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REPORT ON ORIBATID MITES (ACARI, ORIBATIDA) FROM BRAZIL, WITH DESCRIPTION OF A NEW SPECIES OF THE GENUS *PAPILLACARUS*

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ABSTRACT: An annotated checklist of identified oribatid mites from Brazil, including 28 species, 22 genera and 18 families, is provided. Eleven species are recorded for the first time in Brazil; of these, *Papillacarus angulatus* Wallwork, 1962 and *Malaconothrus aureopunctatus* Hammer, 1973 are recorded for the first time in the Neotropical region. A new species of the family Lohmanniidae, *Papillacarus parapolysetosus* Ermilov et Tolstikov sp. n., is described. This species is morphologically similar to *Papillacarus polysetosus* Ermilov, Anichkin et Wu, 2012 from Vietnam, however, it differs from the latter by the body size and length of some notogastral setae and by the band S_2. An identification key to known *Papillacarus*-species from the Neotropical region is provided.

KEY WORDS: oribatid mites, fauna, checklist, new record, new species, *Papillacarus*, key, Brazil, Neotropical region

INTRODUCTION

This work is a final part of our study of oribatid mites (Acari, Oribatida) from Brazil (Ermilov *et al*. 2014a, b; Shtanchaeva et al. 2014). The primary goal of this paper is to present an annotated checklist and new records of the registered taxa. Earlier, we presented data on several new taxa of the superfamilies Oppioidea, Oripodoidea and Galumnoidea (Ermilov and Tolstikov, 2015).

During taxonomic identification, we found a new species, belonging to the genus *Papillacarus* Kunst, 1959 (Lohmanniidae). Thus, the secondary goal of this paper is to describe this species.

Papillacarus (=*Vepracarus* Aoki, 1965) was proposed by Kunst (1959) with *Lohmannia murcioides aciculata* Berlese, 1905 as type species. Currently it comprises 32 species, which are distributed in the Pantropical and Subtropical regions (Subías 2004, updated 2014). The main generic characters for genus were summarized by Balogh (1961), Wallwork (1962), Aoki (1965), and Balogh and Balogh (1987, 1988, 1992). Identification keys for some species of *Papillacarus* were presented by Balogh and Balogh (1987, 2002), Ermilov *et al*. (2012). The tertiary goal of this paper is to present an identification key to the *Papillacarus*-species of the Neotropical region.

MATERIAL AND METHODS

Our results are based on collections from three sites in Brazil (unknown date and collector) deposited in the Tyumen State University Museum of Zoology:

— Braz-2014–1: Brazil, 22°57′S, 43°12′W, Rio de Janeiro, Corcovado Mountain, Parque Nacional da Tijuca, 683 m.a.s.l., Atlantic forest, soil litter.

— Braz-2014–2: Brazil, 23°33′S, 46°39′W, São Paulo, Parque Trianon, 852 m a.s.l., Atlantic forest, soil litter.

— Braz-2014–3: Brazil, 22°57′S, 43°09′W, Rio de Janeiro, Morro do Leme, Forte Duque de Caxias, 91 m a.s.l., Atlantic forest, soil litter.

Specimens were mounted in lactic acid on temporary cavity slides for measurement and illustration. The body length was measured in lateral view, from the tip of the rostrum to the posterior edge of the ventral plate. Notogastral width refers to the maximum width in dorsal aspect. Lengths of body setae were measured in lateral aspect. All body measurements are presented 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. General terminology used in this paper follows that of F. Grandjean (1950; summarized by Norton and Behan-Pelletier 2009). Drawings were obtained through a drawing tube mounted on a Carl Zeiss transmission light microscope "Axioskop-2 Plus".

CHECKLIST[1]

This annotated checklist indicates the specific localities where mites were collected, and notes new records and overall known distribution[2].

[1]Oppioid, oripodoid, galumnoid and ptyctimous mites, and also the species which remained unidentified are not included in the checklist.

[2]See mostly Subías (2004, updated 2014).

Lohmanniidae

— *Meristacarus longisetosus* Mahunka, 1978. Locality: Braz-2014–3. Distribution: Neotropical region. First record for Brazil.

— *Papillacarus angulatus* Wallwork, 1962. Locality: Braz-2014–1. Distribution: Ethiopian region and Caucasus. First record for Brazil and the Neotropical region.

— *Papillacarus parapolysetosus* Ermilov et Tolstikov sp. n. Locality: Braz-2014–1. Distribution: Brazil.

Epilohmanniidae

— *Epilohmannia dolosa* Pérez-Íñigo et Baggio, 1985. Locality: Braz-2014–3. Distribution: Brazil.

Malaconothridae

— *Malaconothrus aureopunctatus* Hammer, 1973. Locality: Braz-2014–1. Distribution: Oriental region. First record for Brazil and the Neotropical region.

Trhypochthoniidae

— *Allonothrus neotropicus* Balogh et Mahunka, 1969. Locality: Braz-2014–1. Distribution: Neotropical region.

Nothridae

— *Nothrus* cf. *macedi* Beck, 1962. Locality: Braz-2014–2. Distribution: Neotropical region and Caucasus. First record for Brazil.

Nanhermanniidae

— *Masthermannia ornatissima* Pérez-Íñigo et Baggio, 1988. Locality: Braz-2014–1. Distribution: Brazil.

Neoliodidae

— *Teleioliodes zikani* (Sellnick, 1930). Locality: Braz-2014–1. Distribution: Neotropical region.

Microzetidae

— *Berlesezetes brazilozetoides* Balogh et Mahunka, 1981. Locality: Braz-2014–1, Braz-2014–2, Braz-2014–3. Distribution: Neotropical region.

— *Brazilozetes* cf. *phaseolus* Balogh et Mahunka, 1969. Locality: Braz-2014–3. Distribution: Neotropical region.

— *Cosmozetes negroi* Balogh et Mahunka, 1977. Locality: Braz-2014–3. Distribution: Brazil.

— *Rhopalozetes brazilianus* (Balogh et Mahunka, 1969). Locality: Braz-2014–3. Distribution: Brazil.

Eremulidae

— *Eremulus crispus* Hammer, 1958. Locality: Braz-2014–3. Distribution: Neotropical region. First record for Brazil.

— *Eremulus* cf. *rigidisetus* Balogh et Mahunka, 1969. Locality: Braz-2014–3. Distribution: Neotropical region.

Licneremaeidae

— *Licneremaeus licnophorus* (Michael, 1882). Locality: Braz-2014–3. Distribution: Holarctic region and Mexico. First record for Brazil.

Charassobatidae

— *Charassobates minimus* Balogh et Mahunka, 1981. Locality: Braz-2014–3. Distribution: Paraguay. First record for Brazil.

Astegistidae

— *Furcoppia americana* Pérez-Íñigo et Baggio, 1994. Locality: Braz-2014–1. Distribution: Brazil.

Liacaridae

— *Xenillus sanctipauli* Pérez-Íñigo et Baggio, 1980. Locality: Braz-2014–3. Distribution: Brazil.

Suctobelbidae

— *Suctobelbella* (*Suctobelbella*) *similidentata* Mahunka, 1983. Locality: Braz-2014–2. Distribution: Neotropical region. First record for Brazil.

— *Suctobelbella* (*Flagrosuctobelba*) cf. *peracuta* (Balogh et Mahunka, 1980). Locality: Braz-2014–1, Braz-2014–3. Distribution: Neotropical region. First record for Brazil.

— *Suctobelbella* (*Flagrosuctobelba*) *semiplumosa* (Balogh et Mahunka, 1967). Locality: Braz-2014–2. Distribution: Oriental region and Brazil.

— *Suctobelbella* (*Ussuribata*) *variosetosa* (Hammer, 1961). Locality: Braz-2014–2. Distribution: Pantropical region and Japan.

Carabodidae

— *Austrocarabodes* (*Austrocarabodes*) cf. *butiae* Pérez-Íñigo et Sarasola, 1998. Locality: Braz-2014–3. Distribution: Uruguay. First record for Brazil.

Tectocepheidae

— *Tectocepheus americanus* Pérez-Íñigo et Baggio, 1989. Locality: Braz-2014–2. Distribution: Neotropical region.

Tegoribatidae

— *Ceratobates fornerisae* Pérez-Íñigo et Baggio 1985. Locality: Braz-2014–2. Distribution: Neotropical region.

— *Ceratobates spathulatus* Balogh et Mahunka 1981. Locality: Braz-2014–1, Braz-2014–2, Braz-2014–3. Distribution: Neotropical region.

Mycobatidae

— *Lamellobates reticulatus* Behan-Pelletier, 1998. Locality: Braz-2014–1, Braz-2014–2. Distribution: Costa-Rica. First record for Brazil.

Hence, we listed 28 species, 22 genera and 18 families. Eleven species are recorded for the first time in Brazil; of these, two species are recorded for the first time in the Neotropical region (see checklist above).

TAXONOMY

Papillacarus parapolysetosus Ermilov et Tolstikov sp. n.

Figs 1–7

Diagnosis. Body size: 747–780 × 315–332. Body surface with reticulate and microfoveolate pattern. Prodorsal setae long, thickened, ciliate. Bothridial setae with 12 to 13 branches. Four transverse bands developed on notogaster, interrupted medially. Notogastral c_1, d_1, e_1, f_1 of medium size, similar in length; f_2 longer than e_2 and h_3. More than 80 pairs of setiform, ciliate neotrichal setae present. Subcapitulum with four pairs of setae *m*. Epimeral setal formula: 15(16)–12(13)–5(6)–5(6); medial setae and one pair of lateral setae of epimere I setiform, smooth, other setae ciliate. Antero-lateral pair of genital setae slightly barbed, others ciliate.

Description. *Measurements*. Large species. Body length: 780 (holotype), 747–780 (two paratypes); body width: 332 (holotype), 315–332 (two paratypes).

Integument. Body color yellow-brownish. Surface of body and legs densely microfoveolate. Foveolae on prodorsum and notogaster forming polygonal network.

Prodorsum. Roughly triangular in dorsal view, occupying about 1/3 of dorsal length. Rostrum rounded. Rostral (*ro*, 106–110), lamellar (*le*, 110–123), interlamellar (*in*, 123–131) and both pairs of exobothridial (*exa*, 110–118; *exp*, 127–135) setae thickened, with short cilia. Bothridial setae (*ss*, 94–102) pectinate, with 12 to 13 branches on one side, and three barbs on the opposite side. Postbothridial transverse band (S_b) present.

Notogaster. Anterior border of the notogaster straight. Four transverse bands (S_2, S_3, S_4 and S_x) developed, interrupted medially. Band S_5 present on right half of notogaster in one specimen. Sixteen pairs of primary notogastral setae and more than 80 pairs of additional neotrichal setae present. Notogastral setae thickened, with short cilia; h_3 (53) shorter than c_1, d_1, e_1, f_1 (57–65), e_2 (69–77), p_3 (77–82), c_2, c_3, d_2, d_3, f_2, (135–143) and h_1, h_2, p_1, p_2 (159–164). Neotrichal setae (32–41) setiform, ciliate. Lyrifissures *ia*, *im*, *ih* and *ips* distinct, *ip* not visible.

Gnathosoma. Generally, morphology of subcapitulum, palps and chelicerae typical for *Papillacarus* (see Ermilov and Anichkin 2011; Ermilov *et al.* 2012). Subcapitulum longer than wide (192–196 × 123–135), with one pair of lateral tubercles. Subcapitular setae *h*, m_1, m_2, m_3 and m_4 (28–32) setiform, ciliate; *a* longer (45–49), simple, smooth. Three pairs of adoral setae present: or_1 (28–32) wide, lobe-formed, smooth; or_2 (32–41) thickened, with tooth in distal part, blunt-ended; or_3 (24–28) slightly lobe-formed, pointed distally, smooth. Palps (69–73) with setation 0–1–0–1–10(+ω). Distal three setae fused basally. Solenidion longer than palptarsus, thick, not fused with *acm*. Chelicerae (196–200) with two setae, *chb* (65) setiform, smooth, longer than *cha* (8), thornlike.

Epimeral region. Apodemes III separated medially to sternal apodeme. Epimeral setal formula: 15(16)–12(13)–5(6)–5(6). Medial setae *1a*, *2a*, *3a*, *4a* and one pair of lateral setae of epimere I short (12–16), setiform, smooth. Other setae ciliate; anterior pair of epimere I (41–45) longer than three pairs of lateral setae on epimere II (32–36) and others (20–28).

Anogenital region. Transverse genital furrow distinct. Antero-lateral pair of genital setae slightly barbed, others ciliate. Four lateral pairs longer (53–61), than six medial pairs (28–32). Two pairs of anal (an_1, an_2, 61–73) and four pairs of adanal (ad_1–ad_4, 73–82) setae thickened, ciliate. One pair of ventrolateral bands present. Lyrifissures *iad* distinct.

Table 1.

Leg setation and solenidia of *Papillacarus parapolysetosus* Ermilov et Tolstikov sp. n.

Leg	Trochanter	Femur	Genu	Tibia	Tarsus
I	–	*d, (l$_1$), l$_2$″, bv″, v″*	*(l), σ′, dσ″*	*(l$_1$), l$_2$″, v′, φ*	*ft′, (tc), (it), (p), (u), (a), s, (pv), m, n, ε, ω$_1$, ft″ω$_2$*
II	–	*d, (l), l$_2$″, l$_3$″, bv″, v″*	*(l), dσ*	*(l$_1$), l$_2$″, v′, φ*	*(ft), (tc), (it), (u), (a), s, (pv), ω$_1$, ω$_2$*
III	*l′, v′*	*d, l$_1$′, l$_2$′, ev′*	*l′, dσ*	*d, l′, v′, φ*	*(ft), (tc), (it), (u), a’, s, (pv)*
IV	*l′, v′*	*d, l′, ev′*	*l′, dσ*	*d, l′, v′*	*(ft), (tc), p’, (u), a’, s, (pv)*

Roman letters refer to normal setae (ε — famulus), Greek letters refer to solenidia, *dσ* and *ftω* — seta and solenidion coupled. 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.

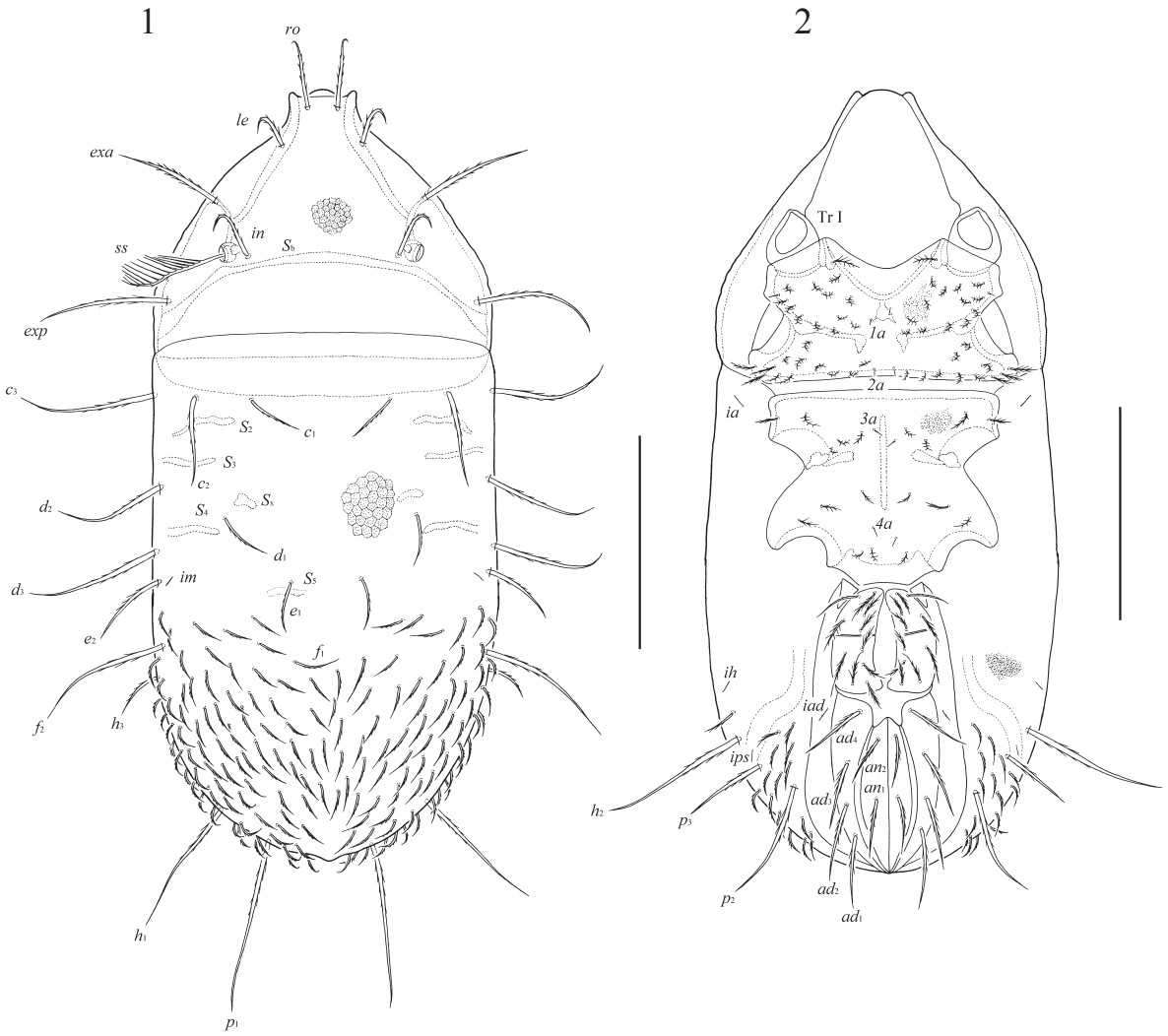


Fig. 1–2. *Papillacarus parapolysetosus* Ermilov et Tolstikov sp. n.: 1— dorsal view; 2 — ventral view (gnathosoma and legs except trochanters I not illustrated). Scale bar 200 μm.

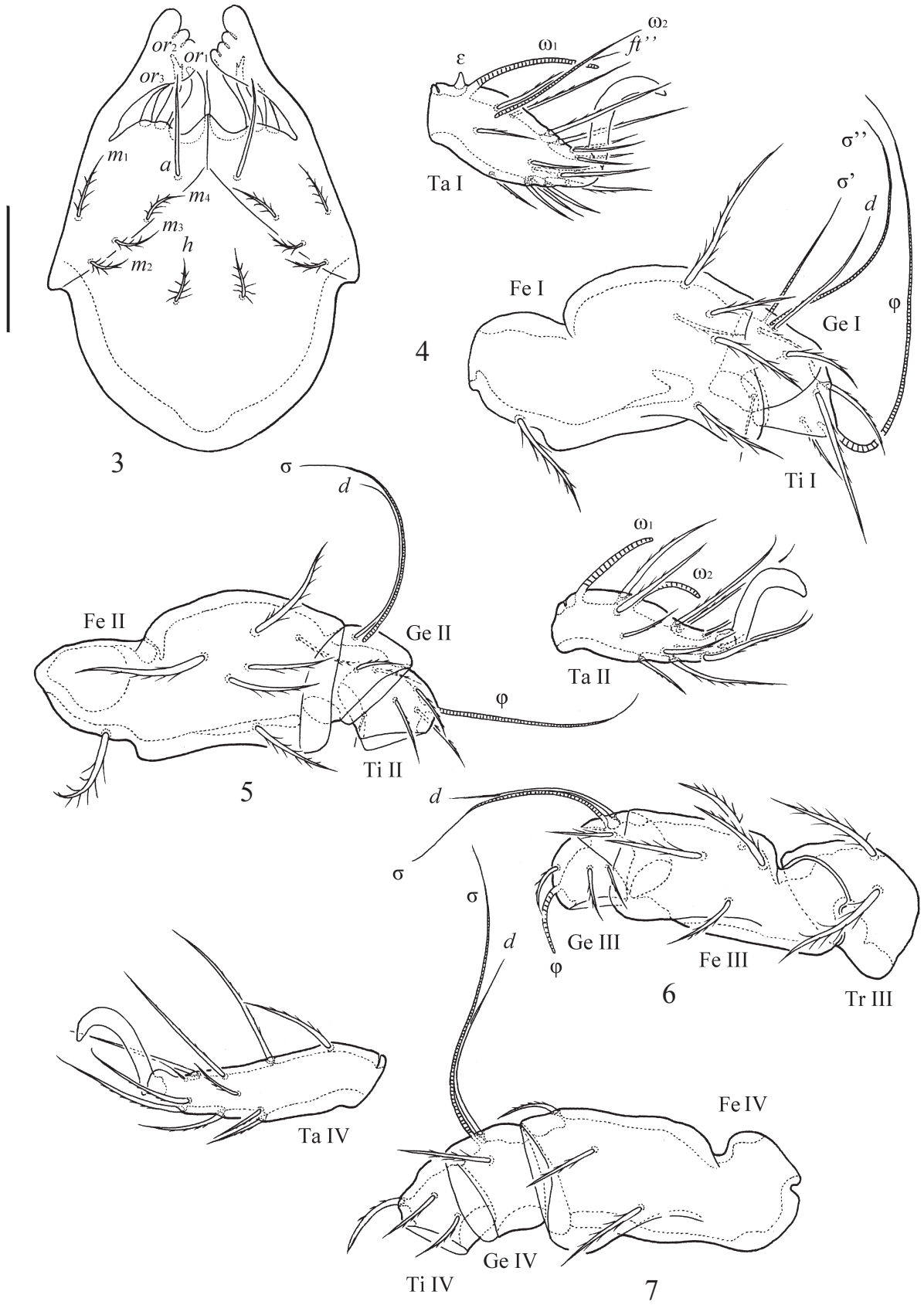
Legs. Generally, morphology of leg segments, setae and solenidia typical for *Papillacarus* (see Ermilov and Anichkin 2011, Ermilov *et al.* 2012). All legs with one claw, with small tooth on ventral side. Femora with large ventral ridge. Formulas of leg setation and solenidia: leg I (0–6–3–4–18) [2–1–2], leg II (0–7–3–4–13) [1–1–2], leg III (2–4–2–3–12) [1–1–0], leg IV (2–3–2–3–11) [1–0–0]; homology of setae and solenidia indicated in Table 1. Famulus (ε) tubercle-like. Solenidia ω_1 on tarsi I, ω_1 and ω_2 on tarsi II, φ on tibiae III thickened, blunt-ended; other solenidia longer, setiform, with thinner tips.

Material examined. Three specimens (holotype and two paratypes): Braz-2014–1.

Type deposition. The holotype is deposited in the collection of the Senckenberg Institution Frankfurt, Germany; two paratypes are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

Etymology. The prefix *para* is Latin meaning "near" and refers the similarity between the new species and the species *Papillacarus polysetosus* Ermilov, Anichkin et Wu, 2012.

Remarks. *Papillacarus parapolysetosus* sp. n. is similar to *Papillacarus polysetosus* Ermilov, Anichkin et Wu, 2012 from Vietnam (see Ermilov *et al*. 2012) in having the long, thickened, ciliate prodorsal setae, reticulate body surface, large number of setiform, ciliate notogastral neotrichal setae (more than 80 pairs). However, the new species differs clearly from the latter by the larger body size (747–780 × 315–332 versus 664–680 × 298–315 in *P. polysetosus*), setae c_1, d_1, e_1 and f_1 similar in length (versus different in *P. polysetosus*), setae f_1 longer than h_3 (versus shorter in *P. polysetosus*)



Figs 3–7. *Papillacarus parapolysetosus* Ermilov et Tolstikov sp. n.: 3 — subcapitulum, ventral view; 4 — leg I, without trochanter, right, antiaxial view; 5 — leg II, without trochanter, right, antiaxial view; 6 — trochanter, femur and genu of leg III, right, antiaxial view, 7 — leg IV, without trochanter, right, antiaxial view. Scale bars 50 μm.

and notogastral band S_2 interrupted medially (versus complete in *P. polysetosus*).

KEY TO SPECIES OF *PAPILLACARUS* FROM THE NEOTROPICAL REGION

1. Strong notogastral neotrichy present, more than 20 pairs of setae developed 2

— Weak notogastral neotrichy present, less than 20 pairs of setae developed 3

2. Surface of prodorsum and notogaster densely papillate, without reticulate pattern; rostral, lamellar, interlamellar and both pairs of exobothridial setae with long ciliate branches; epimeral setal formula: 9–4–3–4; body size: 380–384 × 152–156 ..... *P. incompletus* (Mahunka, 1985) (see Mahunka 1985). Distribution: Neotropical region.

— Surface of prodorsum and notogaster with reticulate pattern, without papillae; rostral, lamellar, interlamellar and both pairs of exobothridial setae with short cilia, without long ciliate branches; epimeral setal formula: 15(16)–12(13)–5(6)–5(6); body size: 747–780 × 315–332 ..... *P. parapolysetosus* Ermilov et Tolstikov sp. n. Distribution: Brazil.

3. Short neotrichal setae represented by 11 pairs; notogastral transverse bands S_3 and S_4 interrupted medially by short interval; four pairs of subcapitular setae *m* present; body size: 524–544 × 246–266 ..... *P. angulatus* Wallwork, 1962 (see Wallwork 1962). Distribution: Ethiopian region, Caucasus and Brazil.

— Short neotrichal setae represented by nine pairs; notogastral transverse bands S_3 and S_4 interrupted medially by long interval; three pairs of subcapitular setae *m* present; body size: 614 × 305 ..... *P. spinosus* Bischoff de Alzuet, 1972 (see Bischoff de Alzuet 1972). Distribution: Neotropical region.

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