

The first record of the introduced spider species *Nesticella mogera* (Yaginuma, 1972) from Russia (Aranei: Nesticidae)

Первое для России указание интродуцированного вида пауков *Nesticella mogera* (Yaginuma, 1972) (Aranei: Nesticidae)

Sergei L. Esyunin, Oksana V. Agafonova, Anastasiya A. Bykova
С.Л. Есюнин, О.В. Агафонова, А.А. Быкова

Perm State University, Bukireva Street 15, Perm, 614600 Russia. E-mail: Sergei.Esyunin@psu.ru
Пермский государственный университет, ул. Букирева 15, Пермь 614600 Россия.

KEY WORDS: Araneae, cave cobweb spiders, *Nesticella*, introduced species, synanthropic fauna, the Urals.

КЛЮЧЕВЫЕ СЛОВА: Araneae, пауки-нектициды, *Nesticella*, интродуцированный вид, синантропная фауна, Урал.

ABSTRACT. The introduced cave cobweb spider *Nesticella mogera* (Yaginuma, 1972) is recorded from greenhouses in Perm City, the Urals, being the first record of this species from Russia.

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РЕЗЮМЕ. Интродуцированная нектицида *Nesticella mogera* (Yaginuma, 1972) обнаружена в теплицах города Пермь, Урал; это первое указание этого вида для России.

Introduction

At the beginning of the 20th century, only two synanthropic species were recorded from Perm Area: viz., *Steatoda grossa* (C.L. Koch, 1838) and *Tegenaria domestica* (Clerck, 1757) [Charitonov, 1925, 1926]. The third, newly introduced species — *Pholcus phalangoides* (Fuesslin, 1775) — was found in cargo on a barge in the river port by Charitonov [1927]. By the end of the 20th century, a list of synanthropic spider species of Perm Area had been supplemented by three more species: viz., *Steatoda castanea* (Clerck, 1757), *Pholcus alticeps* Spassky, 1932 and *Sosticus loricatus* (L.Koch, 1866) [Esyunin, 1995]. In the last decade, two new species of the Nesticidae have been discovered in Perm City, of which the data on *Aituaria pontica* (Spassky, 1932) were published Esyunin [2017]. The main aim of this paper is to provide new distributional and ecological data for *Nesticella mogera* (Yaginuma, 1972) which was collected from the greenhouse of the Botanical Garden of the Perm State University.

Material and methods

In October 2017, two males and a female of *N. mogera* were caught by pitfall-traps in the territory of the Perm State University during inspection of the greenhouse of the Botanical Garden. When the population of this species was re-examined in March 2018, a large number of mature and immature specimens was found, which allowed the authors to study a spatial distribution of this species and to assess some of its ecological requirements.

The greenhouse of the botanical garden of the Perm State University was built in 2010. Its plant collection is divided into five climatic/thematic compartments: “Wet Tropics”, “Dry Tropics”, “Subtropics”, “Epi-phytes”, “Cacti and succulents” [Botanical Garden..., 2018]. The specimens of *N. mogera* were found in the first three compartments only.

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

Nesticella mogera (Yaginuma, 1972)

MATERIAL. 2 ♂♂, 1 ♀ (PSU-7669), Russia, Perm City, Botanic Garden of the Perm State University, greenhouse, pitfall-traps, 29.IX–9.X.2017, Agafonova O.V., Bykova A.A. & Farzaliyeva G.Sh. kyzy.; 1 ♂, 1 ♀ (ZMMU), 2 ♂♂, 5 ♀♀, 3 immature ♂♂, 2 immature ♀♀, 9 juvenile specimens of different ages (MMUE), Russia, Perm City, Botanic Garden of the Perm State University, greenhouse, in litter, 14.III.2018, Esyunin S.L.

DESCRIPTION. The species has been repeatedly collected and is well-described and illustrated (e.g., Gertsch, 1973; Lehtinen, Saaristo, 1980; Marusik, Guseinov, 2003; Liu, Li, 2013); for a complete list of the taxonomic references see WSC [2018].

Table. Literature-derived and original data on the habitat preferences of *Nesticella mogera* (Yaginuma, 1972).
Таблица. Литературные и оригинальные данные о биотопической приуроченности *Nesticella mogera* (Yaginuma, 1972).

Region	Habitats	Literature source
China (Hunan, Inner Mongol, Shaanxi, Shandong, Zhejiang)	Sugarcane and rice fields	Yin <i>et al.</i> [2012]
Guizhou Province of China	Caves	Liu, Li [2013]
Korea	Rice field, in ruderal vegetation of agricultural, industrial and residential areas	Kim <i>et al.</i> [1999]; Jung <i>et al.</i> , 2008 cited in Kielhorn [2009]
Japan	Burrows of moles	Yaginuma [1972]
Azerbaijan	Forest litter	Marusik, Guseinov [2003]
Hawaiian Islands	Caves	Gertsch [1973, 1984]
Fiji Islands	Bush between cultivated field and coastal mangrove swamp; in jungle litter	Lehtinen, Saaristo [1980]
Germany	Zoo-Aquarium	Kielhorn [2009]
England	Humid tropical greenhouse: in leaf litter	Snazell, Smithers [2007]
Poland	Butterfly Park: under mahogany wood and large scarp bark	Bielak-Bielecki, Rozwalka [2011]
Poland	Garden-building hyper-market: between flowerpots	Rozwalka <i>et al.</i> [2013]
Hungary	Tropical house of the Botanic Garden: in leaf litter	Pfliegler [2014]
Urals (Perm City)	Tropical section of greenhouse: in litter and micro-cavities under stones	present data

HABITATS AND ECOLOGICAL PREFERENCES. The primary natural habitats of *N. mogera* is unknown. In the regions of origin (see below), the species was caught both from natural habitats (caves, burrows, China, Japan; forest litter, Azerbaijan) and from anthropogenic ones (see Table). A similar habitat preference of this species was shown for the islands of the Pacific Ocean [Lehtinen, Saaristo, 1980]. In Europe and the Urals, *N. mogera* is a true synanthropic (=eusynanthropic) species.

On October 9th, 2017, *N. mogera* was discovered in the PSU's Botanical Garden for the first time. A repeated survey conducted by the authors in March 2018 revealed the viability and stability of the population of this species.

Specimens of *N. mogera* were found in the three of the five greenhouse compartments, except for its driest compartments. The largest number of specimens was found in the "Dry Tropics" compartment (Fig. 1), whereas only singletons were collected from the "Wet Tropics" and "Subtropics" compartments. In the compartment that is preferred by spiders, two climatic regimes are maintained: the summer (wet and hot) and the winter (drier and cooler). Night temperature can fall down to +16°C; day temperature can reach up to +30°C. An average temperature lies within the range +21 to +25°C, with the air humidity being about 80% (Sergei Shumikhin, pers. comm.).

In the "Dry Tropics" compartment, plants grow either in pots or in soil (Fig. 2). The soil surface is bare, since the leaf litter is regularly removed. Paths made of quarry tiles are laid between plants (Fig. 2) for the convenience of staff and visitors. Single specimens of *N. mogera* were found in small niches under tiles. Yet, a large population of this species was found in the garden tub, which was filled with fallen oak leaves (Fig. 3). Wet leaves were partially rotted at the tub bottom, but remained intact and dry in the upper part.

Most of the collected specimens concentrated in the lower part of the dry layer of loose leaves, on the border with the wet and densely laid litter (Fig. 4). This population consisted of males and females, immature of both sexes and juveniles.

Our observations are in agreement with Bielak-Bielecki and Rozwalka's viewpoint that *N. mogera* can be characterized as a thermophilic-hygrophilic species [Bielak-Bielecki, Rozwalka, 2011].

Historical background and modern distribution

According to Ballarin & Li [2017], the *mogera* species group of the genus *Nesticella* was originally distributed in mainland China, separated from other species groups of the north-clade some 24 m.y.a. This hypothesis describes the continued stagnation of this group in the indigenous territory and the resettlement northward to Korea and from there eastward to Japan. The species *N. mogera* differentiated from other congeners of the *mogera* group at the end of the Miocene, about seven m.y.a.

Unfortunately, Marusik's hypothesis about the ancient Caucasian-Far East disjunctive range of *N. mogera* [Marusik, Guseinov, 2003] was not discussed by Ballarin & Li [2017]. Yet, the disjunctive type of species distribution is not unique. Numerous examples of the similar ranges in spiders from different families were summarized by Marusik *et al.* [2004]. It should be noticed though that in the Caucasus the *N. mogera* was collected from "the litter at the edge of relic Lenkoran



Figs 1–4. A general view of the “Dry Tropics” compartment of the greenhouse in the Botanical Garden of the Perm State University and the habitat of *Nesticella mogera* (Yaginuma, 1972): 1, 2 — planted plants and soil surface; 3 — garden tub with leaf litter; 4 — the female of *N. mogera* on moist litter.

Рис. 1–4. Общий вид отдела “Сухие тропики” оранжереи Ботанического сада Пермского университета и местообитание *Nesticella mogera* (Yaginuma, 1972): 1, 2 — посаженные растения и поверхность почвы; 3 — садовая кадка с лиственной подстилкой; 4 — самка *N. mogera* на сырой подстилке.

forest” [Marusik, Guseinov, 2003: 38]. The time of species differentiation in the *mogera* species group coincided with the time of biota change in Europe and the Caucasus. According to viewpoints of Soviet botanists (e.g., Kleopov, 1990), the “Turgai” flora of Europe and the Caucasus was formed under a strong influence of the East Asian genetic center. Migrations of the biota from the east to the west could go both through “northern” plains and through “southern” mountain routes. Southern migration flows passed through the “southern mountain path across Central China Ridges, Kunlun, Tien-Shan and Pamir-Altai (translated by S.E.)” [Kleopov, 1990: 253]. Thus, according to the latter hypothesis, the Caucasian population of *N. mogera* could be allochthonous, originating from mainland China.

Thus, before the human impact, the species’ historical natural range consisted of two parts. The first part covered the territory of China (Hunan, Inner Mongolia, Shaanxi, Shandong, Zhejiang, Guizhou) [Yin *et al.*, 2012; Liu, Li, 2013], Korea [Kim *et al.*, 1999; Jung *et al.*, 2008] and Japan [Yaginuma 1972], the second one — the Lankaran Lowland in the Caucasus [Marusik, Guseinov, 2003].

Despite the fact that the “vast majority of modern *Nesticella* are essentially troglomorphic organisms” [Bal-

larin, Li, 2017: 587], *N. mogera* has preserved an ancient epigeal lifestyle. Perhaps, this fact contributed to its modern expansion, unique “among all the nesticids” [Marusik, Guseinov, 2003: 38]. In the 20th century, the species was introduced to the Hawaiian [Gertsch, 1973, 1984] and Fiji [Lehtinen, Saaristo, 1980] Islands, whereas in the 21st century to Europe (England; Germany; Poland, Hungary) [Snazell, Smithers, 2007; Kielhorn, 2009; Bielak-Bielecki, Rozwalka, 2011; Rozwalka *et al.*, 2013; Pfliegler, 2014].

The Urals population is likely to be of the Caucasian origin. The Botanical Garden of the Perm State University actively interacts with European botanical gardens. However, only plant seeds are imported from European centers (Sergei Shumikhin, pers. comm.). Yet, living plants along with the soil have been imported from various botanical gardens on the Black Sea coast many times. Most likely, the *N. mogera* was introduced into the greenhouse with tropical plants originated from the “White Nights”, the Subtropical Botanical Garden of the Kuban, in March 2017. Earlier, in 2013, lots of tropical plants were imported from the Sukhumi Botanical Garden, Abkhazia (Sergei Shumikhin, pers. comm.).

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