



On the fauna of false scorpions (Arachnida: Pseudoscorpiones) of south-eastern Belarus

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Seven species of the false scorpions have been found in the south-eastern Belarus during targeted studies in 2017–2019. Sylvatic forms represent a significant part of species diversity of the regional fauna of the false scorpions. Only one species, *Chelifer cancroides* (Linnaeus, 1761), occurs in synanthropic habitats.

Keywords: false scorpions, pseudoscorpiones, species diversity, biotopic allocation, distribution, morphology, synonymy.

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Introduction

The study of the biodiversity is among the emerging issues of modern zoological science.

False scorpions (Arachnida: Pseudoscorpiones) is one of the oldest arachnid orders, their representatives are characterized by small body sizes (2–3 mm, on average) and large pedipalps ending with strong claws, which serve to capture the prey. They are found on all continents (except Antarctica) and are especially numerous in the tropics. False scorpions are quite widespread, but are mostly invisible for humans, because they lead a hidden predatory lifestyle in moss, litter, under stones and lagging bark, in anthills, bee hives, burrows and nests of mammals and birds, as well as caves, human dwellings, and livestock premises (Jones, 1970; Lange, 1984; Shear et al., 1989; Shear, 1991; Weygoldt, 1969; Witt and Dill, 1996). Since false scorpions have a limited ability for re-settling, they have historically developed the phenomenon of phoresis, or passive settlement on the body of animal hosts from different systematic groups (Kaisila, 1949). This behavior arose very early during the evolution of this group and is known from Cretaceous amber (Schawaller, 1991).

Currently, over 3500 species of the false scorpions are known, combined in 446 genera that belong to 26 families (Harvey, 2013). Meantime,

the global fauna of the false scorpions has been studied extremely unevenly. For example, in Europe, the species composition of the false scorpions is considered relatively well known for a few countries only, namely, Germany, France, the Czech Republic, Italy, and some others; a total of 787 species were recorded (Harvey, 2015). Alongside with that, there are regions where the fauna of the false scorpions has either not been studied at all, or only scarce data on their species composition and distribution have been published. Therefore, the knowledge on many species is very limited. This is especially true in Republic of Belarus, where the order Pseudoscorpiones has almost never been studied. For example, according to L.D. Burko and I.K. Lopatin (2001), there are only two species (a maximum of three: O.I. Borodin, pers. comm.) registered in the local fauna out of several dozen species likely to be found. However, these studies are based on random collections and do not represent a big picture of the species composition and distribution of this arachnid group in the Republic of Belarus. For comparison, 14 species are known for the neighboring Baltic countries, 47 for Poland, and 26 species for Ukraine (Harvey, 2013); in the Russian Federation, 44 to 48 species of the false scorpions have been recorded according to different literature sources (Krajčovičová et al., 2018; Mikhailov, 2016).

The study aims to describe the fauna of the false scorpions and their biotopic allocation in the south-eastern part of Republic of Belarus.

Materials and Methods

The material for the study was the author's own collections sampled during the period of 2017–2019 and carried out manually in various biocenoses in the south-eastern part of Republic of Belarus. The surveys were performed by the direct method: in the wild, the plant debris, the areas under the bark, rotten wood, and litter were inspected, as well as the anthills have been sieved; in the anthropogenic environment, the areas under household and construction waste, bird droppings, and residential premises were checked.

In total, 62 specimens of the false scorpions were collected and determined over the study period. The species determining was carried out according to the taxonomic keys developed for Europe (Christophoryová et al., 2011; Legg and Jones, 1988; Stol, 2005; Tooren, 2005) and to the study by S. Dashdamirov and V. Schawaller (1992). Information on the geographical distribution and origin of species is given according to several reports (Harvey, 2013, 2015; Rafalski, 1967; Sammet et al., 2016). The taxonomy and nomenclature are given according to the catalogue of M.S. Harvey (Harvey, 2013). The material is stored in 70% ethanol in the author's collection.

Results and Discussion

The false scorpions collected in various biocenoses of the south-eastern part of Republic of Belarus are represented by seven species belonging to the two families: Cheliferidae (3 species) and Chernetidae (4 species).

Most of the false scorpions are typical inhabitants of the sylvatic environment, except only one species, *Chelifer cancroides* (Fig. 1), which is synanthropic one.

The morphological descriptions of the species found, as well as data on their ecology and distribution are given below.

Class Arachnida – ARACHNIDA CUVIER, 1812

Order Pseudoscorpions – PSEUDOSCORPIONES DE GEER, 1778

Pseudoscorpionidea: Claus, 1872

Pseudoscorpiones: Latreille, 1804

Chelifera: Jarocki, 1825

Chernetidae: Menge, 1855

Didactyla: Nowicki, 1874

Chernetidae: Kulczyński, 1876

Chelonethi: Thorell, 1882

Chelonethida: Chamberlin, 1929

Pseudoscorpionidea: Beier, 1932, 1963

Suborder Icocheirata Harvey, 1992

Cheliferinea: Beier, 1932

Panctenodactyli: Balzan, 1891 (part.), auct.
Monosphyronida (part.): Chamberlin, 1929

Superfamily Cheliferoidea Risso, 1826

Cheliferides: Stecker, 1875 (Cheliferinae part.),
Beier, 1932

Family Cheliferidae Risso, 1826

Cheliferidae: Stecker, 1875, Hagen, 1879, part.,
E. Simon, 1879, part.

Flagellum consists of as few as three bristles. Males have paired cylindrical sacs; both segments of the femur of the first pair of legs are separated by a nearly vertical gap; abdominal sternites in males without margins, with sensitive setae. The poisonous apparatus is developed equally in the movable and non-movable fingers of the pedipalp; additional cloves are never developed. All legs with single-segmented tarsi. The articulation of the femur of both front legs differs significantly from that of the hind legs (heterofemorate articulation) (Dashdamirov and Schawaller, 1992).

Subfamily Cheliferinae Risso 1826

Cheliferinae: Stecker, 1875, part., E. Simon, 1879, part.

Genus *Chelifer* E.L. Geoffroy, 1762

Chelifer cancroides (Linnaeus, 1761)

Acarus cancroides: Linnaeus, 1761

Chelifer cancroides: + ?*C. rhododactylus* Menge, 1855

Chelifer granulatus: C.L. Koch, 1843, L. Koch, 1873,
Kulczyński, 1876

Chelifer ixoides: Lebert, 1875

Chelifer serratus: Stecker, 1874

Chelifer cancroides: Lehnert, 1933, Rafalski, 1953,
Rolnik et Szmidt, 1959

The body is 3–4-mm long, elongated-oval, very flattened, the color is variable, yellowish-brown of different saturation degree, cuticle is finely granulated (Fig. 1). The sides of the thorax in their anterior halves with spiky tubercles, matte; the bristles are clavate. Cephalothorax slightly elongated; both its grooves are clearly expressed, straight; the first groove locates in the middle of the cephalothorax, the second one is much closer to the posterior end of the body than to the first groove. Two clearly seen eyes in front of the thorax, on the sides of latter. Ridge locates along the moving finger of the chelicer and carries 18 cloves. Chelicera with 4 setae (seta *sb* is absent). Flagellum consists of 3 bristles, the front bristle is notched. Pedipalps are 1.5 times longer than body, slender; trochanter elongated; femur is slightly widened to the apex and joints an unclearly expressed stalk, the femur surface is finely granulated; tibia slightly shorter than femur, markedly widened to apex; the arm is oblong-oval, slightly wider than the tarsus, tapering smoothly to the slightly curved fingers, the length of latter is



Fig. 1. *Chelifer cancroides* (Linnaeus, 1761), female.

similar to the length of the arm. The tibia and tarsus of the first pair of legs in males are slender, not modified, without secondary reproductive structures. All tergites are longitudinally separated; in the male, they carry powerful lateral carinae. In males, the claws of tarsi carry additional denticles from below, the coxa of the hind legs has a coxal sac on the outer edge with a blunt wide tooth, and the lower edge is strongly concave. In female, medial sieve-like plates are paired. A pair of tactile bristles on the sides of the last abdominal tergite is absent (Christophoryová et al., 2011; Dashdamirov and Schawaller, 1992; Redikortsev, 1924).

C. cancroides is a synanthropic cosmopolitan species with an unknown center of origin. It is a typical inhabitant of residential buildings (including libraries), chicken coops, and attics (Rafalski, 1967). It settles in bookcases among books and papers, under lagging wallpaper, in linen, in the bird nests and bee hives; less often it can be found in nature, for example, among deciduous litter, in hollows and under the bark, more often, of the pine trees (Atakishiev, 1969; Beier, 1963; Christophoryová, 2010; Christophoryová and Krumpál, 2010; Christophoryová et al., 2011; Drogla and Lippold, 2004; Šťáhlavský, 2001). In the natural habitat, it occurs from May to August (Kolomyets and Bogdanova, 1980). Regard must be paid to all the findings dated before the description of *Mesochelifer resslī*, since they refer solely to *C. cancroides*, and it is now difficult to separate these two species if referring to the literature data from that period (Mahnert, 1981).

Females are fertilized through spermatophores secreted by males. Female always carries the eggs on the underside of the abdomen, and, presumably, they are laid all at once. The eggs are ellipsoidal, slightly yellowish, glued into a dense pack by a trans-

parent substance. Eggs remain on the female abdomen until the juveniles hatch. Within the present study, *C. cancroides* has been found in the book depository of the Gomel Regional Universal Library named after V.I. Lenin (in the early 2000s) (N 52°25'53.3", E 31°0'0.5") and among the household garbage and bird droppings in an abandoned water tower in vicinity of the urban village of Uvarovichi, Buda-Koshelevsky District (May 23, 2019) (N 52°36'18", E 30°44'54"). In the synanthropic environment, it preys mainly on the booklice (for example, on grain psocid *Liposcelis* spp. and larger pale booklouse *Trogium pulsatorium* (Linnaeus, 1758)), but can also feed on cereal mites, bed bugs, and also small larvae of beetles; in xylophilic communities, it predates on the larvae of bark beetles and sawyer beetles. Passive resettlement (phoresis) was observed for genus *Coeloides* (Hymenoptera: Braconidae) (Kolomyets and Bogdanova, 1980) and other hymenopterans, as well as daddy longlegs, dipterans, moths, and butterflies (Poinar et al., 1998); however, these data may be partially related to representatives of the genus *Mesochelifer* at least in Europe (Zaragoza, 2009).

Genus *Mesochelifer* Vachon, 1940

***Mesochelifer resslī* Mahnert, 1981**

Brownish to grayish brown body, flattened, ovoid (Fig. 2). The cephalothorax is triangular, covered from above with a continuous chitinous shield, the two eyes locate in front of the cephalothorax, on the sides of the latter. Very similar to the previous species, it differs by the presence of five bristles (*sb*) on the chelicerae and a pair of short tactile bristles on the sides of the last tergite of the abdomen. The body length of males is from 2.68 to 3.47 mm, of females, from 2.67 to 3.69 mm (Christophoryová et al., 2011; Mahnert, 1981).

Distributed widely in Central Europe, including Poland (Jędryczkowski, 1985), it is found also in the southern Urals (Kozminykh, 2017) and in the eastern Kazakhstan (Schawaller, 1989). Inhabits mainly the areas under the bark of conifers (Christophoryová et al., 2011; Mahnert, 1981), where it predates on the larvae of bark beetles and sawyer beetles. The only



Fig. 2. *Mesochelifer resslī* Mahnert, 1981, male.



Fig. 3. *Dactylochelifera latreillei* (Leach, 1817), female.

specimen (male) has been found by the author on October 13, 2019 in timber on felled pine trees inhabited by striped ambrosia beetle *Trypodendron lineatum* (Olivier, 1795), near the Lisichki dacha village in the vicinity of Gomel city (N 52°22'47.7", E 31°3'45.4"). Only one case of phoresis was reliably recorded for the black arches *Lymantria monacha* (Linnaeus, 1758) in Austria (Hauser, 1990).

Genus *Dactylochelifera* Beier, 1932

***Dactylochelifera latreillei* (Leach, 1817)**

Chelifera latreillei: Leach, 1817

Chelifera degeerii: C.L. Koch, 1835

Chelifera schaefferi: Kulczyński, 1876

Dactylochelifera latreillei: Lehnert, 1933

Tibia and tarsus of the first pair of walking legs of the male are stocky, modified. Tergites without lateral carinae or with very poorly developed lateral carinae (Fig. 3). The female medial sieve-like plates are fused into a single central plate. Coxae of IV pair of legs in male with coxal sacs. The pedipalps are very slender, the length of the tibia of the pedipalps exceeds its width in 2.7–3.1 times, of the femur, in 3.5 times. The subterminal seta of all tarsi is simple and pointed (Dashdamirov and Schawaller, 1992).

Distributed widely in the southern and central Europe and at the Caucasus. It inhabits the litter, hides under the bark and in the bird nests, prefers near-water biotopes on sandy soils (Rafalski, 1967). Known by two specimens (male and female), collected on April 1, 2018 under the bark of deciduous tree, at the

margin of the lowland swamp, in the vicinity of the Uza village, Gomel District, Gomel Region, Republic of Belarus (N 52°23'11.9", E 30°51'38.2").

Family Chernetidae Menge, 1855

All legs with single-segmented tarsi. The articulation of the femur of both front legs differs significantly from that of the hind legs (heterofemorate articulation). Poisonous apparatus only in the movable finger of the pedipalp; pedipalp fingers with at least a few extra denticles (Dashdamirov and Schawaller, 1992).

Subfamily Chernetinae Menge, 1855, Beier, 1932

Tribe Chernetini Menge, 1855, Beier, 1932

Genus *Chernes* Menge, 1855

***Chernes* cf. *cimicoides* (Fabricius, 1793)**

Chernes Mengei: L. Koch, 1873

Scorpio cimicoides: Fabricius, 1793

Chernes cimicoides: Rafalski, 1953

The body is 2.0–2.5-mm long, short, wide, flattened (Fig. 4). Cephalothorax, pedipalps and tergites are reddish-brown, pedipalps with a reddish tincture; the cuticle is finely grained, matte; from below, there are pointed setae, from above, the setae are club-shaped, some of which are very wide. The cephalothorax is slightly elongated, granular; both grooves are straight, the first groove is in the middle of the cephalothorax, the second one is much closer to the posterior edge than to the first groove. The ridge on chelicera with 16 denticles; galea is straight, with 3 lateral branches. Flagellum consists of 4 bristles, the front bristle is notched. Pedipalps are body-long, trochanter with a large rounded tubercle; femur with almost straight edges; tibia length and width are similar to that of femur; the outer edge of tibia is evenly arched; the arm is very wide, almost spherical, shorter and almost twice as wide as the tibia; the length of



Fig. 4. *Chernes* cf. *cimicoides* (Fabricius, 1793), male.

the fingers is similar to that of arm; the fingers are strongly curved. Tarsi and tibia of hind legs without long protruding bristles. Additional teeth on the fingers of the pedipalp chela are not reduced, more than one additional tooth on the medial side. Sclerites I–X are widely longitudinally divided. The latter tergite on the sides with two long tactile setae (Dashdamirov and Schawaller, 1992; Redikortsev, 1924).

Trans-Palaearctic species (Kozminykh, 2017). It occurs in the forest zone under the bark of trees and stumps, sometimes in anthills and litter (Rafalski, 1967). In the south-eastern part of Republic of Belarus, all the specimens of *Ch. cf. cimicoides* have been found in the anthills of *Formica rufa* Linnaeus, 1761: June 4, 2017, in the forest in the suburbs of Gomel city (7 specimens) (N 52°22'36.8", E 31°2'8.7") and October 28, 2018, in the mixed forest near the "Glushets" horticultural community of the Gomel District, Gomel Region (11 specimens) (N 52°14'34", E 30°50'18"). A.S. Sazhnev et al. (2016) have also discovered *Ch. cf. cimicoides* in the nests of *F. rufa* ants in addition to insects during their study of myrmecophilous coleoptera in the Saratov Oblast of Russia.

***Chernes hahni* (C.L. Koch, 1843)**

Chelifer hahni: C.L. Koch, 1843

Chernes cimicoides: Menge, 1855, Joseph, 1871 part., Beier, 1932

Chernes Hahni: Nowicki, 1874, Lebert, 1875, Kulczyński, 1876

Toxochernes panzeri: Rafalski, 1953

The cephalothorax is granular (Fig. 5). Tarsi and tibiae of hind legs without long protruding bristles. The pedipalps are stocky, the length of their femur is 0.5–0.7 mm; the tibia length exceeds the tibia width in 2.0–2.1 times; the femur length exceeds its width in 2.3–2.5 times. Pedipalp chela in both males and females is slender, its length (without a leg) is 2.4–2.6 times greater than its width. Additional teeth on the chela fingers are not reduced, more than one additional tooth on its medial side. The last abdominal tergite with 8 short setae at the posterior margin (Dashdamirov and Schawaller, 1992).

Trans-Palaearctic species (Kozminykh, 2017). It lives mainly under the bark and in the hollows of single-standing deciduous trees (Rafalski, 1967). It has also been found in the bird nests and in the leafy litter (Beier, 1963; Christophoryová, 2010; Christophoryová and Krumpál, 2010; Christophoryová et al., 2011; Droglá and Lippold, 2004; Štáhlavský, 2001). The only specimen (female) was discovered by author on May 12, 2018 among a pile of construction debris and wood waste populated by the ants *Camponotus vagus* (Scopoli, 1763) and *Formica fusca* Linnaeus, 1758, in the forest area of Gomel city (N 52°24'1.9", E 31°3'17.4").



Fig. 5. *Chernes hahni* (C.L. Koch, 1843), female.

Genus *Dendrochernes* Beier, 1932

***Dendrochernes cyrneus* (L. Koch, 1873)**

Chernes cyrneus: L. Koch, 1873

Dendrochernes cyrneus: Rafalski, 1953

The largest representative of the false scorpions of the fauna of Republic of Belarus (Fig. 6). Body is 4–5-mm long, elongated, flattened. The cephalothorax and pedipalps are dark brown, with a reddish tincture; sclerites are dark brown, almost black; legs are yellow-brown. The cuticle is finely and evenly grained, matte; the pedipalp arm is shiny, with serrated bristles from above and pointed bristles from below. The cephalothorax is granular, elongated, with a slight interception behind the middle; the first groove locates in the middle and forms an angle forward; the second groove is slightly closer to the posterior edge and forms an angle back. In front of the thorax, there are two obscure eye spots along its sides. Ridge of chelicera with 22 denticles; galea is long, straight, with 5 lateral branches. Flagellum consists of 4 bristles, the front one is notched, both posterior bristles are of the same size. Pedipalps are stocky, very massive, trochanter with a small tubercle; the femur is short and uniformly wide; tarsus is somewhat shorter and wider than femur, with a strongly curved inner edge; the arm is very large, longer than tarsus and almost twice as wide; chela fingers with more than 10 additional teeth, strongly curved, almost twice as short as the arms. Tibia of hind legs always without long protruding bristles. Trichobotria of the hind tarsus significantly longer than the double width of the tarsus, located distally; the *st* trichobotria of the moving finger of the pedipalp is closer to *sb* than to



Fig. 6. *Dendrochernes cyrneus* (L. Koch, 1873), female.

t. Sclerites I–X are widely longitudinally divided, each with a rounded dark spot; on the XI sclerite, there is a pair of sensitive hairs (Dashdamirov and Schawaller, 1992; Redikortsev, 1924).

Trans-Palaearctic species (Kozminykh, 2017), ecologically associated with old-growth broad-leaved and mixed forests (Harvey, 2013; Kew, 1906). It lives under the lagging bark of old trees, in xylophagous settlements with developing larvae, mainly longhorn beetles (Cerambycidae) and bark beetles (Curculionidae: Scolytinae), as well as in abandoned passages (Beier, 1963). This species is rare and local everywhere. The only female was discovered on July 14, 2017 during the hunt for the true weevil *Rhyncolus* (s. str.) *elongatus* (Gyllenhal, 1827) under the bark of a standing dried-up pine near the village of Yakimovka, Rechitsa District, Gomel Region (N 52°23'27.1", E 30°36'24.7"). In this species, passive resettlement (phoresia) is observed on the beetles from the families Cerambycidae (Beier, 1929; Ducháč, 1993; Huber, 2014; Jones, 1978; Karpiński et al., 2017; Kew, 1929;), Melandryidae (Vachon, 1954) and some others (Lohmander, 1939), as well as on the representatives of braconid wasps, family Braconidae (Kolo-miets, 1980; Ressler, 2007), and ichneumon wasps, family Ichneumonidae (Legg, 2015). Adult false scorpions attach to the underside of the abdomen or to

the legs of the host insect and follow it to the sites of xylophage settlement: *Dryocoetes villosus* (Fabricius, 1792) (Curculionidae: Scolytinae), *Bitoma crenata* (Fabricius, 1775) (Zopheridae) (Kew, 1929), and *Ptilinus pectinicornis* (Linnaeus, 1758) (Ptinidae) (Karpiński et al., 2017).

Subfamily Lamprochernetinae, 1932

Genus *Lamprochernes* Tömösvary, 1882

***Lamprochernes chyzeri* (Tömösvary, 1882)**

Chernes (*Lamprochernes*) *chyzeri*: Tömösvary, 1882

Lamprochernes chyzeri: Rafalski, 1953

The body is up to 2.8-mm long, oblong-oval (Fig. 7). The pedipalps are reddish-brown, the cephalothorax is lighter in color; the tergites of the abdomen and legs are yellow-brown. The cuticle is very thin and evenly granular. The pedipalp arm is almost smooth, shiny; the pointed setae are white. Cephalothorax is almost smooth, elongated; its first groove is slightly ahead of the middle, clearly expressed; it forms in the middle a weak angle forward; the second groove is very obscure, twice as close to the posterior margin as to the first groove. Ridge of chelicera with 16 denticles; galea with 4 lateral branches. Flagellum consists of 3 bristles, the front one is notched. Pedipalps are of the body length, trochanter with two strongly protruding tubercles; the femur behind the leg is sharply widened and noticeably narrowed to the apex; tarsus with arched edges, its length and width are similar of those of femur; the arm length is similar to that of a tibia and somewhat wider than it, gradually tapering to the fingers; the latter are the of the arm length and are slightly bent. Sclerites I–X are longitudinally divided; sclerite XI is incised only in front; each sclerite has two dark spots. Tarsi of two hind pairs of legs with long protruding bristles. The anterior part of the female operculum carries 9–11 setae (Dashdamirov and Schawaller, 1992; Redikortsev, 1924).

European-Asian species (Kozminykh, 2017). It is distributed in Austria, Bulgaria, Croatia, Czech Republic, Denmark, Finland, Germany, Hungary, Italy, Latvia, Norway, Poland, Romania, Slovakia,



Fig. 7. *Lamprochernes chyzeri* (Tömösvary, 1882), male.

Sweden, Switzerland, Great Britain, Georgia, Kazakhstan, Turkey, and in the countries of the Balkan Peninsula (Harvey, 2013). It occurs under the bark of old and decaying trees, in the passages of bark beetles, in the anthills, bird nests, litter, and moss (Beier, 1948, 1963; Christophoryová, 2010; Christophoryová et al., 2011; Droglá and Lippold, 2004; Jędrzyckowski, 1987; Kaisila, 1949; Krumpál and Christophoryová, 2007; Krumpál and Cyprich, 1988; Legg and Jones, 1988; Lohmander, 1939; Palmgren, 1973; Petrov, 2004; Rafalski, 1967), as well as in greenhouses and compost heaps at the household plots (Christophoryová, 2009; Droglá and Lippold, 2004; Helversen, 1966; Krumpál et al., 1997; Legg and Jones, 1988; Lohmander, 1939).

In Denmark, *L. chyzeri* is considered a synanthropic species (Meinertz, 1964). This species is not numerous in the south-eastern part of Republic of Belarus. Single specimens were found under the bark of old rotten stumps, of the sawn and felled trees in the vicinity of the working village of Bolshevik in the Gomel Region (June 19, 2018) (N 52°34'27.8", E 30°51'54.1"), at power transmission line right-of-way in a mixed forest on the territory of Makeevsky forestry, westwards off Gomel city (July 13, 2019) (N 52°24'24.2", E 30°53'40.3"), in a floodplain meadow between the villages of Verkhnie Zhary and Nizhnie Zhary of the Bragin District, Gomel Region (August 15, 2019) (N 51°18'44.2", E 30°34'34.3"). Several specimens were also collected in a pile of construction debris and wood waste, inhabited by the ants *C. vagus* and *F. fusca*, in the forest area of Gomel city on May 12, 2018 (N 52°24'1.9", E 31°3'17.4"). In Europe, cases of phoresis of *L. chyzeri* were noted for the double dart *Graphiphora augur* (Fabricius, 1775) (Vachon, 1954) and the housefly *Musca domestica* (Christophoryová et al., 2011; Meinertz, 1964).

Conclusions

Seven species of the false scorpions have been registered in the south-eastern part of Republic of Belarus; *Chelifer cancroides*, *Chernes* cf. *cimicoides*, and *Lamprochernes chyzeri* are the most common species in our collections. The greatest biodiversity of this group of arachnids is noted in the sylvatic environment and represented by dendrophilic (inhabiting the areas under the bark) and myrmecophilous species. However, due to the relatively small amount of the material analyzed, as well as the lack of literary information about the fauna of the false scorpions in this region, the indicated number of species is far from final, and therefore this note should be considered as a preliminary review only. In the future, one should expect an extension of the species list of the false scorpions of Republic of Belarus, since the study is planned to be continued.

References

- Atakishiev, T.A., 1969. Pseudoscorpion *Chelifer cancroides* v pchelinykh ul'iakh [Pseudoscorpion *Chelifer cancroides* in bee hives]. *Uchenye Zapiski Kazanskogo Gosudarstvennogo Veterinarnogo Instituta [Scientific Notes of the Kazan State Veterinary Institute]* **105**, 324–327. (In Russian).
- Balzan, L., 1891. Chernetes (Pseudoscorpionides). Voyage de M.E. Simon au Venezuela. 16e mémoire. *Annales de la Société Entomologique de France* **60**, 497–552. (In French).
- Beier, M., 1929. Alcuni Pseudoscorpioni raccolti da C. Menozzi. *Bollettino della Società Entomologica Italiana* **61**, 154–156. (In Italian).
- Beier, M., 1932. Pseudoscorpionidea II. Subord. C. Cheliferinea. *Tierreich* **58**, 1–294. (In German).
- Beier, M., 1948. Phoresie und Phagophilie bei Pseudoscorpionen. *Österreichische Zoologische Zeitschrift* **1**, 441–497. (In German).
- Beier, M., 1963. Ordnung Pseudoscorpionidae (Afterscorpione). In: d'Aguilar, J., Beier, M., Franz, H., Raw, F. (eds.), *Bestimmungsb. Über zur Bodenfauna Europas. B. 1. Akademie-Verlag, Berlin, Deutschland*, 1–204. (In German).
- Burko, L.D., Lopatin, I.K., 2001. Opyt otsenki taksonomicheskogo raznoobraziia zhivotnogo mira Belarusi [Experience in assessing the taxonomic diversity of the animal world of Belarus]. *Vestnik Belorusskogo Gosudarstvennogo Universiteta. Ser. 2 [Bulletin of the Belarusian State University. Ser. 2]* **1**, 40–42. (In Russian).
- Chamberlin, J.C., 1929. A synoptic classification of the false scorpions or chela-spinners, with a report on a cosmopolitan collection of the same. Part 1. The Heterosphyronida (Chthoniidae) (Arachnida-Chelonethida). *Annals and Magazine of Natural History* **4** (19), 50–80.
- Christophoryová, J., 2009. Štúriky – Pseudoscorpiones. In: Mašán, P., Mihál, I. (eds.), *Pavúkovce Cerovej vrchoviny (Arachnida: Araneae, Pseudoscorpiones, Opiliones, Acari)*. Štátna ochrana prírody SR, Banská Bystrica, Správa CHKO Cerová vrchovina, Rimavská Sobota, Ústav zoológie SAV, Bratislava, Ústav ekológie lesa SAV, Zvolen, Slovensko, 125–135. (In Slovakian).
- Christophoryová, J., 2010. Štúriky (Pseudoscorpiones) pod kôrou stromov, v dutinách a v

- hniezdach na Slovensku. *Folia faunistica Slovaca* **15** (1), 1–12. (In Slovakian).
- Christophoryová, J., Krumpál, M., 2010. Štúriky (Pseudoscorpiones) PR Šúr. In: Majzlan, O., Vidlička, L. (eds.), *Príroda rezervácie Šúr*. Ústav zoológie SAV, Bratislava, Slovensko, 105–114. (In Slovakian).
- Christophoryová, J., Šťáhlavský, F., Fedor, P., 2011. An updated identification key to the pseudoscorpions (Arachnida: Pseudoscorpiones) of the Czech Republic and Slovakia. *Zootaxa* **2876**, 35–48.
- Claus, C., 1872. Grundzüge der Zoologie. Zum gebrauch an universitäten und höheren lehranstalten sowie zum selbststudium. 2., verm. aufl. N.G. Elwert, Marburg und Leipzig, Deutschland, 1170 p. (In German).
- Dashdamirov, S., Schawaller, W., 1992. Lozhnoskorpiony (Arachnida, Pseudoscorpiones) fauny Kavkaza [Pseudoscorpions of the Caucasian fauna (Arachnida Pseudoscorpionida)]. *Arthropoda Selecta* **1** (4), 31–72. (In Russian).
- Drogla, R., Lippold, K., 2004. Zur Kenntnis der Pseudoskorpion-Fauna von Ostdeutschland (Arachnida, Pseudoscorpiones). *Arachnologische Mitteilungen* **27/28**, 1–54. (In German).
- Duchač, V., 1993. Zwei neue Afterskorpion-Arten aus der Tschechischen Republik. *Arachnologische Mitteilungen* **5**, 36–38. (In German).
- Fabricius, J.C., 1793. *Entomologia systematica emendata et aucta, secundum classes, ordines, genera, species adjectis, synonymis, locis, observationibus, descriptionibus*. **3** (1). C.G. Proft, Hafniae, Denmark, 487 p. (In Latin).
- Hagen, H., 1879. Hoehlen-*Chelifer* in Nord-America. *Zoologischer Anzeiger* **2**, 399–400. (In German).
- Harvey, M.S., 2013. Pseudoscorpions of the World, version 3.0. Western Australian Museum, Perth. Web page. URL: <http://www.museum.wa.gov.au/catalogues-beta/pseudoscorpions> (accessed: 10.03.20).
- Harvey, M.S., 2015. Fauna Europaea: Pseudoscorpiones. Fauna Europaea, version 2.6. Web page. URL: <https://www.fauna-eu.org> (accessed: 10.03.20).
- Hauser, E., 1990. Ein Phoresie-Nachweis beim Pseudoskorpion *Mesochelifer resslii* Mahner (Cheliferidae) mit der "Nonne" *Lymantria monacha* L. (Lep., Lymantriidae) im Bezirk Steyr (Oberösterreich). *Steyrer Entomologenrunde* **24**, 62–66. (In German).
- Helversen, O. von, 1966. Pseudoskorpione aus dem Rhein-Main-Gebiet. *Senckenbergiana biologica* **47**, 131–150. (In German).
- Huber, B., Büche, B., 2014. Vielfalt der Tothholzkäferfauna im Urwald Scatlè, Breil/Brigels (Schweiz, Graubünden) (Coleoptera). *Mitteilungen der Schweizerischen Entomologischen Gesellschaft* **87** (3–4), 311–326. (In German).
- Jarocki, F.P., 1825. *Zoologia czyli zwierzętopismo ogólne podług najnowszego systematu ułożone*. T. 5. Skorupiaki i pajaki. Drukarnia Rzadowey Jego Cesarsko-Krol, Warszawa, Polska, 434 s. (In Polish).
- Jędrzyckowski, W.B., 1985. Pseudoscorpions (Pseudoscorpiones) of Mazovia. *Fragmenta Faunistica* **29** (5), 77–83. (In Polish).
- Jędrzyckowski, W.B., 1987. Zaleszczotki (Pseudoscorpiones) Bieszczadów. *Fragmenta Faunistica Musei Zoologici Polonici* **30**, 341–349. (In Polish).
- Jones, P.E., 1970. The occurrence of *Chthonius ischnocheles* (Hermann) (Chelonethi: Chthoniidae) in two types of hazel coppice leaf litter. *Bulletin of the British Arachnological Society* **1**, 72–79.
- Jones, P.E., 1978. Phoresy and commensalism in British Pseudoscorpions. *Proceedings and Transactions of the British Entomological and Natural History Society* **1978**, 90–96.
- Joseph, G., 1871. Gibt es augenlose Arthropoden in Schlesien? *Jahrbücher der Schlesische Gesellschaft für Vaterländische Kultur* **48**, 160–162. (In German).
- Kaisila, J., 1949. A revision of the pseudoscorpion fauna of eastern Fennoscandia. *Annales Entomologici Fennici* **15**, 72–92.
- Karpiński, L., Rutkowski, T., Szczepański, W.T., 2017. First record of phoresy of *Dendrochernes cyrneus* (L. Koch, 1873) (Pseudoscorpiones, Chernetidae) on *Cerambyx cerdo* Linnaeus, 1758

- (Coleoptera, Cerambycidae) and their potential value as bioindicators. *Animal Biodiversity and Conservation* 40 (2), 187–192.
- Kew, H.W., 1906. *Chernes cyrneus* in Nottinghamshire, a recent addition to the known False Scorpions of Britain. *54th Report and Transactions of the Nottingham Naturalists' Society for 1905–1906*, 41–46.
- Kew, H.W., 1929. Notes on some Coleoptera and a *Chelifer*, observed on a Richmond Park Oak after nightfall. *Entomologist's monthly magazine* 15, 83–86.
- Koch, C.L., 1835. Deutschlands Crustaceen, Myriapoden und Arachniden. Ein Beitrag zur deutschen Fauna. B. 2. F. Pustet, Regensburg, Deutschland, 24 p. (In German).
- Koch, C.L., 1843. Die Arachniden. B. 10. C.H. Zeh'sche Buchhandlung, Nürnberg, Deutschland, 142 p. (In German).
- Koch, L., 1873. Uebersichtliche Darstellung der europäischen Chernetiden (Pseudoscorpione). Bauer und Raspe, Nürnberg, Deutschland, 68 p. (In German).
- Kolomiets, N.G., Bogdanova, D.A., 1980. Parazity i khishchniki ksilofagov Sibiri [Parasites and predators of xylophages of Siberia]. Nauka, Novosibirsk, USSR, 280 p. (In Russian).
- Kozminykh, V.O., 2017. Spisok lozhnoskorpionov (Arachnida: Pseudoscorpiones) Urala [List of the pseudoscorpions (Arachnida: Pseudoscorpiones) of the Urals]. *Fauna Urala i Sibiri [Fauna of the Urals and Siberia]* 2, 38–45. (In Russian).
- Krajčovičová, K., Matyukhin, A.V., Christophoryová, J., 2018. First comprehensive research on pseudoscorpions (Arachnida: Pseudoscorpiones) collected from bird nests in Russia. *Turkish Journal of Zoology* 42, 480–487.
- Krumpál, M., Christophoryová, J., 2007. Štúriky (Pseudoscorpiones) PR Ostrov Kopáč. In: Majzlan, O. (ed.), *Príroda ostrova Kopáč*. Fytoterapia OZ, Bratislava, Slovensko, 95–100. (In Slovakian).
- Krumpál, M., Cyprich, D., 1988. O výskyte štúrikov (Pseudoscorpiones) v hniezdach vtákov (Aves) v podmienkach Slovenska. *Zborník Slovenského národného múzea, Prírodné vedy* 34, 41–48. (In Slovakian).
- Krumpál, M., Krumpálová, Z., Cyprich, D., 1997. Bezstavovce (Vertebrata) skleníkov Bratislavy (Slovensko). *Entomofauna carpathica* 9, 102–106. (In Slovakian).
- Kulczyński, Wł., 1876. Dodatek do fauny pajęczaków Galicji. *Sprawozdanie Komisji Fizyjograficznej* 10, 41–67. (In Polish).
- Lange, A.B., 1984. Otryad lozhnoskorpiony (Pseudoscorpiones, ili Chelonethi) [Order pseudoscorpions (Pseudoscorpiones, or Chelonethi)]. In: Gilyarov, M.S., Pravdin, F.N. (eds.), *Zhizn' zhivotnykh. T. 3. Chlenistonogie: trilobity, khelitserovy, trakhejnodyshaschie. Onikhofory. 2-e izd., pererabotannoe [Animal Life. Vol. 3. Arthropods: Trilobites, Chelicerata, Trehantiria. Onychophores. 2nd ed., revised]*. Prosveschenie, Moscow, USSR, 35–37. (In Russian).
- Latreille, P.A., 1804. Histoire naturelle, générale et particulière, des crustacés et des insectes. Ouvrage faisant suite aux oeuvres de Leclerc de Buffon, et partie du cours complet d'histoire naturelle rédigé par C.S. Sonnini, membre de plusieurs sociétés savantes. Tome onzième. F. Dufart, Paris, France, 422 p. (In French).
- Leach, W.E., 1817. On the Characters of the Genera or the Family *Scorpionidea* with Description of the British Species of *Chelifer* and *Obisium*. *Zoological Miscellany* 3, 48–53.
- Lebert, H., 1875. Verzeichniss schlesischer Spinnen mit Aufzählung der schlesischen Myriapoden. H. Laupp, Tübingen, Deutschland, 63 p. (In German).
- Legg, G., 2015. *Dendrochernes cyrneus* (L. Koch, 1873) (Pseudoscorpiones, Chernetidae) phoretic on *Ephialtes manifestator* (Lin., 1758) (Hymenoptera, Ichneumonidae, Pimplinae). *Newsletter of the British Arachnological Society* 132, 5–7.
- Legg, G., Jones, R.E., 1988. Pseudoscorpions (Arthropoda; Arachnida). Keys and notes for the identification of the species. In: Kermack, D.M., Barnes, R.S.K. (eds.), *Synopses of the British Fauna (New Series)*, No. 40. The Linnean Society of London and the Estuarine and Brackish-Water Sciences Association, Leiden – New York – København – Köln, 1–159.
- Lehnert, W., 1933. Beobachtungen über die Biocönose der Vogelnester. *Ornithologische Monatsberichte* 41, 161–166. (In German).

- Linnaeus, C., 1761. Fauna Svecica. Editio altera. Laurenti Salvii, Stockholmiae, Suecia, 578 p. (In Latin).
- Lohmander, H., 1939. Zur Kenntnis der Pseudoscorpionfauna Schwedens. *Entomologisk tidskrift* **60**, 279–323. (In German).
- Mahnert, V., 1981. *Mesochelifer ressl* n. sp., eine mit *Chelifer cancroides* (L.) verwechselte Art aus Mitteleuropa (Pseudoscorpiones, Cheliferidae). *Veröffentlichungen des Tiroler Landesmuseums Ferdinandeum* **61**, 47–53. (In German).
- Meinertz, T., 1964. Beiträge zur Verbreitung der Pseudoscorpioniden in Dänemark. *Videnskabelige Meddelelser fra Dansk Naturhistorisk Forening i Kjøbenhavn* **126**, 387–402. (In German).
- Menge, A., 1855. Über die Scheerenspinnen, Chernetidae. *Neueste Schriften der Naturforschenden Gesellschaft* **5** (2), 1–43. (In German).
- Mikhailov, K.G., 2016. Arakhnologija v Rossii/SSSR [Arachnology in Russia/USSR]. *Aspekty bioraznoobraziia. Sbornik trudov Zoologicheskogo muzeia MGU im. M.V. Lomonosova [Aspects of biodiversity. Collection of works of the Zoological Museum of Lomonosov Moscow State University]* **54** (2), 655–691. (In Russian).
- Nowicki, M., 1874. Dodatek do fauny pajęczaków Galicyi. *Sprawozdanie Komisji Fizyograficznej* **8**, 1–11. (In Polish).
- Palmgren, P., 1973. Über die Biotopverteilung waldbodenlebender Pseudoscorpionidea (Arachnoidea) in Finnland und Österreich. *Commentationes Biologicae* **61**, 1–11. (In German).
- Petrov, B.P., 2004. The false scorpions (Arachnida: Pseudoscorpiones) of the Eastern Rhodopes (Bulgaria and Greece). In: Beron, P., Popov, A. (eds.), *Biodiversity of Bulgaria. 2. Biodiversity of Eastern Rhodopes (Bulgaria and Greece)*. Pensoft and National Museum of Natural History, Sofia, Bulgaria, 153–166.
- Poinar, G.O., Jr., Čurčić, B.P.M., Cokendolpher, J.C., 1998. Arthropod phoresy involving pseudoscorpions in the past and present. *Acta Arachnológica* **47** (2), 79–96.
- Rafalski, J., 1953. Fauna pajęczaków Parku Narodowego na wyspie Wolinie w świetle dotychczasowych badań. *Ochrona Przyrody* **21**, 217–246. (In Polish).
- Rafalski, J., 1967. Zaleszczotki. Pseudoscorpionidea. In: Katalog Fauny Polski. Vol. 32 (1). Polska Akademia Nauk, Warszawa, Polska, 1–34. (In Polish).
- Redikortsev, V.V., 1924. Lozhnoskorpiony ural'skoi fauny [False scorpions of the fauna of Urals]. *Zapiski Ural'skogo Obshchestva Lyubitelei Estestvoznaniia [Notes of the Ural Society of Natural History Lovers]* **39**, 11–27. (In Russian).
- Ressler, F., 2007. Die scheren tragenden Spinnentiere des Bezirkes Scheibbs (Niederösterreich). *Wissenschaftliche Mitteilungen aus dem Niederösterreichischen Landesmuseum* **18**, 263–283. (In German).
- Rolnik, S., Szmidt, A., 1959. Z badań nad entomofauną pasieki doświadczalnej w Nadleśnictwie Zielonka. *Pszczelnicze Zeszyty Naukowe* **3** (2), 61–76. (In Polish).
- Sammet, K., Talvi, T., Süda, I., Kurina, O., 2016. Pseudoscorpions (Arachnida: Pseudoscorpiones) in Estonia: new records and an annotated checklist. *Entomologica Fennica* **27**, 149–163.
- Sazhnev, A.S., Riga, E.Yu., Zabaluev, I.A., 2016. Novye dannye o faune mirmekofil'nykh zhestkokrylykh (Coleoptera) v gnezdash murav'ev *Formica rufa* Linnaeus, 1761 (Hymenoptera) na territorii Saratovskoi oblasti [New data on the fauna of myrmecophilous beetles (Coleoptera) in the nests of ants *Formica rufa* Linnaeus, 1761 (Hymenoptera) for territory of Saratov Oblast]. *Izvestiya Saratovskogo Universiteta. Novaya seriya. Seriya: Khimiya. Biologiya. Ekologiya [Proceedings of Saratov University. New Series. Series: Chemistry. Biology. Ecology]* **16** (2), 182–185. (In Russian). <http://www.doi.org/10.18500/1816-9775-2016-16-2-182-185>
- Schawaller, W., 1989. Pseudoskorpione aus der Sowjetunion. T. 3 (Arachnida: Pseudoscorpiones). *Stuttgarter Beiträge zur Naturkunde. Serie A (Biologie)* **440**, 1–30. (In German).
- Schawaller, W., 1991. The first Mesozoic pseudoscorpion from Cretaceous Canadian amber. *Paleontology* **34**, 971–976.
- Shear, W.A., 1991. The early development of terrestrial ecosystems. *Nature* **351**, 283–289. <http://dx.doi.org/10.1038/351283a0>
- Shear, W.A., Schawaller, W., Bonamo, P.M., 1989. Record of Palaeozoic pseudoscorpions. *Nature* **341**, 527–529. <http://dx.doi.org/10.1038/341527a0>

- Simon, E., 1879. Les Arachnides de France. Contenant les ordres des chernetes, scorpiones et opiliones. Librairie Encyclopedique de Roter, Paris, France, 379 p. (In French).
- Štáhlavský, F., 2001. Štírci (Arachnida: Pseudoscorpiones) Prahy. *Klapalekiana* 37, 73–121. (In Czech).
- Stecker, A., 1874. Zur Kenntniss der Chernetiden-fauna Böhmens. *Sitzungsberichte der Königl. Böhmischen Gesellschaft der Wissenschaften* 8, 227–241. (In German).
- Stecker, A., 1875. Ueber die geographische Verbreitung der europäischen Chernetiden (Pseudoscorpione). *Archiv für Naturgeschichte* 41, 159–182. (In German).
- Stol, I., 2005. Nordiske mosskorpioner (Pseudoscorpiones). *Norske Insekttabeller* 18, 1–35. (In Norwegian).
- Thorell, T., 1882. Descrizione di alcuni Aracnidi inferiori dell'Arcipelago Malese. *Annali del Museo Civico di Storia Naturale di Genova* 18, 21–69. (In Italian).
- Tömösváry, O., 1882. Pseudoscorpiones Faunae Hungaricae. A Magyar fauna álskorpiói. *Magyar Tudományos Akadémia Matematikai és Természettudományi Közlemények* 18, 135–256. (In Hungarian).
- Tooren, D. van den, 2005. Naamlijst en determinatiesleutel tot de pseudoschorpioenen van Nederland (Arachnida: Pseudoscorpiones). *Nederlandse Faunistische Mededelingen* 23, 91–102. (In Norwegian).
- Vachon, M., 1954. Nouvelles captures de Pseudoscorpions (Arachnides) transportés par des insectes. *Bulletin du Muséum National d'Histoire Naturelle* 2 (2), 590–592. (In French).
- Weygoldt, P., 1969. The biology of pseudoscorpions. Harvard University Press, Cambridge, USA, 145 p.
- Witt, D.L., Dill, L.M., 1996. Springtail postmolt vulnerability to pseudoscorpion predation: mechanisms and implications. *Journal of Insect Behavior* 9, 395–406.
- Zaragoza, J.A., 2009. Synonymy of *Mesochelifer insignis* Callaini, 1986 with *Mesochelifer fradei* Vachon, 1940 (Pseudoscorpiones: Cheliferidae), with remarks on the biology of the genus *Mesochelifer* Vachon. *Revista Ibérica de Aracnología* 17, 45–51.