

Some remarkable Oribatida (Acari) new to the fauna of Baden-Württemberg

RAYMOND A. LAMOS

Abstract

Collection records for Baden-Württemberg in Germany are provided for seven rare oribatid mite species, five of which are so far unknown from this federal state. The species *Camisia biverrucata* (C. L. KOCH, 1840), *Microzetorchestes emeryi* (COGGI, 1898), *Neoliodes theleproctus* (HERMANN, 1804), *Parhypochthonius aphidinus* BERLESE, 1904 and *Scapheremaeus palustris* (SELLNICK, 1924) were discovered in sites in Mannheim. *Camisia invenusta* (MICHAEL, 1888) and *Licnobelba latiflabellata* (PAOLI, 1908) originate from the Königstuhl mountain near Heidelberg. *Camisia invenusta* is recorded for the first time in Germany.

Kurzfassung

Einige bemerkenswerte Oribatida (Acari) neu für die Fauna Baden-Württembergs

Sieben seltene Oribatidenarten wurden in Baden-Württemberg gesammelt und werden hier vorgestellt. Fünf Arten sind neu für Baden-Württemberg. Die Arten *Camisia biverrucata* (C. L. KOCH, 1840), *Microzetorchestes emeryi* (COGGI, 1898), *Neoliodes theleproctus* (HERMANN, 1804), *Parhypochthonius aphidinus* BERLESE, 1904 und *Scapheremaeus palustris* (SELLNICK, 1924) wurden in Mannheim entdeckt. *Camisia invenusta* (MICHAEL, 1888) und *Licnobelba latiflabellata* (PAOLI, 1908) stammen vom Berg Königstuhl bei Heidelberg. *Camisia invenusta* wird zum ersten Mal für Deutschland nachgewiesen.

Author

RAYMOND A. LAMOS, Rosenstr. 21, 68199 Mannheim;
E-mail: cicindela127@protonmail.com

Introduction

A comprehensive monograph on the oribatid fauna of South-West Germany was recently provided by BECK, HORAK and WOAS (2018). In the following I will present distribution records for some rarely collected Oribatida not listed by these authors and which, to the best of my knowledge, are up to now unknown from Baden-Württemberg. Additionally, new records for *Licnobelba latiflabellata* (PAOLI, 1908) and *Parhypochthonius aphidinus* BERLESE, 1904, each so far known from South-West Germany on the basis of only a single occurrence, are supplied.

Methods

The mites were extracted from the collected material either by hand employing a fine brush, or by using a Berlese funnel. They were fixed in 70 % ethanol, macerated in lactic acid and examined under a light microscope. Specimens were stored in microvials in 70 % ethanol. All Oribatida were collected by the author. Altitude values in the text are given in metres above mean sea level. One or more representatives of each species were deposited as voucher specimens in the oribatid collection of the Zoology section of the State Museum of Natural History Karlsruhe, in Germany.

Results and Discussion

Camisia biverrucata (C. L. KOCH, 1840)

Original combination: *Nothrus biverrucatus* C. L. KOCH, 1840.

Species identification based on KOCH (1840: section 15), COLLOFF (1993: 1391, 1404), OLSZANOWSKI (1996: 25, 40) and WEIGMANN (2006: 152).

Collected in the Dossenwald in Mannheim at an elevation of 112 m from fruticose lichen (*Cladonia* HILL ex P. BROWNE), growing under Scots pine (*Pinus sylvestris* L.). Collection date 11.10.2009. Nine adults were found.

Comments: This is the first record of the species for Baden-Württemberg. *Camisia biverrucata* is noted to occur in Saxony, Thuringia and Schleswig-Holstein by WEIGMANN et al. (2015), who consider it a rare species. It is also known from Austria, Switzerland and the Italian Alps and shows a Holarctic distribution (SCHATZ 2020). The name *Camisia biverrucata* is dated to 1839 by virtually all authors mentioning it, including COLLOFF (1993), OLSZANOWSKI (1996) and WEIGMANN (2006). I here follow MICHAEL (1898: 71) and WILLMANN (1931: 109) in dating the species to 1840 instead. An original print of KOCH's Vol. 29 of "Deutschlands Crustaceen, Myriapoden und Arachniden" in the Bavarian State Library, in which *Camisia biverrucata* is described, is dated to 1840. The descriptions of three other Crotonioidea THORELL, 1876, namely *Camisia biurus* (C. L. KOCH, 1840), *Nothrus palustris* C. L. KOCH,

1840 and *Platynothrus peltifer* (C. L. KOCH, 1840) similarly were first published in 1840 instead of in 1839.

Camisia invenusta (MICHAEL, 1888)

Original combination: *Nothrus invenustus*

MICHAEL, 1888.

Species identification based on MICHAEL (1888: 500 + pl. 47A, fig. 12, + pl. 47, fig 6), COLLOFF (1993: 1365, 1404), OLSZANOWSKI (1996: 25, 46) and WEIGMANN (2006: 152).

Collected on the Königstuhl mountain near Heidelberg at a submontane altitude of 430 m, from fruticose lichen on sandstone rock. Collection date 5.11.2007. One adult specimen was found.

Comments: This is the first record of the species for Germany. *Camisia invenusta* is not mentioned by either WEIGMANN et al. (2015) or BECK, HORAK & WOAS (2018) and is also not listed as occurring in Germany in the online databases of the Global Biodiversity Information Facility (2020) and the Fauna Europaea (2020). WEIGMANN (2006) included the species in his determination key of Central European members of the genus *Camisia*.

Camisia invenusta has so far been discovered in more than a dozen countries in the Palaearctic, including Austria (COLLOFF 1993), France (TRAVE 1960), Poland (OLSZANOWSKI 1996), Denmark (COLLOFF 1993), Finland (NIEMI 1995), Norway (COLLOFF 1993), Sweden (SELLNICK & FORSSLUND 1955), the United Kingdom (MICHAEL 1888), Italy (SCHATZ 2018a), Spain (SUBÍAS 1977), Japan (AOKI 2006) and Arctic Russia (LEONOV, RAKHLEEVA & SIDORCHUK 2015). It has also been collected by COLLOFF (1993) in Shimla in the Himalayan region of India at the boundary of the Palaearctic and Indomalayan biogeographic realms.

The species has frequently been collected in mountainous sites such as by LEONOV, RAKHLEEVA & SIDORCHUK (2015) in the Khibiny Mountains in the Kola Peninsula. WEIGMANN (2006) considers *Camisia invenusta* to inhabit primarily montane to subalpine habitats. An association of *C. invenusta* with lichen on rock has also been noted by several other authors besides me such as MICHAEL (1888), TRAVÉ (1960), COLLOFF (1993), NIEMI (1995), FRÖBERG et al. (2003) and SEBERNEGG (2017). The taxon has however also been found in other microhabitats as discussed by SEYD and SEAWARD (1984).

Neoliodes theleproctus (HERMANN, 1804)

Original combination: *Notaspis theleproctus* HERMANN, 1804.

Species identification based on HERMANN (1804: 91, 142, figs. 5, K, L, M), GRANDJEAN (1936: 54) and WEIGMANN (2006: 171).

Collected in the Dossenwald in Mannheim at an elevation of about 110 m from foliose lichen on a branch of a Cornish oak (*Quercus petraea* (MATT.) LIEBL.). Collection date 11.10.2009. Five adults and 5 nymphs were found.

Comments: This is the first collection record of the species for Baden-Württemberg. HALLER (1882: 306) mentions collecting material of a "*Nothrus theleproctus* KOCH" in the Fulgenstadter forest in this German federal state. This finding by HALLER is, however, not confirmed since *Neoliodes ionicus* (SELLNICK, 1932), which is very similar to *N. theleproctus* in morphology, was not known at the time. Furthermore HALLER (1882) regarded *Platylodes scaliger* (C. L. KOCH, 1840) as being juveniles of *Neoliodes theleproctus* and may also not have differentiated between the latter species and *Poroliodes farinosus* (C. L. KOCH, 1840). As a literature reference HALLER (1882: 306) gives page 244 and plate 10, figure 3 of a work published in 1879 by MICHAEL and GEORGE. The species depicted by these two authors is clearly *Poroliodes farinosus* and not at all *Neoliodes theleproctus*.

Scapheremaeus palustris (SELLNICK, 1924)

Original combination: *Cymbaeremaeus*

(*Scapheremaeus*) *palustris* SELLNICK, 1924.

Species identification based on SELLNICK (1929: 25), WEIGMANN (2006: 330) and NORTON, FRANKLIN & CROSSLEY (2010).

Collected in Neckarau in Mannheim at a low elevation of 96 m from foliose lichen on a horse chestnut tree (*Aesculus hippocastanum* L.), at 1 m height. Collection date 26.11.2008. A single dead adult mite was found.

Comments: This is the first time that the species has been recorded for Baden-Württemberg. *Scapheremaeus palustris* is predominantly arboreal (WEIGMANN et al. 2015) and has a Holarctic distribution (BEHAN-PELLETIER & LINDO 2019). The specimen collected by me in Mannheim was damaged, with several structures such as most legs and the distal thickenings of the sensilli broken off. Nevertheless it was readily identifiable. Its characteristics agree well with the description of the species by SELLNICK (1929) and WEIGMANN (2006). It differs from these in that in dorsal view the humeral angle of the notogaster is not sharply pointed and 90 degrees but instead is somewhat indistinct. The perceived degree of development

of the humeral angle to some extent depends on the angle of tilt along the anterior-posterior axis, and also on the degree of notogastral distension of the examined specimen (NORTON, FRANKLIN & CROSSLEY 2010). I regard the differences in the humeral angle between the Mannheim specimen and those of SELLNICK (1929) and WEIGMANN (2006) as probably being due to either individual or geographic variation within the species. Interestingly, the specimen from Mannheim shows a broken microsculpture pattern between the costulae with there being irregular ridges instead of complete alveoli. This conforms to the pattern, mentioned by NORTON, FRANKLIN & CROSSLEY (2010), shown by European populations of *Scapheremaeus palustris* as opposed to that of North American individuals.

***Microzetorchestes emeryi* (COGGI, 1898)**

Original combination: *Zetorchestes emeryi* COGGI, 1898.

Species identification based on COGGI (1898: 73, 83, + pl. 2, figs. 7-13) and WEIGMANN (2006: 222). Collected in the Dossenwald in Mannheim at an elevation of 110 m, from leaf litter and upper soil beneath a silver birch tree (*Betula pendula* ROTH). Collection date 23.4.2005. Two adults were found.

Comments: This is the first record of the species for Baden-Württemberg. Within Germany it has been noted to occur in Bavaria, North Rhine-Westphalia, Saxony and Thuringia (WEIGMANN et al. 2015). *Microzetorchestes emeryi* displays a Palearctic distribution and has, for example, been found in Portugal (WEIGMANN 2013), South Tyrol in Italy (SCHATZ 2018b), Finland (NIEMI 1995), Poland (KLIMEK & CHACHAJ 2018), Iran (AKRAMI 2015), Japan (AOKI 2005), China (AOKI et al. 1997) and the Russian Far East (RYABININ et al. 2018).

SCHATZ (2018b: 65) indicates that *Microzetorchestes emeryi* is a xerophilic taxon. WEIGMANN (2013: 50) similarly states that *M. emeryi* occurs in the moss and soil of dry habitats. This characterization applies well to the Mannheim collection site in the Dossenwald (LAMOS 2019), which lies in the Upper Rhine Rift Valley.

***Licnobelba latiflabellata* (PAOLI, 1908)**

Original combination: *Licneremaeus latiflabellatus* PAOLI, 1908.

Species identification based on PAOLI (1908: 87 + pl. 5, figs. 39, 55), GRANDJEAN (1931: 242) and PÉREZ-ÍÑIGO (1994: 317, 1997: 71).

Collected on the Königstuhl mountain in Heidelberg, at an altitude of 430 m from crustose lichen on sandstone rock. Collection date 5.11.2007. One adult was found.

Comments: *Licnobelba latiflabellata* was re-described in detail by PÉREZ-ÍÑIGO (1994), who concluded that *Licnobelba alestensis* GRANDJEAN, 1931 and *L. montana* MIHELČIĆ, 1957 are its junior synonyms. The species is known from numerous countries in the Western Palearctic such as Italy (PAOLI 1908, SCHATZ 2018b), France (GRANDJEAN 1931), Spain (PÉREZ-ÍÑIGO 1997), Morocco (GRANDJEAN 1934b), Poland (OLSZANOWSKI, KAJSKI & NIEDBALA 1996), Belarus and Ukraine (GILYAROV & KRIVOLUTSKIJ 1975), Turkey (TOLUK & AKIN 2017) and Iran (AKRAMI 2015). It also was noted to occur in the Volgograd Oblast in European Russia (LEBEDEVA & POLTAVSKAYA 2013), at Kolguyev Island in the Barents Sea in Arkhangelsk Oblast in the Russian Far North (MELEKHINA 2020) and in at least one further site in the Russian Arctic (LEBEDEVA & KRIVOLUTSKY 2003).

Licnobelba latiflabellata seems to prefer relatively dry regions. It is listed as being a xerophile by WEIGMANN et al. (2015: 50), who also show the species as having been collected at only a single site in Germany. From the distribution map provided by the authors it appears that they refer to the collection record SMNK 921 of the State Museum of Natural History Karlsruhe, later mentioned by BECK, HORAK & WOAS (2018: 63), when discussing the discovery of the species at a location on the Kaiserstuhl at an elevation of 224 m. The collection of the specimen of *Licnobelba latiflabellata* in Heidelberg is therefore only the second time the species has been found in Germany.

***Parhypochthonius aphidinus* BERLESE, 1904**

Species identification based on BERLESE (1904: 25 + pl. 2, fig. 42), WILLMANN (1931: 98), BALOGH & MAHUNKA (1983: 112, 284) and WEIGMANN (2006: 107).

The species was discovered on two locations. It was collected in Neckarau in Mannheim at an elevation of 96 m from the organic litter layer under a pine tree (*Pinus* L. sp.). Nine individuals including 6 adults were collected here on 23.06.2006. Fifteen more individuals, of whom 10 were adults, were collected in the Luisenpark in Mannheim at an elevation of 100 m on 22.4.2009. There they were taken from the needle litter and uppermost topsoil under a giant sequoia (*Sequoiadendron giganteum* (LINDL.) J. BUCHHOLZ).

Comments: WEIGMANN et al. (2015) list the species as having been detected in one site in Baden-Württemberg but do not refer to the publication indicating this. The only other record of the species for Germany so far is by WILLMANN (1931), who found them in Naumburg an der Saale in Saxony-Anhalt, associated with the roots of grapevines.

WILLMANN (1931: 98) actually termed the specimens he discovered as belonging to the then newly erected variety "*Parhypochthonius aphidinus* BERL. var. *germanicus* WILLM.", which is nowadays regarded as being a subspecies name correctly proposed in accordance with the current rules of the International Commission of Zoological Nomenclature. He did not present a differential diagnosis for the taxon, but his illustration of the dorsal whole mount view (fig. 18) shows more posterior notogastral setae than are visible in the original drawing by BERLESE (1904, fig. 42). Furthermore WILLMANN (1931) comments on an asymmetry between the left and right sensillus, (as seen in dorsal perspective and apparently through the lenses of a compound microscope), with the elongate pectinations of the right sensillus being directed anteriorly or anterolaterad, and those of the left sensillus being directed upwards and simultaneously either posteriorly or posterolaterad, whereas the sensilli in the drawing of the specimen by BERLESE (1904, fig. 42) are approximately symmetrical. Asymmetric sensilli were similarly present in the *Parhypochthonius aphidinus* collected by GRANDJEAN (1932) in France, which in a later paper (GRANDJEAN 1934a: 424) he had named "*Parhypochthonius* sp."

VAN DER HAMMEN (1959) inspected the *Parhypochthonius aphidinus* material of BERLESE in Florence in Tuscany, Italy. He noted that several microscope slides of the species were present and that one of these showed an asymmetry of the sensillus sensu WILLMANN. Many years later WEIGMANN also travelled to Florence and examined the material of *Parhypochthonius aphidinus* in the BERLESE collection. From WEIGMANN'S (2006: 108, fig. 55d) illustration it can be seen that the original drawing by BERLESE (1904) is inaccurate with regard to both the setal lengths and also to the number of setae on the posterior notogaster. The drawing of *P. aphidinus* by WEIGMANN (2006) agrees very well with the morphology of the specimens from Mannheim. Similarly, the adult body length including the chelicerae (mean value 428 µm, n = 9) of the Mannheim

mites is very similar to that of the actual Italian specimen examined by WEIGMANN (2006), namely 415 µm, while BERLESE (1904) gives a length of 450 µm for the Italian specimens of the species. The pectination of the right and left sensillus in the material from Mannheim was dissimilar sensu WILLMANN (1931) in 8 out of 10 adult specimens examined. Since useful comparative specimens of *Parhypochthonius aphidinus* from the WILLMANN Collection do not exist (WEIGMANN 2006: 107), the Mannheim specimens fit well to what is reliably known about *P. aphidinus*, and the sensillus of this species may possibly also very often be asymmetric in mites originating from the type location in Florence, I here treat the subspecies erected by WILLMANN as a synonym of the nominotypical subspecies. In this classification I follow VAN DER HAMMEN (1959), WEIGMANN (2006) and SCHATZ (2020). A detailed study of this species using also new material from the original collection sites in Naumburg and Florence as well as from other locations may conclusively answer the question of whether or not the material from Mannheim represents *Parhypochthonius aphidinus germanicus*.

Literature

- AOKI, J.-I. (2005): Oribatid mites of the Tokiwamatsu Imperial Villa, Tokyo. – Memoir of the National Science Museum, Tokyo **39** (March 25): 479-483.
- AOKI, J.-I. (2006): New and newly recorded oribatid mites (Arachnida, Acari, Oribatida) from the Ryukyu Islands, Japan. – Bulletin of the National Science Museum, Tokyo, Series A **32**(3): 105-124.
- AOKI, J.-I., YAMAMOTO, Y., WEN, Z., WANG, H. & HU, S. (1997): A checklist of oribatid mites of China (Acari: Oribatida) First report. – Bulletin of the Institute of Environmental Science and Technology, Yokohama National University **23**: 63-80.
- AKRAMI, M. A. (2015): An annotated checklist of oribatid mites (Acari: Oribatida) of Iran. – Zootaxa **3963**(4): 451-501.
- BALOGH, J. & MAHUNKA, S. (1983): Primitive oribatids of the Palaearctic region. – Soil mites of the world **1**: 1-372.
- BECK, L., HORAK, F. & WOAS, S. (2018): Südwestdeutsche Oribatiden (Acari, Oribatida) – Arten, Taxonomie, Vorkommen. – Andrias **21**: 1-196.
- BEHAN-PELLETIER, V. M. & LINDO, Z. (2019): Checklist of oribatid mites (Acari: Oribatida) of Canada and Alaska. – Zootaxa **4666**(1): 1-180.
- BERLESE, A. (1904): Acari nuovi. Manipulus III. – Redia **2**: 10-32.
- COGGI, A. (1898): Descrizione di specie nuove di Oribatidi italiani e annotazioni a specie conosciute. – Bollettino della Società Entomologica Italiana **30**: 68-83.

- COLLOFF, M. J. (1993): A taxonomic revision of the oribatid mite genus *Camisia* (Acari: Oribatida). – *Journal of Natural History* **27**(6): 1325-1408.
- Fauna Europaea online database: <https://fauna-eu.org> (accessed 27 July 2020).
- FRÖBERG, L., SOLHOY, T., BAUR, A. & BAUR, B. (2003): Lichen specificity of oribatid mites (Acari: Oribatida) on limestone walls in the Great Alvar of Öland, Sweden. – *Entomologisk Tidskrift* **124**(3): 177-182.
- GHILAROV, M. S. & KRIVOLUTSKY, D. A. (eds.) (1975): *Sarcoptiformes. Opredelitel obitajuschtschich w potschwe kleschtschej* – 492 pp, Nauka, Moscow.
- Global Biodiversity Information Facility online database: <https://www.gbif.org> (accessed 27 July 2020).
- GRANDJEAN, F. (1931): Le genre *Licneremaeus* PAOLI (Acariens). – *Bulletin de la Société zoologique de France* **56**: 221-250.
- GRANDJEAN, F. (1932): Au sujet des Palaeacariformes TRÄGARDDH. – *Bulletin du Museum d'Histoire Naturelle, Paris, 2e serie* **4**(4): 411-426.
- GRANDJEAN, F. (1934a): Observations sur les Oribates (Arach. Acar.) (7e serie). – *Bulletin du Museum d'Histoire Naturelle, Paris, 2e serie* **6**(5): 423-431.
- GRANDJEAN, F. (1934b): Oribates de l'Afrique du Nord (2e serie). – *Bulletin de la Société d'Histoire Naturelle de l'Afrique du Nord* **25**(7): 235-252.
- GRANDJEAN, F. (1936): Les oribates de JEAN FRÉDÉRIC HERMANN et de son père (Arachn. Acar.). – *Annales de la Société Entomologique de France* **105**: 27-110.
- HALLER, G. (1882): Beitrag zur Kenntniss der Milbenfauna Württembergs. – *Jahreshefte des Vereins für vaterländische Naturkunde in Württemberg* **38**: 293-325 + pl. 5.
- HERMANN, J. F. (1804): *Mémoire Aptérologique*. – 154 pp.; Strasbourg.
- KLIMEK, A. & CHACHAJ, B. (2018): Colonization of hardwood and pine wood chips by mites (Acari), with particular reference to oribatid mites (Oribatida). – *Folia Forestalia Polonica, Series A, Forestry* **60**(1): 22-33.
- KOCH, C. L. (1840): Deutschlands Crustaceen, Myriapoden und Arachniden. Ein Beitrag zur deutschen Fauna. – Band **29**, contents page + 37 pp text + 24 plates; Pustet, Regensburg.
- LAMOS, R. A. (2019): Discovery of *Belba sculpta* MIHELČIĆ, 1957 (Acari, Oribatida, Damaeidae) in an aeolian sand habitat of the Upper Rhine Rift Valley. – *Carolinea* **77**: 145-180.
- LEBEDEVA, N. V. & KRIVOLUTSKY, D. A. (2003): Birds spread soil microarthropods to Arctic islands. – *Doklady Biological Sciences* **391**: 329-332.
- LEBEDEVA, N. V. & POLTAVSKAYA, M. P. (2013): Oribatid mites (Acari, Oribatida) of plain area of the Southern European Russia. – *Zootaxa* **3709**(2): 101-133.
- LEONOV, V. D., RAKHLEEVA, A. A. & SIDORCHUK, E. A. (2015): Distribution of oribatid mites (Acari: Oribatida) along an altitudinal profile of Mount Vud' yavrchorr (the Khibiny Mountains). – *Eurasian Soil Science* **48**: 1257-1267.
- MELEKHINA, E. N. (2020): Analysis of oribatid fauna of the East European tundra with first reported data of subpolar Urals. – *Diversity* **12**(235): 1-19.
- MICHAEL, A. D. (1888): *British Oribatidae. Vol. II*. – Ray Society, London, p. v-xi, and 337-657 + plates 25-53.
- MICHAEL, A. D. (1898): *Oribatidae*. In: SCHULZE, F. E. (ed.): *Das Tierreich, Lief. 3, (Acarina)*: **8**(3): 1-93; Friedländer und Sohn, Berlin.
- MICHAEL, A. D. & GEORGE, C. F. (1879): A contribution to the knowledge of British Oribatidae. – *Journal of the Royal Microscopical Society* **2**(3): 225-251 + plates 9-11.
- NORTON, R. A., FRANKLIN, E. & CROSSLEY JR., D. A. (2010): *Scapheremaeus rodickae* n. sp. (Acari: Oribatida: Cymbaeremaeidae) associated with temporary rock pools in Georgia, with key to *Scapheremaeus* species in eastern USA and Canada. – *Zootaxa* **2393**: 1-16.
- OLSZANOWSKI, Z. (1996): A monograph of the Nothridae and Camisidae of Poland (Acari: Oribatida: Crotonioidea). – *Genus, suppl.*: 1-201.
- OLSZANOWSKI, Z., KAJSKI, A. & NIEDBALA, W. (1996): *Roztocze Acari Mechowce Oribatida*. – *Katalog Fauny Polski* **34**: 1-243.
- NIEMI, R. (1995): Oribatid species (Acari, Oribatida) new to the fauna of Finland. – *Entomologica Fennica* **5**: 213-217.
- PAOLI, G. (1908): *Monografia del genere Dameosoma BERL. e generi affini*. – *Redia* **5**: 31-91 + pl. 3-5.
- PÉREZ-ÍÑIGO, C. (1994): Redescription of *Licnobelba la-tiflabellata* (PAOLI, 1908) (Acari, Oribatei, Licnobelbidae). – *Redia* [1993] **76**(2): 317-326.
- PÉREZ-ÍÑIGO, C. (1997): Acari Oribatei, Gymnonota 1. – In: RAMOS, M. A. (ed.): *Fauna Iberica* **9**: 1-374; Museo Nacional de Ciencias Naturales, Madrid.
- RYABININ, N. A., LIU, D., GAO, M. & WU, D.-H. (2018): Checklist of oribatid mites (Acari, Oribatida) of the Russian Far East and Northeast of China. – *Zootaxa* **4472**(2): 201-232.
- SCHATZ, H. (2018a): Catalogue of oribatid mites (Acari: Oribatida) from South Tyrol (Prov. Bolzano, Italy). – *Zootaxa* **4435**(1): 1-89.
- SCHATZ, H. (2018b): Faunistics of oribatid mites (Acari, Oribatida) in dry grassland sites in the Eisack Valley (South Tyrol, Prov. Bolzano, Italy). – *Soil Organisms* **90**(2): 57-70.
- SCHATZ, H. (2020): Catalogue of oribatid mites (Acari: Oribatida) from Vorarlberg (Austria). – *Zootaxa* **4783**(1): 1-106.
- SEBERNEGG M. (2017): *Vergleichende Untersuchung der lichenicolen Hornmilbenfauna subalpiner-alpiner Standorte*. – Master of Science thesis. University of Graz: 1-98.
- SELLNICK, M. (1929): *Formenkreis Hornmilben, Oribatei*. In: BROHMER, P., EHRMANN, P. & ULMER, G. (eds.). *Die Tierwelt Mitteleuropas* **3**(9): 1-42; Quelle & Meyer, Leipzig.
- SELLNICK, M. & FORSSLUND, K. H. (1955): *Die Camisiidae Schwedens*. – *Arkiv för Zoologi* **8**(4): 473-530.
- SEYD, E. L. & SEAWARD, M. R. D. (1984): The association of oribatid mites with lichens. – *Zoological Journal of the Linnean Society* **80**: 369-420.

- SUBÍAS, L. S. (1977): Taxonomía y ecología de los oribátidos saxícolas y arborícolas de la Sierra de Guadarrama (Acarida, Oribatida). – Doctoral thesis. Complutense University of Madrid: 375 pp.
- TOLUK, A. & AKIN, A. T. (2017): Oribatid mite fauna (Acari) of Cat Forest, Sivas province, Turkey – *Türkiye Entomoloji Dergisi* **41**(3): 293-307.
- TRAVÉ, J. (1960): Contribution a l'étude de la faune de la Massane (3e note) Oribates (Acariens) 2e partie (I). – *Vie et Milieu* **11**(2): 209-232.
- VAN DER HAMMEN, L. (1959): BERLESE'S primitive oribatid mites. – *Zoologische Verhandelingen* **40**(1):1-93.
- WILLMANN, C. (1931): Moosmilben oder Oribatiden (Cryptostigmata). In: DAHL, F. (publ.) *Die Tierwelt Deutschlands* **22**: 79-200; Fischer, Jena.
- WEIGMANN, G. (2006): Hornmilben (Oribatida). – *Die Tierwelt Deutschlands* **76**: 1-520.
- WEIGMANN, G. (2013): Ecology and biogeography of oribatid mites (Acari: Oribatida) from the coastal region of Portugal. – *Soil Organisms* **85**(3): 147-160.
- WEIGMANN, G., HORAK, F., FRANKE, K. & CHRISTIAN, A. (2015): Verbreitung und Ökologie der Hornmilben (Oribatida) in Deutschland. – *Peckiana* **10**: 1-171.