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## Article

### New species of oribatid mites (Acari, Oribatida) from Western Venezuela

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#### ABSTRACT

Two new species of oribatid mites (Oribatida)—*Hermannobates neotropicus* **sp. nov.** (Hermanniellidae) and *Mucrobates venezuelaensis* **sp. nov.** (Scheloribatidae)—are described, based on materials collected from sweep sample in the cloud forest in Western Venezuela. The genus *Mucrobates* is recorded in the Venezuelan fauna for the first time. *Hermannobates neotropicus* **sp. nov.** differs from the closely related species, *H. intermedius* Călugăr, 1990, by length and morphology of the bothridial seta. *Mucrobates venezuelaensis* **sp. nov.** differs from the closely related species, *M. cayoaguaensis* Ermilov & Kontschán, 2021, by the body size, the length of the bothridial and exobothridial setae, the presence of the pedotectum II, keel-shaped ridge and seta *v'* on the leg genu II, and the location of the adanal seta *ad*<sub>1</sub>.

**KEYWORDS:** *Hermannobates*, morphology, *Mucrobates*, Neotropical region, taxonomy.

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#### INTRODUCTION

In the course of taxonomic identification of oribatid mites (Acari, Oribatida) collected from Western Venezuela, I found new species belonging to the genera *Hermannobates* Hammer, 1961 (family Hermanniellidae) and *Mucrobates* Balogh & Mahunka, 1979 (family Scheloribatidae). The main goal of the paper is to describe two new species under the names *Hermannobates neotropicus* **sp. nov.** and *Mucrobates venezuelaensis* **sp. nov.**

*Hermannobates* was proposed by Hammer (1961), with *Hermannobates monstruosus* Hammer, 1961 as type species. The genus comprises 12 species, which are distributed in the Neotropical region (Ermilov *et al.* 2023). The generic characteristics, identification key, distribution and habitats of representatives of *Hermannobates* are provided by Ermilov *et al.* (2023).

*Mucrobates* was proposed by Balogh & Mahunka (1979), with *Mucrobates fissuratus* Balogh & Mahunka, 1979 as type species. The genus comprises three species, which are distributed in the Neotropical region (Ermilov & Yurtaev 2023). The generic characteristics are summarized by Ermilov & Kontschán (2021). An identification key, distribution and habitats of representatives of *Mucrobates* are provided by Ermilov & Yurtaev (2023).

Prior to this study, two identified species of *Hermannobates*—*H. intermedius* Călugăr, 1990 and *H. monstruosus* Hammer, 1961—have been registered in the Venezuelan fauna (Călugăr 1990; Behan-Pelletier *et al.* 1993); *Mucrobates* was not reported in Venezuela.

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## METHODS

**Observation and documentation** – For measurement and illustration, specimens were mounted in lactic acid on temporary cavity slides. All measurements are in micrometers ( $\mu\text{m}$ ); 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 in dorsal aspect; setal lengths were measured in lateral aspect. 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 DM 2500 transmission light microscope.

**Terminology** – Morphological terminology used in this paper mostly follows that of papers on *Hermannobates* and *Mucrobates* (e.g., Ermilov and Kontschán 2021; Ermilov and Yurtaev 2023; Ermilov *et al.* 2014, 2023); also, Norton (1977) for leg setal nomenclature and Norton and Behan-Pelletier (2009) for overview.

**Abbreviations** – *Prodorsum*: *lam* = lamella; *plam* = prolamella; *Al* = sublamellar porose area; *kf* = keel-shaped ridge; *ro*, *le*, *in*, *bs*, *ex* = rostral, lamellar, interlamellar, bothridial, and exobothridial setae, respectively; *Ad* = dorsosejugal porose area; *D* = dorsophragma; *P* = pleurophragma. *Notogaster*: *c*, *d*, *la*, *e*, *lm*, *f*, *lp*, *h*, *p* = notogastral setae; *cpE*, *e<sub>2</sub>E* = exuvial setae; *Sa*, *S1*, *S2*, *S3* = saccules; *ia*, *im*, *ip*, *ih*, *ips* = lyrifissures; *gla* = opisthonotal gland opening. *Gnathosoma*: *a*, *m*, *h* = subcapitular setae; *or* = adoral seta; *d*, *l*, *sup*, *inf*, *cm*, *acm*, *ul*, *su*, *vt*, *lt* = palp setae;  $\omega$  = palp solenidion; *ep* = postpalpal seta; *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; *z* = aperture of supracoxal gland; *car* = carina; *dis* = discidium. *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; *tip* = tibial process; *pa* = porose area;  $\omega$ ,  $\phi$ ,  $\sigma$  = solenidia; *d*, *l*, *v*, *bv*, *ev*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *p<sub>v</sub>*, *pl* = setae.

## TAXONOMY

### Family Hermannelliidae Genus *Hermannobates* Hammer, 1961

**Type species:** *Hermannobates monstruosus* Hammer, 1961

#### *Hermannobates neotropicus* sp. nov. (Figs. 1–10)

<http://zoobank.org/urn:lsid:zoobank.org:act:AFBB75CB-94BF-49B3-ADD8-2D1720258D48>

#### *Type material*

Holotype (female) and three paratypes (three females): Western Venezuela, Merida State, 2300 m a.s.l., 10 km E Tabay, sweeping in the cloud forest, 28.IV.1981 (L. Masner and Marsh).

#### *Type deposition*

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

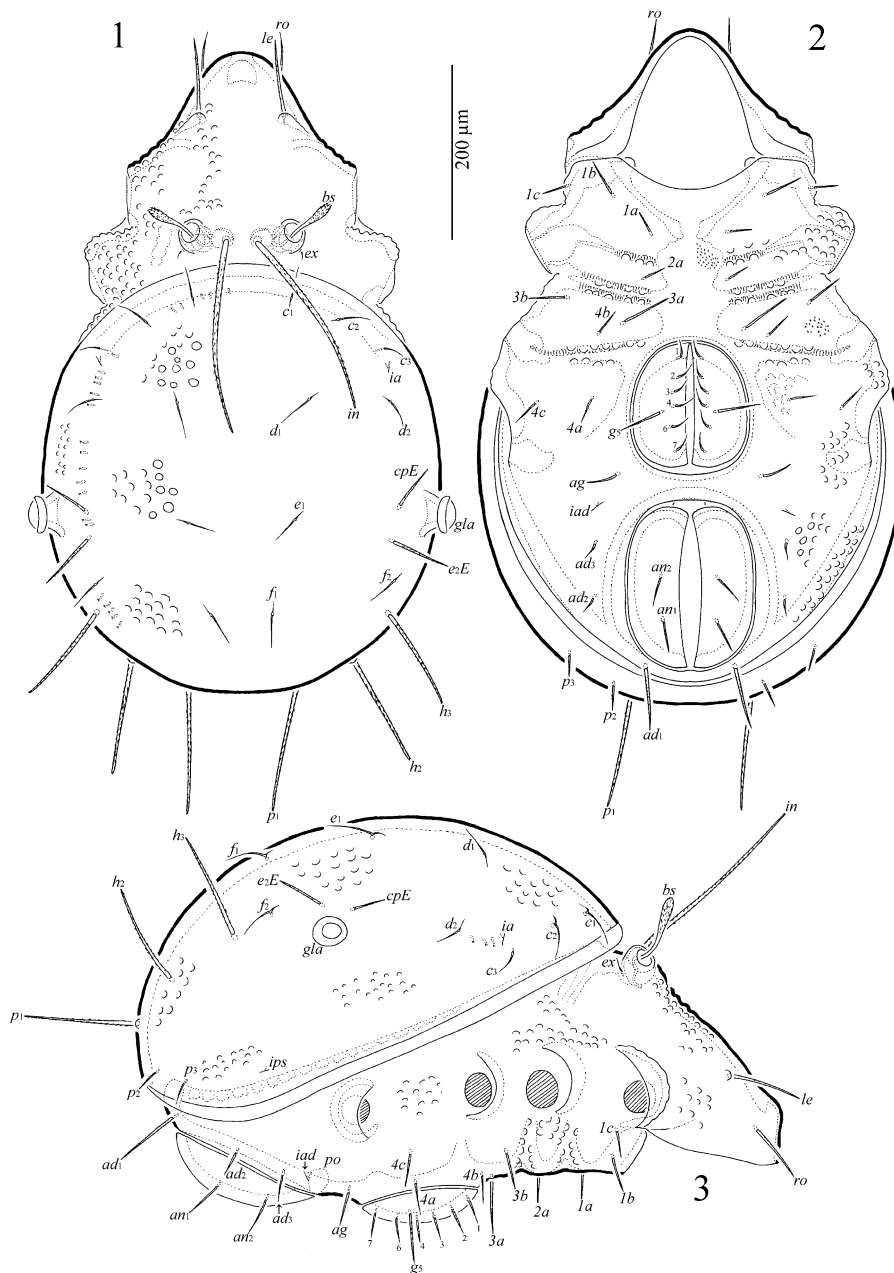
#### *Diagnosis*

Body length: 750–840. Prodorsum, ventral side of body and lateral side of notogaster partially

tuberculate; notogastral exuvial scalp with medium-sized, sparse foveolae. Rostral and lamellar setae medium-sized, setiform, stiff, roughened; interlamellar seta long, slightly thickened, barbed; bothridial seta comparatively short, clavate, barbed. Exuvial notogastral setae *cpE*, *e<sub>2</sub>E* short, setiform, stiff, slightly barbed; *e<sub>2</sub>E* > *cpE*; true notogastral seta *c<sub>3</sub>* short, setiform, roughened; *p<sub>2</sub>*, *p<sub>3</sub>* short, setiform, stiff, roughened; *p<sub>1</sub>*, *h<sub>2</sub>*, *h<sub>3</sub>* long, slightly thickened, barbed. Subcapitular seta *a* narrowly phylliform; *m*, *h* setiform. Epimeral and anogenital setae setiform, stiff, roughened.

### Description

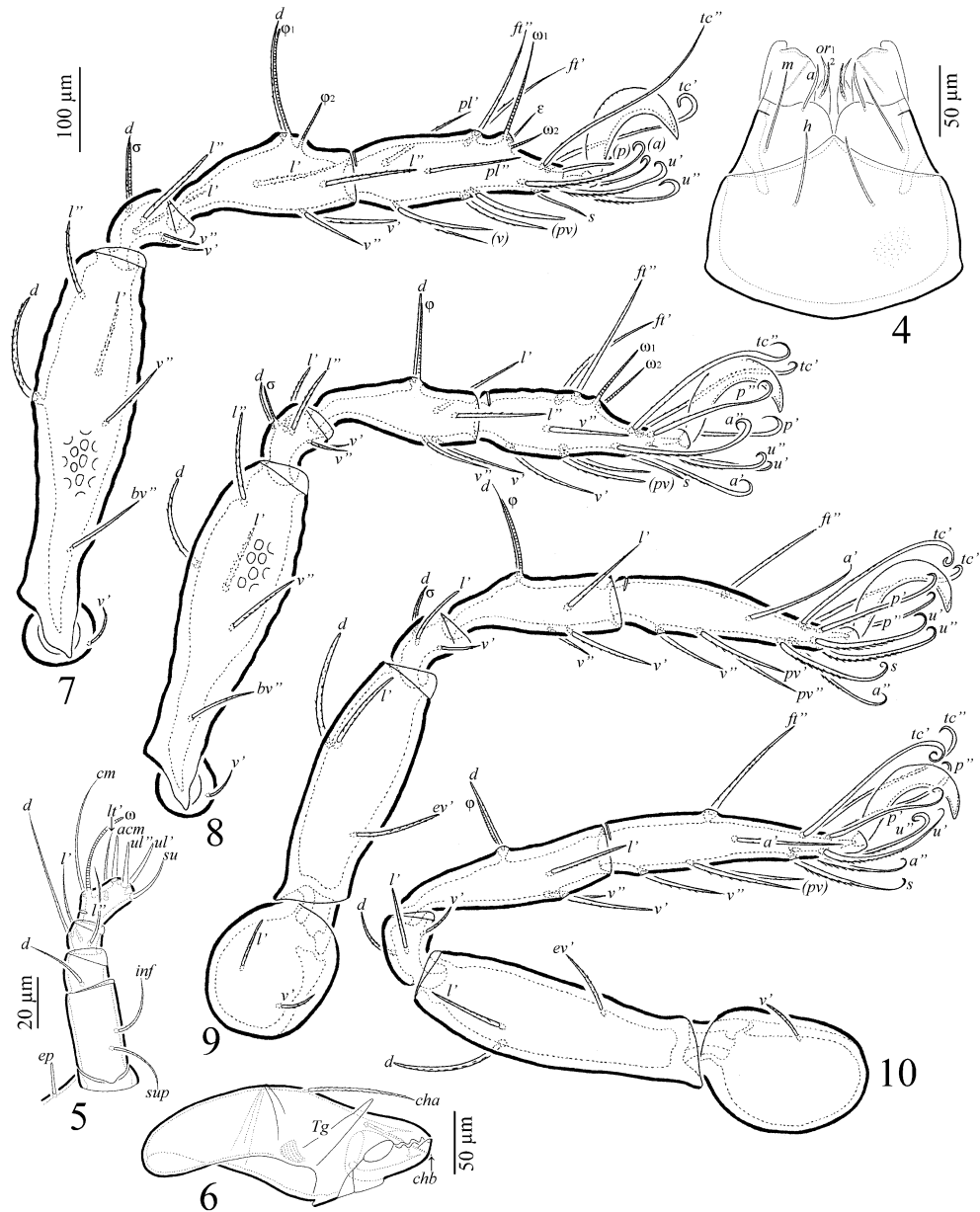
**Measurements** – Body length: 840 (holotype), 750–825 (paratypes); body width: 570 (holotype), 465–570 (paratypes).



**Figures 1–3.** *Hermannobates neotropicus* sp. nov. (adult, gnathosoma and legs not shown) – 1. Dorsal view; 2. Ventral view; 3. Right lateral view.

**Integument** – Body color brown to dark brown. Body surface covered by gel-like cerotegument including dense microgranules. Prodorsum, ventral side of body and lateral side of notogaster partially tuberculate (diameter of tubercle up to 11). Notogastral exuvial scalp sparsely foveolate (diameter of foveola up to 11).

**Prodorsum** – Rostrum widely rounded. Rostral (75–90) and lamellar (94–105) setae setiform, stiff, roughened; interlamellar seta (255–281) slightly thickened, barbed, directed upwards; interlamellar seta thicker than rostral and lamellar setae; bothridial seta (86–94) clavate, barbed, with head slightly longer than stalk; exobothridial seta (19–26) setiform, slightly roughened.



**Figures 4–10.** *Hermannobates neotropicus* sp. nov. (adult) – 4. Subcapitulum, ventral view; 5. Palp, right, antiaxial view; 6. Chelicera, left, paraxial view; 7. Leg I, right, antiaxial view; 8. Leg II, right, antiaxial view; 9. Leg III, left, antiaxial view; 10. Leg IV, left, antiaxial view.

**Notogaster** – Two pairs of exuvial notogastral setae remaining; *cpE* (52–56), *e<sub>2</sub>E* (67–71) setiform, stiff, slightly barbed. Six pairs of true notogastral setae (*c<sub>3</sub>*, *h<sub>2</sub>*, *h<sub>3</sub>*, *p<sub>1</sub>*, *p<sub>2</sub>*, *p<sub>3</sub>*) observable (other true setae under exuvium reduced); *c<sub>3</sub>* (30–34) setiform, roughened; *p<sub>2</sub>*, *p<sub>3</sub>* (26–30) setiform,

stiff, roughened;  $p_1$  (165–187),  $h_2$ ,  $h_3$  (139–180) slightly thickened, barbed. Only lyrifissures  $ia$ ,  $ips$  observable.

**Gnathosoma** – Subcapitulum size: 199–206 × 169–180; subcapitular seta  $a$  (34–37) narrowly phylliform, smooth or partially roughened mediodistally;  $m$  (60–67),  $h$  (52–56) setiform, roughened. Palp length: 94–97; setation: 0–2–1–3–6(+ $\omega$ ); postpalpal seta (15–19) spiniform, slightly roughened. Chelicera length: 225–236; both cheliceral setae ( $cha$ : 82–86;  $chb$ : 52–56) setiform, barbed.

**Epimeral and lateral podosomal regions** – Epimeral formula: 3–1–2–3; setae ( $1a$ ,  $1c$ ,  $2a$ ,  $4b$ : 37–45;  $1b$ ,  $3b$ ,  $4a$ ,  $4c$ : 45–52;  $3a$ : 67–79) setiform, stiff, roughened. Respiratory organs and channels not observed.

**Anogenital region** – Anogenital formula: 7–1–2–3; genital ( $g_5$ : 56–60; others: 30–37), aggenital (41–45), anal (49–56), and adanal ( $ad_1$ : 75–86;  $ad_2$ ,  $ad_3$ : 30–34) setae setiform, stiff, roughened. Adanal lyrifissure oblique, located anteriorly to  $ad_3$ .

**Legs** – Claw of each leg strong, slightly barbed on dorsal side. Formulas of leg setation and solenidia: I (1–5–5–5–18) [1–2–2], II (1–5–5–5–15) [1–1–2], III (2–3–3–4–13) [1–1–0], IV (1–3–3–4–13) [0–1–0]; homology of setae and solenidia indicated in Table 1; seta  $s$  on tarsi I, II and  $p'$ ,  $p''$  on tarsus I eupathidial; some distal setae of all tarsi dilated in distal part.

**Table 1.** Leg setation and solenidia of adult *Hermannobates neotropicus* sp. nov.

Leg	Tr	Fe	Ge	Ti	Ta
I	$v'$	$d$ , ( $l$ ), $bv''$ , $v''$	( $l$ ), ( $v$ ), $d\sigma$	( $l$ ), ( $v$ ), $d\phi_1$ , $\phi_2$	( $ft$ ), ( $tc$ ), ( $p$ ), ( $u$ ), ( $a$ ), $s$ , ( $pv$ ), ( $v$ ), ( $pl$ ), $\varepsilon$ , $\omega_1$ , $\omega_2$
II	$v'$	$d$ , ( $l$ ), $bv''$ , $v''$	( $l$ ), ( $v$ ), $d\sigma$	( $l$ ), ( $v$ ), $d\phi$	( $ft$ ), ( $tc$ ), ( $p$ ), ( $u$ ), ( $a$ ), $s$ , ( $pv$ ), ( $v$ ), $\omega_1$ , $\omega_2$
III	$l'$ , $v'$	$d$ , $l'$ , $ev'$	$l'$ , $v'$ , $d\sigma$	$l'$ , ( $v$ ), $d\phi$	$ft''$ , ( $tc$ ), ( $p$ ), ( $u$ ), ( $a$ ), $s$ , ( $pv$ ), $v''$
IV	$v'$	$d$ , $l'$ , $ev'$	$d$ , $l'$ , $v'$	$l'$ , ( $v$ ), $d\phi$	$ft''$ , ( $tc$ ), ( $p$ ), ( $u$ ), ( $a$ ), $s$ , ( $pv$ ), $v''$

Note: Roman letters refer to normal setae; Greek letters to solenidia (except  $\varepsilon$  = 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;  $d\sigma$ ,  $d\phi$  – seta and solenidion coupled.

### Comparison

*Hermannobates neotropicus* sp. nov. is morphologically similar to the other Venezuelan species, *H. intermedius* Călugăr, 1990, in having comparatively long, slightly thickened interlamellar and posterior notogastral setae  $p_1$ ,  $h_2$ ,  $h_3$ , and the presence of the head in the bothridial seta. However, the new species is distinguished from the latter by short, clavate bothridial seta (versus comparatively long, with slightly developed fusiform head).

### Etymology

The species name *neotropicus* refers to the place of origin, Neotropical region.

## Family Scheloribatidae Genus *Mucrobates* Balogh & Mahunka, 1979

**Type species:** *Mucrobates fissuratus* Balogh & Mahunka, 1979

### *Mucrobates venezuelaensis* sp. nov. (Figs. 11–20)

<http://zoobank.org/urn:lsid:zoobank.org:act:33A2B863-A9F2-4524-A3EC-E0C176F88FFE>

### Type material

Holotype (male) and two paratypes (two females): Western Venezuela, Merida State, 2300 m a.s.l., 10 km E Tabay, sweeping in the cloud forest, 28.IV.1981 (L. Masner and Marsh).

*Type deposition*

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

*Diagnosis*

Body length: 600–690. Prolamella not complete (distal part not observable), directed slightly laterally to insertion of rostral seta; translamella absent; keel-shaped ridge present. Rostral, lamellar and interlamellar setae setiform, barbed;  $in > le > ro$ ; bothridial seta short, clavate, barbed; exobothridial seta well developed. Notogastral setae  $p_2, p_3$  short, setiform, slightly roughened; other setae vestigial. Epimeral and anogenital setae setiform, slightly roughened. Pedotectum II present. Adanal seta  $ad_1$  located behind anal aperture. Seta  $v'$  on leg genu II developed.

*Description*

**Measurements** – Body length: 600 (holotype), 675, 690 (paratypes); notogaster width: 375 (holotype), 405, 420 (paratypes).

**Integument** – Body color brown. Cuticle densely microporose (visible under high magnification,  $\times 1000$ ); lateral side of body partially densely microgranulate.

**Prodorsum** – Rostrum rounded. Lamella slightly shorter than half of prodorsum; prolamella not complete (distal part not observable), directed slightly laterally to insertion of rostral seta; translamella absent; sublamella absent; sublamellar porose area (4) rounded; keel-shaped ridge slightly developed, small. Rostral (94–105), lamellar (131–150) and interlamellar (217–225) setae setiform, barbed; bothridial seta (49–52) clavate, barbed, with head slightly longer than stalk; exobothridial seta (37–41) setiform, slightly roughened. Dorsosejugal porose area ( $8 \times 4$ ) oval. Dorsophragma slightly elongated.

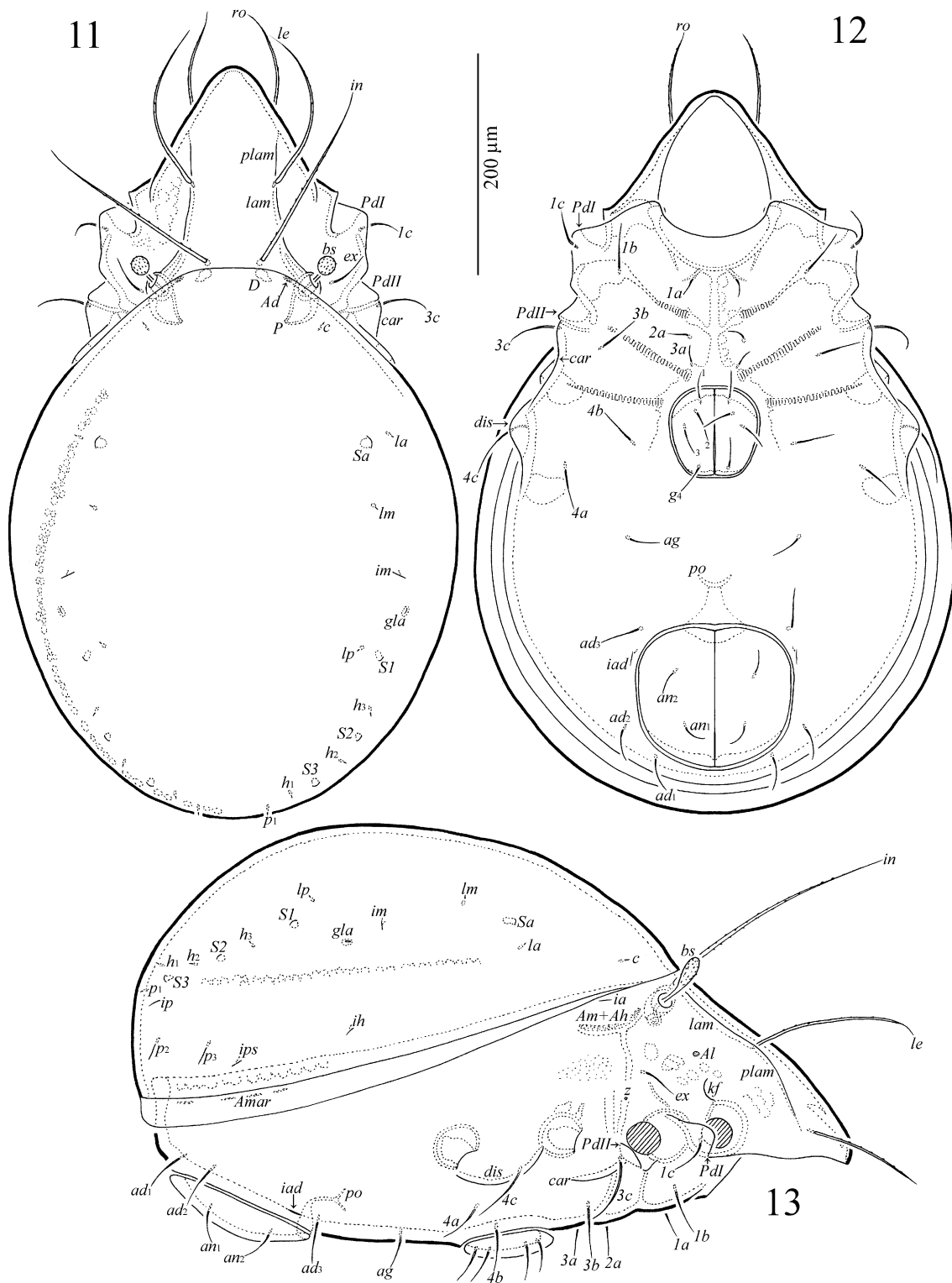
**Notogaster** – Posterior notogastral setae  $p_2, p_3$  (11–15) setiform, slightly roughened; other setae (1) vestigial. Four pairs of saccules drop-like. Opisthonotal gland opening and all lyrifissures distinct.

**Gnathosoma** – Subcapitulum size:  $135\text{--}146 \times 94\text{--}97$ ; subcapitular seta  $a$  (19–22) setiform, shortly ciliated distally;  $m$  (19–22) setiform, slightly roughened;  $h$  (36–41) setiform, barbed;  $m$  thinnest; both adoral setae (19–22) setiform, barbed. Palp length: 94–97; setation: 0–2–1–3–9(+ $\omega$ ); postpalpal seta (11) spiniform, roughened. Chelicera length: 135–146; both cheliceral setae ( $cha$ : 37–41;  $chb$ : 26) setiform, barbed.

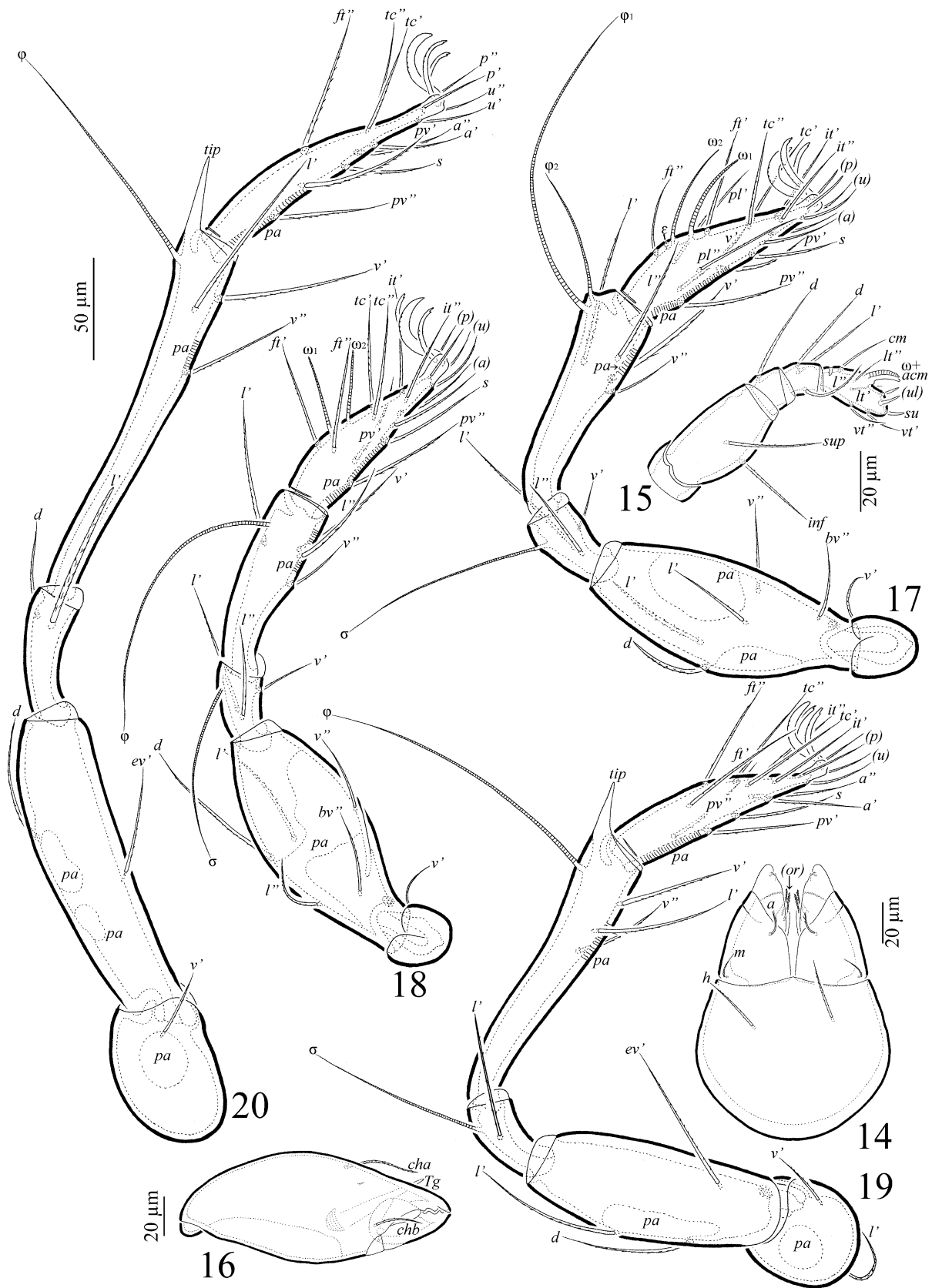
**Epimeral and lateral podosomal regions** – Epimeral setal formula: 3–1–3–3; all setae ( $1a, 2a, 3a$ : 26–30;  $3c, 4c$ : 49–55; others: 37–41) setiform, slightly roughened;  $3c$  on carina located perpendicularly to pedotectum II;  $4c$  on discidium. Humeral porose areas  $Am$  and  $Ah$  fused into single elongate oval area. Pedotectum II developed, small. Discidium broadly triangular, with rounded top.

**Anogenital region** – Anogenital formula: 4–1–2–3; genital (22–30), aggenital (22–30), anal (22–30), and adanal (36–41) setae setiform, slightly roughened;  $ad_1$  posteriorly to anal aperture. Adanal lyrifissure located close and parallel to anterior half of genital plate. Marginal porose area represented by some elongate oval areas.

**Legs** – Median claw distinctly thicker than lateral claws; all claws slightly barbed on dorsal side; lateral claw with minute tubercle ventrodistally. Anterodorsal process on tibiae III and IV well developed. Porose area on tarsi I–IV, tibiae I–IV, femora I–IV, and trochanters III, IV well observable. The extreme proximoventral region of femora I–IV contains a well-circumscribed, discrete globule that is resistant to lactic-acid treatment; each globule contains a cluster of 15–20 minute, discrete granules that are similarly resistant. Formulas of leg setation and solenidia: I (1–5–3–4–19) [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 2; setae  $p', p''$  on tarsus I eupathidial; seta  $s$  on tarsus I setiform, barbed (not eupathidial).



**Figures 11–13.** *Mucrobates venezuelaensis* sp. nov. (adult, gnathosoma and legs not shown) – 11. Dorsal view; 12. Ventral view; 13. Right lateral view.



**Figures 14–20.** *Mucrobates venezuelaensis* sp. nov. (adult) – 14. Subcapitulum, ventral view; 15. Palp, right, antiaxial view; 16. Chelicera, right, antiaxial view; 17. Leg I, right, antiaxial view; 18. Leg II, right, antiaxial view; 19. Leg III, left, antiaxial view; 20. Leg IV, left, antiaxial view.

**Table 2.** Leg setation and solenidia of adult *Mucrobates venezuelaensis* sp. nov.

Leg	Tr	Fe	Ge	Ti	Ta
I	v'	d, (l), bv'', v''	(l), v', σ	(l), (v), φ <sub>1</sub> , φ <sub>2</sub>	(ft), (tc), (it), (p), (u), (a), s, (pv), v', (pl), ε, ω <sub>1</sub> , ω <sub>2</sub>
II	v'	d, (l), bv'', v''	(l), v', σ	(l), (v), φ	(ft), (tc), (it), (p), (u), (a), s, (pv), ω <sub>1</sub> , ω <sub>2</sub>
III	v', l'	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: See Table for explanations.

### Comparison

*Mucrobates venezuelaensis* sp. nov. is morphologically similar to *M. cayoaguaensis* Ermilov & Kontschán, 2021 from Panama in having clavate bothridial seta. However, the new species is distinguished from the latter by larger body size (length: 600–690 versus 423–481), short bothridial seta (versus comparatively long), well developed exobothridial seta (versus minute), the presence (versus absence) of the pedotectum II, keel-shaped ridge and seta v' on the leg genu II, and the location of the adanal seta *ad*<sub>1</sub> (posteriorly to anal aperture versus laterally to anal aperture).

### Etymology

The species name *venezuelaensis* refers to the place of origin, Venezuela.

## ACKNOWLEDGEMENTS

I thank W. Knee for facilitating the loan of Venezuelan Acari material from the Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Canada, and two anonymous reviewers for valuable comments. This study was supported by the Ministry of Science and Higher Education of the Russian Federation within the framework of the Carbon Measurement Test Area in Tyumen' Region (FEWZ-2024-0016).

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## گونه‌های جدید کنه‌های اوریباتید (*Acari, Oribatida*) از غرب ونزوئلا

سرگی جی. ارمیلوف

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### چکیده

دو گونه جدید کنه اوریباتید (*Oribatida*) - (*Hermanniellidae*) - *Mucrobates* و *Hermannobates neotropicus sp. nov.* (*Schelorbitidae*) - *venezuelaensis sp. nov.* بر اساس مواد جمع‌آوری شده از سطح خاک در جنگل ابر در غرب ونزوئلا توصیف می‌شوند. جنس *Mucrobates* برای نخستین بار برای زیانگان ونزوئلا گزارش می‌شود. گونه جدید *Hermannobates neotropicus sp. nov.* با گونه نزدیک، *H. intermedius* Călugăr, 1990، از نظر طول و ظاهر موی درشت‌حفره‌ای متفاوت است. گونه جدید *Mucrobates venezuelaensis sp. nov.* با گونه نزدیک، *M. cayoaguaensis* Ermilov & Kontschán, 2021، از نظر اندازه بدن، طول موهای درشت‌حفره‌ای و برون‌حفره‌ای، وجود پدوتکتوم دوم، برجستگی تیرمانند و موی '۷' روی ساق پای دوم، و محل موهای کنارمخرجی *ad*<sub>1</sub> متفاوت است.

**واژگان کلیدی:** *Hermannobates*، ریخت‌شناسی، *Mucrobates*، منطقه نئوتروپیکال، آرایه‌شناسی.

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