Arthropoda Selecta 31(3): 363–371

New data on introduced spider species (Arachnida: Aranei) from the Urals

Новые данные об интродуцированных видах пауков (Arachnida: Aranei) на Урале

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KEY WORDS: Araneae, synanthropic fauna, greenhouse, *Coleosoma floridanum*, *Oecobius navus*, *Ostearius melanopygius*, *Parasteatoda tabulata*.

КЛЮЧЕВЫЕ СЛОВА: Araneae, синантропная фауна, оранжерея, *Coleosoma floridanum*, *Oecobius navus*, *Ostearius melanopygius*, *Parasteatoda tabulata*.

ABSTRACT. Data on four introduced spider species from the Urals are provided. One species, *Coleosoma floridanum* (Banks, 1900), is found in the fauna of Russia for the first time, and three others, *Oecobius navus* (Blackwall, 1859), *Ostearius melanopygius* (O. Pickard-Cambridge, 1880) and *Parasteatoda tabulata* (Levi, 1980), are new to the Urals fauna. Thus, the synanthropic fauna of spiders of Perm currently consists of 20 species. Four of the five recorded introduced species, *C. floridanum*, *O. melanopygius*, *P. tabulate*, and *Nesticella mogera* (Yaginuma, 1972), were found in the greenhouse of the Botanical Garden of the Perm State University. The greenhouse spider fauna appears to be rather diverse: besides four introduced species, three synanthropic and 20 native spider species are found there. Data on ecology and/or phenology of the newly recorded introduced species are provided as well.

How to cite this paper: Plakkhina E.V., Esyunin S.L. 2022. New data on introduced spider species (Arachnida: Aranei) from the Urals // Arthropoda Selecta. Vol.31. No.3. P.363–371. doi: 10.15298/arthsel.31.3.13

РЕЗЮМЕ. Приведены данные о 4 интродуцированных видах пауков с Урала. Один вид, *Coleosoma floridanum* (Banks, 1900), новый для фауны России, три вида, *Oecobius navus* (Blackwall, 1859), *Ostearius melanopygius* (O. Pickard-Cambridge, 1880) и *Parasteatoda tabulata* (Levi, 1980), новые для фауны Урала. Таким образом, эусинантропная фауна пауков Перми на данный момент включает 20 видов. Четыре из пяти известных интродуцированных видов, *C. floridanum*, *O. melanopygius, P. tabulate* и *Nesticella mogera* (Yaginuma, 1972), обнаружены в оранжерее ботанического сада Пермского университета. Фауна пауков оранжереи довольно разнообразна: кроме 4 интродуцированных видов, здесь обнаружены 3 синантропных и 20 нативных видов пауков. Также приведены данные по экологии и/или фенологии найденных интродуцированных видов.

Introduction

The European fauna is undergoing accelerating changes due to global warming, habitat transformation and the spread of invasive species [Řezáč *et al.*, 2021]. A number of alien species is steadily increasing, mainly through continuous globalization with increasing transportation of people and goods [Hulme *et al.*, 2009]. Such species are transferred, with direct or indirect human assistance, from the areas of their origin to other biogeographical areas where they may become established [Ricciadi *et al.*, 2013]. First records of alien spiders in Europe date back 200 years; they were compiled by Bonnet [1929] for the first time. The latest review on this problem was made by Nentwig [2015].

Greenhouses, with relatively stable temperature and humidity conditions, provide a suitable environment for various groups of invertebrates. With the usual synanthropic and native species that occasionally make their way into greenhouses, newly introduced exotic (sub)tropical species can be found as well. It is an old tradition to search for exotic invertebrate animals in greenhouses [Simon, 1896; Boettger, 1929; Holzapfel, 1932]. A large part of such alien species seems to have been imported with overseas plants from nurseries or other greenhouses. In most cases, they are restricted to heated greenhouses (hothouses) due to their ecological demands, especially with regards to temperature [Hänggi *et al.*, 2021].

The findings of introduced spider species in Russia are quite rare, even in the European part. Such finds usually belong to the synanthropic species collected from private houses and other kind of indoor habitats.

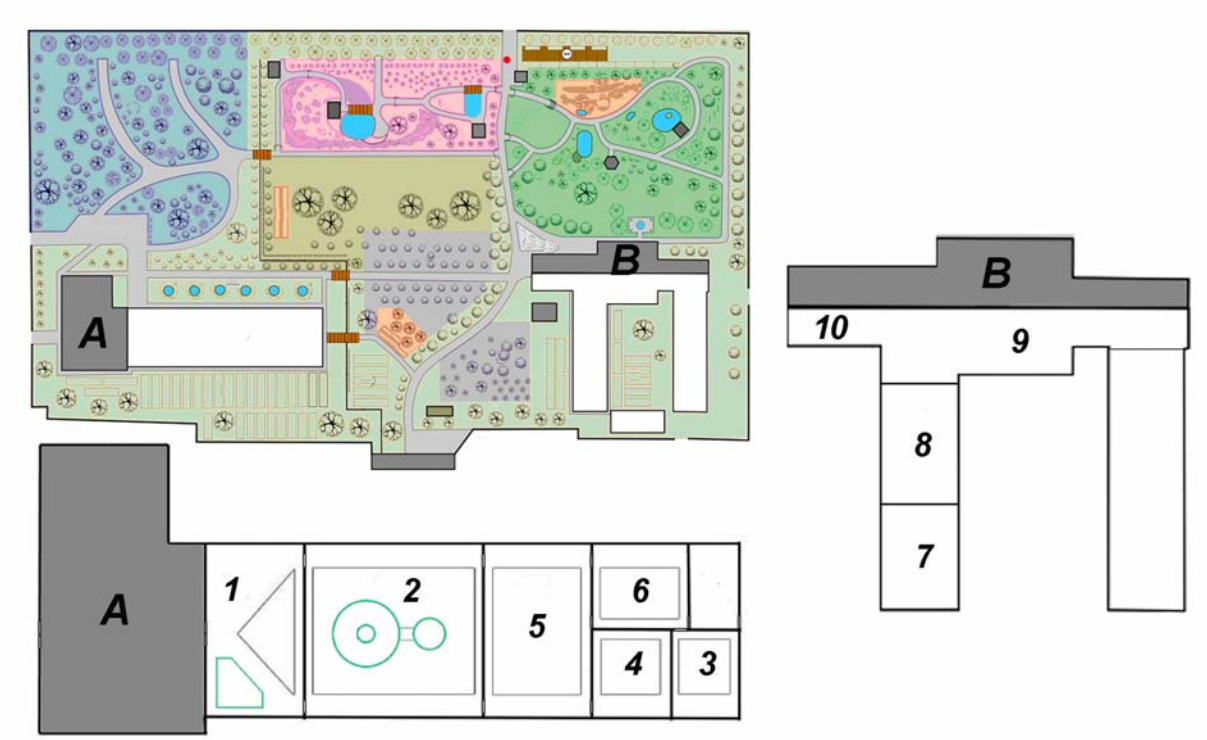

Fig. 1. Map-scheme of compartments in the new (A) and memorial part (B) of greenhouses of the Botanical Garden of the Perm State University (after Shumiknin [2015]; Botanical Garden…, 2021]). Compartments 1–10 as in the text.

Рис. 1. Карта-схема отделений новой (А) и мемориальной (В) частей оранжереи Ботанического сада Пермского государственного университета (по [Shumiknin, 2015; Botanical Garden…, 2021]). Отделения 1–10 как в тексте.

In 2019, the theridiid spider *Nesticella mogera* was discovered in the greenhouse complex of the Botanical Garden of the Perm State University (Russia). It was probably introduced there with plants originated from the Kuban Subtropical Botanical Garden [Esyunin *et al.*, 2019]. This finding prompted a more detailed study of the greenhouse complex for possible records of other introduced species.

In the present paper, new records of some anthropochorally distributed spider species are given, with some remarks on their ecology and phenology. Of these species, three are new to the greenhouse and one has established itself as a synanthropic species in Perm.

Material and Methods

The studied material was collected by pitfall-traps set up in the greenhouse complex of the Botanical Garden of the Perm State University (Russia) from January to December 2021. Ten greenhouse compartments (Fig. 1) that differ in a hydro-thermal regime and selected plants were examined (Figs 2–7): 1) Permian Period, 2) Wet Tropics, 3) Cacti and Succulents, 4) Epiphytes, 5) Dry Tropics, 6) Useful Tropic Plants, 7) Collection of orchids, 8) Subtropics, 9) Warm and 10) Cold Sections of the memorial greenhouse [Shumikhin, 2015]. The compartments No. 1–6 are located in the new part of the greenhouse which was built up in 2010; the compartments No. 7–10 belong to the memorial part of the greenhouse which was built up in 1930 (Fig. 1).

In each section of the greenhouse, the air temperature and humidity are adjusted to the needs of cultivated plants (Table 1). All greenhouse compartments are regularly treated with insecticides.

The material was collected every 14 days. The air temperature at the ground level was measured every time the traps were emptied. During the season, 5–7 measurements were made. Table 1 shows average temperatures.

In addition, specimens of *Oecobius navus* (Blackwall, 1859) recorded from the ‘urban wall spider’ were also observed in a high-rise apartment building from May 2019 to January 2022.

The studied material is deposited in the Zoological Museum of the Moscow State University (ZMMU, curator: K.G. Mikhailov), Manchester Museum of the University of Manchester, UK (MMUE, curator: D.V. Logunov) and the Department of Invertebrate Zoology and Aquatic Ecology of the Perm State University (PSU, curator: S.L. Esyunin).

Results

Linyphiidae

Ostearius melanopygius (O. Pickard-Cambridge, 1880)

MATERIAL. Russia, Perm, botanical garden of the Perm State University, greenhouse, pitfall-traps, E. Plakkhina: 1♀ (ZMMU), 26.IV–11.V.2021; 1♀, (ZMMU), 7–21.VI.2021; 3♂♂, 4♀♀ (MMUE), 30.VIII.2021.

Figs 2–7. A general view of the greenhouse compartments of the Botanical Garden of the Perm State University: 2 — Permian Period, 3 — Wet Tropics, 4 — Dry Tropics, 5 — warm section of memorial part, 6 — Cacti and Succulents, 7 — Subtropics.

Рис. 2–7. Общий вид отделений оранжереи Ботанического сада Пермского государственного университета: 2 — Пермский период, 3 — влажные тропики, 4 — сухие тропики, 5 — теплое отделение Мемориальной части, 6 — кактусы и суккуленты, 7 — субтропики.

Table 1. Basic climatic conditions in different compartments of the greenhouse complex of the Botanical Garden.
Таблица 1. Основные климатические условия в различных отделениях оранжерейного комплекса Ботанического сада.

Compartment*	Relative humidity (%)	Average air temperature (°C)			
		Winter	Spring	Summer	Autumn
1	80–90	22.3	21.5	23.3	19.3
2	90–100	28.6	23.6	23.2	23.2
3	60–70	20.9	24.6	24.5	21.3
4	95–100	24.1	23.4	23.3	21.7
5	80	27.5	22.9	23.0	22.9
6	80	26.0	24.4	23.2	22.0
7	85–90	14.8	21.1	23.2	13.3
8	85–90	15.1	19.7	23.1	13.8
9	85–90	12.5	16.6	20.2	13.1
10	85–90	11.6	17.7	21.0	12.5

* Compartments 1–10 as in text.

Table 2. Numbers of three spider species collected by pitfall traps in greenhouses of the Botanical Garden of the Perm State University.
Таблица 2. Численность трех видов пауков, собранных в оранжерее Ботанического сада Пермского государственного университета с помощью ловушек.

Species	Compartment*								
	1	2	3	4	5	6	7	8	9
Ostearius melanopygius	–	–	–	–	–	–	18 mm 10 ff 2 juv.	6 mm 5 ff 3 im. m 1 im. f 2 juv.	–
Parasteatoda tabulata	1 m	–	1 m 1 f	–	1 juv.	1#	–	–	1 juv.
Coleosoma floridanum	10 mm 2 im. ff 2 juv.	11 mm 8 ff 3 im. mm 2 im. ff 2 juv.	81 mm 39 ff 19 im. mm 15 im. ff 24 juv.	11 mm 4 ff 1 im. m 1 im. f 2 juv.	12 mm 8 ff 2 im. mm 2 im. ff 5 juv.	16 mm 21 ff 8 im. mm 9 im. ff 6 juv.	1$ 1 juv.	–	2 ff 1 im. m 1 juv.

* Compartments 1–9 as in the text. Abbreviations: im. — immature ♂♂ and ♀♀; juv. — juvenile specimens at different stages; f, ff — female(s); m, mm — male(s).

IDENTIFICATION. Locket, Millidge [1953: Fig. 197D–G]. Wiehle [1960: Abb.8–15].

COMMENTS. It is believed that *O. melanopygius* is native to South America. The species has been introduced now to North and South Africa, Canary Islands, Turkey, China, Malaysia, Indonesia, New Zealand [WSC, 2022], Japan [Chikuni, 1989], Australia [GBIF, 2021] and Europe [Nentwig *et al.*, 2022]. Wiehle [1960] suggested that the species was introduced to Europe via England (Zwisterne Station in the Atlantic Islands). Having summarized the available data, Ruzicka [1995] came to the conclusion that *O. melanopygius* spread eastward at a speed of about 50 km per year. Now the species has established throughout Europe [Nentwig *et al.*, 2022].

O. melanopygius was discovered near the western border of Russia, in Donetsk Area of Ukraine in 2016 [Ponomarev *et al.*, 2017]. In the same year, the species was caught in Udmurtia [Sozontov, 2021]. Yet, the species is known from the Maritime Territory of Russia [Marusik, Koponen, 2000]. *O. melanopigyus* is recorded from Perm Region and the Urals for the first time.

HABITAT AND ECOLOGY. Data on the biotopic preferences of *O. melanopygius* in South America are scarce. Freiberg [2017] noted that the species was abundant on pastures and soybean fields in the integrated agricultural production system of Rio Grande do Sul, Brazil. The species is confined to agricultural lands in Egypt [El-Hennawy *et al*., 2016] and Europe [Rozvałka *et al*., 2013] as well. At the same time, in Europe, the species inhabits urbanized territories, such as natural biotopes, parks, landfill areas and even buildings [Benz *et al*., 1983; Rozvałka *et al*., 2013]. Rozvałka with the co-authors [2013] showed that the main route of species' expansion is gardening (houseplants, pots, packaging, etc.), which allows it to establish new populations almost everywhere. Yet, in addition to anthropogenic factors, the authors mentioned that ballooning could be another important way of dispersal for *O. melanopygius*. However, in northern Europe, this species was found in the greenhouses only [Pajunen *et al*., 2008].

In the Russian Plain, this species was recorded only from such natural landscapes as the steppe [Ponomarev *et al*., 2017] and the *Quercus-Tilia* forest [Sozontov, 2021].

On August 8th 2021, *O. melanopygius* was found in the Perm Botanical Garden for the first time. Since then, it has recorded from the greenhouse only. Yet, its distribution over the greenhouse sections is not uniform. Specimens were found in two compartments of the memorial part of greenhouse: 'Collection of Orchids' and 'Subtropics' (Table 2).

The species abundance in the 'Collection of Orchids' is twice as high than in the 'Subtropics'. The compartments have the same temperature and air humidity, but differ in the soil surface. In the 'Subtropics', plants are kept as pot culture. The soil under the shelves is quite dense, consisting of peat and sand covered with a layer of synthetic coating. In the 'Collection of Orchids', the soil composition is lighter, consisting of peat and leafy soil covered with mulch of dry pine bark (about 3 cm thick).

In the papers available to us, the phenology data on *O. melanopygius* are scarce. Gruberg [1997] found this species in Vienna in the second half of May. In Zurich, the phenomenon of mass reproduction was recorded in the first half of November [Benz, 1983]. According to 'Spiders of Europe', *O. melanopygius* is found all year-round but "mainly early year and autumn" [Nentwig *et al*., 2022]. In the Perm Botanical Garden, the specimens of *O. melanopygius* were caught from August till December with a maximum abundance in September (Fig. 8).

Oecobiidae

Oecobius navus (Blackwall, 1859)

MATERIAL. 1♂ (PSU-8201), Perm, indoor (flat), 28.V.2019, T.S. Esyunin; 2♂♂, 1♀ (PSU-8542), same locality, 20.IX.2019,

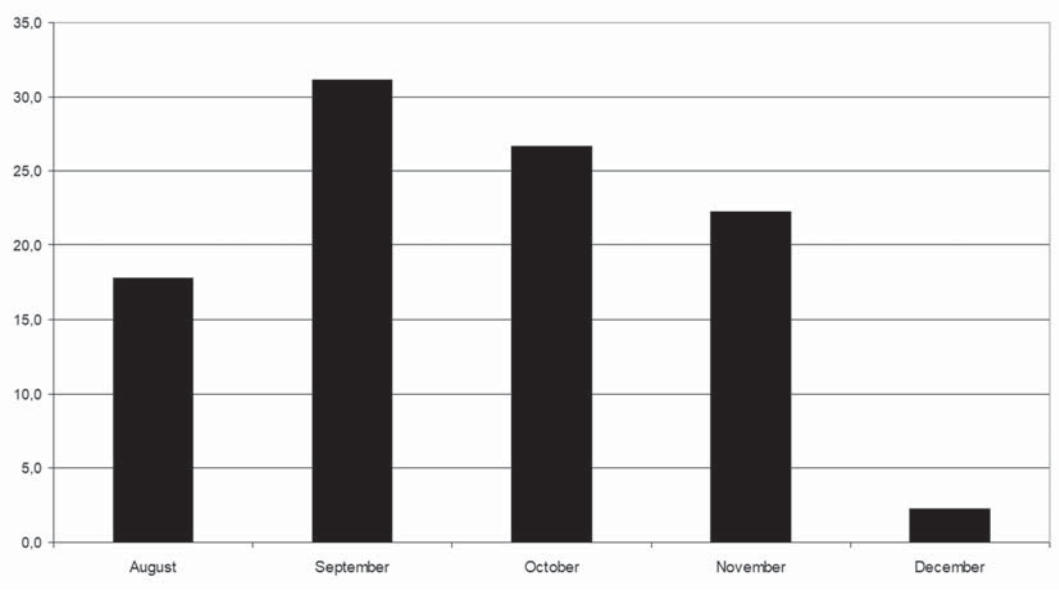

Fig. 8. Population dynamics of *Ostearius melanopigius* in the Botanical Garden of the Perm State University in 2021 (% of all the captured specimens).

Рис. 8. Динамика численности *Ostearius melanopigius* в Ботаническом саду Пермского государственного университета в 2021 г. (% от всех отловленных особей).

S.L. Esyunin; 1♂ (MMUE), same locality, 25.VIII.2020, S.L. Esyunin; 2♀♀ (MMUE), same flat, X–XI.2020, S.L. Esyunin; 1♂ (ZMMU), same flat, 2.I.2021, G.Sh. Farzalieva; 1♀ (ZMMU), same flat, 16.X.2021, E.S. Esyunina; 1♀ (ZMMU), same locality, 17.I.2022, E.S. Esyunina.

IDENTIFICATION. [Wunderlich, 1987: Abb. 281–283].

COMMENTS. There are 90 species of *Oecobius* Blackwall, 1862 worldwide, of which many (8.9%) species have been introduced to many regions from outside their natural occurrence [WSC 2022]: viz., *O. amboseli* Shear et Benoit, 1974, *O. annulipes* Lucas, 1846, *O. cellariorum* (Dugès, 1836), *O. concinnus* Simon, 1893, *O. maculatus* Simon, 1870, *O. marathaus* Tikader, 1962, *O. navus*, *O. putus* O. Pickard-Cambridge, 1876).

O. navus was first described from Madeira but is now reported worldwide [Nentwig et. al., 2022]. Presumably its natural range was limited to the Mediterranean (south Europe, northern Africa, Turkey, the Caucasus), but to date it has been introduced to South Africa, China, Korea, Japan, New Zealand, Canada, USA, South America [WSC, 2022], apparently, as a result of human transportation [Oxford, 2020].

In Europe, *O. navus* was first recorded by Pickard-Cambridge [1909] from Britain, based on the material sent to him from the Royal Botanic Gardens (Kew) where a single adult female was caught on a bundle of imported cork probably from Spain or northern Africa [Oxford, 2015]. Since then, during few decades, this species has spread out across Europe. Yet, it is not listed as alien or invasive because it is native to Europe [Nentwig *et al*., 2022].

O. navus has been recorded from the western borders of Russia since the 1980s: Estonia [Vilbaste, 1974: as *Oecobius annulatus* Lucas, 1846], Latvia [Šternbergs, 1980: as *O. annulatus*], Ukraine [Evtushenko, 2001: as *Talamia annulatus*], Belarus [Dashkevich, 2015]. In 1996, the species was discovered in Ryazan City, and in 2017 in Chuvash Republic (for details, see Mikhailov & Borisova [2017]). However, *O. navus* is recorded from Perm Region (and the Urals) for the first time.

HABITAT AND ECOLOGY. In the temperate regions of Europe, *O. navus* is almost exclusively synanthropic, but in warmer regions it is also known from outdoor habitats such as garrigue, oak woods, heathlands, under stones [Nentwig *et al*., 2022]. In northern Africa, it was found in desert habitats, under stones [Hassan, 1953]. In South America, it is common in the Mediterranean scrubs in Chile and caves in Brazil (specimens were even collected at patches of bat guano in a cave, up to 120 m from the cave entrance) [Santos, Gonzaga, 2003].

In the City of Perm, *O. navus* was observed exclusively indoor, in an apartment of a multi-flat house. In the same house there is also a large colony of the Pharaoh Ant (*Monomorium pharaonis* (Linnaeus, 1758); Myrmicinae, Formicidae, Hymenoptera), which seems to represent a potential prey for this spider [Voss *et al*., 2007].

According to the GBIF Metrics [GBIF, 2021], individuals of *O. navus* are found throughout the year, with a significant increase in numbers in April and May. Such dynamics correlates with the data from 'Spiders of Europe': viz., females are observed all year round, while males are observed mainly in the summer [Nentwig *et al*., 2022].

Despite a small number of individuals caught (see above), it is worth mentioning that both males and females were caught in all seasons of the year.

Theridiidae

Coleosoma floridanum (Banks, 1900)

MATERIAL: Russia, Perm City, Botanic Garden of the Perm State University, pitfall traps, E. Plakkhina: 6♂♂, 7♀♀ (ZMMU), 11.I.2021; 20♂♂, 14♀♀, (MMUE), 25.I.2021.

IDENTIFICATION. [Knoflach, 1999: Abb. 71–82].

COMMENTS. *Coleosoma floridanum* is considered to be native to Central and South America [WSC, 2022], but now the species is known from Canada, USA, central and

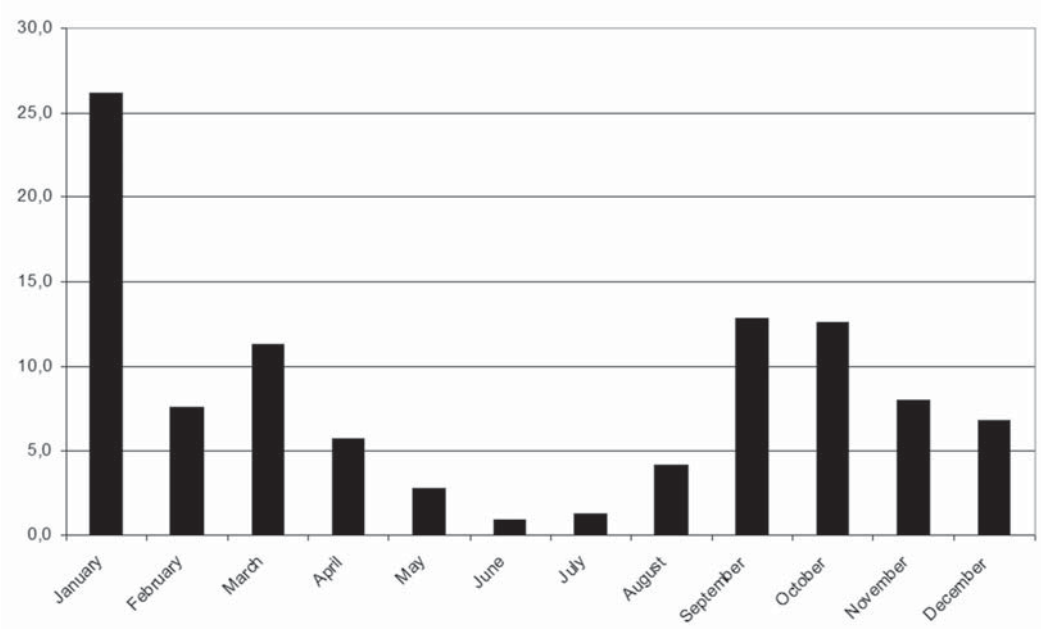

Fig. 9. Population dynamics of *Coleosoma floridanum* in the Botanical Garden of the Perm State University in 2021 (% of all the captured specimens).

Рис. 9. Динамика численности *Coleosoma floridanum* в Ботаническом саду Пермского государственного университета в 2021 г. (% от всех отловленных особей).

north Europe [GBIF, 2021], Macaronesia, West Africa, Seychelles, India, Sri Lanka, the Philippines, China, Japan, Pacific Islands [WSC, 2022]. The species is pan-tropical and, thanks to its inconspicuous size and the habit of clinging to vegetation, it is easily imported to any country with plants carried aboard ships [Spoczynska, 1969]; it was assumed that the species could occur in any large greenhouse installation [Cutler, 1972].

In Europe, *C. floridanum* was recorded from Britain (Kew Gardens) for the first time in the late 60s [Spoczynska, 1969]. Then no further finds were reported from Europe for a long time. At the end of the 20th century, *C. floridananum* was found in central Europe [Helsdingen, 1995; Broen *et al*., 1998; Knoflach, 1999; Emerit, Ledoux, 2008], and in the 21st century it was discovered in eastern and northern Europe [Pfliegler, 2014; Šestakova *et al*., 2013, 2017; Koponen *et al*., 2016; Řezáč *et al*., 2021]. It is the first record of *C. floridanum* from Russia.

HABITAT AND ECOLOGY. In the Central and South America, *C. floridanum* was found under stems of dead coconut leaves and under rocks [Levi, 1959]. Later, in Florida, Levi [1967] found specimens climbing vegetation and also taking refuge in litter, under bark and stones on the ground.

All the finds of the species from the USA, Canada or European countries indicate that *C. floridanum* forms populations in artificial environments that imitate the climatic conditions of tropical countries [Broen *et al*., 1998]: in botanical gardens, zoos, butterfly pavilions, etc. For example, in Canadian Biodôme de Montréal *C. floridanum* is restricted to the understory of artificial tropical ecosystems [Paquin *et al*., 2008]. Šestakova with the co-authors [2013] found *C. floridanum* in highly humid and heated greenhouses (about 20–30 °C). They observed numerous specimens under plant leaves. Some were between stones and under the flowerpots, and only few specimens were collected within the soil [Šestakova *et al*., 2013].

The record of *C. floridanum* from the Netherlands was done from a different kind of artificial biocenoses. The species was found in large numbers in a hot-cell (28–30 °C, 80–85 relative humidity) of a Freesia Trading Company in Honselersdijk [Helsdingen, 1995].

In the Botanical Garden of the Perm State University, almost all specimens were collected from a new part of the greenhouse which was built up in 2010. In the memorial greenhouse of the Botanical Garden, only singletons were caught. The preferred habitat for *C. floridanum* was the compartment ‘Cacti and Succulents’ (Table 2), which was driest and most extreme in terms of temperature fluctuations of all other compartments of the new part of greenhouse (Table 1). The temperature in ‘Cacti and Succulents’ is highest in the spring/summer and lowest in the winter among all the compartments (Table 1). Yet, a significant number of the specimens of *C. floridanum* were captured in the ‘Useful Tropic Plants’ compartment (Table 2). This section does not differ significantly from other sections with regards to its temperature and humidity (Table 1).

Usually, in greenhouses, specimens of *C. floridanum* were hand-collected, or collected by beating trays [Tharmarajan, Benjamin, 2021]. It should be noted that a number of individuals collected by these methods is always relatively small. We used pitfall-traps which allowed us to collect a large number of individuals moving along the soil surface (332 individuals in total).

In the papers known to us, the phenology of *C. floridanum* is not described. In Europe, this species was observed from May to July [Nentwig *et al*., 2022]. In the City of Perm, *C. floridanum* was collected throughout the year, with a sharp decline in the summer (Fig. 9). We also observed two peaks of the *C. floridanum* activity: the spring (March) and the autumn (September–October).

Parasteatoda tabulata (Levi, 1980)

MATERIAL. Russia, Perm City, Botanic garden of Perm State University, greenhouse, pitfall-traps, E. Plakkhina: 1♂ (MMUE), 16.VIII.2021; 1♂, 1♀ (ZMMU), 11.X.2021.

OTHER MATERIAL. Russia, Lipetsk City: 1♀ (PSU-722), *Pinus-Betula* forest, 4.VII.1999, G.Sh. Farzalieva; 1♂ (PSU-722), same locality, outbuildings, VII.2004, S.L. Esyunin. – Amur Oblast: 1♀ (PSU-8140), Nora (=Norsky) Reserve, meadow with *Carex* and another herbs, VI.2018, coll. unknown; 1♀ (PSU-8140), same locality, Mal'tsevskiy cordon, VI.2018, coll. unknown; 2♂♂, 4♀♀ (PSU-8141), Belogorsk District, Vozzhaevka Vil., kitchen garden, 20.VI.2018, coll. unknown.

IDENTIFICATION. [Knoflach, 1991: Abb.6–10, 14–15; Gromov, 1997: Figs 1–5].

COMMENTS. *Parasteatoda tabulata* seems to be native to southern Asia [Dondale *et al*., 1994], but now is widely distributed across the northern Hemisphere [WSC, 2022], displaying a Holarctic range [Le Peru, 2011].

The first species record from Europe was made by Moritz and the co-authors [Moritz *et al*., 1988] eight years after the original description. *P. tabulata* was introduced to Europe at least once and did establish [Nentwig *et al*., 2022], being currently widespread in central and eastern Europe and the Caucasus [Nentwig *et al*., 2022].

In the European part of Russia, *P. tabulata* was hitherto recorded from the cis-Caucasia [Abdurakhmanov *et al*., 2012; Ponomarev, Komarov, 2013], Krasnodar Province [Esyunin, 2010], Kursk [Polchaninova, 2009], Belgorod [Ponomarev, Polchaninova, 2006], Rostov [Ponomarev, Tsvetkov, 2003] and Ulyanovsk Areas [Kuz'min, Alekseenko, 2011] and Republic of Udmurtia [Sozontov, Esyunin, 2012]. In addition, this species was found in southern regions of Siberia [Trilikauskas, 2013; Azarkina. Trilikauskas, 2013; Danilov, 2008], and in the Far East [Seyfulina, 2006; Mikhailov, Temereva, 2015]. Yet, *P. tabulata* is recorded for the spider fauna of Lipetsk and Perm Regions for the first time.

HABITAT AND ECOLOGY. In Europe, *P. tabulata* appears to be a synanthropic specie that prefers outer house walls [Knoflach, 1991; Dimitrov, 1994; Šestáková, Gajdoš, 2011], but is occasionally found in pine forests [Le Peru, 2011] or under rubble [Bink, 2014]. Juveniles and adults build a shelter consisting of a dome lined with various materials such as plant debris, pebbles, prey remains or empty egg sacks [Bink, 2014], as well as glass and plastic fragments [Knoflach, 1991]. According to Gromov [1997], in Kazakhstan, *P. tabulata* was caught in the rocky steppe.

Specimens of *P. tabulata* can be found throughout the growing season, but calendar dates of their activity depend on a region. For example, in Germany it was active from May to October with the main activity period for males in May [Moritz *et al*., 1988]. In Canada, *P. tabulata* was found from June to September [Dondale *et al*., 1994]. Females with egg sacs were registered from September to November [Le Peru, 2011]. In the City of Perm, adult specimens were caught from August to November.

Discussion

Three years ago, we thought of the synanthropic spider fauna of the City of Perm ase well-studied and extremely poor, with the finding of a new species being a sensation [Esyunin *et al*., 2019]. The research specifically designed to collect spiders changed that perception. The records of one species new to Russia (*Coleosoma floridanum*) and three new to the Urals (*Parasteatoda tabulata*, *Oecobius navus* and *Ostearius melanopygius*) underline the fact that the knowledge of the synanthropic spider fauna of European part of Russia is still unsatisfactory. At the moment, the synanthropic spider fauna of Perm accounts for twelve species [Esyunin *et al*., 2019; present data]: *Aituaria pontica* (Spassky, 1932), *C. floridanum*, *Nesticella mogera* (Yaginuma, 1972), *O. navus*, *O. melanopygius*, *P. tabulata*, *Pholcus alticeps* Spassky, 1932, *Pholcus phalangioides* (Fuesslin, 1775), *Sosticus loricatus* (L. Koch, 1866), *Steatoda castanea* (Clerck, 1757), *Steatoda grossa* (C.L. Koch, 1838), *Tegenaria domestica* (Clerck, 1757).

The fauna of heated greenhouses of Perm turned out to be especially diverse. In addition to twenty native species, such as *Bathyphantes nigrinus* (Westring, 1851), *Centromerita bicolor* (Blackwall, 1833), *Diplocephalus cristatus* (Blackwall, 1833), *Diplostyla concolor* (Wider, 1834), *Enoplognatha ovata* (Clerck, 1757), *Erigone dentipalpis* (Wider, 1834), *Evarcha falcata* (Clerck, 1757), *Gnathonarium dentatum*, *Lepthyphantes leprosus* (Ohlert, 1865), *Megalepthyphantes pseudocollinus* Saaristo, 1997, *Oedothorax apicatus* (Blackwall, 1850), *Pachygnatha degeeri* Sundevall, 1830, *Pardosa amentata* (Clerck, 1757), *Phylloneta impressa* (L. Koch, 1881), *Piratula hygrophila* (Thorell, 1872), *Porrhomma pygmaeum* (Blackwall, 1834), *Singa hamata* (Clerck, 1757), *Trochosa ruricola* (De Geer, 1778), *Walckenaeria nudipalpis* (Westring, 1851), *Xysticus* ssp.), three synanthropic (*S. castanea*, *S. grossa* and *T. domestica*) and four introduced species (*N. mogera*, *O. melanopygius, P. tabulata*, and *C. floridanum*) have been found there. The latest non-native species should have arrived with imported plants, in the same way as it happens in Europe [Paquin *et al*., 2008; Nentwig, Kobelt, 2010; Šestakova *et al*., 2013; Pfliegler, 2014; Nentwig, 2015; Hänggi *et al*., 2021].

In Europe, there is a risk of naturalization of introduced species, especially in the context of climate change [Hänggi *et al*., 2021]. Tropical and subtropical spiders from the greenhouses of Perm have no potential to establish any populations outdoors due to the absence of necessary climatic conditions. Yet, in the early spring 2021 (May 7), we observed a male and a female of *N. mogera* in a weedy area outside the greenhouse. Later, during the spring-summer period, we didn't find any more specimens of introduced spider species outside greenhouses.

Acknowledgments. The authors are grateful to D.V. Logunov (Manchester, UK) for editing the English of the final draft.

References

Abdurakhmanov G.M., Ponomarev A.V., Alieva S.V. 2012. [Spider (Arachnida: Aranei) of the Republick of Dagestan: species composition, distribution]. Makhachkala. 220 p. [In Russian]

Azarkina G.N., Trilikauskas L.A. 2013. Spider fauna (Aranei) of the Russian Altai, part III: families Mimetidae, Miturgidae, Oxyopidae, Philodromidae, Pholcidae, Pisauridae, Salticidae, Sparassidae, Tetragnathidae, Theridiidae, Thomisidae, Titanoecidae, Uloboridae and Zoridae // Euroasian Entomological Journal. Vol.12, No.3. P.243–254.

Benz G., Nyffeler M., Hug R. 1983. *Ostearius melanopygius* (O.P. Cambridge) (Aranei, Micryphantidae) neu für die Schweiz. Über ein Massenauftreten der Spinne in Zürich und die Zerstörung der Population durch Schneefall // Mitteilungen der Schweizerischen Entomologischen Gesellschaft. Bd.56. S.201–204.

Bink J. 2014. *Parasteatoda tabulata* Levi, 1980 (Araneae, Theridiidae) voor het eerst waargenomen in Nederland // Nieuwsbrief SPINED. Bd.34. S.12–15.

Boettger C.R. 1929. Eingeschleppte Tiere in Berliner Gewächshäuser // Zeitschrift für Morphologie und Ökologie der Tiere. Bd.15. S.675–704.

Bonnet P. 1929. Les araignées exotiques en Europe // Bulletin de la Société zoologique de France. T.54. P.501–523.

Broen B. von, Thaler-Knoflach B. Thaler K. 1998. Nachweis von *Coleosoma floridanum* in Deutschland (Araneae: Theridiidae) // Arachnologische Mitteilungen. H.16. S.31–32.

Chikuni Y. 1989. [Pictorial encyclopedia of spiders in Japan]. Tokyo: Kaisei-sha Publishing Company. 310 p. [In Japanese]

Cutler B. 1972. Notes on the behavior of *Coleosoma floridanum* Banks // Journal of the Kansas Entomological Society. Vol.45. P.275–281.

Danilov S.N. 2008. [Catalog of spiders (Arachnida, Aranei) of the Transbaikalia]. Ulan-Ude. 108 p. [In Russian]

Dashkevich M. 2015. [Addition to the list of spider species (Arachnida, Aranei) of Belarus] // Sovremennye problemy entomologii Vostochnoy Evropy. Minsk. P.97–99 [in Russian].

Dimitrov D. 1994. A record of *Achaearanea tabulata* from Balkan Peninsula (Araneae: Theridiidae) // Arachnologische Mitteilungen. H.8. P.77–79.

Dondale C.D., Redner J.H., LeSage L. 1994. A comb-footed spider, *Achaearanea tabulata*, new to the fauna of Canada (Araneae: Theridiidae) // Journal of Arachnology. Vol.22. No.2 P.176–178.

El-Hennawy H.K., Mohafez M.A., El-Gendy A.A., Zaher I.A.I. 2016. The first record of *Ostearius melanopygius* (O. Pickard-Cambridge, 1879) and genus *Ostearius* Hull, 1911 (Araneae: Linyphiidae) in Egypt // Serket. Vol.15. No.1. P.63–67.

Emerit M., Ledoux J.-C. 2008. Arrivée en France de *Coleosoma floridanum* Banks // Revue Arachnologique. T.17. P.53–55.

Esyunin S.L. 2010. [Addition to the spider fauna (Aranei) of the Krasnodar Province] // Bulletin of Perm University. Biology. No.1. P.12–14 [in Russian].

Esyunin S.L., Agafonova O.V., Bykova A.A. 2019. The first record of the introduced spider species *Nesticella mogera* (Yaginuma, 1972) from Russia (Aranei: Nesticidae) // Arthropoda Selecta. Vol.28. No.1. P.131–134.

Evtushenko K.V. 2001. [Eusynanthropic spiders (Aranei) of Chernigovskoe Polesye] // Izvestiya Kharkovskogo Entomologicheskogo Obshchestva. Vol.8 (for 2000). No.2. P.184–185. [in Russian].

Freiberg J.A. 2017. Efeito da intensidade de pastejo na estrutura da comunidade de aranhas do solo. PhD thesis. Santa Maria. 56 p.

GBIF: The Global Biodiversity Information Facility. 2021. Available online at https://www.gbif.org/ru/species/2155867 (accessed on December 29, 2021).

Gromov A.V. 1997. New records of spider *Achaearanea tabulata* Levi (Arachnida: Araneae, Theridiidae) in Palearctics // Izvestiya Ministerstva Nauki-Akademii Nauk Respubliki Kazakhstan. Seriya Biologicheskaya i Meditsinskaya. No.1. P.31–35.

Gruber J. 1997. Neufund der "kosmopolitischen" Baldachinspinne *Ostearius melanopigius* (O. Pickard-Cambridge, 1879) in Wein (Arachnida: Araneae: Linyphiidae) // Entomologisches Nachrichtenblatt. Bd.4. S.8–9.

Hänggi A., Bobbitt I., Kranz-Baltensperger Y., Bolzern A., Gilgado J.D. 2021. Spiders (Araneae) from Swiss hothouses, with records of four species new for Switzerland // Arachnologische Mitteilungen. H.62. P.67–74.

Hassan A.I. 1953. The Oecobiidae of Egypt // Bulletin Zoological Society of Egypt. Vol.11. P.14–28.

Helsdingen P.J. 1995. Een stukje tropen in Nederland // Nieuwsbrief spined. Vol.9. P.4–6.

Holzapfel M. 1932. Die Gewächshausfauna des Berner Botanischen Gartens // Revue suisse de Zoologie. T.39. S.325–374.

Hulme P.E., Pyšek P., Nentwig W., Vilà M. 2009. Will threat of biological invasions unite the European Union? // Science. No.324. P.40–41.

Knoflach B. 1991. *Achaearanea tabulata* Levi, eine für Österreich neue Kugelspinne (Arachnida, Aranei: Theridiidae) // Berichte des Naturwissenschaftlich-Medizinischen Vereins in Innsbruck. Bd.78. S.59–64.

Knoflach B. 1999. The comb-footed spider genera *Neottiura* and *Coleosoma* in Europe (Araneae, Theridiidae) // Mitteilungen der Schweizerischen Entomologischen Gesellschaft. Bd.72. H.3–4. S.341–371.

Koponen S., Fritzén N.R., Pajunen T. 2016. Checklist of spiders in Finland (Araneae). 6th version. Online at: http://biolcoll.utu.fi/arach/checklist_of_spiders_in_Finland.htm (accessed on December 29, 2021).

Kuz'min E.A., Alekseenko Yu.G. 2011. [Additions to the list of spider species (Arachnida: Aranei) of the Ulyanovsk Oblast] // Priroda Simbirskogo Povolzh'ya. No.12. P.169–178 [in Russian].

Le Peru B. 2011. The spiders of Europe, a synthesis of data: Atypidae to Theridiidae // Mémoires de la Société Linnéenne de Lyon. Vol.2. P.1–522.

Levi H.W. 1959. The spider genus *Coleosoma* (Araneae, Theridiidae) // Breviora. Vol.110. P.1–8.

Levi H.W. 1967. Cosmopolitan and pantropical species of theridiid spiders (Araneae: Theridiidae) // Pacific Insects. Vol.9. P.175–186.

Locket G.H., Millidge A.F. 1953. British spiders. Vol.2. London: Ray Society. 449 p.

Marusik Yu.M., Koponen S. 2000. New data on spiders (Aranei) from the Maritime Province, Russian Far East // Arthropoda Selecta. Vol.9. No.1. P.55–68.

Mikhailov K.G., Borisova N.V. 2017. On the records of *Oecobius* spp. (Aranei: Oecobiidae) in European Russia // Russian Entomological Journal. Vol.26. No.3. P.287–288.

Mikhailov K.G., Temereva E.N. 2015. Spiders (Aranei) of Vostok Biological Station, Maritime Province, Russia // Arthropoda Selecta. Vol.24. No.4. P.473–475.

Moritz M., Levi H.W., Pfüller R. 1988. *Achaearanea tabulata*, eine für Europa neue Kugelspinne (Araneae, Theridiidae) // Deutsche Entomologische Zeitschrift. Bd.35. H.4–5. S.361–367.

Nentwig W. 2015. Introduction, establishment rate, pathways and impact of spiders alien to Europe // Biological Invasions. Vol.17. P.2757–2778.

Nentwig W., Blick T., Bosmans R., Gloor D., Hänggi A., Kropf C. 2022. Spiders of Europe. Version 3.2022 // Online version at https://www.araneae.nmbe.ch (accessed on March 5, 2022).

Nentwig W., Kobelt M. 2010. Spiders (Araneae) // BioRisk. Vol.4. P.131–147.

Oxford G. 2015. *Oecobius navus* (Oecobiidae) in North Yorkshire // Newsletter of the British Arachnological Society. No.132. P.19–20.

Oxford G. 2020. *Oecobius navus* – a self-sustaining population in York? // Newsletter of the British Arachnological Society. No.147. P.3.

Paquin P., Dupérré N., Labelle S. 2008. Introduced spiders (Arachnida: Araneae) in an artificial ecosystem in eastern Canada // Entomological News. Vol.119. P.217–226.

Pajunen Ò., Terhivuo J., Koponen S. 2008. Contributions to anthropochorous spiders (Araneae) in Finland // Memoranda Societatis pro Fauna et Flora Fennica. Vol.84. P.110–116.

Pfliegler W.P. 2014. Records of some rare and interesting spider (Araneae) species from anthropogenic habitats in Debrecen, Hungary // e-Acta Naturalia Pannonica. No.7. P.143–156.

Polchaninova N.Yu. 2009. [Spiders (Araneae) of the Streletskiy section of the Central Chernozem Reserve (Kursk Oblast)] //

Caucasian Entomological Bulletin. Vol.5. No.1. P.13–27 [in Russian].
Ponomarev A.V., Komarov Yu.E. 2013. [Spiders (Aranei) of the Republic of South Ossetia] // Yugh Rossii: ekologiya, razvitie. Vol.10. No.1. P.116–147 [in Russian].
Ponomarev A.V., Polchaninova N.Yu. 2006. [The materials on the fauna of spiders (Aranei) of Belgorod Area] // Caucasian Entomological Bulletin. Vol.2. No.2. P.143–164 [in Russian].
Ponomarev A.V., Prokopenko E.V., Shmatko V.Yu. 2017. [New and interesting records of spiders (Arachnida: Aranei) from the southeastern part of the Russian Plain] // Trudy Russkogo Entomologicheskogo Obshchestva. Vol.88. No.1. P.103–117 [in Russian].
Ponomarev A.V., Tsvetkov Yu.A. 2003. [Spiders (Aranei) on the territory of the Razdorskiy Museum-Reserve] // Istoriko-kulturnye i prirodnye issledovaniya na territorii Razdorskogo etnographicheskogo muzeya-zapovednika. Rostov-on-Don. Vol.1. P.167–207 [in Russian].
Řezáč M., Růžička V., Hula V., Dolanský J., Machač O., Roušar A. 2021. Spiders newly observed in Czechia in recent years – overlooked or invasive species // BioInvasions Records. Vol.10. P.555–566.
Ricciardi A., Hoopes M.F., Marchetti M.P., Lockwood J.L. 2013. Progress toward understanding the ecological impacts of nonnative species // Ecological Monographs. Vol.83. P.263–282.
Rozvałka R., Rutkowski T., Bielak-Bielicki P. 2013. New data on introduced and rare synanthropic spider species (Arachnida: Araneae) in Poland // Annales Universitatis Mariae Curie-Sklodowska Lublin-Polonia. Section C. Vol.68. P.127–150.
Ruzicka V. 1995. The spreading of *Ostearius melanopygius* (Araneae: Linyphiidae) through central Europe // European Journal of Entomology. Vol.92. No.4. P.723–726.
Santos A.J., Gonzaga M.O. 2003. On the spider genus *Oecobius* Lucas, 1846 in South America (Araneae, Oecobiidae) // Journal of Natural History. Vol.37. P.239–252.
Šestáková A., Gajdoš P. 2011. Expanzný druh snovačky *Parasteatoda tabulata* Levi, 1980 (Araneae, Theridiidae) na Slovensku // Folia Faunistica Slovaca. Vol.16. No.3. P.169–172.
Šestakova A., Christophoryova J., Korenko S. 2013. A tropical invader, *Coleosoma floridanum*, spotted for the first time in Slovakia and the Czech Republic (Araneae, Theridiidae) // Arachnologische Mitteilungen. H.45. P.40–44.
Šestáková A., Suvák M., Krajèovièová K., Kaòuchová A., Christophoryová J. 2017. Arachnids from the greenhouses of the botanical garden of the PJ Šafárik University in Košice, Slovakia (Arachnida: Araneae, Opiliones, Palpigradi, Pseudoscorpiones) // Arachnologische Mitteilungen. H.53. P.19–28.
Seyfulina R.R. 2006. A contribution to the knowledge of the spider fauna (Arachnida: Aranei) of Russia: new records for the Amur Area // Arthropoda Selecta. Vol.14 (for 2005). No.3 P.271–279.
Simon E. 1896. Recherches zoologiques dans les serres du Muséum de Paris. II. Arachnides // La Feuille des Jeunes Naturalistes. T.26. P.92–93.
Shumikhin S.A. 2015. Botanical tours of the collections and expositions of the Botanical Garden of Perm State University: guide. Saint-Petersburg: Mamatov. 208 p.
Sozontov A.N. 2021. Spiders of the Udmurt Republic, Russia. Version 1.3. Institute of Plant and Animal Ecology (IPAE). Online at: https://doi.org/10.15468/nvzbxq (accessed on December 21, 2021).
Sozontov A.N., Esyunin S.L. 2012. On the spider fauna (Arachnida: Aranei) of Udmurt Republic // Arthropoda Selecta. Vol.21. No.1. P.85–95.
Spoczynska J.O.I. 1969. A theridiid spider new to Britain established at Kew // Proceedings and Transactions of the British Entomological and Natural History Society. Vol.2. Part 1. P.1–4.
Šternbergs M.T. 1980. [On the record of a local population of *Oecobius annulatus* Lucas, 1846 (Aranei, Oecobiidae) in Latvia] // Fauna i ekologiya bespozvonochnykh LatvSSR. Riga: Latvian Univ. P.86–87 [in Russian].
Tharmarajan M., Benjamin S.P. 2021. New records of *Coleosoma blandum* O. Pickard- Cambridge, 1882 and *C. floridanum* Banks, 1900 from Sri Lanka (Araneae: Theridiidae) // Arachnology. Vol.18. Pt.8. P.833–837.
Trilikauskas L.A. 2013. On the fauna of spiders and harvestmen (Arachnida: Aranei et Opiliones) of Gornaya Shoriya, South Siberia // Euroasian Entomological Journal. Vol.12. No.5. P.438–450.
Vilbaste A. 1974. Subtropilina ämblike sugukond eesti faunas // Eesti Loodus. Kd.17. No.6. Lk.360–361 [in Estonian].
Voss S., Main B.Y., Dadour I.R. 2007. Habitat preferences of the urban wall spider *Oecobius navus* (Araneae, Oecobiidae) // Australian Journal of Entomology. Vol.46. No.4. P.261–268.
Wiehle H. 1960. Beiträge zur Kenntnis der deutschen Spinnenfauna // Zoologische Jahrbücher. Bd.88. S.195–254.
WSC 2022. World Spider Catalog. Natural History Museum Bern. Online at: http://wsc.nmbe.ch, version 23.0 (accessed on January 22, 2022). DOI: 10.24436/2.
Wunderlich J. 1987. Die Spinnen der Kanarischen Inseln und Madeiras: Adaptive Radiation, Biogeographie, Revisionen und Neubeschreibungen. Langen: Triops. 435 S.

Responsible editor D.V. Logunov