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## New species of oribatid mites from Southern Germany

(Acari, Oribatida)

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Two European oribatid mite species new for Germany are redescribed: *Dolichere-maeus dorni* (Balogh, 1937) (Otocephidae) found in Bayrischer Wald in South-East Germany, and *Phauloppia nemoralis* (Berlese, 1916) (Oribatulidae) from a dry-warm wooded slope of Altmuehl River. Furthermore, a species new for science is described: *Oribatella abhorrens* spec. nov. from the family Oribatellidae, which was found at the same site as the latter species. The new species is unique within the genus *Oribatella* since it has a smooth sensillus with a claviform head bearing a spine-like distal appendix.

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### Introduction

Within the framework of a recent study investigating the ecology and distribution of oribatid mites in Germany (in preparation), three species were found in Southern Germany which are new for Germany: *Dolichere-maeus dorni* (Balogh, 1937) from the family Otocephidae Balogh, 1961; *Phauloppia nemoralis* (Berlese, 1916) from the family Oribatulidae Thor, 1929; *Oribatella abhorrens* spec. nov. from the family Oribatellidae Jacot, 1925. The first two species are insufficiently described in the literature and are therefore redescribed in the following. The latter species is new for science and is described below.

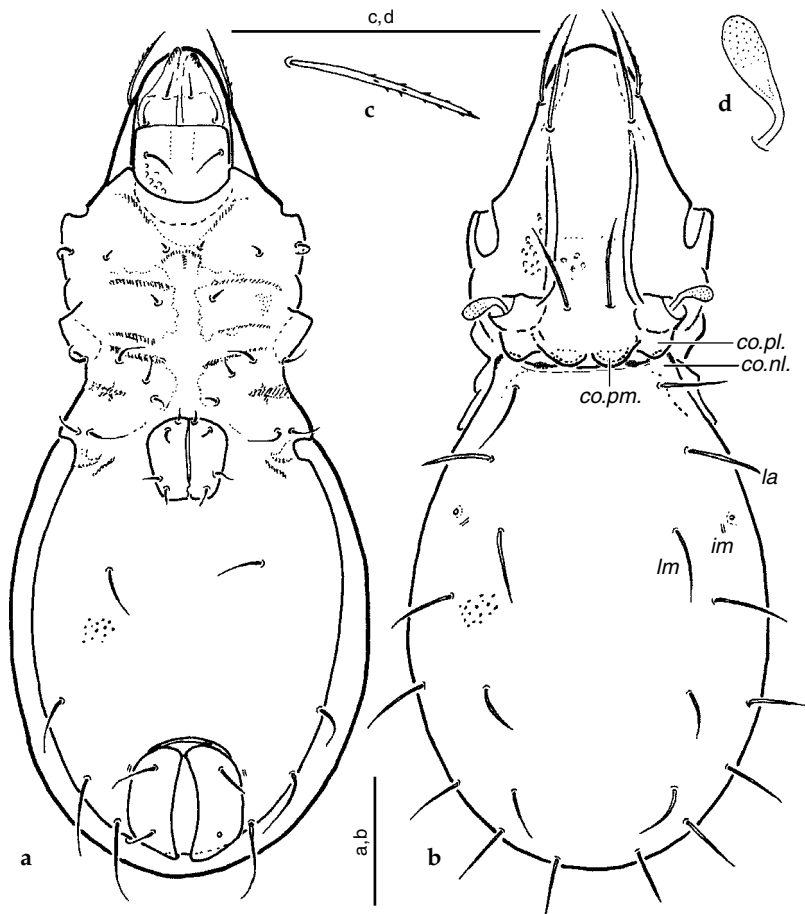
The general terminology of oribatid mite morphology and the systematic concept follows Norton & Behan-Pelletier (2009) and Weigmann (2006). Additional references regarding diagnoses of the genera and families are given in the species sections.

### Taxonomy

#### Otocephidae Balogh, 1961

The family is new for the German fauna of Oribatida and thus not represented in Weigmann (2006). Therefore, short diagnoses of the family and the genus are given, extracted from Aoki (1965, 1967), Balogh & Balogh (1992) and the family key in Norton & Behan-Pelletier (2009).

**Family diagnosis.** Pycnonotic Brachypyliina without scalps. Elongate body (length: width ratio between 1.9:1 and 3.1:1). Lamella long, nearly parallel to each other, no translamella; mostly longish tutorium present. Dorsejugal suture distinct, with opposed lateral condyles well developed on prodorsum (postbothridial) and notogaster (humeral), median pair of condyles on prodorsum mostly large, median pair of condyles on anterior notogaster edge large, small or absent. Mostly 10 pairs of notogastral setae (exceptionally 9 or up to 15). Pedotecta I and II well developed. Setal formula of epimeres mostly 3–1–3–3. Anal and genital apertures widely separated; normal number of pairs of setae: 4 genital setae, 1 aggenital setae, 2 anal setae, 3 adanal setae mostly parallel to border of ventral plate. Legs monodactylous.



**Fig. 1.** *Dolicheremaeus dorni*. **a.** ventral aspect (legs omitted). **b.** dorsal aspect (legs omitted). **c.** notogastral seta *la*. **d.** sensillus. Abbreviations: *co.pl.*, lateral prodorsal condyle; *co.pm.*, median prodorsal condyle; *co.nl.*, lateral notogastral condyle; *la, lm*, notogastral setae; *im*, lyrifissure. Scale bars: 100  $\mu$ m.

**Genus diagnosis of *Dolicheremaeus* Jacot, 1938.** Genital plates darker than ventral and anal plates. Adanal fissures besides anal plates; no aggenital condyles present; pedotecta I and II not conspicuously developed.

***Dolicheremaeus dorni* (Balogh, 1937)**

Figs 1-2

*Oppia dorni* Balogh, 1937: Zoologischer Anzeiger 119: 221.

*Tetracondyla dorni*: Travé 1961a.

*Dolicheremaeus dorni*: Travé 1978 (descr. juveniles); Kunst 1971 (fig. p. 569).

**Diagnosis.** Body length 480–630  $\mu$ m; length: width ratio about 2:1. Very short claviform sensillus;

notogastral setae setiform; two pairs of strong condyles at posterior edge of prodorsum, lateral condyles of prodorsum opposing lateral condyles of notogaster.

**Material examined.** Five specimens, collected 2009 in Bayrischer Wald near Grafenau (South-East Germany) by Dana Augustin, Goettingen; in a mushroom (*Fomitopsis pinicola*). One mounted specimen deposited in Zoologische Staatssammlung, Munich; four specimens in the collection of the author.

**Redescription**

**General characters.** Body length 480–630  $\mu$ m (German findings: three females 520–630, two males 480 and 535); length-width ratio about 2:1. Colour pale brown.

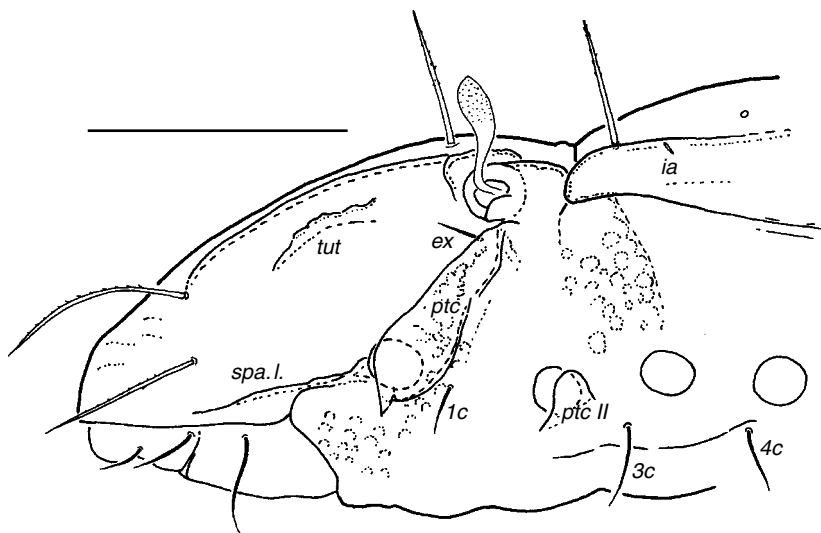


Fig. 2. *Dolicheremaeus dorni*, lateral aspect (legs omitted). Abbreviations: *ex*, exobothridial seta; *ptc I, II*, pedotecta; *spa.l.*, latero-ventral ridge of prodorsum; *tut*, tutorium; *1c, 3c, 4c*, epimeral setae; *ia*, lyrifissure. Scale bar: 100  $\mu$ m.

Prodorsum. Costula long, nearly parallel to each other, anteriorly ending at lamellar seta (Figs 1b, 2). Surface with granules; tutorium an undulating short ridge near costula; an other latero-ventral ridge present (Fig. 2: *spa.l.* in the terminology of Aoki 1965). All prodorsal setae setiform, slightly barbed; rostral setae about 60–65  $\mu$ m, lamellar setae about 70–80  $\mu$ m, interlamellar setae about 55  $\mu$ m, exobothridial setae about 20  $\mu$ m long. Sensillus with claviform granulated head and very short stalk (Figs 1d, 2); bothridium with lateral scale. With two pairs of strong condyles at posterior edge of prodorsum; lateral condyles of prodorsum (*co.pl.*; terminology after Aoki 1965) opposing lateral condyles of notogaster.

Notogaster. Surface granulated. Lateral (humeral) condyles of notogaster (*co.nl.*) well developed; median condyles of prodorsum (*co.pm.*) broad, touching each other; median condyles of notogaster not present. Ten pairs of robust setiform notogastral setae, slightly barbed, length about 55–65  $\mu$ m in genus-typical positions. Five pairs of fissures, *im* near opisthotal gland opening, laterad seta *lm*.

Podosoma and ventral region. Pedotecta (*ptc*) I and II well developed, lateral podosoma and *ptc I* with mesh-like ornamentation (Fig. 2); discidium tooth-shaped. Formula of epimeral setae 3-1-3-3, setae short to moderately long (6–25  $\mu$ m); four pairs of genital setae, one pair of aggenital setae (about 40  $\mu$ m), two pairs of anal setae (40  $\mu$ m), three pairs of long adanal setae (45–65  $\mu$ m), *ad*<sub>2</sub> and *ad*<sub>3</sub> in distance to anal opening, inserted parallel to lateral border of ventral plate; fissure *iad* laterally at anal opening (Fig. 1a). Epimeral and ventral surface granulated.

Legs. All tarsi without dorsal teeth; ultimate setae of all tarsi long-setiform (type *L* in the terminology of Aoki 1967).

**Distribution and ecology.** This single European species of the genus *Dolicheremaeus* with world-wide, mostly tropical and subtropical distribution of about 170 species (cf. Subías 2013) has been recorded occasionally from South-European countries – from Hungary (Balogh 1937, Mahunka & Mahunka-Papp 2004) to Southern France (Travé 1961a, 1978). This finding is the first one from Germany.

### *Phauloppia nemoralis* (Berlese, 1916) (Oribatulidae Thor, 1929)

Fig. 3

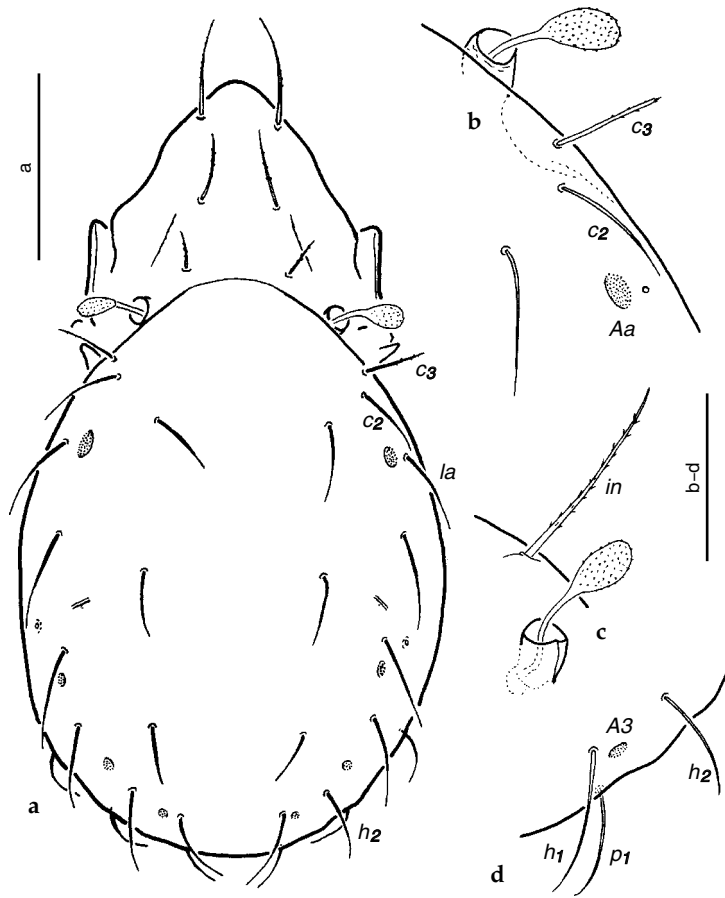
*Lucoppia* (*Phauloppia*) *nemoralis* (Berlese, 1916): Redia 12: 325.

*Lucoppia* (*Phauloppia*) *nemoralis*: Schweizer 1956.

*Oribata nemoralis*: Balogh 1943.

*Phauloppia nemoralis*: Travé 1961b; Mahunka & Mahunka-Papp 1995; Weigmann 2006.

**Diagnosis.** With characters typical for the genus: Lamella indistinct; lamellar seta closer to interlamellar seta than to rostral seta; 14 pairs of notogastral setae; four pairs of genital setae. – Specific characters: Body length 410–550  $\mu$ m; notogastral setae from about 30–40  $\mu$ m (*c* and *p* setae) to 55  $\mu$ m long; notogastral porose areas small oval; notogastral and ventral cuticle smooth.



**Fig. 3.** *Phauloppia nemoralis*. **a.** dorsal aspect (legs omitted). **b.** dorsal aspect of humeral part of notogaster and sensillus. **c.** dorsal aspect of prodorsal part with seta *in* and sensillus. **d.** dorsal aspect of posterior part of notogaster. Abbreviations: *in*, interlamellar seta; *Aa*, *A3*, anterior and posterior porose area of notogaster; *c*<sub>2</sub>, *c*<sub>3</sub>, *h*<sub>1</sub>, *h*<sub>2</sub>, *p*<sub>1</sub>, notogastral setae. Scale bars: a = 100 µm, b–d = 50 µm.

**Material examined.** One male specimen from Altmuehl Valley (Bavaria) near Solnhofen, south-exposed river slope; found in dry deciduous forest litter by the author, May 1, 2001. Deposited in the collection of the author.

### Redescription

**General characters.** Body length range after literature 400–550 µm; one male from Altmuehl Valley (Bavaria) 412 µm. Cuticle smooth, with slightly wavy surface and posterior outline; colour pale brown.

**Prodorsum.** Lamella indicated as weak line; all prodorsal setae compact setiform, straight and barbed; rostral seta about 50 µm, lamellar and interlamellar seta about 60 µm (measured in lateral aspect), exobothridial seta about 35 µm. Sensillus with short stalk and claviform head with some small spines (Fig. 3).

**Notogaster.** Anterior border weakly developed in the middle, posterior outline somewhat undulating (Fig. 3a). Moderately long setiform notogastral setae, from about 30 up to 55 µm long; seta *c*<sub>3</sub> bacilliform, 34 µm long, rarely barbed (Fig. 3b); other setae setiform and nearly smooth; seta *c*<sub>2</sub> about 40 µm long and reaching area *Aa*, setae *lm*, *lp* and *h*<sub>1</sub>–*h*<sub>3</sub> longest (45–55 µm), *p*-setae shortest (about 30 µm). Four pairs of oval porose areas in typical positions, *Aa* the largest (length about 13 µm; Fig. 3b), *A3* the smallest (about 5 µm) (Fig. 3d).

**Ventral region.** Epimeral setation formula 3–1–3–3; setae small setiform. Ano-genital setae small setiform, four pairs of genital setae, on pair of aggenital, two pairs of anal and three pairs of adanal setae.

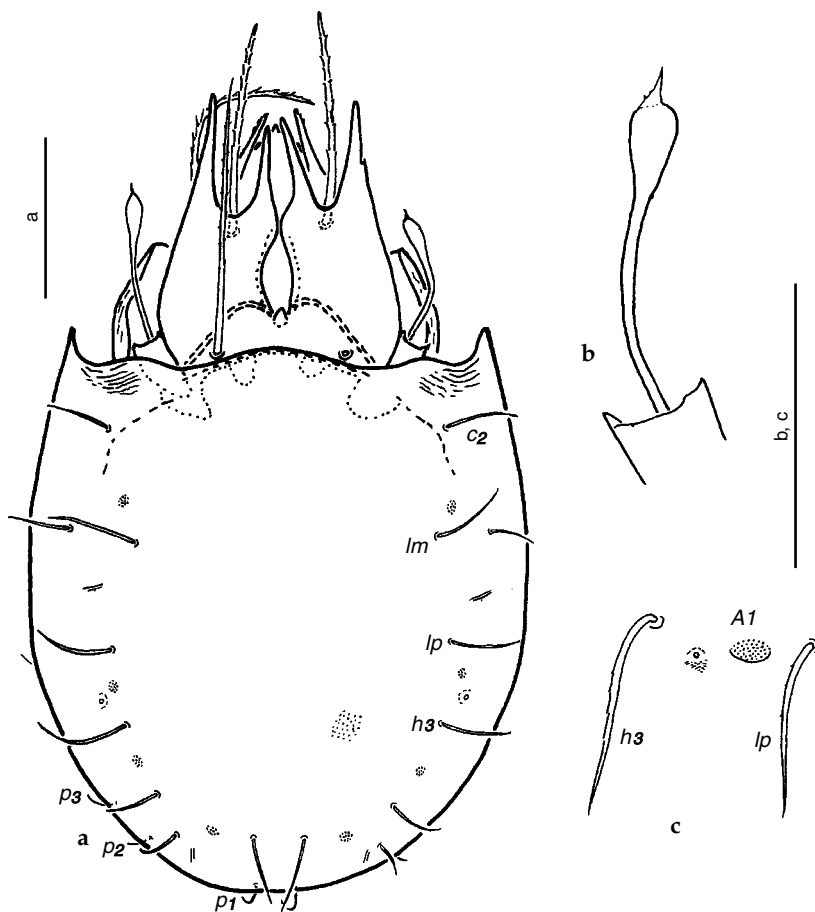


Fig. 4. *Oribatella abhorrens* spec. nov. a. dorsal aspect (legs omitted). b. bothridium with sensillus. c. lateral aspect of notogaster part with setae  $h_3$ ,  $lp$  and porose area  $A1$ . Abbreviations:  $A1$ , porose area of notogaster;  $c_2$ ,  $lm$ ,  $lp$ ,  $h_3$ ,  $p_1$ – $p_3$ , notogastral setae. Scale bars: 100  $\mu$ m.

Legs. Tarsi with three claws each. As far as observable, setation as indicated for *P. rauschenensis* by Wunderle et al. (1990).

**Distribution and ecology.** Southern Europe (from Bulgaria and Hungary to Southern France; references in Mahunka & Mahunka-Papp 1995); the species seems to prefer dry habitats.

### Discussion

*Phauloppia nemoralis* is one of the smaller species of the genus with short porose area  $Aa$ , contrary to e.g. *P. lucorum* (C. L. Koch, 1841), and *P. asperula* (Berlese, 1916) with very long and narrow  $Aa$ . Berlese's description is very poor as is the sketch in Schweizer (1956). Nevertheless, some authors published oc-

casional findings in eastern and southern European countries cited by Mahunka & Mahunka-Papp (1995: 166) who also gave a short diagnostic illustration of the sensillus and the shoulder part with  $c$ -setae and  $Aa$  which coincides with the redescription above. There are three European species, *P. nemoralis*, *P. coineaui* Travé, 1961, *P. rauschenensis* (Sellnick, 1908), with similar diagnostic characters (body size, sensillus shape, notogastral setation) which have to be discriminated.

*Phauloppia rauschenensis* is the smallest of the three species with a body length range of 310–390  $\mu$ m (Wunderle et al. 1990, Weigmann 2006). *Phauloppia coineaui* has a length of 430–500  $\mu$ m (Travé 1961b). Berlese (1916) indicates the length of *P. nemoralis* with 450 and 550  $\mu$ m, Balogh (1943) with 400–500  $\mu$ m, Schweizer (1956) with 414–450  $\mu$ m; the single specimen of this study measures 412  $\mu$ m.

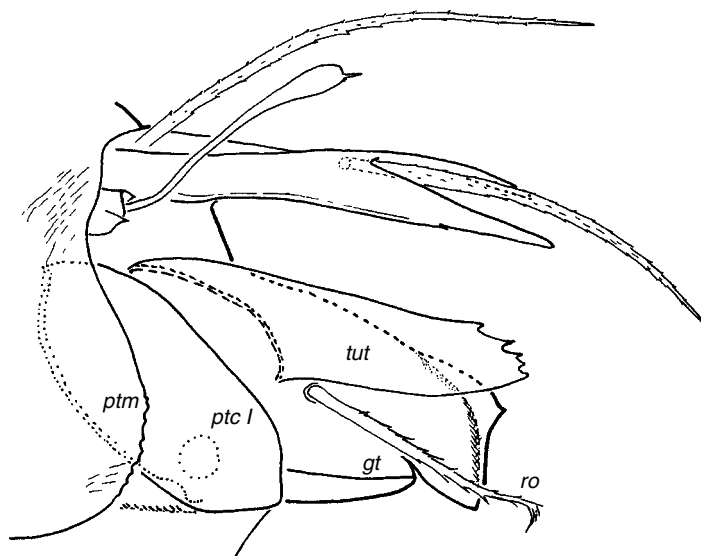


Fig. 5. *Oribatella abhorrens* spec. nov.; anterior lateral aspect (legs omitted). Abbreviations: *gt*, genal tooth; *ptc I*, pedotectum I; *ptm*, pteromorph; *ro*, rostral seta; *tut*, tutorium. Scale bar: 100  $\mu$ m.

*Phauloppia rauschenensis* has the shortest sensillus with a globular head. The sensilli of both *P. nemoralis* and *P. coineai* are of the same shape, with moderately short stalk and a longish-claviform head.

The shortest notogastral setae occur in *P. rauschenensis* with about 25  $\mu$ m maximal length. The notogastral setation is longest in *P. coineai* with mostly 60–70  $\mu$ m length (*c*<sub>3</sub> and *p*-setae shorter); seta *c*<sub>2</sub> overtops clearly the area *Aa* and the insertion of seta *la*. Most notogastral setae in *P. nemoralis* range between 45 and 55  $\mu$ m length (*c*<sub>3</sub> and *p*-setae shorter). Seta *c*<sub>2</sub> reaches the middle of area *Aa* and the insertion of *la*, but do not overtop them, as seen in Figs 3a,b above and in fig. 85 in Mahunka & Mahunka-Papp (1995).

*Phauloppia rauschenensis* is well differentiated by all three criteria. *Phauloppia coineai* differs from *P. nemoralis* only by the length of the notogastral setae which is a weak diagnostic criterion which may have caused Subías (2004) to synonymize *coineai* with *nemoralis*. Further studies have to confirm the taxonomic status by studying the variability of the characters.

***Oribatella abhorrens* spec. nov.**  
(*Oribatellidae* Jacot, 1925)

Figs 4–6

**Diagnosis.** Small species, length 480  $\mu$ m; with mucro (translamellar tubercle) instead of translamella; genal tooth with rounded tip; border of camero-stome without further incisions. Sensillus shape

unique: smooth, with long stalk, head club-shaped, distally with asymmetrical spin-like appendix. Longest notogastral setae about 60–70  $\mu$ m; epimeral setae 3*c* and 4*c* strong and enlarged, 4*c* largest.

**Material examined.** One male specimen from Altmuehl Valley (Bavaria) near Solnhofen, south-exposed river slope; found in dry deciduous forest litter by the author, May 1, 2001. Deposited in the collection of the author.

**Description**

**General characters.** Body length 480  $\mu$ m, width 307  $\mu$ m (one male). Cuticle with fine granulation; colour yellow-brown.

**Prodorsum.** Rostrum with median crest (Fig. 5). Cuspis of lamella with long median and slightly longer lateral tip, laterally with or without a small tooth, dorsally with striped ornamentation; in translamellar position with distinct mucro (Fig. 4a). Large rostral, lamellar and interlamellar setae (about 105, 120 and 170  $\mu$ m) barbed; sensillus about 100  $\mu$ m long, smooth, with long stalk and short club-shaped head distally with asymmetrical spine-like appendix (Fig. 4b). Tutorium long, broad, with distal teeth; genal tooth distally rounded (Fig. 5).

**Notogaster.** Pteromorph with fine striation at anterior region and irregular small teeth at anterio-lateral edge (Figs 4, 5). Ten pairs of setiform setae with poor granulation, *lm*, *lp*, *h*<sub>3</sub> the longest with 60–70  $\mu$ m, *c*<sub>2</sub> about 45  $\mu$ m, *p*<sub>1</sub>–*p*<sub>3</sub> shortest (Fig. 4). Porose areas small, roundish, about 5–10  $\mu$ m in diameter, *Aa* largest.

Ventral region. Border of camerostome a rounded bulge without incisions or teeth (Fig. 6). Epimeral setation formula 3-1-3-3; epimere II with additional 2*b* seta at one side (probably an individual aberration). Most setae short and smooth, seta 3*b* longer (about 15 µm), barbed seta 4*c* strongly enlarged and thick (about 35 µm long), seta 3*c* less enlarged and thick (about 20 µm long). Custodium moderately short. Cuticle of epimeres with fine striation. Anogenital setation as typical for genus (Fig. 6).

Legs. Tarsi with three claws each. Setation not studied in detail.

### Remarks

Most morphological characters in *Oribatella abhorrens* spec. nov. indicate membership in the “berleseigroup” of species (cf. Weigmann 2011) characterized by small or medium body size, legs with three claws, with distinct mucro in translamellar position, border of camerostome anterior the genal tooth bulged without further incisions. However, the shape of sensilli is unique within the species-rich genus. Also, the lack of granulation of the sensillus head and the spine-like appendix are specific characters; the symmetric peculiarity makes an individual deformation implausible.

### Acknowledgements

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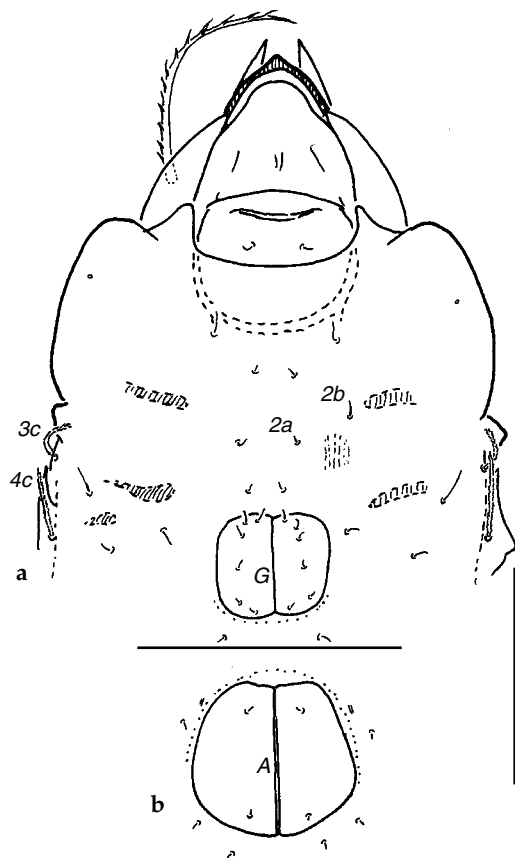


Fig. 6. *Oribatella abhorrens* spec. nov., ventral aspect. a. anterior body part with epimeral and genital region. b. anal region. Abbreviations: A, anal plate; G, genital plate; 2*a*, 2*b*, 3*a*, 3*b*, 3*c*, 4*c*, epimeral setae. Scale bar: 100 µm.

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