

Centipedes from urban areas in southwestern Siberia, Russia (Chilopoda). Part 2. Geophilomorpha

Губоногие многоножки урбанизированных территорий юга Западной Сибири, Россия (Chilopoda). Часть 2. Geophilomorpha

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КЛЮЧЕВЫЕ СЛОВА: Geophilidae, Schendylidae, антропохор, фаунистика, интродуцент, Сибирь.

ABSTRACT. The geophilomorph centipede fauna of urban areas in southwestern Siberia comprises at least seven species belonging to four genera and two families. The following records are new to western Siberia (*Geophilus flavus* (De Geer, 1778)) or southwestern Siberia (*G. proximus* C.L. Koch, 1847 and *Pachymerium ferrugineum* (C.L. Koch, 1835)). The northernmost range limits are reported for *Arctogeophilus macrocephalus* Folkmanová et Dobroruka, 1960, *Escaryus japonicus* Attems, 1927 and *E. koreanus* Takakuwa, 1937, all lying in western Siberia. The distributions of all relevant species encountered in the region are mapped.

РЕЗЮМЕ. Фауна многоножек-землянок урбанизированных территорий юга Западной Сибири включает как минимум семь видов, принадлежащих четырем родам и двум семействам. Указанные ниже находки оказались новыми: *Geophilus flavus* (De Geer, 1778) для Западной Сибири; *G. proximus* C.L. Koch, 1847 и *Pachymerium ferrugineum* (C.L. Koch, 1835) для юга Западной Сибири. Отмечена северная граница ареала для *Arctogeophilus macrocephalus* Folkmanová et Dobroruka, 1960, *Escaryus japonicus* Attems, 1927 и *E. koreanus* Takakuwa, 1937 в Западной Сибири. Даны карты с распространением всех видов в указанном регионе.

Introduction

This paper continues our review of the centipede fauna of urban habitats in southwestern Siberia, Russia [Nefediev et al., 2016b, c, d]. Despite all recent progress in the investigation of geophilomorph centipedes in the European part of Russia [Farzalieva, 2008; Volkova, 2014a, b, 2016; Zuev, 2016], the fauna of Geophilomor-

pha in western Siberia, Asian Russia [Stuxberg, 1876; Sselivanoff, 1881, 1884; Byzova, Chadaeva, 1965; Kozlovskaya, 1965; Titova, 1969, 1972a, b, 1975; Poryadina, 1991; Gerasko, Kolesnichenko, 1997; Nefediev, 2001; Striganova, Poryadina, 2005; Sergeeva, 2010, 2013, 2014, 2015; Bukhhalo, Sergeeva, 2012; Bukhhalo et al., 2014] remains understudied. To date, based on the literature data, the geophilomorph fauna of the Asian part of Russia comprises at least 26 species with the greatest species diversity observed in the Russian Far East (21 species), followed first by western and eastern Siberia (about 9 species), and then the mountains of southern Siberia (= Altai) (5 species). This can only be related to the latter territory still being poorly studied. Its geophilomorph fauna seems to be especially similar to those of eastern Siberia and the Russian Far East.

The material treated herein has mainly been deposited in the collection of the Altai State University, Barnaul, Russia (ASU), partly shared also with the collections of the Palacký University, Olomouc, Czech Republic (PUO) and of the Zoological Museum of the Lomonosov Moscow State University, Moscow, Russia (ZMUM), as indicated in the text. Literature references to the species concern western Siberia only.

Taxonomic part

ORDER GEOPHILOMORPHA

Family GEOPHILIDAE

Arctogeophilus macrocephalus Folkmanová et Dobroruka, 1960

Map 1.

? *Arctogeophilus* sp.: Byzova, Chadaeva, 1965: 337.

Arctogeophilus macrocephalus Folkmanová et Dobroruka, 1960: Zaleskaja et al., 1982: 189.

MATERIAL EXAMINED (17 specimens from 2 localities). 8 ind. (ASU), 4 ind. (ZMUM), Russia, southwestern Siberia, **Tomsk Area**, Tomsk, Irkutskii Tract, glade in *Betula* forest, 20.07.1999, leg. P.S. Nefediev; 5 ind. (ASU), Russia, southwestern Siberia, **Altai Province**, Pervomaiskii District, Bobrovka, *Pinus sylvestris* forest with *Betula*, 20.08.1999, leg. A.V. Udaloy.

DISTRIBUTION. Being originally described by Folkmanová and Dobroruka [1960] from the Tatar Republic (= Tatarstan), European Russia, *A. macrocephalus* is highly widespread, ranging from the European part of Russia through Siberia to the mainland Russian Far East and Sakhalin Island [Zaleskaja et al., 1982]. The records of *A. macrocephalus* from the Asian part of Russia have previously been known from western Siberia in the Kemerovo Area and the Altai State Nature Reserve, Republic of Altai [Byzova, Chadaeva, 1965; Zaleskaja et al., 1982]; from eastern Siberia in the Krasnoyarsk Province [Vorobiova, 1999; Rybalov, 2002; Vorobiova et al., 2002]; and from the Russian Far East in the Jewish Autonomous Area, the Khabarovsk and Maritime provinces, the Chukotka Autonomous Area and the Sakhalin Area (southern Sakhalin Island) [Zaleskaja et al., 1982].

REMARKS. This species has hitherto been recorded neither from the Tomsk Area nor from the Altai Province, both southwestern Siberia. The former record is the northernmost range limit of its distribution in western Siberia. According to Zaleskaja et al. [1982], *A. macrocephalus* can prove to be a junior synonym of *A. sachalinus* Verhoeff, 1934 and *A. attemsi* Folkmanová, 1956, both of these in their turn possibly junior subjective synonyms of *A. glacialis* Attems, 1909, from Alaska, USA. Re-examination of type materials, as well as barcoding might be the proper tools to resolve these problems.

Geophilus proximus C.L. Koch, 1847
Map 2.

Geophilus proximus C.L. Koch, 1847: Sselivanoff, 1881: 6–7, 1884: 87–89; Titova, 1969: 165; Poryadina, 1991: 14; Striganova, Poryadina, 2005: 130; Bukhhalo, Sergeeva, 2012: 61; Sergeeva, 2013: 530–532; 2014: 72; Bukhhalo et al., 2014: 73–74.

MATERIAL EXAMINED (230 specimens: 136 ♀♀, 94 juveniles from 13 localities). 3 ♀♀ (PUO), Russia, southwestern Siberia, **Tomsk Area**, Tomsk, “Lagernyi Sad” Park, *Betula*, 17.05.2004; 2 ♀♀ (PUO), same Area, Tomsk, “Buff-Sad” Park, *Acer* and *Populus*, 15.05.2008; 3 ♀♀, 2 juv. (ASU), Russia, southwestern Siberia, **Altai Province**, Biysk, Sorokino, *Malus* stands on the bank of Biya River, litter, 11.10.2009; 1 ♀ (ASU), same locality, *Populus* stands, under bark of cut trees, 19.10.2009; 3 juv. (ASU), same Province, Pervomaiskii District, Beriozki Railway Station, open man-made grounds, 12.06.2010; 1 ♀ (PUO), same locality, 7.06.2014; 7 ♀♀, 2 juv. (ASU), same locality, 3–20.09.2014; 1 juv. (ASU), same locality, 11.05.2015; all leg. P.S. Nefediev; 1 ♀ (PUO), same Province, Barnaul, Avalman, summer 2013, leg. V.M. Mamina; 8 ♀♀, 4 juv. (PUO), same Province, Barnaul, Yuzhnyi, South Siberian Botanical Garden, open man-made grounds, 19.06.2013, leg. P.S. Nefediev, Yu.V. Dyachkov; 2 ♀♀ (PUO), same locality, 27.09.2013, leg. Yu.V. Dyachkov; 6 ♀♀, 6 juv., (ASU), same Province, Barnaul, “Nagornyi” Park, soil samples (0–10 cm deep), June 2014; 2 ♀♀, 2 juv. (ASU), same locality, soil samples (10–20 cm deep), June 2014; 4 juv. (ASU), same Province, Barnaul, “Lesnaya Skazka” Park, hand sampling, June–July 2014; 6 juv. (ASU),

same locality, soil samples (0–10 cm deep), June–July 2014; 1 ♀, 4 juv. (ASU), same locality, soil samples (10–20 cm deep), June–July 2014; 27 ♀♀, 4 juv. (ASU), same Province, Barnaul, “Izumrudnyi” Park, hand sampling, June 2014; 26 ♀♀, 8 juv. (ASU), same locality, soil samples (litter), June 2014; 18 ♀♀, 38 juv. (ASU), same locality, soil samples (0–10 cm deep), June 2014; 3 juv. (ASU), same locality, soil samples (10–20 cm deep), June 2014; 2 ♀♀, 5 juv. (ASU), same Province, Barnaul, “Yubileinyi” Park, soil samples (0–10 cm deep), June 2014; 1 ♀, 3 juv. (ASU), same locality, soil samples (10–20 cm deep), June 2014, all leg. A.A. Streltsova; 4 ♀♀ (ASU), same Province, Blagoveschenka District, Glyaden, *Acer* and *Populus* woodland belt, 10–14.08.2014, leg. A. Polyakov; 14 ♀♀ (ASU), 4 ♀♀ (ZMUM), same Province, Barnaul, “Lesnaya Skazka” Park, *Acer* and *Betula*, under planks, stones, in litter, 1.05.2015, leg. P.S. Nefediev; 1 ♀ (ASU), same Province, Romanovo District, Tambovskii, 19.08.2015, leg. I.K. Tyutyunnik; 3 ♀♀ (PUO), Russia, southwestern Siberia, **Novosibirsk Area**, Novosibirsk, Pervomaiskii Square, flower beds with bushes, 29.05.2014, leg. P.S. Nefediev.

DISTRIBUTION. This northern European, eurytopic species is distributed across the northern part of the Palaearctic from northeastern Europe to Japan, while the real distribution in the southern European countries is hard to estimate because of numerous misidentifications in the past [Bonato et al., 2005]. *Geophilus proximus* is widespread across most of European Russia, ranging from the Murmansk Area in the north to the Rostov-on-Don Area in the south and to the Urals in the east [Farzalieva, 2008; Volkova, 2016]. In the Asian part of Russia, it has previously been recorded only from western Siberia [Sselivanoff, 1881, 1884; Titova, 1969], the Tyumen Area [Poryadina, 1991; Striganova, Poryadina, 2005; Bukhhalo, Sergeeva, 2012; Sergeeva, 2013; Bukhhalo et al., 2014].

REMARKS. According to Zaleskaja et al. [1982], *G. proximus* tends to inhabit moderately humid soils, but Sergeeva [2013] noted its being a typical pedobiont that needs no litter, predominating in open, well heated sites. Zaleskaja et al. [1982] also suggested *Schizotaenia ornata* Folkmanová et Dobroruka, 1960 to be a junior synonym of *G. proximus*, despite the lack of information on the carpophagous structure in the original description [cf. Bonato, Minelli, 2014]. This is the most common geophilomorph centipede from urban areas in southwestern Siberia. The Siberian populations of this species are parthenogenetic like are those across most of European Russia. This species has hitherto been recorded neither from the Tomsk nor the Novosibirsk areas, nor the Altai Province, all in southwestern Siberia, where it dwells only in outdoor habitats such as city parks and open man-made grounds.

Geophilus flavus (De Geer, 1778)
Map 3.

MATERIAL EXAMINED. 1 ♀ (ASU), Russia, southwestern Siberia, **Tomsk Area**, Tomsk, Siberian Botanical Garden, hot-house, 21.04.2000, leg. P.S. Nefediev.

DISTRIBUTION. An Euro-Siberian species distributed in the western Palaearctic, ranging from northwestern Africa through most of Europe to Siberia; also introduced to North America [Bonato et al., 2005]. However, in the Asian part of Russia a single specimen of this species that comes from a single locality has



Map 1. Distribution of *Arctogeophilus macrocephalus* Folkmanová et Dobroruka, 1960 in Asian Russia (asterisk).
 Карта 1. Распространение *Arctogeophilus macrocephalus* Folkmanová et Dobroruka, 1960 в азиатской России (звезда).



Map 2. Distribution of *Geophilus proximus* C.L. Koch, 1847 in Asian Russia (pentagon).
 Карта 2. Распространение *Geophilus proximus* C.L. Koch, 1847 в азиатской России (пятиугольник).



Map 3. Distribution of *Geophilus flavus* (De Geer, 1778) in Asian Russia (circle).
 Карта 3. Распространение *Geophilus flavus* (De Geer, 1778) в азиатской России (круг).

hitherto been known, referred to as a junior subjective synonym of *Arthronomalus longicornis* Leach, 1815, from the environs of the village of Shilkinskii Zavod, Zabaikalskii Province, eastern Siberia [see Gerstfeldt, 1859].

REMARKS. This is the first record of *G. flavus* in western Siberia. Its absence from almost all previously known faunistic papers (except Gerstfeldt [1859]), coupled with the above record from a hothouse in the Siberian Botanical Garden, may indicate its anthropochore introduction east of the Urals. The published synonymy of *S. ornata* under *G. flavus* by Bonato and Minelli [2014] implies that there may be some previous records of *G. flavus* from the former USSR reported under the name of *G. proximus* [see Zaleskaja et al., 1982].

Pachymerium ferrugineum (C.L. Koch, 1835)
Map 4.

Pachymerium ferrugineum (C.L. Koch, 1835): Sergeeva, 2013: 530–532; Bukhkalov et al., 2014: 73.

MATERIAL EXAMINED (17 specimens: 1 ♂, 9 ♀♀, 7 juveniles from 2 localities). 1 ♀ (ASU), Russia, southwestern Siberia, **Tomsk Area**, Tomsk, Siberian Botanical Garden, hothouses, 10.12.1999; 2 ♀♀, 1 juv. (ASU), 2 ♀♀ (ZMUM), same locality, 3.03.2000; 1 ♂, 3 ♀♀ (ASU), same locality, 21.04.2000; 1 ♀ (ASU), same locality, 3.11.2005, all leg. P.S. Nefediev; 1 juv. (ASU), same locality, rose hothouse, pitfall traps, 28.03.–14.04.2006, leg. P.S. Nefediev, A.M. Folin; 1 juv. (ASU), Russia, southwestern Siberia, **Altai Province**, Barnaul, OJSC “Dekorativnye kultury”, houseplants hothouse No. 3, 22.12.2014; 1 juv. (ASU), same locality, rose hothouse No. 5, 22.12.2014; 1 juv. (ASU), same locality, seedling flowers hothouse No. 10, 26.12.2014; 2 juv. (ASU), same locality, rose hothouse No. 13, 24.12.2014, all V.M. Mamina.

DISTRIBUTION. A trans-Palaearctic polyzonal species that ranges across most of the western Palaearctic, from Macaronesia through Europe to Central Asia [Bonato et al., 2005]; also known, obviously as anthropochore introductions, from other parts of the world, e.g. the eastern states of the USA [Bonato et al., 2005; Volkova, 2016]. In Asian Russia, it has previously been reported from the Jewish Autonomous Area and Maritime Province in the Russian Far East [Zaleskaja et al., 1982], as well as from the Chelyabinsk, Sverdlovsk and Tyumen areas within western Siberia [Farzalieva, 2008; Sergeeva, 2013; Bukhkalov et al., 2014].

REMARKS. This species prefers dry, xerophyte habitats such as upland meadows, cultivated fields and pine forests [Zaleskaja et al., 1982; Sergeeva, 2013]. It has hitherto been recorded neither from the Tomsk Area nor from the Altai Province, both southwestern Siberia, where *P. ferrugineum* has been found dwelling only in indoor anthropogenic habitats, i.e. hothouses.

Family SCHENDYLIDAE

Escaryus japonicus Attems, 1927
Map 5.

Escaryus japonicus Attems, 1927: Byzova, Chadaeva, 1965: 337; Titova, 1972a: 135; 1972b: 113–114; Pereira, Hoffman, 1993: 9.

MATERIAL EXAMINED (18 specimens: 7 ♂♂, 8 ♀♀, 3 juveniles from 2 localities). 5 ♂♂, 2 ♀♀, 3 juv. (ASU), 2 ♂♂, 2 ♀♀ (ZMUM), Russia, southwestern Siberia, **Tomsk Area**, Tomsk District, Molodiozhnyi, potato field, 8.09.1999; 4 ♀♀ (ASU), same Area, ca 10 km N of Tomsk, “Tomskneftekhim”, near Acetylene Plant, *Populus tremula*, 4.05.2003, all leg. P.S. Nefediev.

DISTRIBUTION. An Eurasian species ranging from Japan through the Russian Far East and Siberia to the middle and southern Urals and the middle Volga region [Farzalieva, 2008; Volkova, 2016], also known from northern China [Takakuwa, Takashima, 1949]. In Asian Russia, it has previously been reported from the Russian Far East in Sakhalin Island, the Maritime Province and Cisamuria, and from western Siberia in the Kemerovo Area and the Altai [Byzova, Chadaeva, 1965; Titova, 1972a]; the record of *E. japonicus* from the middle flow of Yenisei River, Krasnoyarsk Province [Vorobiova, 1999] is doubtful (omitted from Map 5) because two different species of *Escaryus* have since been identified and published from the same material [Rybalov, 2002: 83; Vorobiova et al., 2002: 62].

REMARKS. This species has hitherto not been reported from the Tomsk Area, southwestern Siberia, where it marks the northernmost range limit of its distribution in Siberia.

Escaryus koreanus Takakuwa, 1937
Map 6.

Escaryus koreanus Takakuwa, 1937: Titova, 1972a: 135; 1972b: 112–113; Pereira, Hoffman, 1993: 9.

MATERIAL EXAMINED (14 specimens: 3 ♂♂, 3 ♀♀, 8 juveniles from 4 localities). 1 ♂, 1 ♀, 8 juv. (ASU), 1 ♀ (ZMUM), Russia, southwestern Siberia, **Tomsk Area**, Tomsk, Siberian Botanical Garden, hothouses, 3.03.2000; 1 ♀ (ASU), same Area, Tomsk, Universitetskaya Roshcha, *Betula*, 23.04.2002; 1 ♂ (ASU), same Area, Tomsk, Michurina Street, *Populus tremula* forest, 2.11.2005; 1 ♂ (ASU), same Area, Tomsk, “Buff-Sad” Park, *Acer* and *Populus*, 15.05.2008, all leg. P.S. Nefediev.

DISTRIBUTION. Originally described by Takakuwa [1937] from the Korean Peninsula, in the Asian part of Russia *E. koreanus* has hitherto been recorded from the Kemerovo Area [Titova, 1972a, b] and the Altai [Titova, 1972a], both western Siberia, from the Yenisei River Basin in the Krasnoyarsk Province, eastern Siberia [Rybalov, 2002; Vorobiova et al., 2002], and from the Maritime Province and Cisamuria, Russian Far East [Titova, 1972a, b].

REMARKS. This species has hitherto not been recorded from the Tomsk Area, southwestern Siberia, where it marks the northernmost range limit of its distribution in western Siberia, while in eastern Siberia the species inhabits even the northern taiga belt [Rybalov, 2002; Vorobiova et al., 2002].

Escaryus retusidens Attems, 1904
Map 7.

Escaryus retusidens Attems, 1904: Titova, 1972a: 135; 1972b: 110–111; Pereira, Hoffman, 1993: 9.

MATERIAL EXAMINED (4 specimens: 3 ♂♂, 1 juv. from 2 localities). 2 ♂♂ (ASU), 1 ♂ (ZMUM), Russia, southwestern Siberia, **Altai Province**, Smolenskoe District, Smolenskoe, Poperechnaya River, *Populus*, 21.04.2013, leg. P.S. Nefediev, J.S.



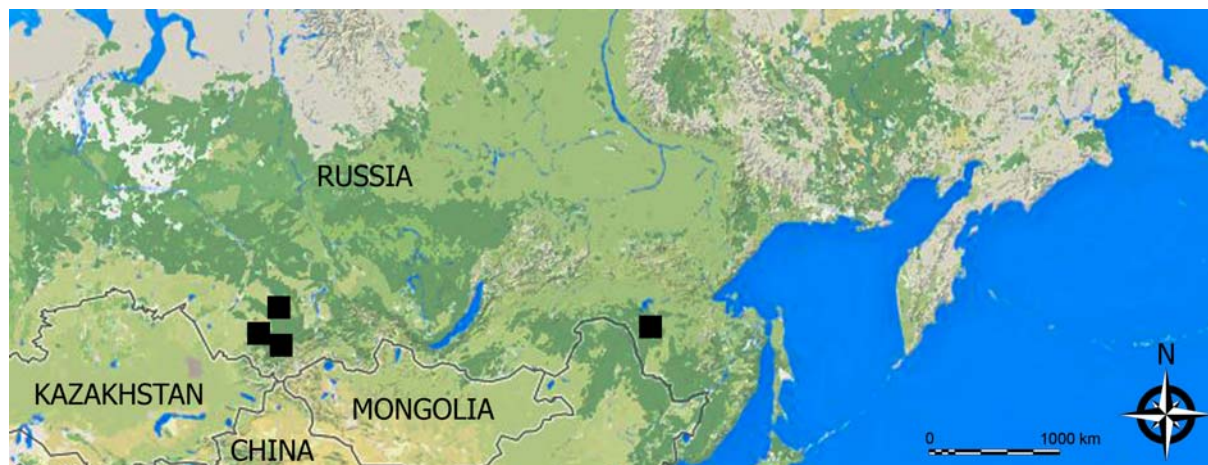
Map 4. Distribution of *Pachymerium ferrugineum* (C.L. Koch, 1835) in Asian Russia (diamond).
 Карта 4. Распространение *Pachymerium ferrugineum* (C.L. Koch, 1835) в азиатской России (ромб).



Map 5. Distribution of *Escaryus japonicus* Attems, 1927 in Asian Russia (rectangle).
 Карта 5. Распространение *Escaryus japonicus* Attems, 1927 в азиатской России (прямоугольник).



Map 6. Distribution of *Escaryus koreanus* Takakuwa, 1937 in Asian Russia (triangle).
 Карта 6. Распространение *Escaryus koreanus* Takakuwa, 1937 в азиатской России (треугольник).



Map 7. Distribution of *Escaryus retusidens* Attems, 1904 in Asian Russia (square).

Карта 7. Распространение *Escaryus retusidens* Attems, 1904 в азиатской России (квадрат).

Nefedieva; 1 juv. (♂ sad) (ASU), same Province, Biysk, Odintsovka, *Salix* along brook, 19.04.2009, leg. P.S. Nefediev.

DISTRIBUTION. Being originally described from Central Asia, i.e. Przhivalsk (now Karakol) in Kyrgyzstan, *E. retusidens* is highly widespread, in the former USSR ranging from Moldova, Ukraine, the Crimean Peninsula, the northern Caucasus and the central part of European Russia in the west, through the Kuznetsk Coal Basin (= Kuzbass) and the Altai in western Siberia, to Cisamuria in the east, also reported from the Ile Alatau and Dzungarsky Alatau mountains in eastern Kazakhstan [Titova, 1972a].

REMARKS. The present first records of *E. retusidens* from the Altai Province show that this rare species tends to dwell in rather weakly disturbed habitats rather than highly urbanized areas.

Conclusions

To date, at least seven species from four genera and two families of Geophilomorpha are known to occur in urban areas in southwestern Siberia, Russia. *Geophilus flavus* (De Geer, 1778) appears to be new to the fauna of western Siberia. Two species, *G. proximus* C.L. Koch, 1847 and *Pachymerium ferrugineum* (C.L. Koch, 1835), are formally recorded in southwestern Siberia for the first time. The former species is the most abundant and widespread geophilomorph in the study area. *Arctogeophilus macrocephalus* Folkmanová et Dobroruka, 1960, *Escaryus japonicus* Attems, 1927 and *E. koreanus* Takakuwa, 1937 show the northernmost range limits of their distribution areas in western Siberia. Most of the study geophilomorph species inhabit city parks, botanical gardens and open man-made grounds in southwestern Siberia, being widespread across Eurasia and representing natural components in the centipede fauna of the investigated area. However, urban scutigermorph, scolopendromorph and lithobiomorph centipedes [Nefediev et al., 2016b, c, d], as

well as urban millipedes [Nefediev et al., 2013, 2014, 2016a] recorded from southwestern Siberia are mainly related to anthropochore introductions.

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