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Article

Checklist of oribatid mites (Acari, Oribatida) of the Transcarpathian lowland, Ukraine

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ABSTRACT
This article summarizes knowledge on the species composition of oribatid mites of the Transcarpathian lowlands. In total, 174 species of oribatid mites (97 genera and 50 families) are recorded from 53 localities and 18 types of biotopes. Ecological and distributional data for each species are specified. The fauna is compared with that of the other areas of the Pannonian lowlands (Hungary, Slovakia, and Romania). Two species, *Rhinoppia similifallax* Subías & Mínguez, 1986 and *Galumna bimorpha* Mahunka, 1987 are first records from Ukraine. Two other species, *Cosmochthonius tenuisetus* Gordeeva, 1980 and *Ceratozetella maxima* (Berlese, 1908) are found for the first time from the Pannonian Plain.

KEY WORDS: Diversity; forests; grasslands; habitats; Sarcoptiformes.

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INTRODUCTION

Oribatid mites (Acari: Oribatida) are free-living, saprotrophic microarthropods, which are ecologically associated with soil, residues of dead organic matter, fungal mycelium and mosses (Schuster 1956; Schneider *et al.* 2004; Kruczyńska and Seniczak 2011). The global fauna of oribatid mites contains more than 11 thousand species from 1300 genera and 163 families, of which more than 3800 species are known from the Palaearctic realm (Subías 2004, 2020 online update). More than 700 species are known from Ukraine (Yaroshenko 2000), which is approximately 7% of the world's fauna. However, in the work of Yaroshenko (2000), there is no information about the oribatid mites of the Transcarpathian lowlands. The fauna of Ukraine is still far from being completely studied, and the number of recorded taxa is constantly increasing. For instance, four species, *Rhinoppia hygrophila* (Mahunka, 1987), *Oxyoppia europaea* Mahunka, 1982, *Achipteria* cf. *quadridentata* (Willmann, 1951) and *Ceratozetes* cf. *psammophilus* Horak, 2000, were recorded for the first time for Ukraine, particularly from the Transcarpathian lowlands (Hushtan 2018a).

The Transcarpathian region is one of the richest territories of Ukraine from the taxonomic point of view, and more interesting region is the Transcarpathian lowland, which constitutes the northeastern part of the Pannonian Plain. About 90% of the Transcarpathian lowland is covered

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with grasslands. The first fragmentary study of oribatid mites in Ukraine dates back to the end of the 19th century (Karpelles 1893).

Later, several works were published about the oribatid mites of the Transcarpathian forests (Polonchik and Fasulati 1964; Kurcheva 1970). However, the territory of the Transcarpathian lowlands was generally ignored by them. The main research on the oribatid fauna of the Transcarpathian region began in the 1980s (see e.g. Kazakov 1983; Melamud 1983; Sergienko 1987; Karppinen *et al.* 1992), but they again did not cover the territory of the Transcarpathian lowlands.

In the works of Melamud (2003, 2008, 2009), one can find information about the oribatid mites collected on hay meadows (eight species), pastures (15 species) and ruderal grasslands (22 species) of the Transcarpathian lowlands. Thus, prior to our research, no study on oribatid mites in the meadow habitats of this region (apart from hay meadows, pastures, and ruderals), was carried out. Hushtan (2014, 2018a, b, 2019a) and Hushtan and Hushtan (2019) have conducted investigations on the oribatid populations in some meadow habitats of the Transcarpathian lowlands, but no generalized catalogue has been published.

The purpose of our work was to compose a catalogue of the oribatid mites of the Transcarpathian lowlands, and compare the fauna with those of the other areas of the Pannonian Plain. The material with details of habitats and specific collection locality has not been previously published except for four species, *Oppiella hygrophila*, *Oxyoppia europaea*, *Achipteria* cf. *quadridentata* and *Ceratozetes* cf. *psammophilus* (Hushtan 2018a).

MATERIALS AND METHODS

Investigations of the oribatid mites were conducted in accordance with the generally accepted methodology widely applied in soil zoological studies (Walter and Krantz 2009; Potapov and Kuznetsova 2011). More than 400 samples were processed (in 2009–2011; 2013–2014). Soil samples were collected using soil corer (125 cm^3). The geographic coordinates for the sampling locations were retrieved from Google Maps. The extraction of mites from soil was carried out using Berlese-Tullgren funnel. Permanent slides were made. Identification of the Oribatida was carried out using a microscope (Olympus BX 42) and the keys by Gilyarov (1975), Pavlichenko (1994), Sergienko (1994), Weigmann (2006), and Bayartogtokh (2010). The taxonomical system is followed according to Schatz *et al.* (2011). Literature data were considered when compiling the oribatid mite checklist of the Transcarpathian lowlands (Melamud 2008, 2009). In total, information from 53 localities and 18 biotope types was processed.

Ecological characteristics (hygropreference, biotope groups and other) of the oribatid mites were generalized according to the literature (Mahunka 1987; Weigmann 2006; Ermilov 2008; Melamud 2008, 2009; Bayartogtokh 2010). According to the hygropreference, six biotope complexes (eurybionts, hygrophilous, hygro-mesophilous, mesophilous, meso-xerophilous, xerophilous) of the Oribatida have been identified. Five biotope groups of the oribatids (eurytopic, forest, forest-grassland, grassland, rock) have been identified. Separately, salt-tolerant species have been identified (Mahunka 1987; Weigmann 2006; Ermilov 2008; Melamud 2008, 2009; Bayartogtokh 2010).

Biogeographical characteristics (distribution) of the oribatid mites were generalized according to the literature (Sergienko 1994, Subías 2004, 2020 online update; Weigmann 2006).

The comparison of the oribatid mites' fauna of the Transcarpathian lowland with other adjacent territories of the Pannonian Plain (the territories of Slovakia, Hungary, and Romania) was based on literature data (see Discussion). The species composition was compared with the territories of entire countries. The Jaccard index was used to determine the faunal similarity (Potapov and Kuznetsova 2011). For the adequacy of the results of the degree of comparison, the Transcarpathian lowland

was compared not with the territories of whole states but with their parts (Upper Tisza region of Hungary and Eastern Slovak Lowland) adjacent to it. These areas are similar in size. The number of detected species of oribatids in the compared areas is approximately the same (Mahunka and Mahunka-Papp 2004, 2007; Luptacik and Miklisova 2005; Stary 2006, 2008a, b; Miko 2011, 2016a, b, c; Krumpalova *et al.* 2020).

Description of sampling sites

1. Petrophilic habitat. Vicinity of Onokivtsi, Uzhhorod district, Zakarpattia region. N 48.659658°, E 22.347477°.
2. Petrophilic habitat. Vicinity of Vynohradiv, Vynohradiv district, Zakarpattia region. N 48.137485°, N 23.073909°.
3. Dry grassland. Vicinity of Onokivtsi, Uzhhorod district, Zakarpattia region. N 48.659683°, E 22.347397°.
4. Dry grassland. Vicinity of Berehove, Berehove district, Zakarpattia region. N 48.232154°, E 22.648406°
5. Dry grassland. Vicinity of Muzhiievo, Berehove district, Zakarpattia region. N 48.171299°, E 22.729119°.
6. Dry grassland. Vicinity of Onok. Vynohradiv district, Zakarpattia region. N 48.219375°, E 22.978781°.
7. Dry grassland. Vicinity of Okli Hed. Vynohradiv district, Zakarpattia region. N 48.016455°, E 23.067047°.
8. Dry grassland. Vicinity of Vynohradiv, Vynohradiv district, Zakarpattia region. N 48.137600°, E 23.073753°.
9. Mesophilic grassland. Vicinity of Mukachevo, Zakarpattia region. N 48.379776º, E 22.668843º.
10. Mesophilic grassland. Vicinity of Serednie, Uzhhorod district, Zakarpattia region. N 48.532738°, E 22.500079°.
11. Mesophilic grassland. Vicinity of Kalnyk. Mukachevo district, Zakarpattia region. N 48.514511°, E 22.577064°.
12. Mesophilic grassland. Vicinity of Irliava. Mukachevo district, Zakarpattia region. N 48.507369°, E 22.577552° (Collector Kron A.A., identified by Melamud V.V.).
13. Mesophilic grassland. Vicinity of Kinchesh. Uzhhorod district, Zakarpattia region. N 48.574760°, E 22.285766° (Collector Kron A.A., identified by Melamud V.V.).
14. Grass-bean meadow. Uzhhorod district, Zakarpattia region (Melamud 2008).
15. Grass-bean meadow. Mukachevo district, Zakarpattia region (Melamud 2008).
16. Pasture. Vicinity of Kalnyk. Mukachevo district, Zakarpattia region. N 48.514174°, E 22.576195°.
17. Pasture. Vicinity of Kalnyk. Mukachevo district, Zakarpattia region (Melamud 2009).
18. Ruderal grassland. Vicinity of Tarnivtsi. Uzhhorod district, Zakarpattia region. N 48.591497°, E 22.227574°.
19. Ruderal grassland. Vicinity of Tarnivtsi. Uzhhorod district, Zakarpattia region (Melamud 2009).
20. Ruderal grassland. Vicinity of Kalnyk. Mukachevo district, Zakarpattia region (Melamud 2009).
21. Ruderal grassland. Vicinity of Mukachevo, Zakarpattia region (Melamud 2009).
22. Hygrophilic grassland. Vicinity of Velyki Berehy, Berehove district, Zakarpattia region. N 48.222434°, E 22.781095°.
23. Hygrophilic grassland. Vicinity of Kvasovo, Beregove district, Zakarpattia region N 48.204063°, E 22.753935°.

24. Hygrophilic grassland. Vicinity of Fornosh, Mukachevo district, Zakarpattia region. N 48.383853°, E 22.747719°.
25. Hygrophilic grassland. Vicinity of Tysaahtelek, Uzhhorod district, Zakarpattia region. N 48.452541°, E 22.322046°.
26. Floodplain meadow. Vicinity of Mala Dobron', Uzhhorod district, Zakarpattia region N 48.467879°, E 22.341546°.
27. Floodplain meadow. Vicinity of Chop, Uzhhorod district, Zakarpattia region. N 48.454518°, E 22.205337°.
28. Floodplain meadow. Vicinity of Vynohradiv, Vynohradiv district, Zakarpattia region. N 48.149145°, N 23.088671°.
29. Hydromeliorated grassland. Vicinity of Chop, Uzhhorod district, Zakarpattia region. N 48.453431°, E 22.209134°.
30. Hydromeliorated grassland. Vicinity of Mala Dobron', Uzhhorod district, Zakarpattia region. N 48.460253°, E 22.351246°.
31. Vineyard. Vicinity of Berehove, Berehove district, Zakarpattia region (Melamud 2008).
32. Hornbeam-oak forests. Vicinity of Mukachevo, Zakarpattia region. N 48.390456°, E 22.657341° (Melamud 2008, 2009).
33. Hornbeam-oak forest. Vicinity of Uzhhorod. Uzhhorod district, Zakarpattia region (Melamud 2008).
34. Oak forest. Vicinity of Mukachevo, Zakarpattia region. N 48.374723°, E 22.646698° (Melamud 2008, 2009).
35. Oak forest. Vicinity of Vynohradiv, Vynohradiv district, Zakarpattia region (Melamud 2009).
36. Oak forest. Vicinity of Yanoshi. Beregove district, Zakarpattia region (Melamud 2008).
37. Oak forest. Vicinity of Tijglas. Uzhhorod district, Zakarpattia region (Melamud 2008, 2009).
38. Oak forest. Vicinity of Shalanky. Vynohradiv district, Zakarpattia region (Melamud 2008, 2009).
39. Oak forest. Vicinity of Hut. Beregove district, Zakarpattia region (Melamud 2008, 2009).
40. Oak forest. Vicinity of Mala Kopania. Vynohradiv district, Zakarpattia region (Melamud 2008, 2009).
41. Oak forest. Vicinity of Uzhhorod, Zakarpattia region (Melamud 2009)
42. Oak-beech forest. Mukachevo district, Zakarpattia region (Melamud 2008).
43. Litter and moss of mixed forest. Vicinity of Mukachevo, Zakarpattia region (Melamud 2008).
44. Vicinity of Mukachevo, Zakarpattia region (Melamud 2008).
45. Uzhhorod city, Zakarpattia region (Melamud 2009).
46. Hydromeliorated grassland. Vicinity of Velyki Heivtsi, Uzhhorod district, Zakarpattia region. N 48.496089°, E 22.341000°.
47. Ruderal grassland. Vicinity of Rozivka, Uzhhorod district, Zakarpattia region. N 48.575341°, E 22.268527°.
48. Pasture. Vicinity of Kholmok, Uzhhorod district, Zakarpattia region. N 48.558736°, E 22.267664°.
49. Pasture. Vicinity of Irliava, Uzhhorod district, Zakarpattia region. N 48.502657°, E 22.582749°.
50. Grasses (wheat dominates). Vicinity of Strabychovo, Mukachevo district, Zakarpattia region. N 48.388490°, E 22.515594°.
51. Oak-ash forest. Vicinity of Velyka Dobron. Uzhhorod district, Zakarpattia region. N 48.419303°, E 22.446334°.
52. Floodplain meadow, pasture. Vicinity of Demechi, Uzhhorod district, Zakarpattia region. N 48.421954°, E 22.322066°.
53. Alfalfa-clover-cereals field. Vicinity of Chervone, Uzhhorod district, Zakarpattia region. N 48.421082°, E 22.289751°.

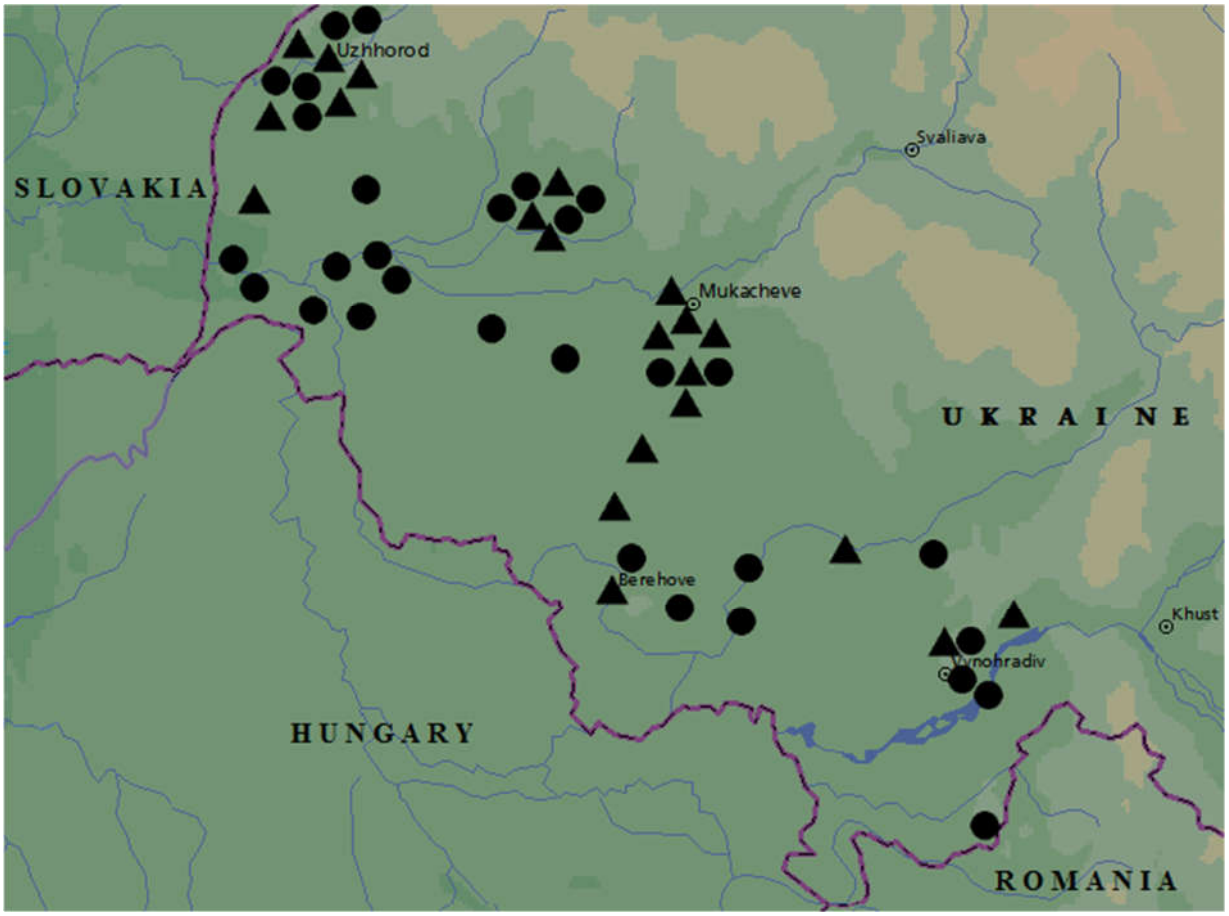

Figure 1. Sampling sites of the Oribatida in the Transcarpathian lowland.
● – collected by the first author, ▲ – literature data (Melamud 2008, 2009).

RESULTUS

At the moment, 174 species belonging to 97 genera and 50 families of the oribatid mites have been recorded in the Transcarpathian lowlands. Two species, *Rhinoppia similifallax* Subías and Mínguez, 1986 and *Galumna bimorpha* Mahunka, 1987 are first recorded from Ukraine, and two other species, *Cosmochthonius tenuisetus* Gordeeva, 1980 and *Ceratozetella maxima* (Berlese, 1908) are found for the first time from the Pannonian Plain.

Family Adelphacaridae Grandjean, 1954

***Adelphacarus* cf. *sellnicki* Grandjean, 1952 –** mesophilic grassland (12).

Distribution – Europe and Neotropical region.
Ecology – Forest species.

Family Brachychthoniidae Thor, 1934

***Brachychthonius bimaculatus* Willmann, 1936 –** mesophilic grassland (13), grass-bean meadow (14).

Distribution – Holartic and Neotropical regions.
Ecology – Forest-grassland species.

***Brachychthonius berlesei* Willmann, 1928 –** hygrophilic grassland (24).

Distribution – Holartic region.
Ecology – Forest species, hygrophilous.

***Liochthonius alpestris* (Forsslund, 1958) –** mesophilic grassland (12, 13), grass-bean meadow (14, 15), pasture (16).

Distribution – Palaearctic region.
Ecology – Forest species.

***Liochthonius muscorum* Forsslund, 1964 –** mesophilic grassland (13), grass-bean meadow (14).

Distribution – Holartic region.
Ecology – Forest-grassland species, hygrophilous.

***Liochthonius hystricinus* (Forsslund, 1942) –** oak forest (36).

Distribution – Holartic and Neotropical regions.
Ecology – Forest species.

***Poecilochthonius italicus* (Berlese, 1910) –** mesophilic grasslands (12, 13), grass-bean meadow (15), floodplain meadow (27).

Distribution – Holartic region.
Ecology – Meso-xerophilous, grassland species.

***Synchthonius crenulatus* (Jacot, 1938) –** mesophilic grassland (12).

Distribution – Holartic region.
Ecology – Forest species, hygrophilous.

***Sellnickochthonius cricoides* (Weis-Fogh, 1948) –** mesophilic grasslands (12, 13), grass-bean meadow (14, 15).

Distribution – Palaearctic region, India and Australia.
Ecology – Forest species.

***Sellnickochthonius rostratus* (Jacot, 1936) –** dry grassland (5).

Distribution – Holartic and Neotropical regions.
Ecology – Forest-grassland species.

***Sellnickochthonius suecicus* (Forsslund, 1942) –** oak-beech forest (42).

Distribution – Semicosmopolitan (Palaearctic, Northern Nearctic regions, Australian region: New Zealand, and Subantarctic: I. Amsterdam).
Ecology – Forest species.

Family Cosmochthoniidae Grandjean, 1947

***Cosmochthonius tenuisetus* Gordeeva, 1980 sensu Sergienko, 1994 –** pasture (16). First record for the Pannonian Plain.

Distribution – Crimea (Ukraine) (Sergienko 1994), Transcarpathian region (Ukraine).
Ecology – Pasture grasslands (ecology requires further research).

Family Hypochthoniidae Berlese, 1910

***Hypochthonius rufulus* Koch, 1835 –** mesophilic grasslands (9, 13), hygrophilic grasslands (23, 24), grasses (50), oak forest (34).

Distribution – Semicosmopolitan: Holartic, Oriental regions, I. Seychelles and Mexico (Subías 2004, 2020 update).
Ecology – Forest-grassland species, hygrophilous.

***Hypochthonius luteus* Oudemans, 1917 –** mesophilic grassland (12), hornbeam-oak forests (32).

Distribution – Holartic, Oriental regions and New Zealand.
Ecology – Forest-grassland species, xerophilous.

Family Phthiracaridae Perty, 1841

***Phthiracarus italicus* (Oudemans, 1900) –** hygrophilic grassland (22).

Distribution – Europe.
Ecology – Forest-grassland species, hygrophilous.

***Phthiracarus lentulus* (Koch, 1841) –** oak forest (36).

Distribution – Holartic, Ethiopian regions and Southeast China.
Ecology – Forest species.

***Phthiracarus longulus* (Koch, 1841) –** oak forest (37).

Distribution – Holartic region and Uruguay.
Ecology – Forest species.

***Phthiracarus ligneus* Willmann, 1931 –** oak forest (34).

Distribution – Holartic region.
Ecology – Forest species (Mahunka & Mahunka-Papp 2004).

***Phthiracarus setosellum bryobius* Jacot, 1930 –** litter and moss of mixed forest (43, 44).

Distribution – Holartic and Neotropical regions, I. Santa Helena, Nepal (Costa Rica and Bolivia).
Ecology – Hygrophilous.

***Atropacarus striculus* (Koch, 1835) –** vineyard (31), hornbeam-oak forests (32).

Distribution – Semicosmopolitan (Holartic, Oriental, Northern Neotropical, Australian regions and Madagascar).
Ecology – Forest-grassland species, hygrophilous.

***Steganacarus spinosus* (Sellnick, 1920) –** hygrophilic grasslands (22, 24).

Distribution – Palaearctic region, India.
Ecology – Forest species, hygrophilous.

***Steganacarus carinatus* (Koch, 1841) –** mesophilic grassland (9), hygrophilic grassland (24), hornbeam-oak forests (32).

Distribution – Palaearctic region and Mexico.
Ecology – Forest species.

Family Euphthiracaridae Jacot, 1930

***Rhysotritia ardua affinis* Sergienko, 1989 –** petrophilic habitat (2), dry grasslands (5, 7, 8), mesophilic grasslands (9, 10, 13), grass-bean meadow (14), pasture (48), ruderal grassland (18), hygrophilic grasslands (22, 23, 24), floodplain meadows (26, 27), hydromeliorated grassland (29), alfalfa-clover-cereals field (53), oak forest (34).

Distribution – Palaearctic region (Sergienko 1994).
Ecology – Eurytopic species, eurybiont.

***Euphthiracarus cribrarius* (Berlese, 1904) –** oak forest (34).

Distribution – Holartic region.
Ecology – Forest species.

Family Trhypochthoniidae Willmann, 1931

***Trhypochthonius tectorum* (Berlese, 1896) –** dry grassland (7), mesophilic grassland (12), hygrophilic grassland (23).

Distribution – Semicosmopolitan: Holartic, Oriental, Ethiopian and Neotropical regions.
Ecology – Grassland species, xerophilous.

Family Nothridae Berlese, 1896

***Nothrus palustris* Koch, 1839 –** hygrophilic grassland (24), oak forest (34).

Distribution – Holartic, Oriental regions and I. St. Helena.
Ecology – Forest species, hygro-mesophilous.

***Nothrus borussicus* Sellnick, 1928 –** hygrophilic grassland (24).

Distribution – Holartic and Northern Neotropical region.
Ecology – Forest-grassland species.

***Nothrus silvestris* Nicolet, 1855 –** hygrophilic grassland (24), hornbeam-oak forests (32).
Distribution – Holartic region, Nepal, New Zealand and Mexico.
Ecology – Forest species, meso-xerophilous.

Family Crotoniidae Thorell, 1876

***Camisia segnis* (Hermann, 1804) –** oak-beech forest (42).

Distribution – Semicosmopolitan (Holartic, Oriental, Neotropical and Antarctic).
Ecology – Arboricolous (Forest species).

***Platynothrus peltifer* (Koch, 1839) –** mesophilic grassland (9), hygrophilic grassland (24), floodplain meadows (26, 27), oak-ash forest (51).

Distribution – Semicosmopolitan (Holartic, Oriental, Australian: New Zealand, North Neotropical and I. Saint Helena).
Ecology – Eurytopic, eurybiont, salt-tolerant.

***Platynothrus humicola* (Forsslund, 1955) –** oak forest (34).

Distribution – Boreoalpine and Iran.
Ecology – Forest-grassland species, hygrophilous (Bayartogtokh 2010).

Family Nanhermanniidae Sellnick, 1928

***Nanhermannia nana* (Nicolet, 1855) –** hygrophilic grassland (24), oak forest (34).

Distribution – Semicosmopolitan (Holartic, Neotropical, Oriental, New Zealand, I. Saint Helena and Antarctica).
Ecology – Forest-grassland species, hygrophilous.

***Nanhermannia elegantula* Berlese, 1913 –** hornbeam-oak forests (32).

Distribution – Holartic regions and I. Santa Helena.
Ecology – Forest-grassland species.

Family Hermanniellidae Grandjean, 1934

***Hermanniella dolosa* Grandjean, 1931 –** oak-beech forest (42).

Distribution – Palaearctic region.
Ecology – Forest species, hygrophilous.

***Hermanniella granulata* (Nicolet, 1855) –** oak-beech forest (42).

Distribution – Holartic and Oriental regions.
Ecology – Forest species.

Family Neoliodidae Sellnick, 1928

***Poroliodes farinosus* (C.L. Koch, 1840) –** oak forest (34).

Distribution – Palaearctic region and Nepal.
Ecology – Forest species.

Family Gymnodamaeidae Grandjean, 1954

***Arthrodamaeus femoratus* (Koch, 1840) –** petrophilic habitat (2), dry grasslands (4, 7).

Distribution – Palaearctic region.
Ecology – Rock species, xerophilous.

Family Licnodamaeidae Grandjean, 1954

***Licnodamaeus pulcherrimus* (Paoli, 1908) –** dry grassland (5).

Distribution – Palaearctic region and Mexico.
Ecology – Xerophilous.

Family Damaeidae Berlese, 1896

***Spatiodamaeus boreus* Bulanova-Zachvatkina, 1957 –** hygrophilic grassland (23).

Distribution – Western Palaearctic.
Ecology – Unclear, mostly in forest litter.

***Damaeus* cf. *gracilipes* (Kulczynski, 1902) –** hygrophilic grassland (24).

Distribution – Holartic region.
Ecology – Forest-grassland species.

***Damaeus riparius* Nicolet, 1855 –** oak forest (34).

Distribution – Palaearctic region.
Ecology – Forest species.

***Adamaeus onustus* (Koch, 1844) –** oak forest (38).

Distribution – Western Palaearctic and Ethiopian.
Ecology – Forest-grassland species.

***Epidamaeus kamaensis* (Sellnick, 1926) –** floodplain meadow (27).

Distribution – Palaearctic region.

Ecology – Grassland species.

***Belba patelloides* (Michael, 1890) –** hygrophilic grassland (24).

Distribution – Western Palaearctic.
Ecology – Forest species (Ermilov 2008).

***Belba corynopus* (Hermann, 1804) –** hygrophilic grasslands (22, 24), oak forest (34).

Distribution – Holartic and Oriental regions.
Ecology – Forest species, hygrophilous.

***Metabelba papillipes* (Nicolet, 1855) –** dry grassland (4), mesophilic grasslands (9, 11, 13), grass-bean meadow (14), hygrophilic grassland (24), floodplain meadow (26), hydromeliorated grassland (29).

Distribution – Holartic region.
Ecology – Forest-grassland species (Melamud 2008), eurybionts.

***Metabelba pulverulenta* (Koch, 1839) –** dry grassland (6), mesophilic grassland (9), hornbeam-oak forests (32).

Distribution – Holartic region.
Ecology – Forest-grassland species.

***Belbodamaeus tuberculatus* Bulanova-Zachvatkina, 1960 –** oak forest (34).

Distribution – Holartic and Oriental regions.
Ecology – Forest species (Mahunka & Mahunka-Papp 2004).

***Metabelbella soror* Bulanova-Zachvatkina, 1965 –** oak- hornbeam forest (33).

Distribution – Central Eastern Europe.**Ecology –** Forest species (Melamud 2008).

Family Eremobelbidae Balogh, 1961

***Eremobelba geographica* Berlese, 1908 –** hygrophilic grasslands (22, 24, 25), oak-hornbeam forest (33).

Distribution – Southern Palaearctic.
Ecology – Forest-grassland species, hygrophilous.

Family Cepheidae Berlese, 1896

***Cepheus cepheiformis* (Nicolet, 1855) –** oak forest (34).

Distribution – Holartic and Southeast China.
Ecology – Forest species.

Family Ameridae Bulanova-Zachvatkina, 1957

***Amerus troisi* (Berlese, 1883) –** oak forest (38).

Distribution – Mediterranean.
Ecology – Forest species (Melamud 2008).

Family Ctenobelbidae Grandjean, 1965

***Ctenobelba pilosella* Jeleva, 1962 –** mesophilic grassland (13), floodplain meadow (27).

Distribution – Mediterranean.
Ecology – Forest species (Melamud 2008).

***Ctenobelba pectinigera* (Berlese, 1908) –** floodplain meadow (27), oak forest (34).

Distribution – South-central Europe.
Ecology – Forest-grassland species, meso-xerophilous.

Family Eremaeidae Oudemans, 1900

***Eremaeus hepaticus* Koch, 1835 –** hornbeam-oak forests (32).

Distribution – Holartic region.
Ecology – Forest species.

***Eueremaeus oblongus* (Koch, 1836) –** oak forest (34).

Distribution – Holartic region and Southeast China.
Ecology – Forest species.

Family Zetorchestidae Michael, 1898

***Zetorchestes micronychus* (Berlese, 1883) –** hornbeam-oak forests (32).

Distribution – Palaearctic region.
Ecology – Forest species.

***Microzetorchestes emeryi* (Coggi, 1898) –** dry grassland (6).

Distribution – South Central Palaearctic.
Ecology – Forest-grassland species, xerophilous, also in caves.

Family Gustaviidae Oudemans, 1900

***Gustavia microcephala* (Nicolet, 1855) –** hygrophilic grassland (24), floodplain meadow (27), hydromeliorated grassland (29).

Distribution – Palaearctic, Oriental regions and Mexico.
Ecology – Eurytopic species, eurybiont.

Family Astegistidae Balogh, 1961

***Astegistes pilosus* (Koch, 1841) –** hygrophilic grassland (25).

Distribution – Palaearctic region.
Ecology – Grassland species, hygrophilous.

***Cultroribula bicultrata* (Berlese, 1905) –** dry grasslands (3, 4, 5, 6), hygrophilic grassland (24), oak forest (34).

Distribution – Holartic region and Java.
Ecology – Forest species.

Family Liacaridae Sellnick, 1928

***Liacarus* cf. *brevilamellatus* Mihelcic, 1955 –** mesophilic grassland (12).

Distribution – Southern Palaearctic (Mediterranean and Iran).
Ecology – Forest-grassland species (Ermilov 2008, Melamud 2008).

***Liacarus coracinus* (Koch, 1840) –** dry grasslands (4, 6), mesophilic grasslands (9, 10, 11, 12, 13), pasture (16), floodplain meadow (27), hydromeliorated grassland (29).

Distribution – Palaearctic and Ethiopian regions.
Ecology – Forest-grassland species.

***Dorycranosus punctulatus* Mihelcic, 1956 –** dry grassland (5).

Distribution – Palaearctic region.
Ecology – Forest-grassland species, xerophilous (Bayartogtokh 2010, Ermilov 2008)

***Xenillus* cf. *tegeocranus* (Hermann, 1804) –** hygrophilic grassland (24), oak forest (34).

Distribution – Palaearctic and Oriental regions.
Ecology – Forest-grassland species.

***Xenillus clypeator* Robineau-Desvoidy, 1839 –** oak forest (34).

Distribution – Holartic region and Mexico.
Ecology – Forest species.

Family Peloppiidae Balogh, 1943

***Ceratoppia quadridentata* (Haller, 1882) –** hygrophilic grassland (24), hornbeam-oak forests (32).

Distribution – Holartic region and Southeast China.
Ecology – Forest-grassland species, hygrophilous.

***Ceratoppia bipilis* (Hermann, 1804) –** oak forest (34).

Distribution – Holartic, Oriental regions and Northern Neotropical.
Ecology – Forest species.

***Metrioppia helvetica* Grandjean, 1931 –** oak forest (39).

Distribution – Holartic region.
Ecology – Forest-grassland species (Melamud 2008).

Family Carabodidae Koch, 1843

***Carabodes areolatus* Berlese, 1916 –** hygrophilic grassland (24), hornbeam-oak forests (32).

Distribution – Holartic region.
Ecology – Forest species, xerophilous.

***Carabodes rugosior* Berlese, 1916 –** hygrophilic grassland (24).

Distribution – Holartic region.
Ecology – Forest species.

***Carabodes coriaceus* Koch, 1835 –** oak forest (41).

Distribution – Holartic region.
Ecology – Forest species, mesophilous.

***Carabodes labyrinthicus* (Michael, 1879) –** oak forest (34).

Distribution – Holartic region and Mexico.
Ecology – Forest species, eurybionts.

Family Tectocepheidae Grandjean, 1954

***Tectocepheus minor* Berlese, 1903 –** dry grassland (3), floodplain meadow (27), hydromeliorated grassland (29).

Distribution – Semicosmopolitan: Holartic, Oriental, Neotropical, New Zealand, and Ethiopia.
Ecology – Forest species, hygrophilous.

***Tectocepheus velatus* (Michael, 1880) –** dry grasslands (3, 4, 5, 7), mesophilic grasslands (9, 10, 11, 12, 13), pasture (16, 48, 49), hygrophilic grasslands (22, 23, 24), floodplain meadow (27, 28), hydromeliorated grassland (29, 46), grasses (50), alfalfa-clover-cereals field (53).

Distribution – Cosmopolitan.
Ecology – Eurytopic species, eurybiont.

***Tectocepheus alatus* Berlese, 1913 –** petrophilic habitat (2).

Distribution – Palaearctic region.

Ecology – Grassland species, xerophilous (Bayartogtokh 2010).

Family Otocepheidae Balogh, 1961

***Dolicheremaeus georgii* Bulanova-Zachvatkina, 1967 –** 44.

Distribution – Transcarpathian region (Ukraine) (Melamud 2008).
Ecology – Unknown.

Family Quadroppiidae Balogh, 1983

***Quadroppia quadricarinata* (Michael, 1885) –** hornbeam-oak forests (32).

Distribution – Semicosmopolitan: Holartic, Southeastern China and Ethiopian.
Ecology – Forest species, eurybionts.

Family Oppiidae Grandjean, 1951

***Dissorhina ornata* (Oudemans, 1900) –** dry grasslands (6, 8), hygrophilic grassland (24).

Distribution – Holartic region and East Africa.
Ecology – Eurytopic species, eurybiont.

***Berniniella bicarinata* (Paoli, 1908) –** petrophilic habitat (2), dry grasslands (4, 5, 8), mesophilic grassland (13), hygrophilic grassland (24), floodplain meadow (27), hydromeliorated grassland (29).

Distribution – Palaearctic region, Madagascar and Vietnam.
Ecology – Eurytopic species, eurybiont.

***Berniniella* cf. *minuta* (Bulanova-Zachvatkina, 1964) –** mesophilic grassland (13), ruderal grassland (20).

Distribution – Palaearctic region.
Ecology – Forest-grassland species (Ermilov 2008; Melamud 2009).

***Berniniella inornata* (Mihelcic, 1957) –** floodplain meadow (27).

Distribution – Mediterranean.
Ecology – unknown, possibly floodplain-meadow species.

***Microppia minus* (Paoli, 1908) –** dry grasslands (4, 5), mesophilic grasslands (9, 12, 13), pasture (17), ruderal grasslands (19, 20), hygrophilic grassland (25), floodplain meadow (27), hydromeliorated grassland (29).

Distribution – Cosmopolitan.
Ecology – Eurybiont.

***Oppiella nova* (Oudemans, 1902) –** dry grasslands (6, 7), mesophilic grasslands (9, 10, 11, 12, 13), pasture (17, 48), ruderal grasslands (19, 20), hygrophilic grasslands (22, 23, 24, 25), floodplain

meadow (26, 27, 28), hydromeliorated grasslands (29, 30), grasses (50), alfalfa-clover-cereals field (53), hornbeam-oak forests (32), oak-ash forest (51).

Distribution – Cosmopolitan.
Ecology – Eurytopic species, eurybiont.

***Oppiella* cf. *maritima* (Willmann, 1929) –** dry grassland (4), mesophilic grassland (13).

Distribution – Holartic region.
Ecology – Forest species.

***Moritzoppia neerlandica* (Oudemans, 1900) –** hornbeam-oak forests (32).

Distribution – Holartic region.
Ecology – Eurytopic species, hygrophilous.

***Rhinoppia similifallax* Subías & Mínguez, 1986 –** grasses (50). The first find for Ukraine.

Distribution – South Central Europe.
Ecology – Eurytopic species, eurybiont.

***Rhinoppia* cf. *loksai* (Schalk, 1966) –** dry grassland (3), hygrophilic grassland (24).

Distribution – Southeastern Europe.
Ecology – Forest species (Weigmann, 2006), eurybiont.

***Rhinoppia subpectinata* (Oudemans, 1900) –** dry grassland (3), mesophilic grasslands (10, 11, 12, 13), pasture (17), ruderal grasslands (19, 20), hygrophilic grassland (23, 24), urban landscape (45), grasses (50), oak-ash forest (51).

Distribution – Holartic region and Senegal.
Ecology – Eurytopic species, eurybiont.

***Rhinoppia hygrophila* (Mahunka, 1987) –** hygrophilic grasslands (22, 25).

Distribution – European.
Ecology – Grassland species, hygrophilous.

***Rhinoppia obsoleta* (Paoli, 1908) –** mesophilic grassland (13), hornbeam-oak forests (32).

Distribution – Palaearctic region, Greenland and Australian.
Ecology – Eurytopic species, hygro-mesophilous.

***Oppia nitens* (Koch, 1835) –** hygrophilic grassland (24), floodplain meadow (27), hornbeam-oak forests (32).

Distribution – Holartic and Antarctic region.
Ecology – Eurytopic species, myrmecophil.

***Graptoppia foveolata* (Paoli, 1908) –** mesophilic grassland (13), floodplain meadow (27), hydromeliorated grasslands (29, 30).

Distribution – Holartic region.
Ecology – Grassland species, hygrophilous (Ermilov 2008).

***Oxyoppia europaea* Mahunka, 1982 –** floodplain meadows (26, 27), hydromeliorated grasslands (29, 30).

Distribution – South Central Europe.
Ecology – Grassland species, hygrophilous.

***Multioppia glabra* (Mihelcic, 1955) –** dry grasslands (4, 8), mesophilic grasslands (9, 11), urban landscape (45), grasses (50), oak-ash forest (51).

Distribution – Palaearctic region.
Ecology – Forest-grassland species, hygrophilous.

***Ramusella clavipectinata* (Michael, 1885) –** dry grasslands (4, 8), mesophilic grasslands (12, 13).

Distribution – Semicosmopolitan.
Ecology – Eurytopic species (Mahunka & Mahunka-Papp 2004).

***Ramusella* cf. *furcata* (Willmann, 1928) –** dry grassland (4), mesophilic grasslands (11, 12), ruderal grassland (19), hygrophilic grassland (23), floodplain meadow (28), oak forest (38).

Distribution – European.
Ecology – Forest species, hygrophilous.

***Ramusella* cf. *insculpta* (Paoli, 1908) –** hydromeliorated grassland (29), grasses (50).

Distribution – Palaearctic region and Vietnam.
Ecology – Forest-grassland species, xerophilous.

***Ramusella elliptica* (Berlese, 1908) –** petrophilic habitat (2), dry grasslands (4, 5).

Distribution – Tropical and subtropical: Palaearctic (Mediterranean: frequent, and Iran), U.S.A. (New Mexico), Neotropical (Costa Rica) and Oriental (Vietnam).
Ecology – Xerophilous.

Family Suctobelbidae Jacot, 1938

***Suctobelba trigona* (Michael, 1888) –** hornbeam-oak forests (32).

Distribution – Holartic region.
Ecology – Forest species.

***Suctobelbella arcana* Moritz, 1970 –** mesophilic grassland (13), ruderal grassland (19).

Distribution – Holartic region.
Ecology – Forest species.

***Suctobelbella alloenasuta* Moritz, 1971 –** mesophilic grassland (10), hygrophilic grasslands (22, 24).

Distribution – Holartic region.
Ecology – Forest species (Weigmann 2006), hygro-mesophilous.

***Suctobelbella* cf. *acutidens* (Forsslund, 1941) –** dry grassland (5), hygrophilic grasslands (22, 23), hornbeam-oak forests (32).

Distribution – Holartic region and Argentina.
Ecology – Eurytopic species (Weigmann 2006), eurybionts.

***Suctobelbella latirostris* (Strenzke, 1950) –** mesophilic grassland (13), ruderal grassland (19).

Distribution – Palaearctic region and Vietnam.
Ecology – Forest-grassland species (Melamud 2009), mesophilous.

***Suctobelbella* cf. *longirostris* (Forsslund, 1941) –** mesophilic grassland (13), ruderal grassland (19).

Distribution – Holartic region.
Ecology – Forest-grassland species (Weigmann 2006), hygro-mesophilous.

***Suctobelbella palustris* (Forsslund, 1953) –** mesophilic grassland (13), ruderal grassland (19), hygrophilic grassland (22).

Distribution – Holartic region.
Ecology – Grassland species, hygrophilous.

***Suctobelbella subcornigera* (Forsslund, 1941) –** petrophilic habitat (2), dry grassland (6), mesophilic grassland (13), ruderal grassland (19).

Distribution – Semicosmopolitan: Holartic, Oriental regions and New Zealand.
Ecology – Eurytopic species (Weigmann 2006) xerophilous.

***Suctobelbella subtrigona* (Oudemans, 1900) –** hygrophilic grassland (22), oak forests (37, 40).

Distribution – Holartic region, Mexico and Vietnam.
Ecology – Eurybionts.

***Suctobelbella forsslundi* (Strenzke, 1950) –** hornbeam-oak forests (32).

Distribution – Palaearctic region.
Ecology – Forest-grassland species, hygro-mesophilous.

***Suctobelbella perforata* (Strenzke, 1950) –** hornbeam-oak forests (32).

Distribution – Palaearctic region.
Ecology – Forest species, hygrophilous.

***Suctobelbella tuberculata* (Strenzke, 1950) –** mesophilic grasslands (12, 13).

Distribution – Palaearctic region.
Ecology – Forest species, hygrophilous.

Family Autognetidae Grandjean, 1960

***Conchogneta dalecarlica* (Forsslund, 1947) –** dry grassland (4), hygrophilic grassland (24).

Distribution – Palaearctic region.
Ecology – Forest species (Mahunka & Mahunka-Papp 2004).

Family Thyrisomidae Grandjean, 1953

***Pantelozetes paolii* (Oudemans, 1913) –** hygrophilic grassland (23).

Distribution – Holartic region and Java.
Ecology – Forest-grassland species, hygrophilous.

***Pantelozetes* cf. *alpestris* (Willmann, 1929) –** hygrophilic grassland (22).

Distribution – Holartic region.
Ecology – Forest species (Bayartogtokh 2010).

Family Micreremidae Grandjean, 1954

***Micreremus brevipes* (Michael, 1888) –** dry grassland (5).

Distribution – Palaearctic region.
Ecology – Forest species, xerophilous (Ermilov 2008).

Family Passalozetidae Grandjean, 1954

***Passalozetes perforatus* (Berlese, 1910) –** petrophilic habitat (2), dry grassland (5, 8).

Distribution – Southern Central Palaearctic.
Ecology – Grassland species, xerophilous (Weigmann 2006, Bayartogtokh 2010).

Family Scutoverticidae Grandjean, 1954

***Scutovertex sculptus* Michael, 1879 –** petrophilic habitats (1, 2), dry grasslands (4, 5, 7, 8), mesophilic grasslands (9, 10, 12, 13), floodplain meadow (28).

Distribution – Palaearctic region and New Zealand.
Ecology – Grassland species, xerophilous, salt-tolerant.

***Scutovertex minutus* (Koch, 1835) –** floodplain meadow (26).

Distribution – Holartic region.
Ecology – Grassland species, eurybiont, salt-tolerant.

***Scutovertex serratus* Sitnikova, 1975 –** mesophilic grasslands (12, 13), pasture (17, 48), ruderal grasslands (19, 20).

Distribution – Palaearctic region.
Ecology – Grassland species (Melamud 2009).

Family Phenopelopidae Petrunkevitch, 1955

***Eupelops occultus* (Koch, 1835) –** dry grassland (4), mesophilic grasslands (9, 11), hygrophilic grassland (23), hydromeliorated grassland (29).

Distribution – Palaearctic region.
Ecology – Grassland species, hygrophilous.

***Eupelops plicatus* (Koch, 1835) –** hygrophilic grassland (23), oak forest (34).

Distribution – Holartic region.
Ecology – Forest species.

***Eupelops acromios* (Hermann, 1804) –** oak forest (35), hornbeam-oak forests (32).

Distribution – Semicosmopolitan: Palaearctic, Oriental, Ethiopian and Neotropical.
Ecology – Forest species, xerophilous.

***Peloptulus phaenotus* (Koch, 1844) –** dry grasslands (3, 4, 5, 6, 7), mesophilic grasslands (11, 12, 13), pastures (16, 17, 48), ruderal grasslands (19, 20), hygrophilic grassland (22, 23), floodplain meadow (27), hydromeliorated grassland (29, 30, 52), alfalfa-clover-cereals field (53).

Distribution – Palaearctic region.
Ecology – Forest-grassland species, hygrophilous, salt-tolerant.

Family Achipteriidae Thor, 1929

***Achipteria nitens* (Nicolet, 1855) –** mesophilic grassland (11), pasture (16), hygrophilic grassland (24), floodplain meadows (26, 27), hydromeliorated grassland (29), hornbeam-oak forests (32).

Distribution – Holartic region.
Ecology – Forest species (Mahunka & Mahunka-Papp 2004), hygro-mesophilous.

***Achipteria coleoptrata* (Linnaeus, 1758) –** mesophilic grasslands (9, 11, 12, 13), ruderal grassland (21), hygrophilic grassland (22, 24), floodplain meadow (26, 27), hydromeliorated grassland (29), hornbeam-oak forests (32).

Distribution – Holartic, Oriental regions and I. Saint Helena.
Ecology – Forest-grassland species, hygrophilous.

***Achipteria italica* (Oudemans, 1914) –** hygrophilic grassland (24).

Distribution – European.
Ecology – Forest-grassland species (Ermilov 2008, Melamud 2009).

***Achipteria* cf. *quadridentata* (Willmann, 1951) –** mesophilic grassland (9), hygrophilic grassland (23), hydromeliorated grassland (29).

Distribution – Central Western Europe.
Ecology – Forest-grassland species, hygrophilous.

***Parachipteria punctata* (Nicolet, 1855) –** dry grassland (3), hornbeam-oak forests (32).

Distribution – Holartic region and I. Santa Helena.
Ecology – Forest-grassland species, hygrophilous.

Family Tegoribatidae Grandjean, 1954

***Tectoribates ornatus* (Schuster, 1958) –** dry grassland (7), mesophilic grasslands (9, 11), pasture (16), floodplain meadow (26).

Distribution – Palaearctic and Neotropical regions (Argentina and Uruguay).
Ecology – Grassland species, xerophilous, salt-tolerant.

***Tegoribates latirostris* (Koch, 1844) –** hydromeliorated grassland (29).

Distribution – Palaearctic region.
Ecology – Grassland species, hygrophilous.

Family Galumnidae Jacot, 1925

***Pergalumna* cf. *nervosa* (Berlese, 1914) –** hygrophilic grassland (24).

Distribution – Holartic region and South Africa.
Ecology – Forest species, hygrophilous.

***Pergalumna altera* (Oudemans, 1915) –** petrophilic habitat (2), dry grassland (6).

Distribution – Semicmopolitan: Holartic, Ethiopian, Oriental and Micronesia.
Ecology – Xerophilous (Mahunka & Mahunka-Papp 2004).

***Galumna obvia* (Berlese, 1915) –** dry grasslands (6, 7), mesophilic grasslands (10, 11, 12, 13), pasture (16), ruderal grassland (20), hygrophilic grassland (24), floodplain meadow (26), hydromeliorated grassland (29), alfalfa-clover-cereals field (53), oak forest (35).

Distribution – Semicmopolitan.
Ecology – Grassland species (Weigmann 2006), eurybiont.

***Galumna lanceata* (Oudemans, 1900) –** dry grasslands (4, 5, 6), oak forests (36, 40, 41).

Distribution – Palaearctic region and Vietnam.
Ecology – Forest species, eurybionts.

***Galumna* cf. *alata* (Hermann, 1804) –** dry grasslands (5, 6, 7, 8), oak forest (41).

Distribution – Semicosmopolitan.
Ecology – Forest-grassland species (Weigmann 2006), eurybionts.

***Galumna bimorpha* Mahunka, 1987 –** petrophilic habitat (1). The first find for Ukraine.

Distribution – Hungary (Subías 2004, 2020 update), Transcarpathian region (Ukraine).
Ecology – Grassland species (Mahunka 1987).

Family Parakalummidae Grandjean, 1936

***Neoribates aurantiacus* (Oudemans, 1914) –** oak forest (41).

Distribution – Holartic and Oriental regions.
Ecology – Forest-grassland species.

Family Ceratozetidae Jacot, 1925

***Ceratozetes minutissimus* Willmann, 1951 –** dry grassland (5), mesophilic grasslands (9, 11, 12, 13), ruderal grassland (18), hygrophilic grasslands (23, 24), floodplain meadow (27), hydromeliorated grassland (29).

Distribution – Southern Central Palaearctic.
Ecology – Forest-grassland species (Bayartogtokh 2010).

***Ceratozetes mediocris* Berlese, 1908 –** dry grasslands (4, 6, 7), mesophilic grasslands (9, 11, 12), pasture (17), ruderal grasslands (18, 19, 20), hygrophilic grasslands (23, 24), floodplain meadow (27), hydromeliorated grassland (29).

Distribution – Semicosmopolitan.
Ecology – Grassland species, hygrophilous.

***Ceratozetes* cf. *psammophilus* Horak, 2000 –** Mesophilic grassland (9).

Distribution – European.
Ecology – Forest-grassland species (Weigmann, 2006), mesophilous.

***Ceratozetes gracilis* (Michael, 1884) –** hornbeam-oak forests (32).

Distribution – Cosmopolitan.
Ecology – Forest-grassland species, hygrophilous.

***Ceratozetes macromediocris* Shaldybina, 1970 –** oak forests (40, 41).

Distribution – Eastern Europe and Iran.
Ecology – Forest-grassland species (Ermilov 2008, Melamud 2009).

***Ceratozetella maxima* (Berlese, 1908) –** hygrophilic grassland (23), floodplain meadow (27). The first recorded for the Pannonian Plain.

Distribution – Western Palaearctic, Cuba and Vietnam.
Ecology – Grassland species (ecology needs specification).

***Trichoribates incisellus* (Kramer, 1897) –** mesophilic grassland (10), floodplain meadow (27).

Distribution – Holartic region.
Ecology – Forest-grassland species, hygrophilous, salt-tolerant.

Family Zetomimidae Shaldybina, 1966

***Heterozetes palustris* Willmann, 1918 –** hygrophilic grassland (23).

Distribution – Palaearctic region.
Ecology – Forest species, hygrophilous.

***Zetomimus furcatus* (Warburton & Pearce, 1905) –** hygrophilic grasslands (23, 25).

Distribution – Euro-Siberian Region (Mahunka & Mahunka-Papp 2004).
Ecology – Forest species, hygrophilous.

Family Euzetidae Grandjean, 1954

***Euzetes globulus* (Nicolet, 1855) –** hygrophilic grassland (24).

Distribution – Palaearctic and Neotropical regions.
Ecology – Forest-grassland species, hygrophilous.

Family Chamobatidae Thor, 1937

***Chamobates subglobulus* (Oudemans, 1900) –** hygrophilic grassland (24), floodplain meadow (27), oak forests (35, 41), hornbeam-oak forests (32).

Distribution – Palaearctic region.
Ecology – Forest-grassland species, hygro-mesophilous.

***Chamobates cuspidatus* (Michael, 1884) –** oak forests (34, 37).

Distribution – Holartic region and I. Seychelles.
Ecology: Forest species.

***Chamobates voigtsi* (Oudemans, 1902) –** hornbeam-oak forests (32).

Distribution – Palaearctic region.
Ecology – Forest species.

***Chamobates pusillus* (Berlese, 1895) –** floodplain meadow (27).

Distribution – Palaearctic region.
Ecology – Forest species.

Family Mycobatidae Grandjean, 1954

***Punctoribates hexagonus* Berlese, 1908 –** mesophilic grasslands (10, 12, 13), pasture (17, 48), ruderal grasslands (19, 20), floodplain meadow (27), hydromeliorated grassland (29).

Distribution – Holartic region, Vietnam and Zambia.
Ecology – Grassland species, salt-tolerant.

***Punctoribates punctum* (Koch, 1839) –** petrophilic habitats (1, 2), dry grasslands (3, 4, 6, 7), mesophilic grasslands (9, 10, 11, 12, 13), pastures (16, 17), ruderal grasslands (18, 19, 20), hygrophilic grasslands (22, 24, 25), floodplain meadow (26), hydromeliorated grassland (29, 52), alfalfa-clover-cereals field (53).

Distribution – Semicosmopolitan.
Ecology – Forest-grassland species, mesophilous.

***Semipunctoribates zachvatkini* Shaldybina, 1969 –** dry grasslands (4, 6), mesophilic grasslands (12, 13), pasture (17), ruderal grasslands (19, 20), hydromeliorated grassland (29), oak forests (36, 41).

Distribution – Southern Palaearctic (Mediterranean and Mongolia).
Ecology – Eurytopic species (Ermilov 2008, Melamud 2009).

***Minunthozetes semirufus* (Koch, 1841) –** mesophilic grasslands (10, 11), hygrophilic grassland (24), hornbeam-oak forests (32).

Distribution – Holartic region.
Ecology – Forest-grassland species, hygro-mesophilous.

***Minunthozetes pseudofusiger* (Schweizer, 1922) –** hornbeam-oak forests (32).

Distribution – Palaearctic region.
Ecology – Forest species, hygro-mesophilous.

Family Mochlozetidae Grandjean, 1960

***Podoribates longipes* (Berlese, 1887) –** dry grassland (7), mesophilic grassland (9), floodplain meadow (27).

Distribution – Holartic region.
Ecology – Grassland species, salt-tolerant (Weigmann 2006), eurybionts.

Family Haplozetidae Grandjean, 1936

***Haplozetes vindobonensis* (Willmann, 1935) –** oak forest (35).

Distribution – Palaearctic region, Ethiopian, Mexico and Vietnam.

Ecology – Forest-grassland species, xerophilous.

***Peloribates europaeus* Willmann, 1935 –** dry grassland (3).

Distribution – Holartic region and Mexico.
Ecology – Grassland species, xerophilous, also found in caves.

***Protoribates capucinus* Berlese, 1908 –** mesophilic grassland (13), ruderal grassland (19), hydromeliorated grassland (29), hornbeam-oak forests (32), oak forest (39).

Distribution – Cosmopolitan (except Antarctica).
Ecology – Forest-grassland species (Weigmann 2006), mesophilous.

***Protoribates lophotrichus* (Berlese, 1904) –** oak forest (34).

Distribution – Semicosmopolitan.
Ecology – Eurytopic species (Ermilov 2008).

Family Scheloribatidae Grandjean, 1933

***Liebstadia similis* (Michael, 1888) –** dry grassland (4), mesophilic grassland (13).

Distribution – Holartic region, India and New Zealand.
Ecology – Forest-grassland species (Weigmann 2006), eurybionts.

***Liebstadia pannonica* (Willmann, 1951) –** petrophilic habitat (2), dry grasslands (3, 6, 7, 8), mesophilic grasslands (9, 10, 11, 12, 13), pastures (16, 17), ruderal grasslands (19, 20), hygrophilic grassland (22), floodplain meadow (26), hydromeliorated grassland (29).

Distribution – Holartic and Oriental regions.
Ecology – Forest-grassland species (Weigmann 2006) eurybionts.

***Liebstadia willmanni* Miko & Weigmann 1996 –** petrophilic habitat (2), dry grasslands (7).

Distribution – Central Europe.
Ecology – Forest-grassland species, hygrophilous.

***Liebstadia humerata* Sellnick, 1929 –** ruderal grassland (19).

Distribution – Holartic and Oriental regions.
Ecology – Forest species.

***Hemileius* cf. *initialis* (Berlese, 1908) –** hygrophilic grassland (23), floodplain meadow (27).

Distribution – Semicosmopolitan.
Ecology – Forest species (Weigmann 2006), hygrophilous.

***Scheloribates laevigatus* (Koch, 1835) –** dry grasslands (6, 7), mesophilic grasslands (9, 10, 11, 12, 13), pasture (16), hygrophilic grasslands (22, 23, 24), floodplain meadows (26, 27), hydromeliorated grasslands (29, 30, 52) ruderal grassland (18, 47), grasses (50), alfalfa-clover-cereals field (53), oak-ash forest (51).

Distribution – Semicmopolitan.
Ecology – Eurytopic species, eurybionts.

***Scheloribates latipes* (Koch, 1844) –** dry grasslands (6, 7), mesophilic grasslands (9, 10, 11, 12, 13), pasture (16, 48), hygrophilic grasslands (22, 23, 24, 25), floodplain meadows (26, 27, 28), hydromeliorated grasslands (29, 30).

Distribution – Holartic region.
Ecology – Forest-grassland species.

***Scheloribates fimbriatus* Thor, 1930 –** mesophilic grassland (13), pasture (16), floodplain meadows (26, 27), hydromeliorated grassland (29).

Distribution – Pantropic and subtropic regions, Ukraine (Yaroshenko 2000, Subías 2004, 2020 update).
Ecology – Xerophilous species (Mahunka & Mahunka-Papp 2004).

***Scheloribates* cf. *holsaticus* Weigmann, 1969 –** mesophilic grassland (11), floodplain meadow (27).

Distribution – Western Palaearctic.
Ecology – Grassland species, hygrophilous, salt-tolerant.

Family Oribatulidae Thor, 1929

***Lucoppia burrowsi* (Michael, 1890) –** dry grassland (4).

Distribution – Holartic region and tropical (Southeast China and Hawaii).
Ecology – Rodent nests (Melamud 2009) grassland species, xerophilous.

***Oribatula tibialis* (Nicolet, 1855) –** hygrophilic grassland (24).

Distribution – Holartic region, India and Northern Neotropical.
Ecology – Eurytopic species, eurybionts, salt-tolerant.

***Oribatula pannonica* Willmann, 1949 –** dry grasslands (4, 7).

Distribution – Palaearctic region.
Ecology – Xerophilous, salt-tolerant.

***Zygoribatula frisiae* (Oudemans, 1900) –** petrophilic habitat (2), dry grasslands (3, 4, 6, 7, 8), mesophilic grasslands (9, 12), pasture (48), ruderal grassland (20), floodplain meadow (26).

Distribution – Holartic region.
Ecology – Xerophilous (Mahunka & Mahunka-Papp 2004).

DISCUSSION

Among the identified oribatids of the Transcarpathian lowlands, more than 9% are European or sub-

European species, 25% of which are pan-European. The Mediterranean oribatids account for 18.8% (among European species). For South-Central European species – 18.8%. For Central Eastern European – 12.5%. For Central European – 12.5%. For Southeastern European – 6.3%. For Central Western European – 6.3%.

According to the hygropreference, six biotope complexes (eurybionts, hygrophilous, hygro-mesophilous, mesophilous, meso-xerophilous, xerophilous) of the Oribatida have been identified on Transcarpathian lowlands. At the same time, hygrophilous (38%), eurybionts (24%) and xerophilous (22%) species prevail. Five biotope groups of the oribatids (eurytopic, forest, forest-grassland, grassland, rock) have been identified. It has been established that forest (41%) and forest-grassland (33%) species predominate in the ecological structure of the oribatids on the Transcarpathian lowlands.

We compared the fauna of the oribatids of the Transcarpathian lowland with the neighboring territories. It has been established that despite the adjacent location with Hungary, Slovakia, and Romania, the Transcarpathian lowland has peculiarities in its taxonomic composition. In particular, for Hungary (Mahunka and Mahunka-Papp 2004, 2007) 32 species of the Transcarpathian lowland are not specified. These are *Ad.* cf. *sellnicki*, *Co. tenuisetus*, *Sell. cricoides*, *Ph. ligneus*, *Pl. humicola*, *Belba patelloides*, *Belbodamaeus tuberculatus*, *E. kamaensis*, *Sp. boreus*, *Metabelbella soror*, *L. brevilamellatus*, *Dorycranosus punctulatus*, *Metrioppia helvetica*, *T. alatus*, *Dolicheremaeus georgii*, *Berniniella minuta, Rh. similifallax*, *Rh. loksai*, *G. foveolata*, *Ram. elliptica*, *Su. latirostris*, *Su. tuberculata*, *Sc. serratus*, *Sch.* cf. *holsaticus*, *Ceratozetes macromediocris*, *Ceratozetes* cf. *psammophilus*, *Ceratozetella maxima*, *Sem. zachvatkini* and *Ac.* cf. *quadridentata.* At the same time, the faunal similarity of oribatids of the Transcarpathian lowland and the Upper Tisza region of Hungary was 0.38. This indicates significant differences in the taxonomic composition of the oribatid mites of the compared areas.

Also, among the oribatid mites of Slovakia (Luptacik and Miklisova 2005; Stary 2006, 2008a, b; Miko 2011, 2016a, b, c; Krumpalova *et al.* 2020), 28 species of the Transcarpathian lowlands are not specified. These are *Ad.* cf. *sellnicki*, *Co. tenuisetus*, *Br. bimaculatus*, *Se. cricoides*, *Sy. crenulatus*, *Ph. italicus*, *Ph. ligneus*, *Be. tuberculatus*, *E. kamaensis*, *M. soror*, *As. pilosus*, *L. brevilamellatus*, *Dorycranosus punctulatus*, *Dolicheremaeus georgii*, *Berniniella inornata*, *B. minuta*, *O. europaea*, *Su. latirostris*, *Su. longirostris*, *Pa. perforatus*, *Sc. serratus*, *Po. longipes*, *Ceratozetes macromediocris*, *C.* cf. *psammophilus*, *Ceratozetella maxima*, *Se. zachvatkini*, *Ac.* cf. *quadridentata*, and *Ga. bimorpha*. At the same time, the faunal similarity of oribatids of the Transcarpathian lowland and the Eastern Slovak Lowland was 0.28. This indicates significant differences in the taxonomic composition of the oribatid mites of the compared areas.

More than 500 species of the oribatids are known for Romania (Vasiliu 1992; Vasiliu *et al.* 1993; Fabian 1997; Ivan *et al.* 2003; Ivan and Calugar 2003; Mahunka 2006; Ivan and Vasiliu 2008; Mahunka and Mahunka-Papp 2008; Vasiliu and Ivan 2009, 2011; Ivan 2010, 2018; Constantinescu *et al.* 2011; Nae and Ivan 2015). We found 39 species of the oribatid mites in the Transcarpathian lowlands, which were not found in Romania. These are *Ad.* cf. *sellnicki*, *Co. tenuisetus*, *Li. alpestris*, *Li. hystricinus*, *Se. suecicus*, *Sy. crenulatus*, *Ph. ligneus*, *Ph. setosellum bryobius, Eu. cribrarius*, *Belbodamaeus tuberculatus*, *Sp. boreus*, *M. soror*, *Er. geographica*, *Ca. rugosior*, *T. alatus*, *D. georgii*, *Berniniella inornata*, *Gr. foveolata*, *Rh. similifallax*, *O. denticulata*, *Ra. elliptica*, *Su. alloenasuta*, *Su. arcana*, *Su. latirostris*, *Su. longirostris*, *Su. tuberculata*, *Scutovertex serratus*, *Po. longipes*, *Lu. burrowsi*, *Sch.* cf. *holsaticus*, *Ceratozetes macromediocris*, *C.* cf. *psammophilus*, *Ceratozetella maxima*, *Se. zachvatkini*, *Ac. italica*, *Ac.* cf. *quadridentata*, *Ga. alata*, *Ga. bimorpha and Pe. altera*.

Thirteen species of oribatids of the Transcarpathian lowland were not found in the territories of Hungary, Slovakia, and Romania: *Ad. cf. sellnicki*, *Co. tenuisetus*, *P. ligneus*, *B. tuberculatus*, *M. soror, D. georgii, S. latirostris, Sc. serratus, Ceratozetes macromediocris, C. cf. psammophilus, Ceratozetella maxima*, *Se. zachvatkini*, and *Ac. cf. quadridentata.*

CONCLUSION

The taxonomic composition of oribatids of the Transcarpathian lowland composes 174 species. A relatively low representation of the European fauna (9%). However, we have identified a number of features of the taxonomic composition of the Oribatida on the Transcar-pathian lowland compared to the adjacent territories. In particular, among the species found on the Transcarpathian lowland, 29 are not specified for Hungary, 28 – for Slovakia, and 39 – for Romania. In addition, the similarity between the study area and the Upper Tisza region of Hungary (0.38), and Eastern Slovak Lowland (0.28) was low. It is likely that in the future, the species of the Transcarpathian lowland will be found in similar habitats of the respective Central European countries. Two species were recorded from Ukraine for the first time (*Rh. similifallax* and *Ga. bimorpha*), and two other species (*C. tenuisetus* and *C. maxima*) are found for the first time in Pannonian Plain.

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فهرست کنه‌های اریباتید (Acari, Oribatida) دشت‌های ترانسکارپاتی، اوکراین

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چکیده

این مقاله به طور خلاصه دانش مربوط به ترکیب گونه‌های کنه‌های اوریباتید دشت‌های ترانسکارپاتی را نشان می‌دهد. در مجموع، ۱۷٤ گونه کنهٔ اریباتید (۹۷ جنس و ۵۰ خانواده) از ۵۳ محل و ۱۸ نوع بیوتوپ گزارش می‌شوند. داده‌های اکولوژیکی و پراکندگی برای هر گونه تعیین شده است. این فون با فون مناطق دیگر دشت پانون (مجارستان، اسلواکی و رومانی) مقایسه شده است. دو گونهٔ *Rhinoppia similifallax* Subías & Mínguez, 1986 و *Galumna bimorpha* Mahunka, 1987 برای نخستین بار از اوکراین گزارش می‌شوند. دو گونهٔ دیگر، *Cosmochthonius tenuisetus* Gordeeva, 1980 و *Ceratozetella maxima* (Berlese, 1908) برای نخستین بار در دشت پانون یافت شدند.

واژگان کلیدی: تنوع؛ جنگل‌ها؛ مراتع؛ زیستگاه؛ Sarcoptiformes.

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