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Two new oribatid mite species of the genus *Gittella* from Ecuador

(Acari, Oribatida, Oppiidae)

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Two new oppiid mite species of the genus *Gittella*, *G. variabilis* spec. nov. and *G. minor* spec. nov., are described from Southern Ecuador. The first new species is morphologically similar to *Gittella maxima* (Balogh & Mahunka, 1981), however, it differs from the latter by the morphology of sensilli, notogastral setae and epimeral region. The second new species is morphologically similar to *Gittella insularis* Mahunka, 1998. However, it differs from the latter by the body size, number of interbothridial muscle sigilla and the morphology of rostral and interlamellar setae. The morphology of the gnathosoma is presented in detail for the first time for a species of this genus.

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Introduction

Gittella is a small genus that was proposed by Hammer (1961) with *Gittella punctata* Hammer, 1961 as type species. At present it comprises five species which are distributed in the Neotropical region: *G. ecuadoriensis* Ermilov & Kalúz, 2012 from Ecuador, *G. flagellata* (Mahunka, 1983) from Brazil, *G. insularis* Mahunka, 1998 from the Antilles Islands, *G. maxima* (Balogh & Mahunka, 1981) from Paraguay and Panama, and *G. punctata* Hammer, 1961 from Peru. The generic characters of *Gittella* proposed by Hammer (1961) have been summarized by Subías & Balogh (1989), Balogh & Balogh (1992) and Ermilov & Kalúz (2012). The known species of this genus were included in the key given in Ermilov & Kalúz (2012).

The main purpose of this paper is to describe and illustrate a sixth and a seventh species of the genus *Gittella*, collected from Southern Ecuador, under the names *G. variabilis* spec. nov. and *G. minor* spec. nov. The morphology of the gnathosoma is presented in detail for the first time for a species of this genus.

Materials and methods

The *Gittella* species described in the present paper were collected in Southern Ecuador by F. Marian and D. Sandmann. Specimens were mounted in lactic acid on temporary cavity slides for measurement and illustration. All body measurements are presented in micrometers. The body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the ventral plate, to avoid discrepancies caused by different degrees

of notogastral distortion. Notogastral width refers to the maximum width in dorsal aspect. Lengths of body setae were measured in lateral aspect. Formulae for leg setation are given in parentheses according to the sequence trochanter–femur–genu–tibia–tarsus (famulus included). Formulae for leg solenidia are given in square brackets according to the sequence genu–tibia–tarsus. General terminology used in this paper follows that summarized by Norton and Behan-Pelletier (2009).

The holotypes are deposited in the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia (ZISP). The paratypes are deposited in the Siberian Zoological Museum, Novosibirsk, Russia (SZMN) and in the personal collection of the first author (PC).

Descriptions

Gittella variabilis spec. nov.
Figs 1–19

Material examined. Holotype: male, Southern Ecuador, 3°58'S 79°50'W, Estación Científica San Francisco, 2000 m a.s.l., upper organic soil layer in mostly undisturbed rain forest, 01.04.2008 (ZISP). – Paratypes: five males and one female in SZMN, and five males in PC, same locality and date as holotype.

Diagnosis. Body size 647–680 × 332–356. Surface of notogaster and anogenital region smooth or foveolate. Interbothridial region with two pairs of muscle sigilla. Interlamellar setae longer than rostral and lamellar setae; all setiform, ciliate unilaterally. Sensilli setiform, with four to five long branches. Notogastral setae long, ciliate unilaterally. Epimeral region with muscle sigilla. Anogenital setae smooth (except ciliate adanal setae). Lyrifissures *iad* located in inverse apoanal or paraanal position.

Description

Measurements: Body length 647 (holotype), 647–680 (mean 660; 11 paratypes); notogaster width 348 (holotype), 332–356 (mean 346; 11 paratypes).

Integument (Figs 1–3): Body colour brown to yellow-brownish. Dorsal surface of prodorsum smooth; lateral sides with small microgranulate

parts between bothridia and acetabula I, II. Interbothridial region with two pairs of distinct muscle sigilla. Surface of notogaster and anogenital region smooth or rarely foveolate (diameter foveolae up to 4 µm). Distance between foveolae considerable longer than diameter of foveolae. Epimeral region with numerous muscle sigilla.

Prodorsum (Figs 1, 3–8): Rostrum rounded. Lamellar lines thin, not visible absolutely in many specimens. Triangular tubercle located posteriorly to each bothridium and interlamellar seta. Rostral (*ro*, 45–53), lamellar (*le*, 53–61), interlamellar (*in*, 90–102) and exobothridial (*ex*, 24–36) setae setiform, with short cilia unilaterally. Sensilli (*ss*, 127–143) setiform, having four (rarely five) long branches in medio-distal part.

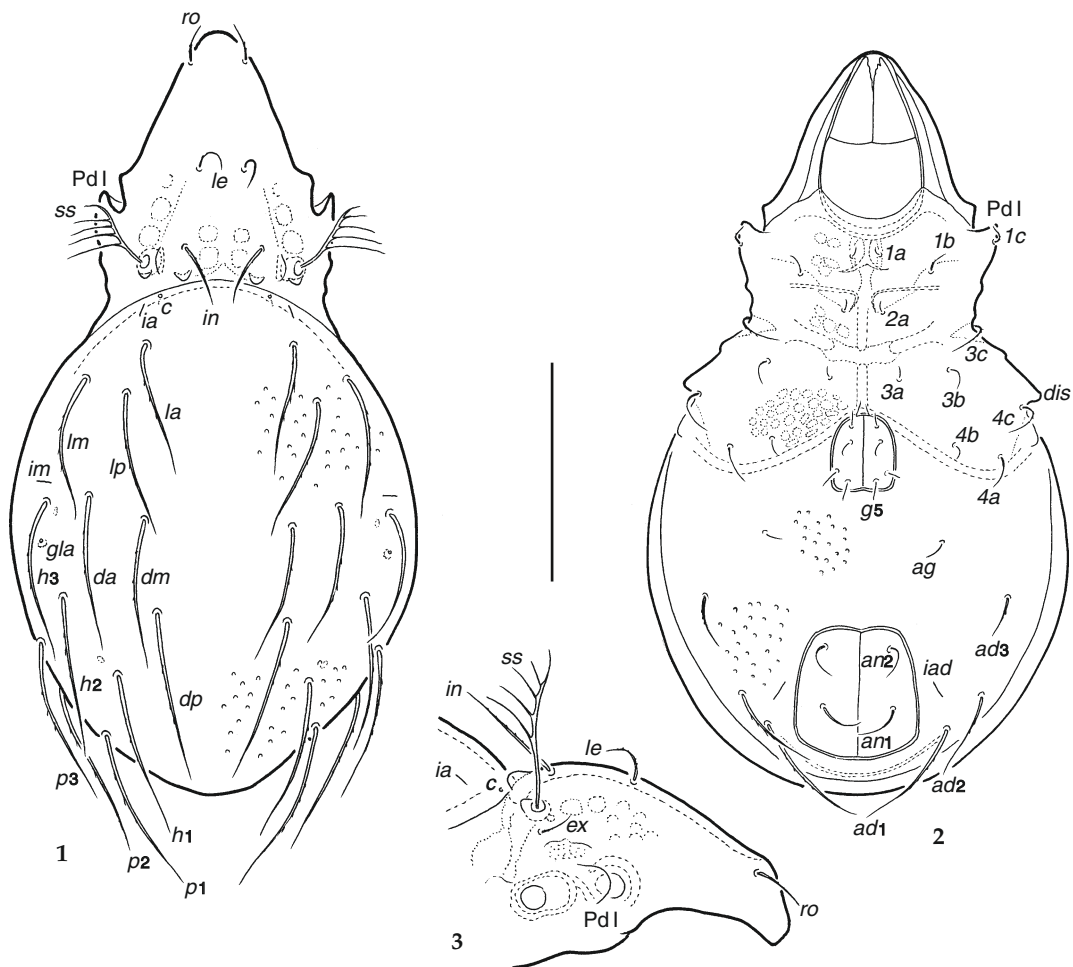
Notogaster (Fig. 1): Anterior border convex. A pair of setae *c* is absent (only alveoli present). Twelve other pairs of notogastral setae long (123–151), setiform, with short cilia unilaterally. Setae in anterior half of body slightly shorter than in posterior half. Lyrifissures *ia*, *im*, *ip*, *ih* and *ips* distinct, located typically for genus. Opisthonotal gland openings (*gla*) located posteriorly to setae *h*₃.

Gnathosoma (Figs 9–12): Subcapitulum longer than wide (155–168 × 98–110). Subcapitular setae (*a*, *m*, *h*) setiform, smooth, similar in length (20–28). Two pairs of adoral setae (*or*₁, *or*₂, 4–6) present, thorn-like. Palps (82–94) with setation 0–2–1–3–9(+ω). Setae of femora with long, thickened cilia; setae of genua and tibia with short cilia unilaterally; setae of tarsi smooth. Solenidion long, thickened, blunt-ended, pressed to the palptarsus surface, attached with distal seta *u*'' in distal half. Chelicerae (159–168) chelate-dentate. Cheliceral setae setiform, barbed; *cha* (36–45) longer than *chb* (24–28). Trägårdh's organ (Tg) distinct.

Epimeral and lateral podosomal regions (Figs 2, 3, 13, 14): Epimeral border IV convex posteriorly. Epimeral setae setiform; *1c*, *3c* and *4c* with short cilia unilaterally, others smooth. Setae *3c*, *4a* and *4c* (53–57) longer than *1b*, *1c*, *3b* (32–41) and *1a*, *2a*, *3a*, *4b* (16–20). Pedotecta I (Pd I) convex. Discidia (*dis*) triangular, blunt-ended.

Table 1. Leg setation and solenidia of *Gittella variabilis* spec. nov. (same for *Gittella minor* spec. nov.). Roman letters refer to normal setae (*e* to famulus), Greek letters to solenidia. Single prime (') marks setae on anterior and double prime (") setae on posterior side of the given leg segment. Parentheses refer to a pair of setae.

Leg	Trochanter	Femur	Genu	Tibia	Tarsus
I	<i>v</i> '	<i>d</i> , (I), <i>bv</i> ", <i>v</i> "	(I), <i>σ</i>	(I), (v), <i>φ</i> ₁ , <i>φ</i> ₂	(<i>ft</i>), (<i>tc</i>), (<i>it</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>), <i>v</i> ', (<i>pl</i>), <i>l</i> ", <i>e</i> , <i>ω</i> ₁ , <i>ω</i> ₂
II	<i>v</i> '	<i>d</i> , (I), <i>bv</i> ", <i>v</i> "	(I), <i>σ</i>	(I), (v), <i>φ</i>	(<i>ft</i>), (<i>tc</i>), (<i>it</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>), <i>l</i> ", <i>ω</i> ₁ , <i>ω</i> ₂
III	<i>l</i> ', <i>v</i> '	<i>d</i> , <i>l</i> ', <i>ev</i> '	<i>l</i> ', <i>σ</i>	<i>l</i> ', (v), <i>φ</i>	(<i>ft</i>), (<i>tc</i>), (<i>it</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>)
IV	<i>v</i> '	<i>d</i> , <i>ev</i> '	<i>d</i> , <i>l</i> '	<i>l</i> ', (v), <i>φ</i>	<i>ft</i> ", (<i>tc</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>)



Figs 1–3. *Gittella variabilis* spec. nov. 1. Dorsal view. 2. Ventral view (legs, subcapitular setae and palps not shown). 3. Lateral view of prodorsum (legs and gnathosoma not shown). Scale bars: 1, 2 = 200 µm; 3 = 100 µm.

Anogenital region (Figs 2, 15, 16): Five pairs of genital (g_1 – g_5 , 16–20), one pair of aggenital (ag , 16–20) and two pairs of anal (an_1 , 36–49; an_2 , 28–32) setiform, smooth. Three pairs of adanal setae (ad_1 , 98–118; ad_2 , 77–90; ad_3 , 49–57) setiform, with short cilia unilaterally. Lyrifissures *iad* located in inverse apoanal (paraanal in two specimens; left lyrifissure inverse apoanal, right lyrifissure paraanal in one specimen) position.

Legs (Figs 17–19): Generally, similar to *Gittella ecuadoriensis* Ermilov & Kalúz, 2012. Formulae of leg setation and solenidia: I (1–5–2–4–20) [1–2–2], II (1–5–2–4–16) [1–1–2], III (2–3–1–3–15) [1–1–0], IV (1–2–2–3–12) [0–1–0]; homology of setae and solenidia indicated in Table 1. Setae *p* on tarsi I setiform; on tarsi II–IV thorn-like. Setae *tc'* on leg II, *tc''* on leg III, *a''* on leg IV with thickened cilia bilaterally.

Setae *a'*, *s*, *pv'* on leg II, *a''*, *s*, *pv''* on leg III, *pv'''* on leg IV with thickened cilia unilaterally. Famulus (*e*) setiform, straight or bent, blunt-ended. Solenidia ω_1 , ω_2 on tarsi I, II, ϕ_2 on tibiae I, ϕ on tibiae II, σ on tibiae III thickened, blunt-ended. Other solenidia thinner and longer, weakly blunt distally.

Etymology. The specific name *variabilis* refers to the variability of some morphological characters (body surface, orientation of lyrifissures *iad*).

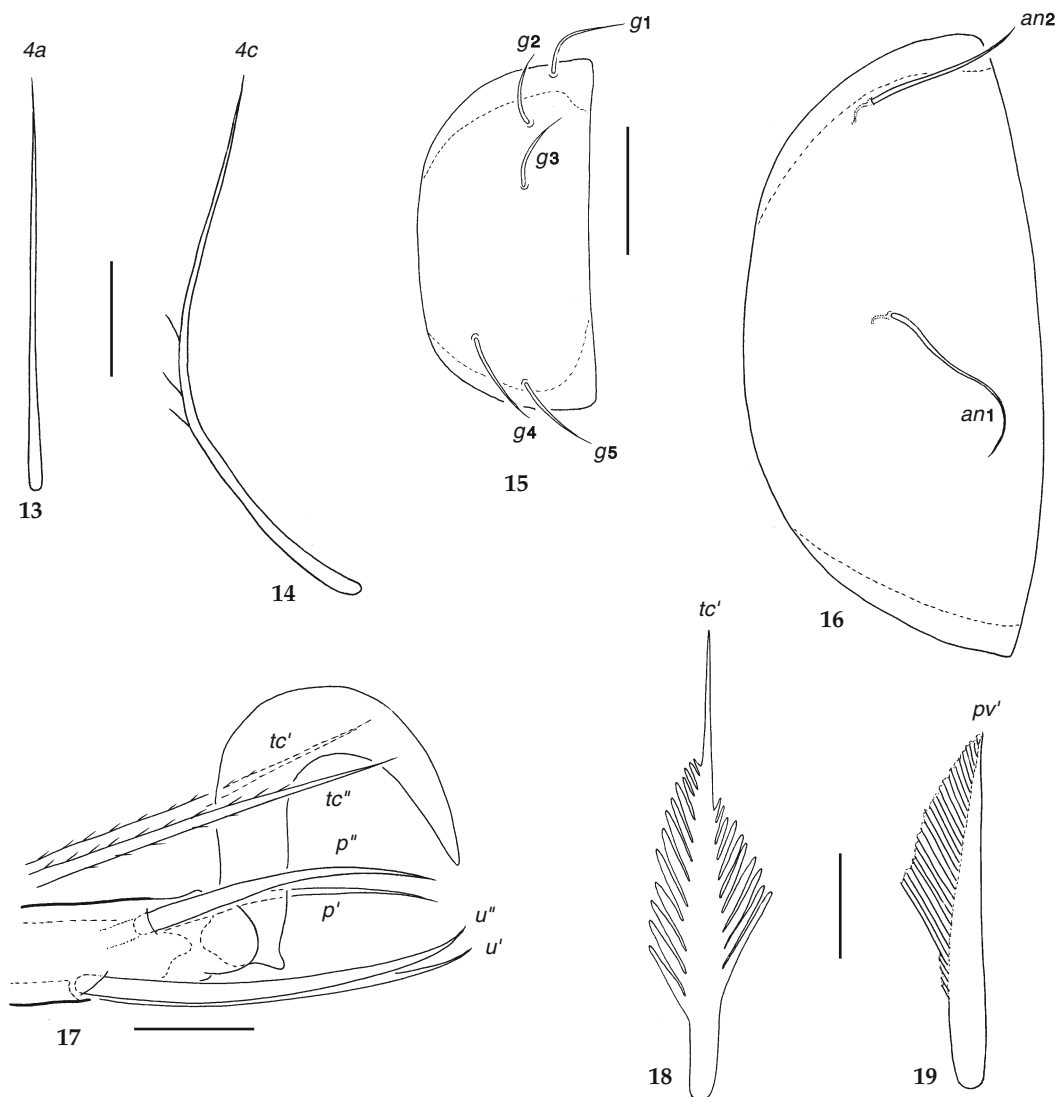
Remarks. In having the combination of morphological characters (setiform, branched sensilli; long and ciliate notogastral setae; length of adanal setae; presence of two pairs of interbothridial muscle sigilla), *Gittella variabilis* spec. nov. is most similar to *Gittella maxima* (Balogh & Mahunka, 1981) (see Balogh & Mahunka 1981), however, it differs from the latter



Figs 4–12. *Gittella variabilis* spec. nov. 4. Rostral seta. 5. Lamellar seta. 6. Interlamellar seta. 7. Sensillus. 8. Exobothridial seta. 9. Subcapitulum, left half. 10. Adoral setae. 11. Palp. 12. Chelicera, anterior part. Scale bars: 4, 5, 8, 10, 11 = 10 µm; 6, 7, 12 = 20 µm; 9 = 50 µm.

by the morphology of sensilli (with long four to five branches in the new species versus with four long and four short branches in *G. maxima*), presence of muscle sigilla in epimeral region (versus absent in

G. maxima), morphology of notogastral setae (ciliate unilaterally in the new species versus ciliate not unilaterally in *G. maxima*).



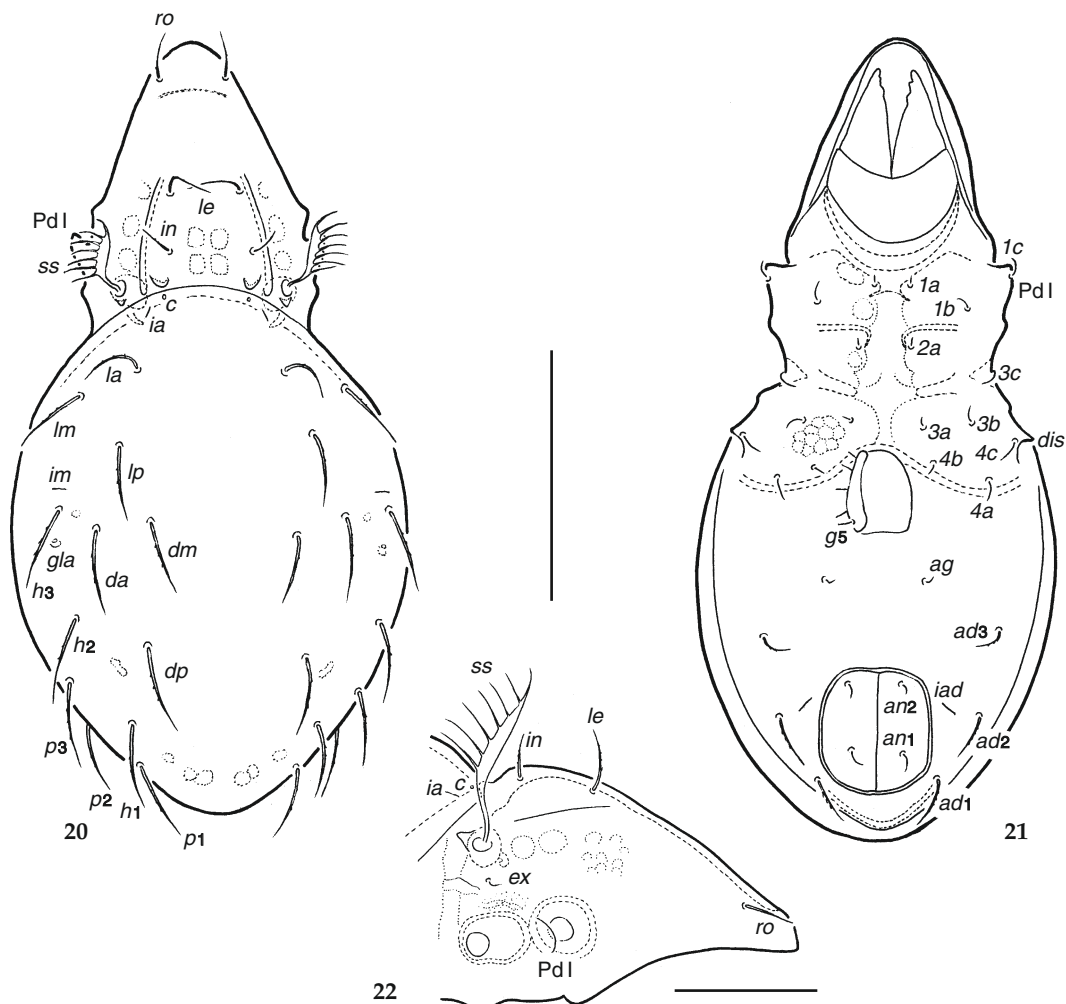
Figs 13–19. *Gittella variabilis* spec. nov. 13. Epimeral seta 4a. 14. Epimeral seta 4c. 15. Genital plate, right. 16. Anal plate, right. 17. Leg tarsus I, right, antiaxial view, anterior part. 18. Seta *tc'* on leg tarsus II. 19. Seta *pv'* on leg tarsus II. Scale bars: 13, 14, 17–19 = 10 µm; 15, 16 = 20 µm.

***Gittella minor* spec. nov.**

Figs 20–34

Material examined. Holotype: male, Southern Ecuador, 3°58'S 79°50'W, Estación Científica San Francisco, 2000 m a.s.l., upper organic soil layer in mostly undisturbed rain forest, 01.04.2008 (ZISP). – Paratypes: one male and two females in SZMN, and three males in PC, same locality and date as holotype.

Diagnosis. Body size 311–328 × 147–159. Body surface smooth. Lamellar lines distinct. Interbothridial region with two pairs of muscle sigilla. Lamellar setae longer than rostral and interlamellar setae. Sensilli with dilated head, having six long branches. Notogastral setae of medium size, ciliate. Epimeral region with muscle sigilla. Anogenital setae smooth (except ciliate adanal setae). Lyrifissures *iad* located in inverse apoanal position.



Figs 20–22. *Gittella minor* spec. nov. 20. Dorsal view. 21. Ventral view (legs, subcapitular setae and palps not shown). 22. Lateral view of prodorsum (legs and gnathosoma not shown). Scale bar: 1, 2 = 100 μ m; 3 = 50 μ m.

Description

Measurements: Body length 311 (holotype), 311–328 (mean 317; six paratypes); notogaster width 147 (holotype), 147–159 (mean 155; six paratypes).

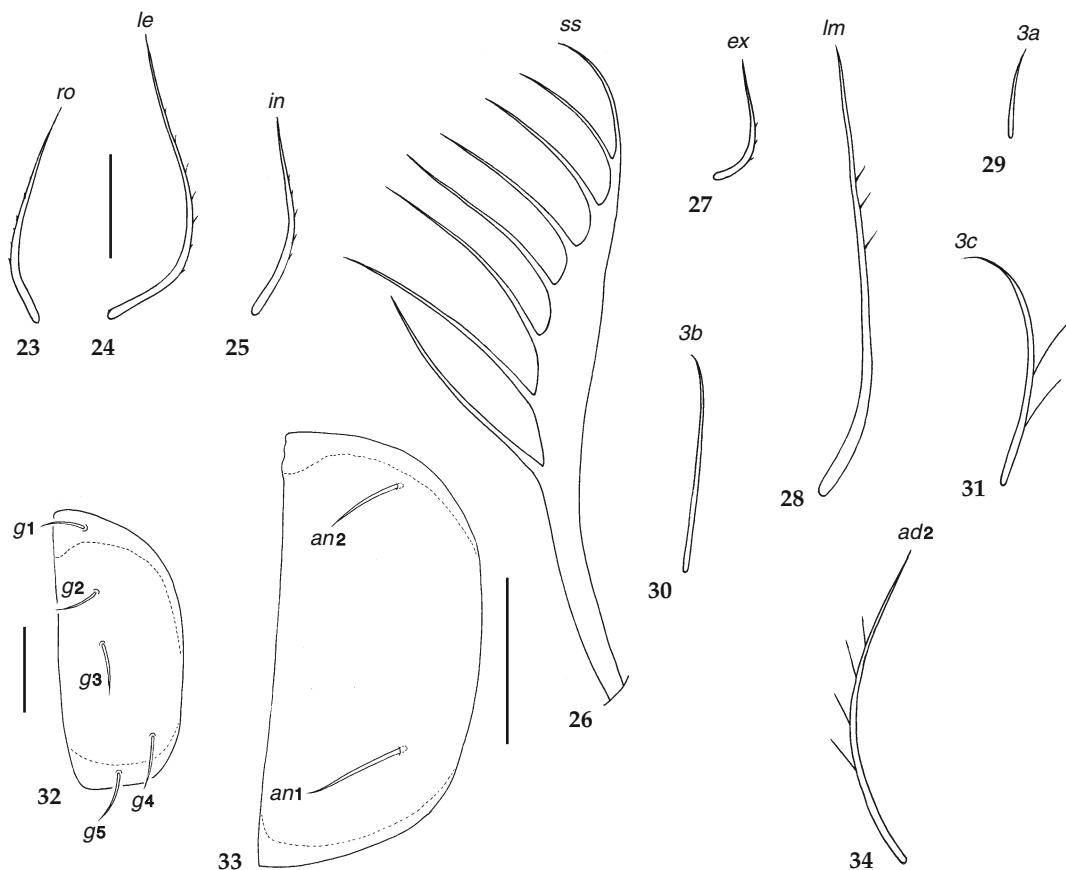
Integument (Figs 20–22): Body colour yellow-brownish. Body surface smooth; lateral sides with small microgranulate parts between bothridia and acetabula I, II. Interbothridial region with two pairs of distinct muscle sigilla. Epimeral region with numerous muscle sigilla.

Prodorsum (Figs 20, 22–27): Rostrum rounded. Lamellar lines well developed. Triangular tubercle located posteriorly to each bothridium and interlamellar seta. Rostral (16–20), lamellar (24–32),

interlamellar (16–20) and exobothridial (8–12) setae setiform, with very short cilia unilaterally. Sensilli (61–69) with dilated head, having six long branches.

Notogaster (Figs 20, 28): Anterior border convex. A pair of setae *c* is absent (only alveoli present). Twelve other pairs of notogastral setae long (36–45), setiform, with short cilia unilaterally. Lyrifissures *ia*, *im*, *ip*, *ih* and *ips* distinct, located typically for genus. Opisthonotal gland openings located posteriorly to setae *h*₃.

Gnathosoma: Subcapitulum longer than wide (82–90 \times 49–53). Subcapitular setae (*a*, *m*, *h*) setiform, smooth, similar in length (16–20). Two pairs of adoral setae present, thorn-like (4). Palps (49–53) with setation 0–2–1–3–9(+ ω). Setae of femora with long, thick-



Figs 23–34. *Gittella minor* spec. nov. 23. Rostral seta. 24. Lamellar seta. 25. Interlamellar seta. 26. Sensillus. 27. Exobothridial seta. 28. Notogastral seta *lm*. 29. Epimeral seta *3a*. 30. Epimeral seta *3b*. 31. Epimeral seta *3c*. 32. Genital plate, left. 33. Anal plate, left. 34. Adanal seta *ad2*. Scale bars: 23–32, 34 = 10 µm; 33 = 20 µm.

ened cilia; setae of genua and tibia with short cilia unilaterally; setae of tarsi smooth. Solenidion long, thickened, blunt-ended, pressed to the palptarsus surface, attached with distal seta u" in distal half. Chelicerae (82–90) chelate-dentate. Cheliceral setae setiform, barbed; *cha* (24–28) longer than *chb* (16). Trägårdh's organ distinct.

Epimeral and lateral podosomal regions (Figs 21, 22, 29–31): Epimeral border IV convex posteriorly. Epimeral setae setiform; *1c*, *3c* and *4c* with short cilia unilaterally, others smooth. Setae *1b*, *1c*, *3b*, *3c*, *3c*, *4a* and *4c* (16–20) longer than others (6–12). Pedotecta I convex. Discidia triangular, blunt-ended.

Anogenital region (Figs 21, 32–34): Five pairs of genital (*4*–*6*), one pair of aggenital (*4*–*6*) and two pairs of anal (*an1*, 8–12; *an2*, 4–8) setiform, smooth. Three pairs of adanal setae (*ad1*, *ad2*, 24–32; *ad3*, 12–16) setiform, with short cilia unilaterally. Lyrifissures *iad* located in inverse apoanal position.

Legs: Similar to *Gittella variabilis* spec. nov. Homology of setae and solenidia indicated in Table 1.

Etymology. The specific name *minor* refers to the small body size.

Remarks. In having the combination of morphological characters (smooth body surface; sensilli with dilated head, having branches; ciliate notogastral setae of medium length), *Gittella minor* spec. nov. is most similar to *Gittella insularis* Mahunka, 1998 (see Mahunka 1998), however, it differs from the latter by the smaller body size (311–328 × 147–159 in the new species versus 576–642 × 255–297 in *G. insularis*), presence of two pairs of interbothridial muscle sigilla (versus three pairs in *G. insularis*), ciliate rostral and interlamellar setae (versus smooth in *G. insularis*).

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