AFROLEIUS CHISTYAKOVI (ACARI: ORIBATIDA: PUNCTORIBATIDAE), A NEW ORIBATID MITE SPECIES FROM MALAWI

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ABSTRACT: A new species, *Afroleius chistyakovi* sp.n. (Oribatida: Punctoribatidae), is described from sifted plant litter collected in a highland forest of Malawi. This is the first record of oribatid mite genus *Afroleius* Mahunka, 1984 in Malawi. The new species differs from a related species, *Afroleius valerieae,* in body size, surface pattern and depressions, as well as the length and morphology of the rostral and interlamellar setae.

KEY WORDS: Taxonomy, morphology, *Afroleius*, Afrotropical region.

DOI: 10.21684/0132-8077-2022-30-1-3-8

INTRODUCTION

Afroleius (Acari: Oribatida: Punctoribatidae) was proposed by Mahunka (1984), with *Afroleius deformis* Mahunka, 1984 as type species. Currently, the genus comprises 15 species that are distributed in the Afrotropical region; of these, 14 species are known only in South Africa (Subías 2004, online version 2021). A revised generic diagnosis and an identification key to the known species of *Afroleius* have been published by Coetzee (2015).

During the taxonomic identification of oribatid mites from Malawi, I found one new species belonging to *Afroleius*. Representatives of this genus have not been recorded in this country before. The main goal of this paper is to describe and illustrate the new species, which bears the name *Afroleius chistyakovi* sp.n.

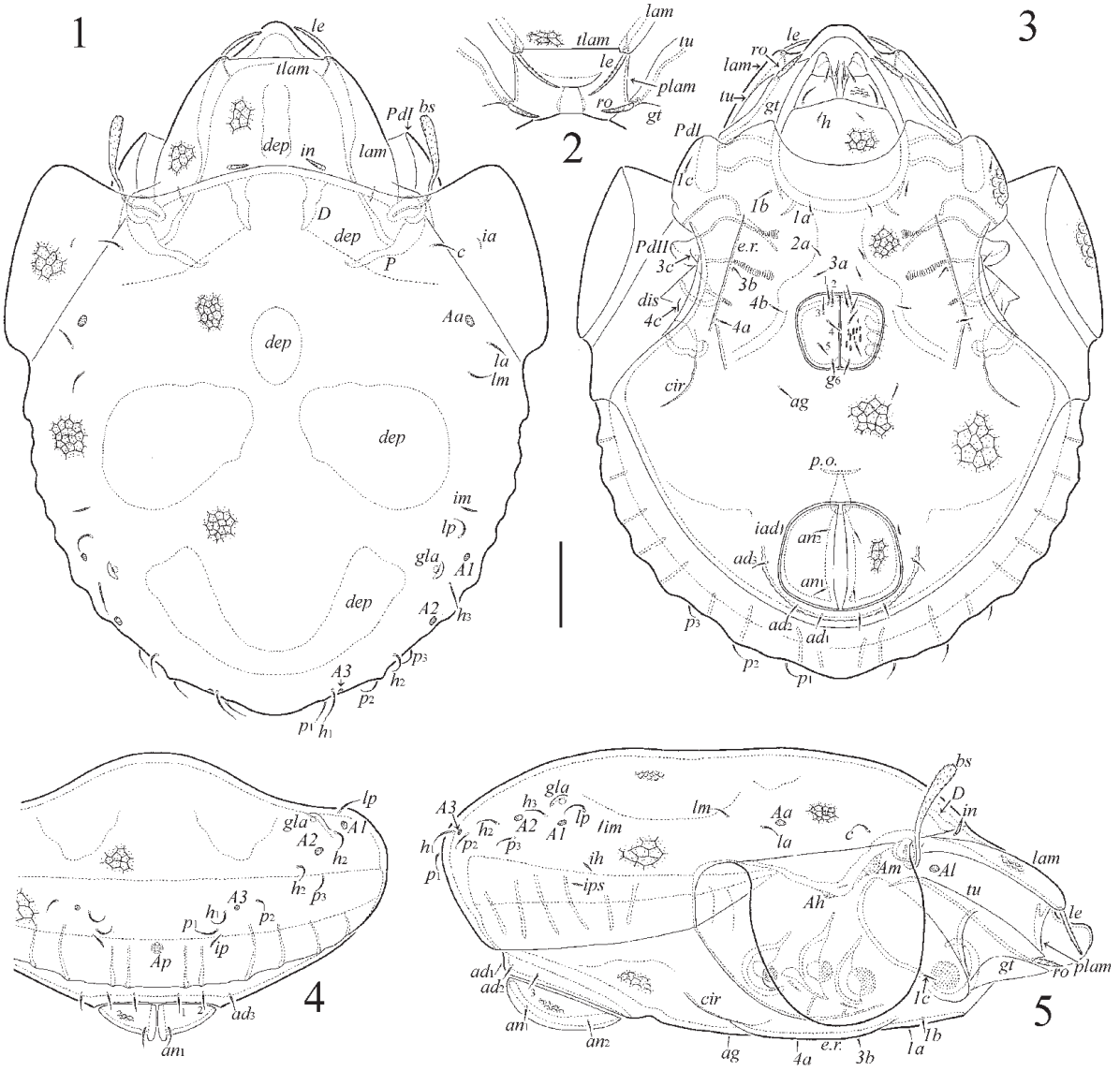
MATERIALS AND METHODS

Specimens. The specimens of the new species were kindly provided by the Institute of Soil Biology, České Budějovice, the Czech Republic (the collection locality is provided in the *Material examined* section).

Observation and documentation. Specimens were mounted in lactic acid, on temporary cavity slides, for measurement and illustration. Body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the notogaster. Notogastral width refers to the maximum width of the notogaster in dorsal view (behind pteromorph). Lengths of body setae were measured in lateral aspect. All body measurements are presented in micrometers (μm). Formulas for leg setation are given in parentheses according to the sequence trochanter–femur–genu–tibia–tarsus (famulus included). Formulas for leg solenidia are given in square brackets, according to the sequence genu–tibia–tarsus. Drawings were made with a camera lucida using a Leica transmission light microscope "Leica DM 2500". For SEM microscopy alcohol preserved mites were dusted with gold and scanned with the aid of a TESCAN Mira3 LMU SEM microscope.

Terminology. Morphological terminology used in this paper follows that of Grandjean: see Travé and Vachon (1975) for references; Norton (1977) for leg setal nomenclature; and Norton and Behan-Pelletier (2009) for overview.

Abbreviations. *Prodorsum*: *lam*—lamella; *tlam*—translamella; *plam*—prolamella; *tu*—tutorium; *gt*—genal tooth; *Al*—lateral porose area; *ro*, *le*, *in*, *bs*—rostral, lamellar, interlamellar and bothridial seta, respectively; *D*—dorsophragma; *P*—pleurophragma. *Notogaster*: *dep*—depression; *c*, *la*, *lm*, *lp*, *h*, *p*—setae; *Aa*, *A1*, *A2*, *A3*—porose areas; *ia*, *im*, *ip*, *ih*, *ips*—lyrifissures; *gla*—opisthonotal gland opening. *Gnathosoma*: *a*, *m*, *h*—subcapitular setae; *or*—adoral seta; *a.s.*—axillary saccule; *d*, *l*, *cm*, *acm*, *ul*, *su*, *lt*, *vt*, *sup*, *inf*—palp setae; ω—palp solenidion; *cha*, *chb*—cheliceral setae; *Tg*—Trägårdh's organ. *Epimeral and lateral podosomal regions*: *e.r.*—epimeral ridge; *1a*, *1b*, *1c*, *2a*, *3a*, *3b*, *3c*, *4a*, *4b*, *4c*—epimeral setae; *Am*, *Ah*—humeral porose areas; *PdI*, *PdII*—pedotectum I and II, respectively; *dis*—discidium; *cir*—circumpedal carina. *Anogenital region*: *g*, *ag*, *an*, *ad*—genital, aggenital, anal and adanal seta, respectively; *iad*—adanal lyrifissure; *Ap*—postanal porose area; *p.o.*—preanal organ. *Legs*: *Tr*, *Fe*, *Ge*, *Ti*, *Ta*—trochanter, femur, genu, tibia and tarsus, respectively; *p.a.*—porose area; ω, σ, φ—solenidia; ε—famulus; *d*, *l*, *v*, *ev*, *bv*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*,



Figs. 1–5. *Afroleius chistyakovi* sp.n., adult: 1—dorsal view; 2—anterior part of prodorsum, dorsoanterior view; 3—ventral view (not shown: legs); 4—posterior view; 5—lateral view (not shown: gnathosoma and legs; genital aperture and some epimeral setae not visible in lateral aspect due epimeral ridge). Scale bar=50 μm.

pl—setae; *t.t.*—tarsal tooth; *g.p.*—genual process; *f.p.*—femoral process.

SYSTEMATICS

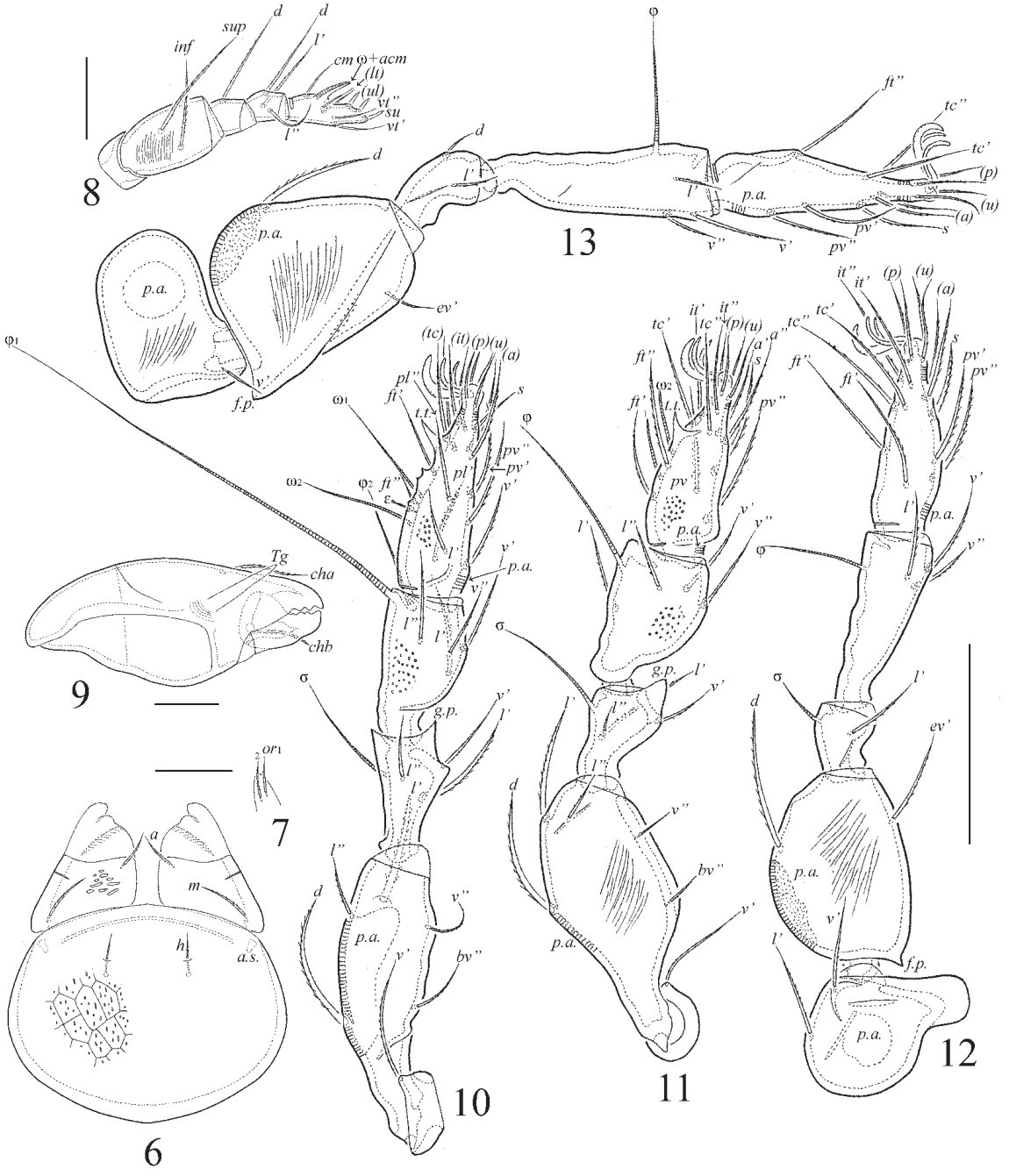
Afroleius chistyakovi Ermilov, sp.n.

Figs. 1–19

Diagnosis. Body length: 415–464. Ventral profile straight. Prodorsum, notogaster, pteromorph and ventral side with reticulate pattern. Rostral seta short, slightly phylliform; lamellar seta medium-sized, thickened; interlamellar seta shortest, hardly phylliform or thickened; bothridial seta long clavate; all setae barbed. Bothridium directed ventrad. Notogaster with one pair of large deep dorsolateral depressions. Octotaxic system as porose areas. All notogastral setae short, setiform, flexible, roughened. Subcapitular seta *m* longest; *h* shortest. Epimeral and anogenital setae short, setiform, roughened. Epimeres with one pair of longitudinal ridges. Postanal porose area present. Leg tarsi I and II with strong dorsal tooth.

Description. *Measurements*. Body length: 464 (holotype: female), 415–464 (11 paratypes: eight males and three females). Body width: 332 (holotype), 298–332 (11 paratypes). No difference between males and females in body size.

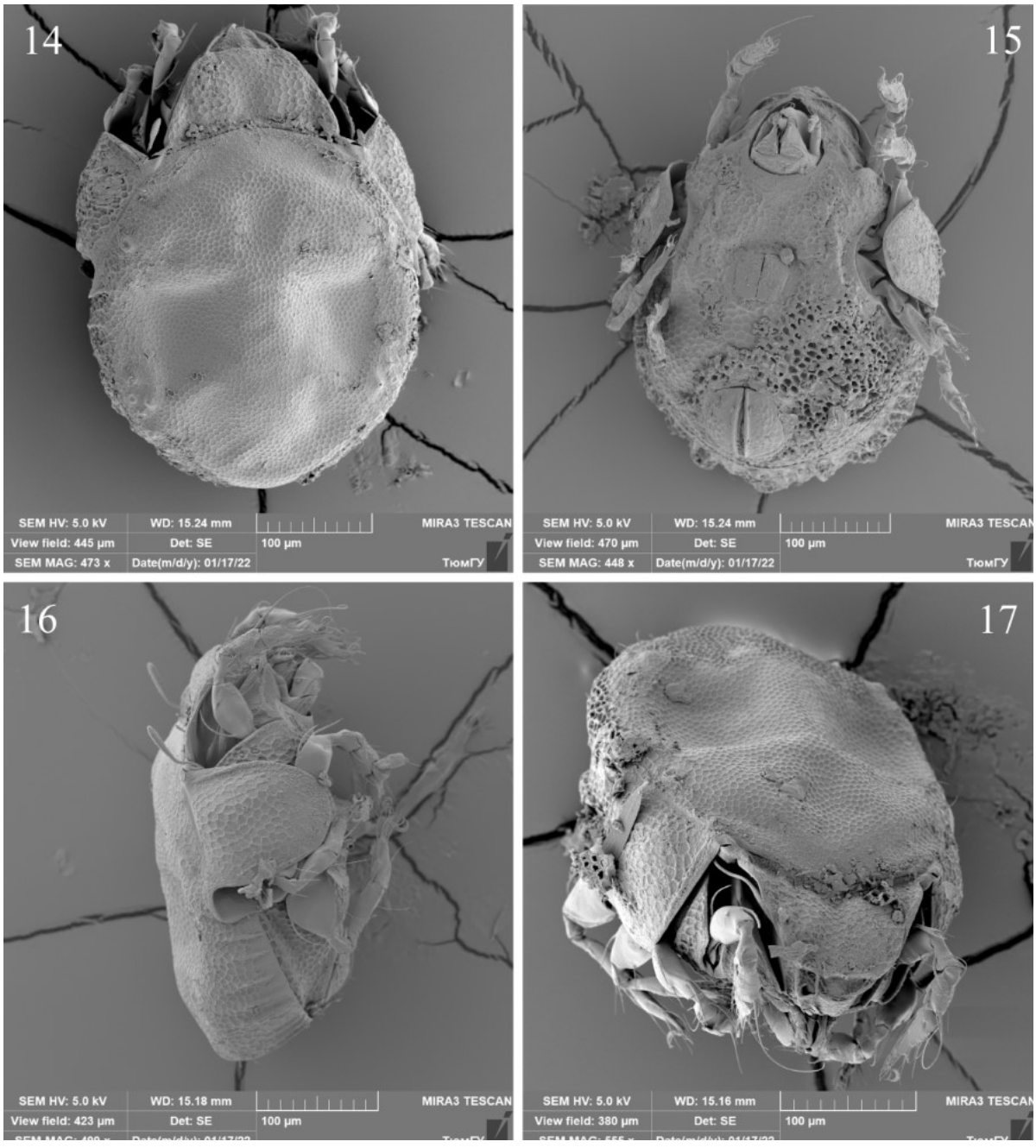
Integument. Color light brownish (in young specimens) or brown. Body often partially covered



Figs. 6–13. *Afroleius chistyakovi* sp.n., dissected adult: 6—subcapitulum, ventral view; 7—lip with adoral setae, left, ventral view; 8—palp, right, antiaxial view; 9—chelicera, left, paraxial view; 10—leg I, right, antiaxial view; 11—leg II, right, antiaxial view; 12—leg III, left, antiaxial view; 13—leg IV, left, antiaxial view. Scale bars=20 μm (6–9), 20 μm (10–13).

by thick gel-like cerotegument. Surface microsculpturing tuberculate. Prodorsum, notogaster, pteromorph, subcapitular mentum, epimeral and anogenital regions, anal plate with reticulate pattern. Subcapitular gena and genital plate with elongate tubercles. Antiaxial side of tarsi I–IV and tibiae I–IV partially with granulate cerotegument (sometimes poorly observed on legs III, IV). Antiaxial side of femora I–IV and trochanters III, IV densely striate.

Prodorsum. Rostrum rounded. Anterior part of prodorsum (nearly rostrum) with large median bulge. Lamella about 3/4 length of prodorsum; cusp short, truncate or with indistinct inner and outer teeth. Translamella well developed. Lateral porose area rounded (8–12), indistinct in light brownish specimens. Tutorium about 4/5 length of prodorsum; cusp short, triangular. Genal tooth strong, elongate triangular. Rostral seta (24–32) slightly

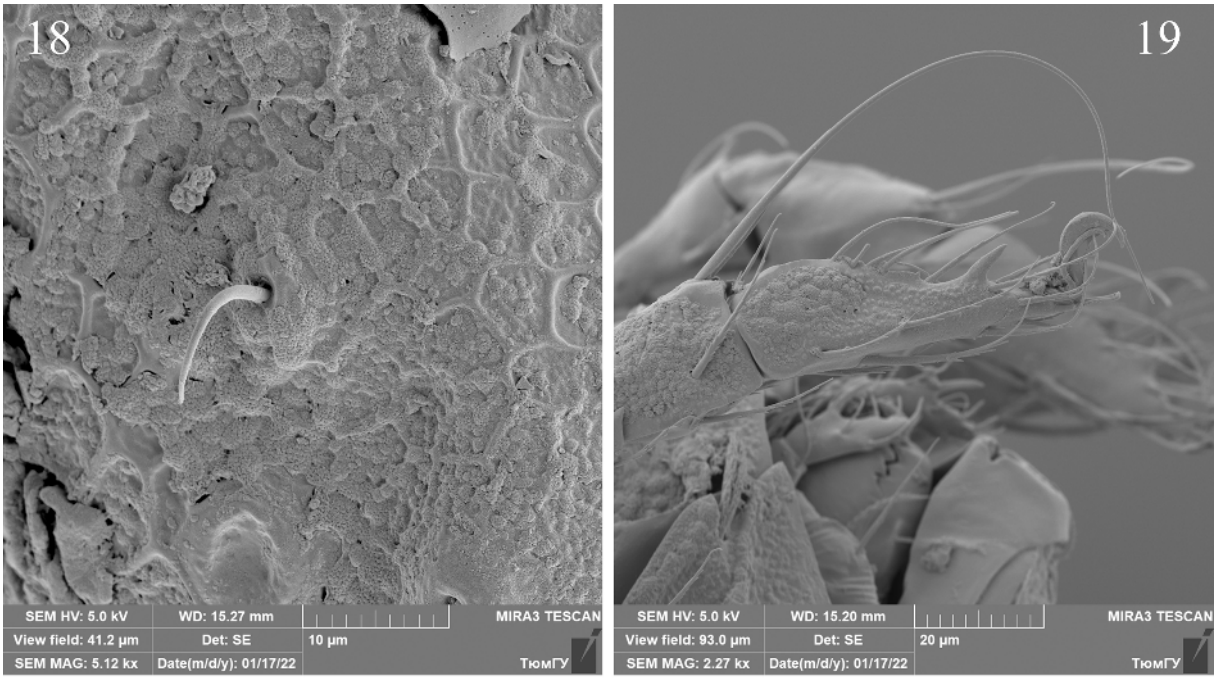


Figs. 14–17. *Afroleius chistyakovi* sp.n., adult, SEM micrographs: 14—dorsal view; 15—ventral view; 16—lateral view; 17—dorsoanterior view.

phylliform, barbed; basal part of *ro* covered by tutorial cusp. Lamellar seta (41–49) thickened, barbed. Interlamellar seta (12–14) hardly phylliform or thickened, barbed. Bothridial seta (65–73) clavate, with long stalk and elongate head, barbed. Bothridium directed ventrad. Exobothridial seta and dorsosejugal porose area not observed. Median prodorsal region between translamella and anterior margin of notogaster slightly depressed.

Notogaster. With one pair of large, deep dorsolateral depressions and one slight centrodorsal depression. Humeral and dorsoposterior regions of notogaster slightly depressed. Posterior notogastral margin with some longitudinal ridges creating an undulate margin in dorsal aspect. Octotaxic system represented by rounded porose areas (*Aa*: 8–10; *A1*, *A2*: 6–8; *A3*: 4–6). All notogastral setae (*c*, *la*, *lm*, *lp*, h_1–h_3: 20; p_1–p_3: 16) setiform, flexible, roughened. Opisthonotal gland opening located medially to porose areas *A1* and *A2*. All lyrifissures distinct.

Gnathosoma. Subcapitulum size: 86–94 × 69–73. Subcapitular (*a*: 10–12; *m*: 14–16; *h*: 6–8)



Figs. 18–19. *Afroleius chistyakovi* sp. n., adult, SEM micrographs: 18—notogastral pattern and seta *lm*; 19—leg tarsus I and anterior part of tibia I.

and adoral (8–10) setae setiform, slightly barbed; *h* thinnest. Palp (69–77) setation: 0–2–1–3–9(+ω). Postpalpal seta (6) spiniform, roughened. Axillary saccule distinct, slightly elongate. Chelicera (98–106) with two setiform, barbed setae (*cha*: 28–32; *chb*: 18–20).

Epimeral and lateral podosomal regions. Epimeral setal formula: 3–1–3–3. Epimeral setae (12–14) setiform, roughened. Epimeres with one pair of longitudinal ridges. Humeral porose areas *Am* and *Ah* diffuse, poorly visible. Circumpedal carina short, rudimentary. Epimeral ridges, humeral porose areas and circumpedal carinae sometimes not observed in light brownish specimens. Discidium triangular.

Anogenital region. Genital, aggenital, anal and adanal setae (12–14) setiform, roughened. Adanal lyrifissure located close and parallel to anal plate. Postanal porose area rounded (10–12).

Legs. Median claw distinctly thicker than lateral claws; all claws slightly barbed dorsally. Dorsal porose area on femora I–IV and on trochanters III, IV distinct. Proximoventral porose area on tarsi I–IV present. Distoventral porose area on tibiae I–IV absent. Dorsal and ventral porose regions on tarsi I–IV hardly visible behind insertions of paired setae *p* and *u*. Tarsi I and II with strong dorsal tooth; tarsus I additionally with some dorsal very small teeth. Genu I pointed anterodorsally. Genua I and II with distoventral triangular process. Femora III and IV with proximoventral triangular process. Formulas 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 as indicated in Table 1. Famulus short, straight, slightly swollen distally, inserted between seta *ft"* and solenidion ω_2. Seta *s* on tarsus I eupathidial, located between paired setae *u* and *a*. Solenidia ω_1 and ω_2 on tarsus II thickened, rounded distally; other solenidia setiform or rod-like.

Material examined. Holotype (female) and 11 paratypes (eight males and three females): Southern Malawi, Zomba District, Zomba Mountain, 15º20′ 37.2″S, 35º16′40.2″E, 1,846 m a.s.l., sifted forest litter, Winkler extraction, 27 Nov. 2018 (leg. P. Baňař and P. Hlaváč).

Type deposition. The holotype is deposited in the collection of the Senckenberg Museum of Natural History, Görlitz, Germany; 11 paratypes are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia. All specimens are preserved in 70% solution of ethanol with a drop of glycerol.

Etymology. The species epithet honors Dr. Mikhail P. Chistyakov (1937–2006)—oribatologist from Nizhny Novgorod, Russia—on his would be 85th birthday.

Remarks. In having notogastral porose areas, rounded posterior notogastral margin, strong dorsal tooth on leg tarsi I, II and a straight ventral profile, *Afroleius chistyakovi* sp.n. is morphologically most similar to *Afroleius valerieae* Coetzee, 2014 from South Africa (see Coetzee 2014). However, the former species differs from the latter in the following: larger body size (length: 415–464 vs. 283–337), the presence of a reticulate (vs. foveate) pattern on the notogaster and on the ventral side of the body, short and slightly phylliform (vs. long, setiform) rostral seta, well developed and hardly phylliform (vs. minute and simple) interlamellar seta, one pair of large and deep (vs. small and hardly visible) dorsolateral notogastral depressions.

ACKNOWLEDGEMENTS

I cordially thank Drs. J. Starý (České Budějovice, Czech Republic), P. Baňař (Brno, Czech Republic) and P. Hlaváč (Prague, Czech Republic) for their long-term cooperation in the study of soil invertebrates from Malawi. I also thank D. Shpindyuk (Tyumen, Russia) for SEM micrographs. The presented research was supported by the Czech Academy of Sciences (Research grant No. RVO 60077344) and the cooperative agreement No. FEWZ-2021-0004 from the Russian Ministry of Science and Higher Education.

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Table 1

Leg setation and solenidia of *Afroleius chistyakovi* sp.n.

Leg	*Tr*	*Fe*	*Ge*	*Ti*	*Ta*
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",* ε, 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	*l', v'*	*d, 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)*

Note: Roman letters refer to normal setae, Greek letters—to solenidia (except ε—famulus); single quotation mark (') designates setae on the anterior and double quotation mark (")—setae on the posterior side of a given leg segment; parentheses refer to a pair of setae.