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# Annotated checklist of Georgian oribatid mites—II

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## Abstract

The checklist of oribatid mites from Georgia is updated using sampling data from more than 230 locations during field works conducted between 2016 and 2022. We report 32 species of oribatid mites, sixteen of them were collected between 2017 and 2019, six were missing in Checklist I, while eleven species are new records for the country. The genus *Ameronothrus* was found in Georgia for the first time, but could not be identified to species level. Additional information about the distribution of *Epilohmannia styriaca* Schuster, 1960, *Sphaerozetes orbicularis* (C.L. Koch, 1835) and *Fuscozetes fuscipes* (C.L. Koch, 1844) is given. For each species we provide notes about regional and global distribution as well as information about their ecology. This list brings the number of identified species known for Georgia up to 563.

**Key words:** New records, rare species, distribution, Caucasus, SEM images

## Introduction

The importance of the exploration of soil biodiversity as one of the drivers of ecosystem functioning is underlined by various authors (Coleman *et al*. 2004; Orgiazzi *et al*. 2016; Potapov *et al*. 2022). Oribatid mites are a dominant arthropod group in the soil environment, with more than 11,000 species described globally (Subías 2004, updated in 2022). As trophically heterogeneous microarthropods, they contribute to soil nutrient cycling and create links between soil microfauna and macrofauna in the food web (Maraun *et al*. 2011, 2020; Potapov *et al*. 2022). Oribatid mites of Georgia, from the Caucasus biodiversity hotspot region, are rather well studied. A recent annotated checklist (hereafter named checklist-I) listed 534 oribatid species collected from 390 locations (Murvanidze & Mumladze 2016). This checklist includes geo-referensed species records from 1963 to 2015. After this period, oribatid mites from more than 230 new locatios were studied and identified. New species were described (Kolesnikov & Miko 2022), a number of new records were published (Miko *et al*. 2017; Murvanidze & Arabuli 2017; Murvanidze *et al*. 2019), and still other unpublished materials were accumulated. In addition, there were several mistakes in the checklist-I, which need to be corrected (Murvanidze *et al*. 2019).

The purpose of this contribution is to compile information on Georgian oribatid mites collected after 2016. In particular, we have developed a second part of the checklist (checklist-II) in which we (1) correct the unnoticed errors in the 2016 checklist-I, (2) summarize the published data, and (3) add unpublished information about new and rare species.

## Material and methods

To develop the checklist-II for Georgian oribatid mites, we summarized all literature published after 2016 (given in the checklist section) along with the missing data from the checklist-I. In addition, unpublished data based on material collected from 2016 to 2022 during various field surveys are also included. New records for Georgia are

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indicated by an asterisk (*). We also provide information about new findings of some rare species which were known only from old literature sources or from single locations. We generally follow the classification and nomenclature of Schatz *et al*. (2011). Information on species' ecological preferences (if available) is given in the "ecology" section, according to Murvanidze & Mumladze (2016), Weigmann (2006), Weigmann *et al*. (2015) and our own experience. The references for taxon authorities are not listed in the References.

For each geographic location the GPS coordinates are provided. Global distribution data are based on Subías (2004, updated in 2022). Map with location of sampling sites was made using QGIS Desctop 3.26.3 (Fig. 1). For new records represented by more than one individual, we provide SEM micrographs. Voucher specimens are deposited into the collections of Agricultural University of Georgia.

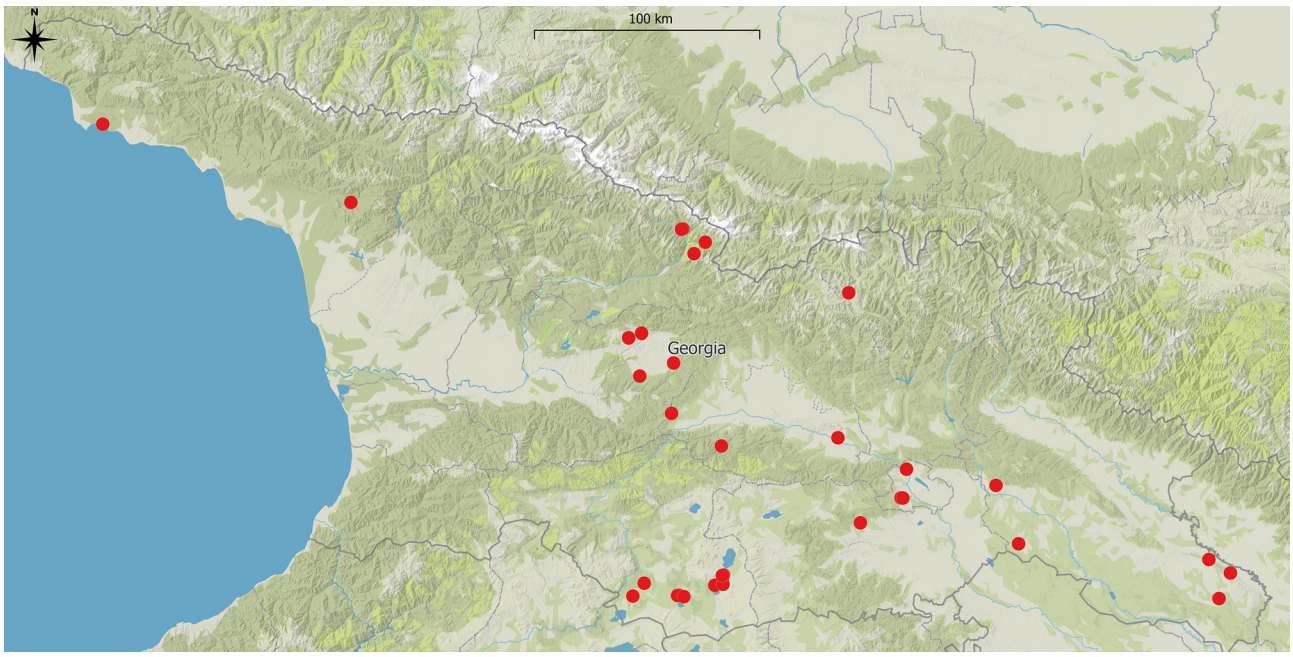


**FIGURE 1.** Map of Georgia with indication of sampling sites

## Annotated checklist

### Superfamily: Brachychthonioidea Thor, 1934

### Family: Brachychthoniidae Thor, 1934

*Eobrachychthonius latior* Berlese, 1910

**Distribution in Georgia:** Tbilisi, artificial meadow, N41.802089˚ E44.7660036˚, 469m a.s.l. Single individual, coll. M. Murvanidze, 15 Apr. 2016 (Murvanidze & Arabuli 2017)

**Global distribution:** Holarctic

**Ecology**: Forest soils and oligotrophic fens

### Superfamily: Epilohmannioidea Oudemans, 1923

### Family: Epilohmanniidae Oudemans, 1923

*Epilohmannia styriaca* Schuster, 1960

**Distribution in Georgia**: Musera, hornbeam-oak forest, N43.170804˚ E40.432904˚, 164m a.s.l, coll. Z. Tarba (Shtanchaeva & Subías 2010); village Mandaeti, home garden, N42.174774˚ E43.328157˚, 776m a.s.l., two individuals coll. L. Mumladze, 26 Oct. 2021.

**Global distribution:** Palaearctic

**Ecology:** Humid forest soils

**Remark:** This is the first report of the species since the early reports from Musera (Tarba 1978). Checklist I include one more location from the Abkhazian region of Georgia (Ochamchire) according to Shtanchaeva & Subías (2010), referring to Bulanova-Zakhvatkina (1970). After examination of the latter paper, we did not find matching information; therefore, this location may be discarded.

**Superfamily: Phthiracaroidea Perty, 1841**

**Family: Phthiracaridae Perty, 1841**

*Phthiracarus (Phthiracarus) longulus* (C.L. Koch, 1841)

**Distribution in Georgia**: Javakheti plateau, litter from artificial pine forest, N41.293114˚ E43.531515˚, 1990m a.s.l and N41.37421869˚ E43.77305123˚ 2120m a.s.l., numerous individuals, coll. L. Mumladze, 05 Jul. 2018.

**Global Distribution:** Holarctic

**Ecology**: Forest soils (Weigmann 2006)

**Remark:** This species is missing in checklist-I. Earlier findings are from the mixed forest of Auadkhara reserve and Batumi botanical garden (Shtanchaeva & Subías 2010).

**Superfamily: Crotonioidea Thorell, 1876**

**Family: Nanhermanniidae Sellnick, 1928**

*Nanhermannia comitalis* Berlese, 1913

**Distribution in Georgia**: Cross Pass, subalpine meadow, N42.505081˚ E44.454129˚, 2400 m a.s.l. two individuals coll. Z. Medoeva in 1985 (Medoeva *et al*. 1987); Shvilobisa cave, soil from cave entrance, N42.326525˚ E43.268253˚, 615m a.s.l., four individuals coll. Sh. Barjadze, 19 Apr. 2017 (Murvanidze *et al*. 2019).

**Global Distribution:** Holarctic

**Ecology**: Wet and humid soils including acidic bogs

**Remark:** This species was missing in checklist I. In the publication of Medoeva *et al.* (1987) only the geographic location is indicated; coordinates were applied via Google Earth.

**Superfamily: Hermannielloidea, Grandjean, 1934**

**Family: Hermanniellidae Grandjean, 1934**

*Hermanniella septentrionalis* Berlese, 1910

**Distribution in Georgia**: Batumi (Shtanchaeva & Subías 2007); village Ghari, soil in coniferous forest, N42.590187˚ E43.457181˚, 1115m a.s.l., one individual coll. N. Todria, 26 Sep. 2019.

**Global distribution:** Holarctic

**Ecology:** Humid forest soils

**Remark:** This species was missing in checklist I. Darejanashvili & Gurgenidze (2004) report it from various forest types of Eastern Georgia without providing exact geographic location; therefore, we do not include this record in the list. Shtanchaeva & Subías report the species from Batumi botanical garden.

**Superfamily: Damaeoidea Berlese, 1896**

**Family: Damaeidae Berlese, 1896**

*Belba paracorynopus* Bulanova-Zakhvatkina, 1962

**Distribution in Georgia**: Village Chiora, litter from mixed forest with *Fagus orientalis* and *Taxus baccata*, N42.75822˚ E43.56074˚, 1750 m a.s.l. Two individuals, coll. N. Todria, 20 Aug. 2016 (Miko *et al*. 2017).

**Global Distribution:** Eastern Palaearctic

**Ecology**: Forest litter/soils

*Coronabelba unicornis* Kolesnikov & Miko, 2022

**Distribution in Georgia**: Tkvarcheli, beech/laurel/cherry forest, N42.862778° E 41.770833°, 550m a.s.l., two individuals, coll. I. Turbanov, 20 March 2021 (Kolesnikov & Miko 2022).

**Global distribution:** Caucasus

**Ecology**: Forest soils

**Superfamily: Cepheoidea Berlese, 1896**

**Family: Cepheidae Berlese, 1896**

**Remark:** Cepheidae Berlese, 1896, the commonly used name for this oribatid mite family, is a junior homonym of Cepheidae Agassiz, 1862 (Cnidaria). A proposal to establish a replacement name for Cepheidae Berlese has been submitted to the International Commission on Zoological Nomenclature (Halliday & Norton 2019).

*Tritegeus bisulcatus* Grandjean, 1953*

**Distribution in Georgia**: Village Chiora. Mixed forest with *Fagus orientalis* and *Taxus baccata.* N42.758222˚ E43.560744˚ 1750 m a.s.l. One individual, coll. N. Todria, 20 Aug. 2016.

**Global distribution:** Palaearctic

**Ecology:** Forest soils

**Superfamily: Ameroidea Bulanova-Zachvatkina, 1957**

**Family: Amerobelbidae Grandjean, 1961**

*Mongaillardia grandjeani* Călugăr & Vasiliu, 1984

**Distribution in Georgia**: Village Patardzeuli, arable land. N41.73694882˚; E45.248295118˚ 803 m a.s.l. Three individuals, coll. M. Murvanidze, 19 Jul. 2016 (Murvanidze & Arabuli 2017).

**Global Distribution:** Mediterranean

**Ecology**: Sandy dunes (Călugăr & Vasiliu 1984), arable soils (Murvanidze & Arabuli 2017).

**Family: Ctenobelbidae Grandjean, 1965**

*Ctenobelba mikaeeli* Ahaniazad, Bagheri, Akrami & Hugo-Coetzee, 2017*

**Distribution in Georgia**: Javakheti plateau, subalpine hay meadow, N41.288452˚ E43.565732˚ 1912 m a.s.l. One individual, coll. L. Mumladze, 05 Jul. 2018.

**Global distribution:** Iran and Caucasus

**Ecology:** Montane habitats

**Remark:** According to the original description, the holotype and paratypes were found in soil under walnut in Iran, at about 1955 m a.s.l. (Ahaniazad *et al*. 2017). We also found this species in soil of subalpine meadows at high altitudes. Possibly, the species mainly occurs in high mountain regions.

**Family: Astegistidae Balogh, 1961**

*Cultroribula lata* Aoki, 1961* (Fig. 2)

**Distribution in Georgia:** Village Mandaeti, N42.174774˚ E43.328157˚ home garden. 34 individuals, coll. L. Mumladze. 26 Oct. 2021.

**Global distribution:** Palaearctic, Oriental, Australian

**Ecology:** Forest soils

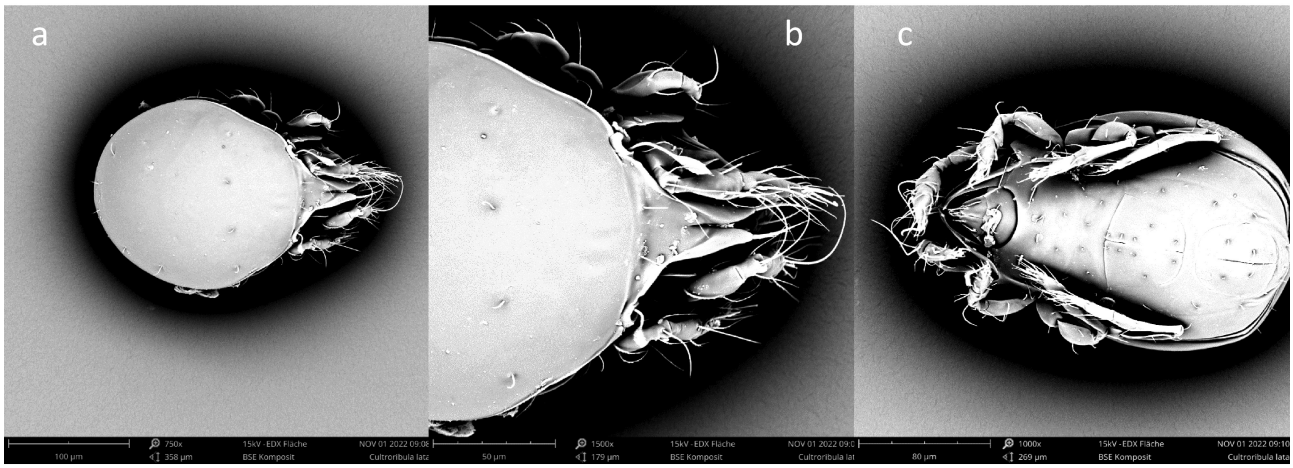


**FIGURE 2.** *Cultroribula lata* Aoki, 1961 a) Dorsal view; b) Prodorsum; c) Ventral view

**Superfamily: Oppioidea Grandjean, 1951**

**Family: Oppiidae Grandjean, 1953**

*Graptoppia paraanalis* Subias & Rodrigues, 1985

**Distribution in Georgia:** Village Patardzeuli, N41.73694882˚ E45.248295118˚ 803 m a.s.l. Arable land, seven individuals coll. M. Murvanidze, 19 Jul. 2016.

**Global Distribution**: Western Palaearctic

**Ecology:** According to Weigmann (2006) this species mainly occurs in cultured soils.

**Superfamily: Carabodoidea C. L. Koch 1837**

**Family: Carabodidae C. L. Koch 1837**

*Carabodes intermedius* Willmann, 1951* (Fig. 3)

**Distribution in Georgia:** Udziro Tba N42.660225° E43.620267° 2834m a.s.l. Wet meadow, 25 individuals coll. Nino Todria.11.07.2021; Shovi N42.705292° E43.681247° 1570 m a.s.l, forest meadow, 45 individuals coll. Nino Todria 03 Jul. 2021.

**Global distribution:** Europe

**Ecology:** Forest soils and litter

**Superfamily: Cymbaeremaeoidea Sellnick, 1928**

**Family: Cymbaeremaeidae Sellnick, 1928**

*Scapheremaeus tricarinatus* Sitnikova, 1975*

**Distribution in Georgia:** Javakheti plateau, subalpine hay meadow, N41.288452˚ E43.565732˚ 1912m a.s.l. One individual, coll. L. Mumladze, 05 Jul. 2018.

**Global distribution:** Mediterranean

**Remark:** In Caucasus this species is reported from Northern Ossetia (Shtanchaeva & Subías 2010) with the reference to the identification key of Ghilarov & Krivolutskyi (1975). No specific location or habitat is indicated.

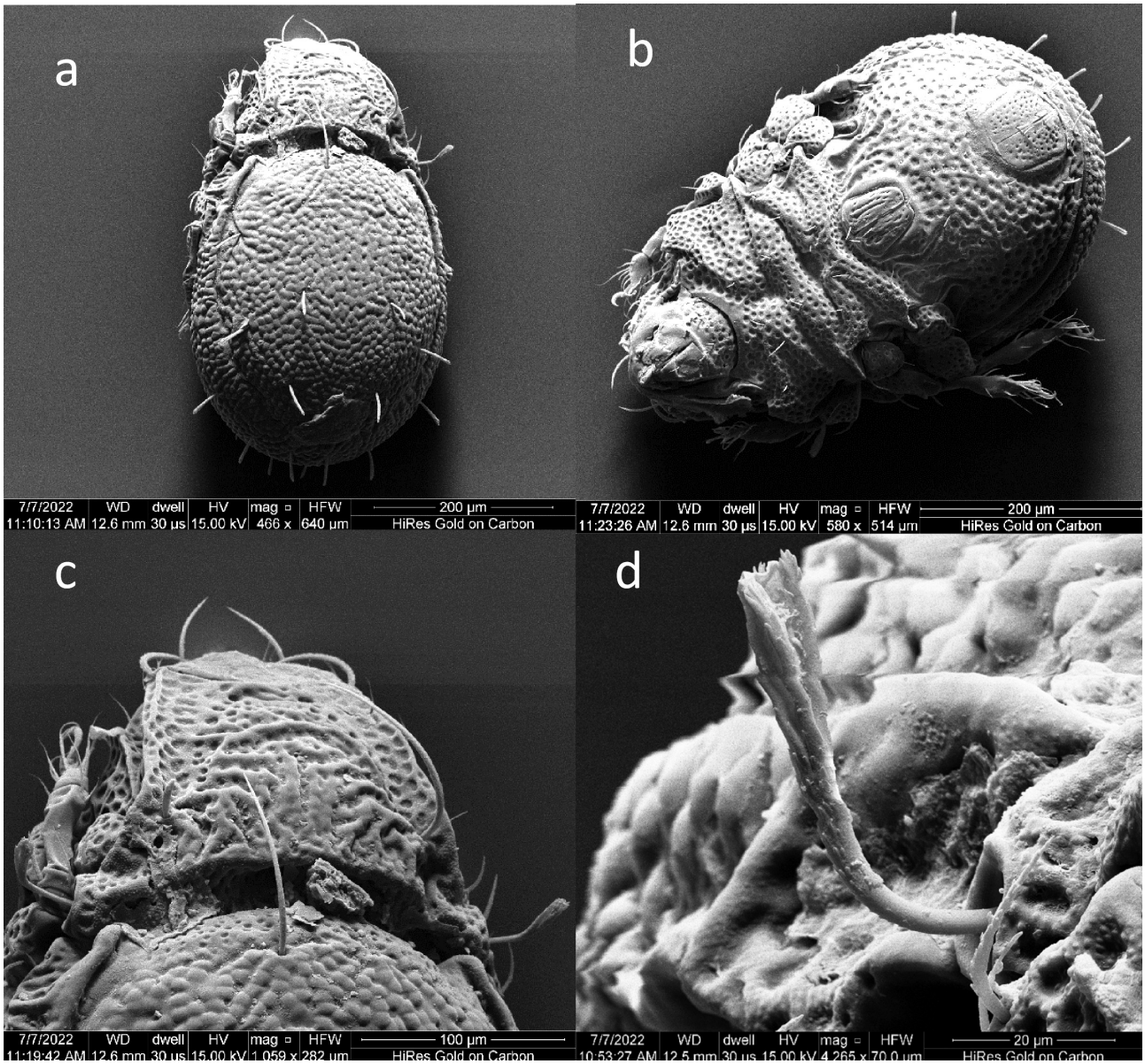


**FIGURE 3.** *Carabodes intermedius* Willmann, 1951. a) Dorsal view; b) Ventral view; 3) Prodorsum; d) Bothridial seta

**Superfamily: Ameronothroidea Willmann, 1931**

**Family: Ameronothridae Willmann, 1931**

*Ameronothrus* sp.*

**Distribution in Georgia:** Udziro Tba N42.660225° E43.620267° 2834m a.s.l. Wet meadow, one individual coll. Nino Todria.11 Jul. 2021.

**Ecology:** Marine or freshwater littoral zones (Behan-Pelletier & Eamer 2007)

**Remark:** The mite could not be identified to the species level as it was damaged, however, we included it in the species list since this is the first report of the genus *Ameronothrus* in Georgia. *Ameronothrus oblongus* Sitnikova, 1975 is reported from Caucasus, Teberda (Shtanchaeva & Subías 2010).

**Superfamily: Licneremaeoidea Grandjean, 1954**

**Family: Scutoverticidae Grandjean, 1954**

*Lamellovertex caelatus* (Berlese, 1895)* (Fig. 4)

**Distribution in Georgia:** Tsavkisi. Soil from natural meadow. N 41.68618˚ E 44.746342˚ 903 m a.s.l. Two individuals collected by M. Murvanidze, 12 Jun.2021.

**Global distribution:** Palaearctic

**Ecology**: Dry soils

**Remark:** Previous records of *L. caelatus* in Caucasus are known from Novorosyisk and Northern Osetia (Shtanchaeva & Subías 2010). Georgian findings confirm the preference of this species to dry soils and mosses (Ayyldiz *et al*. 2005; Bernini 1976; Krisper *et al* 2002; Weigmann 2006), while Shtanchaeva and Netuzhilin (2003) refer to previous findings in soil litter.

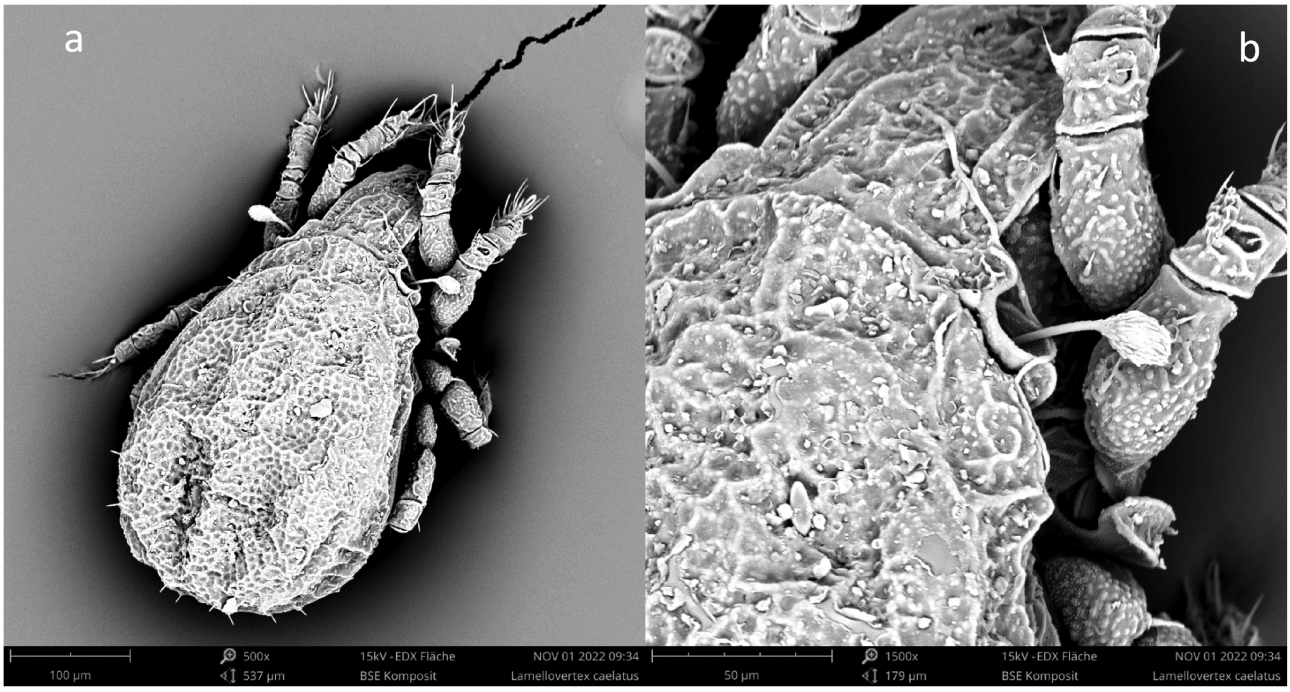


**FIGURE 4.** *Lamellovertex caelatus* (Berlese, 1895). A) Dorsal view; b) Prodorsum with bothridial seta

*Hypovertex saxicola* Sitnikova, 1975*

**Distribution in Georgia:** Tsavkisi. Soil from natural meadow. N41.686816˚ E44.736348˚ 1095m a.s.l. One individual collected by M. Murvanidze, 14 Aug. 2022.

**Global distribution:** Southern Palaearctic

**Ecology**: Dry montane soils

**Remark:** New record for Georgia. Previous finding in Caucasus refers to the original species description by Sitnikova (1975) in Northern Osetia which was included in the identification key of palaearctic oribatid mites by Ghilarov & Krivolutsky (1975). Later, the author provided a more detailed description of the species and specified the sampling location of the type species—soil under Juniper shrubs close to Gizeldon River at 1400 m a.s.l. (Sitnikova 1980).

**Superfamily: Phenopelopoidea Petrunkevich, 1955**

**Family: Phenopelopidae Petrunkevich, 1955**

*Eupelops hirtus* (Berlese, 1916)

**Distribution in Georgia:** Javakheti plateau. N41.294489˚ E43.538343˚ 2293m a.s.l. two individuals, coll. L. Mumladze, 16 Sep. 2018 (Murvanidze *et al*. 2019).

**Global distribution:** Holarctic

**Ecology**: Acidic forest soils

**Superfamily: Oripodoidea Jacot, 1925**

**Family: Haplozetidae Grandjean, 1936**

*Podoribates longipes* (Berlese, 1887)*

**Distribution in Georgia:** Surami Pass. Mixed forest with artificial pine plantations. Soil. N42.025949˚ E43.499230˚ 947 m. a.s.l. One individual, coll. L. Mumladze 29 Aug. 2016.

**Global distribution:** Holarctic

**Ecology**: Broadleaved forest soils

**Family: Oribatulidae Thor, 1929**

*Oribatula (Oribatula) interrupta* (Willmann, 1939)

**Distribution in Georgia:** Javakheti plateau. Subalpine hay meadow. Soil. N˚41.3647024, E43.77508485˚, 2096 m a.s.l. Six individuals collected by L. Mumladze, 18 Sep. 2018; Samgle Klde cave. Soil from the cave entrance. N42.344692˚, E 43.337976˚, 403m a.s.l. One individual coll. Sh. Barjadze, 03 March 2017 (Murvanidze *et al*. 2019).

**Global distribution:** Holarctic, Ethiopian

**Ecology**: Mountainous meadow soils and moss

**Remark**: The species is missing in checklist-I as explained by Murvanidze *et al.* (2019).

*O. (Zygoribatula) skrjabini* (Bulanova-Zakhvatkina, 1967)

**Distribution in Georgia:** Patardzeuli, arable land. N41.73694882˚; E45.248295118˚ 803 m a.s.l. 39 individuals collected by M. Murvanidze, 19 Jul. 2017 (Murvanidze & Arabuli 2017).

**Global distribution:** Eastern Palaearctic

**Ecology**: Dry arable meadows

**Family: Scheloribatidae Grandjean, 1933**

*Lagenobates lagenula* (Berlese, 1904)*

**Distribution in Georgia:** Udziro Tba. N42.660225° E43.620267° 2834m a.s.l. Wet meadow, one individual coll. Nino Todria, 11 Jul. 2021.

**Global distribution:** Holarctic

**Ecology:** Acidic raised bogs

*Scheloribates* (*Hemileius*) *ovalis* (Kulijev, 1968)

**Distribution in Georgia:** Village Kvemo Kedi N41.384133˚ E46.512133˚, 465 m a.s.l. grassland, 25 individuals coll. N. Todria, 24 Apr 2018; village Zemo Kedi N41.438600˚, E 46.396000˚ 560 m a.s.l. grassland, 25 individuals coll. N. Todria, 24 Apr 2018; Eldary valley N41.280833˚, E46.450533˚, 178 m a.s.l, pasture, 27 individuals, coll. Todria, N., 15 Sep 2018 (Murvanidze *et al*. 2019).

**Global distribution:** Palaearctic

**Ecology:** Grasslands

*Scheloribates (Topobates) holsaticus* (Weigmann, 1969)

**Distribution in Georgia:** Auadkhara, mixed forest, coll. Shtanchaeva and Magomedova (Shtanchaeva & Subías 2010); Okami, N41.3427˚ E43.35189˚, overgrazed meadow, one individual, coll. L. Mumladze, 27 Jun. 2016; Korbouli, N42.22679˚, E43.51036˚, 1094 m a.s.l., degraded forest with anthropogenic disturbance (grazing), one individual, coll. L. Mumladze, 28 Jun. 2018 (Murvanidze *et al*. 2019).

**Global distribution:** Palaearctic

**Ecology:** Forest soils

**Remark:** The species is missing in checklist-I

**Superfamily: Ceratozetoidea Jacot, 1925**

**Family: Ceratozetidae Jacot, 1925**

*Ceratozetes bregetovae* (Shaldybina, 1970)

**Syn.:** *Ceratozetella bregetovae* Shaldybina, 1970 *sensu* Shtanchaeva & Subías 2010

**Distribution in Georgia:** Numerous locations on Javakheti plateau in May-June 2017 (Murvanidze *et al*. 2019).

**Global distribution:** Eastern Palaearctic

**Ecology**: subalpine meadows

*Ceratozetes bulanovae* Kulijev, 1962

**Distribution in Georgia:** Udabno N41.502100˚, E45.370250˚, 769 m a.s.l. overgrazed pasture, one individual coll. N. Todria 26 Jun. 2016 (Murvanidze *et al*. 2019).

**Global distribution:** Mediterranean

**Ecology**: anthropogenically disturbed habitats: overgrazed pastures, arable lands (Kulijev 1962)

*Sphaerozetes orbicularis* (C.L. Koch, 1835) (Fig. 5)

**Distribution in Georgia:** Ritsa reserve, Musera (Murvanidze & Mumladze 2016); Udziro Tba N42.660225° E43.620267° 2834m a.s.l. Wet meadow, twelve individuals coll. Nino Todria.11 Jul. 2021.

**Global distribution:** Palaearctic

**Ecology:** Forest soils

**Remark:** This is the first report of the species after 1970 (Tarba 1976, 1978).

*Fuscozetes fuscipes* (C.L. Koch, 1844)

**Distribution in Georgia:** Tsaghveri; Tavkvetila mountain (Murvanidze & Mumladze 2016); Shovi, N42.705292° E43.681247° 1570m a.s.l, forest meadow, numerous individuals coll. Nino Todria 03 Jul. 2021.

**Global distribution:** Holarctic

**Ecology:** Wet to humid forest soils and meadows

**Remark:** This species was known from only two locations (see above), both from mountainous habitats, the new finding confirms the occurence of this species at high altitudes.

**Family: Chamobatidae Grandjean, 1954**

*Chamobates birulai* (Kulczynski, 1902)

**Distribution in Georgia:** Bateti Lake. N41.895149˚ E43.767928˚ 1370 m a.s.l. Forested lake shore, three individuals coll. Nino Todria, 02 Oct. 2016.

**Global distribution:** Holarctic

**Ecology:** Wet to humid forest soils and meadows

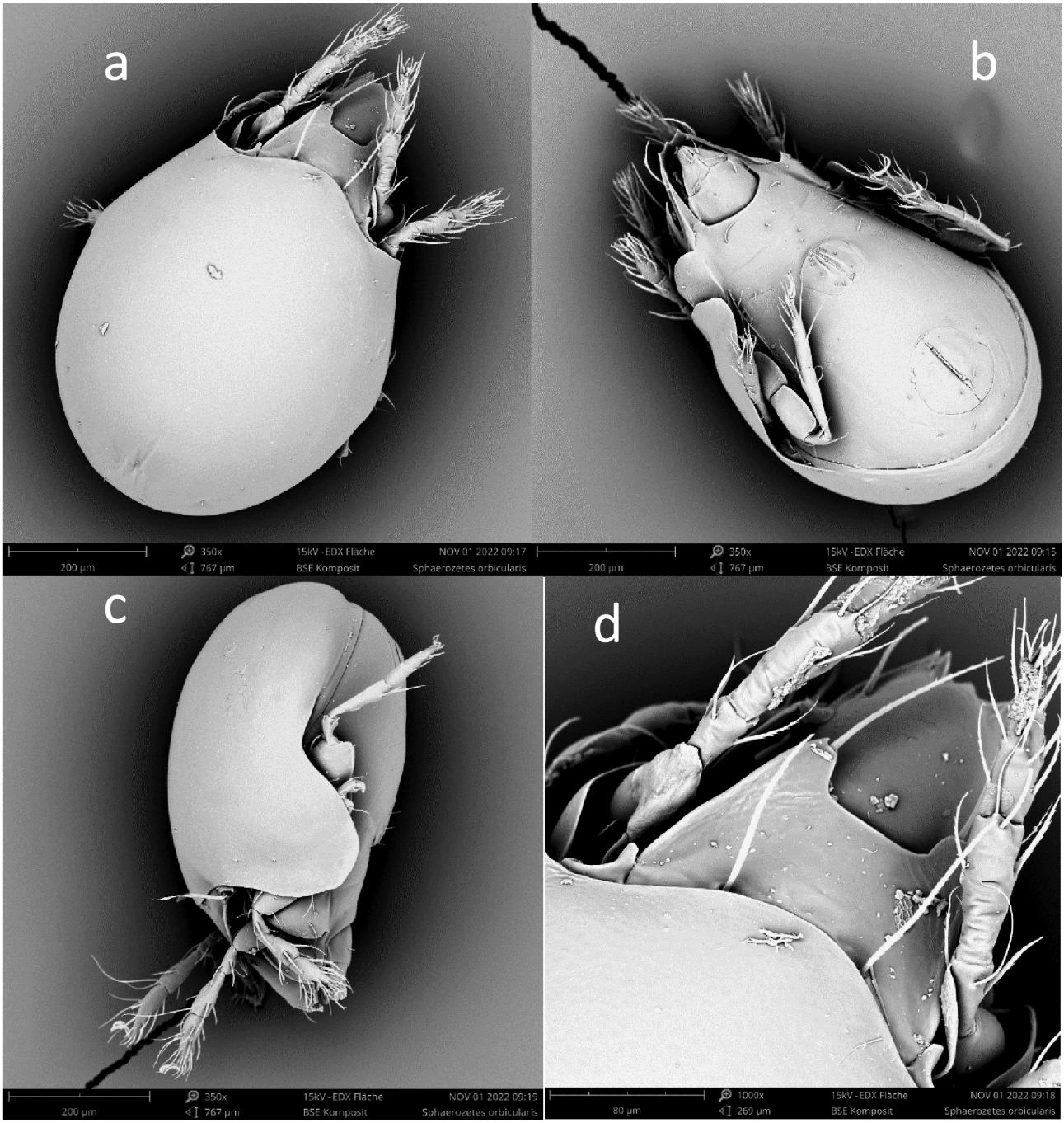


**FIGURE 5.** *Sphaerozetes orbicularis* (C.L. Koch, 1835). A) Dorsal view; b) Ventral view; c) Lateral view; d) Prodorsum

**Family: Mycobatidae Grandjean, 1954**

*Mycobates (Calyptozetes) patrius* Shaldybina, 1970* (Fig. 6).

**Distribution in Georgia:** Udziro Tba N42.660225° E43.620267° 2834 m a.s.l. Wet meadow, 13 individuals coll. Nino Todria, 11 Jul. 2021.

**Global distribution:** Palaearctic

**Ecology:** alpine meadows and high-altitude forests.

**Remark:** Previous findings from the Caucasian region include two locations of Daghestan (Russia) Samur and Tsumilukh (Shtanchaeva & Subías 2010). The authors reported species from alpine meadows and forests at high altitudes 1500-3000 m a.s.l. We confirm the occurrence in alpine habitats for *M. patrius* in the Caucasian region

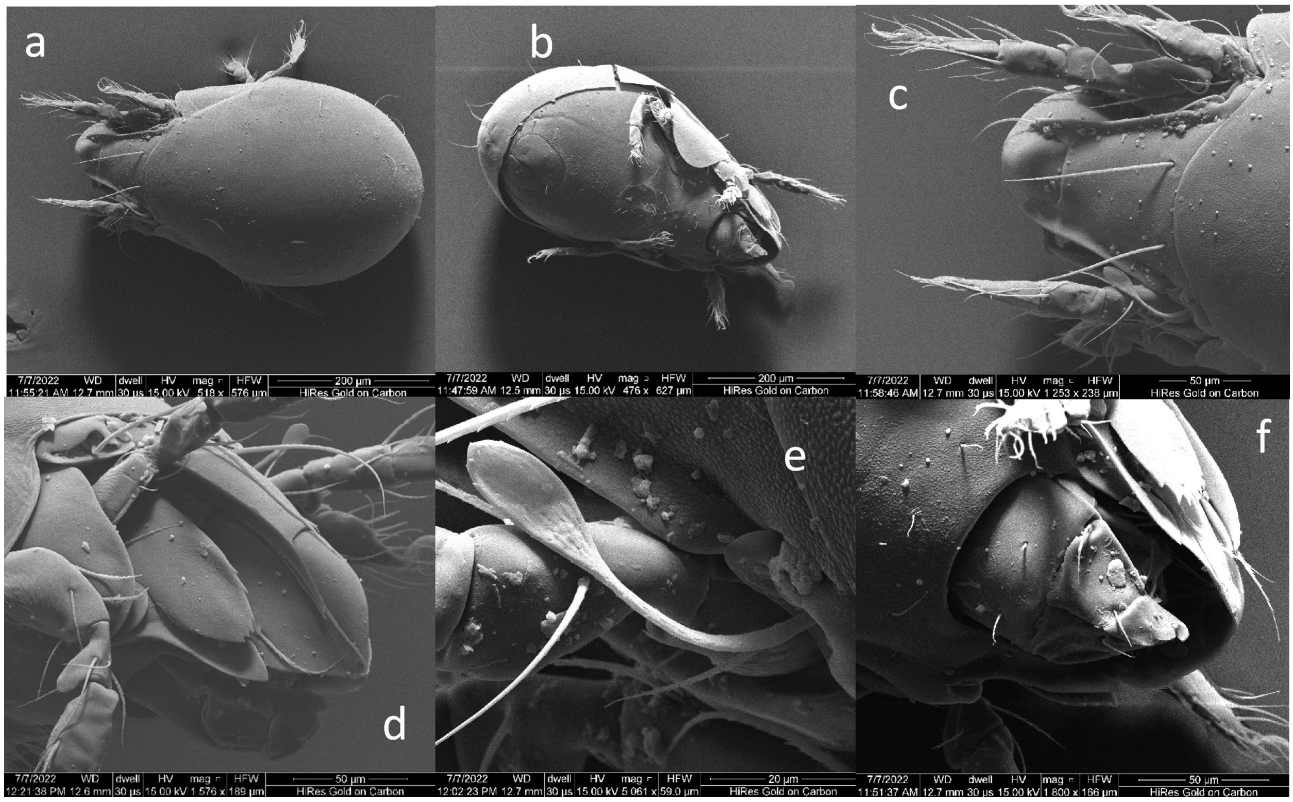


**FIGURE 6.** *Mycobates (Calyptozetes) patrius* Shaldybina, 1970. a) Dorsal view; b) Ventral view; c) Prodorsum; d) Tutorium; e) Bothridial seta; f) Gnathosoma

## Family Galumnidae Jacot, 1925

*Galumna rossica* Sellnick, 1926

**Distribution in Georgia:** Algeti Reserve. N 41.586337˚ E 44.517425˚ 807 m a.s.l. Mixed forest. Ten individuals coll. Kh. Tsiklauri in May 2001 (Murvanidze *et al*. 2003); Kaspi. N 41.92817˚ E 44.3963˚, 520m a.s.l. Reclaimed clay mining site. Highly disturbed (overgrazed) meadow, one individual coll. Maka Murvanidze. 23 Oct. 2015. (Murvanidze *et al*. 2019).

**Global distribution:** Palaearctic

**Ecology:** forest soils

**Remark**: The species was missing in Checklist-I

## Conclusions on oribatid species diversity in Georgia

The checklist-I of oribatid mites of Georgia listed 534 species from 390 geo-referenced locations. The investigations from 2016 to 2022 (which included 230 sampling points countrywide), resulted in 26 additional species of which eleven were new for Georgia. This increased the known fauna of Georgian oribatid mite to 562 species. In the checklist-I it was calculated (based on rarefaction analyses) that doubling sampling efforts would result in an additional 50 (±15) species for Georgia. Thus 26 new records accumulated since 2016 from 230 sampling points, match with this prediction perfectly. Given these circumstances, we suppose that the Georgian oribatid mite species diversity is close to being fully inventoried. On the other hand, the rate of single individual/species or single species/location cases is still high indicating the need for further research to better understand the species distribution and community compositions across the landscapes of Georgia.

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