

Two new species of oribatid mites of the genus *Liacarus* (Acari: Oribatida) from Ethiopia

Два новых вида орибатидных клещей рода *Liacarus* (Acari: Oribatida) из Эфиопии

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Two species of oribatid mites genus *Liacarus* Michael, 1898 (Acari: Oribatida), *L. paratanzicus* sp. nov. and *L. shipitsyni* sp. nov. are described from mosses (first species also is in litter) from southern Ethiopia. In Ethiopian fauna, this genus is recorded for the first time.

Два новых вида орибатидных клещей рода *Liacarus* Michael, 1898, *L. paratanzicus* sp. nov. and *L. shipitsyni* sp. nov., описаны из южной части Эфиопии. Для фауны Эфиопии род *Liacarus* отмечен впервые.

Key words: Ethiopia, oribatid mites, *Liacarus*, new species

Ключевые слова: Эфиопия, орибатидные клещи, *Liacarus*, новые виды

INTRODUCTION

This work is a part of our continuing study of the Ethiopian fauna of oribatid mites (e.g. Ermilov et al., 2010a, 2010b, 2011; Niedbała & Ermilov, 2011), and includes the data about species from the family Liacaridae.

The oribatid mite family Liacaridae comprises nine genera and 125 species that collectively have a cosmopolitan distribution. In the course of taxonomic studies of the oribatid fauna of southern Ethiopia we found two new species of Liacaridae, belonging to the genus *Liacarus* Michael, 1898. The description of these new species are provided below.

Liacarus is the largest genus of Liacaridae and comprises 111 species (Subías,

2004, online version 2011). Until now, this genus has not been recorded in Ethiopia. The African fauna of *Liacarus* comprises four species, of which three species inquirenda (see Balogh, 1958): *L. celisi* Balogh, 1958 “sp. inq.” from central Africa, *L. curvidentatus* Balogh, 1958 “sp. inq.” from Congo, *L. leleupi* Balogh, 1958 “sp. inq.” from Congo and *L. tanzicus* Mahunka, 1983 from Tanzania.

MATERIALS AND METHODS

Number of specimens, collection localities and habitats of the new species are characterised in the “Type material examined” sections.

Specimens were studied in lactic acid, mounted in temporary cavity slides for the

duration of the study, then stored in 70% alcohol in vials. All body measurements are presented in micrometers. 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 distension. Notogastral width refers to the maximum width in dorsal aspect. Length of body setae was measured in lateral aspect.

Formulae of leg setation are given according to the sequence trochanter–femur–genu–tibia–tarsus (famulus included). Formulae of leg solenidia are given (in square brackets) according to the sequence genu–tibia–tarsus. All measurements are given in μm .

Terminology used in this paper follows that of F. Grandjean (see Travé & Vachon, 1975 for references).

RESULTS

Suborder ORIBATIDA

Family LIACARIDAE

Genus *Liacarus* Michael, 1898

Subgenus *Liacarus* Michael, 1898

Liacarus (Liacarus) paratanzicus sp. nov. (Figs 1–3)

Type material. *Holotype* (female), Ethiopia, 8°53'N, 38°09'E, 10 km to the south from Ginchi city, 2900 m.a.s.l., Cholomu Forest (wood species, in particular, *Hagenia abissinica* and *Podocarpus* forming the canopy; undergrowth of ferns), in mosses on trees, 15 Nov. 2009, coll. L.B. Rybalov. Five *paratypes* (three females, two males) were obtained from Ethiopia, 8°53'N, 38°09'E, 3300 m.a.s.l., 10 km to the south from Ginchi city, Cholomu Forest (*Erica* forming the canopy), Wenchi crater, mosses, coll. L.B. Rybalov and A.I. Bastrakov, 20 Nov. 2010. One *paratype* (one male) was obtained from: Ethiopia, 8°53'N, 38°09'E, 2810 m.a.s.l., 10 km to the south from Ginchi city, Cholomu Forest (*Hagenia abissinica* forming the canopy), litter, coll. L.B. Rybalov and A.I. Bastrakov, 4 Nov. 2010.

Deposition of holotype and paratypes.

The holotype is deposited in the collection of the Zoological Institute of the Rus-

sian Academy of Sciences, St. Petersburg, Russia; five paratypes are deposited in the collection of Siberian Zoological Museum, Novosibirsk, Russia; one paratype is in the personal collection of the first author.

Diagnosis. New species is distinguished by the following combination of character states: body size 913–1079 \times 581–680; notogaster and anogenital surfaces foveolate; rostrum truncate, with two incisions and two pairs of small lateral teeth; lamellae not touching medially, lamellar cusps well developed: inner cusps long, outer ones short; interlamellar (*in*) setae longer than lamellar (*le*) setae, rostral (*ro*) setae shortest; sensilli (*ss*) spindle-form, slightly barbed, its apical part longer, than length of head; setae p_1 longer than other notogastral setae.

Description. Measurements. Large-sized species. Body length 979 (holotype), 913–1079 (five paratypes); body width 647 (holotype), 581–680 (five paratypes).

Integument. Body color brown to black. Notogaster and anogenital surface with very small foveolae. Lateral part of lamellae, tutoria and pedotectae I striate. Lateral parts of body granulate.

Prodorsum (Figs 1A, C, D; 2A–E). Rostrum truncate in dorso-anterior view, with two incisions and two pairs of small lateral teeth. Lamellae longer than half of prodorsum, not touching medially. Lamellar cusps well developed; inner cusps long, outer ones short. Translamella absent. Rostral (94–123), lamellar (131–168), interlamellar (229–262) setae setiform, slightly barbed. Sensilli (143–164) spindle-form, slightly barbed; apical part longer, than length of head.

Notogaster (Fig. 1A). Dorsosejugal suture straight. Eleven pairs of notogastral setae developed: p_1 32–41, h_1 20, others setae 12. All setae smooth, except hardly barbed p_1 .

Lateral part of body (Fig. 1C). Exobothridial setae not observed. Tutoria (*tu*) long, thin.

Anogenital region (Figs 1B; 2F–H). Two pairs of anal (an_1 , an_2 , 36–41), 3

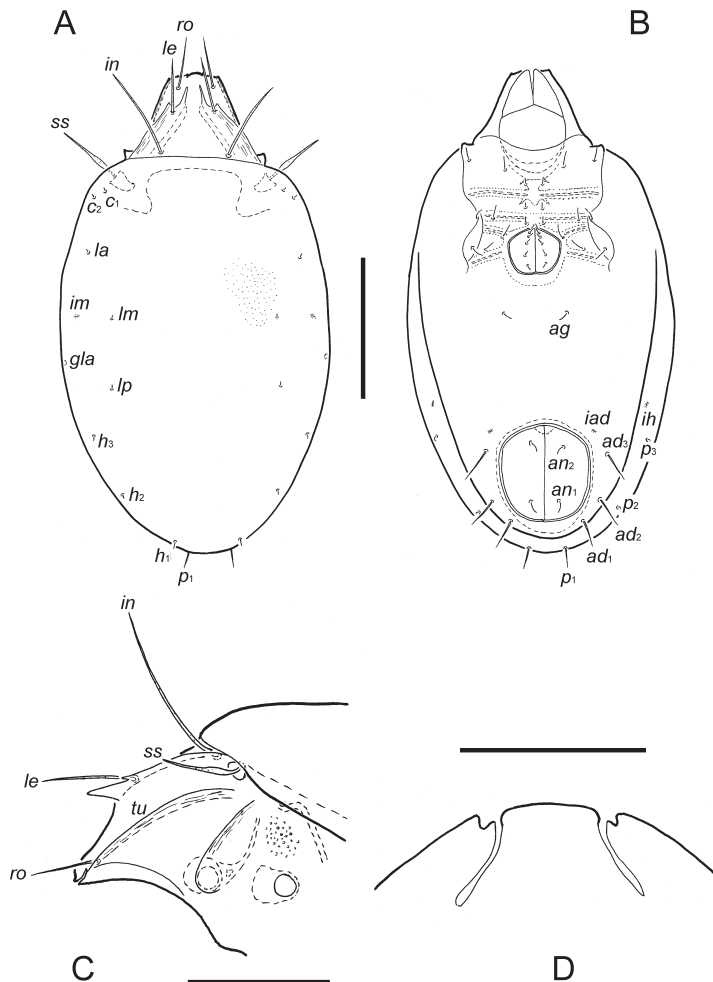


Fig. 1. *Liacarus paratanzicus* sp. nov.: **A**, dorsal view, leg not shown; **B**, ventral view, legs, palps and subcapitular setae not shown; **C**, lateral view of prodorsum, gnathosoma, notogastral setae and legs not shown; **D**, rostrum, dorso-anterior view. Scale bars: 300 μ m (A, B), 200 μ m (C), 50 μ m (D).

pairs of adanal (ad_1 – ad_3 , 61–65), 1 pair of aggenital (ag , 36–41) and 6 pairs of genital (g_1 – g_6 , 24–28) setae setiform, thin, slightly barbed. Ovipositor 306 \times 82. Length of lobes 114, length of cylindrical distal part (bDp) 192. All setae setiform, smooth. Lobe setae ψ_1 (41) longer than τ_1 (24) and $\psi_2 \approx \tau_a \approx \tau_b \approx \tau_c$ (16–20). Six short (8) coronal setae k present.

Epimeral region (Fig. 1B). All apodemes well developed. Epimeral setal formula 3–1–3–3. Setae setiform, slightly barbed; medial setae ($1a$, $2a$, $3a$) 28–36, others 41–61.

Gnathosoma (Fig. 3A–C). Subcapitulum longer than wide: 213–225 \times 151–164. Hypostomal setae setiform, slightly barbed; m (61–69) longer than h (49–57) and a (32–45). Two pairs of thickened, curved distally, barbed adoral setae (24–28). Palp (length 86–118) with setation 0–2–1–3–8(+1 ω). Solenidion thick. Chelicera (length 213–215) with two setiform, barbed cheliceral setae; cha (73–82) longer, than chb (36–41).

Legs. Formulae of leg setation and solenidia: I (1–5–3–4–20) [1–2–2], II (1–

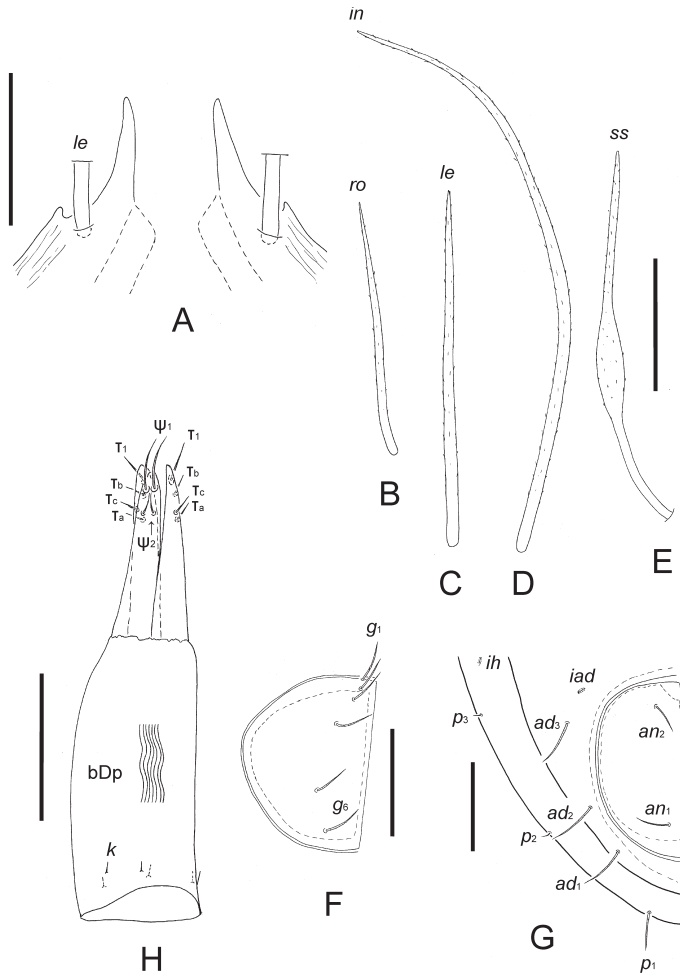


Fig. 2. *Liacarus paratanzicus* sp. nov.: **A**, lamellar cusps and distal parts of lamellae, lamellar setae partly not shown; **B**, rostral seta; **C**, lamellar seta; **D**, interlamellar seta; **E**, sensillus; **F**, genital plate, right; **G**, anal plate, right, with adanal setae and notogastral setae p_1 – p_3 ; **H**, ovipositor. Scale bars: 50 μ m (A–F), 100 μ m (G, H).

4–2–4–16) [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. Almost all setae setiform, slightly barbed. Famulus short, blunt-ended. Solenidia ω_1 and ω_2 on tarsi I and II rod-like, weakly curved, blunt-ended; other solenidia setiform, with thinner tips.

Etymology. This specific epithet refers to the resemblance to *Liacarus tanzicus* Mahunka, 1983.

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

Comparison. *Liacarus paratanzicus* sp. nov. is very similar to *L. tanzicus* from Tanzania (Mahunka, 1983) in having the lamellae with lamellar cusps, shape of sensilli (spindle-form, slightly barbed; apical part longer, than length of head) and foveolate body integument. The new species differs by the larger body (913–1079 \times 581–680 in new species; 360–455 \times 217–293 in *L. tanzicus*), the rostrum with two pairs of the lateral tooth (a single pair in *L. tanzicus*) and by setae p_1 distinctly longer than other notogastral setae (short, subequal in *L. tanzicus*).

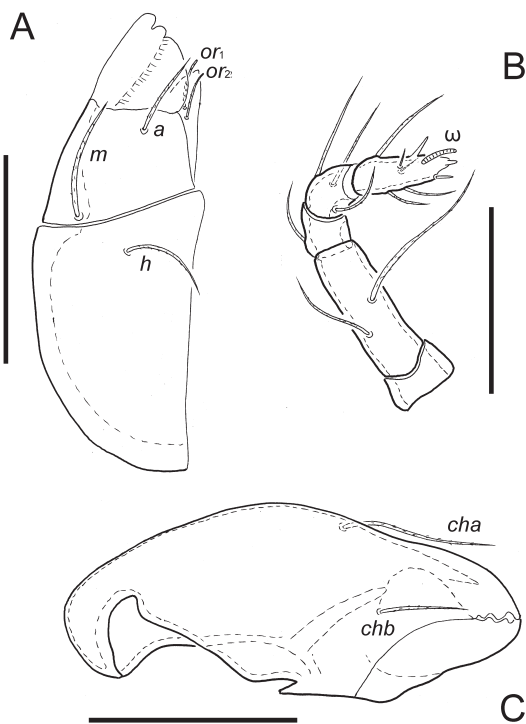


Fig. 3. *Liacarus paratanzicus* sp. nov.: **A**, right half of subcapitulum; **B**, palp; **C**, chelicera. Scale bars: 100 μm (A, C), 50 μm (B).

Genus *Liacarus* Michael, 1898

Subgenus *Dorycranosus* Woolley, 1969

Liacarus (Dorycranosus) shipitsyni sp. nov. (Figs 4, 5)

Type material. *Holotype* (female) and two paratypes (female and male), Ethiopia, 8°53'N, 38°09'E, 10 km to the south from Ginchi city, 2900 m.a.s.l., Cholomu Forest (wood species, in particular, *Hagenia abissinica* and *Podocarpus* forming the canopy; undergrowth of ferns), in mosses on trees, 15. Nov. 2009, coll. L.B. Rybalov.

Deposition of holotype and paratypes. The holotype is deposited in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia; one paratype is deposited in the collection of Siberian Zoological Museum, Novosibirsk, Russia; one paratype (dissected) is in the personal collection of the first author.

Diagnosis. New species is distinguished by the following combination of character states: body size 929–1062 \times 664–730; body surface smooth, medial parts of genital plates striate; rostrum truncate, with two incisions and two pairs of small lateral teeth; lamellae not touching medially, lamellar cusps well developed: inner cusps long, outer ones short; large prodorsal tubercle between inner cusps present; interlamellar setae longer than lamellar setae, rostral setae shortest; sensilli lanceolate, pointed distally, slightly barbed; setae p_1 longer than other notogastral setae.

Description. *Measurements.* Large-sized species. Body length 929 (holotype), 929–1062 (two paratypes); body width 664 (holotype), 664–730 (two paratypes).

Integument. Body color brown to black. Body surface smooth. Lateral part of lamellae, tutoria, pedotectae I and medial parts of genital plates striate. Lateral parts of body granulate.

Prodorsum (Figs 2A–E; 4A, C, D). Rostrum truncate, with two incisions and two pairs of small lateral teeth. Lamellae longer than half of prodorsum, not touching medially. Lamellar cusps well developed; inner cusps long, outer ones short. Translamella absent. Large prodorsal tubercle between inner cusps present. Rostral (90–98), lamellar (143–151), interlamellar (246–258) setae setiform, slightly barbed. Sensilli (77–90) lanceolate, pointed distally, slightly barbed.

Notogaster (Fig. 4A). Dorsosejugal suture straight. Eleven pairs of notogastral setae developed: p_1 (36–41) longer than other setae (16–20). All setae setiform, smooth.

Lateral part of body (Fig. 4C). Exobothridial setae not observed. Tutoria long, thin.

Anogenital region (Figs 2F, G; 4B). Two pairs of anal (36), 3 pairs of adanal (61–65), 1 pair of aggenital (24–28) and 6 pairs of

Table. Leg setation of *Liacarus paratanzicus* sp. nov. (same for *L. shipitsyni* sp. nov.). Roman letters refer to normal setae (*e* – famulus), Greek letters refer to solenidia. One apostrophe (') marks setae on anterior and double apostrophe (") 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, (l), bv", v"</i>	<i>(l), v', σ</i>	<i>(l), (v), φ₁, φ₂</i>	<i>(ft), (tc), (it), (p), (u), (a), s, (pv), v', (pl), l', e, ω₁, ω₂</i>
II	<i>v'</i>	<i>d, (l), bv", v"</i>	<i>(l), σ</i>	<i>(l), (v), φ</i>	<i>(ft), (tc), (it), (p), (u), (a), s, (pv), l', ω₁, ω₂</i>
III	<i>v', l'</i>	<i>d, l', ev'</i>	<i>l', σ</i>	<i>l', (v), φ</i>	<i>(ft), (tc), (it), (p), (u), (a), s, (pv)</i>
IV	<i>v'</i>	<i>d, ev'</i>	<i>d, l'</i>	<i>l', (v), φ</i>	<i>ft", (tc), (p), (u), (a), s, (pv)</i>

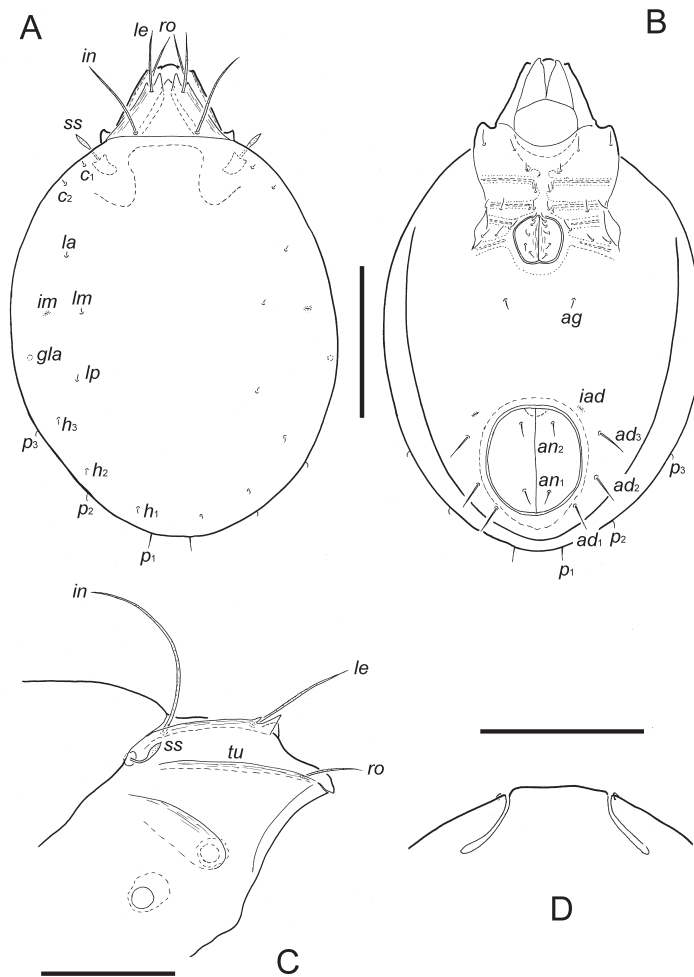


Fig. 4. *Liacarus shipitsyni* sp. nov.: **A**, dorsal view, leg not shown; **B**, ventral view, legs, palps and subcapitular setae not shown; **C**, lateral view of prodorsum, gnathosoma, notogastral setae and legs not shown; **D**, rostrum, dorso-anterior view. Scale bars: 300 μm (A, B), 200 μm (C), 50 μm (D).

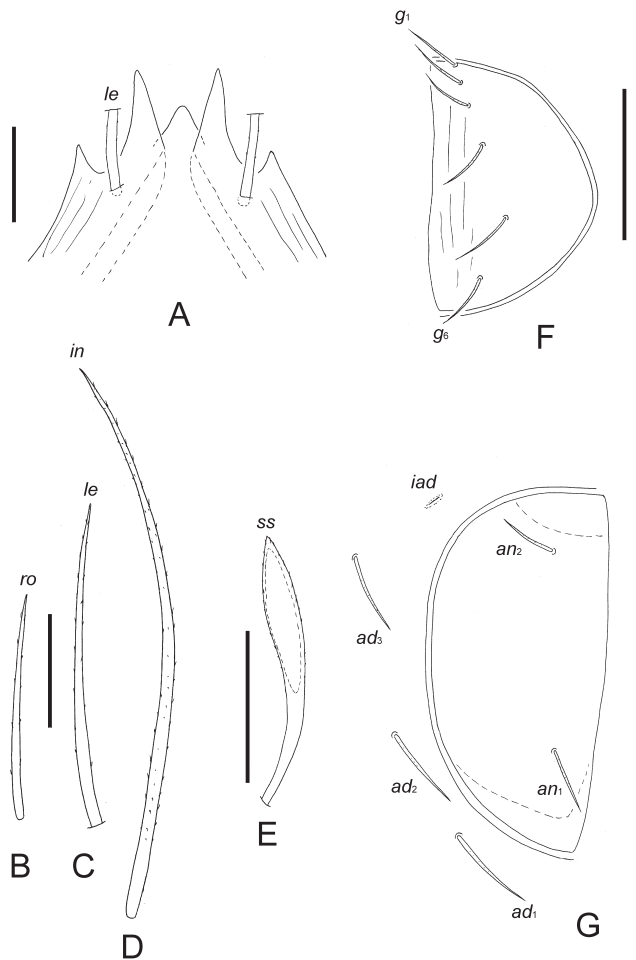


Fig. 5. *Liacarus shipitsyni* sp. nov.: **A**, lamellar cusps and distal parts of lamellae, lamellar setae partly not shown; **B**, rostral seta; **C**, lamellar seta; **D**, interlamellar seta; **E**, sensillus; **F**, genital plate, left; **G**, anal plate, right, with adanal setae. Scale bars: 50 μ m (A–F), 100 μ m (G).

genital (20–24) setae setiform, thin, slightly barbed.

Epimeral region (Fig. 4B). All apodemes well developed. Epimeral setal formula 3–1–3–3. Setae setiform, slightly barbed; medial setae (*1a*, *2a*, *3a*) 32, others 41–53.

Gnathosoma. Morphology very similar to *L. paratanzicus* sp. nov. (see Fig. 3A–C). Subcapitulum longer than wide: 225 \times 164. Hypostomal setae setiform, slightly barbed; *m* (69) longer than *h* (49) and *a* (41). Two pairs of thickened, curved distally, barbed adoral setae (28). Palp (length 131) with se-

tation 0–2–1–3–8(+1 ω). Chelicera (length 225) with two setiform, barbed cheliceral setae; *cha* (69) longer, than *chb* (45).

Legs. Formulae of leg setation and solenidia: I (1–5–3–4–20) [1–2–2], II (1–4–2–4–16) [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. Almost all setae setiform, slightly barbed. Famulus short, blunt-ended. Solenidia ω_1 and ω_2 on tarsi I and II rod-like, weakly curved; other solenidia setiform, with thinner tips.

Etymology. This species is dedicated to our colleague and friend, the agriculturist Vasilij I. Shipitsyn (Nizhniy Novgorod Referral Center of the Federal service for Veterinary and Phytosanitary Inspection, Nizhniy Novgorod, Russia) for his constant support of pedobiological investigations of the first author.

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

Remarks. In having the combination of a shape of lamellae with lamellar cusps, shape of sensilli and presence of prodorsal tubercles between inner cusps of lamellae *L. shipitsyni* sp. nov. is clearly differs from all the species of *Liacarus*.

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