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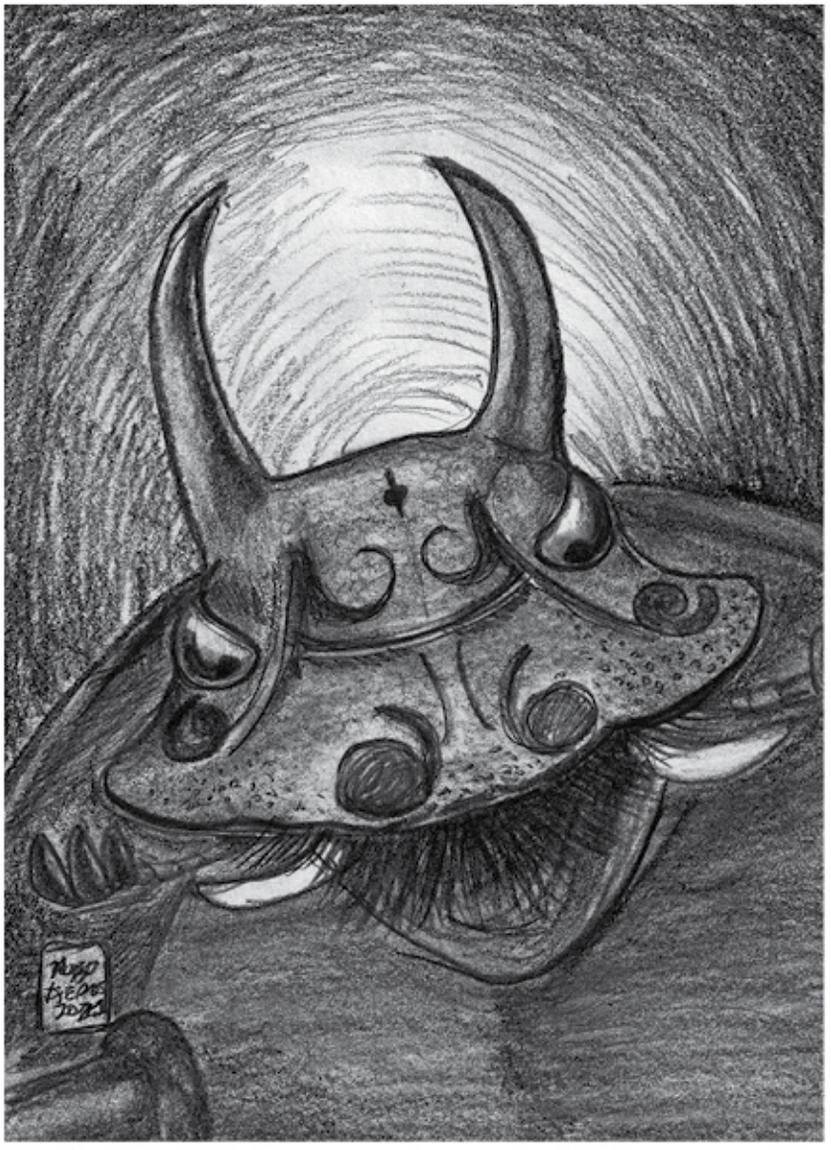

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A new *Parichoronyssus* Radovsky, 1966 (Acari: Macronyssidae) associated with the bat *Rhinophylla fischerae* Carter, 1966 (Chiroptera: Phyllostomidae) from Peru, with identification key

Un nuevo *Parichoronyssus* Radovsky, 1966 (Acari: Macronyssidae) asociado con el murciélago *Rhinophylla fischerae* Carter, 1966 (Chiroptera: Phyllostomidae) de Perú, con clave de identificación

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ABSTRACT

The new species *Parichoronyssus tilaperezae* was found parasitizing to the bat *Rhinophylla fischerae* Carter, 1966 in the central region of Peru. The females are described and illustrated. The females of this new species are distinguished from other species of the genus by presenting the setae of the dorsal shield, broad and robust; with conspicuous sternal glands with granular ornamentation; anal shield subtriangular, with anterior margin curved and trilobulated, and with two intermediate concavities, and not interrupted by perianal zone; adanal setae stout and long, and postanal seta stouter and much longer, which looks like a trident. Additionally, an updated key of the twelve known species of the genus *Parichoronyssus* is included.

Key Words: Macronyssidae, *Parichoronyssus tilaperezae*, new species, *Rhinophylla,* bat ectoparasites.

RESUMEN

La nueva especie *Parichoronyssus tilaperezae* fue encontrada parasitando al murciélago *Rhinophylla fischerae* Carter, 1966 en la región central del Perú. Las hembras se describen e ilustran. Las hembras de esta nueva especie se distinguen de otras especies del género por presentar las setas de la placa dorsal, anchas y robustas; con glándulas esternales muy conspicuas con ornamentación granular; placa anal subtriangular, con margen anterior curveado y trilobulado, y con dos concavidades intermedias, y la zona perianal no interrumpida; sedas adanales, gruesas y largas, y seda postanal más gruesa y mucho más larga, que asemeja un tridente. Adicionalmente, se incluye una clave actualizada de las doce especies conocidas para el género *Parichoronyssus*.

Palabras clave: Macronyssidae, *Parichoronyssus tilaperezae*, nueva especie, *Rhinophylla,* ectoparásito de murciélagos.

The macronyssid mites of the genus *Parichoronyssus* are permanent parasites of bats. These mites usually feed on tissue fluids and occasionally blood from their hosts. They commonly are found on the body and occasionally on the wings of bats. In addition, they have a viviparous development, giving direct birth to protonymphs, but sometimes inactive deutonymphs, which can molt into adults, are found.

Currently the genus *Parichoronyssus* Radovsky, 1966, comprises 11 described species (Radovsky 1966, 1967; Morales-Malacara 1992, 1996; Morales-Malacara and Guerrero 2007; Heddergott 2008; Morales-Malacara and Guerrero 2020), which are associated mainly to bats of the family Phyllostomidae; however, they have also been recorded in Mormoopidae, Emballonuridae, and Noctilionidae in the neotropics (Morales-Malacara and Guerrero 2020). Among the species of the genus, six have been recorded from Peru: *P. alexanderfaini* Morales-Malacara and Guerrero, 2020, *P. bakeri* Morales-Malacara and Guerrero, 2007, *P. euthysternum* Radovsky, 1967, *P. lopezi* Morales-Malacara, 1996, *P. radovskyi* Morales-Malacara, 1992, and *P. sclerus* Radovsky, 1966 (Radovsky 1966, 1967; Morales-Malacara 1992, 1996; Morales-Malacara and Guerrero 2007, 2020; Minaya et al. 2021)

After the revision of ectoparasitic mites on bats in the central region of Peru, we found a few specimens of *Parichoronyssus* on the Fischer´s little fruit bat *Rhinophylla fischerae* Carter. Based on the above, the aim of the present study was to describe this new species of the genus *Parichoronyssus*, based on females; therefore, this new species represents the 12th for the genus and the 7th species found in Peru. Additionally, we include an updated key for females of all known species of *Parichoronyssus* distributed in the Neotropical region.

MATERIALS AND METHODS

Specimens of the genus *Parichoronyssus* from Cusco, Peru were obtained (by RG) on loan from the Colección de Parasitología, Museo de Biología, Universidad Central de Venezuela, Caracas, Venezuela [CP-MBUCV]. The specimens of the new species were obtained from bats collected in Peru by one of us (RG) and other field collaborators, using nylon mist nets. Each bat was collected (following protocols under a scientific collector license granted to RG: Instituto Nacional de Recursos Naturales (INRENA, Peru), through BIOLAT and SI/MAB, and the Ministerio del Ambiente y los Recursos Naturales Renovables, Venezuela, collector license N° 43.00269) and revised for mites. Mites were preserved in vials with ethanol 80%, and posteriorly were cleared with Nesbitt`s solution or lactophenol for 2-3 days and mounted in Hoyer´s medium (Morales-Malacara and Juste 2002). The specimens of the new species were

selected for the type series, which include only females.

Revision and measurements of all the specimens were generated using a Zeiss Axioskop 2 plus microscope (ZA2) with phase contrast optics and with a coupled micrometer (Göttingen, Niedersachen, Germany). Drawings were prepared with the ZA2 with a coupled drawing tube. Photographs were taken with differential interference contrast (DIC) microscope Zeiss Axio Imager.A2, with AxioCam MRc and sofware AxioVision 4.8.2 (Göttingen, Niedersachen, Germany). The nomenclature for idiosomal chaetotaxy follows Lindquist and Evans (1965) and some other morphological features follows Radovsky (2010), Morales-Malacara (1996), and Morales-Malacara and Guerrero (2007; 2020). All measurements are in micrometers.

Parichoronyssus tilaperezae
Morales-Malacara and Guerrero n. sp.
(Fig. 1-4)
http://zoobank.org/0F32BFED-6861-4319-9CA4-A60A772A2CC4

Diagnosis. Female dorsal shield with 21 pairs of setae; dorsal shield without sculpturing; two setae on peritremal shield. Sternal shield rectangular at the posterior level of *St1*, and with an anterior presternal region with protruded middle portion. Sternal glands conspicuously present with granular-shaped pattern. Epyginial shield broad with lateral margins straight, with two pairs of accessory setae. Anal shield anterior margin biconcave and not interrupted by perianal zone. Adanal setae are quite broad, long, and robust, and the postanal seta is quite broad, much longer, and robust. Unarmed opisthosomal venter with 16 setal pairs. Ventral ridge of coxa I as diagonal ridge from the middle portion of the coxa to posterolateral border; ridges of Coxae II-III curved and with hyaline margin; Coxa IV with fine curved ridge.

Female. *Dorsum* (Fig. 1A). Dorsal shield with 21 pairs of setae, some of them with a brief nimbus on its bases, including 20 primary setal pairs (*j1-j2, j4-j6, z2-z3, z5, s3-s6, J1-J4, Z1-Z3*), and one pair of accessory setae at the middle between the pair *J3*. Setae *j1* small and stout; *j2*, *z2*, *z3*, *s5*, and *r6* stout and large; *s3-s4, s6*, *j5-j6*, *z5*, *J1-J3,* and *Z1-Z3* medium in size and stout; *J4* long and slender. Dorsal shield without sculpturing, just it is observed a few lines of the prodorsal sigillae. Dorsal integument with four pairs of slightly robust setae, laterally flanking dark area of dorsal shield covered with striated cuticle; 1st pair *r4* medium sized at level of the middle portion of peritreme; 2nd pair *R1* almost at level of *r6* and immediately posterior to stigma; 3th pair *S2* at level of between *Z1-Z2* and 4th pair *S3* at level of between *Z2-Z3*; *Z5* absent. Peritreme short, ending on dorsum near level of posterior margin of Coxa II. Peritremal shield bearing two robust and medium sized setae *r2-r3*.

Venter (Figs. 1B, 2-4). Tritosternum bipartite with laciniae smooth and short. Setae on armed and unarmed idiosomal venter rather long and robust. Sternal shield wider than long (Figs. 1B, 2-3); anterior presternal region with protruded middle portion, nearly straight; anterolateral angles of shield formed as sinuous short flanges and concave; lateral margins almost straight but curved posteriorly; posterior margin very weakly arched between angles on posterolateral corners; sternal glands conspicuously present with granular-shaped pattern; sternals *St1-St3* robust and long; three pairs of sternal pores, with 3rd pair posterior to *St3* and on posterolateral angles of shield; *St4* quite robust and long and on the integument laterally flanking the anterior portion of epyginial shield. Epigynial shield rather narrow (Figs. 1B and 2); lateral margins straight at level of epigynial setae, narrow near posterior end, with narrow pointed and rounded tip; with one pair of epigynial setae near midlength of shield; with two pairs of accessory setae (Holotype female with 1 accessory seta out of the tip of epyginial shield: Fig. 1B). Anal shield subtriangular, with anterior margin curved and trilobulated, and with two intermediate concavities, and not interrupted by perianal zone; with latero-posterior outline broad and slightly rounded; adanal setae quite stout and long, and postanal seta stouter and much longer, which looks like a trident (Figs. 1B and 4). Cribum with 3 rows of denticles. Unarmed opisthosomal venter with 16 setal pairs (Fig. 1B).

Legs. Coxa I with one ventral ridge extending posteriorly from middle portion of coxa and with thinner hyaline margin, and with slightly cuplike depression distal to ridge (Figs. 1B and 2). Coxae II-IV ventral ridge with curved projecting hyaline margin (Figs. 1B and 2). Leg chaetotaxy as in Table 1.

Gnathosoma. Deutosternal groove with nine denticles. Hypostomal setae *h1* imperceptible or absent, *h2* (5-6) minute, and *h3* and *pc* thin and medium-sized (16-21). Palpal trochanter with lateral seta small (9), medial seta absent.

Measurements. HOLOTYPE ♀ (followed in parenthesis of 1 PARATYPE ♀): idiosoma length 395 (-- [broken specimen]), width at level of peritreme 245 (-- [broken specimen]); dorsal shield length 352 (353), width at level of *s4*, 182 (184); sternal shield length at level of anterolateral corner of shield near *St1*, 93 (92), width at level of *St2*, 106 (106). Setal lengths: *j1*, 11 (10); *j2*, 45 (41); *z2*, 40 (36); *z3*, 34 (37); *s3*, 21 (20); *s4*, 25 (25); *s5*, 33 (34); *s6*, 17 (17); *r6*, 35 (37); *J1*, 18 (18); *J2*, 18 (18); *J3*, 17 (18); *J4*, 27 (25); *Z1*, 18 (19); *Z2*, 19 (19); *Z3*, 18 (18); *r2*, 14 (17); *r3*, 20 (23); *r4*, 16 (12); *R1*, 11 (11); *S2*, 12 (9); *S3*, 11 (11); *St1*, 44 (42); *St2*, 41 (44); *St3*, 44 (47); *St4*, 45 (46); *St5* (epigynial), 47x 5 (48 x 5); adanal seta, 53 x 7 (49 x 6); postanal seta, 85 x 7 (87 x 7).

Male, Deutonymph, and Protonymph. Unknown

Type series. HOLOTYPE ♀, 1 PARATYPE ♀, ex *Rhinophylla fischerae* ♀, Armihuari, Río Camisea, La Convención, Cusco, Perú. R. Guerrero (301-010597) [field number].

The HOLOTYPE ♀, is deposited in the Colección de Parasitología, Museo de Biología, Universidad Central de Venezuela, Caracas, Venezuela [CP-MBUCV No. 6329]. The paratype is in the Colección Nacional de Ácaros, Instituto de Biología, Universidad Nacional Autónoma de México [CNAC012476] (1 ♀).

Etymology. The species name *"tilaperezae"* is dedicated to Dr. Tila M. Pérez, as an homage to her extraordinary academic and scientific trajectory throughout many years devoted to Acarology.

Remarks. Some morphological features of *P. tilaperezae* n. sp. are similar to *P. alexanderfaini*, including the sternal shield´s outline, the presence of the sternal glands, and the robust and long adanal and postanal setae (Morales-Malacara and Guerrero, 2020). However, *P. tilape-*

rezae n. sp. is easily distinguished from *P. alexanderfaini* by the sternal glands with a granular-shaped pattern, and the adanal and postanal setae are rather robust and longer, which looks like a trident. In *P. alexanderfaini* the sternal glands have a fingerprint pattern, and the adanal and postanal setae are slightly robust, almost the same size, and do not looks like a trident.

Additionally, concerning the chaetotaxy of the leg segments, in some species of the genus *Parichoronyssus*, uni-deficiency or bi-deficiency condition has been occasionally observed in the total number of setae, mainly in some leg segments such as the genu and the tibiae. But comparing both species, *P. alexanderfaini* and *P. tilaperezae* n. sp., that it is noteworthy that *P. alexanderfaini*, shows uni-deficiency of setae in Trochanter III (4), and tibia I-II (12, 8 respectively) and bideficiency in Genua II (8) (see Morales -Malacara and Guerrero 2020), about *P. tilaperezae* n. sp. has a regular pattern of setae in the Trochanter III (5) and the tibiae I-II (13, 9 respectively). The rest of the leg chaetotaxy in other leg segments is similar in both species.

On the other hand, it is noteworthy that both species share hosts that belong to the genus *Rhinophylla*. This could reflect that they have evolved in parallel with their hosts, *Rhinophylla fischerae* and *Rhinophylla pumilio*, respectively, and reinforces the evidence of both *Rhinophylla* species as sister species, as mentioned by Wright and collaborators (1999).

The presence of *P. tilaperezae* n. sp. on *Rhinophylla fischerae* suggests it is a monoxenous species at the moment. If so, its distribution may be related to *R. fischerae*, which occur in the Amazonian region of Brazil, Colombia, Ecuador, Perú and Venezuela (Gardner, 2007).

Key to known species of *Parichoronyssus*, is an update from Morales-Malacara and Guerrero (2020) (Females)

1. Dorsal shield with 13 setal pairs; setae *j4-j6*, and *z5* lacking but represented by trichopores 2

Dorsal shield with > 13 setal pairs; setae *j4-j6*, and *z5* present 4

2. Unarmed opisthosomal venter with > 24 setal pairs; setae *J4* < 16μ ….....… 3

Unarmed opisthosomal venter with < 14 setal pairs; setae *J4* > 20μ ….....…… ***kretzschmari* Heddergott, 2008**

3. Setae *r2* on dorsal integument present; setae *j2* ≥ 20μ, and setae *s4* ≥ 30μ ..…. ***radovskyi* Morales-Malacara, 1992**

Setae *r2* on dorsal integument absent; setae *j2* ≤ 20μ, and setae *s4* ≤ 20μ ….....…… …… ***bakeri* Morales-Malacara and Guerrero, 2007**

4. Dorsal shield with 18 setal pairs; dorsal setae *J1* and *Z1* absent ….....… 5

Dorsal shield with > 18 setal pairs; dorsal setae *J1* and *Z1* present ….....…… 6

5. Sternal grands present; 2 setal pairs on epyginial shield; seta *r6* ≥ 28μ ….....…… ***sclerus* Radovsky, 1967**

Sternal glands absent; 1 setal pair on epyginial shield; seta *r6* < 14μ ….....***moralesmalacari* Heddergott, 2008**

6. Dorsal shield with 23-24.5 setal pairs; coxa I with 3 ventral ridges ….....… ***lopezi* Morales-Malacara, 1996**

Dorsal shield with 20 setal pairs; coxa I with 2 or 1 ventral ridges ….....…… 7

7. Anterior margin of anal shield interrupted by perianal zone ….....…… 8

Anterior margin of anal shield not interrupted by perianal zone ….....…..…..... 9

8. Dosal shield essentially without not reticulated sculpturing; Sternal glands present; 2 setal pairs on epyginial shield ..... ***cyrtosternum* Radovsky, 1967**

Dosal shield with conspicuous reticulated sculpturing; Sternal glands absent; 1 setal pair on epyginial shield .... ***gettingeri* Morales-Malacara and Guerrero, 2020**

9. Sternal glands present; setae *r6* long (≥ 28μ) ….... 10

Sternal glands absent; setae *r6* small (≤ 17μ) .... ***euthysternum* Radovsky, 1967**

10. Epyginial shield with 2 setal pairs; adanal and postanal seta normal in shape, and almost as the same size as the unarmed opisthosomal setae … ***crassipes* Radovsky, 1967**

Epyginial shield with 3 setal pairs; adanal and postanal seta longer that the other unarmed opisthosomal setae ….11

11. Dorsal shield setae narrow and setiform; sternal glands with a fingerprint pattern; adanal (≥ 30μ x 5μ) and postanal (≥ 30μ x 3μ) setae slightly broad, robust and long …….. ***alexanderfaini* Morales-Malacara and Guerrero, 2020**

Dorsal shield setae broad and robust; sternal glands with a granulated pattern; adanal (≥ 50μ x 7μ) and postanal (≥ 80μ x 7μ) setae broad, robust and very long, that looks like a trident ….....… ***tilaperezae* n. sp.**

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Table 1. Leg chaetotaxy of female of *Parichoronyssus tilaperezae* n. sp.

Leg	Coxa	Trochanter	Femur	Genu	Tibia	Tarsus
I	2	1-1/3-1 (6)	2-5/4-1 (12)	2-6/3-1 (12)	2-7/3-1 (13)	--
II	2	1-0/3-1 (5)	1-4/4-1 (10)	2-4/3-1 (10)	2-3/3-1 (9)	2-/-2 (17)
III	2	1-0/4-0 (5)	0-4/2-0 (6)	1-2/3-1 (7)	1-1/3-1 (6)	2-/-2 (17)
IV	1	1-0/3-1 (5)	1-2/2-1 (6)	1-1/2-0 (4)	0-1/3-1 (5)	2-/-2 (17)

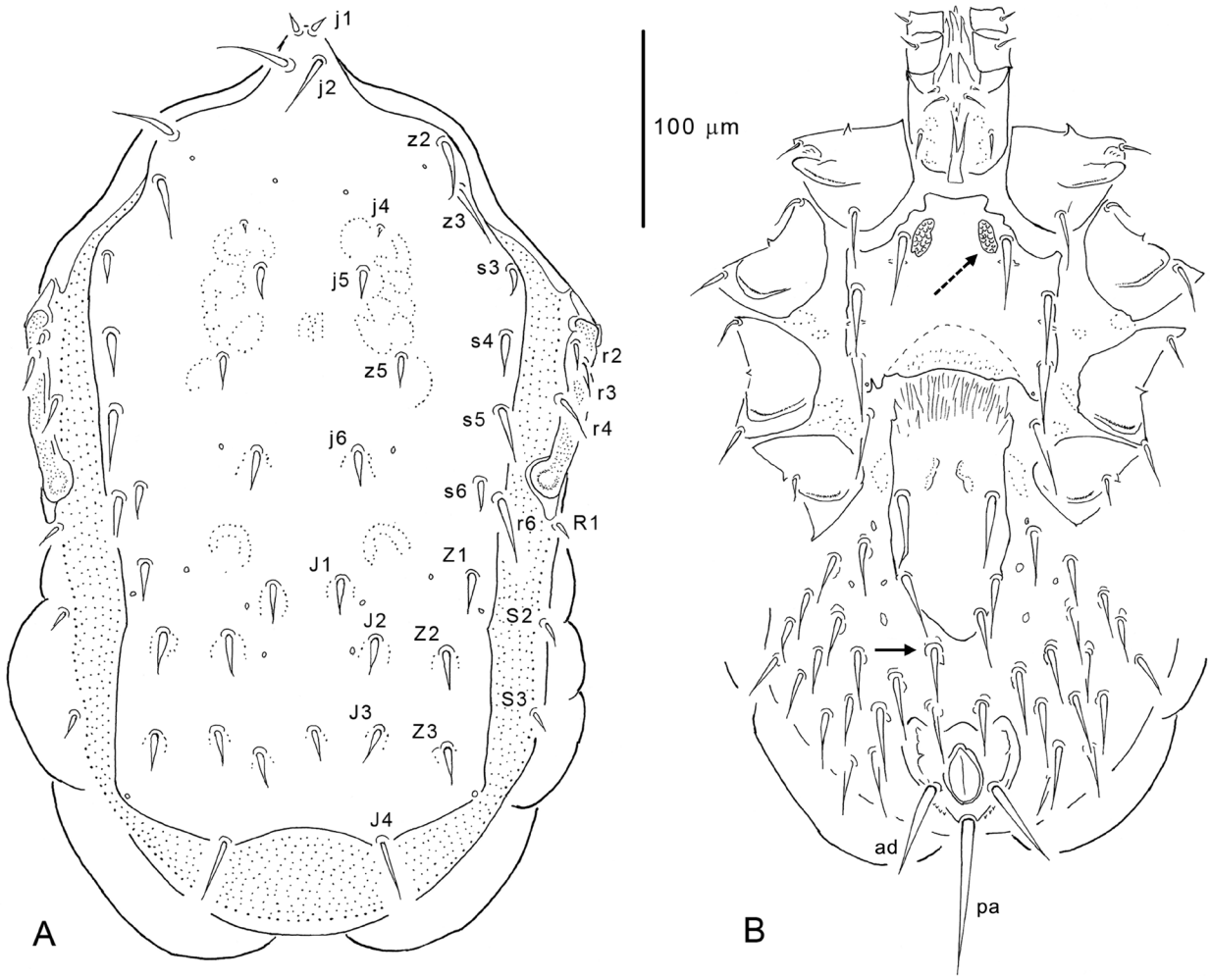
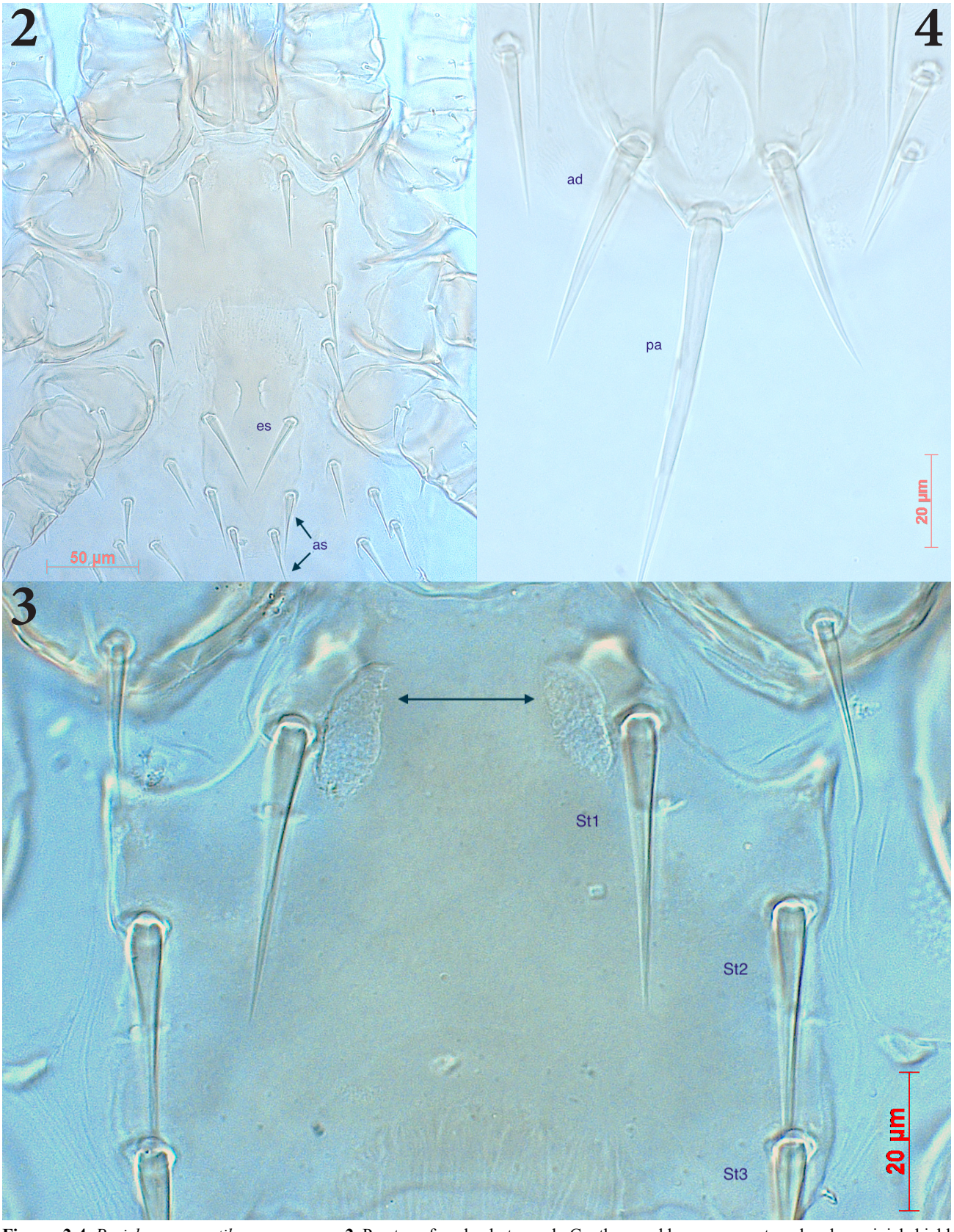


Figure. 1. *Parichoronyssus tilaperezae* n. sp. Holotype female. (A) Dorsum (including chaetotaxy nomenclature). (B) Venter (ad: adanal setae; pa: postanal seta; dashed arrow: sternal gland; arrow: accessory seta out of the tip of epyginial shield).



Figures 2-4. *Parichoronyssus tilaperezae* n. sp.**. 2.** Paratype female photograph. Gnathosomal base, coxae, sternal and epyginial shield (es: epigynial setae; as (arrows): accessory setae). **Fig. 3.** Holotype female photograph. Detail of Sternal shield (Sternal setae: St1, St2, St3; Arrows: sternal glands with granular-shaped pattern). **Fig. 4.** Holotype female photograph. Anal shield, adanal (ad) and postanal setae (pa).

