

Unguizetes (Knorozovia) ershovae (Acari, Oribatida, Mochlozetidae), a new oribatid mite subgenus and species from Mexico

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Original research

ABSTRACT

A new oribatid mite subgenus of the genus *Unguizetes* (Oribatida, Mochlozetidae)—*U. (Knorozovia)* **n. subgen.**, with *U. (K.) ershovae* **n. sp.** as type species—is described, based on material collected from Mexico. It can be distinguished from the nominate subgenus by the number of notogastral setal alveoli (14 pairs versus 10 pairs) and well-developed dorsosejugal suture. An identification key to the known supraspecies taxa within Mochlozetidae is provided.

Keywords mochlozetid mites; taxonomy; morphology; identification key; Neotropical region**Zoobank** <http://zoobank.org/7D3FB050-7F63-4EAB-9279-84166B14DC0D>

Introduction

The oribatid mite family Mochlozetidae (Acari, Oribatida) comprises 13 supraspecies taxa (11 genera and two subgenera) with 79 species having a cosmopolitan distribution collectively. Many representatives of the family are arboreal but some species are registered in soil-litter (e.g., Norton 1983, 1984; Corpuz-Raros and Ermilov 2019, 2020).

Unguizetes Sellnick, 1925, with type species *Oribata sphaerula* Berlese, 1905, is the largest genus of Mochlozetidae. Its taxonomic revision has been presented by Ermilov (2016). During faunistic study of oribatid mites collected from Mexico, we found a new species belonging to the new subgenus of *Unguizetes*. The main goal of our paper is to describe *Unguizetes (Knorozovia)* **n. subgen.**, with *U. (K.) ershovae* **n. sp.** as type species, based on adults.

Also, we present an identification key to the known genera/subgenera of Mochlozetidae using morphological traits and supraspecies system mostly from the systematic and revision taxonomic papers (e.g., Grandjean 1959, 1960; Norton 1983, 1984; Norton and Behan-Pelletier 2009; Schatz *et al.* 2011; Ermilov 2016; Ermilov and Corpuz-Raros 2017; Ermilov and Friedrich 2017).

Presently, five Mochlozetidae genera were found in Mexico (Palacios-Vargas and Iglesias 2004; Vázquez-González *et al.* 2016): *Dynatozetes* Grandjean, 1960; *Mahunkazetes* Balogh and Balogh, 1992; *Mochloribatula* Mahunka, 1978; *Mochlozetes* Grandjean, 1930; and *Uracrobat* Balogh and Mahunka, 1967.

Methods

Observation and documentation

For measurement and illustration, specimens were mounted in lactic acid on temporary cavity slides. All measurements are in micrometers. Body length was measured in lateral view, from

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the tip of the rostrum to the posterior edge of the notogaster; other structures were oriented to avoid parallax errors. Notogastral width refers to the maximum of the ventral plate in ventral aspect and on level of the pteromorphs in dorsal aspect. Setal lengths were measured perpendicular to their long axis, accounting for curvature. 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 DM 2500 transmission light microscope. For SEM microscopy alcohol preserved mites were dusted with silver and scanned with the aid of a JEOL-JSM-6510LV SEM microscope.

Terminology

Morphological terminology used in this paper follows that of Grandjean (Grandjean 1959, 1960), Norton (1983, 1984), Ermilov (2016, 2017); also Norton (1977) for leg setal nomenclature and Norton and Behan-Pelletier (2009) for overview are used.

Abbreviations

Prodorsum: *lam* = lamella; *tlam* = translamella; *slam* = sublamella; *Al* = sublamellar porose area; *tu* = tutorium; *ro*, *le*, *in*, *bs*, *ex* = rostral, lamellar, interlamellar, bothridial, and exobothridial setae, respectively; *D* = dorsophragma. Notogaster: *c*, *da*, *la*, *dm*, *lm*, *dp*, *lp*, *h*, *p* = notogastral 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; *d*, *l*, *cm*, *acm*, *ul*, *su*, *lt*, *vt*, *inf*, *sup* = palp setae; ω = palp solenidium; *cha*, *chb* = cheliceral setae; *Tg* = Trägårdh's organ. Epimeral and lateral podosomal regions: *1a*, *1b*, *1c*, *2a*, *3a*, *3b*, *3c*, *4a*, *4b*, *4c* = epimeral setae; *Am*, *Ah* = humeral porose areas; *PdI*, *PdII* = pedotecta I, II, respectively; *cus* = custodium; *dis* = discidium; *cir* = circumpedal carina; *z* = aperture of supracoxal gland. Anogenital region: *g*, *ag*, *an*, *ad* = genital, aggenital, anal, and adanal setae, respectively; *iad* = adanal lyrifissure; *po* = preanal organ. Legs: *Tr*, *Fe*, *Ge*, *Ti*, *Ta* = trochanter, femur, genu, tibia, and tarsus, respectively; *pa* = porose area; ω , σ , ϕ = solenidia; ϵ = famulus; *d*, *l*, *v*, *ev*, *bv*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*, *pl* = setae.

Taxonomy

Family Mochlozetidae Grandjean, 1960

Genus *Unguizetes* Sellnick, 1925, p. 473

Type species: *Oribata sphaerula* Berlese, 1905, by original designation, p. 171

Unguizetes (*Knorozovia*) n. subgen.

Zoobank: 82B48A2A-3D97-4E3F-991F-A8AAF25ACEB6

Type species: *Unguizetes* (*Knorozovia*) *ershovae* n. sp.

Adult — With character states of *Unguizetes* (see Ermilov 2016) but with 14 pairs of notogastral setal alveoli and well developed, complete dorsosejugal suture.

Remarks — The new subgenus is similar to the nominate subgenus in many morphological traits, but differs from the latter by the subgeneric traits (14 pairs of notogastral setal alveoli; dorsosejugal suture strong, complete versus 10 pairs of notogastral setal alveoli; dorsosejugal suture interrupted or indistinct medially).

Also, the new subgenus is similar to *Gephyrazetes* (*Gephyrazetes*) Hirauchi, 1999 in the presence of 14 pairs of notogastral setae and complete dorsosejugal suture, but differs from the latter by the notogastral setae represented by alveoli (versus setae medium-sized, setiform), the localization of notogastral porose area *A1* in dorsomedial position (versus *A1* in lateroperipheral position), long tutorium (versus short), and in having six pairs of genital setae (versus four or five pairs).

Etymology — The subgenus is named after Yuri Valentinovich Knorozov (1922–1999), a brilliant Russian scholar in the American studies, who deciphered the Mayan hieroglyphic writing in the middle of the 20th century. Knorozov was a historian, ethnographer, linguist, a staunch supporter of systemic and interdisciplinary research, the creator of the theory of ethnic semiotics and the theory of communication as the basis of collective activity. He repeatedly visited Guatemala and Yucatan, studying the culture and the origin of Native American languages, especially the Mayan. In addition, the zoo environment, which is an important part of the ethno-cultural context, has always been a special interest of Yu.V. Knorozov.

Unguizetes (Knorozovia) ershovae n. sp.

Zoobank: [DA26D698-E8B0-4FE5-AAE3-8669ED54D294](https://zoobank.org/DA26D698-E8B0-4FE5-AAE3-8669ED54D294)

(Figures 1–4)

Material examined — Holotype (female) and five paratypes (three males and two females): Mexico, 20°41'N, 87°03'W, Quintana Roo, Municipio de Solidaridad, vicinities of Playa del Carmen, leaf litter under trees and bushes in secondary semi-evergreen tropical forest (date and collector unknown; collection of the Tyumen State University Museum of Zoology, Tyumen, Russia; Gashev *et al.* 2005).

Type deposition — The holotype is deposited in the collection of the Senckenberg Museum of Natural History, Görlitz, Germany; five 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.

Diagnosis — Body length: 585–690. Notogaster distinctly striate, partially forming reticulate ornamentation. Cusp of lamella with lateral tooth; translamella straight, comparatively broad; tutorium without cusp, directed to insertion of rostral seta. Rostral, lamellar and interlamellar setae long, setiform, barbed; *ro* shortest, *in* longest; bothridial seta long, with slightly developed, fusiform, barbed head. Dorsosejugal suture undulate. Pteromorph well developed. Notogastral porose areas rounded; *A1* and *A2* located close to each other. Fourteen pairs of notogastral setae as alveoli. Palp setae *lt'*, *lt''*, *vt'*, *vt''* on tarsus and *l'*, *l''* on genu short. Custodium long, narrowly triangular. Discidium broadly triangular. Epimeral, genital and aggenital setae medium-sized to comparatively short, setiform, slightly barbed; anal and adanal setae minute, setiform, roughened. Adanal lyrifissure located close and slightly diagonal to anal plate.

Description of adult — Measurements – Body length: 690 (holotype), 585, 600, 630 (male paratypes), 675, 690 (female paratypes); notogaster width (level of pteromorphs): 510 (holotype), 435, 450, 465 (male paratypes), 495, 510 (female paratypes); ventral plate width: 480 (holotype), 420, 435, 435 (male paratypes), 465, 480 (female paratypes).

Integument (Figs 1a, 1c, 1d, 3c, 3d, 4b) – Body color brown. Body and legs covered by thin layer of gel-like cerotegument; lateral side of body partially with microgranulate cerotegument. Surface densely microfoveolate (visible in dissected specimens under high magnification, 10 × 100); lamella entirely slightly striate (Fig. 3c); notogaster distinctly longitudinally striate (Fig. 4b), forming in anterior part reticulate ornamentation (Fig. 3d).

Prodorsum (Figs 1a, 1c, 3a–3d, 4a) – Rostrum broadly rounded. Lamella (including cusp) about 1/2 length of prodorsum, with short cusp having distinct lateral tooth; translamella straight, comparatively broad; tutorium about 1/2 length of prodorsum, lamelliform, without cusp. Sublamellar porose area oval (9–11 × 6–7). Rostral (75–82), lamellar (120–127) and interlamellar (165–176) setae setiform, barbed; *ro* inserted on tutorial end; bothridial seta (109–116) with long stalk and short, slightly developed, fusiform, barbed head; exobothridial seta (37–45) setiform, thin, barbed. Dorsosejugal porose area not observed.

Notogaster (Figs 1a, 1c, 1d, 3a, 3b, 4a) – Dorsosejugal suture strong, undulate. Pteromorph broadly rounded laterally. Four pairs of rounded porose areas (11–15); *A1* and *A2* located comparatively close to each other, both in lateral position but *A1* anteromedial to *A2*. Fourteen pairs of notogastral setae represented by alveoli. Opisthonotal gland opening and all lyrifissures distinct.

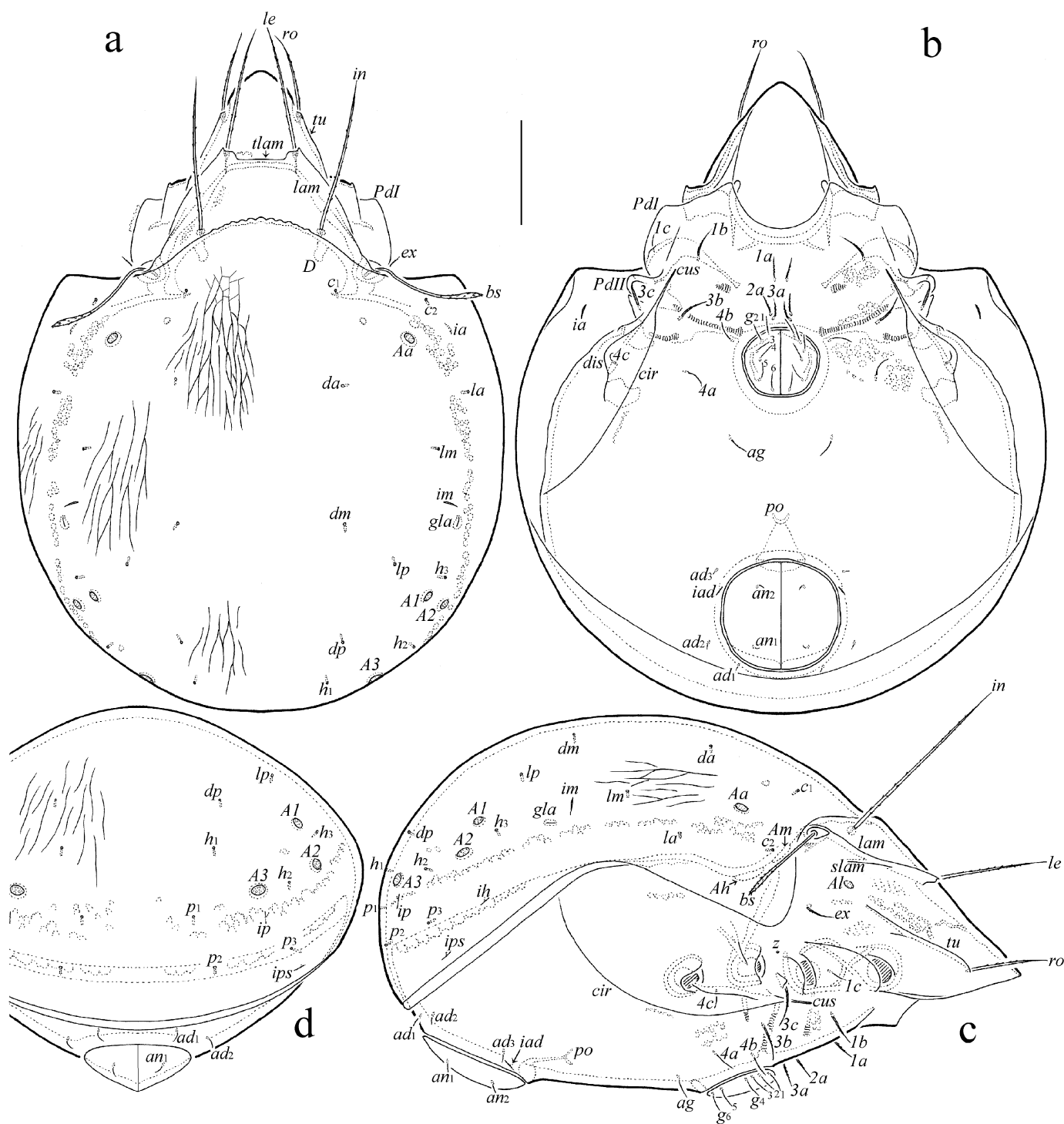


Figure 1 *Unguizetes (Knorozovia) ershovaie* n. sp., adult (gnathosoma and legs omitted): a – dorsal view; b – ventral view; c – right lateral view; d – posterior view. Scale bar 100 μ m.

Gnathosoma (Figs 2a–c) – Subcapitulum size: 150–161 $\times$ 97–101; subcapitular (*a*, *h*: 22–26; *m*: 41–49) and adoral (11) setae setiform, thin, barbed. Palp length: 116–120; setation: 0–2–1–3–9(+ ∞); setae (*lt*), (*vt*) on tarsus and (*l*) on genu short; postpalpal seta (6) spiniform,

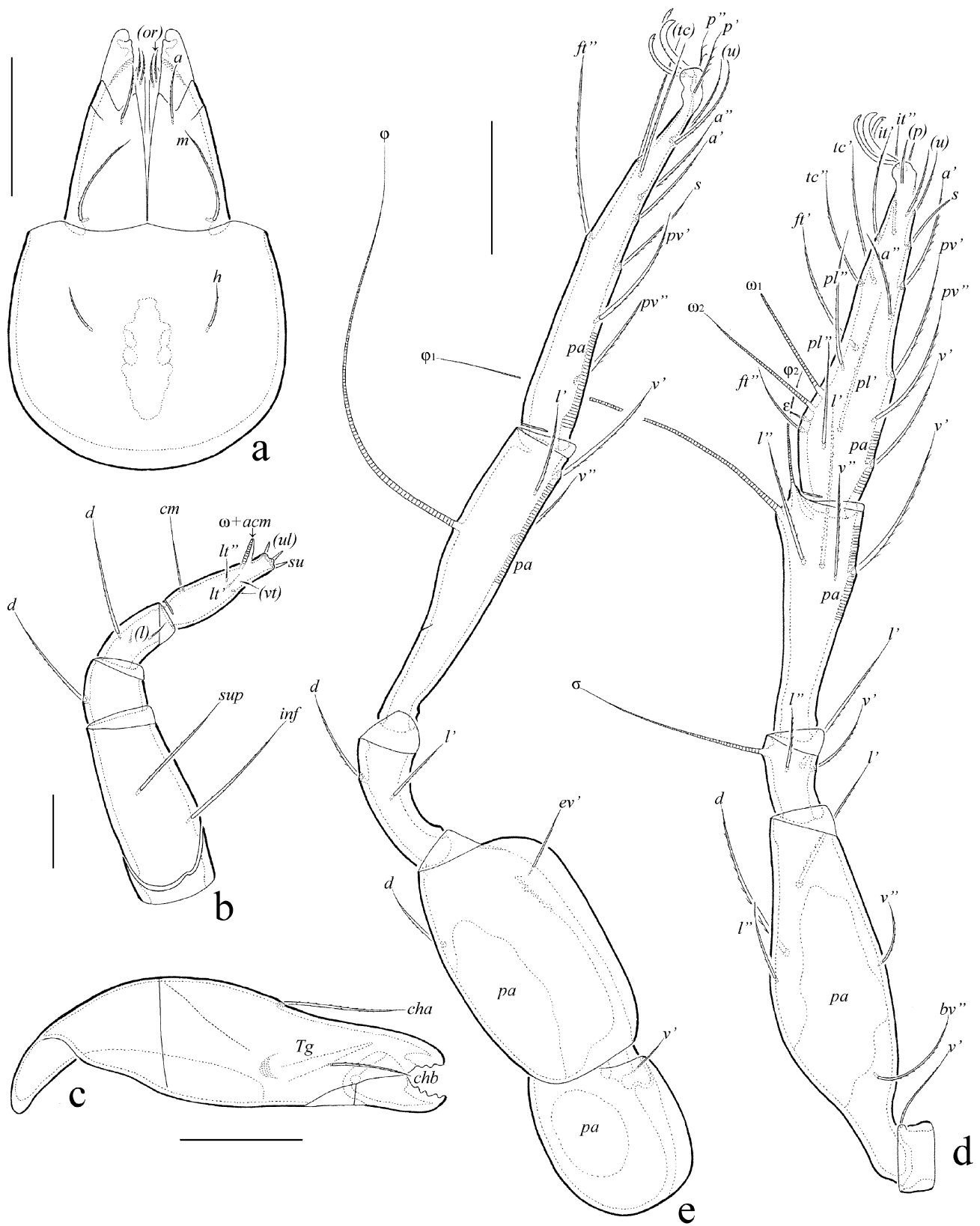


Figure 2 *Unguizetes (Knorozovia) ershova* n. sp., adult: a – subcapitulum, ventral view; b – palp, right, antiaxial view; c – chelicera, right, antiaxial view; d – leg I, right, antiaxial; e – leg IV, left, antiaxial view. Scale bars 50 μm (a, c–e), 20 μm (b).

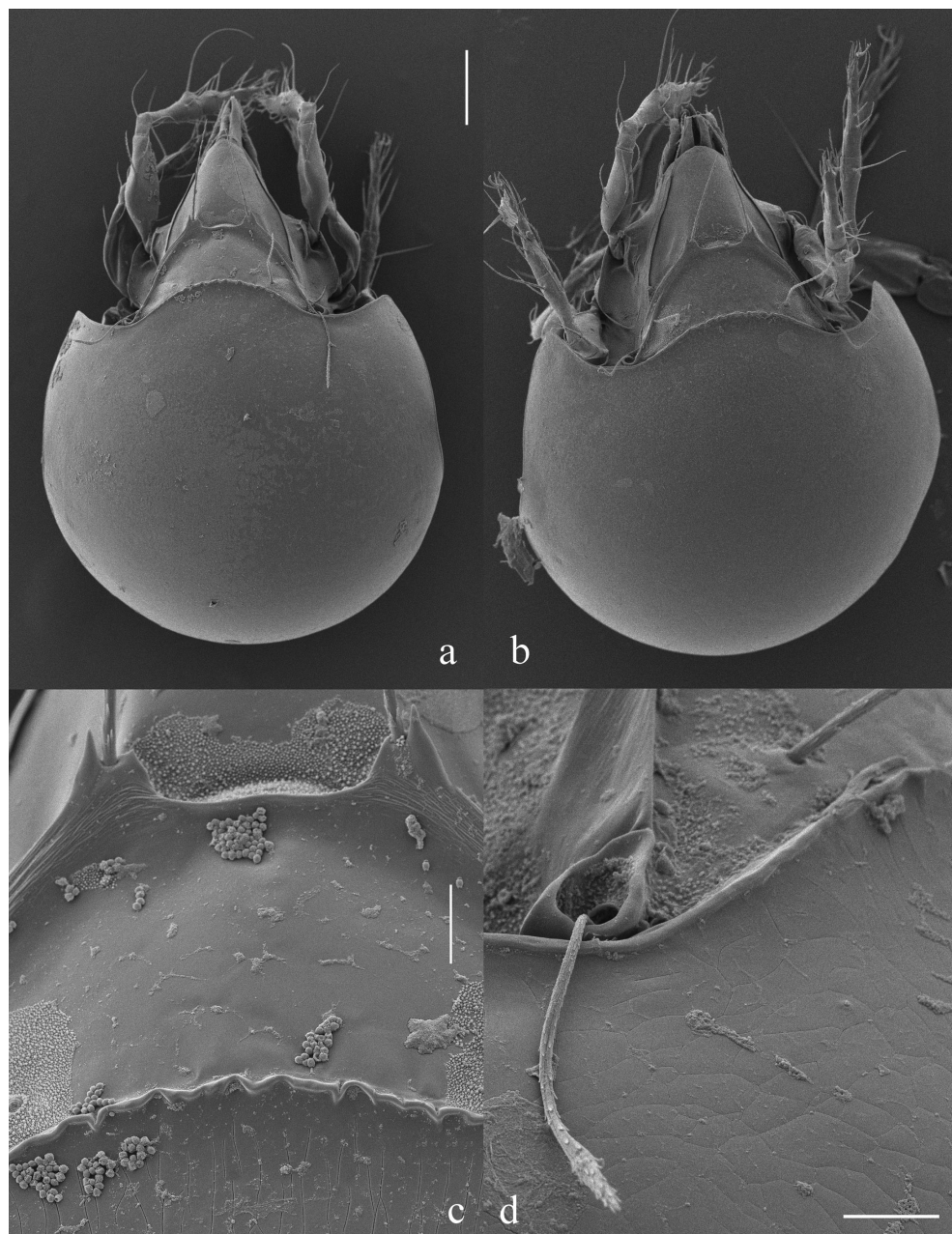


Figure 3 *Unguizetes (Knorozovia) ershova* n. sp., adult, SEM micrographs: a – dorsal view; b – dorsoanterior view; c – mediobasal part of prodorsum and anterior part of notogaster, dorsal view; d – bothridial seta, bothridium and anterior part of notogaster, dorsolateral view. Scale bars 100 μ m (a, b), 20 μ m (c, d).

roughened. Chelicera length: 172–187; setae (*cha*: 52–56; *chb*: 32–34) setiform, barbed.

Epimeral and lateral podosomal regions (Figs 1b, 1c, 4a) – Epimeral setal formula: 3–1–3–3; all setae (*3c*: 37–45; *1b*, *3b*: 34–41; *1a*, *2a*, *3a*, *4a*, *4b*: 26–30; *1c*, *4c*: 13–15) setiform, thin, slightly barbed; *1c*, *4a*, *4b*, *4c* thinner than others. Humeral porose areas *Am* and *Ah* elongate oval, slightly visible (Fig. 1c). Custodium long, narrowly triangular. Discidium broadly triangular. Circumpedal carina long, distally fused to custodium.

Anogenital region (Figs 1b, 1c) – Genital and aggenital setae (22–26) setiform, thin, slightly barbed; anal and adanal setae (11) setiform, thin, roughened. Adanal lyrifissure located close

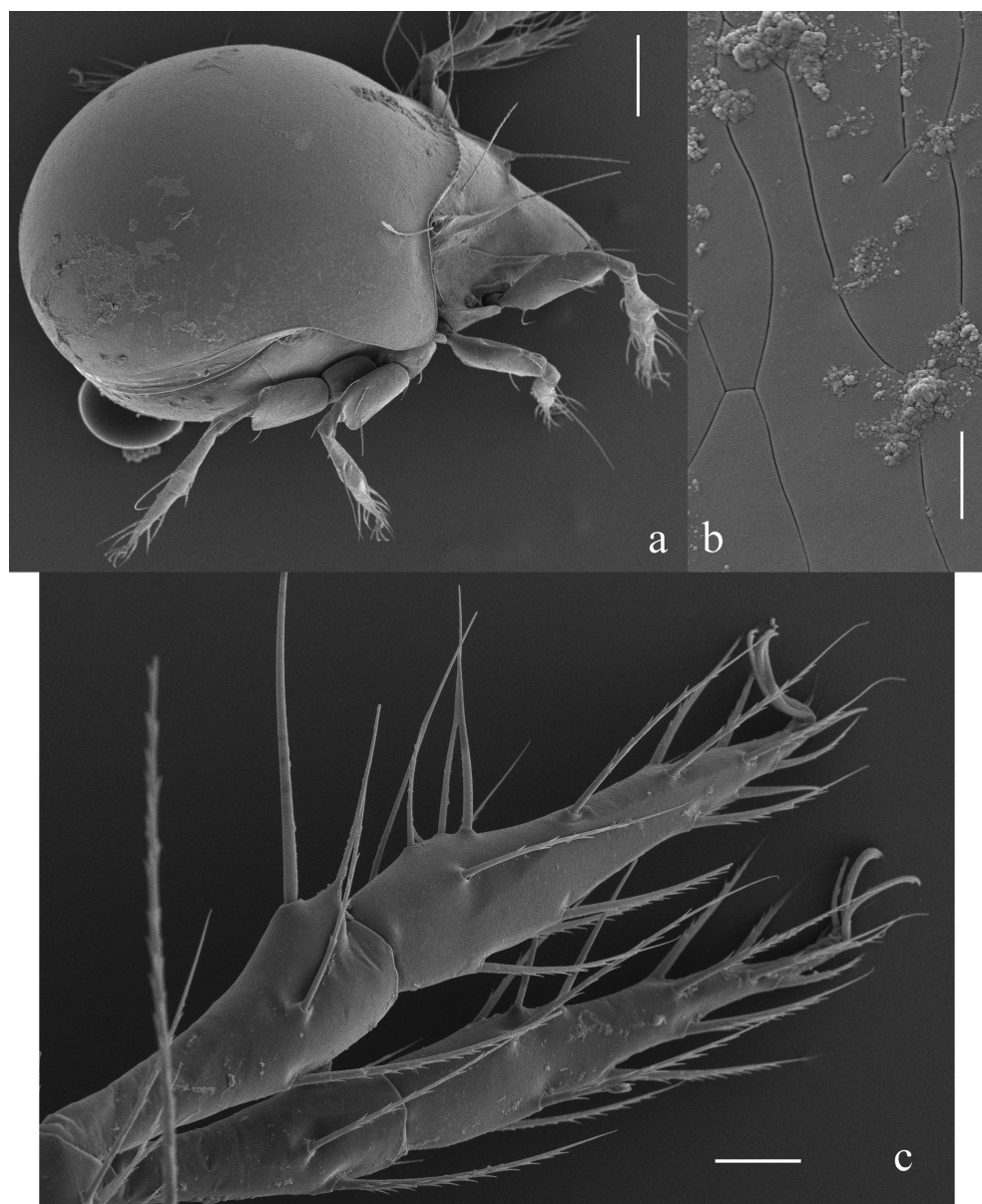


Figure 4 *Unguizetes (Knorozovia) ershova* n. sp., adult, SEM micrographs: a – right dorsolateral view; b – striae on notogaster; c – distal part of legs I, II, left, paraxial view. Scale bars 100 μ m (a), 5 μ m (b), 20 μ m (c).

and slightly diagonal to anterior half of anal plate, posterior to ad_3 . Marginal porose area not observed.

Legs (Figs 2e, 2d, 4a, 4c) – Generally, typical for *Unguizetes* (e.g., Ermilov 2016, 2017). Median claw distinctly thicker than lateral claws, all slightly barbed dorsally; each lateral claw with small tooth ventrodistally. Dorsoparaxial porose area on femora I–IV, trochanters III, IV, ventrodistal porose area on tibia I–IV and proximoventral porose area on tarsi I–IV well visible. 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 (2–3–1–3–15) [1–1–0], IV (1–2–2–3–12) [0–1–0]; homology of setae and solenidia indicated in Table 1.

Etymology — The species is named in honor of Galina Gavrilovna Ershova, a world-renowned Russian historian, anthropologist and epigrapher specializing in the study of the

Table 1 Leg setation and solenidia of tritonymph and adult *Unguizetes (Knorozovia) ershova* n. sp.

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, 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)

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

ancient civilizations, cultures, and languages of the New World. She is a disciple of Yu.V. Knorozov and currently continues to successfully develop his scientific ideas.

Discussion

Subías (2022, online version 2023) includes 10 genera and three subgenera in Mochlozetidae. He considers the genus *Drymobatoides* Jacot, 1936, with additional subgenus *Rykella* Balogh, 1962 as a representative of the family Drymobatidae and supported an independence of the subgenus *Unguizetes (Calugarella)* Balogh and P. Balogh, 1992.

The main family trait of Drymobatidae is the presence of both porose areas and sacculs on the notogaster (see Balogh and Balogh 1984; Norton and Behan-Pelletier 2009). The representatives of *Drymobatoides* have only porose areas; therefore, we support the placement of the genus within Mochlozetidae. Also, earlier, we (Ermilov 2016; Ermilov and Corpuz-Raros 2017) explained the reasons why we do not support subgeneric statuses of *Calugarella* and *Rykella*.

Key to the known supraspecies taxa of Mochlozetidae

1. Posterior margin of notogaster triangularly narrowed or truncate 2
— Posterior margin of notogaster broadly rounded 3
2. Posterior margin of notogaster triangularly narrowed
..... *Uracrobates (Uracrobates)* Balogh and Mahunka, 1967
— Posterior margin of notogaster truncate
..... *Uracrobates (Parauracrobates)* Ermilov and Martens, 2015
3. All notogastral setae medium-sized, setiform; dorsosejugal suture complete 4
— All notogastral setae minute, needle-form or represented by alveoli; dorsosejugal suture usually interrupted medially, rarely, complete 6
4. All or some notogastral porose areas shortly band-like; notogastral porose area *A1* in dorsomedial position; translamella absent *Nesiotizetes* Jacot, 1934
— All notogastral porose areas rounded/oval; notogastral porose area *A1* in lateroperipheral position; translamella present 5
5. Notogaster with 14 pairs of setae *Gephyrazetes (Gephyrazetes)* Hirauchi, 1999
— Notogaster with 10 pairs of setae *Gephyrazetes (Oligogephyrazetes)* Subías, 2019
6. Notogaster with 20–50 pairs of minute porose areas; dorsosejugal suture complete
..... *Drymobatoides* Jacot, 1936
— Notogaster with less than 20 pairs of well-developed porose areas; dorsosejugal suture

- usually interrupted medially, rarely, complete 7
7. Notogastral porose area *Aa* divided, represented by two areas 8
 — Notogastral porose area *Aa* not divided, represented by one area 11
8. Genital plate with five setae; all notogastral setae minute, needle-form 9
 — Genital plate with six setae; all notogastral setae represented by alveoli 10
9. Translamella absent; tutorium present; pteromorph developed; notogaster usually with two pairs of posteroperipheral porose areas *Mochlobates* Norton, 1984
 — Translamella present; tutorium absent; pteromorph reduced; notogaster usually with more than two pairs of posteroperipheral porose areas *Mochloribatula* Mahunka, 1978
10. Both part of notogastral porose area *Aa* distant from each other, one part in dorsomedial position, the other part in lateroperipheral position; all notogastral porose areas rounded/oval *Mahunkazetes* Balogh and Balogh, 1992
 — Both part of notogastral porose area *Aa* located close to each other, in lateroperipheral position; all or some notogastral porose areas shortly band-like *Mochlozetes* Grandjean, 1930
11. Notogaster with five to eight pairs of porose areas, of them, three to six pairs in posteroperipheral position; translamella absent *Dynatozetes* Grandjean, 1960
 — Notogaster with four pairs of porose areas, of them, two pairs (*A2*, *A3*) in posteroperipheral position; translamella usually present, rarely, absent 12
12. Notogaster with 14 pairs of setae; dorsosejugal suture complete *Unguizetes* (*Knorozovia*) **n. subgen.**
 — Notogaster with 10 pairs of setae; dorsosejugal suture interrupted medially 13
13. Notogastral porose area *AI* in dorsomedial position *Unguizetes* (*Unguizetes*) Sellnick, 1925
 — Notogastral porose area *AI* in lateroperipheral position *Podoribates* Berlese, 1908

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