

PERSCHELORIBATES PARATZITZIKAMAENSIS N. SP., WITH SUPPLEMENTARY
DESCRIPTIONS OF *SCHELORIBATES ELEGANS* AND *MONOSCHELOBATES PARVUS*
(ACARI, ORIBATIDA, SCHELORIBATIDAE) FROM ECUADOR

Sergey G. ERMILOV^{1*}, Dorothee SANDMANN², Franca MARIAN² and Mark MARAUN²

(Received 06 May 2013; accepted 17 July 2013; published online 19 December 2013)

¹ Tyumen State University, Tyumen, Russia; (*Corresponding author) ermilovacari@yandex.ru

² Georg August University Göttingen, J.F. Blumenbach Institute of Zoology and Anthropology, Göttingen, Germany.
mark.maraun@biologie.uni-goettingen.de

ABSTRACT — A new oribatid mite species, *Perscheloribates paratzitzikamaensis* n. sp., is described from Ecuador. This species is morphologically similar to *Perscheloribates tzitzikamaensis* (Pletzen, 1965) from South Africa, however, it differs from the latter by the smaller body size, longer notogastral setae p_1 , the absence of a translamellar line and prolamellar lines represented only by short basal part. The supplementary descriptions of *Scheloribates elegans* Hammer, 1958 and *Monoschelobates parvus* Balogh and Mahunka, 1969 are presented on the basis of Ecuadorian specimens.

KEYWORDS — oribatid mites; Scheloribatidae; new species; supplementary description; Ecuador

INTRODUCTION

The present study is based on the oribatid mite material collected by Dorothee Sandmann (second author) and Franca Marian (third author) in 2008–2010 from Ecuador. This paper includes the data on the family Scheloribatidae (Acari, Oribatida).

Ecuadorian scheloribatid mites are poorly studied; only a few species have been recorded (Balogh 1988; Schatz 1998; Illig *et al.* 2007; Ermilov and Kalúz 2012, Ermilov *et al.* 2013).

In the course of the identification of scheloribatid mites from Ecuador we found one new species belonging to the genus *Perscheloribates* Hammer, 1973. The primary purpose of our paper is to describe and illustrate this species. *Perscheloribates* is a genus that was proposed by Hammer

(1973) with *Perscheloribates clavatus* Hammer, 1973 as type species. Currently, it comprises more than 40 species, which are distributed in tropical regions. The main generic characters are summarized by Hammer (1973), Corpus-Raros (1980) and Balogh and Balogh (1990, 1992), including our additional opinion: rostrum rounded (rarely pointed or with incisions); rostral setae inserted dorso-laterally or laterally on prodorsum; interlamellar setae long or medium size; sensilli with dilated head (exceptionally setiform); prolamellar lines present or absent; pteromorphae well developed; notogaster with 10 pairs of setae, which are short (rarely medium size) or represented by alveoli; genital plates with four setae; aggenital setae present; lyrifissures *iad* in paraanal position; tarsi of all legs with one claw. An identification key for the Neotropical species of *Per-*

scheloribates has been presented earlier (Balogh and Balogh 1990, 2002).

The second purpose of our paper is to present detailed supplementary descriptions of *Schelorigates elegans* Hammer, 1958 and *Monoschelobates parvus* Balogh and Mahunka, 1969 on the basis of Ecuadorian specimens. *Schelorigates elegans* was briefly described by Hammer (1958) from Bolivia. Later, it was briefly redescribed by Corpus-Raros (1980) from the Philippines. *Monoschelobates parvus* was briefly described by Balogh and Mahunka (1969; see also Balogh and Balogh 1990) from Brazil.

MATERIALS AND METHODS

Specimens were collected by F. Marian and D. Sandmann in 2008 – 2010 from Southern Ecuador:

- 1) Ec-1: 4°70'S, 78°58'W, Bombuscaro, Podocarpus National Park, 1050 m a.s.l., upper organic soil layer in mostly undisturbed rain forest, 1.X.2008 and 1.IV.2009.
- 2) Ec-2: 3°58'S, 79°50'W, Estación Científica San Francisco, 2000 m a.s.l., upper organic soil layer in mostly undisturbed rain forest, 1.IV.2009 and 1.VIII.2010.
- 3) Ec-3: 4°60'S, 78°58'-79°10'W, Cajanuma, Podocarpus National Park, 3000 m. a.s.l., upper organic soil layer in mostly undisturbed rain forest, 1.IV.2009.

Specimens were studied in lactic acid, mounted in temporary cavity slides for the duration of the study and then stored in 90% alcohol in vials. 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. The length of body setae was measured in lateral aspect. Positions of lyrifissures (*ia*, *im*, *ip*, *ih*, *ips*), opisthonotal gland openings (*gla*), and morphology of subcapitulum, palps, chelicerae, leg segments, leg setae and solenidia resembled that in other Schelorigatidae (Coetzer 1967-1968; Ermilov *et al.* 2011; Ermilov and Kalúz 2012), therefore, we do not give detailed data in this paper. All body measurements are given in micrometers. Formulae of leg setation are given according to the sequence trochanter-femur-genu-tibia-tarsus (femulus included). Formulae of leg solenidia are

given (in square brackets) according to the sequence genu-tibia-tarsus. General terminology used in this paper follows that summarized by Coetzer (1967-1968), and Norton and Behan-Pelletier (2009).

DESCRIPTIONS OF NEW SPECIES

Perschelorigates paratzitzikamaensis n. sp. (Figure 1)

Diagnosis — Body size: 298 – 315 × 182 – 199. Rostrum rounded. Prodorsal setae long, setiform, barbed. Sensilli spindle-form, with short cilia. Translamellar line absent. Prolamellar lines represented by short basal part. Notogaster with nine pairs of setal alveoli and one pair (*p*₁) of setae. Epimeral setal formula: 3-1-2-2. Leg claw serrate on dorsal side.

Description — Measurements. Body length: 315 (holotype), 298 – 315 (four paratypes); notogaster width: 199 (holotype), 182 – 199 (four paratypes).

Integument — Body color light brown. Body surface smooth.

Prodorsum — Rostrum rounded. Lamellae located dorso-laterally, as long as half of prodorsum (in lateral view), without cusps. Translamellar line absent. Prolamellar lines represented only by short basal part. Sublamellar lines distinct, long. Sublamellar porose areas (*Al*) small, oval (6×4). Rostral (*ro*, 41 – 49), lamellar (*le*, 53 – 61) and interlamellar (*in*, 65 – 73) setae setiform, barbed. Sensilli (*ss*, 61 – 65) spindle-form (with well dilated head and long, thin apex), with short cilia. Exobothridial setae and their alveoli absent. A pair of elongate, narrow porose areas present (visible in dissected specimens) latero-posterior to interlamellar setae.

Notogaster — Anterior notogastral margin convex medially. Dorsophragmata (*D*) of medium size, widely rounded. Nine pairs of notogastral setae represented by alveoli; one pair of thin, smooth setae present (*p*₁, 24-32). Four pairs of sacculi (*Sa*, *S1*, *S2*, *S3*) oval, with small openings.

Epimeral and lateral podosomal regions — Apodemes 1, 2, 3 and sejugal apodemes distinct. Epimeral setal formula: 3-1-2-2 (*3c*, *4c* absent). Setae setiform, thin, smooth; medial setae *1a*, *2a*, *3a* (6

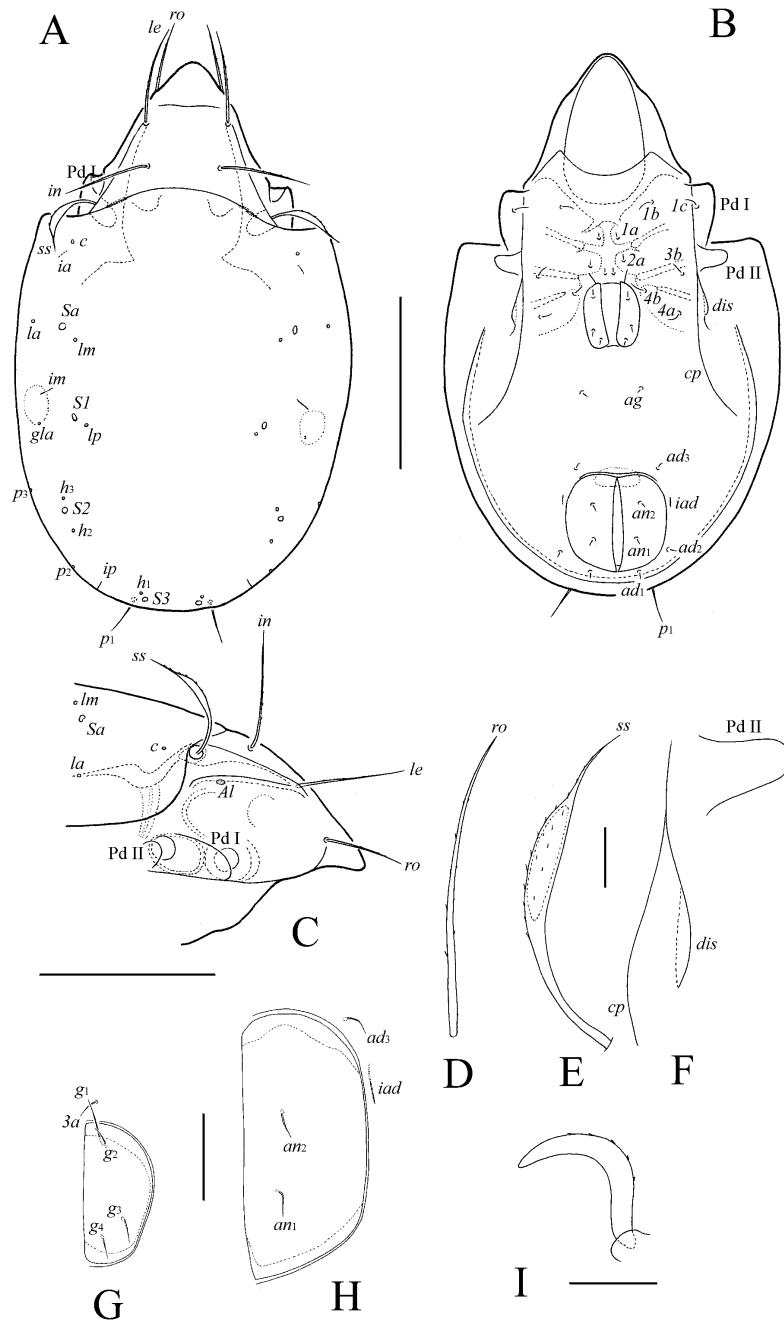


FIGURE 1: *Perscheloribates paratitzikamaensis* n. sp.: A – body dorsally; B – body ventrally (gnathosoma and legs not illustrated); C – prodorsum and anterior part of notogaster laterally (gnathosoma and legs not illustrated); D – rostral seta; E – sensillus; F – pedotectum II and discidium in dissected specimen; G – left genital plate and epimarginal seta 3a; H – left anal plate and adanal seta ad_3 ; I – claw on leg I. Scale bars (A–C) 100 μ m, scale bar (D–F, I) 10 μ m, scale bar (G, H) 20 μ m.

TABLE 1: Leg setation and solenidia of *Perscheloribates paratzitzikamaensis* n. sp. (same data for *Scheloribates elegans* Hammer, 1958 and *Monoschelobates parvus* Balogh and Mahunka, 1969)

Leg	Trochanter	Femur	Genu	Tibia	Tarsus
I	v'	$d, (l), bv'', v''$	$(l), v', \sigma$	$(l), (v), \phi_1, \phi_2$	$(ft), (tc), (it), (p), (u), (a), s, (pv), v', (pl), e, \omega_1, \omega_2$
II	v'	d, l'_1, l'_2, bv'', v''	$(l), \sigma$	$(l), (v), \phi$	$(ft), (tc), (it), (p), (u), (a), s, (pv), \omega_1, \omega_2$
III	l', v'	d, l', ev'	l', σ	$l', (v), \phi$	$(ft), (tc), (it), (p), (u), (a), s, (pv)$
IV	v'	d, ev'	d, l'	$l', (v), \phi$	$ft'', (tc), (p), (u), (a), s, (pv)$

Roman letters refer to normal setae (e – famulus), Greek letters refer to solenidia. One apostrophe (') marks setae on anterior and double apostrophe (") setae on posterior side of the given leg segment. Parentheses refer to a pseudosymmetrical of setae.

– 12) shorter than others (16 – 24). Pedotecta I (Pd I) large, concave, pedotecta II (Pd II) rounded anteriorly. Discidia (*dis*) poorly developed, rounded distally. Circumpedal carinae (*cp*) distinct.

Anogenital region — Four pairs of genital ($g_1, 12 - 20, g_2 - g_4, 6 - 12$), one pair of aggenital ($ag, 6 - 12$), two pairs of anal ($an_1, an_2, 6 - 12$) and three pairs of adanal ($ad_1 - ad_3, 6 - 12$) setae thin, smooth. Lyrifissures *iad* in paraanal position.

Legs — Claw of each leg with several minute barbs on dorsally side. Formulae of leg setation and solenidia: I (1-5-3-4-19) [1-2-2], II (1-5-2-4-15) [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 1.

Material examined — Holotype (female): Ec-2 (1.IV.2009, collected by F. Marian and D. Sandmann). Four paratypes (all females): Ec-3 (1.IV.2009, collected by F. Marian and D. Sandmann).

Type deposition — The holotype is deposited in the collection of the Zoological Institute of the Russian Academy of Sciences, St. Petersburg, Russia; two paratypes are deposited in the collection of the Siberian Zoological Museum, Novosibirsk, Russia; two paratypes are in the personal collection of the first author.

Etymology — The prefix *para* is Latin meaning "near" and refers to the similarity between the new species and the species *Perscheloribates tzitzikamaensis* (Pletzen, 1965).

Remarks — In having the long notogastral setae p_1 (other setae represented by alveoli) and spindle-form sensilli, *Perscheloribates paratzitzikamaensis* n. sp. is similar to *Perscheloribates tzitzikamaensis* (Pletzen, 1965) from South Africa (see Pletzen 1965), however, it differs from the latter by smaller body size (298 – 315 × 182 – 199 versus 405 – 423 × 279 – 293 in *P. tzitzikamaensis*), longer setae p_1 (considerably longer than adanal setae versus not longer in *P. tzitzikamaensis*), the absence of a translamellar line (rudimentary parts of lines present in *P. tzitzikamaensis*) and prolamellar lines represented only by short basal part (versus present in *P. tzitzikamaensis*).

Also, in having the long notogastral setae p_1 (other setae represented by alveoli), *Perscheloribates paratzitzikamaensis* n. sp. is similar to *Perscheloribates aculeatus* (Hammer, 1961) from Peru (see Hammer 1961), however, it differs from the latter by the spindle-form sensilli (versus fusiform in *P. aculeatus*) and the rounded rostrum (versus pointed in *P. aculeatus*).

SUPPLEMENTARY DESCRIPTIONS OF SPECIES (ON THE BASIS OF ECUADORIAN SPECIMENS)

Scheloribates elegans Hammer, 1958 (Figure 2)

Diagnosis — Body size: 581 – 630 × 365 – 415. Rostrum rounded. Prodorsal setae long, setiform, barbed. Sensilli spindle-form, with short cilia. Translamellar line represented by rudimentary parts. Prolamellar lines present. Notogaster with ten pairs of short setae. Leg claws serrate on dorsal side.

Description — Measurements. Body length: 581 – 630 (10 specimens); notogaster width: 365 – 415 (10 specimens).

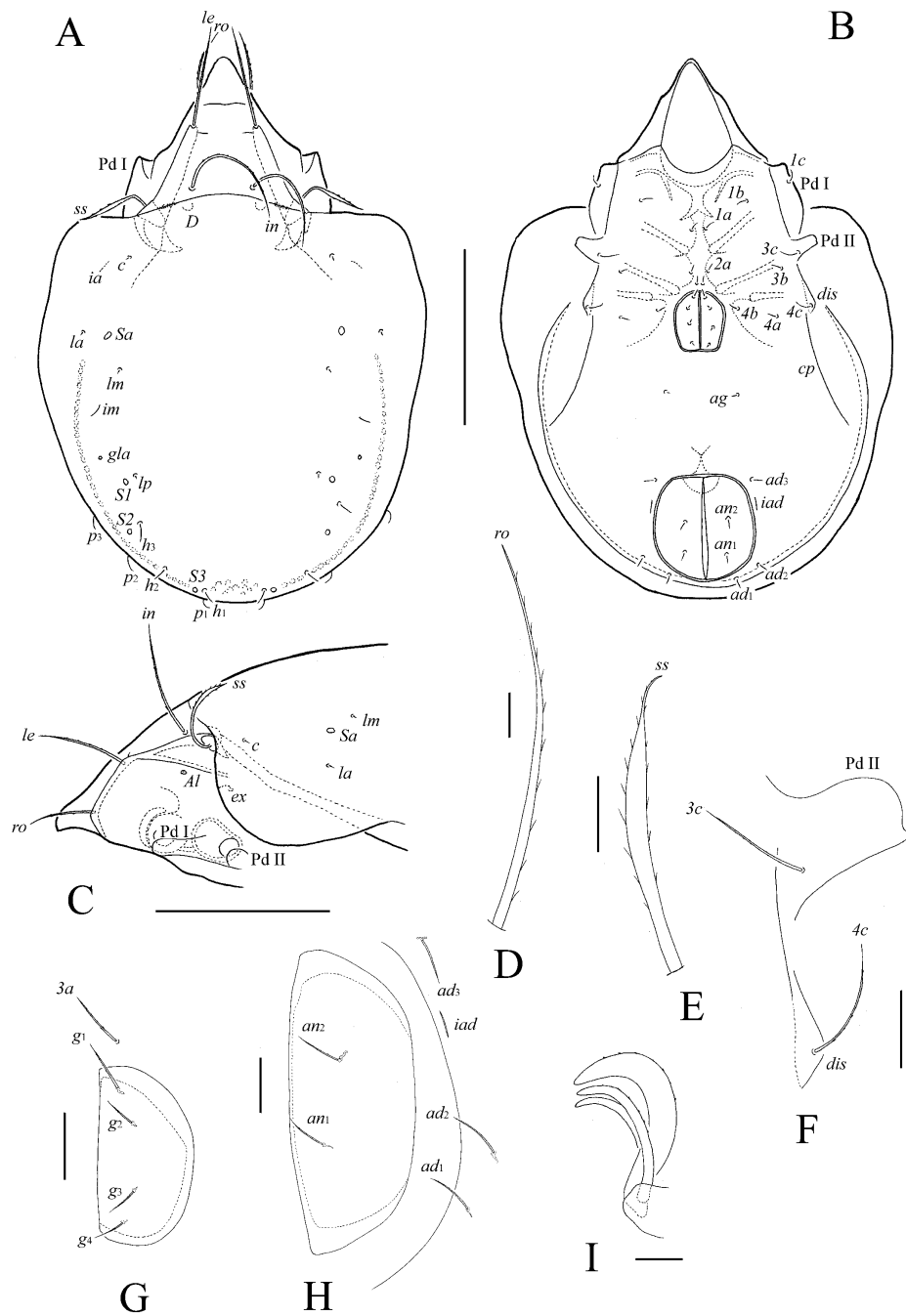


FIGURE 2: *Schelorbates elegans* Hammer, 1958: A – body dorsally; B – body ventrally (gnathosoma and legs not illustrated); C – prodorsum and anterior part of notogaster laterally (gnathosoma and legs not illustrated); D – rostral seta; E – medio-distal part of sensillus; F – pedotectum II, discidium and epimeral setae 3c, 4c in dissected specimen; G – left genital plate and epimeral seta 3a; H – left anal plate and adanal setae ad_1 – ad_3 ; I – claws on leg I. Scale bars (A–C) 200 μ m, scale bar (D, I) 10 μ m, scale bar (E–H) 20 μ m.

Integument — Body color light brown. Body surface smooth.

Prodorsum — Rostrum narrowly rounded. Lamellae located dorso-laterally, as long as half of prodorsum (in lateral view), without cusps. Translamellar line represented by rudimentary parts near to lamellae. Prolamellar and sublamellar lines distinct. Sublamellar porose areas (*Al*) oval ($10 - 12 \times 8$). Rostral (69 – 77), lamellar (102 – 114) and interlamellar (139 – 151) setae setiform, barbed. Sensilli (98-110) spindle-form (with well-dilated head and distinct, thin apex), with short cilia. Exobothridial setae (*ex*, 16 – 20) thin, smooth. A pair of elongate, narrow porose areas present (visible in dissected specimens) latero-posterior to interlamellar setae.

Notogaster — Anterior notogastral margin convex medially. Dorsophragmata small. Ten pairs of notogastral setae present; setae *c*, *la*, *lm*, *lp* (4 – 8) short (visible under high magnification), smooth, others longer (16 – 20), indistinctly barbed. Four pairs of sacculi (*Sa*, *S1*, *S2*, *S3*) oval, with small openings.

Epimeral and lateral podosomal regions — Apodemes 1, 2, 3 and sejugal apodemes distinct. Epimeral setal formula: 3-1-3-3. Setae setiform, slightly barbed; *3a*, *4a* (28 – 32) longer than others (16 – 20). Pedotecta I large, convex, pedotecta II rounded anteriorly, with small tooth. Discidia rounded distally. Circumpedal carinae distinct.

Anogenital region — Four pairs of genital (*g*₁, 16 – 20, *g*₂₋₄, 6 – 8), one pair of aggenital (6 – 8), two pairs of anal (16 – 20) and three pairs of adanal (16 – 20) setae setiform, slightly barbed. Lyrifissures *iad* in paraanal position.

Legs — Leg tarsi with one strong claw and two thinner claws; all with several minute barbs on dorsal side. Formulae of leg setation and solenidia: I (1-5-3-4-19) [1-2-2], II (1-5-2-4-15) [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 1.

Material examined — Five specimens (four females and one male): Ec-2 (1.VIII.2010, collected by D. Sandmann). Five specimens (four females and one male): Ec-3 (1.IV.2009, collected by D. Sandmann).

Remarks — Ecuadorian specimens of *Schelobates elegans* are similar in general appearance to specimens from Bolivia (see Hammer 1958) and Philippines (Corpus-Raros 1980), but there is a clear morphometrical difference: body length larger (581 – 630) than in Bolivian (460) and Philippine (303-500) specimens. We assume this difference to represent intraspecific (perhaps geographical) variability.

***Monoschelobates parvus* Balogh and Mahunka, 1969
(Figure 3)**

Diagnosis — Body size: 282 – 315 × 166 – 199. Rostrum rounded. Prodorsal setae long, setiform, barbed. Sensilli clavate, weakly barbed. Translamellar line represented by rudimentary parts. Prolamellar lines present. Notogaster with ten pairs of short setae. Aggenital setae absent. Leg claws serrate on dorsal side.

Description — Measurements. Body length: 282-315 (six specimens); notogaster width: 166-199 (six specimens).

Integument — Body color light brown. Body surface smooth.

Prodorsum — Rostrum rounded. Lamellae located dorso-laterally, as long as half of prodorsum (in lateral view), without cusps. Translamellar line represented by rudimentary parts near to lamellae. Prolamellar and sublamellar lines distinct. Sublamellar porose areas (*Al*) very small ($2 - 4 \times 1 - 2$), oval. Rostral (28-32), lamellar (36-45) and interlamellar (61 – 65) setae setiform, barbed. Sensilli (53 – 65) clavate, with well dilated head, having small barbs. Exobothridial setae (2) minute. A pair of elongate, narrow porose areas present (visible in dissected specimens) latero-posterior to interlamellar setae.

Notogaster — Anterior notogastral margin convex medially. Dorsophragmata small. Ten pairs of thin, smooth notogastral setae present; setae *c* and *la* (8) slightly longer than others (4 – 6). Four pairs of sacculi (*Sa*, *S1*, *S2*, *S3*) oval, with small openings.

Epimeral and lateral podosomal regions — Apodemes 1, 2, 3 and sejugal apodemes distinct. Epimeral setal formula: 3-1-3-3. Setae setiform, thin, smooth; medial setae *1a*, *2a*, *3a* (4) shorter than

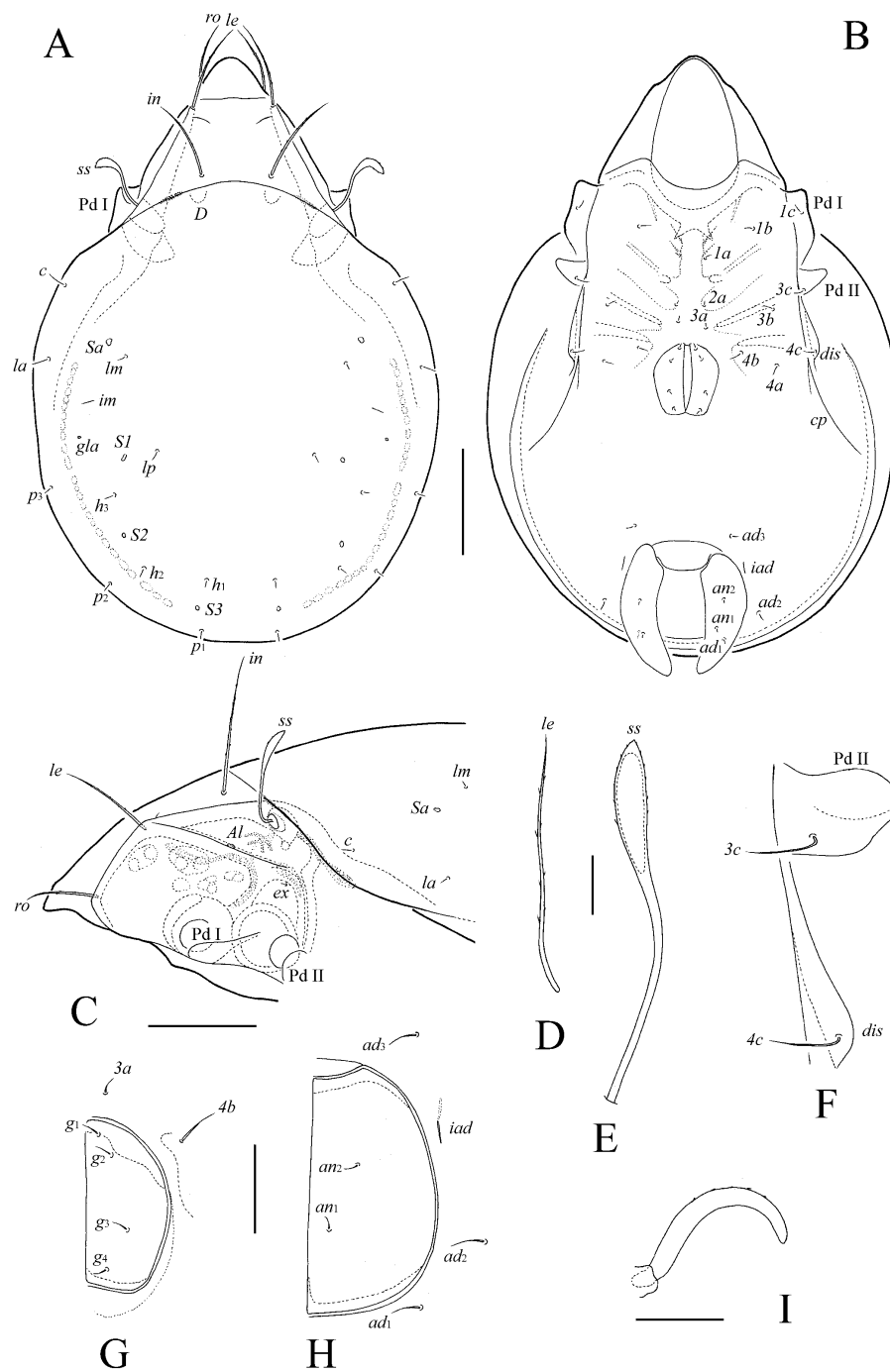


FIGURE 3: *Monoschelobates parvus* Balogh and Mahunka, 1969: A – body dorsally; B – body ventrally (gnathosoma and legs not illustrated); C – prodorsum and anterior part of notogaster laterally (gnathosoma and legs not illustrated); D – lamellar seta; E – sensillus; F – pedotectum II, discidium and epimeral setae 3c, 4c in dissected specimen; G – left genital plate and epimeral setae 3a, 4b; H – left anal plate and adanal setae ad_1 – ad_3 ; I – claw on leg I. Scale bars (A–C) 50 μ m, scale bar (D–F, I) 10 μ m, scale bar (G, H) 10 μ m.

others (8 – 12). Pedotecta I large, convex, pedotecta II rounded anteriorly. Discidia rounded distally. Circumpedal carinae distinct.

Anogenital region — Four pairs of genital (4), two pairs of anal (4) and three pairs of adanal (8 – 12) setae setiform, thin, smooth. Aggenital setae absent. Lyrifissures *iad* in paraanal position.

Legs — Each claw with several minute barbs on dorsal side. Formulae of leg setation and solenidia: I (1-5-3-4-19) [1-2-2], II (1-5-2-4-15) [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 1.

Material examined — Three specimens (two females and one male): Ec-1 (1.IV.2009, collected by F. Marian). Three specimens (one female and two males): Ec-1 (1.X.2008, collected by F. Marian).

Remarks — Ecuadorian specimens of *MonoscheLOBATES parvus* are similar in general appearance to Brazilian specimens (Balogh and Mahunka 1969; Balogh and Balogh 1990), but there is a clear difference: prolamellar lines present versus absent in Brazilian specimens. Sometimes presence or absence of prolamellar lines or their partial development can vary in specimens of one species in Scheloribatidae: for example, prolamellar lines in *SchelORIBATES fimbriatus* Thor, 1930 - present (see Subbotina 1978), developed partially (Mahunka 1987), indistinctly visible or absent (data of first author, based on specimens from Western Europe); similar situation is known for *SchelORIBATES (BischelORIBATES) mahunkai* Subías, 2010 (Ermilov 2013). Hence, we assume this difference to represent intraspecific variability in the case of *M. parvus*.

ACKNOWLEDGEMENTS

We gratefully acknowledge two anonymous reviewers for valuable comments.

Oribatid mites were investigated as part of the Research Unit "Biodiversity and sustainable management of a megadiverse mountain ecosystem in South Ecuador", subproject "Soil fauna: Diversity and functioning" headed by Mark Maraun and Stefan Scheu; financial support by the German Research Foundation is gratefully acknowledged (RU 816).

REFERENCES

- Balogh P. 1988 — Oribatid mites from Ecuador (Acari) — *Acta Zool. Hung.*, 34 (4): 321-328.
- Balogh J., Balogh P. 1990 — Oribatid mites of the Neotropical region. II — Budapest, Akad. Kiadó press, 333 p.
- Balogh J., Balogh P. 1992 — The oribatid mites genera of the world. Vol. 1 — Budapest, Hung. Nat. Mus. press, 263 p.
- Balogh J., Balogh P. 2002 — Identification keys to the oribatid mites of the Extra-Holarctic regions. Vol. 1 — Miskolc, Well-Press Publishing Limited, 453 p.
- Balogh J., Mahunka S. 1969 — The scientific results of the Hungarian soil zoological expeditions to South America. 10. Acari: Oribatids, collected by the second expedition. I — *Acta Zool. Acad. Sci. Hung.*, 15 (1-2): 1-21.
- Coetzer A. 1967-1968 — New Oribatulidae Thor, 1929 (Oribatei, Acari) from South Africa, new combinations and a key to the genera of the family — *Mem. Inst. Invest. Cient. Moçam.*, 9 (A): 15-126.
- Corpuz-Raros L. 1980 — Philippine Oribatei (Acarina) V. Scheloribates Berlese and related genera (Oribatulidae) — *Kalikasan*, 9 (2-3): 169-245.
- Ermilov S.G. 2013 — Additional description of Scheloribates (Bischeloribates) mahunkai Subías, 2010 (Acari: Oribatida: Scheloribatidae) — *Opusc. Zool. Budapest*, 44 (1): 9-14.
- Ermilov S.G., Kalúz S. 2012 — A new subgenus and three new species of oribatid mites of the family Scheloribatidae (Acari: Oribatida) from Ecuador — *Ann. Zool.*, 62 (4): 773-787.
- Ermilov S.G., Rybalov L.B., Franke K. 2011 — Ethiopian oribatid mites of the family Scheloribatidae (Acari: Oribatida) — *Afr. Inverteb.*, 52 (2): 311-322. doi:10.5733/afin.052.0207
- Ermilov S.G., Sandmann D., Marian F., Maraun M. 2013 — Three new species of oribatid mites (Acari, Oribatida) from Ecuador — *Acarologia*, 53 (1): 111-123.
- Illig J., Sandmann D., Schatz H., Scheu S., Maraun M. 2007 — Checklist reserva biológica San Francisco (Prov. Zamora-Chinchipe, S. Ecuador) — *Ecotropical monogr.*, 4: 221-230.
- Hammer M. 1958 — Investigations on the oribatid fauna of the Andes Mountains. I. The Argentine and Bolivia — *Det Kong. Dansk. Vidensk. Selsk. Biol. Skr.*, 10 (1): 1-129.
- Hammer M. 1961 — Investigations on the oribatid fauna of the Andes Mountains. II. Peru — *Det Kong. Dansk. Vidensk. Selsk. Biol. Skr.*, 13 (1): 1-157.
- Hammer M. 1973 — Oribatids from Tongatapu and Eua, the Tonga Islands, and from Upolu, Western Samoa —

- Det Kong. Dansk. Vidensk. Selsk. Biol. Skr., 20 (3): 1-70.
- Mahunka S. 1987 — A survey of the oribatids of the Kiskunság National Park (Acari: Oribatida) — The fauna of the Kiskunság National Park, 2, Budapest: 346-397.
- Norton R.A., Behan-Pelletier V.M. 2009 — Oribatida. Chapter 15. In: G.W. Krantz & D.E. Walter (eds.). A Manual of Acarology — Texas Tech Univ. Press, Lubbock, 430-564.
- Pletzen R. 1965 — Studies on the South African oribatei (Acari). III. Further new species of the genus *Schelorbates* Berlese, 1908 — *Acarologia*, 17 (1): 113-120.
- Schatz H. 1998 — Oribatid mites of the Galapagos Islands - faunistics, ecology and speciation — *Exp. Appl. Acarol.*, 22: 373-409. doi:10.1023/A:1006097928124

- Subbotina I.A. 1978 — Redescription of the species *Schelorbates fimbriatus* S. Thor, 1930 from the family *Schelorbatiidae* (Oribatei) — Fauna, biology and ecology of helminthes and their intermediate hosts, Gorkiy: 81-83.

COPYRIGHT

 Ermilov S.G. *et al.* *Acarologia* is under free license. This open-access article is distributed under the terms of the Creative Commons-BY-NC-ND which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original author and source are credited.