

Revision and renovation of oribatid mites (Acari: Oribatida) specimen collection of Institute of Biology, Latvia

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Abstract

Renovation and revision of the twenty years old oribatid mites (Acari: Oribatida) collection of Institute of Biology, University of Latvia was performed. The method of renovation is briefly described and the results are summarised in a species list. The revised list of 77 recorded species and subspecies, including 13 species new to the fauna of Latvia, is presented and show high discrepancy in identification.

Key words: fauna, Latvia, Oribatida mites, renovation, remounting, specimen.

Abbreviations: ad(s), adult(s); m., municipality; REM., remounted specimen(s); ♀(♀), female(s); ♂(♂), male(s).

Introduction

Oribatid mites (Acari: Oribatida = Cryptostigmata) are saprophagous microarthropods inhabiting mostly soil ecosystems world wide. With huge abundances these creatures feed mainly on dead organic matter, fungi, algae and lichens, and show high potential in bioindication (Gilyarov 1975; Krantz 1978; Weigmann 2006).

Latvian oribatids have been investigated irregularly over the last two hundred years by different entomologists (Kagainis 2011). In the middle of the 1980's, a specimen collection was created, to ease time-consuming work in identification. The mites of this collection were sampled from different habitats and mounted in Hoyer's medium (Krantz 1978). Around 70% of the specimens were identified to the species level using identification keys of Bulanova-Zachvatkina (1967) and Gilyarov (1975). About 150 preparation slides were created and labelled with data on taxon, locality, habitat, substrate, date and in some cases also with microscopic slide number. When completed, it was deposited in the Institute of Biology, University of Latvia. This particular collection was the first oribatid collection in Latvia and were used in further studies (Karps et al. 1990) as a model for identification. Still, the species from the collection remained unpublished. Later, the collection started to dry out, and became useless – medium cracked and air bubbles appeared in the microscopic slides.

Specimen renovation, or so-called remounting, has been conducted by numerous acarologists from time to time world-wide and appears to be a simple method. The cracked medium must be dissolved with alcohol or distilled water before the specimen is mounted in a new medium or placed in a 75% ethanol (Ewing 1909; Hammen 1952; Krivolutsky, Krasilov 1977; Metz et al. 1977; Schauff 2005).

However, the remounting procedure may not always be successful (Callogg, Perdomo 2009).

During the last two years, all available historical data was reviewed and a species list of Latvian oribatid mites was published (Kagainis 2010; Kagainis, Eitminavichute 2011; Kagainis, Spungis 2011; Kagainis 2011). However, the specimen material of the collection remained unrevised. Since a significant part of microscopic slides were damaged, identification of species was impossible without renovation.

The aim of the study was to revise and renovate the collection of oribatid mites in order to preserve it and regain conformity with the latest taxonomy of the group.

Materials and methods

Microscopic slides were sorted by their quality. Damaged slides were prepared for renovation.

The renovation started with rewriting old labels. Next, slides were placed in glass Petri dishes filled with water and placed on an electric stove with an operating temperature of 80 °C. Preparation slides were heated for twenty minutes. After the water had cooled, slides were dried on filter paper. Cover slips were removed and mites were placed in lactic acid for seven days. Cleared oribatid specimens were mounted in Hoyer's medium (Krantz 1978; Schauff 2005).

Each mite was positioned in a specific manner, depending on the family. All phthiracarids and euphthiracarids were positioned laterally. Nothridae and Camisiidae mites were oriented dorsally with leg I stretched out. Suctobelbids were positioned dorsally at an approximate angle of 40 degrees. Other oribatids were placed dorsally. In case of many individuals, mites were row-oriented for easier counting. Renovated specimen slides were maintained in a laboratory drying oven at 48 °C for seven days.

Specimens were observed under an Olympus BX41 microscope combined with a digital camera Olympus DP12. Species were identified following Weigmann (2006). Sex was determined by the presence or absence of an ovipositor, when possible. Data were ordered by locality, habitat and sampling date.

More detailed description of some localities is given further.

Locality 1. In 1981, a field study was carried out near a collective farm complex named „Ogre” (56°40'N, 24°58'E), situated in Jumprava village, municipality of Lielvārde. Samples were collected in a 40- to 50-year-old stand of Norway spruce. The site type was Pictum vacinosum. European white birch was recorded as minor species. *Pleurozium schreberi* and *Rhytidiadelphus triquetrus* were the dominant moss species. Common vascular plant species were *Oxalis acetosella*, *Vaccinium myrtillus*, *Rubus idaeus*, *Luzula pilosa*, *Mycelis muralis*, *Equisetum sylvaticum* and *Athyrium filix-femina* (Karps et al. 1990). Soils were sandy Podzolic. Evidence of pig slurry pollution from the collective farm was noted.

Locality 2. Coniferous forest near the town of Mazsalaca (57°53'N, 24°59'E). The site type was Pinetum myrtilli. *Pinus sylvestris* stands with age 30 to 200 years were sampled. Soils were poor sands with a thin humus layer (around 2 cm). The sampling sites were part of a long-term ecological research monitoring project (Jucevica, Melecis 2002).

Locality 3. Island of Moricsala (57°11'N, 22°08'E) in Usmas lake. The area is protected as a nature reserve (83 ha). Forests are dominated by nemoral tree species *Quercus robur* and *Tilia cordata* (Lapina et al. 1981).

Results

The revision and renovation of 152 microscope slides yielded 1230 mite individuals, which were identified to species level. Only 43 individuals were lost or significantly damaged during the process of renovation of the collection.

List of oribatid species

The order of Oribatida families in the list follows taxonomical principles and the species are ordered alphabetically. Records are ordered alphabetically by name of municipality (all underlined), and then by locality (if recorded), and chronologically by sampling date (dd. mm.yyyy). Then number of individuals and number of samples are given in brackets (if recorded). No non-English alphabet letters (ñ, e, ä, ö, ü, å, etc.) are used, and in these cases letters are written as non-accented letters (e.g. TRÄGÅRDH = TRAGARDH).

Abbreviations used in the text: m. – municipality, ♀(♀) – female(s), ♂(♂) – male(s), ad(s). – adult(s), REM. – remounted specimen(s), * – new species for the fauna of Latvia

Hypochthoniidae BERLESE, 1910

Hypochthonius C.L. KOCH, 1835

1. *Hypochthonius rufulus* C.L. KOCH, 1835

Lielvārde m., Jumprava, 03.09.1981, spruce forest, soil with pig slurry, 72 ♀♀, (16), leg. V. Spungis, det. V. Spungis; Mazsalaca m., 01.09.1992, pine forest, soil, 2 ♀♀, leg. V. Melecis, det. V. Spungis; 31.08.1994, pine forest, soil, 3 ♀♀, leg. V. Melecis, det. V. Spungis.

Eniochthoniidae GRANDJEAN, 1947

Eniochthonius GRANDJEAN, 1933

2. *Eniochthonius minutissimus* (BERLESE, 1903)

Mazsalaca m., 31.08.1994, pine forest, soil, 1 ♀, leg. V. Melecis, det. U. Kagainis.

Phthiracaridae PERTY, 1841

Phthiracarus PERTY, 1841

3. *Phthiracarus boresetosus* JACOT, 1930

Mazsalaca m., 31.08.1994, pine forest, soil, 1 ad., REM., leg. V. Melecis, det. U. Kagainis.

4. *Phthiracarus lentulus* (C.L. KOCH, 1841)

Mazsalaca m., 01.09.1992, pine forest, soil, 2 ads., REM., leg. V. Melecis, det. V. Spungis.

5. *Phthiracarus laevigatus* (C.L. KOCH, 1844)

Mazsalaca m., 01.09.1989, pine forest, soil, 1 ♀, 1 ad., REM., leg. V. Melecis, det. U. Kagainis; 01.09.1992, pine forest, soil, 7 ♀♀, 5 ads., leg. V. Melecis, det. U. Kagainis.

Steganacarus EWING, 1917

6. *Steganacarus (Atropacarus) striculus* (C.L. KOCH, 1835)

Mazsalaca m., 01.09.1992, pine forest, soil, 15 ♀♀, leg. V. Melecis, det. U. Kagainis; 31.08.1994, pine forest, soil, 11 ♀♀, leg. V. Melecis, det. U. Kagainis.

7. *Steganacarus (Steganacarus) applicatus* (SELLNICK, 1920)

Lielvārde m., Jumprava, 03.09.1981, spruce forest, soil with pig slurry, 15 ads., (11), REM., leg. V. Spungis, det. U. Kagainis.

8. *Steganacarus (Tropacarus) carinatus* (C.L. KOCH, 1841)

Mazsalaca m., 01.09.1989, pine forest, soil, 3 ads., REM., leg. V. Melecis, det. U. Kagainis; 31.08.1994, pine forest, soil, 10 ads., leg. V. Melecis, det. U. Kagainis.

Euphthiracaridae JACOT, 1930

Microtritia MARKEL, 1964

9. *Microtritia minima* (BERLESE, 1904)

Mazsalaca m., 31.08.1994, pine forest, soil, 10 ♀♀, leg. V. Melecis, det. U. Kagainis.

Rhysotritia MARKEL ET MEYER, 1959

10. *Rhysotritia ardua* (C.L. KOCH, 1840)

Mazsalaca m., 01.09.1989, pine forest, soil, 5 ♀♀, REM., leg. V. Melecis, det. U. Kagainis; 01.09.1992, pine forest, soil, 17 ♀♀, leg. V. Melecis, det. U. Kagainis; 31.08.1994, pine forest, soil, 2 ♀♀, leg. V. Melecis, det. U. Kagainis; Olaine m., 15 km from Riga, near E77 road, at hatchery, 01.10.1989, meadow,

soil, 2 ♀♀, (20), leg. V. Spungis, det. U. Kagainis.

Malaconothridae BERLESE, 1916

Malaconothrus BERLESE, 1904

11. *Malaconothrus monodactylus* (MICHAEL, 1888)

Mazsalaca m., 01.09.1989, pine forest, soil, 7 ♀♀, leg. V. Melecis, det. U. Kagainis; 01.09.1992, pine forest, soil, 2 ♀♀, leg. V. Melecis, det. U. Kagainis.

Nothridae BERLESE, 1896

Nothrus C.L. KOCH, 1835

12. *Nothrus palustris* C.L. KOCH, 1839

Lielvārde m., Jumprava, 03.09.1981, spruce forest, soil with pig slurry, 1 ♀, (23), leg. V. Spungis, det. V. Spungis; Ventspils m., Moricsala Nature Reserve, 16.11.1978, oak forest, soil, 4 ♀♀, (9), leg. V. Spungis, det. V. Spungis.

13. *Nothrus silvestris* NICOLET, 1855

Lielvārde m., Jumprava, 03.09.1981, spruce forest, soil with pig slurry, 1 ♀, (18), leg. V. Spungis, det. V. Spungis; Mazsalaca m., 01.09.1992, pine forest, soil, 11 ♀♀, leg. V. Melecis, det. V. Spungis; 31.08.1994, pine forest, soil, 6 ♀♀, leg. V. Melecis, det. V. Spungis.

Camisiidae OUDEMANS, 1900

Camisia HEYDEN VON, 1826

14. *Camisia biurus* (C.L. KOCH, 1839)*

Mazsalaca m., 01.09.1992, pine forest, soil, 8 ♀♀, leg. V. Melecis, det. V. Spungis; 31.08.1994, pine forest, soil, 7 ♀♀, leg. V. Melecis, det. V. Spungis.

15. *Camisia solhoeyi* COLLOFF, 1993*

Mazsalaca m., 01.09.1989, pine forest, soil, 3 ♀♀, REM., leg. V. Melecis, det. V. Spungis.

16. *Camisia spinifer* (C.L. KOCH, 1835)

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 1 ♀, leg. V. Spungis, det. V. Spungis; Mazsalaca m., 01.09.1989, pine forest, soil, 7 ♀♀, leg. V. Melecis, det. V. Spungis; 31.08.1994, pine forest, soil, 2 ♀♀, leg. V. Melecis, det. V. Spungis.

Heminothrus BERLESE, 1913

17. *Heminothrus longisetosus* WILLMANN, 1925

Mazsalaca m., 01.09.1989, pine forest, soil, 6 ♀♀, leg. V. Melecis, det. U. Kagainis; 31.08.1994, pine forest, soil, 3 ♀♀, leg. V. Melecis, det. U. Kagainis.

Platynothrus BERLESE, 1913

18. *Platynothrus peltifer* (C.L. KOCH, 1839)

Olaine m., 15 km from Riga, near E77 road, at hatchery, 01.10.1989, meadow, soil, 1 ♀, REM., leg. V. Spungis, det. V. Spungis; Ventspils m., Moricsala Nature Reserve, 16.11.1978, oak forest, soil, 6 ♀♀, REM., leg. V. Spungis, det. V. Spungis.

Nanhermanniidae SELLNICK, 1928

Nanhermannia BERLESE, 1913

19. *Nanhermannia cf. coronata* BERLESE, 1913*

Lielvārde m., Jumprava, 03.09.1981, spruce forest, soil with pig slurry, 5 ♀♀, (14), REM., leg. V. Spungis, det. U. Kagainis; Mazsalaca m., 01.09.1992, pine forest, soil, 11 ♀♀, leg. V. Melecis, det. V. Spungis.

20. *Nanhermannia komareki* KUNST, 1956

Mazsalaca m., 31.08.1994, pine forest, soil, 8 ♀♀, leg. V. Melecis, det. U. Kagainis.

Neoliodidae SELLNICK, 1928

Poroliodes GRANDJEAN, 1934

21. *Poroliodes farinosus* (C.L. KOCH, 1840)

Lielvārde m., Jumprava, 03.09.1981, spruce forest, soil with pig slurry, 1 ♂, (23), REM., leg. V. Spungis, det. U. Kagainis.

Damaeidae BERLESE, 1896

Damaeus C.L. KOCH, 1835

22. *Damaeus riparius* NICOLET, 1885*

Ventspils m., Moricsala Nature Reserve, 16.11.1978, oak forest, soil, 4 ♀♀, 6 ♂♂, (2), REM., leg. V. Spungis, det. V. Spungis.

Porobelba GRANDJEAN, 1936

23. *Porobelba spinosa* (SELLNICK, 1920)*

Mazsalaca m., 01.09.1992, pine forest, soil, 5 ♀♀, 2 ♂♂, 2 ads., leg. V. Melecis, det. U. Kagainis; 31.08.1994, pine forest, soil, 6 ♀♀, 1 ♂, (15), REM., leg. V. Melecis, det. U. Kagainis.

Spatiodamaeus BULANOVA-ZACHVATKINA, 1957

24. *Spatiodamaeus verticillipes* (NICOLET, 1855)

Mazsalaca m., 01.09.1992, pine forest, soil, 6 ♀♀, 3 ♂♂, REM., leg. V. Melecis, det. U. Kagainis; 31.08.1994, pine forest, soil, 1 ♀, 2 ♂♂, REM., leg. V. Melecis, det. U. Kagainis.

Eremaeidae OUDEMANS, 1900

Eremaeus C.L. KOCH, 1835

25. *Eremaeus hepaticus* C.L. KOCH, 1835

Mazsalaca m., 01.09.1989, pine forest, soil, 1 ♂, leg. V. Melecis, det. A. Baranovska; 01.09.1992, pine forest, soil, 5 ♀♀, 9 ads., leg. V. Melecis, det. A. Baranovska; 31.08.1994, pine forest, soil, 3 ♀♀, 4 ♂♂, leg. V. Melecis, det. A. Baranovska.

Eueremaes MIHELICIC, 1963

26. *Eueremaes oblongus* (C.L. KOCH, 1835)

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 1 ♂, REM., leg. V. Spungis, det. U. Kagainis; Mazsalaca m., 31.08.1994, pine forest, soil, 2 ♂♂, leg. V. Melecis, det. U. Kagainis.

27. *Eueremaes silvestris* (FORSSLUND, 1956)

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 8 ♀♀, 10 ♂♂, REM., leg. V. Spungis, det. U. Kagainis; Mazsalaca m., 01.09.1989, pine forest, soil, 4 ♀♀, 6 ads., leg. V. Melecis, det. U. Kagainis; 1 ♂, REM., leg. V. Melecis, det. U. Kagainis; 01.09.1992, pine forest, soil, 1 ♀, 6

ads., leg. V. Melecis, det. U. Kagainis.

Astegistidae BALOGH, 1961

Furcoribula BALOGH, 1943

28. *Furcoribula furcillata* (NORDENSKIOLD, 1901)

Mazsalaca m., 01.09.1992, pine forest, soil, 1 ♀, 3 ♂♂, 10 ads., leg. V. Melecis, det. V. Spungis; 31.08.1994, pine forest, soil, 3 ♀♀, 4 ♂♂, leg. V. Melecis, det. V. Spungis.

Liacaridae SELLNICK, 1928

Adoristes HULL, 1916

29. *Adoristes ovatus* (C.L. KOCH, 1839)

Mazsalaca m., 01.09.1992, pine forest, soil, 1 ♂, REM., leg. V. Melecis, det. U. Kagainis; 5 ♀♀, leg. V. Melecis, det. V. Spungis; 31.08.1994, pine forest, soil, 3 ♀♀, 2 ♂♂, 3 ads., leg. V. Melecis, det. V. Spungis.

Liacarus MICHAEL, 1898

30. *Liacarus subterraneus* (C.L. KOCH, 1841)*

Lielvārde m., Jumprava, 09.07.1981, spruce forest, soil with pig slurry, 1 ♀, REM., leg. V. Spungis, det. U. Kagainis.

Carabodidae C.L. KOCH, 1843

Carabodes C.L. KOCH, 1835

31. *Carabodes coriaceus* C.L. KOCH, 1835

Ventspils m., Moricsala Nature Reserve, 16.11.1978, oak forest, soil, 3 ♀♀, (15), REM., leg. V. Spungis, det. U. Kagainis.

32. *Carabodes femoralis* (NICOLET, 1855)

Lielvārde m., Jumprava, 09.07.1981, spruce forest, soil with pig slurry, 1 ♀, (17), REM., leg. V. Spungis, det. V. Spungis; 1 ad., leg. V. Spungis, det. V. Spungis.

33. *Carabodes labyrinthicus* (MICHAEL, 1879)

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 1 ♀, REM., leg. V. Spungis, det. U. Kagainis;

Ventspils m., Moricsala Nature Reserve, 16.11.1978, oak forest, soil, 1 ♀, leg. V. Spungis, det. U. Kagainis.

34. *Carabodes ornatus* STORKAN, 1925

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 1 ♂, REM., leg. V. Spungis, det. U. Kagainis; 9 ads., leg. V. Spungis, det. V. Spungis; Mazsalaca m., 01.09.1992, pine forest, soil, 1 ad., leg. V. Melecis, det. U. Kagainis; 31.08.1994, pine forest, soil, 6 ads., leg. V. Melecis, det. U. Kagainis;

Ventspils m., Moricsala Nature Reserve, 16.11.1978, oak forest, soil, 1 ♂, (16), REM., leg. V. Spungis, det. U. Kagainis.

35. *Carabodes subarcticus* TRAGARDH, 1902

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 3 ♀♀, 4 ♂♂, REM., leg. V. Spungis, det. U. Kagainis; Lielvārde m., Jumprava, 09.07.1981, spruce forest, soil with pig slurry, 2 ♂♂, (17), REM., leg. V. Spungis, det. U. Kagainis; Mazsalaca m., 31.08.1994, pine forest, soil, 2 ♀♀, 1 ♂, 2 ads., leg. V. Melecis, det. U. Kagainis.

Tectocephidae OUDEMANS, 1900

Tectocephus BERLESE, 1895

36. *Tectocephus velatus sarekensis* TRAGARDH, 1910

Olaine m., 15 km from Riga, near E77 road, at hatchery, 18.07.1989, meadow, soil, 18 ♀♀, REM., leg. V. Spungis, det. U. Kagainis.

37. *Tectocephus velatus velatus* (MICHAEL, 1880)

Mazsalaca m., 01.09.1992, pine forest, soil, 15 ♀♀, leg. V. Melecis, det. V. Spungis; 31.08.1994, pine forest, soil, 7 ♀♀, leg. V. Melecis, det. V. Spungis; Zilupe m., 06.07.1979, meadow, soil, 19 ♀♀, leg. I. Lapina, det. V. Spungis.

Quadropiidae BALOGH, 1983

Quadropia JACOT, 1939

38. *Quadropia quadricarinata* (MICHAEL, 1885)

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 1 ad., leg. V. Spungis, det. U. Kagainis; Olaine m., 15 km from Riga, near E77 road, at hatchery, 01.10.1989, meadow, soil, 2 ads., leg. V. Spungis, det. V. Spungis.

Oppidae GRANDJEAN, 1951

Microppia BALOGH, 1983

39. *Microppia minus* (PAOLI, 1908)

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 28 ♀♀, REM., leg. V. Spungis, det. V. Spungis; Mazsalaca m., 31.08.1994, pine forest, soil, 2 ♀♀, leg. V. Melecis, det. U. Kagainis; Olaine m., 15 km from Riga, near E77 road, at hatchery, 18.07.1989, meadow, soil, 1 ♀, leg. V. Spungis, det. V. Spungis.

Oppiella JACOT, 1937

40. *Oppiella (Oppiella) nova* (OUDEMANS, 1902)

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 23 ♀♀, leg. V. Spungis, det. V. Spungis; Mazsalaca m., 31.08.1994, pine forest, soil, 8 ♀♀, leg. V. Melecis, det. U. Kagainis; 1 ♀, REM., leg. V. Melecis, det. U. Kagainis; Olaine m., 15 km from Riga, near E77 road, at hatchery, 18.07.1989, meadow, soil, 2 ♀♀, (18), leg. V. Spungis, det. V. Spungis.

41. *Oppiella (Rhinoppia) subpectinata* (OUDEMANS, 1900)

Mazsalaca m., 31.08.1994, pine forest, soil, 1 ♀, 2 ♂♂, leg. V. Melecis, det. U. Kagainis.

Suctobelbidae JACOT, 1938

Suctobelbella JACOT, 1937

42. *Suctobelbella falcata* (FORSSLUND, 1941)*

Mazsalaca m., 31.08.1994, pine forest, soil, 1 ad., leg. V. Melecis, det. U. Kagainis; 1 ♀, REM., leg. V. Melecis, det. U. Kagainis.

43. *Suctobelbella sarekensis* (FORSSLUND, 1941)*

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 22 ads., REM., leg. V. Spungis, det. U. Kagainis; Olaine m., 15 km from Riga, near E77 road, at hatchery, 18.07.1989, meadow, soil, 1 ad., leg. V. Spungis, det. U. Kagainis; Olaine m., 15 km from Riga, near E77 road, at hatchery, 01.10.1989, meadow, soil, 1 ad., (17), leg. V. Spungis, det. U. Kagainis.

44. *Suctobelbella similis* (FORSSLUND, 1941)*

Mazsalaca m., 31.08.1994, pine forest, soil, 2 ads., REM., leg. V. Melecis, det. U. Kagainis; 1 ♀, REM., leg. V. Melecis, det.

U. Kagainis.

45. *Suctobelbella subcornigera* (FORSSLUND, 1941)

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 2 ads., leg. V. Spungis, det. U. Kagainis; 26 ads., (9), REM., leg. V. Spungis, det. U. Kagainis.

46. *Suctobelbella subtrigona* (OUDEMANS, 1916)

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 24 ads., leg. V. Spungis, det. V. Spungis; Mazsalaca m., 31.08.1994, pine forest, soil, 2 ads., leg. V. Melecis, det. U. Kagainis; Olaime m., 15 km from Riga, near E77 road, at hatchery, 01.10.1989, meadow, soil, 1 ad., (17), leg. V. Spungis, det. U. Kagainis.

Autognetidae GRANDJEAN, 1960

Conchogneta GRANDJEAN, 1963

47. *Conchogneta trageardhi* (FORSSLUND, 1947)

Mazsalaca m., 31.08.1994, pine forest, soil, 8 ♀♀, leg. V. Melecis, det. U. Kagainis.

Passalozetidae GRANDJEAN, 1954

Passalozetes GRANDJEAN, 1932

48. *Passalozetes perforatus* (BERLESE, 1910)*

Olaime m., 15 km from Riga, near E77 road, at hatchery, 18.07.1989, meadow, soil, 1 ♀, 3 ♂♂, REM., leg. V. Spungis, det. U. Kagainis.

Scutoverticidae GRANDJEAN, 1954

Scutovertex MICHAEL, 1879

49. *Scutovertex sculptus* MICHAEL, 1879

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 2 ♀♀, 7 ♂♂, 5 ads., leg. V. Spungis, det. V. Spungis.

Phenopelopidae PETRUNKEVICH, 1955

Eupelops EWING, 1917

50. *Eupelops occultus* (C.L. KOCH, 1835)

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 1 ♂, REM., leg. V. Spungis, det. U. Kagainis.

51. *Eupelops torulosus* (C.L. KOCH, 1840)

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 1 ♀, 2 ♂♂, leg. V. Spungis, det. V. Spungis; Lielvārde m., Jumprava, 09.07.1981, spruce forest, soil with pig slurry, 5 ♀♀, 6 ♂♂, (13), REM., leg. V. Spungis, det. V. Spungis; Mazsalaca m., 01.09.1989, pine forest, soil, 2 ads., leg. V. Melecis, det. U. Kagainis; Mazsalaca m., 01.09.1992, pine forest, soil, 2 ♀♀, 2 ♂♂, REM., leg. V. Melecis, det. U. Kagainis; 2 ♂♂, 5 ads., leg. V. Melecis, det. V. Spungis; Mazsalaca m., 31.08.1994, pine forest, soil, 3 ♀♀, 6 ads., leg. V. Melecis, det. U. Kagainis; 1 ♂, 2 ads., V. Melecis, det. V. Spungis.

Peloptulus BERLESE, 1908

52. *Peloptulus phaenotus* (C.L. KOCH, 1844)

Olaime m., 15 km from Riga, near E77 road, at hatchery, 01.10.1989, meadow, soil, 8 ♀♀, 3 ♂♂, REM., leg. V. Spungis, det. U. Kagainis.

Achipteriidae THOR, 1929

Achipteria BERLESE 1885

53. *Achipteria coleoptrata* (LINNE, 1758)

Olaime m., 15 km from Riga, near E77 road, at hatchery, 18.07.1989, meadow, soil, 20 ♀♀, REM., leg. V. Spungis, det. U. Kagainis.

Parachipteria HAMMEN VAN DER, 1952

54. *Parachipteria punctata* (NICOLET, 1855)

Mazsalaca m., 01.09.1992, pine forest, soil, 3 ♀♀, 3 ♂♂, 7 ads., leg. V. Melecis, det. V. Spungis; 31.08.1994, pine forest, soil, 2 ♀♀, 1 ♂, 1 ad., leg. V. Melecis, det. V. Spungis.

Tectoribates BERLESE, 1910

55. *Tectoribates ornatus* (SCHUSTER, 1958)*

Olaime m., 15 km from Riga, near E77 road, at hatchery, 18.07.1989, meadow, soil, 12 ♀♀, 5 ♂♂, 4 ads., leg. V. Spungis, det. V. Spungis.

Oribatellidae JACOT, 1925

Oribatella BANKS, 1895

56. *Oribatella quadricornuta* MICHAEL, 1880

Mazsalaca m., 01.09.1989, pine forest, soil, 1 ♂, leg. V. Melecis, det. V. Spungis.

Galumnidae JACOT, 1925

Galumna VON HEYDEN, 1826

57. *Galumna lanceata* (OUDEMANS, 1900)

Lielvārde m., Jumprava, 03.09.1981, spruce forest, soil with pig slurry, 6 ♀♀, 7 ads., (12), leg. V. Spungis, det. V. Spungis; Mazsalaca m., 01.09.1992, pine forest, soil, 1 ♂, 13 ads., leg. V. Melecis, det. U. Kagainis; 31.08.1994, pine forest, soil, 3 ♀♀, 3 ♂♂, 2 ads., leg. V. Melecis, det. U. Kagainis; Olaime m., 15 km from Riga, near E77 road, at hatchery, 01.10.1989, meadow, soil, 1 ad., leg. V. Spungis, det. V. Spungis.

58. *Galumna obvia* (BERLESE, 1915)

Lielvārde m., Jumprava, 03.09.1981, spruce forest, soil with pig slurry, 14 ads., (7), leg. V. Spungis, det. V. Spungis.

Pergalumna GRANDJEAN, 1936

59. *Pergalumna nervosa* (BERLESE, 1914)

Mazsalaca m., 01.09.1989, pine forest, soil, 1 ♀, 1 ad., leg. V. Melecis, det. U. Kagainis; 01.09.1992, pine forest, soil, 6 ♀♀, 5 ♂♂, REM., leg. V. Melecis, det. U. Kagainis; 31.08.1994, pine forest, soil, 1 ♂, 3 ads., leg. V. Melecis, det. U. Kagainis; 1 ♀, REM., leg. V. Melecis, det. U. Kagainis.

Ceratozetidae JACOT, 1925

Ceratozetes BERLESE, 1908

60. *Ceratozetes gracilis* (MICHAEL, 1884)

Mazsalaca m., 01.09.1992, pine forest, soil, 5 ♀♀, 18 ads., leg. V. Melecis, det. V. Spungis; Olaime m., 15 km from Riga, near E77 road, at hatchery, 18.07.1989, meadow, soil, 3 ads., leg. V. Spungis, det. U. Kagainis.

61. *Ceratozetes mediocris* BERLESE, 1908

Olaine m., 15 km from Riga, near E77 road, at hatchery, 18.07.1989, meadow, soil, 1 ad., leg. V. Spungis, det. U. Kagainis.

62. *Ceratozetes thienemanni* WILLMANN, 1943*

Mazsalaca m., 31.08.1994, pine forest, soil, 4 ♀♀, leg. V. Melecis, det. U. Kagainis.

Diapterobates GRANDJEAN, 1936

63. *Diapterobates humeralis* (HERMANN, 1804)

Mazsalaca m., 01.09.1989, pine forest, soil, 1 ♀, 1 ad., leg. V. Melecis, det. U. Kagainis.

Fuscozetes SELLNICK, 1928

64. *Fuscozetes setosus* (C.L. KOCH, 1839)

Mazsalaca m., 01.09.1992, pine forest, soil, 2 ♀♀, 1 ♂, 6 ads., leg. V. Melecis, det. U. Kagainis; 31.08.1994, pine forest, soil, 1 ♀, 1 ad., leg. V. Melecis, det. U. Kagainis.

Trichoribates BERLESE, 1910

65. *Trichoribates novus* (SELLNICK, 1928)

Lielvārde m., Jumprava, 03.09.1981, spruce forest, soil with pig slurry, 1 ♀, (5), REM., leg. V. Spungis, det. V. Spungis; 1 ♀, (9), REM., leg. V. Spungis, det. V. Spungis; 1 ♂, (8), REM., leg. V. Spungis, det. U. Kagainis; Mazsalaca m., 31.08.1994, pine forest, soil, 1 ♂, leg. V. Melecis, det. U. Kagainis; Zilupe m., 06.07.1979, meadow, soil, 11 ♀♀, 1 ♂, REM., leg. I. Lapina, det. U. Kagainis.

Chamobatidae GRANDJEAN, 1954

Chamobates HULL, 1916

66. *Chamobates borealis* (TRAGARDH, 1902)

Mazsalaca m., 31.08.1994, pine forest, soil, 6 ♀♀, 2 ♂♂, leg. V. Melecis, det. U. Kagainis.

67. *Chamobates cuspidatus* (MICHAEL, 1884)

Lielvārde m., Jumprava, 03.09.1981, spruce forest, soil with pig slurry, 1 ♂, (9), REM., leg. V. Spungis, det. U. Kagainis; 35 ads., leg. V. Spungis, det. U. Kagainis; Mazsalaca m., 01.09.1992, pine forest, soil, 4 ♀♀, 2 ♂♂, 9 ads., leg. V. Melecis, det. V. Spungis; 31.08.1994, pine forest, soil, 5 ♀♀, 6 ads., leg. V. Melecis, det. V. Spungis.

Mycobatidae GRANDJEAN, 1954

Minunthozetes HULL, 1916

68. *Minunthozetes semirufus* (C.L. KOCH, 1841)

Lielvārde m., Jumprava, 03.09.1981, spruce forest, soil with pig slurry, 26 ads., (20), leg. V. Spungis, det. U. Kagainis.

Punctoribates BERLESE, 1908

69. *Punctoribates hexagonus* BERLESE, 1908

Zilupe m., 06.07.1979, meadow, soil, 2 ♀♀, 1 ♂, REM., leg. I. Lapina, det. U. Kagainis.

70. *Punctoribates punctum* (C.L. KOCH, 1839)

Lielvārde m., Jumprava, 03.09.1981, spruce forest, soil with pig slurry, 11 ♀♀, 9 ♂♂, leg. V. Spungis, det. V. Spungis;

Olaine m., 15 km from Riga, near E77 road, at hatchery, 01.10.1989, meadow, soil, 13 ♀♀, 4 ♂♂, 4 ads., leg. V. Spungis, det. U. Kagainis; Zilupe m., 06.07.1979, meadow, soil, 5 ♀♀, 3 ♂♂, REM., leg. I. Lapina, det. U. Kagainis.

Euzetidae GRANDJEAN, 1954

Euzetes BERLESE, 1908

71. *Euzetes globulus* (NICOLET, 1855)

Lielvārde m., Jumprava, 09.07.1981, spruce forest, soil with pig slurry, 3 ♀♀, 4 ♂♂, (26), REM., leg. V. Spungis, det. V. Spungis.

Scheloribatidae GRANDJEAN, 1933

Liebstadia OUDEMANS, 1906

72. *Liebstadia pannonica* (WILLMANN, 1951)*

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 1 ♀, 3 ♂♂, REM., leg. V. Spungis, det. U. Kagainis.

73. *Liebstadia similis* (MICHAEL, 1888)

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 5 ♂♂, REM., leg. V. Spungis, det. U. Kagainis; Lielvārde m., Jumprava, 03.09.1981, spruce forest, soil with pig slurry, 16 ♀♀, 34 ♂♂, (2), REM., leg. V. Spungis, det. V. Spungis; Olaine m., 15 km from Riga, near E77 road, at hatchery, 18.07.1989, meadow, soil, 1 ♀, REM., leg. V. Spungis, det. V. Spungis.

Scheloribates BERLESE, 1908

74. *Scheloribates (Hemileius) initialis* (BERLESE, 1908)

Mazsalaca m., 01.09.1992, pine forest, soil, 4 ♀♀, 6 ♂♂, REM., leg. V. Melecis, det. U. Kagainis; 31.08.1994, pine forest, soil, 3 ♀♀, 3 ♂♂, REM., leg. V. Melecis, det. U. Kagainis.

75. *Scheloribates laevigatus* (C.L. KOCH, 1836)

Jūrmala m., Priedaine, near E22 road, 21.08.1979, pine forest, soil, 5 ♀♀, 3 ♂♂, 15 ads., leg. V. Spungis, det. V. Spungis; Mazsalaca m., 01.09.1992, pine forest, soil, 4 ♀♀, 12 ads., leg. V. Melecis, det. U. Kagainis; 31.08.1994, pine forest, soil, 3 ♀♀, 3 ♂♂, REM., leg. V. Melecis, det. U. Kagainis; Olaine m., 15 km from Riga, near E77 road, at hatchery, 18.07.1989, meadow, soil, 12 ♀♀, 8 ♂♂, REM., leg. V. Spungis, det. U. Kagainis.

76. *Scheloribates latipes* (C.L. KOCH, 1844)

Mazsalaca m., 01.09.1989, pine forest, soil, 2 ♀♀, 3 ♂♂, REM., leg. V. Melecis, det. U. Kagainis; 31.08.1994, pine forest, soil, 3 ♀♀, 2 ♂♂, REM., leg. V. Melecis, det. U. Kagainis; Olaine m., 15 km from Riga, near E77 road, at hatchery, 01.10.1989, meadow, soil, 18 ads., leg. V. Spungis, det. U. Kagainis.

Oribatulidae THOR, 1929

Oribatula BERLESE, 1895

77. *Oribatula tibialis* (NICOLET, 1855)

Mazsalaca m., 01.09.1992, pine forest, soil, 6 ♀♀, 1 ♂, REM., leg. V. Melecis, det. U. Kagainis; 31.08.1994, pine forest, soil, 2 ♀♀, 4 ♂♂, REM., leg. V. Melecis, det. U. Kagainis.

Table 1. Species list (arranged taxonomically) of oribatid specimen collection of Institute of Biology, University of Latvia compared with present species identification after the renovation. * – sequence of the species from the present list

No	Taxa according to original labels	Identified incorrectly	Identified correctly
1	<i>Hypothonius rufulus</i> C.L. KOCH		1
2	<i>Phthiracarus lentulus</i> (C.L. KOCH)		5
3	<i>Steganacarus magnus</i> (NICOLET, 1855)	7	
4	<i>Euphthiracarus cribrarius</i> (BERLESE)	10	
5	<i>Rhysotritia duplicata</i> (GRANDJEAN)	10	
6	<i>Nothrus palustris</i> C.L. KOCH		12
7	<i>Nothrus silvestris</i> NICOLET		13
8	<i>Camisia biurus</i> (C.L. KOCH)		14
9	<i>Camisia lapponica</i> (TRAGARDH)		15
10	<i>Camisia spinifer</i> (C.L. KOCH)		16
11	<i>Heminothrus thori</i> (BERLESE)	19	
12	<i>Platynothrus peltifer</i> (C.L. KOCH)		18
13	<i>Nanhermannia coronata</i> BERLESE	20	19
14	<i>Liodes theleproctus</i> (HERMANN)	21	
15	<i>Damaeus riparius</i> (NICOLET)		22
16	<i>Furcoribula furcillata</i> NORDENSKIOLD		28
17	<i>Adoristes ovatus</i> (C.L. KOCH)		29
18	<i>Liacarus coracinus</i> (C.L. KOCH)	30	
19	<i>Carabodes areolatus</i> BERLESE	35	
20	<i>Carabodes femoralis</i> (NICOLET, 1855)	31	32
21	<i>Carabodes forsslundi</i> SELLNICK		34
22	<i>Carabodes marginatus</i> (MICHAEL)	33, 34, 35	
23	<i>Carabodes minusculus</i> BERLESE	33	
24	<i>Carabodes reticulatus</i> BERLESE	31, 34	
25	<i>Tectocephus velatus</i> MICHAEL	36, 48	37
26	<i>Quadroppia quadricarinata</i> (MICHAEL)	43, 46	38
27	<i>Oppia minutissima</i> (PAOLI)		27
28	<i>Oppia nova</i> (OUDEMANS)	43	40
29	<i>Oppia neerlandica</i> OUDEMANS		40
30	<i>Suctobelbella forsslundi</i> (STRENZKE, 1956)	45	
31	<i>Suctobelbella nasalis</i> (FORSSLUND, 1950)	38, 43, 45	
32	<i>Suctobelbella subtrigona</i> (OUDEMANS)		46
33	<i>Passalozetes africanus</i> GRANDJEAN, 1933	27	
34	<i>Scutovertex sculptus</i> MICHAEL		49
35	<i>Eupelops bilofus</i> SELLNICK	52	
36	<i>Eupelops occultus</i> (C.L. KOCH)	51, 65	
37	<i>Eupelops plicatus</i> (C.L. KOCH)	51	
38	<i>Eupelops torulosus</i> (C.L. KOCH, 1836)	50	51
39	<i>Parachipteria punctata</i> (NICOLET)	53	54
40	<i>Oribatella quadricornuta</i> MICHAEL		56
41	<i>Tectoribates ornatus</i> (SCHUSTER, 1958)		55
42	<i>Galumna allata</i> (HERMANN)	59	
43	<i>Galumna europaea</i> BERLESE, 1914	57	
44	<i>Galumna lanceata</i> (OUDEMANS)		57
45	<i>Galumna obvia</i> (BERLESE)	59	58
46	<i>Ceratozetes gracilis</i> (MICHAEL)	62, 66	60
47	<i>Fuscozetes fuscipes</i> (C.L. KOCH)	64, 75	

(continued)

Table 1. continued

No	Taxa according to original labels	Identified incorrectly	Identified correctly
48	<i>Punctoribates punctum</i> (C.L. KOCH)	44, 45, 49	51
49	<i>Trichoribates novus</i> (SELLNICK, 1928)		65
50	<i>Trichoribates trimaculatus</i> (C.L. KOCH)	65	
51	<i>Chamobates cuspidatus</i> (MICHAEL)		67
52	<i>Minunthozetes pseudofusiger</i> (SCHWEIZER)	68	
53	<i>Minunthozetes semirufus</i> (C.L. KOCH)	69, 70	
54	<i>Punctoribates punctum</i> (C.L. KOCH)	60, 61, 67	70
55	<i>Euzetes globulus</i> (NICOLET, 1955)		72
56	<i>Liebstadia humerata</i> SELLNICK, 1928	72	
57	<i>Liebstadia similis</i> (MICHAEL)	75	73
58	<i>Scheloribates laevigatus</i> (C.L. KOCH)	29, 73, 74, 76, 77	75
	Species identified to genera	3, 4, 6, 8, 17, 23, 24, 25, 26, 27, 34 35, 51, 63, 64, 65, 75, 76	
	Species identified to familie	9, 39, 40, 41, 42, 44, 46, 47, 59	
	Taxa unidentified	2, 11, 13, 23	

Discussion

The following 13 species from the collection are published as a part of the fauna of Latvia for the first time: *Camisia biurus* (C.L. KOCH, 1839), *Camisia solhoeyi* COLLOF, 1993, *Nanhermannia* cf. *coronata* BERLESE, 1913, *Damaeus riparius* NICOLET, 1885, *Porobelba spinosa* (SELLNICK, 1920), *Liacarus subterraneus* (C.L. KOCH, 1841), *Suctobelbella falcata* (FORSSLUND, 1941), *Suctobelbella sarekensis* (FORSSLUND, 1941), *Suctobelbella similis* (FORSSLUND, 1941), *Passelozetes perforatus* (BERLESE, 1910), *Tectoribates ornatus* (SCHUSTER, 1958), *Ceratozetes thienemanni* WILLMANN, 1943, *Liebstadia pannonica* (WILLMANN, 1951). Considering our earlier published lists (Kagainis 2011; Kagainis, Eitminavichute 2011), presently 199 oribatid species are known for the fauna of Latvia.

More than one third (39%) of the identified species matched with the data on the original labels (Table 1). There are several reasons for the high discrepancy in the identification. Firstly, about 26% of the oribatid mites of the collection were not identified to species level. Secondly, taxonomy of oribatids has been changed many times since the 1980's (Kagainis 2011), and species have been moved to different genera and even to different families (Weigmann 2006). Thirdly, the determination keys used during the preparation of the collection in the 1980s (Bulanova-Zachvatkina 1967; Gilyarov 1975) can not be regarded as perfect and correct compared with recently available keys. Species descriptions in the newest determination keys are more detailed. More rational morphological features are used to distinguish similar species (Weigmann 2006).

Only 3% of all mite individuals from the collection were lost during the remounting or were significantly damaged. Perhaps, if white coloured and smaller Petri dish were used, mites would not have been lost. While failed renovation

procedures have been experienced also by other authors (Callogg, Perdomo 2009), the chosen renovation technique in present study can be stated as successful.

Based on the previous experience of numerous authors (Ewing 1909; Hammen 1952; Krivolutsky, Krasilov 1977; Metz et al. 1977; Schauff 2005; Callogg, Perdomo 2009) it seems clear that renovation can be a very important part of taxonomical study. The renovated and revised collection of the present research not only provided several species new to the fauna of Latvia that were not yet published, but also can be useful in the future to regain conformity with the latest taxonomy of the group. The results of this study can be used to ease interpolations of identification if additional material that is taxonomically out-dated and unrevised is found.

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