

A CONTRIBUTION TO THE KNOWLEDGE OF ORIBATID MITES (ACARI, ORIBATIDA) OF ZANZIBAR

Sergey G. Ermilov* and Alexander A. Khaustov

Tyumen State University, Tyumen, Russia

*corresponding author; e-mail: ermilovacar@yandex.ru

ABSTRACT: The present study is based on the oribatid mite material (Acari, Oribatida) collected in Zanzibar (Tanzania) in 2018. A list of identified taxa, including 66 species/subspecies from 53 genera and 34 families, is presented. Of these, six species/subspecies (*Eohypochthonius gracilis*, *Papillacarus aciculatus*, *Gymnodamaeus bicostatus*, *Discoppia* (*Cylindroppia*) *cylindrica rostrincisa*, *Karenella lanceosetoides*, and *Neogymnobates luteus*) are recorded in the Ethiopian region for the first time. A new species of the genus *Eremobelba* (Eremobelbidae), *E. jeno* sp.n., is described. It differs from *Eremobelba bisulcata* Balogh, 1958 by a larger body size and by the presence of long interlamellar setae.

KEY WORDS: Fauna, Tanzania, eremobelbid mites, systematics, morphology.

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INTRODUCTION

The oribatid mite (Acari, Oribatida) fauna is poorly investigated in Tanzania (e.g., Mahunka 1988; Starý 1992; Niedbala 2017) and is absolutely unknown for Zanzibar. Our work is based on material collected in Zanzibar in 2018. The primary goal of the paper is to present a list of the identified taxa. The secondary goal is to describe and illustrate one new species, belonging to the genus *Eremobelba* Berlese, 1908 (Eremobelbidae). This genus comprises 44 species, which are distributed in the tropics and subtropics (Subías 2004, updated 2018). The main generic morphological traits have been summarized by J. Balogh and P. Balogh (1992), and Weigmann (2006). In addition, an identification key to some species of *Eremobelba* has been generated by J. Balogh and P. Balogh (2002).

MATERIAL AND METHODS

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. Lengths of body setae were measured in lateral aspect. All body measurements are provided in micrometers. 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”.

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

The following abbreviations are used: *cos*—costula; *abr*—anterobothridial ridge; *tub*—tubercle; *ro*, *le*, *in*, *ex*, *bs*—rostral, lamellar, interlamellar, exobothridial and bothridial setae, respectively; *c*, *la*, *lm*, *lp*, *h*, *p*—notogastral setae; *cr*—crista; *r*—ridge; *ia*, *im*, notogastral lyrifissures; *gla*—opisthototal gland opening; *h*, *m*, *a*—subcapitular setae; *v*, *l*, *d*, *cm*, *ul*, *sul*, *vt*, *lt*—palp setae; ω —palp and leg solenidium; *sac*—axillary and leg sacculus; *cha*, *chb*—cheliceral setae; *Tg*—Trägårdh’s organ; *Pd I*, *Pd II*—pedotecta I, II, respectively; *1b*, *1b*, *1c*, *2a*, *3a*, *3b*, *3c*, *4a*, *4b*, *4c*—epimeral setae; *Va*, *Vp*—ventrojugal tubercles; *g*, *an*—genital and anal setae, respectively; *p.o.*—preanal organ; *Tr*, *Fe*, *Ge*, *Ti*, *Ta*—leg trochanter, femur, genu, tibia and tarsus, respectively; σ , ϕ —leg solenidia; ε —leg famulus; *v*, *ev*, *bv*, *l*, *d*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*—leg setae.

LIST OF IDENTIFIED ORIBATID MITE TAXA FROM ZANZIBAR*

Ctenacaridae

Beklemishevia demeteri Mahunka, 1984. Distribution: Ethiopian region.

Sphaerochthoniidae

Sphaerochthonius splendidus (Berlese, 1904). Distribution: Tropical and Subtropical regions.

*Distribution: mostly from Subías (2018). Ptyctimous mites: not included. All species (except holotype) are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

Epilohmanniidae

Epilohmannia minuta Berlese, 1920. Distribution: Tropical and Subtropical regions.

Hypochthoniidae

Eohypochthonius gracilis (Jacot, 1936). Distribution: Tropical (except Ethiopian region) and Subtropical regions. First record of the species in the Ethiopian region.

Malacoangelia remigera Berlese, 1913. Distribution: Tropical and Subtropical regions.

Lohmanniidae

Annectacarus sp.

Heptacarus hirsutus Wallwork, 1964. Distribution: Ethiopian and Oriental regions.

Meristacarus africanus Balogh, 1958. Distribution: Ethiopian region.

Papillacarus aciculatus (Berlese, 1904). Distribution: southern Palaearctic region, Vietnam. First record of the species in the Ethiopian region.

Strinatacarus sp.

Malaconothridae

Tyrphonothrus heterotrichus (Mahunka, 1992). Distribution: Ethiopian region.

Nothridae

Nothrus senegalensis Mahunka, 1992. Distribution: Senegal.

Nanhermanniidae

Masthermannia mammillaris (Berlese, 1904). Distribution: Tropical and Subtropical regions.

Hermanniellidae

Hermanniella dubiosa Mahunka et Mahunka-Papp, 2007. Distribution: Ethiopian region.

Hermanniella spiniseta Mahunka et Mahunka-Papp, 2007. Distribution: Kenya.

Plasmobatidae

Plasmobates foveolatus Ermilov, Sidorchuk et Rybalov, 2010. Distribution: Ethiopia.

Gymnodamaeidae

Gymnodamaeus bicostatus (Koch, 1835). Distribution: Holarctic region. First record of the species in the Ethiopian region.

Aleurodamaeidae

Aleurodamaeus vicinus Hugo-Coetzee, 2013. Distribution: South Africa.

Damaeidae

Kunstidamaeus sp.

Otocepheidae

Dolicheremaeus sp.

Zetorchestidae

Zetorchestes phylliferus Mahunka, 1983. Distribution: Ethiopian region, Vietnam.

Eremulidae

Eremulus avenifer Berlese, 1913. Distribution: southern Palaearctic, Oriental and Ethiopian regions, Tahiti.

Eremobelbidae

Eremobelba jeno sp.n.

Damaecolidae

Fosseremus laciniatus (Berlese, 1905). Distribution: Cosmopolitan.

Basilobelbidae

Basilobelba africana Wallwork, 1961. Distribution: Ethiopian region.

Oppiidae

Discoppia (*Cylindroppia*) *cylindrica rostrin-cisa* Subías y Rodríguez, 1986. Distribution: Europe, Dominicana. First record of the subspecies in the Ethiopian region.

Karenella lanceosetoides (Hammer, 1971). Distribution: Australian and Oriental regions. First record of the species in the Ethiopian region.

Oppiella nova (Oudemans, 1902). Distribution: Cosmopolitan.

Oxyoppia (*Aciculoppia*) *complicata* Mahunka, 1986. Distribution: Ethiopian region.

Oxyoppia (*Dzarogneta*) sp.

Pseudoamerioppia lamellata (Wallwork, 1961). Distribution: Ghana.

Ramusella hainardorum (Mahunka, 1992). Distribution: Senegal.

Ramusella tasetata Subías, 1980. Distribution: Pakistan, Congo.

Ramusella (*Sabahoppia*) sp.

Machuellidae

Machuella draconis Hammer, 1961. Distribution: Subtropical region.

Teratoppiidae

Teratoppia minor Wallwork, 1961. Distribution: Ghana.

Quadroppiidae

Quadroppia quadricarinata (Michael, 1885). Distribution: Semicosmopolitan.

Suctobelbidae

Suctobelbella (*Flagrosuctobelba*) *elegantula* (Hammer, 1958). Distribution: Neotropical, Oriental, Holarctic and Ethiopian regions.

Suctobelbella (*Flagrosuctobelba*) *sempilumosa* (Balogh et Mahunka, 1967). Distribution: Oriental, Australian, Neotropical and Ethiopian regions.

Suctobelbella (*Ussuribata*) *spirochaeta* Mahunka, 1983. Distribution: Ethiopian region, Japan.

Caloppiidae

Zetorchella pedestris Berlese, 1916. Distribution: Ethiopian region.

Carabodidae

Austrocarabodes ocellatus Mahunka, 1987.

Distribution: Kenya.

Kalloia foveolata (Mahunka, 1978). Distribution: Mauritius.

Tectocephidae

Tectocephus velatus (Michael, 1880). Distribution: Cosmopolitan.

Microzetidae

Acaroceras szerediae Mahunka et Mahunka-Papp, 2009. Distribution: Kenya.

Berlesezetes ornatissimus (Berlese, 1913). Distribution: Cosmopolitan.

Haplozetidae

Haplozetes madagascarensis (Balogh, 1961). Distribution: Ethiopian region.

Pilobatella xena Mahunka, 1977. Distribution: Kenya.

Protoribates lophothrichus (Berlese, 1904). Distribution: Cosmopolitan.

Protoribates paracapucinus (Mahunka, 1988). Distribution: Oriental, Ethiopian and Neotropical regions, Iran, Vanuatu.

Rostrozetes ovulum (Berlese, 1908). Distribution: Tropical and Subtropical regions.

Scheloribatidae

Scheloribates aethiopicus Mahunka, 1982. Distribution: Ethiopian region, Canary Islands.

Scheloribates leleupi Balogh, 1959. Distribution: Ethiopian region.

Tuberemaeus areolatus Balogh et Mahunka, 1967. Distribution: Ethiopian region.

Ceratozetidae

Neogymnobates luteus (Hammer, 1955). Distribution: Holarctic region. First record of the species in the Ethiopian region.

Punctoribatidae

Allozetes africanus Balogh, 1958. Distribution: Paleotropical region.

Lamellobates molecula (Berlese, 1916). Distribution: Tropical and Subtropical regions.

Galumnidae

Galumna nuda Engelbrecht, 1972. Distribution: Ethiopian region, Peru.

Pergalumna longisetosa Balogh, 1960. Distribution: Ethiopian, Neotropical and Oriental regions.

Pergalumna tsavoensis Mahunka, 1986. Distribution: Ethiopian region.

Pergalumna sp₁.

Pergalumna sp₂.

Pilizetes denticulatus Mahunka, 1986. Distribution: Kenya.

Pilizetes (Pseudopilizetes) camerunensis Ermilov, 2017. Distribution: Cameroon.

Galumnellidae

Galumnella subareolata Mahunka, 1969. Distribution: Ethiopian region.

Galumnella sp.

The list of identified oribatid mites collected from Zanzibar includes 66 species/subspecies from 53 genera and 34 families. Of these, six species/subspecies (*Eohypochthonius gracilis*, *Papillacarus aciculatus*, *Gymnodamaeus bicostatus*, *Discopia (Cylindropia) cylindrica rostrincisa*, *Karenella lanceosetoides*, *Neogymnobates luteus*) are recorded in the Ethiopian region for the first time.

SYSTEMATICS

Superfamily **Ameroidea**

Family **Eremobelbidae**

Genus ***Eremobelba* Berlese, 1908**

Type species *Eremaeus leporosus* Haller, 1884

***Eremobelba jeno* Ermilov et Khaustov sp.n.**

(Figs. 1–7)

Diagnosis. Body size: 448–481 × 265–298. Notogaster with tuberculate cerotegumental bands. Rostral, lamellar, interlamellar and exobothridial setae long, thickened, barbed, *in* longest. Bothridial setae setiform, curved in distal part, barbed. Eleven pairs of notogastral setae present, *p*₁ and *p*₂ thickened, indistinctly dilated, barbed, others phylliform, barbed. Subcapitular setae *a* and *m* barbed, *h* ciliate basally. Ventrosejugal tubercles *Va* tubercle-like, *Vp* quadrangular. Epimeral setae *1b* setiform, ciliate basally, other setae setiform, roughened. Pedotecta II with lateral tubercle. Aggenito-adanal region with 15 pairs of setae; of these, seven pairs phylliform, smooth, and eight pairs setiform, slightly barbed.

Description. Measurements. Body length: 464 (holotype, female), 448, 481 (two paratypes, two males); notogaster width: 298 (holotype), 265, 298 (two paratypes).

Integument. Body color light brown to brown. Body (including genital and anal plates, subcapitular mentum and genae) and legs covered by gel-like and tuberculate cerotegument, tubercles (diameter up to 4) forming specific bands on notogaster.

Prodorsum (Fig. 1). Rostrum narrowly rounded. Costulae well-developed. Interbothridial region with one pair of triangular tubercles. Rostral (49–53), lamellar (57–61), interlamellar (73–86) and

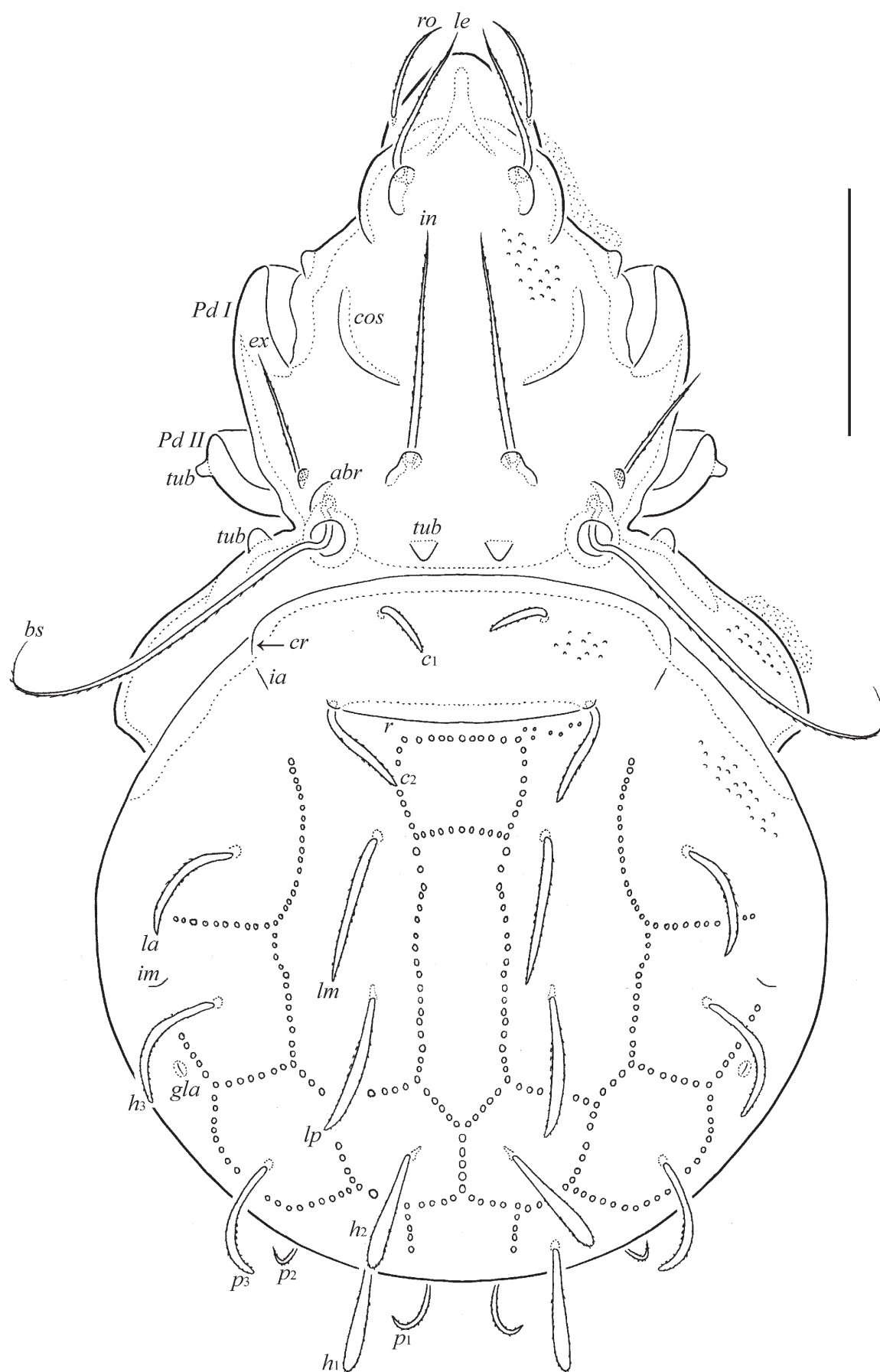
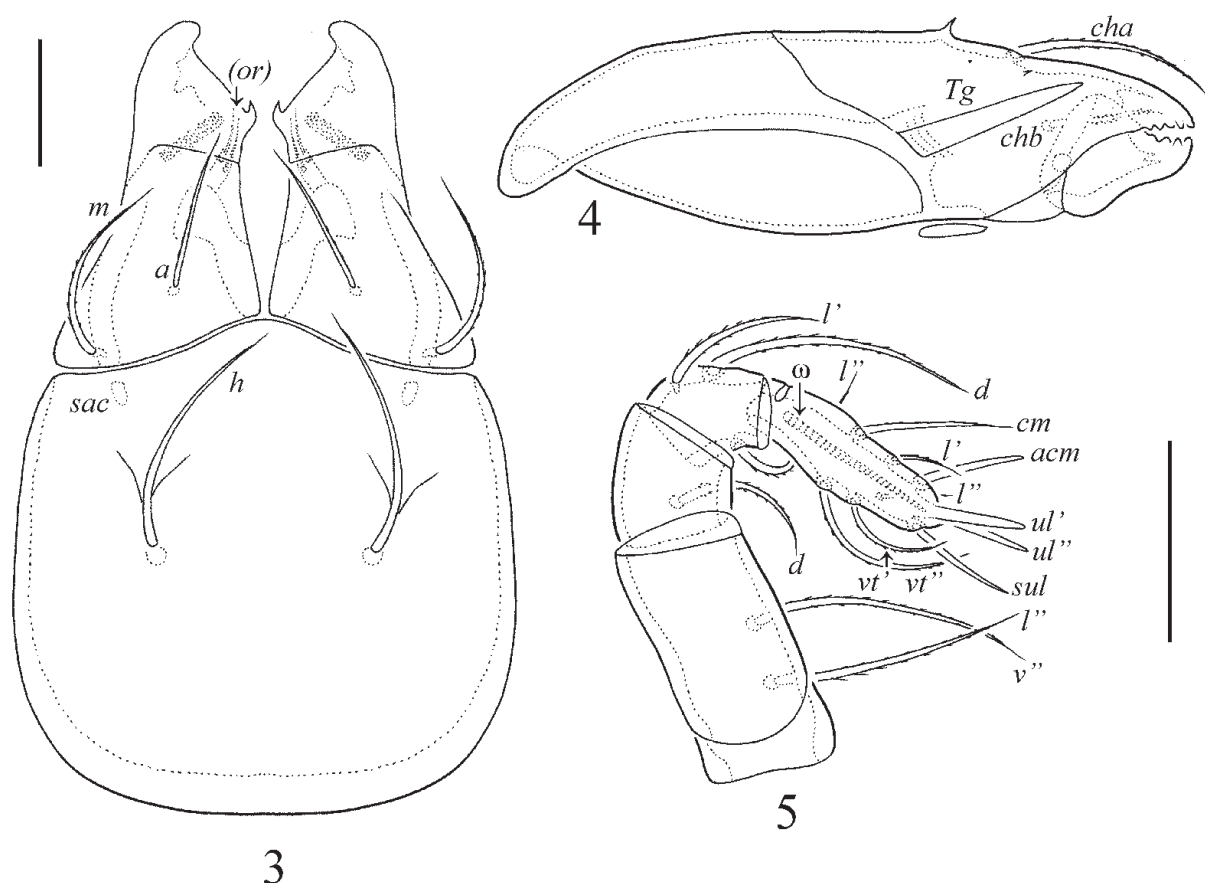


Fig. 1. *Eremobelba jeni* sp.n., adult: dorsal view (legs not illustrated). Scale bar=100 μ m.



Fig. 2. *Eremobelba jenoï* sp.n., adult: ventral view (gnathosoma and legs except trochanters IV not illustrated). Scale bar=100 μ m.



Figs. 3–5. *Eremobelba jeno* sp.n., adult: 3—subcapitulum, ventral view; 4—chelicera, left, paraxial view; 5—palp, left, paraxial view. Scale bars=20 μ m.

exobothridial (41–49) setae thickened, barbed; *le*, *in* and *ex* inserted on distinct apophyses. Bothridial setae (180–192) setiform, curved in distal part, barbed.

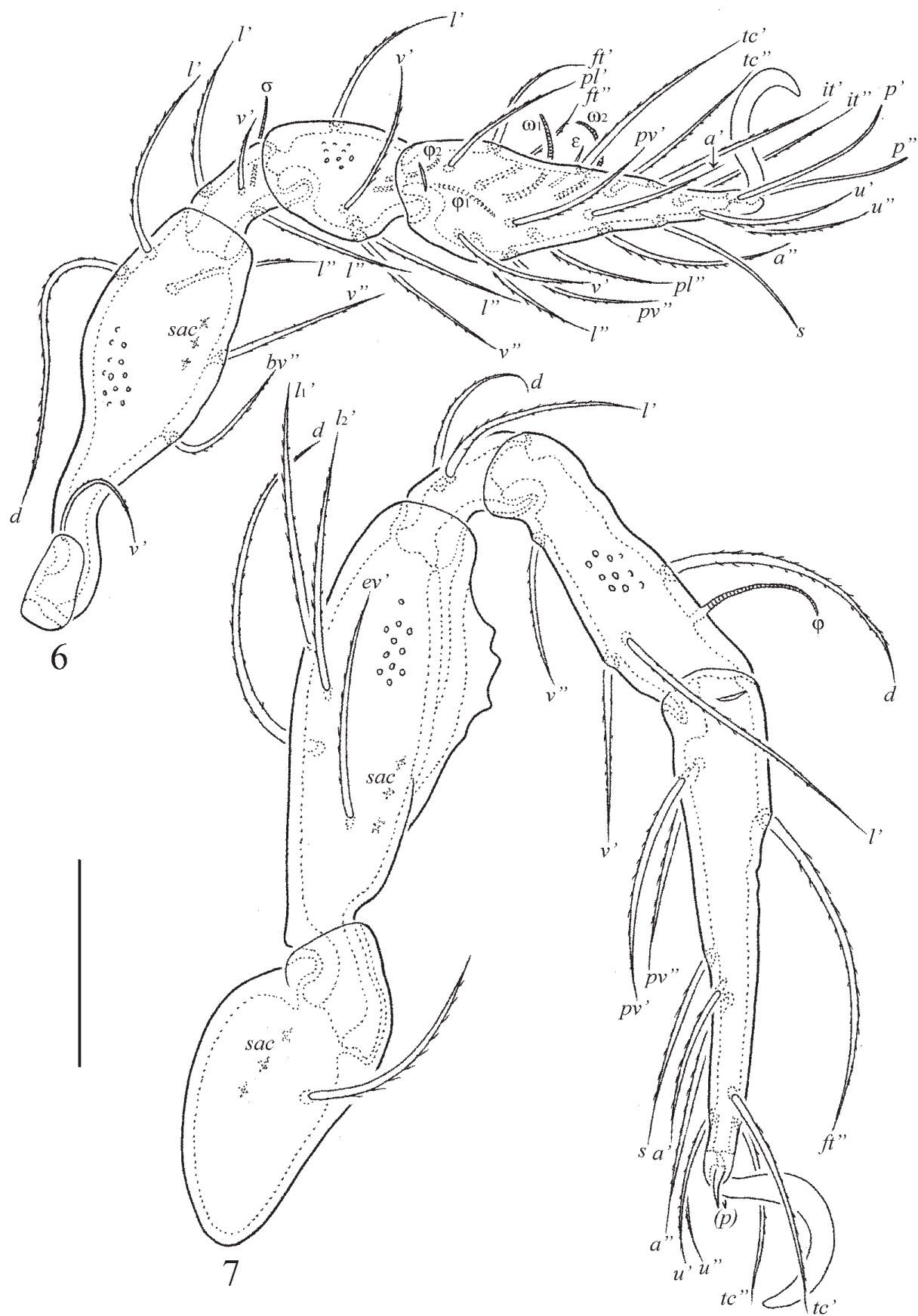
Notogaster (Fig. 1). One pair of humeral cristae slightly developed. Humeral tubercles absent. Eleven pairs of notogastral setae mostly phylliform, barbed, except p_1 and p_2 thickened, indistinctly dilated, barbed; p_2 (28–32), c_1 and p_1 (36–41) shorter than others (61–65). Lyrifissures and opisthonotal gland openings poorly visible.

Gnathosoma (Figs. 3–5). Subcapitulum longer than wide (110–123 $\times$ 73–77). Subcapitular setae setiform, *a* (28–32) and *m* (28–32) barbed, *h* (41–45) with two or three cilia basally. Adoral setae (12) setiform, thin, smooth. Postpalpal setae (12) erect, blunt-ended, slightly barbed. Axillary saccules poorly visible. Palps (61–65) with setation 0–2–1–3–9(+ ω). Solenidion of palptarsi long, bacilliform. Chelicerae (106–114) with tooth dorsally and with two typical setiform, barbed setae, *cha* (36) longer than *chb* (20). Trägårdh's organ of chelicerae elongate triangular.

Epimeral and lateral podosomal regions (Figs. 1, 2). Podosomal regions with tubercle (visible in dorsal and lateral view) between bothridia and acetabula III. Ventrosejugal tubercles *Va* tubercle-like, *Vp* quadrangular. Epimeral setal formula 3–1–3–3. All epimeral setae setiform, *Ib* (61–65) with cilia basally, *Ic* (57–61), *Ia*, *2a*, *3a* (24–32) and others (41–49) roughened; *3c* inserted on *Vp*. Pedotecta II with one clear lateral tubercle.

Anogenital region (Fig. 2). Six pairs of genital (g_1 , 28–36; others 16–24) and two pairs of anal (20–24) setae setiform, slightly barbed. Aggenito-adanal region with 15 pairs of setae; of these, seven pairs (28–32) phylliform, smooth, and eight pairs (36–41) setiform, slightly barbed. Adanal lyrifissures located parallel and close to anal plates.

Legs (Figs. 6, 7). Claw of each leg strong, smooth. Saccules on all femora and on trochanters III, IV poorly visible. Formulas of leg setation and solenidia: I (1–5–4–4–20) [1–2–2], II (1–5–4–5–16) [1–1–2], III (2–3[4]–2–4–15) [1–1–0], IV (1–3[4]–2–4–12) [0–1–0]; homology of setae and solenidia indicated in Table 1. Solenidia thickened,



Figs. 6–7. *Eremobelba jenoii* sp.n., adult: 6—leg I, left, paraxial view; 7—leg IV, left, antiaxial view. Scale bar=50 μ m.

slightly curved, blunt-ended. Famulus of tarsi I setiform, erect.

Material examined. *Eremobelba jeno* sp.n. (holotype, female; two paratypes, two males): Tanzania, Zanzibar, litter in the mixed forest, 06°16'46.2" S, 039°25'41.0" E, 8 m a.s.l., 2.II.2018 (A.A. Khaustov, S.G. Ermilov).

Type deposition. The holotype (in ethanol with a drop of glycerol) is deposited in the collection of the Senckenberg Institute, Görlitz, Germany. Two paratypes (in ethanol with a drop of glycerol) are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

Etymology. The specific name is dedicated to our friend and colleague, a well-known acarologist, Dr. Jenő Kotschán (Budapest, Hungary).

Remarks. *Eremobelba jeno* sp.n. is morphologically most similar to *Eremobelba bisulcata* Balogh, 1958* from Congo in having tuberculate bands on notogaster, thickened interlamellar setae and phylliform notogastral setae. At the same time, the former species differs by its larger body size (448–481 × 265–298 versus 385–394 × 218–225) and long interlamellar setae (versus interlamellar setae being short in the latter species).

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*The original description of *Eremobelba bisulcata* (see Balogh 1958) is very brief, but the main morphological traits of this species were kindly studied and photographed by Dr. Jenő Kotschán (Budapest, Hungary).

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Table 1

Leg setation and solenidia of adult *Eremobelba jeno*i sp.n.

Leg	Tr	Fe	Ge	Ti	Ta
I	v'	$d, (l), bv'', v''$	$d, (l), v', \sigma$	$(l), (v), \varphi_1, \varphi_2$	$(ft), (tc), (it), (p), (u), (a), s, (pv), (pl), l'', v', \varepsilon, \omega_1, \omega_2$
II	v'	$d, (l), bv'', v''$	$d, (l), v', \sigma$	$d, (l), (v), \varphi$	$(ft), (tc), (it), (p), (u), (a), s, (pv), l'', \omega_1, \omega_2$
III	l', v'	d, l_1', l_2'', ev'	d, l', σ	$d, l', (v), \varphi$	$(ft), (tc), (it), (p), (u), (a), s, (pv)$
IV	v'	d, l_1', l_2'', ev'	d, l'	$d, l', (v), \varphi$	$ft'', (tc), (p), (u), (a), s, (pv)$

Roman letters refer to normal setae, Greek letters—to solenidia (except ε =famulus). Single prime (') marks setae on the anterior and double prime (')—setae on the posterior side of a given leg segment. Parentheses refer to a pair of setae. *—setae l_2' on femora III and IV are absent or present.