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Ethiopian oribatid mites (Acari: Oribatida) from the Joint Russian-Ethiopian Biological Expedition (2012), with description of a new species

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ABSTRACT

The present study is based on oribatid mite material collected during October and November 2012 in the course of a Russian-Ethiopian expedition to southern Ethiopia. An annotated checklist of identified taxa is provided, with 22 species, 19 genera and 15 families recorded. A new species, *Perscheloribates paratranslamellatus* sp. n., from xerophytic forest litter is described. It is most similar morphologically to *Perscheloribates translamellatus* (Pérez-Iñigo & Baggio, 1991), but differs from the latter by larger body size, presence of a rudimentary translamellar line, absence of prolamellar lines, longer setae *p*₁ and elongate openings of sacculi *Sa*, *Sl*. A supplementary description of *Paropopia breviseta* (Balogh, 1962) based on Ethiopian specimens is presented.

KEY WORDS: Oribatida, *Perscheloribates*, *Paropopia breviseta*, new species, checklist, supplementary description, oribatid mites, xerophytic forest, Afrotropical, Ethiopia.

INTRODUCTION

Currently, oribatid mite (Acari: Oribatida) fauna of Ethiopia includes little more than 150 species (Ermilov *et al.* 2012a, b; Ermilov & Rybalov 2013a, b). This work forms part of our ongoing study of the Ethiopian oribatids. The present investigation is based on new material collected in the course of a two-month Russian-Ethiopian expedition during October and November 2012. An annotated checklist of identified oribatid mite taxa is provided (Table 1).

The genus *Perscheloribates* (Scheloribatidae) was proposed by Hammer (1973) with *Perscheloribates clavatus* Hammer, 1973 as type species. The genus comprises 44 species that collectively have pan- and subtropical distributions (Subías 2004; online version 2013). Up to now, eight species have been recorded from the Ethiopian region (Ermilov *et al.* 2011): *P. crassisetosus* Ermilov, Rybalov & Franke, 2011, *P. ethiopicus* (Mahunka, 1986), *P. luminosus* (Hammer, 1961), *P. minimus* (Mahunka, 1992), *P. minutus* (Pletzen, 1965), *P. rustenburgensis* (Pletzen, 1963), *P. shiraensis* (Evans, 1953) and *P. tzitzikamaensis* (Pletzen, 1963). The identification key to aforementioned species and generic diagnostic characters were presented by Ermilov *et al.* (2011). The new species is described as *Perscheloribates paratranslamellatus* sp. n.

The collected material further included *Paropopia breviseta* (Balogh, 1962) (Oppiidae), a species described from Tanzania (Balogh 1962). The original description of this species is, however, incomplete and brief (lacking information about the measurements of morphological structures, leg setation, and solenidia together with the morphology of the gnathosoma). *P. breviseta* is redescribed based on newly sampled Tanzanian specimens.

MATERIAL AND METHODS

Mosses on trees were collected by hand (total volume = 0.03 m³). Litter was collected by taking 10 samples using a stainless steel frame (50 × 50 cm) and passed through a sifter (mesh size 2 × 2 cm). Oribatid mites were extracted into 75 % ethanol using Berlese funnels with ambient light for the first three days and 160 W electric lamps (at a distance of 25–30 cm) from the fourth until the seventh day.

Specimens were mounted in lactic acid on temporary cavity slides for measurement and illustration. All body measurements are presented in micrometres. The body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the ventral plate. Notogastral width refers to the maximum width in dorsal view. The lengths of body setae were measured in lateral view. Formulae for leg setation are given in parentheses according to the sequence: trochanter–femur–genu–tibia–tarsus (femulus 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 summarised by Coetzer (1967–1968), and Norton and Behan-Pelletier (2009).

The holotype material is deposited at the Zoological Institute of the Russian Academy of Sciences, St Petersburg, Russia (ZISP). The paratype material is deposited at the Siberian Zoological Museum, Novosibirsk, Russia (SZMN) and in the personal collection of the first author (PC).

List of collecting sites:

Et-12–10: 09°04'N 38°08'E, 10 km north of Ginchi city, Chilimo forest (*Hagenia abyssinica* and *Juniperus* sp. forming the canopy), 2900 m, mosses on trees, 25.x.2012 (collected by L.B. Rybalov and A.I. Bastrakov).

Et-12–11: 08°58'N 37°51'E, Ambo Plant Protection Research Center, xerophytic forest on vertisols, 2077 m, litter (sifter), 20.xi.2012 (collected by L.B. Rybalov and A.I. Bastrakov).

TAXONOMY

Samples from the collecting sites yielded 22 species, 19 genera and 15 families. *Pedrocortesella africana* Pletzen, 1963, *Liacarus shipitsyni* Ermilov, Rybalov & Kemal, 2011, *Zetorchella pedestris* Berlese, 1916 and *Scheloribates discifer* Balogh, 1959 were the only species recorded from mosses on trees; all other species were recorded only from forest litter (Table 1).

Family Scheloribatidae Grandjean, 1933

Genus *Perscheloribates* Hammer, 1973

***Perscheloribates paratranslamellatus* sp. n.**

Figs 1–2

Etymology: From the Latin prefix *para* (near) referring to the similarity between the new species and the species *Perscheloribates translamellatus* (Pérez-Íñigo & Baggio, 1991).

Diagnosis: body size 481–531 × 298–348; rostrum rounded; rudimentary translamellar line; prolamellar lines absent; prodorsal setae setiform, barbed; sensilli spindle-form, ciliate; exobothridial setae short; one pair of notogastral setae *p*₁ present; sacculi *Sa*, *Sl*

TABLE 1

Oribatid mites collected from tree mosses (Et-12–10) and xerophytic forest litter (Et-12–11) in Ethiopia.

Identification	Author	Collecting site	
		Et-12–10	Et-12–11
Nothridae			
<i>Nothrus crassisetus</i>	Mahunka, 1982		x
Hermanniellidae			
<i>Hermanniella congoensis</i>	Balogh, 1958		x
Pedrocortesellidae			
<i>Pedrocortesella africana</i>	Pletzen, 1963	x	
Aleurodamaeidae			
<i>Aleurodamaeus recenfesevpi</i>	Ermilov & Rybalov, 2012		x
Damaeidae			
<i>Metabelba glabriseta</i>	Mahunka, 1982		x
Astegistidae			
<i>Cultroribula bicuspidata</i>	Mahunka, 1978		x
Gustaviidae			
<i>Gustavia longiseta</i>	Mahunka, 1984		x
Liacaridae			
<i>Liacarus shipitsyni</i>	Ermilov, Rybalov & Kemal, 2011	x	
Oppiidae			
<i>Arcoppia rugosa</i>	(Mahunka, 1974)		x
<i>Neoamerioppia polygonata</i>	(Mahunka, 1982)		x
<i>Paroppia breviseta</i>	(Balogh, 1962)		x
Phenopelopidae			
<i>Eupelops acromios</i>	(Hermann, 1804)		x
<i>Eupelops torulosus</i>	(Koch, 1839)		x
Humerobatidae			
<i>Humerobates africanus</i>	(Mahunka, 1984)		x
Caloppiidae			
<i>Zetorchella nortoni</i>	Ermilov, Sidorchuk & Rybalov, 2010		x
<i>Zetorchella pedestris</i>	Berlese, 1916	x	
Scheloribatidae			
<i>Perscheloribates paratranslamellatus</i> sp. n			x
<i>Scheloribates aethiopicus</i>	Mahunka, 1982		x
<i>Scheloribates discifer</i>	Balogh, 1959	x	
Galumnidae			
<i>Galumna lanceosensilla</i>	Ermilov, Sidorchuk & Rybalov, 2011		x
<i>Trichogalumna africana</i>	Ermilov, Sidorchuk & Rybalov, 2011		x
Galumnellidae			
<i>Galumnella subareolata</i>	Mahunka, 1969		x

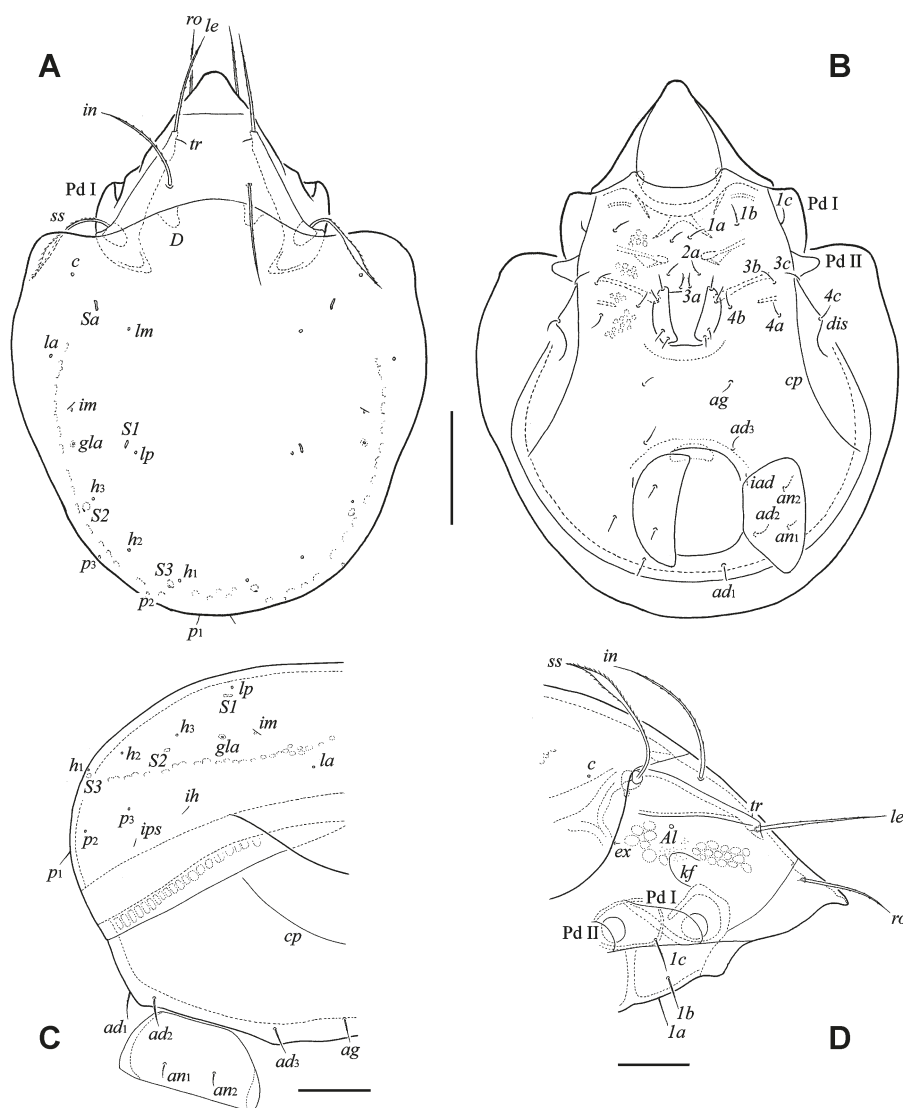


Fig. 1. *Perscheloribates paratranslamellatus* sp. n.: (A) dorsal view (legs not shown); (B) ventral view (gnathosoma and legs not shown); lateral view of (C) body posterior; (D) body anterior. Scale bars A, B=100 µm; C, D=50 µm.

with elongate openings, S2, S3 with rounded openings; ventral setae setiform, slightly barbed, and with little difference in length; leg claws serrate on dorsal side.

Description:

Measurements. Body (length × width): 481 × 298 (holotype ♂); 481–531 × 298–348 (paratypes: 1♂ 4♀).

Integument. Body brown and light brown. Dorsal and ventral surfaces of body smooth, lateral surfaces weakly microgranulate.

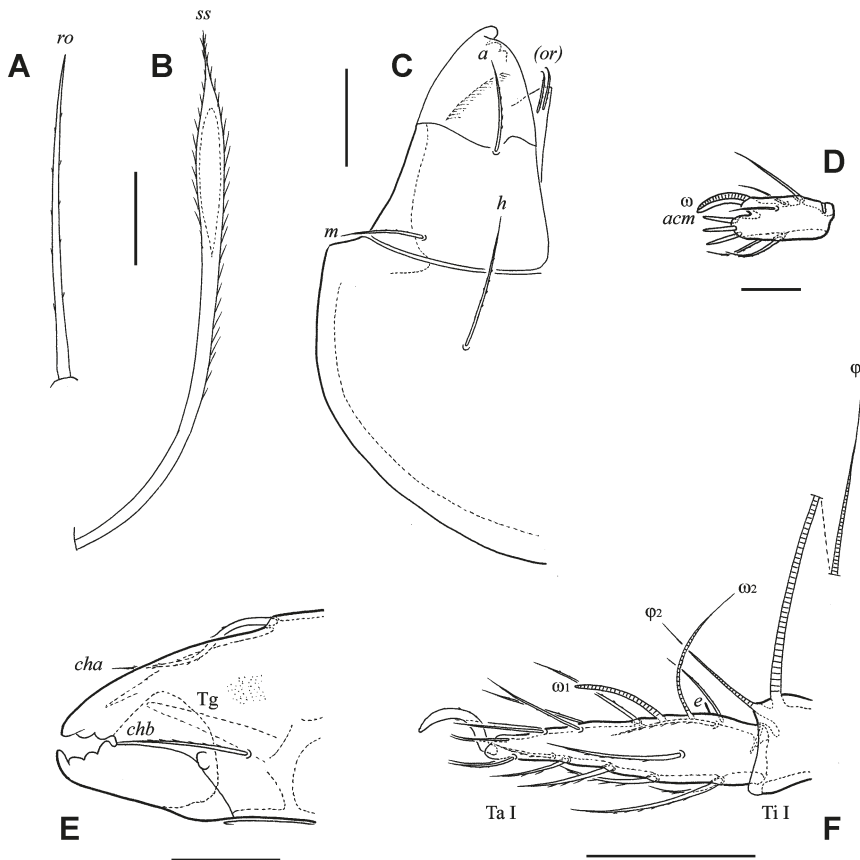


Fig. 2. *Perscheloribates paratranslamellatus* sp. n.: (A) rostral seta; (B) sensillus; (C) subcapitulum, right half; (D) palptarsus; (E) anterior part of chelicera; (F) tarsus and anterior part of tibia, leg I, left, antiaxial view. Scale bars A–C, E=20 µm; D=10 µm; F=50 µm.

Prodorsum (Figs 1A, 1B, 1D; 2A, 2B). Rostrum slightly protruding, rounded. Lamellae located dorsolaterally, as long as half of prodorsum (in lateral view), without cusps. Translamellar line (*tr*) rudimental, at tips of lamellae. Prolamellar lines absent. Sublamellar lines distinct, long. Sublamellar porose areas (*Al*) very small, rounded (2–4). Keel-shaped chitinised ridges (*kf*) distinct. Rostral (*ro*, 61–69), lamellar (*le*, 90–102) and interlamellar (*in*, 114–127) setae setiform, barbed. Sensilli (*ss*, 110–118) spindle-form (with long stalk, elongated lanceolate head and well developed thin apex), with numerous cilia. Exobothridial setae (*ex*, 4–6) short, thin, smooth.

Notogaster (Figs 1A, 1C). Anterior notogastral margin convex medially. Dorsophragmata (*D*) of medium size, widely rounded. Nine pairs of notogastral setae represented by alveoli; only one pair of thin, smooth setae developed (*p*₁, 8–10). Four pairs of sacculi present: *Sa*, *S1* with elongate openings, *S2*, *S3* with small, rounded openings. Circumgastric band of muscle sigillae distinct. Opisthonotal gland openings (*gla*) and lyrifissures developed in typical arrangement for genus.

TABLE 2

Leg setation and solenidia of *Perscheloribates paratranslamellatus* sp. n. Roman letters refer to normal setae (*e* – famulus), Greek letters refer to solenidia. Single (') and double (") apostrophes mark anteriorly and posteriorly placed setae on the given leg segments respectively. Parentheses refer to a pair of setae.

Leg	Trochanter	Femur	Genu	Tibia	Tarsus
I	<i>I''</i>	<i>d</i> , (<i>l</i>), <i>bv''</i> , <i>v''</i>	(<i>l</i>), σ	(<i>l</i>), (<i>v</i>), ϕ_1 , ϕ_2	(<i>fi</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>e</i> , ω_1 , ω_2
II	<i>v'</i>	<i>d</i> , <i>l'</i> , <i>l'_2</i> , <i>bv''</i> , <i>v''</i>	(<i>l</i>), σ	(<i>l</i>), (<i>v</i>), ϕ	(<i>fi</i>), (<i>tc</i>), (<i>it</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>), ω_1 , ω_2
III	<i>l'</i> , <i>v'</i>	<i>d</i> , <i>l'</i> , <i>ev'</i>	<i>l'</i> , σ	<i>l'</i> , (<i>v</i>), ϕ	(<i>fi</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> , (<i>v</i>), ϕ	<i>fi''</i> , (<i>tc</i>), (<i>p</i>), (<i>u</i>), (<i>a</i>), <i>s</i> , (<i>pv</i>)

Anogenital region (Figs 1B, 1C). Three pairs of adanal (*ad*₁–*ad*₃, 16–20), one pair of aggenital (*ag*, 16–20), two pairs of anal (*an*₁, *an*₂, 12–16) and four pairs of genital (*g*₁–*g*₄, 16–20) setae setiform, slightly barbed. Lyrifissures *iad* in para-anal position, located nearly to anal aperture.

Epimeral and lateral podosomal regions (Figs 1B, 1D). Apodemes 1, 2, 3 and sejugal apodemes distinct. Epimeral setal formula: 3–1–3–3. Setae (16–24) setiform, thin, slightly barbed; medial setae little shorter than others. Pedotecta I (Pd I) large, concave; pedotecta II (Pd II) rounded anteriorly. Discidia (*dis*) triangular, rounded. Circumpedial carina (*cp*) distinct.

Gnathosoma (Figs 2C–2E). Subcapitulum longer than wide: 118–123 × 82. Subcapitular setae setiform, barbed; *h* (28–32) longer than *a*, *m* (both 20). Lateral lips with two pairs of setiform, barbed adoral setae (*or*₁, *or*₂, 10–12). Palps (length 69–73) with setation 0–2–1–3–9 (+ ω). Solenidion coupled with eupathidium *acm*. All setae (except some on tarsi) weakly barbed. Chelicerae (length 118–123) with two setiform, barbed cheliceral setae; *cha* (36–41) longer than *chb* (24–28).

Legs (Fig. 2F). Claw of each leg with several minute barbs on dorsally side. Formulae of leg setation and solenidia: I (1–5–2–4–19) [1–2–2], II (1–5–2–4–15) [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 2. Almost all setae (except *p*) barbed or with short cilia. Famulus (*e*) short, straight, indistinctly dilated apically, blunted. Solenidia ω_1 on tarsi I, ω_1 and ω_2 on tarsi II, σ on genua III short, thickened, blunt-ended; other solenidia longer, thinner, setiform.

Holotype: ♂ ETHIOPIA: Et-12–10. Preserved in ethanol (ZISP).

Paratypes: 1♂ 4♀ ETHIOPIA: Et-12–10. Preserved in ethanol (1♂ 2♀ SZMN; 2♀ PC).

Distribution: At present, this species is only known from the type locality.

Remarks: In having one pair of notogastral setae *p*₁ (other setae represented by alveoli), spindle-form and ciliate sensilli, and rounded rostrum, *P. paratranslamellatus* sp. n. is similar to *P. translamellatus* from Peru (Pérez-Íñigo & Baggio 1991); however, it differs from the latter by larger body size (481–531 × 298–348 versus 324–360 × 196–216), a rudimental translamellar line running nearly to lamellae (translamella complete in *P. translamellatus*), absence of prolamellar lines (present, not reaching insertions of rostral setae in *P. translamellatus*), longer setae *p*₁ (minute in *P. translamellatus*) and elongate openings of sacculi *Sa*, *S1* (rounded in *P. translamellatus*).

From the Ethiopian species, *Perscheloribates minutus* (Pletzen 1965; Corpuz-Raros 1980) is the closest morphologically to *P. paratranslamellatus* sp. n.; however, it differs from *P. minutus* in that it has a larger body size ($481\text{--}531 \times 298\text{--}348$ versus $343\text{--}394 \times 216\text{--}303$ in *P. minutus*), absence of prolamellar lines (present in *P. minutus*), and development of a single pair of notogastral setae p_1 (versus $p_1\text{--}p_3$ developed in *P. minutus*).

Family Oppiidae Sellnick, 1937
Genus *Paroppia* Hammer, 1968
***Paroppia breviseta* (Balogh, 1962)**

Figs 3–4

Oppia breviseta: Balogh 1962: 100.

Paroppia breviseta: Subías & Balogh 1989: 385.

Diagnosis (based on Ethiopian specimens): body size $315\text{--}332 \times 182\text{--}199$; rostrum rounded; rostral setae ciliate, longer than smooth lamellar and interlamellar setae; sensilli long, with elongate lanceolate, indistinctly barbed head; interbothridial region with three pairs of muscle sigillae; notogastral setae c represented by alveoli, other setae of medium size, thin, slightly barbed; anogenital setae of medium size, similar in length, smooth.

Description:

Measurements. Body (length \times width): $315\text{--}332 \times 182\text{--}199$ (2♂ 5♀).

Integument. Body light brown. Dorsal and ventral surfaces of body smooth, lateral surfaces microgranulate.

Prodorsum (Figs 3A, 3C; 4A, 4B). Rostrum rounded. Rostral setae (24–32) setiform, unilaterally with short cilia. Lamellar and interlamellar setae similar in length (12), setiform, smooth. Sensilli (65–73) with long stalk and elongate lanceolate head; sensillar heads with several poorly developed barbs in anterior part (visible only under high magnification). Exobothridial setae and their alveoli absent. Interbothridial region with three pairs of muscle sigillae removed from each other.

Notogaster (Figs 3A, 3C, 4C). Anterior notogastral margin convex medially. A pair of small tubercles (tb) located dorsolaterally to anterior margin. Nine pairs of notogastral setae of medium size (18–24), setiform, with poorly developed barbs (visible only under high magnification); one pair (c) represented by alveoli. Circumgastric band of muscle sigillae distinct. Opisthonotal gland openings and lyrifissures developed in typical arrangement for genus.

Anogenital region (Figs 3B, 3C, 4G). Three pairs of adanal, one pair of aggenital, two pairs of anal, four pairs of genital setae similar morphologically: 12–26, setiform, thin, smooth. Lyrifissures iad in para-anal position, located near to anal aperture.

Epimeral and lateral podosomal regions (Figs 3B, 3C). Apodemes 1, 2, 4 and sejugal apodemes distinct. Epimeral setal formula: 3–1–3–3. Setae $3c$ longer (24–28), barbed; other setae shorter (12–26), indistinctly barbed. Pedotecta I concave. Discidia triangular.

Gnathosoma (Figs 4D–4F). Subcapitulum anarthric, longer than wide: $65\text{--}73 \times 49\text{--}53$. Subcapitular setae similar in length (16–18), setiform, with one to three small barbs. Lateral lips without setae and associated alveoli. Palps (length 49–53) with setation

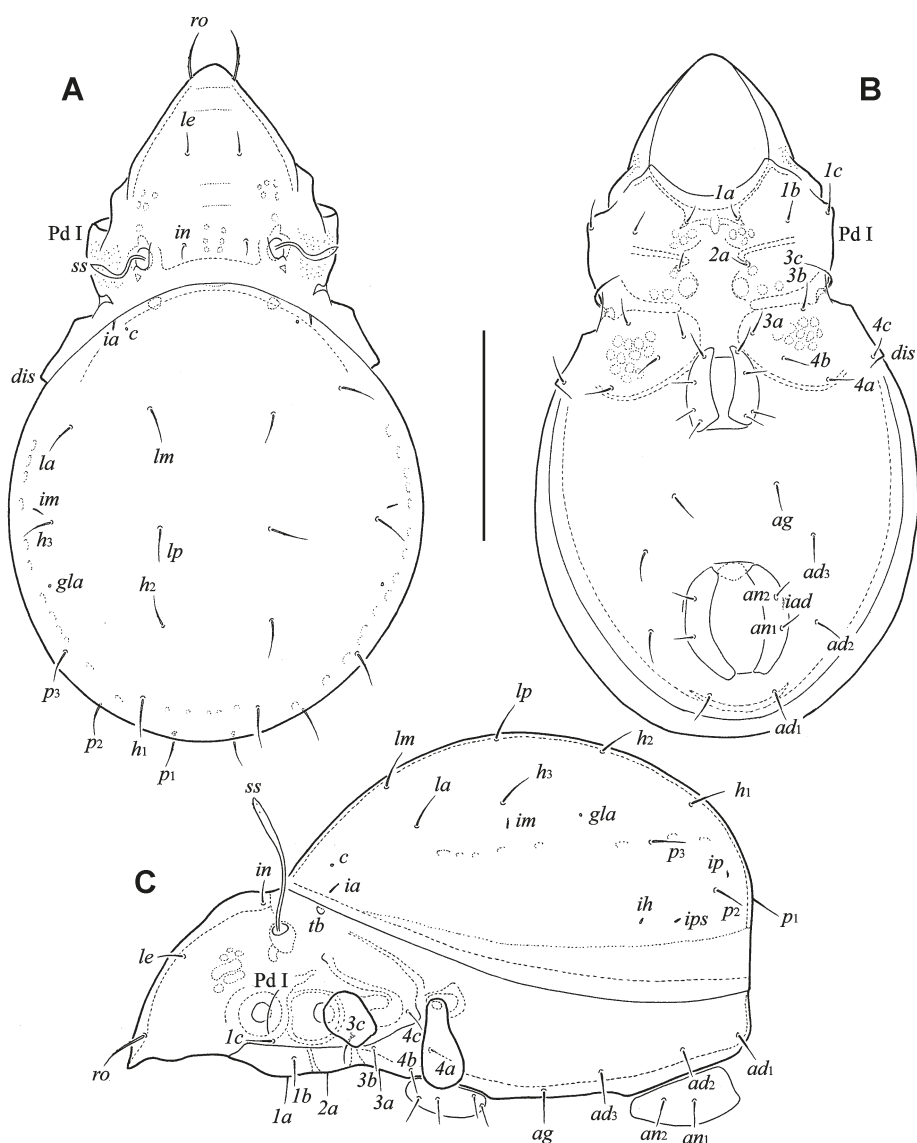


Fig. 3. *Paroppia breviseta* (Balogh, 1962): (A) dorsal view (legs not shown); (B) ventral view (gnathosoma and legs not shown); (C) lateral view (gnathosoma and legs except trochanters III, IV not shown). Scale bar = 100 μ m.

0–2–1–2–7 (+ ω). Solenidion thickened, blunt-ended, pressed to the palptarsus, not coupled with eupathidium. All setae (except some on tarsi) weakly barbed. Chelicerae (length 65–73) with one tooth on each movable and fixed digit; both cheliceral setae similar in length (10), setiform, slightly barbed.

Legs (Figs 4H–4J). Claw of each leg smooth. Apophysis on tibiae I well developed. Formulae of leg setation and solenidia: I (1–5–2–4–20) [1–2–2], II (1–5–2–4–16)

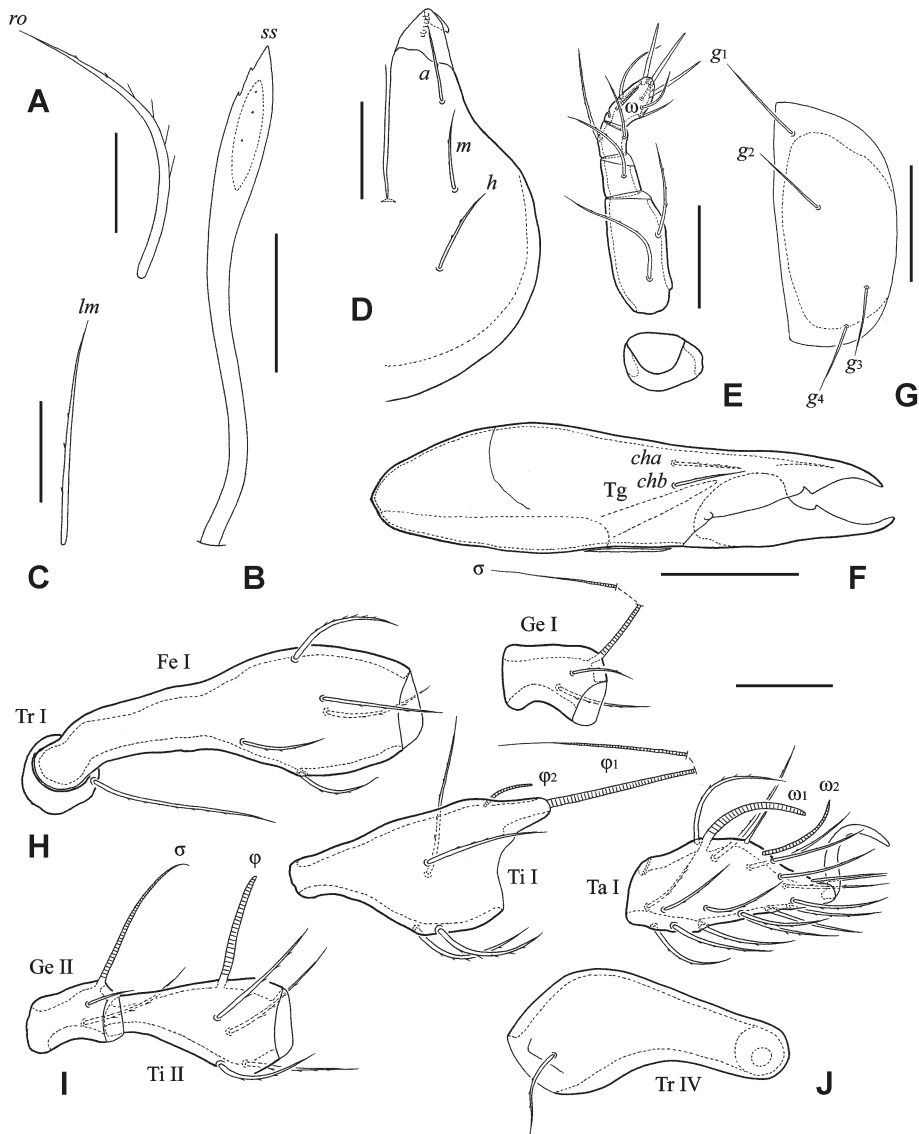


Fig. 4. *Paroppia breviseta* (Balogh, 1962): (A) rostral seta; (B) sensillus; (C) notogastral seta *lm*; (D) subcapitulum, left half; (E) palp; (F) chelicera; (G) genital plate, left; (H) leg I, right, antiaxial view; (I) tibia and genu of leg II, right, antiaxial view; (J) trochanter of leg IV, right, antiaxial view. Scale bar A, C = 10 μ m; B, D–J = 50 μ m.

[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 3. Almost all setae (except *p*, *s*) barbed or with short cilia. Famulus short, straight, indistinctly dilated apically, blunted. Setae *p* on tarsi II–IV represented by poorly developed thorn-like setae. Solenidia σ on genua I, II and ϕ_1 on tibia I long, setiform; other solenidia shorter, thickened, blunt-ended.

Material examined: 2 ♂ 5 ♀ ETHIOPIA: Et-12–10. Preserved in ethanol (PC).

TABLE 3

Leg setation and solenidia of *Paroppia breviseta* (Balogh, 1962). See Table 2 for explanation.

Leg	Trochanter	Femur	Genu	Tibia	Tarsus
I	v'	d, (l), bv'', v''	(l), σ	(l), (v), φ_1 , φ_2	(fi), (tc), (it), (p), (u), (a), s, (pv), v', (pl), l'', e, ω_1 , ω_2
II	v'	d, (l), bv'', v''	(l), σ	(l), (v), φ	(fi), (tc), (it), (p), (u), (a), s, (pv), l'', ω_1 , ω_2
III	l', v'	d, l', ev'	l', σ	l', (v), φ	(fi), (tc), (it), (p), (u), (a), s, (pv)
IV	v'	d, ev'	d, l'	l', (v), φ	fi'', (tc), (p), (u), (a), s, (pv)

Distribution: At present, this species is only known from Tanzania and Ethiopia.

Remarks: The present Ethiopian specimens of *P. brevipes* are morphologically and in general appearance comparable to the Tanzanian specimens (Balogh 1962), although with slight differences: lamellar and interlamellar setae similar in length (interlamellar setae shorter in Tanzanian specimens), anterior part of sensillar heads with several poorly visible barbs (sensillar heads smooth in Tanzanian specimens), interlamellar muscle sigillae removed from each other (sigillae dense in Tanzanian specimens). We regard these differences as intraspecific (perhaps geographical) variability within the species.

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REFERENCES

- BALOGH, J. 1962. Acari Oribates. *Annales du Musée Royal de l'Afrique Centrale* (Série Zoologie) **110**: 90–131.
- COETZER, A. 1967–1968. New Oribatulidae Thor, 1929 (Oribatei, Acari) from South Africa, new combinations and a key to the genera of the family. *Memórias do Instituto de Investigação Científica de Moçambique* **9** (A): 15–126.
- CORPUZ-RAROS, L. 1980. Philippine Oribatei (Acarina) V. *Scheloribates* Berlese and related genera (Oribatulidae). *Kalikasan* **9** (2–3): 169–245.
- ERMILOV, S.G. & RYBALOV, L.B. 2013a. Two new species and new records of oribatid mites (Acari: Oribatida) from Ethiopia. *Annales Zoologici* **63** (1): 45–55.
- 2013b. Two new species of oribatid mites of the superfamily Oripodoidea (Acari: Oribatida) from Ethiopia. *Systematic and Applied Acarology* **18** (1): 71–79.
- ERMILOV, S.G., RYBALOV, L.B. & FRANKE, K. 2011. Ethiopian oribatid mites of the family Scheloribatidae (Acari: Oribatida). *African Invertebrates* **52** (2): 311–322.
- ERMILOV, S.G., SIDORCHUK, E.A. & RYBALOV, L.B. 2012a. Oribatid mites (Acari: Oribatida) of Ethiopia. *Zootaxa* **3208**: 27–40.
- ERMILOV, S.G., WINCHESTER, N.N., LOWMAN, M.M. & WASSIE, A. 2012b. Two new species of oribatid mites (Acari: Oribatida) from Ethiopia, including a key to species of *Pilobatella*. *Systematic and Applied Acarology* **17** (3): 301–317.
- HAMMER, M. 1973. Oribatids from Tongatapu and Eua, the Tonga Islands, and from Upolu, Western Samoa. *Det Kongelige Danske Videnskabernes Selskab Biologiske Skrifter* **20** (3): 1–70.

- NORTON, R.A. & BEHAN-PELLETIER, V.M. 2009. *Oribatida*. Chaper 15. In: Krantz, G.W. & Walter, D.E., eds, *A Manual of Acarology*. Lubbock: Texas Tech Univ. Press, pp. 430–564.
- PÉREZ-ÍÑIGO, C. & BAGGIO, D. 1991. Oribates édaphiques du Brésil (VI). Oribates de l'État de São Paulo (troisième partie). *Acarologia* **32** (1): 79–92.
- PLETZEN, R. 1965. Studies on the South African oribatei (Acari). III. Further new species of the genus *Scheloribates* Berlese, 1908. *Acarologia* **17** (1): 113–120.
- SUBÍAS, L.S. 2004. Listado sistemático, sinonímico y biogeográfico de los ácaros oribátidos (Acariformes: Oribatida) del mundo (excepto fósiles). *Graellsia* **60** (número extraordinario): 3–305. (http://escalera.bio.ucm.es/usuarios/bba/cont/docs/RO_1.pdf; accessed in May 2013).
- SUBÍAS, L.S. & BALOGH, P. 1989. Identification keys to the genera of Oppiidae Grandjean, 1951 (Acari: Oribatei). *Acta Zoologica Hungarica* **35** (3–4): 355–412.

