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TWO NEW SPECIES OF ORIBATID MITES (ACARI, ORIBATIDA) OF THE SUPERFAMILY ACHIPTERIOIDEA THOR 1929 FROM TROPICAL FORESTS OF CUBA

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Two new species of oribatid mites representing the superfamily Achipterioidea are described from Cuba. *Epactozetes cubaensis* sp. n. (Epactozetidae) differs from all other species of the genus in, (1) the presence of an elongate trapezoid interlamellar region, (2) having comparatively larger foveolae on the notogaster, and (3) the morphology of the lamellae. *Parachipteria neotropica* sp. n. (Achipteriidae) differs from all species of the genus in the presence of monodactylous legs and in having foveolate and striate pteromorphs.

Keywords: Parachipteria, *Epactozetes*, taxonomy, morphology, Neotropical Region

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Presently, the Cuban oribatid mite (Acari, Oribatida) fauna is understudied (e.g. Balogh, Mahunka, 1974; Socarrás, Palacios-Vargas, 1999; Prieto Trueba, Schatz, 2004; Niedbała, 2009; Ermilov, 2016a).

During the taxonomic identification of materials from Cuba, we found two new species of the superfamily Achipterioidea. One of the species belongs to the genus *Epactozetes* Grandjean 1930 (family Epactozetidae Grandjean 1930) and the other – to the genus *Parachipteria* Hammen 1952 (family Achipteriidae Thor 1929). The genus *Epactozetes* comprises two species which are distributed in the Neotropical region (Subías, 2020, electronic update). The genus *Parachipteria* comprises seven species which are distributed in the Holarctic and Oriental regions (Subías 2020, electronic update); hence, we have recorded this genus in the Neotropical region for the first time. The main goal of our paper is to describe and illustrate these new species.

MATERIALS AND METHODS

Specimens. The specimens are distributed among two institutions: the Senckenberg Museum of Natural History, Görlitz, Germany (SMNH); and the Tyumen State University Museum of Zoology, Tyumen, Russia (TSUMZ).

Observation and documentation. 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 notogaster. Notogastral width refers to the maximum 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.

Drawings were made with a camera lucida using a Leica transmission light microscope “Leica DM 2500”.

Terminology and conventions. Morphological terminology used in this paper mostly 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.

Abbreviations and notations. *Prodorsum*: *lam* = lamella; *rr* = rostral ridge; *inr* = interlamellar region; *ro*, *le*, *in*, *bs* = rostral, lamellar, interlamellar, and bothridial setae, respectively; *bo* = bothridium; *tu* = tutorium; *D* = dorsophragma; *P* = pleurophragma. *Notogaster*: *len* = lenticulus; *c*, *la*, *lm*, *lp*, *h*, *p* = notogastral setae; *Sa*, *S1*, *S2*, *S3* = sacculi; *ia*,

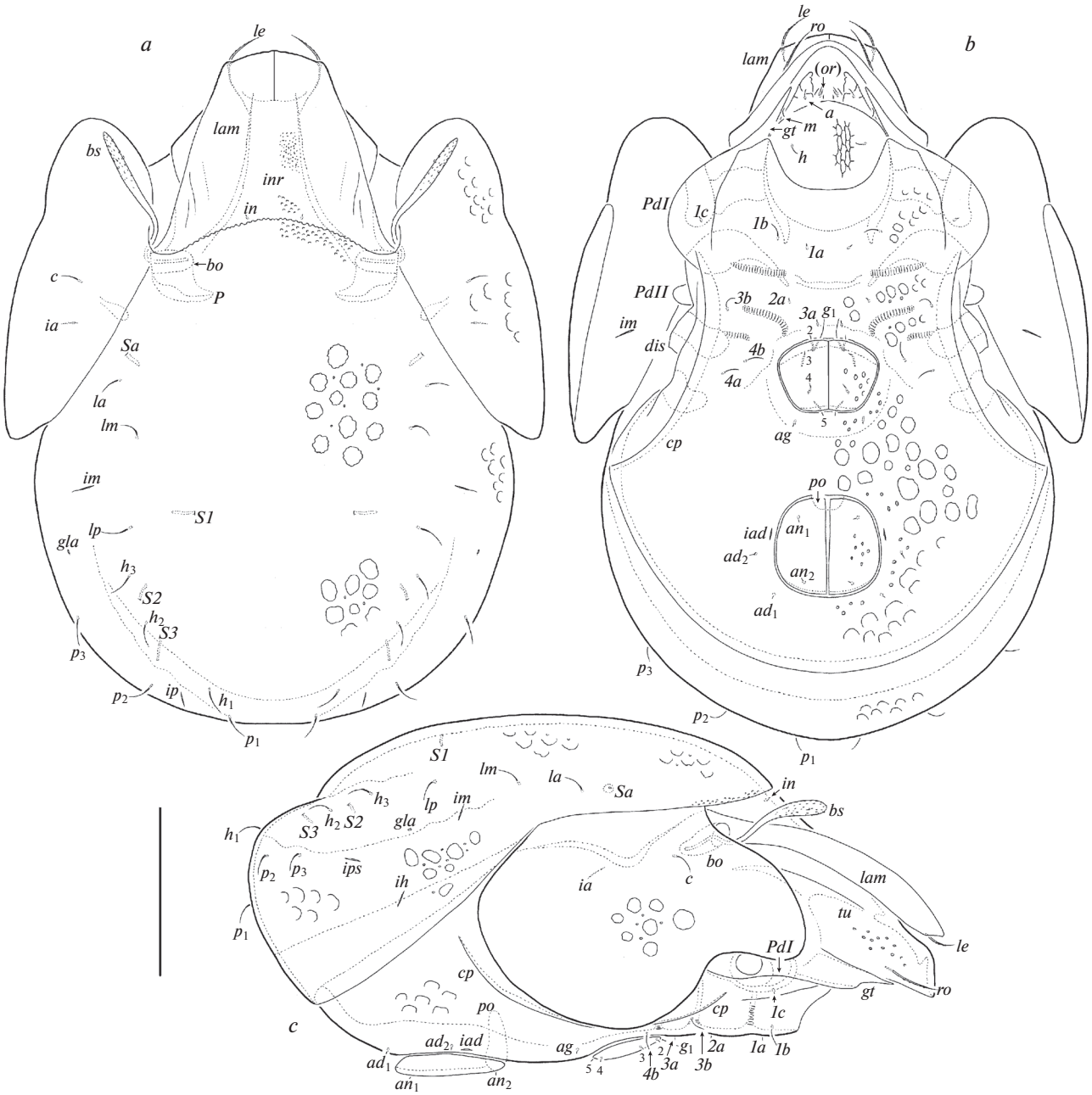

Fig. 1. *Epactozetes cubaensis* sp. n., adult: *a* – dorsal view, *b* – ventral view (legs not shown), *c* – lateral view (gnathosoma and legs not shown). Scale bar 50 μm.

im, *ip*, *ih*, *ips* = lyrifissures; *gla* = opisthonotal gland opening. *Gnathosoma*: *a*, *m*, *h* = subcapitular setae; *or* = adoral seta. *Epimeral and lateral podosomal regions*: *1a*, *1b*, *1c*, *2a*, *3a*, *3b*, *3c*, *4a*, *4b*, *4c* = epimeral setae; *gt* = genital tooth; *can* = capitular ange; *PdI*, *PdII* = pedotecta I, II, respectively; *dis* = discidium; *cp* = circumpedal carina; *Am*, *Ah* = humeral porose areas. *Anogenital region*: *g*, *ag*, *an*, *ad* – genital, aggenital, anal, and adanal setae, respectively; *iad* = adanal lyrifissure; *po* = preanal organ. *Legs*: *pa* = porose area; *t* – tooth; *Tr*, *Fe*, *Ge*, *Ti*, *Ta* – trochanter, femur, genu, tibia, tarsus, respectively; ε – leg famulus; ω, σ, φ – leg solenidia.

SYSTEMATICS

Epactozetes cubaensis Ermilov, Shtanchaeva et Subías sp. n.
(Figs 1, 2)

M a t e r i a l. Holotype (♀) and six paratypes (4♂♂, 2♀♀): Cuba, Cayajabos (Pinar del Río), litter and

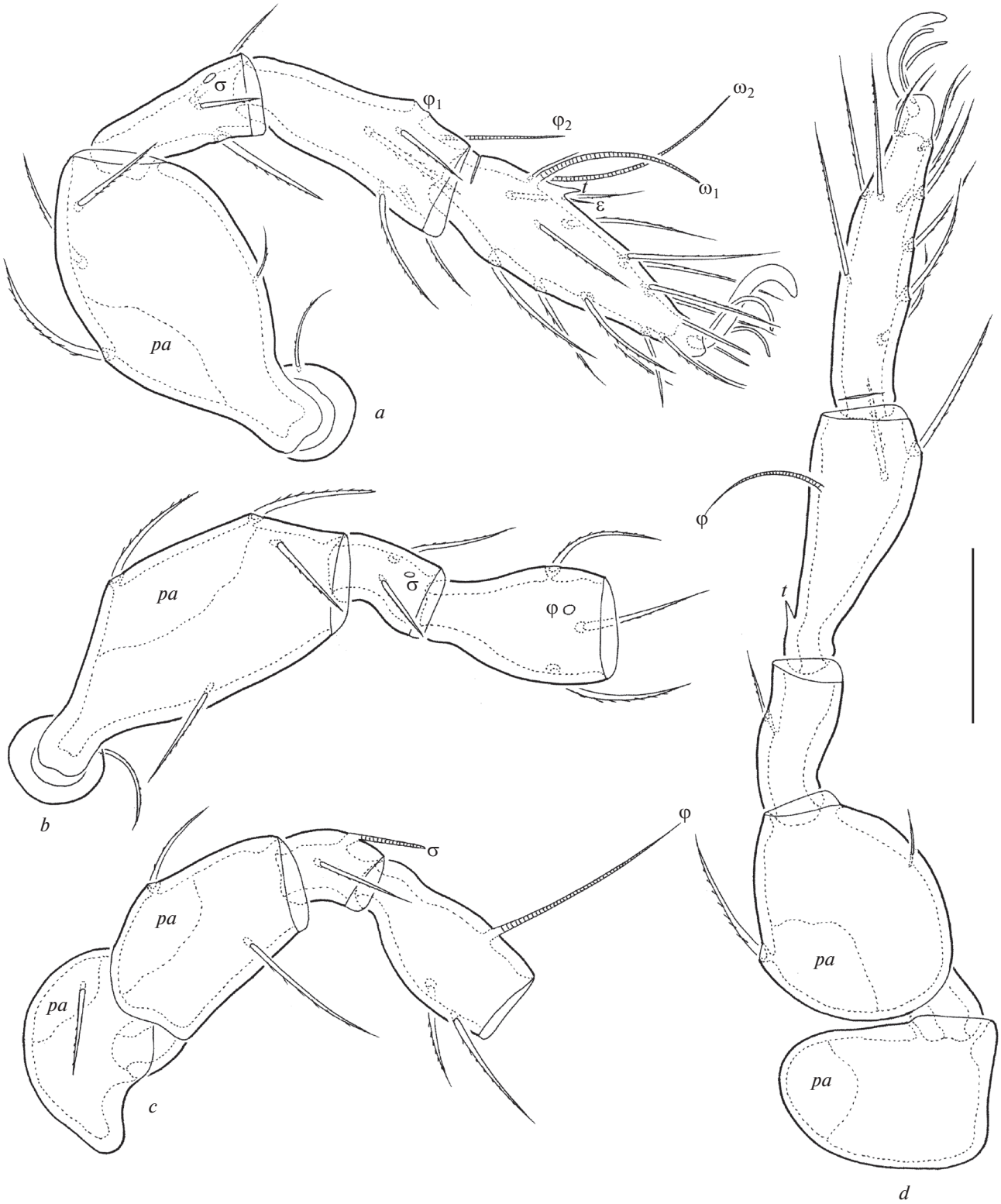

Fig. 2. *Epactozetes cubaensis* sp. n., adult: *a* – leg I, right, antiaxial view (some solenidia broken); *b* – leg II, without tarsus, right, dorsoantiaxial view (some solenidia broken); *c* – leg III, without tarsus, left, antiaxial view; *d* – leg IV, left, antiaxial view. Scale bar 20 μm.

Table 1. Leg setation and solenidia of adult *Epactozetes cubaensis* sp. n.

Leg	*Tr*	*Fe*	*Ge*	*Ti*	*Ta*
I	*v'*	*d*, (*l*), *bv"*	(*l*), σ	(*l*), (*v*), φ_1, φ_2	(*ft*), (*tc*), (*it*), (*p*), (*u*), (*a*), *s*, (*pv*), (*pl*), ε, ω_1, ω_2
II	*v'*	*d*, (*l*), *bv"*	(*l*), σ	*l'*, (*v*), φ	(*ft*), (*tc*), (*it*), (*p*), (*u*), (*a*), *s*, (*pv*), ω_1, ω_2
III	*v'*	*d*, *ev'*	*l'*, σ	(*v*), φ	(*ft*), (*tc*), (*it*), (*p*), (*u*), (*a*), *s*, (*pv*)
IV	–	*d*, *ev'*	*d*	(*v*), φ	*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.

moss in tropical forest, 24.VII.1994 (collected by E. Ruiz).

The holotype is deposited in the SMHM; six paratypes are deposited in the TSUMZ. Additional material (two adults): personal collection of U.Ya. Shtanchaeva and L.S. Subías. All specimens are preserved in ethanol with a drop of glycerol.

D i a g n o s i s. Body size: 207–215 × 140–149. Interlamellar region microtuberculate; basal part of prodorsum and anterior part of notogaster tuberculate; notogaster, pteromorph and ventral side of body foveolate. Lamellae distally truncate, anteromedially separated, but tightly connected. Interlamellar region elongate trapezoid. Rostral and lamellar setae of medium length, setiform, slightly barbed. Interlamellar seta minute, simple. Bothridial seta long, elongate clavate, barbed. All notogastral setae short, setiform, smooth. Four pairs of sacculi present, elongate. Epimeral setae *1b*, *3b*, *4a* and *4b* and genital seta g_1 short, setiform, smooth; other epimeral and anogenital setae minute, simple. Leg tarsus I and tibia IV with tooth dorsoproximally.

D e s c r i p t i o n. *Measurements*. Body length: 215 (holotype), 207–215 (paratypes); notogaster width: 149 (holotype), 140–149 (paratypes). No difference between females and males in body size.

Integument (Figs 1*a*–1*c*). Body color brown. Cerotegument thin, gel-like. Anterolateral side of prodorsum and genital and anal plates with small scattered foveolae. Interlamellar region densely microtuberculate. Basal part of prodorsum and anterior part of notogaster with small tubercles. Basal part of lamella with some thin longitudinal ridges. Notogaster, pteromorph and ventral side of body with well-separated large (notogastral foveola with undulate internal margin) and with some small foveolae. Subcapitular mentum with dense longitudinally elongate foveolae, forming heavily reticulate pattern.

Prodorsum (Figs 1*a*, 1*c*). Rostrum broadly rounded. Lamellae distally truncate, anteromedially separated, but tightly connected. Interlamellar region elongate trapezoid. Translamella absent. Rostral (16–20) and lamellar (12–14) setae setiform, slightly barbed. Interlamellar seta (2) minute, simple. Bothridial seta (45–49) elongate clavate, barbed. Exobothridial seta not observed. Tutorium poorly visible, ridge-like, with indistinct perpendicular prop.

Notogaster (Figs 1*a*, 1*c*). Dorsoposterior notogastral part depressed. Lateral part of pteromorph bilobed. All notogastral setae similar in length (8–10), setiform, thin, smooth. Four pairs of sacculi present, elongate. Lyrifissures *ia*, *im*, *ip*, *ih*, and *ips* and opisthonotal gland opening poorly visible.

Gnathosoma (Fig. 1*b*). Typical for Epactozetidae (e.g. Nübel-Reidelbach, Woas, 1992; Ermilov et al., 2013).

Epimeral and lateral podosomal regions (Figs 1*b*, 1*c*). Epimeral setal formula: 3–1–2–2. Setae *1b*, *3b*, *4a*, and *4b* (6–8) setiform, thin, smooth; *1a*, *1c*, *2a*, and *3a* (2) minute, simple. Genital tooth, pedotecta I and II, circumpedal carina and discidium of typical morphology.

Anogenital region (Figs 1*b*, 1*c*). Genital seta g_1 (6–8) setiform, thin, smooth; other anogenital setae (2) minute, simple.

Legs (Figs 2*a*–2*d*). Median claw strong, lateral claws thin, all smooth. Tarsus I and tibia IV with dorsal tooth proximally. Porose area on all femora and on trochanters III and IV poorly visible. Formulas of leg setation and solenidia: I (1–4–2–4–18) [1–2–2], II (1–4–2–3–15) [1–1–2], III (1–2–1–2–15) [1–1–0], IV (0–2–1–2–12) [0–1–0]; homology of setae and solenidia indicated in Table 1.

R e m a r k s. *Epactozetes cubaensis* sp. n. differs from other known species of the genus (*E. imitator* Grandjean 1930 and *E. setosus* Balogh et Mahunka 1969 from the Neotropical region) in: 1) presence of an elongate trapezoid interlamellar region (*versus* the interlamellar region being elongate triangular in other species), 2) having comparatively larger foveolae on the notogaster (*versus* notogastral foveolae being clearly smaller in other species), and 3) the morphology of the lamellae (in particular, its lamellae are distally truncate, anteromedially separated, but tightly connected *versus* lamellae being distally triangular and well-separated in *E. imitator* and distally completely fused into a uniform rounded ledge in *E. setosus*).

E t y m o l o g y. The specific name *cubaensis* refers to the place of origin, Cuba.

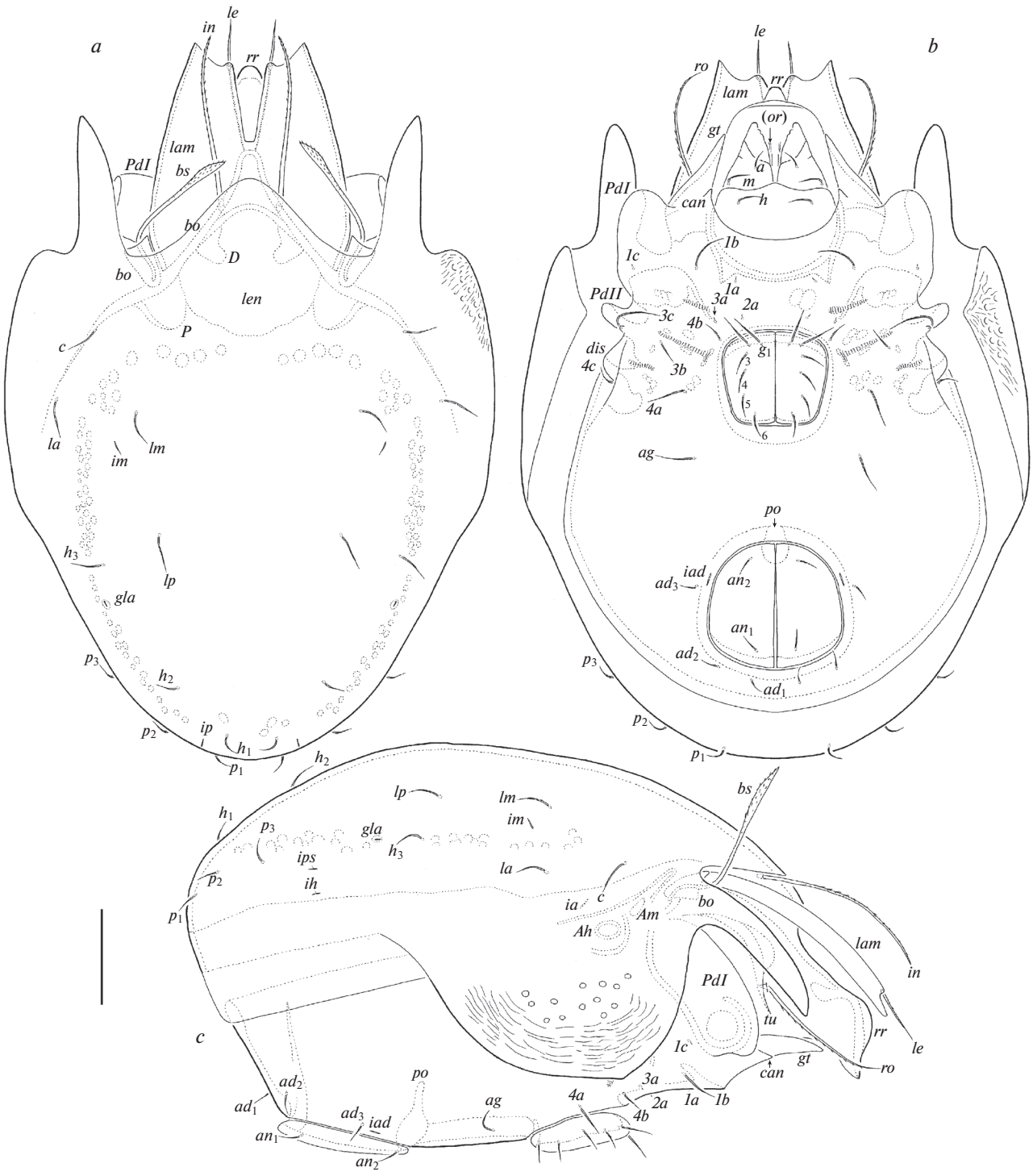

Fig. 3. *Parachipteria neotropica* sp. n., adult: *a* – dorsal view (legs not shown), *b* – ventral view (legs not shown), *c* – lateral view (gnathosoma and legs not shown). Scale bar 50 μm.

Parachipteria neotropica Ermilov, Shtanchaeva et Subías sp. n.
(Figs 3, 4)

M a t e r i a l. Holotype (♂) and five paratypes (1♂♂, 4♀♀): Cuba, Escalera de Jaluco (La Habana), karst zone, litter in tropical forest, 22.VII.1994 (collected by E. Ruiz).

The holotype is deposited in the SMHM; five paratypes are deposited in the TSUMZ. Additional material (two adults): personal collection of U.Ya. Shtan-

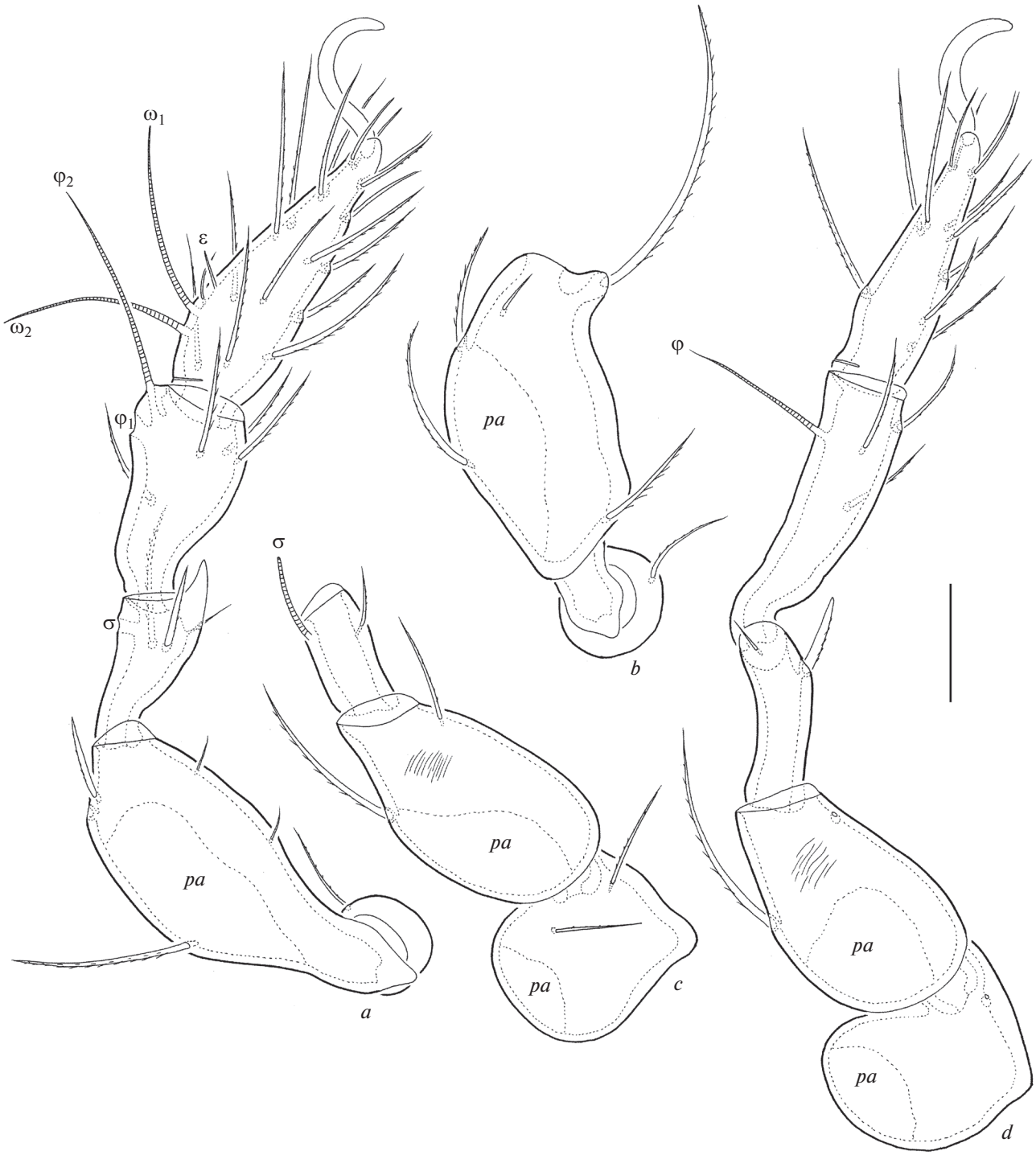

Fig. 4. *Parachipteria neotropica* sp. n., adult: *a* – leg I, right, antiaxial view (some solenidia and setae broken); *b* – trochanter and femur of leg II, right, antiaxial view; *c* – leg III, without tibia and tarsus, left, antiaxial view; *d* – leg IV, left, antiaxial view (some setae broken). Scale bar 20 μm.

chaeva and L.S. Subías. All specimens are preserved in ethanol with a drop of glycerol.

Diagnosis. Body size: 298–365 × 190–232. Lateral part of pteromorph striate and foveolate. Lamella slightly divergent anteromedially, with lateral tooth distally, small tubercle medially and semi-oval indentation between them. Rostral seta long, setiform, barbed. Lamellar seta of medium length, setiform, slightly barbed. Interlamellar seta long, setiform, barbed. Bothridial seta long, with elongate, unilateral-

Table 2. Leg setation and solenidia of adult *Parachipteria neotropica* sp. n.

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*), (*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*, *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*)

See Table 1 for explanations.

ly dilated, barbed head. Notogastral setae of medium length, setiform, roughened. Epimeral setae *1b*, *3b*, *3c*, *4a*, *4b*, and *4c* and anogenital setae setiform, slightly barbed; other epimeral setae minute, simple. Legs monodactylous.

D e s c r i p t i o n. *Measurements*. Body length: 315 (holotype), 298–365 (paratypes); notogaster width: 190 (holotype), 190–232 (paratypes). Males smaller than females: 298–315 × 190 versus 332–365 × × 215–232.

Integument (Figs 3*a*–3*c*). Body color brown. Cerotegument thin, gel-like. Lateral part of pteromorph striate and foveolate. Antiaxial side of all femora slightly striate.

Prodorsum (Figs 3*a*, 3*c*). Rostrum broadly rounded. Anterior prodorsal part with strong median longitudinal ridge. Lamellae slightly divergent anteromedially, with lateral tooth distally, small tubercle medially (bearing lamellar seta) and slight, semi-oval indentation between them. Rostral seta (73–82) setiform, barbed. Lamellar seta (28–36) setiform, straight, slightly barbed. Interlamellar seta (94–98) setiform, barbed (except basal part). Bothridial seta (77–82) with long stalk and elongate, unilaterally dilated, barbed head. Exobothridial seta not observed. Tutorium ridge-like.

Notogaster (Figs 3*a*, 3*c*). Humeral process elongate triangular. Lateral part of pteromorph slightly pointed. Lenticulus present, but without distinct border. All notogastral setae (*c*, *la*, *lm* and *lp*, 18–20; others 14–16) setiform, roughened. Lyrifissures *ia*, *im*, *ip*, *ih*, and *ips* and opisthonotal gland opening poorly visible.

Gnathosoma (Fig. 3*b*). Typical for Achipteriidae (e.g. Ermilov, Minor, 2015; Ermilov, 2016).

Epimeral and lateral podosomal regions (Figs 3*b*, 3*c*). Epimeral setal formula: 3–1–3–3. Setae *1b* and *3c* (32–41), *4a* (28–36) and *3b*, *4b* and *4c* (14–20) setiform, slightly barbed; *1a*, *1c*, *2a*, and *3a* (2) minute, simple. Genital tooth, capitular ange, pedotecta I and II and discidium of typical morphology. Custodium absent.

Anogenital region (Figs 3*b*, 3*c*). Genital (g_1, g_2, 24–32; others 12–20), aggenital (24–32), anal (12–16), and adanal (12–16) setae setiform, slightly barbed.

Legs (Figs 4*a*–4*d*). Claw strong, smooth. Genua I and II with ventrodistal tooth. Porose area on all femora and on trochanters III and IV poorly visible. 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 (2–2–1–3–15) [1–1–0], IV (1–2–2–3–12) [0–1–0]; homology of setae and solenidia indicated in Table 2.

R e m a r k s. *Parachipteria neotropica* sp. n. differs from other known species of the genus (*P. agenjoi* (Pérez-Íñigo 1976) from Canary Islands, *P. floresiana* (Pérez-Íñigo 1992) and *P. insularis* (Pérez-Íñigo 1992) from Azores, *P. magna* (Sellnick 1928) from the Palearctic region, *P. orientalis* (Mondal et Kundu 1999) from India, *P. ovalis* (Koch 1835) from Alemania, and *P. punctata* (Nicolet 1855) from the Holarctic region and Saint Helena) in the presence of monodactylous (*versus* tridactylous) legs and in the pteromorphs being foveolate and striate (*versus* pteromorphs not foveolate and striate).

E t y m o l o g y. The specific name *neotropica* refers to the place of origin, the Neotropical region.

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ДВА НОВЫХ ВИДА ПАНЦИРНЫХ КЛЕЩЕЙ (ACARI, ORIBATIDA) НАДСЕМЕЙСТВА ACHIPTERIOIDEA THOR 1929 ИЗ ТРОПИЧЕСКИХ ЛЕСОВ КУБЫ

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Описаны два новых вида панцирных клещей надсемейства Achipterioidea с Кубы. *Epactozetes cubaensis* sp. n. (Epactozetidae) отличается от всех видов рода присутствием продолговато-трапециевидной межламеллярной области и более крупными нотогастральными ямками, а также строением ламелл. *Parachipteria neotropica* sp. n. (Achipteriidae) отличается от всех видов рода однокоготковыми ногами, а также ямистыми и линейными покровами птероморф.

Ключевые слова: Parachipteria, *Epactozetes*, таксономия, морфология, Неотропическая область