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New oribatid mites of the superfamily Ceratozetoidea (Acari: Oribatida) from Ethiopia

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ABSTRACT

Four new species of oribatid mites of the superfamily Ceratozetoidea, *Ceratozetes baleensis* sp. n. (Ceratozetidae), *Ocesobates schatzi* sp. n. (Chamobatidae), *Africoribates subiasi* sp. n. and *A. amorphus* sp. n. (both Humerobatidae), are described from southern Ethiopia. The first two species were collected in soil from Harenna Forest of Bale Mountains National Park (the second species was also collected in plants on rock from Cholomu Forest, 10 km to the south of Ginchi city); the third and fourth species were collected in litter (Cholomu Forest) and plants (Bale Mountains National Park, plateau Sanetti). The genus *Ocesobates* is recorded for the first time in Africa. The genus Africoribates is recorded for the first time in Ethiopia. Identification keys to all known species of *Ocesobates* and *Africoribates* are presented.

KEY WORDS: Oribatida, Ceratozetoidea, *Africoribates*, *Ceratozetes*, *Ocesobates*, mites, new species, Afrotropical, Ethiopia.

INTRODUCTION

Ceratozetoidea is a very large superfamily of oribatid mites, comprising nine families, 52 genera and more than 490 species that collectively have a cosmopolitan distribution (Norton & Behan-Pelletier 2009). The oribatid mites of Ethiopia are poorly studied (Berlese 1916; Aoki 1971; Mahunka 1982, 1983, 1984*a*; Bernini 1988; Niedbała 2008) and, at present, only one species of ceratozetoid mite is recorded: *Ceratozetes problematicus* Mahunka, 1982 (Ceratozetidae).

In the course of faunistic studies of the oribatid fauna of the southern part of Ethiopia in 2009–2010, we found representatives of four new species of the superfamily Ceratozetoidea, belonging to the genera *Ceratozetes* Berlese, 1908, *Ocesobates* Aoki, 1965 and *Africoribates* Evans, 1953.

Ceratozetes is a large genus of the family Ceratozetidae that was proposed by Berlese (1908) with *Oribata gracilis* Michael, 1884 as type species. Currently, it comprises 60 species that collectively have a cosmopolitan distribution (Subías 2004, online version 2011). Previously only three species of *Ceratozetes* were recorded from Africa: *C. insignis* Balogh, 1966 from Cameroon, *C. problematicus* Mahunka, 1982 from Ethiopia, *C. rostroserratus* Wallwork, 1965 from Chad and Congo. The diagnostic characters of the genus *Ceratozetes* are (see also Behan-Pelletier & Eamer 2009): pteromorphs immovable; lamellar cusps truncated; four or five pairs of areae porosae; 10 or 11 pairs of notogastral setae; rostrum without (occasionally with) small lateral teeth, with or without medial tooth, or with medial indentation; custodium with free distal point.

Ocesobates is a small genus of the family Chamobatidae that was proposed by Aoki (1965) with *Ocesobates kumadai* Aoki, 1965 as type species. Currently, it comprises

three species that are collectively distributed in Europe and Japan (Subías 2004, online version 2011): *O. boedvarssoni* (Sellnick, 1974) from Europe, *O. bregetovae* Shaldybina, 1974 from the southern Palearctic region, *O. kumadai* Aoki, 1965 from Japan. This genus has not previously been recorded in Africa. The diagnostic characters of the genus *Ocesobates* are (see also Aoki 1965; Shaldybina 1969; Sellnick 1974; Gjelstrup 1978): lamellae with short, truncate cusp, bearing lamellar seta; rostrum U-shaped (one exception: rostrum of *O. kumadai* with medial anterior point).

Africoribates is a genus of the family Humerobatidae that was proposed by Evans (1953) with *Africoribates ornatus* Evans, 1953 as type species. Currently, it comprises 10 species that are collectively distributed on the African continent (Subías 2004, online version 2011): *A. australis* Mahunka, 1985 from South Africa, *A. depilatus* (Berlese, 1910) from South Africa, *A. evansi* Balogh, 1959 from Angola and Congo (Balogh 1959*a*), *A. glabratus* (Berlese, 1908) from South Africa, *A. macfarlanei* Balogh, 1959 from Angola (Balogh 1959*a*), *A. maximus* Mahunka, 1984 from Tanzania, *A. ornatus* Evans, 1953 from Tanzania, *A. pilosus* (Mahunka, 1985) from South Africa, *A. polygonatus* (Mahunka, 1985) from South Africa, *A. undulatus* Balogh, 1959 from eastern Africa (Balogh 1959*b*). *Africoribates* has not previously been recorded in Ethiopia. The diagnostic characters of the genus *Africoribates* are (see also Evans 1953): body surface with sculpturing; notogaster with 10 pairs of setae; four pairs of rounded areae porosae (one exception: *A. maximus* with sacculi); translamella well-developed.

The new species are described below as *Ceratozetes baleensis* sp. n., *Ocesobates schatzi* sp. n., *Africoribates subiasi* sp. n. and *A. amorphus* sp. n. Identification keys to all known species of *Ocesobates* and *Africoribates* are presented.

MATERIAL AND METHODS

The specimens were studied in lactic acid, mounted on temporary cavity slides for the duration of the study, then were stored in 70 % alcohol in vials. 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, to avoid discrepancies caused by different degrees of notogastral distension. The notogastral width refers to the maximum width in dorsal aspect. The 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.

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 is in the personal collection of the first author (PC).

TAXONOMY

Family Ceratozetidae Jacot, 1925

Genus *Ceratozetes* Berlese, 1908

Ceratozetes baleensis sp. n.

Figs 1–3

Etymology: The new species is named after the Ethiopian Bale Mountains National Park.

Diagnosis: The new species is distinguished by the following combination of character states: body size 464–481 × 298–332; rostrum rounded medially, with two lateral indentations (one on each side) and two blunt-ended teeth (one on each side); notogastral surface smooth, rostrum punctate and weakly striated, pteromorphae weakly punctate, epimeral region with very short striae laterally; lamellar cusps long (half the length of lamellae), close medially; rostral setae (*ro*) setiform, densely ciliate, with thinner smooth tips; lamellar setae (*le*) setiform, with cilia; interlamellar setae (*in*) setiform, with small barbs; sensilli (*ss*) short, clavate, with round head distally; pteromorphae short.

Description:

Measurements. Body length 464 (holotype, male), 464–481 (3 female paratypes); body width 298 (holotype, male), 298–332 (3 female paratypes).

Integument. Body brown. Notogaster and anogenital surface smooth. Rostrum punctate and with four to six short longitudinal striae. Pteromorphae weakly punctate. Epimeral region with very short striae laterally.

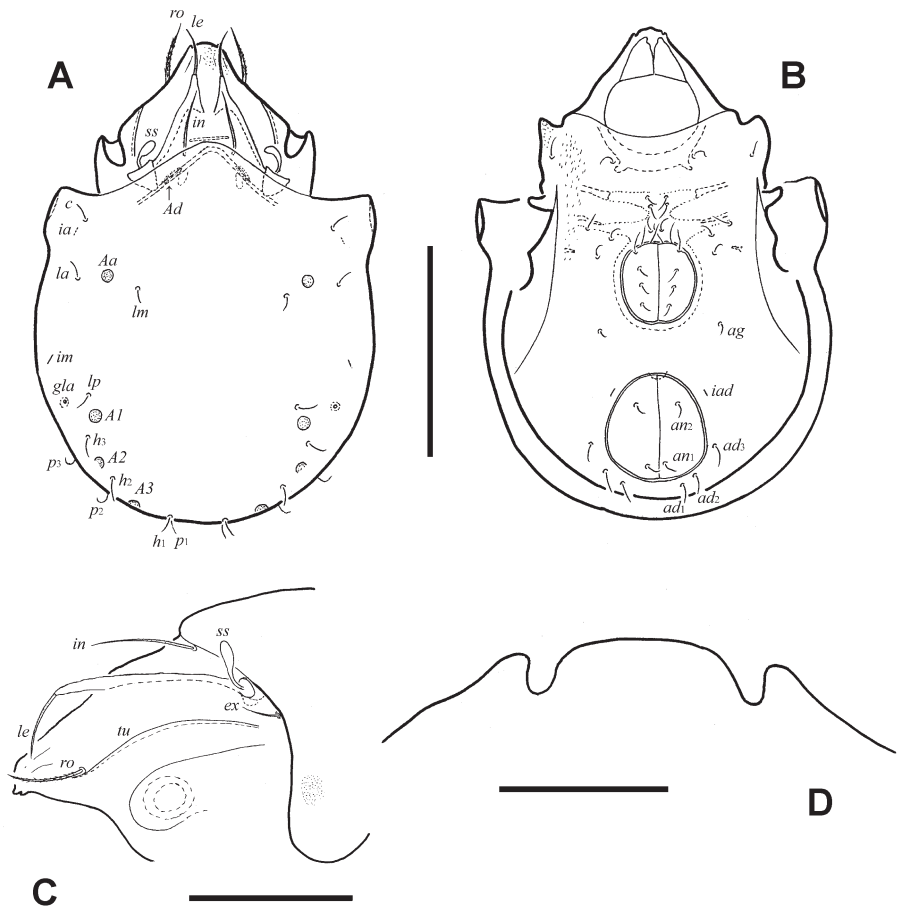

Fig. 1. *Ceratozetes baleensis* sp. n.: (A) dorsal view, legs not shown; (B) ventral view, legs, palps and subcapitular setae not shown; (C) lateral view of prodorsum, gnathosoma not shown; (D) rostrum, dorso-anterior view. Scale bars: A, B = 200 μm; C = 100 μm; D = 10 μm.

Prodorsum (Figs 1A, 1C, 1D; 2A–D). Rostrum rounded medially, with two lateral indentations (one on each side) and two blunt-ended teeth (one on each side). Lamellae narrow, half the length of prodorsum. Lamellar cusps long (half as long as lamellae), truncate or weakly slanting distally. Distance between cusps shorter than length of cusp. Rostral setae 53–61, setiform, densely ciliate, with thinner smooth tips. Lamellar setae 45–49, setiform, with sparse cilia. Interlamellar setae 61–65, setiform, with small barbs. Sensilli short, 32–36, with oval, smooth head. A pair of oval areae porosae *Ad* visible posterior to interlamellar setae.

Notogaster (Fig. 1A). Anterior notogastral margin convex medially. Pteromorphae short. Ten pairs of notogastral setae 24–28, thin and smooth. Four pairs of round areae porosae present (diameter of all 10–14). All lyrifissures and opisthonotal gland opening (*gla*) located typically as for *Ceratozetes*.

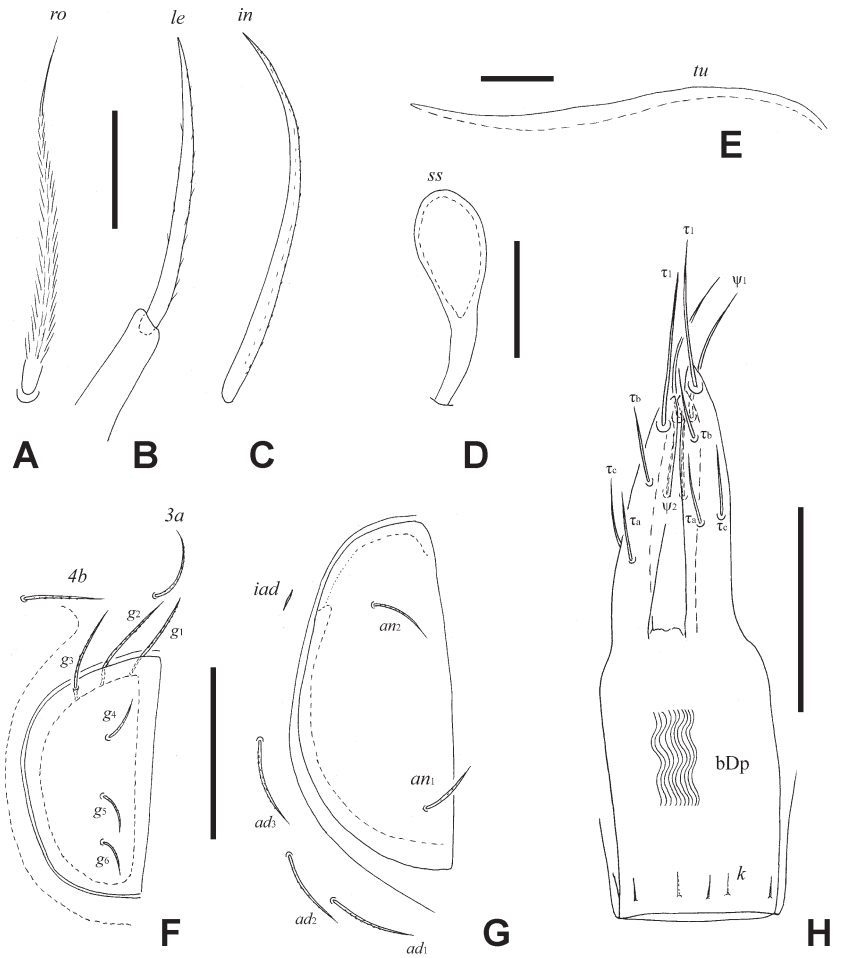

Fig. 2. *Ceratozetes baleensis* sp. n.: (A) rostral seta; (B) lamellar seta and distal part of lamellar cusp; (C) interlamellar seta; (D) sensillum; (E) tutorium; (F) genital plate, right and epimeral setae *3a*, *4b*; (G) anal plate, right and adanal setae; (H) ovipositor. Scale bars A–E = 20 μm; F–H = 50 μm.

Lateral part of body (Figs 1C; 2E). Exobothridial setae (*ex*, 28) setiform, barbed. Tutorium (*tu*) long, thin, with thin cusp distally.

Anogenital region (Figs 1B; 2F–H). Two pairs of anal (an_1, an_2, 24), three pairs of adanal (ad_1–ad_3, 28–32), one pair of aggenital (*ag*, 16–24) and six pairs of genital (g_1–g_3, 28–32; g_4–g_6, 12–16) setae setiform, thin, slightly barbed. Anterior margins of genital plates with three pairs of genital setae (g_1–g_3). Distance between ad_1 and ad_2 little shorter than distance between ad_2 and ad_3. Ovipositor 134 × 41. Length of lobes 65, length of cylindrical distal part (bDp) 69. All setae setiform, smooth. Lobe setae $\psi_1 \approx \tau_1$ (41) longer than $\psi_2 \approx \tau_a \approx \tau_b \approx \tau_c$ (20). Six short (8) coronal setae *k* present.

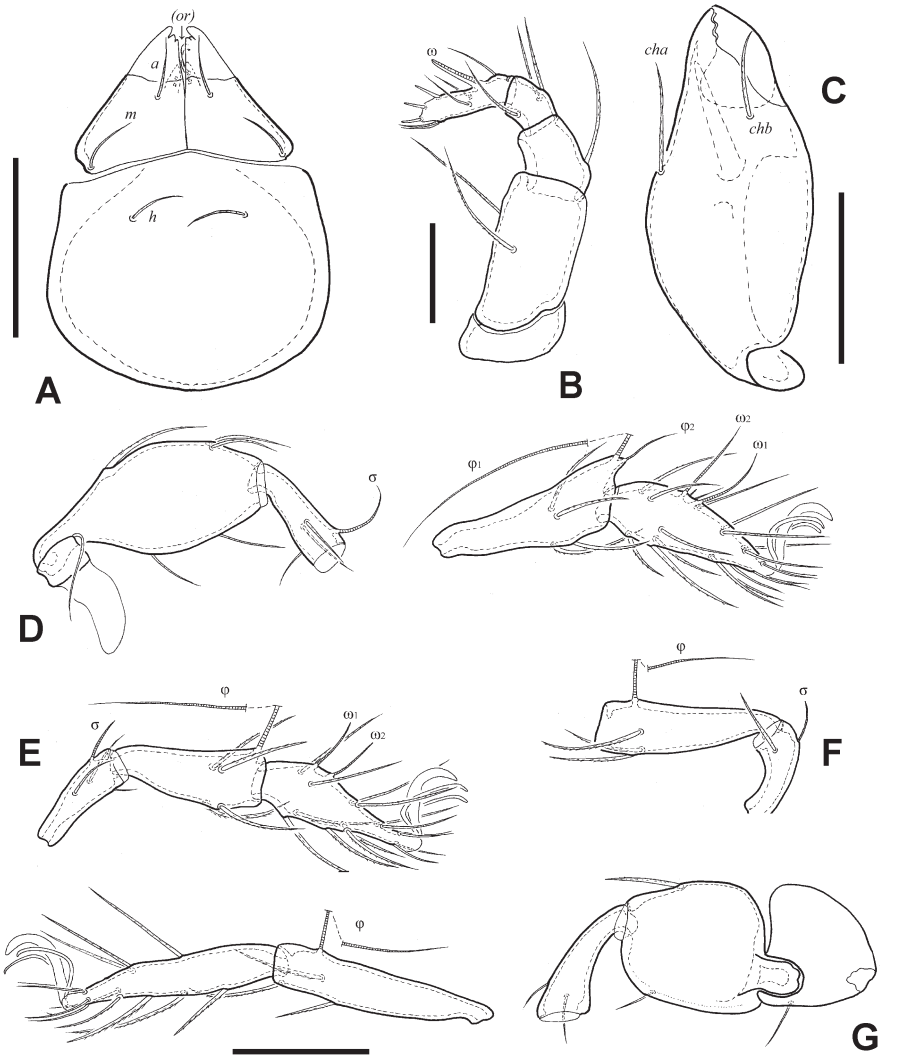

Fig. 3. *Ceratozetes baleensis* sp. n.: (A) subcapitulum; (B) palp; (C) chelicera; (D) leg I, right, antiaxial view; (E) leg II, without trochanter and femur, right, antiaxial view; (F) genu and tibia of leg III, right, antiaxial view; (G) leg IV, left, paraxial view. Scale bars A, C–G = 50 μm; B = 20 μm.

Epimeral region (Fig. 1B). Apodemes 1, 2, sejugal apodeme and very short apodeme 3 present. Epimeral setal formula 3–1–3–3. Setae 28–36, setiform, slightly barbed. Lateral setae *3c* and *4c* visible in lateral view. Custodium extending anteriorly to pedotectum II. Circumpedal carina well visible.

Gnathosoma (Figs 3A–C). Subcapitulum longer than wide: 106 × 82. Hypostomal setae *a*, *m*, *h* 20–24, setiform, slightly barbed. Two pairs of setiform, curved distally, slightly barbed adoral setae (12–16). Palp (length 69–73) with setation 0–2–1–3–9(+1ω). Chelicera (length 114) chelate-dentate. Cheliceral setae setiform, barbed; *cha* (36) slightly longer, than *chb* (34).

Legs (Figs 3D–G). Formulae of leg setation and solenidia: I (1–5–3–4–20) [1–2–2], II (1–5–3–4–15) [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 1. Setae setiform, slightly barbed. Famulus short, blunt-ended. Solenidia setiform.

Holotype: ♂ ETHIOPIA: Bale Mountains National Park, Harenna Forest (wood species, in particular, *Hagenia abissinica* forming the canopy), 6°38'N:39°43'E, 1883 m, in soil, 23.xi.2009, L.B. Rybalov (ZISP).

Paratypes: 3♀ same data as holotype (two paratypes, SZMN; one paratype, PC)

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

Remarks: In having the combination of shape of rostrum (rounded medially, with two lateral indentations) and long cusps (as long as half the length of lamellae), *C. baleensis* sp. n. is morphologically similar only to *C. nigrisetosus* Hammer, 1958 from Bolivia and *C. rostroundulatus* Pavlichenko, 1991 from Ukraine. The new species differs from *C. nigrisetosus* by having blunt-ended lateral rostral tubercles (rostrum with lateral pointed teeth in *C. nigrisetosus*), lamellar cusps closed medially, distance between cusps shorter than length of cusp (lamellar cusps removed medially, distance between cusps not shorter than length of cusp in *C. nigrisetosus*); notogaster with 10 pairs of setae (11 pairs in *C. nigrisetosus*), pteromorphae short (long in *C. nigrisetosus*). The new species differs from *C. rostroundulatus* by the absence of notogaster lenticulus (present in *C. rostroundulatus*), blunt-ended lateral rostral tubercles (rostrum with lateral pointed teeth in *C. rostroundulatus*), sensilli rounded distally (sensilli oblong, with pointed tip in *C. rostroundulatus*), lamellar cusps close medially, distance between cusps shorter than length of cusp (lamellar cusps removed medially, distance between cusps not shorter than length of cusp in *C. rostroundulatus*); pteromorphae short (long in *C. rostroundulatus*).

In having the combination of shape of rostrum, short pteromorhae, shape of notogastral anterior margin and morphology of ventral plate, *C. baleensis* sp. n. is morphologically similar to *Austroceratobates endroedyi* Mahunka, 1985 from South Africa, however it differs from the latter by having larger body size (464–481 × 298–332 in *C. baleensis*; 385–426 × 262–295 in *A. endroedyi*); short interlamellar setae (shorter than lamellae in *C. baleensis*; longer than lamellae in *A. endroedyi*); smooth lateral margin of lamellae (with tooth in *A. endroedyi*); distinct notogastral areae porosae (indistinct in *A. endroedyi*); prodorsum and epimeral region with short striae (striae long in *A. endroedyi*).

Austroceratobates is a monotypical genus of the family Ceratozetidae that was proposed by Mahunka (1985) with *Austroceratobates endroedyi* Mahunka, 1985 as type species. It differs from other genera of family by the shape of tutoria (long, narrow, without cusps) (Mahunka 1985). In our opinion, only the shape of tutoria cannot be used for the separation of *Austroceratobates* from the other genera, therefore most likely this

genus should be considered as a synonym of *Ceratozetes*. In turn, *Austroceratobates* is similar morphologically to the genus *Limnozetella* Willmann, 1931 (Limnozetidae) with the single (type) species *Limnozetella lamellata* Willmann, 1931. We do not discuss placing *Austroceratobates* in Ceratozetidae and the taxonomic relations between *Ceratozetes*, *Austroceratobates* and *Limnozetella* herein, because it should be addressed by separate research.

Family Chamobatidae Thor, 1937
Genus *Ocesobates* Aoki, 1965
Ocesobates schatzi sp. n.

Figs 4–6

Etymology: The specific name is dedicated to our colleague, the acarologist Dr Heinrich Schatz (Institute of Ecology, Leopold-Franzens University of Innsbruck, Austria), who has contributed significantly to the study of oribatid mites throughout the world.

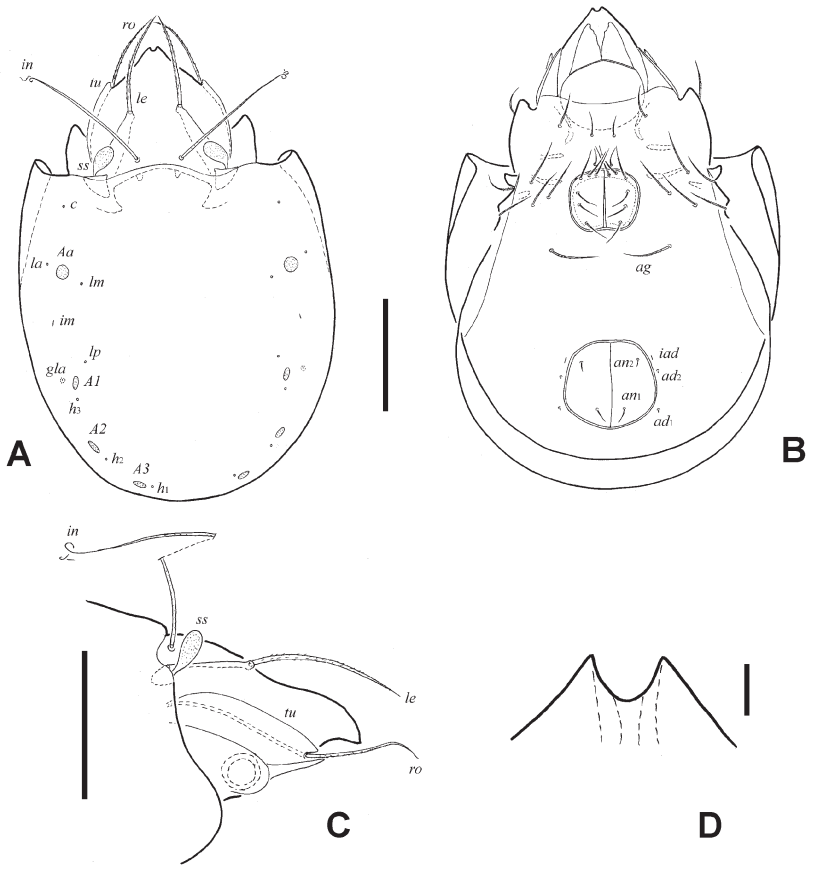

Fig. 4. *Ocesobates schatzi* sp. n.: (A) dorsal view, legs not shown; (B) ventral view, legs, epimeral setae *2a*, palps and subcapitular setae not shown; (C) lateral view of prodorsum, gnathosoma not shown; (D) rostrum, dorso-anterior view. Scale bars A–C = 100 μm; D = 10 μm.

Diagnosis: The new species is distinguished by the following combination of character states: body size 415–464 × 282–315; rostrum U-shaped; interlamellar setae with flagellate and strongly curved tips; epimeral, genital and aggenital setae longer than anal setae; two pairs of adanal setae present.

Description:

Measurements. Body length 448 (holotype, female), 415–464 (two paratypes, females); body width 315 (holotype, female), 282–315 (two paratypes, females).

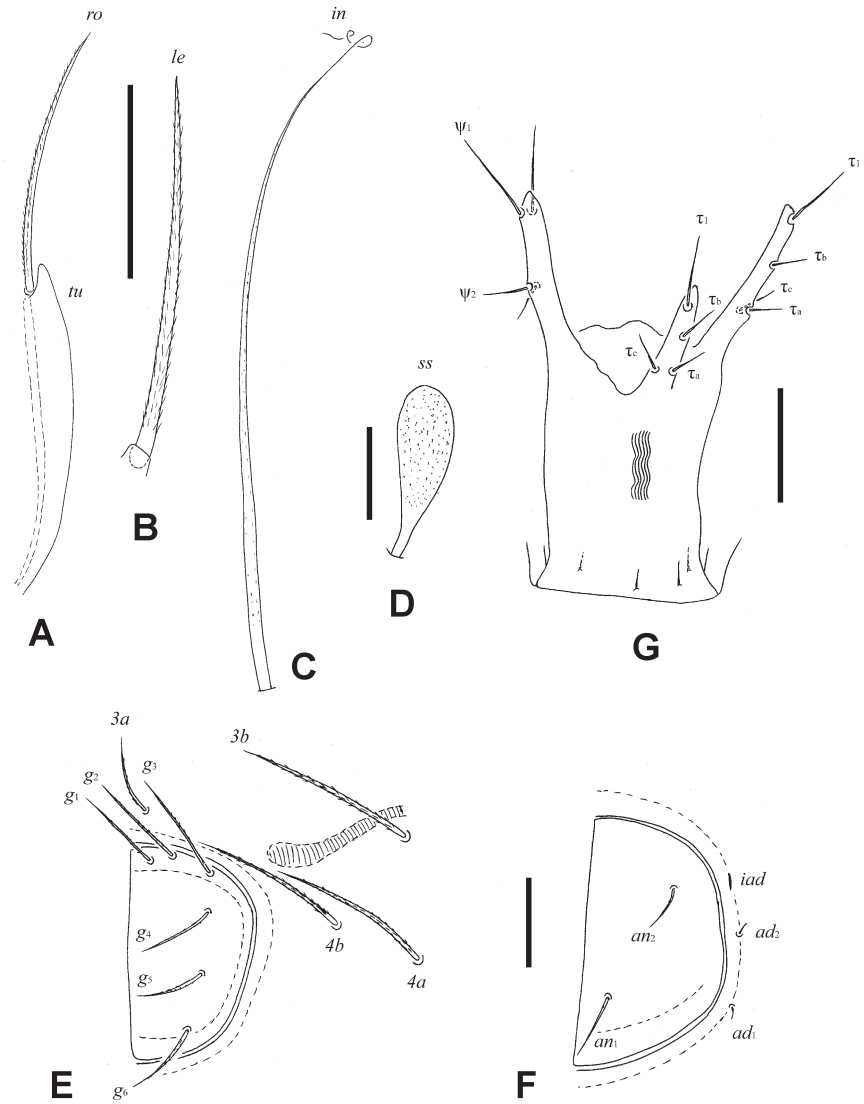

Fig. 5. *Ocesobates schatzi* sp. n.: (A) rostral seta and tutorium; (B) lamellar seta and cusp; (C) interlamellar seta; (D) sensillum; (E) genital plate, left and epimeral setae *3a*, *3b*, *4a*, *4b*; (F) anal plate, left and adanal setae; (G) ovipositor. Scale bars A–C, G = 50 μm; D–F = 20 μm.

Integument. Body brown. Body surface smooth.
Prodorsum (Figs 4A, 4C, 4D; 5A–D). Rostrum U-shaped (with deep indentation medially and two lateral teeth, one on each side. Lamellae narrow, half the length of prodorsum. Lamellar cusps minute, truncate distally. Rostral (82–90) and lamellar (102–114) setae

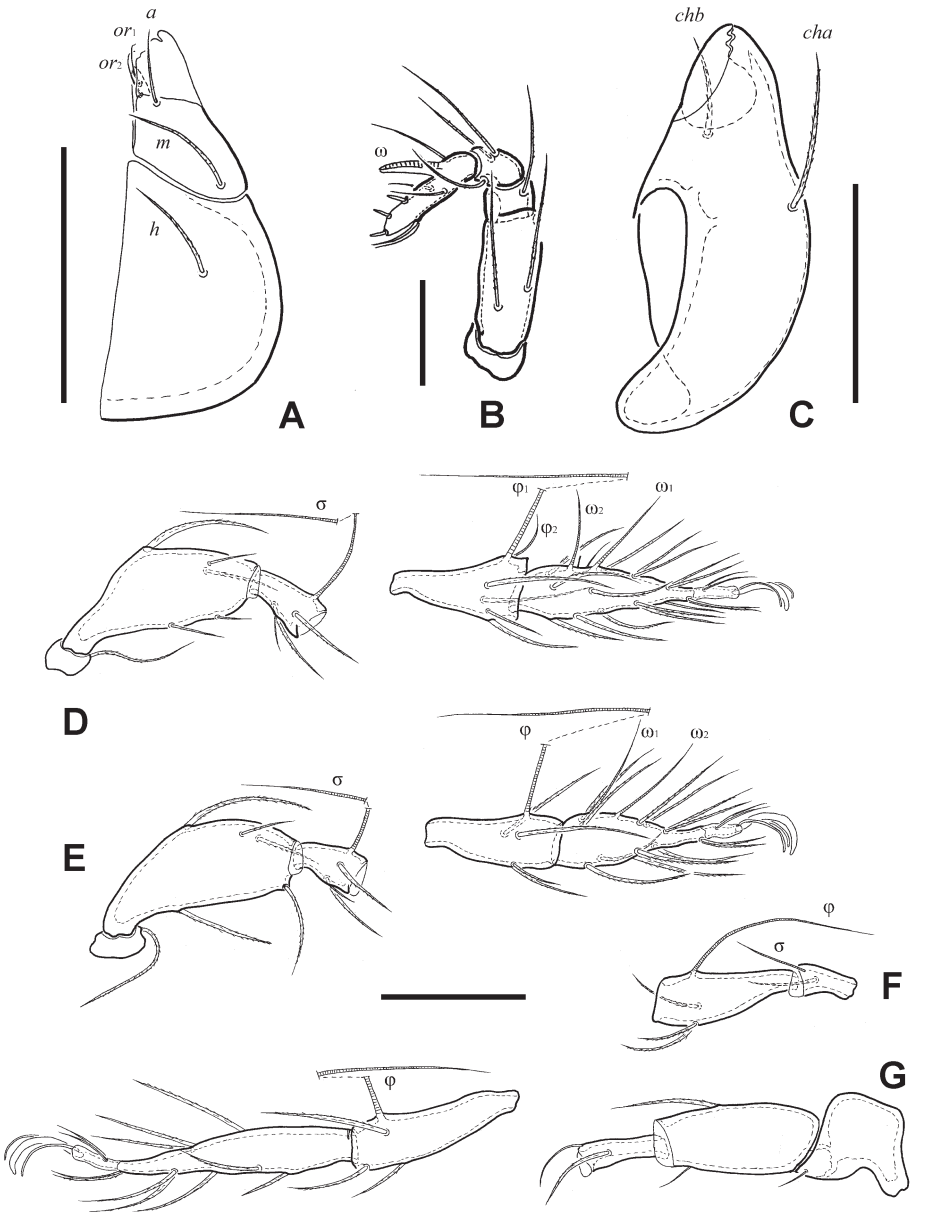

Fig. 6. *Ocesobates schatzi* sp. n.: (A) left part of subcapitulum; (B) palp; (C) chelicera; (D) leg I, right, antiaxial view; (E) leg II, right, antiaxial view; (F) genu and tibia of leg III, left, paraxial view; (G) leg IV, right, antiaxial view. Scale bars A, C–G = 50 μm; B = 20 μm.

setiform, barbed. Interlamellar setae 196–213, setiform, with flagellate and strongly curved tips. Sensilli 32–36, clavate, with oval, rounded distally and hardly barbed head.

Notogaster (Fig. 4A). Dorsosejugal suture slightly convex medially. Ten pairs of notogastral alveoli present. Four pairs of areae porosae developed dorsally: *Aa* round (diameter 16), *A1*, *A2*, *A3* oval (12 × 6–8). All lyrifissures and opisthonotal gland opening located typically as for *Ocesobates*.

Lateral part of body (Figs 4C; 5A). Exobothridial setae absent, only alveoli present. Tutorium long, thin, weakly dilated in median part, with thin and smooth cusp distally.

Anogenital region (Figs 4B; 5E–G). Two pairs of anal setae (an_1 16–20, an_2 12–16), thin, slightly barbed. Two pairs of adanal setae minute (4). One pair of aggenital (41–45) and six pairs of genital (g_1–g_3, 28–32; g_4–g_6, 20–24) setae setiform, barbed. Anterior margins of genital plates with three pairs of genital setae (g_1–g_3). Ovipositor 171 × 82, typical as for Chamobatidae (Ermilov 2010). Length of lobes 69, length of cylindrical distal part 102. All setae setiform, smooth. Lobe setae $\psi_1 \approx \tau_1$ (41) longer than $\psi_2 \approx \tau_a \approx \tau_b \approx \tau_c$ (20). Six short (12) coronal setae *k* present.

Epimeral region (Fig. 4B). Apodemes 1, 2, sejugal apodeme and very short apodeme 3 present. Epimeral setal formula 3–1–3–3. All setae long and barbed. Setae *1a*, *2a* and *3a* (20) shorter than others (41–53). Custodium short, extending anteriorly to pedotectum II. Circumpedal carina well visible.

Gnathosoma (Figs 6A–C). Subcapitulum longer than wide: 90 × 73. Hypostomal setae setiform, slightly barbed; *m* (28–32) longer than *h* (24–28) and *a* (16). Two pairs of setiform, curved distally, slightly barbed adoral setae (8–12). Palp (length 61–65) with setation 0–2–1–3–9(+1ω). Chelicera (length 94) chelate-dentate. Cheliceral setae setiform, barbed; *cha* (36–41) slightly longer, than *chb* (24–28).

Legs (Figs 6D–G). Tibiae I with tubercle anteriodorsally. Genua I with processes anterioventrally. Formulae of leg setation and solenidia: I (1–5–3–4–20) [1–2–2], II (1–5–3–4–15) [1–1–2], III (2–2–1–3–15) [1–1–0], IV (1–2–2–3–12) [0–1–0]; homology of setae and solenidia indicated in Table 1. Setae setiform, slightly barbed. Famulus short, blunt-ended. Solenidia setiform.

Holotype: ♀ ETHIOPIA: Bale Mountains National Park, Harenna Forest (wood species, in particular, *Hagenia abissinica* forming canopy), 6°42'N:39°43'E, 2249 m, in soil, 23.xi.2009, L.B. Rybalov (ZISP).

Paratypes: 1♀ same data as holotype (SZMN); 1♀ 10 km south of Ginchi city, Cholomu Forest (*H. abissinica* forming canopy), 8°53'N:38°09'E, 2920 m, Wenchi crater, plants on rock, 20.xi.2010, L.B. Rybalov & A.I. Bastrakov (PC).

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

Remarks: The new species clearly differs from all the species of *Ocesobates* (*O. boedvarssoni* (Sellnick, 1974) from Europe (see also Gjelstrup 1978; Mahunka 2008), *O. bregetovae* Shaldybina, 1974 from the southern Palearctic region and *O. kumadai* Aoki, 1965 from Japan) by larger body length (415–464 in new species; 326–371 in *O. boedvarssoni*; 280–330 in *O. bregetovae*; 250–256 in *O. kumadai*), morphology of interlamellar setae (with flagellate, strongly curved tips in new species; setiform in *O. kumadai* and *O. bregetovae*; setiform, with thickened ends or setiform in *O. boedvarssoni*) and number of adanal setae (two pairs in new species; three pairs in the other species).

Aoki (1965), Sellnick (1974) and Gjelstrup (1978) listed the characters of *Ocesobates*, one of which was the presence of three pairs of adanal setae. However, *O. schatzi* has two pairs of adanal setae. This should be indicated in any future diagnosis of the genus.

Key to known species of *Ocesobates*

1 Rostrum with a medial anterior point .....**kumadai** Aoki
– Rostrum U-shaped.....2
2 Interlamellar setae with flagellate, strongly curved tips; two pairs of adanal setae ..... **schatzi** sp. n.
– Interlamellar setae without flagellate and curved tips; three pairs of adanal setae 3
3 Epimeral and genital setae obviously longer than anal and adanal setae..... ..... **boedvarssoni** (Sellnick)
– Epimeral and genital setae more or less the same length as anal and adanal setae ..... **bregetovae** Shaldybina

Family Humerobatidae Grandjean, 1970
Genus *Africoribates* Evans, 1953
Africoribates subiasi sp. n.

Figs 7–9

Etymology: The species is named in honour of Prof. Luis Subías (Universidad Complutense de Madrid, Madrid, Spain), the distinguished acarologist, who has contributed significantly to the study of oribatid mites throughout the world.

Diagnosis: The new species is distinguished by the following combination of character states: body size 531–564 × 348–381; body surface granulate; lamellae and dorsal parts of tutoria with longitudinal lines; lamellae and translamella broad; rostral and lamellar setae shorter than interlamellar setae; sensilli short, with oval, slightly barbed head; tutorium with broad cusp distally, bearing two small teeth; areae porosae *Al* present, slightly visible; notogastral setae setiform, barbed; four pairs of round areae porosae present; oval postanal area porosa (*PA*) present; leg setae *l″* on tarsi I, tibiae I, II and IV, genua I thick, with strongly conical teeth.

Description:

Measurements. Body length 531 (holotype, female), 547–564 (paratypes: two female, one male); body width 381 (holotype, female), 348–381 (paratypes: two female, one male).

Integument. Body brown to dark brown. Body surface with very small granules (diameter: up to 4 μm). Lamellae and dorsal parts of tutoria with longitudinal lines.

Prodorsum (Figs 7A, 7C–G). Rostrum rounded, with indistinct lateral tubercles in dorsal view. Lamellae broad, longer than half the length of prodorsum. Lamellar cusps with weakly developed median dens. Translamella straight, slightly thinner than lamellae. Rostral (90–94), lamellar (90–94) and interlamellar (102–110) setae long, setiform, strong, barbed (correct lengths of setae visible in lateral view; see Fig. 7C). Sensilli short (32–41), with oval, slightly barbed head. A pair of oval areae porosae *Ad* present posterior to interlamellar setae.

Notogaster (Figs 7A; 8A–E). Dorsosejugal suture slightly convex medially. Ten pairs of notogastral setae (12–20) setiform, with sparse, hardly visible barbs. Four pairs of round areae porosae present dorsally: *Aa* (diameter 12–14), *A1* (8–12), *A2* and *A3* (8). All lyrifissures long and narrow: *im* visible in dorsal view; *ia*, *ih* and *ips* visible in la-

teral view; *ip* visible in posterior view. Opisthonotal gland opening located laterally to seta h_3.

Lateral part of body (Figs 7A, 7C, 7D). Exobothridial setae (20–24) setiform, barbed. Tutorium with broad cusp distally, bears two small distal dents. Areae porosae *Al* round (16), slightly visible.

Anogenital region (Figs 7B; 8F–H). Two pairs of anal (an_1, an_2, 8), three pairs of adanal (12), one pair of aggenital (8) and six pairs of genital (g_1–g_2, 12; g_3–g_6, 8) setae present;

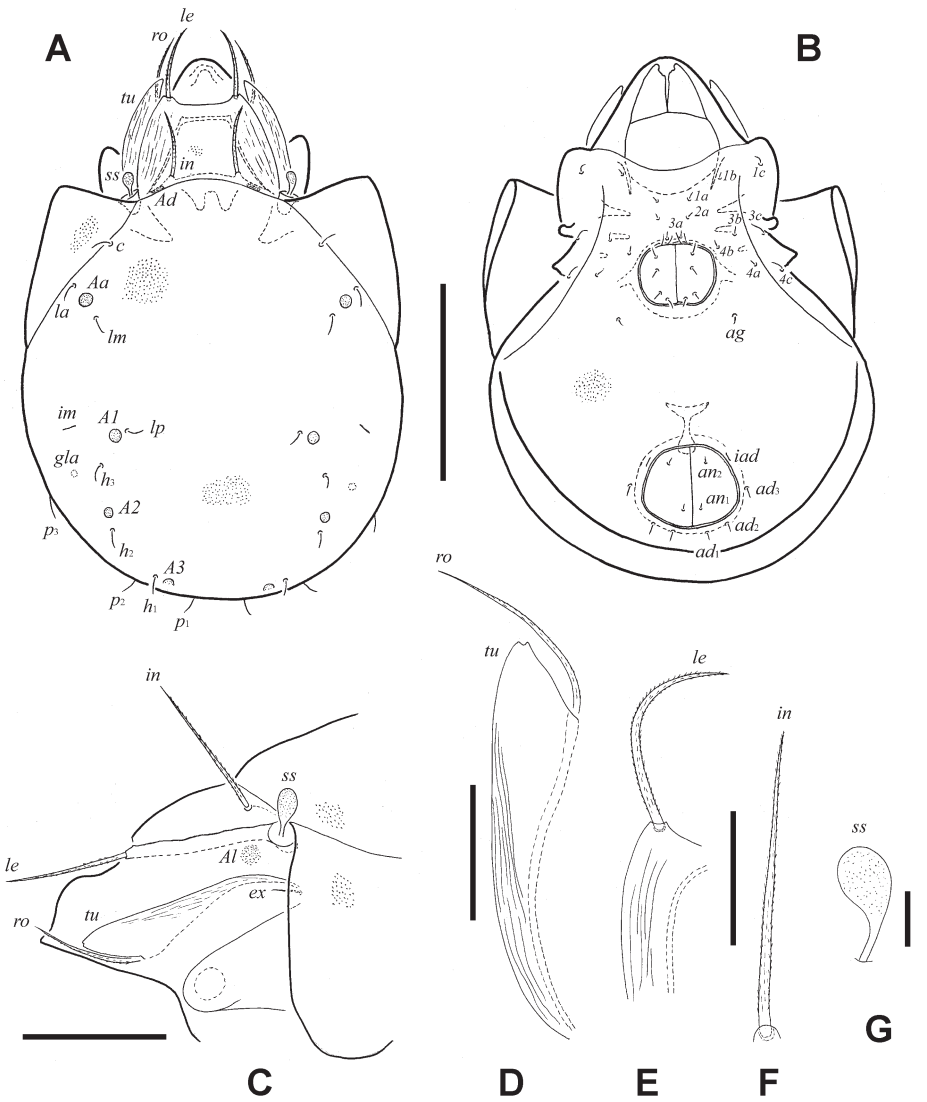

Fig. 7. *Africoribates subiasi* sp. n.: (A) dorsal view, legs not shown; (B) ventral view, legs, palps and subcapitular setae not shown; (C) lateral view of prodorsum, gnathosoma not shown; (D) rostral seta and tutorium; (E) lamellar seta and distal part of lamella; (F) interlamellar seta; (G) sensillum. Scale bars A, B = 200 μm; C = 100 μm; D–F = 50 μm; G = 20 μm.

setae setiform, thin, slightly barbed. Oval postanal area porosa (16 × 8) present (visible in posterior view). Ovipositor elongate, narrow (216 × 69). Length of lobes 102, length of cylindrical distal part 114. All setae setiform, smooth. Lobe setae $\psi_1 \approx \tau_1$ (41) longer than $\psi_2 \approx \tau_a \approx \tau_b \approx \tau_c$ (20). Six coronal setae *k* short (12).

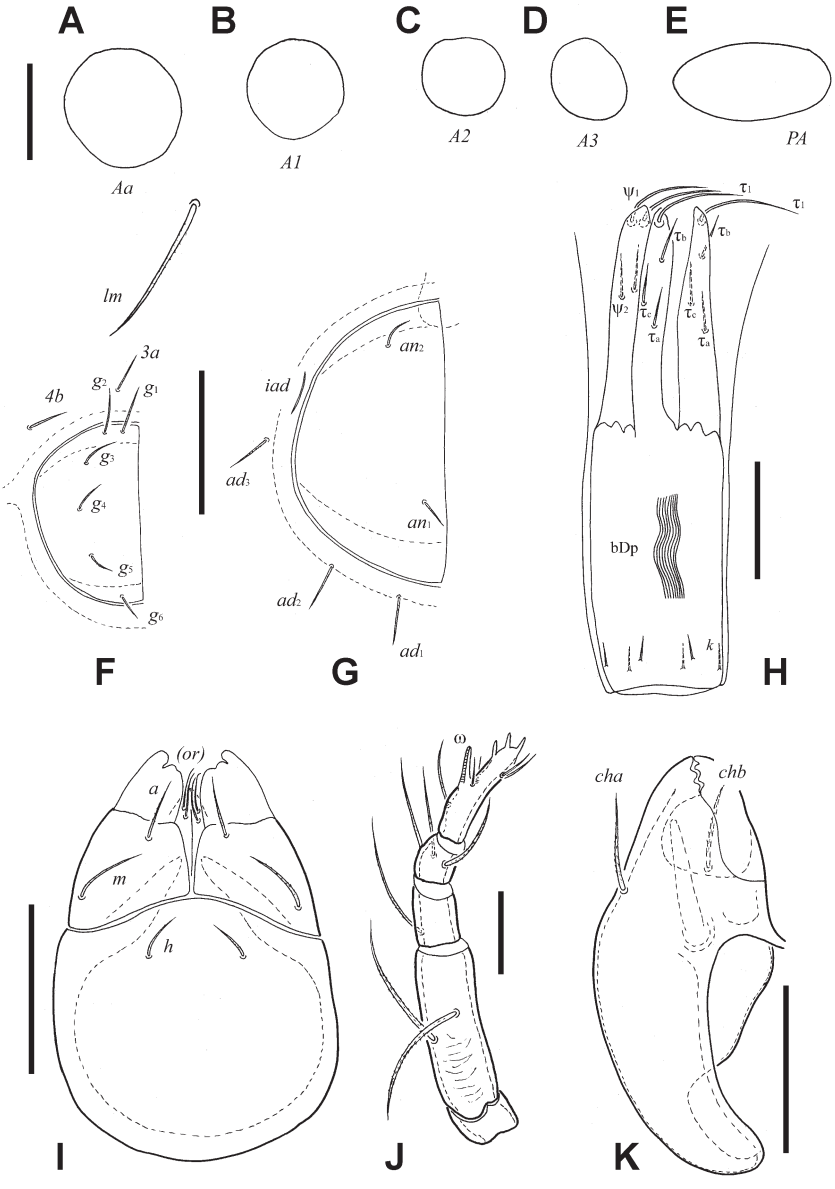

Fig. 8. *Africoribates subiasi* sp. n.: (A) area porosa *Aa* and notogastral seta *lm*; (B) area porosa *A1*; (C) area porosa *A2*; (D) area porosa *A3*; (E) postanal area porosa; (F) genital plate, right, and epimeral setae *3a*, *4b*; (G) anal plate, right; (H) ovipositor; (I) subcapitulum; (J) palp; (K) chelicera. Scale bars A–E = 10 μm; F–I, K = 50 μm; J = 20 μm.

Epimeral region (Fig. 7B). Apodemes 1, 2 and sejugal apodeme long, apodeme 3 short. Epimeral setal formula 3–1–3–3. Setae setiform, slightly barbed. Lateral setae *3c* and *4c* (36) longer than others (16–20). Circumpedal carina well-developed.
Gnathosoma (Figs 8I–K). Subcapitulum longer than wide: 123 × 82. Hypostomal setae *a*, *m*, *h* setiform, slightly barbed; *m* (24–28) longer than *a* (20–24) and *h* (16–20). Two

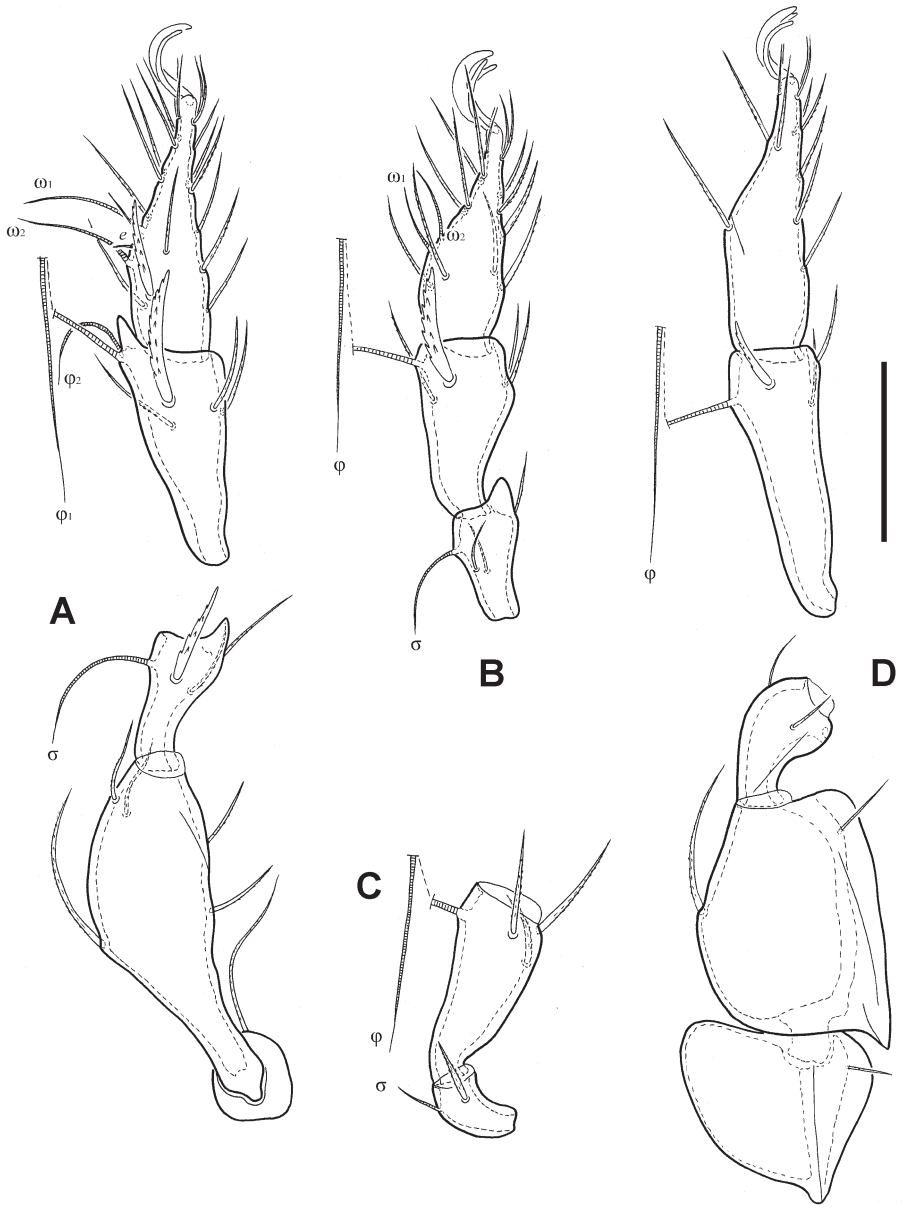

Fig. 9. *Africoribates subiasi* sp. n.: (A) leg I, right, antiaxial view; (B) leg II, without trochanter and femur, right, antiaxial view; (C) genu and tibia of leg III, left, antiaxial view; (D) leg IV, left, antiaxial view. Scale bar A–D = 50 μm.

TABLE 1

Leg setation and solenidia of *Ceratozetes baleensis* sp. n., *Ocesobates schatzi* sp. n., *Africoribates subiasi* sp. n. and *A. amorphus* sp. n. Roman letters refer to normal setae (*e* – famulus), Greek letters refer to solenidia. One apostrophe (′) marks setae on anterior, double apostrophe (″) setae on posterior side of the given leg segment. Parentheses refer to a pair of setae. * – Seta present only in *C. baleensis* sp. n.

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

pairs of setiform, distally curved, barbed adoral setae (12–16). Palp (length 94) with setation 0–2–1–3–9(+1ω). Chelicera (length 131) chelate-dentate. Cheliceral setae setiform, barbed; *cha* (28–32) slightly longer, than *chb* (26–30).

Legs (Figs 9A–D). Tibiae I with process anterodorsally. Genua I and II with processes anteroventrally. Femora IV with process posteroventrally. Formulae of leg setation and solenidia: I (1–5–3–4–20) [1–2–2], II (1–5–3–4–15) [1–1–2], III (2–2–1–3–15) [1–1–0], IV (1–2–2–3–12) [0–1–0]; homology of setae and solenidia indicated in Table 1. Setae *l″* on tarsi I, tibiae I, II and IV, genua I thick, with strongly conical teeth. Solenidia setiform, thin.

Holotype: ♀ ETHIOPIA: 10 km south of Ginchi city, Cholomu Forest (*Hagenia abissinica* forming the canopy), 8°53'N:39°09'E, 2810 m, in litter, 28.xi.2010, L.B. Rybalov & A.I. Bastrakov (ZISP).

Paratypes: 2♀, 1♂ Bale Mountains National Park, plateau Sanetti, Batu mountain peak, 6°49'N:39°49'E, 4367 m, plants *Artemisia* spp. and *Oxytriops* spp., 23.xi.2009, L.B. Rybalov (1♀, 1♂ SZMN; 1♀ PC).

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

Remarks: In having the combination of long interlamellar setae (as long as lamellae), morphology of lamellae and translamella, granulate body surface and presence of notogastral setae, *A. subiasi* sp. n. is similar only to *A. maximus* Mahunka, 1984 from Tanzania (Mahunka 1984*b*); however, it differs from the latter by the smaller body size (531–564 × 348–381 in the new species; 671–707 × 419–444 in *A. maximus*) and presence of areae porosae (sacculi in *A. maximus*).

In having the combination of a granulate body surface, presence of notogastral setae and areae porosae, *A. subiasi* sp. n. is similar to *A. ornatus* Evans, 1953 from Tanzania (Evans 1953; Mahunka 1984*a*); however, it differs from the latter by having larger body size (531–564 × 348–381 in the new species; 429–454 × 295–324 in *A. ornatus*) and long interlamellar setae, as long as lamellae (obviously shorter than lamellae in *A. ornatus*).

In having the combination of the morphology of lamellae and translamella, granulate body surface and presence of areae porosae, *A. subiasi* sp. n. also is similar to *A. evansi* Balogh, 1959 from Angola and Congo (Balogh 1959*a*). The problem in the comparative analysis, however, is that the length and structure of interlamellar setae is unknown in *A. evansi*. Balogh (1959*a*) wrote that the interlamellar setae are broken in the specimen available to him for study. However, *A. subiasi* sp. n. can be differentiated from *A. evansi* by having larger body size (531–564 × 348–381 in the new species; 415–420

× 270–275 in *A. evansi*), body surface without obscure polygonate structure (with obscure polygonate structure in *A. evansi*), notogastral setae relatively longer (longer than diameter of bothridia in new species; shorter in *A. evansi*); areae porosae *Aa* and *A1* larger (as diameter of bothridia in new species; obviously smaller in *A. evansi*), short sensilli (sensillar stalk shorter than diameter of bothridia in new species; as long as diameter of bothridia in *A. evansi*).

Africoribates amorphus sp. n.

Figs 10–12

Etymology: From Latin *amorphus* (shapeless), referring to the amorphous areae porosae.

Diagnosis: The new species is distinguished by the following combination of character states: body size 431–448 × 282–290; body surface granulate; dorsal parts of tutorium with longitudinal lines; lamellae of medium width; translamella narrow; lamellar setae longer than interlamellar and rostral setae; sensilli short, with oval, slightly barbed head; notogastral setae setiform, slightly barbed; four pairs of amorphous, round areae porosae present; thick leg setae absent.

Description:

Measurements. Body length 431 (holotype, female), 448 (paratype, female); body width 290 (holotype, female), 282 (paratype, female).

Integument. Body brown to dark brown. Body surface with very small granules (diameter: up to 4 μm). Dorsal parts of tutoria with longitudinal lines.

Prodorsum (Figs 10A, C–G). Rostrum rounded in dorsal view. Lamellae slightly longer than half the length of the of prodorsum. Lamellar cusps with weakly developed lateral and medial tooth. Lamellae of medium width. Translamella narrow, straight. Rostral (36–41), lamellar (86–90) and interlamellar (69–77) setae long, setiform, thickened, slightly barbed (correct lengths of setae visible in lateral view; Fig. 10C). Sensilli short (28–32), with oval, slightly barbed head. A pair of areae porosae *Ad* indistinct.

Notogaster (Figs 10A; 11A). Dorsosejugal suture slightly convex medially. Ten pairs of notogastral setae (8) setiform, with sparse, hardly visible barbs. Four pairs of small (diameter 8), indistinct (slightly visible only under high magnification), borderless areae porosae present dorsally. All lyrifissures long and narrow. Opisthonotal gland opening (*gla*) located posterolaterally to areae porosae *A1*.

Lateral part of body (Figs 10C, 10D). Exobothridial setae (24) setiform, barbed. Tutorium with broad rounded cusp distally. Areae porosae *Al* absent.

Anogenital region (Figs 10B; 11B–D). Two pairs of anal (12), three pairs of adanal (16), one pair of aggenital (8) and six pairs of genital (g_1–g_2, 8; g_3–g_6, 12) setae present; setae setiform, thin, slightly barbed. Anal plates of paratype with three pairs of anal setae. Oval postanal area porosa absent. Ovipositor elongate, narrow (167 × 57). Length of lobes 65, length of cylindrical distal part 102. All setae setiform, smooth. Lobe setae $\psi_1 \approx \tau_1$ (32) longer than $\psi_2 \approx \tau_a \approx \tau_b \approx \tau_c$ (16). Six coronal setae *k* short (12).

Epimeral region (Fig. 10B). Apodemes 1, 2 and sejugal apodeme long, apodeme 3 short. Epimeral setal formula 3–1–3–3. Setae (12–16) setiform, slightly barbed. Circumpedal carina well-developed.

Gnathosoma (Figs 11E–G). Subcapitulum longer than wide: 106 × 86. Hypostomal setae *a*, *m*, *h* setiform, slightly barbed; *m* (24) longer than *a* and *h* (16). Two pairs

of setiform, distally curved, barbed adoral setae (12). Palp (length 73) with setation 0–2–1–3–9(+1ω). Chelicera (length 110) chelate-dentate. Cheliceral setae setiform, barbed; *cha* (28) slightly longer, than *chb* (26).

Legs (Figs 12A–D). Tibiae I with weakly developed process anterodorsally. Genua I and II with processes anteroventrally. Femora IV with weakly developed process posteroventrally. Formulae of leg setation and solenidia: I (1–5–3–4–20) [1–2–2],

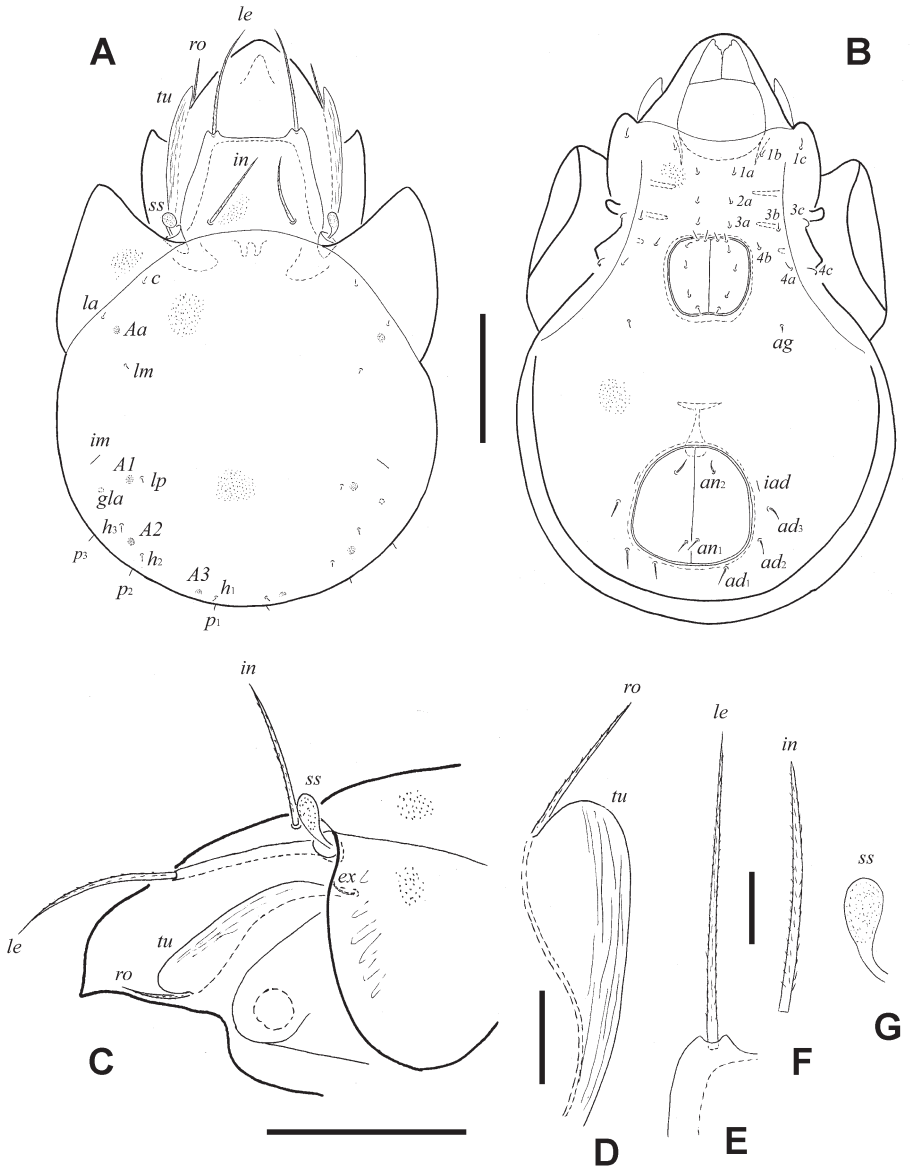

Fig. 10. *Africoribates amorphus* sp. n.: (A) dorsal view, legs not shown; (B) ventral view, legs, palps and subcapitular setae not shown; (C) lateral view of prodorsum, gnathosoma not shown; (D) rostral seta and tutorium; (E) lamellar seta and distal part of lamella; (F) interlamellar seta; (G) sensillum. Scale bars A–C = 100 μm; D–G = 20 μm.

II (1–5–3–4–15) [1–1–2], III (2–2(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. Thick setae absent. Solenidia setiform, thin.

Holotype: ♀ ETHIOPIA: 10 km south of Ginchi city, Cholomu Forest (*Hagenia abissinica* forming the canopy), 8°53'N:39°09'E, 2810 m, in litter, 28.xi.2010, L.B. Rybalov & A.I. Bastrakov (ZISP).

Paratype: ♀ Bale Mountains National Park, plateau Sanetti, Batu mountain peak, 6°49'N:39°49'E, 4367 m, plants *Artemisia* spp. and *Oxytriops* spp., 23.xi.2009, L.B. Rybalov (PC).

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

Remarks: In having the combination of long interlamellar setae (as long as lamellae), granulate body surface, presence of notogastral setae and areae porosae, *A. amorphus* sp. n. is similar only to *A. subiasi* sp. n. from Ethiopia, however it differs from the latter by having smaller body size (431–448 × 282–298 in *A. amorphus*; 531–564 × 348–381

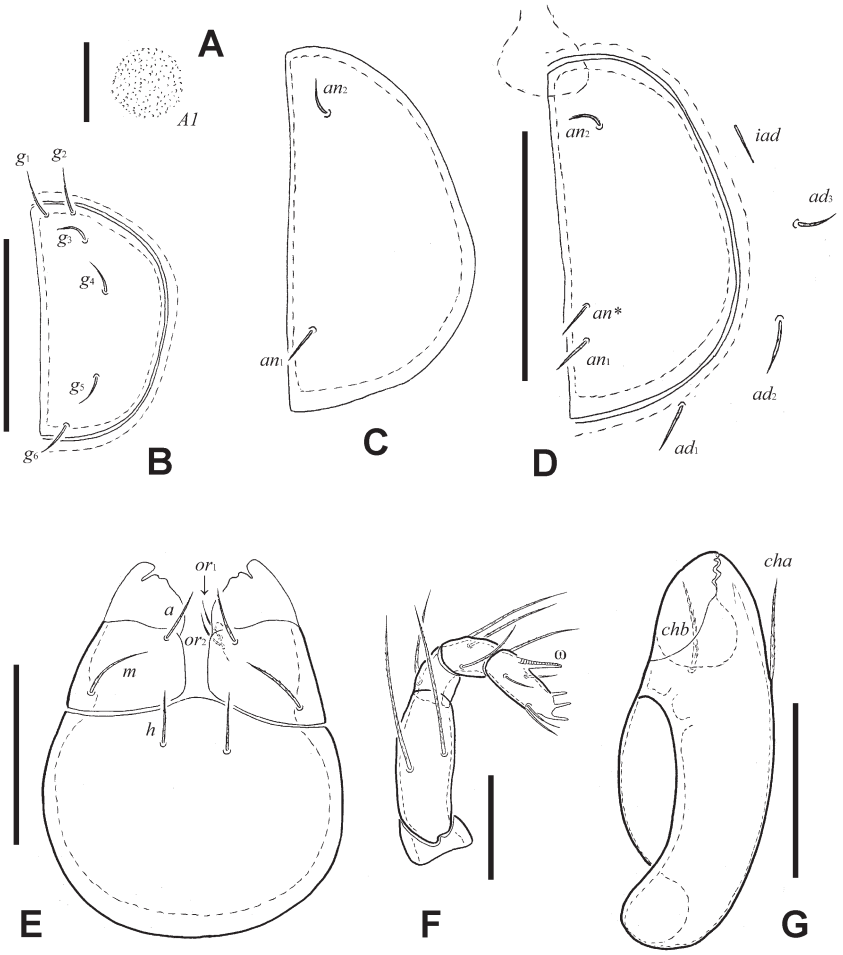

Fig. 11. *Africoribates amorphus* sp. n.: (A) area porosa *A1*; (B) genital plate, left; (C) anal plate of holotype, left; (D) anal plate of paratype, left; (E) subcapitulum, right lip with adoral setae not shown; (F) palp; (G) chelicera. Scale bars A = 10 μm; B–E, G = 50 μm; F = 20 μm.

in *A. subiasi*); lamellar setae obviously longer than rostral setae (lamellar setae not longer than rostral setae in *A. subiasi*); lamellae smooth (with longitudinal lines in *A. subiasi*); translamella narrow (broad, slightly thinner than lamellae in *A. subiasi*); tutoria without dens distally (with two dens in *A. subiasi*); areae porosae small, amorphous (larger, distinct in *A. subiasi*).

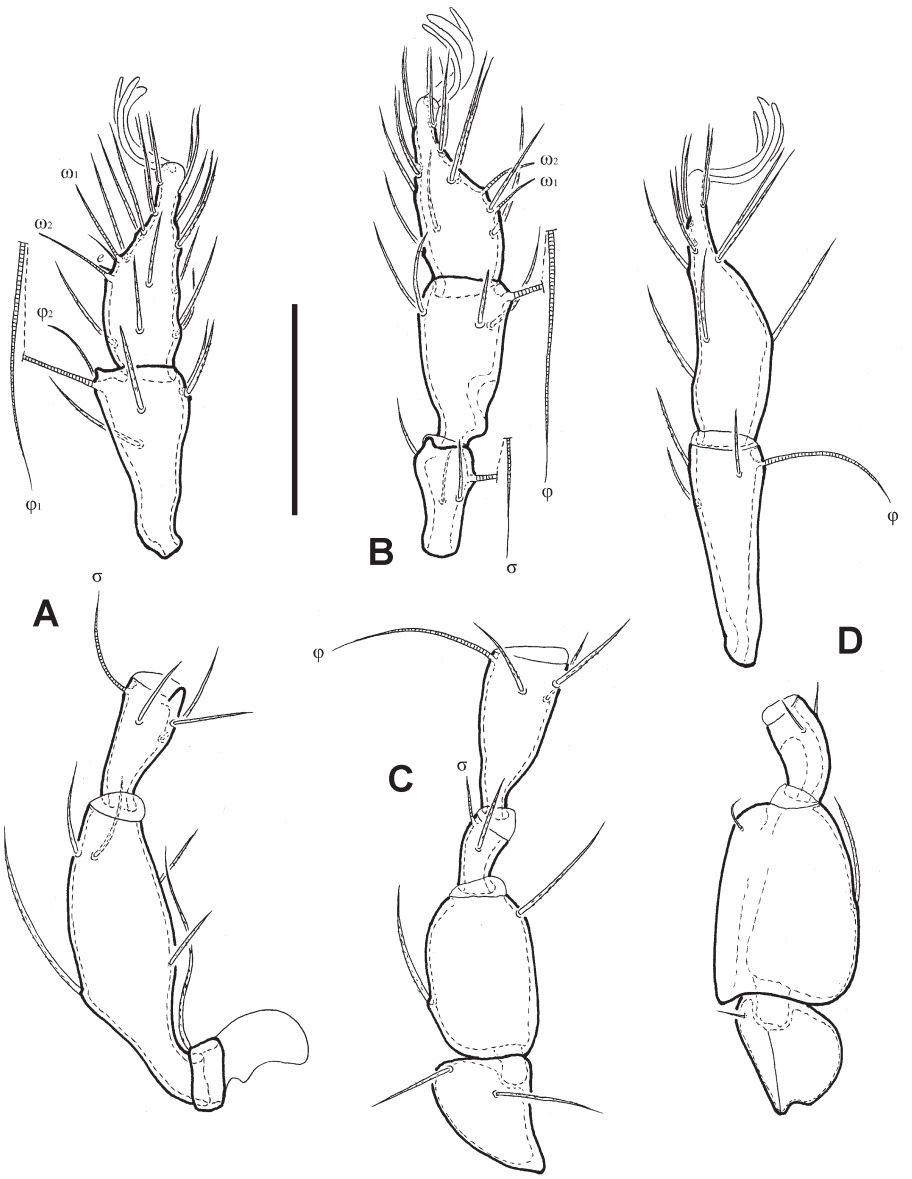

Fig. 12. *Africoribates amorphus* sp. n.: (A) leg I, right, antiaxial view; (B) leg II, without trochanter and femur, left, antiaxial view; (C) leg III, without tarsus, left, antiaxial view; (D) leg IV, right, antiaxial view. Scale bar A–D = 50 μm.

Key to species of *Africoribates*

1 Body surface of notogaster granulate 2
– Body surface of notogaster not granulate 6

2 Notogaster with sacculi ..... **maximus** Mahunka
– Notogaster with areae porosae 3

3 Areae porosae amorphous; lamellae of medium width; translamella thin ..... **amorphus** sp. n.
– Areae porosae distinct; lamellae broad; translamella slightly thinner than lamellae 4

4 Body surface with granules and obscure polygonate structure ..... **evansi** Balogh
– Body surface without obscure polygonate structure 5

5 Interlamellar setae obviously shorter than lamella ..... **ornatus** Evans
– Interlamellar setae as long as lamellae ..... **subiasi** sp. n.

6 Surface of notogaster foveolate ..... **undulatus** Balogh
– Surface of notogaster not foveolate 7

7 Surface of notogaster polygonate 8
– Surface of notogaster not polygonate 9

8 Pteromorphae polygonate; interlamellar setae extremely short (shorter than diameter of bothridium) ..... **polygonatus** Mahunka
– Pteromorphae not polygonate; interlamellar setae longer than diameter of bothridium ..... **macfarlanei** Balogh

9 Surface of notogaster with central longitudinal line 10
– Surface of notogaster without central longitudinal line 11

10 Notogastral setae present; sensillar stalk strongly curved, S-shaped ..... **pilosus** (Mahunka)
– Notogastral setae absent; sensillar stalk slightly curved ..... **glabratus** (Berlese)

11 Notogastral setae present; body surface rugose ..... **australis** (Mahunka)
– Notogastral setae absent; body surface not rugose ..... **depilatus** (Berlese)

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