First comprehensive research on pseudoscorpions (Arachnida: Pseudoscorpiones) collected from bird nests in Russia

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Abstract: The first comprehensive research on pseudoscorpion fauna in bird nests in Russia was carried out. A total of 131 pseudoscorpion specimens belonging to nine species and three families were collected. Eight of them were present in bird nests. One species was found in the plumage of dead Larus ridibundus (Linnaeus, 1766). Four species, Diplotemnus balcanicus (Redikorzev, 1928), Chernes vicinus (Beier, 1932), Dinocheirus panzeri (C.L. Koch, 1837), and Dinocheirus transcaspius (Redikorzev, 1922), are presented as new to the fauna of Russia. Simultaneously genera Dinocheirus and Diplotemnus and family Atemnidae are new for the pseudoscorpion fauna of Russia.

Key words: Dinocheirus, Diplotemnus, faunistic, first record, phoresy, Chernes vicinus

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Although Russia is the largest country in the world spread over two continents with a long tradition of education and research, pseudoscorpion species received little attention until the turn of the 20th century. Taking into account the current borders of the Russian Federation, among the earliest publications belongs that of Tullgren (1907) with the first record of Dactylochelifer amurensis. A major part of the pseudoscorpion data from Russia consists of scattered findings mainly from the east of the country. Beier (1979) recorded three new species, Mundochthonius ussuricus, Centrochthonius ussuriensis, and Bisetocregris silvica, from Primorsky Krai. Ćurčić (1985) added the new Orientocregris syrinx from the same area. Later Schawaller (1985, 1986, 1989) published most of the known records of the Far East and Schawaller (1994) also summarized all known data, which comprised 15 species in five families.

Comprehensive research has been carried out only in a few areas. Main attention has been paid to the Caucasus Mountains and surroundings. Beier (1937) recorded Neobisium granulatum and N. labinskyi from the Northwest Caucasus for the first time. Schawaller and Krumpál (1983) published other neobisiid species, N. golovatchi and N. vilcekii, from the area. Later Krumpál (1986) added N. spelophillum from a cave located in the Caucasus. Finally, Schawaller and Dashdamirov (1988) and Dashdamirov and Schawaller (1992) summarized all known records from the Caucasus, which comprised 20 species from seven families for the Russian part of the mountains. Recently Kozminykh (2017) compiled data from the Ural Mountains based on preserved specimens and new material collected in 2016 and 2017. Ten species from four families, including one new record, are presently known from the Urals (Kozminykh, 2017).

Due to its enormous size and different zoogeographical zones, Russia is guaranteed to have high species biodiversity. However, according to Harvey (2013) and Kozminykh (2017), the Russian pseudoscorpion fauna to date includes 40 species from eight families, which is a relatively small number. This could be due to the fact that the species composition and distribution has not been studied in detail. The majority of the records represent specimens from litter and soil and little is known about species living in tree microhabitats, such as tree hollows, microhabitats under tree bark, or deadwood. Similarly, very little is known about species inhabiting bird or mammal nests (Schawaller, 1985, 1989).

The country still offers many opportunities and is very attractive for zoological research. Thus, the aim of the present paper is to provide new data about pseudoscorpions from Russia based on samples collected during the parasitological research of bird nests.

The samples were taken at eleven localities during 1997–2016 (Table 1; Figure 1). All of the pseudoscorpion material was collected by the second author. All nests were collected immediately after the fledging of chicks and were
saved in cellophane bags. After that, the nests were heat-extracted in Berlese funnels. One pseudoscorpion was found attached in the plumage of a dead bird (directly on its chest), whose skin was dried in EGUATOR. Obtained pseudoscorpions were immediately preserved in 70% ethanol. For identification, all specimens were mounted as temporary slide mounts without preparation, using lactic acid for clearing. Digital photographs were taken using a Canon EOS 5D camera attached to a Zeiss Axio Zoom.V16 stereomicroscope and EOS 1100D camera connected to a Zeiss Stemi 2000-C stereomicroscope. Image stacks were produced manually, combined using

### Table 1. List of localities. Lc – Locality code, E – longitude, N – latitude, m – altitude, meters above sea level.

<table>
<thead>
<tr>
<th>Lc</th>
<th>Republic</th>
<th>Region</th>
<th>Locality</th>
<th>N</th>
<th>E</th>
<th>m</th>
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<td>Dosang</td>
<td>46°54′00″</td>
<td>47°54′49″</td>
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</tr>
<tr>
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<td>Russia</td>
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<td>230</td>
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<tr>
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<td>37°49′16″</td>
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<td>184</td>
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</tr>
<tr>
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<td>Kislovodsk</td>
<td>43°54′20″</td>
<td>42°43′41″</td>
<td>884</td>
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</tbody>
</table>

Figure 1. Position of the studied localities in Russia. For locality codes, see Table 1.
Zerene Stacker software and edited in Adobe Photoshop CC. Pseudoscorpions were identified using the keys of Beier (1932) and Christophoryová et al. (2011b) and the original descriptions of Redikorzev (1922), Schawaller (1986), and Novák and Harvey (2015). Nomenclature for all taxa follows Harvey (2013). The material is deposited in the zoological collections of Comenius University in Bratislava, Slovakia.

Altogether 131 pseudoscorpion specimens belonging to nine species and three families were collected during parasitological research of bird nests (Table 2). Most of the species collected in nests belong to Chernetidae. Two specimens were damaged and therefore they were identified only to family level. Pseudoscorpions were found in nests of 11 bird taxa (Table 2). The highest species diversity was found in Sturnus vulgaris nests. The majority of the species were present in nests from more than two different bird species (Table 2). Chernes hahnii (C.L. Koch, 1839) and Dinocheirus panzeri (C.L. Koch, 1837) were present in five different bird nests (Table 2). During the research one atemnid species was found attached in the plumage of a dead bird. Four species are presented as new to the fauna of Russia.

**Remarks:** First record for Russia. The genus Diplotenmus was recently partly revised and several species were considered as junior synonyms of Chelifer balcanicus Redikorzev, 1928 that is newly transferred from Rhacochelifer, forming the new combination Diplotenmus balcanicus (Redikorzev, 1928). Diplotenmus balcanicus is widely distributed throughout Asia, northern Africa (including the Canary Islands), and southern Europe (Novák and Harvey, 2015). Most data were recorded under stones (Beier, 1959; Dashdamirov and Schawaller, 1993). Redikorzev (1928) found the species introduced in a house. Schawaller (1985, 1989) and Schawaller and Dashdamirov (1988) recorded it from nests of dormouse and gerbil and also under tree bark. Verner (1959) and Novák and Harvey (2015) recorded D. balcanicus in owl pellets and in bat guano.

**Cheliferidae**

**Chelifer cancroides** (Linnaeus, 1758)


**Remarks:** The species is considered to be cosmopolitan, often found in nests and in synanthropic habitats (Turienzo

### Table 2

The specimen number of pseudoscorpion taxa in bird nests. Nests of: Cf – Certhia familiaris (Linnaeus, 1758), Du – Delichon urbica (Linnaeus, 1758), Fc – Fringilla coelebs (Linnaeus, 1758), Fh – Ficedula hypoleuca (Pallas, 1764), Ha – Haliaeetus albicilla (Linnaeus, 1758), Hr – Hirundo rustica (Linnaeus, 1758), Pm – Passer montanus (Linnaeus, 1758), Sv – Sturnus vulgaris (Linnaeus, 1758), Tm – Turdus merula (Linnaeus, 1758), Tp – Turdus pilaris (Linnaeus, 1758), Tsp – Turdus sp. Σ – Number of bird nests in which the taxa were present, ( ) – number in parentheses indicates the number of positive nests.

<table>
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<th>Du</th>
<th>Fc</th>
<th>Fh</th>
<th>Ha</th>
<th>Hr</th>
<th>Pm</th>
<th>Sv</th>
<th>Tm</th>
<th>Tp</th>
<th>Tsp</th>
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<td>5</td>
<td>1</td>
<td>4</td>
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</tbody>
</table>

482
et al., 2010; Harvey, 2013). The first record for Russia was Ellingsen’s (1910) finding in a house in Moscow. Since then, numerous occurrences were recorded in Russia, but unfortunately mostly without giving a habitat type (Redikorzev, 1924; Schawaller, 1986, 1989). The known habitats were herbariums and houses (Ellingsen, 1910; Schawaller, 1989). One case of phoresy has been recorded from Russia whereby the species was found attached to Apis mellifera (Linnaeus, 1758) (Beier, 1948). The current findings are the first ones known from bird nests in Russia.

**Chernetidae**

**Damaged specimens:**

5: Moscow, Klementovo, urban area, 24 June 2013, 1 tritonymph, nest of *S. vulgaris*; 11: Kislovodsk, urban area, June 2005, 1 tritonymph, nest of *Turdus merula*.

After receiving the material, these two specimens were dried and not able to be identified.

**Chernes cinicoides** (Fabricius, 1793)

1: Obja, rural area, 23 June 2016, 1 female, nest of *Ficetula hypoleuca*.

**Remarks:** The species is distributed within the Palearctic region (Harvey, 2013). Data about its occurrence from several localities in Russia are known (Redikorzev, 1924; Schawaller, 1986, 1989, 1994). In Russia, it has been found under tree bark and in tree cavities (Schawaller, 1986, 1989). The current findings represent the first ones known from bird nests in Russia.

**Chernes hahnii** (C.L. Koch, 1839)

2: Dosang, urban area, 20 October 2007, 1 protonymph, nest of *H. albicilla*; 6: Moscow, Kuskovo Park, 25 June 2008, 1 female, 1 tritonymph, 1 deutonymph, nest of *Turdus pilaris*; 25 June 2008, 1 deutonymph, nest of *Turdus* sp.; 27 July 2008, 1 tritonymph, nest of *T. pilaris*; 23 June 2010, 1 male, 1 deutonymph, nest of *T. pilaris*; 26 July 2010, 1 female, 2 deutonymphs, nest of *T. pilaris*; 7: Moscow, Perekhulsko Park Forest, 4 September 2005, 1 protonymph, nest of *S. vulgaris*; 8: Moscow, Tereletskiy Park Forest, 11 July 2008, 1 female, nest of *Fringilla coelebs*; 9: Moscow, Tolstostaltssevo, urban area, 4 August 2005, 1 female, nest of *S. vulgaris*.

**Remarks:** The species occurs in a wide range within the Palearctic region (Harvey, 2013) and its occurrence in Russia is well known. Schawaller (1983) recorded *C. hahnii* from Checheno-Ingushetia. Later it was found under tree bark and in tree cavities at several localities in Russia (Schawaller, 1986, 1989, 1994; Dashdamirov and Schawaller, 1992). Most recently Kozminykh (2017) reported the species from the Urals. The current findings are the first ones known from bird nests in Russia.

**Chernes vicinus** (Beier, 1932)

4: Moscow, urban area, 5 June 2008, 3 males, 1 tritonymph, 1 deutonymph, 1 protonymph, nest of *S. vulgaris*; 8: Moscow; Tereletskiy Park Forest, 11 July 2008, 1 male, nest of *F. coelebs*.

**Remarks:** First record for Russia. *Chernes vicinus* is a quite rare species. It was previously reported from Austria, Belgium, the Czech Republic, Germany, Slovakia, and Sweden (Harvey, 2013). The species inhabits predominantly anthills (Beier, 1948; Ressl and Beier, 1958; Kofler, 1972; Drogla and Lippold, 2004), though it was found as well in bird nests (Krumpáil and Cyprich, 1988; Krajčovičová et al., 2015).

**Dinocheirus panzeri** (C.L. Koch, 1837) (Figures 2 and 3)

4: Moscow, urban area, 23 June 1997, 1 female, 2 deutonymphs, nest of *F. hypoleuca*; 5 June 2008, 1 female, nest of *S. vulgaris*; 6: Moscow, Kuskovo Park, July 2008, 6 males, 4 females, 1 tritonymph, nest of *Passer montanus*; 8: Moscow, Tereletskiy Park Forest, June 2008, 1 male, 1 female, 1 tritonymph, 2 deutonymphs, nest of *T. pilaris*; 6 August 2008, 1 female, 7 protonymphs, nest of *Certhia familiaris*; 2 September 2010, 1 tritonymph, nest of *T. pilaris*.

**Remarks:** First record for Russia. The species is widespread in Europe (Harvey, 2013). Georgia represents the closest country of the species distribution to the current findings (Kobakhidze, 1963). *Dinocheirus panzeri* has frequently been reported from tree cavities (Šťáhlavský, 2001; Drogla and Lippold, 2004; Christophorová et al., 2017) and its occurrence in bird nests is also commonly known (Turienzo et al., 2010).

**Dinocheirus transcaspius** (Redikorzev, 1922) (Figures 2 and 3)

8: Moscow, Tereletskiy Park Forest, 25 June 2009, 1 female, nest of *T. pilaris*.

**Remarks:** First record for Russia. The species has previously been reported from Afghanistan, Kazakhstan, Kyrgyzstan, Pakistan, Tajikistan, Turkmenistan, and Uzbekistan (Harvey, 2013). *Dinocheirus transcaspius* has been found in caves and mammal nests (Schawaller, 1986).

The species belongs to the genus *Dinocheirus* based on the shape of spermatheca and presence of pseudotactile setae on tarsus IV (Schawaller, 1986). As did Muchmore (1972), Schawaller (1986) suggested the revision of the genus because of the absence versus presence of tactile setae on tergite XI. That is why the main diagnostic characters of both recorded species of the genus are presented (Figures 2 and 3).

**Allochernes wideri** (C.L. Koch, 1843)

4: Moscow, urban area, 16 July 2010, 1 female, nest of *T. pilaris*.

**Remarks:** The species occurs in a wide range within the Palearctic region (Harvey, 2013). It has been previously found in only a few localities in Russia, in the nest of *Parus major* (Linnaeus, 1758) and phoretic on true fly *Tephrochlamys flavipes* (Zetterstedt, 1838) (Schawaller, 1989). Most recently Kozminykh (2017) reported the...
species from the Urals. The current finding represents the fourth record for Russia.

_Pselaphochernes scorpioides_ (Hermann, 1804): Moscow, Kuskovo Park, July 2008, 6 males, 8 females, 4 tritonymphs, 13 deutonymphs, 11 protonymphs, nest of _P. montanus_.

Remarks: The species occurs within the Palearctic realm with a distribution center in Europe (Harvey, 2013). In Russia, the species is known only from a few localities (Redikorzev, 1924; Schawaller, 1989, 1994). Schawaller (1989) reported a single species record from a Microtus nest. All other known data from Russia are missing habitat specifications.

To date, 86 different pseudoscorpion species are known to be associated with birds, occurring in their nests, among guano, or on the birds themselves (Turienzo et al., 2010; Harvey et al., 2015; Krajčovičová et al., 2015). From Russia, only scarce records have been reported until now: _Cheiridium museorum_ (Leach, 1817) in the nest of _H. rustica_ and _A. wideri_ in the nest of _Parus major_ (Linnaeus, 1758) (Schawaller, 1985, 1989). In the current study, a single _A. wideri_ specimen was present in a _T. pilaris_ nest, while _C. museorum_ was not present in the studied bird nests.

According to the study of Christophoryová et al. (2011a), _C. cancroides, D. panzeri, C. hahni_, and _A. wideri_ are pseudoscorpions that occur regularly in bird nests, including their nymphal stages or females with brood sacks. In the present study, the mentioned species, except _A. wideri_, were collected together with their nymphal stages. Females of _D. panzeri_ were present with brood sacks. The close association of _C. cancroides_ with synanthropic habitats is well known (Turienzo et al., 2010; Christophoryová et al., 2011a). Our obtained results correspond with this as the majority of _C. cancroides_ specimens were found in _H. rustica_ and _D. urbica_ nests situated in anthropogenic zones. Both _C. hahni_ and _D. panzeri_ were present in nests of five different bird taxa. According to Christophoryová et al. (2011a), these two species can be found in open nests and in nests in tree cavities, thus explaining their presence in so many different bird nests. On the other hand, the occurrence of _C. vicinus_ in bird nests is known only scarcely (Krumpil and Cyprich, 1988; Krajčovičová et al., 2015). The current findings in _S. vulgaris_ and _F. coelebs_ nests confirmed our knowledge about the habitat range and distribution of the species. Similarly, new information is obtained for the quite rare _D. transcaspius_, as the current finding is the northernmost known and represents the first record in bird nest for the species.
One tritonymph of *D. balcanicus* was found attached in plumage of *R. ridibundus* during the present study. Data about phoresy on vertebrates are not as common as on invertebrates, but this phenomenon is not entirely unknown (Beier, 1948; Poinar et al., 1998; Turienzo et al., 2010). Henderickx (1998) assumed that it is likely that association with mammals gives pseudoscorpions opportunities for phoretic dispersion. In fact, phoretic occurrence in the pelage is quite common in cases of the species associated with mammals (Beier, 1948; Durden, 1991). Harvey et al. (2015) published a comprehensive review about pseudoscorpion observations from bird plumage with the discovery of a new cheliferid pseudoscorpion, *Sociochelifer metoecus*, found in *Philetairus socius* (Latham, 1790) plumage. A single record has been recorded from Russia, as well: *Apocheiridium rossicum* was recorded on the head of a wild duck from Siberia and on an unidentified bird from Perm (Redikorzev, 1935).

According to Harvey (2013) and Kozminykh (2017), the Russian pseudoscorpion fauna includes 40 species from eight families. After reviewing the published data, several missing data in the work by Harvey (2013) and contradiction in that of Kozminykh (2017) were noticed. Therefore, the elaboration of an updated annotated checklist from Russia and Crimea based on revised material is recommended.

Figure 3. The main diagnostic characters of *Dinocheirus* species. *Dinocheirus panzeri*: A – the position of pseudotactile setae on tarsus of leg IV, male; C – tactile setae on tergite XI; E – female spermatheca. *Dinocheirus transcaspius*: B – the position of pseudotactile setae on tarsus of leg IV, female; D – absence of tactile setae on tergite XI; F – detail of female spermatheca. Arrows point to bulbs of bifid spermathecae. Scale bars: 0.5 mm.
checklist of pseudoscorpions of Russia (Harvey, 2013) and the work of Kozminykh (2017), supplemented by newly recorded *Diplotemnus balcanicus*, *Chernes vicinus*, *Dinocheirus panzeri*, and *Dinocheirus transcaspius*, the number of Russian pseudoscorpions has increased by four new species.

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**References**


