*, *Nesticella mogera*, *Uloborus plumipes*). In the case of *Pseudeuophrys lanigera*, the ways of its spread as well as its status are not obvious. Our record, on the sun-heated wall of the historic Palace, is in accordance with previously described environment for this species (5, 33, 69), and might indicate a gradual acclimatization of this spider to the climatic conditions prevailing in Poland.

The present discovery of stable, autochthonous populations of *Holocnemus pluchei* and *Triaeris stenaspis* in Poland, may point out that similar localizations of these species in Poland are possible and indicate their expansion.

Most of newly discovered species (*Aphantaulax trifasciata*, *Cheiracanthium furculatum*, *Nurscia albomaculata*, *Phoneutria boliviensis*) were represented by single or few specimens imported in fruits. They may be treated as species incidentally introduced, with very limited chances for acclimatization and producing local populations. In contrast, the species spread with potted plants (*Holocnemus pluchei*, *Nesticella mogera*, *Triaeris stenaspis*) are easily finding favourable conditions in greenhouses etc., and create local populations (68).

These relationships are clear, when the differences in the methods of transport are compared. In fruits, the spiders are often transported in a low temperature and at reduced oxygen content in the atmosphere (68). Then, they eventually go to a totally different environment in comparison with that they come from. In contrast, species occurred on the potted plants are transported along with part of their niche, in stable thermal conditions and with optimal humidity for plants, usually also exotic and thermophilic. Hence, the introduced spiders are in a better shape and they are going to new places with “part of their environment” (68). On the base of the data, concerning the spiders introduced with fruits, we have to note that this is the pathway of the spread of aggressive species like *Ch. furculatum* or potentially harmful for human health (*Cheiracanthium mildei*) or even life (*Phoneutria boliviensis*).

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