SPIXIANA	41	2	189–196	München, Dezember 2018	ISSN 0341–8391

A new species of *Perscheloribates* from Vietnam, with notes on the genus records in the country

(Acari, Oribatida, Scheloribatidae)

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Ermilov, S. G. & Starý, J. 2018. A new species of *Perscheloribates* from Vietnam, with notes on the genus records in the country (Acari, Oribatida, Scheloribatidae). Spixiana 41 (2): 189–196.

A new species of *Perscheloribates* (Oribatida, Scheloribatidae) is described from moss under a solitary deciduous tree in Hanoi (Northern Vietnam); *P. hanoiensis* spec. nov. differs from *P. crassisetosus* Ermilov, Rybalov & Franke, 2011 by the pointed rostrum and spindle-form bothridial setae. Some data on distribution and ecology of representatives of the genus in Vietnamese fauna are presented.

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Introduction

During taxonomic studies of oribatid mites (Acari, Oribatida) from Northern Vietnam (Ermilov & Starý 2017a–g, Miko & Ermilov 2017), we discovered a new species of the genus *Perscheloribates* Hammer, 1973, nominative subgenus. The primary goal of the paper is to describe and illustrate this new species.

Perscheloribates was proposed by Hammer (1973) with *Perscheloribates clavatu*s Hammer, 1973 as type species. Currently, it comprises four subgenera (*P.* (*Perscheloribates*) Hammer, 1973, *P.* (*Ecuadoribates*) Ermilov & Kalúz, 2012, *P.* (*Makischeloribates*) Corpuz-Raros, 1980, *P.* (*Oxyscheloribates*) J. & P. Balogh, 1990) and 50 species, which are distributed in the tropical and subtropical regions. However, Subías (2004, updated 2017) considered *Ecuadoribates* as independent genus and the other genera as subgenera of the genus *Scheloribates* Berlese, 1908. The main diagnostic characters of *P.* (*Perscheloribates*) (including traits of *Ischeloribates* Corpuz-Raros, 1980 – junior synonym of *Perscheloribates*) were summarized by Hammer (1973), Corpuz-Raros (1980), Balogh & Balogh (1990, 1992). The identification keys for many species from the different regions were presented earlier by Balogh & Balogh (1990, 2002), Ermilov et al. (2011), and Ermilov & Martens (2014).

Earlier, only four species of *Perscheloribates* were registered in Vietnam (Ermilov 2015). The secondary goal of the paper is to present some information on the distribution and ecology of representatives of the genus in the Vietnamese fauna.

Material and methods

Material examined. Holotype (female) and five paratypes (three females and two males) were collected from: Northern Vietnam, Hanoi, Thank-Tri, Hotel La Thanh, hotel garden, moss sample under solitary deciduous tree (No. VIE-8), 7.X.1988 (J. Starý).

Methods. Specimens were mounted in lactic acid on temporary cavity slides for measurement and illustration. 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 of the notogaster in dorsal view (behind pteromorphs). Lengths of body setae were measured in lateral aspect. All body measurements are presented in micrometers.

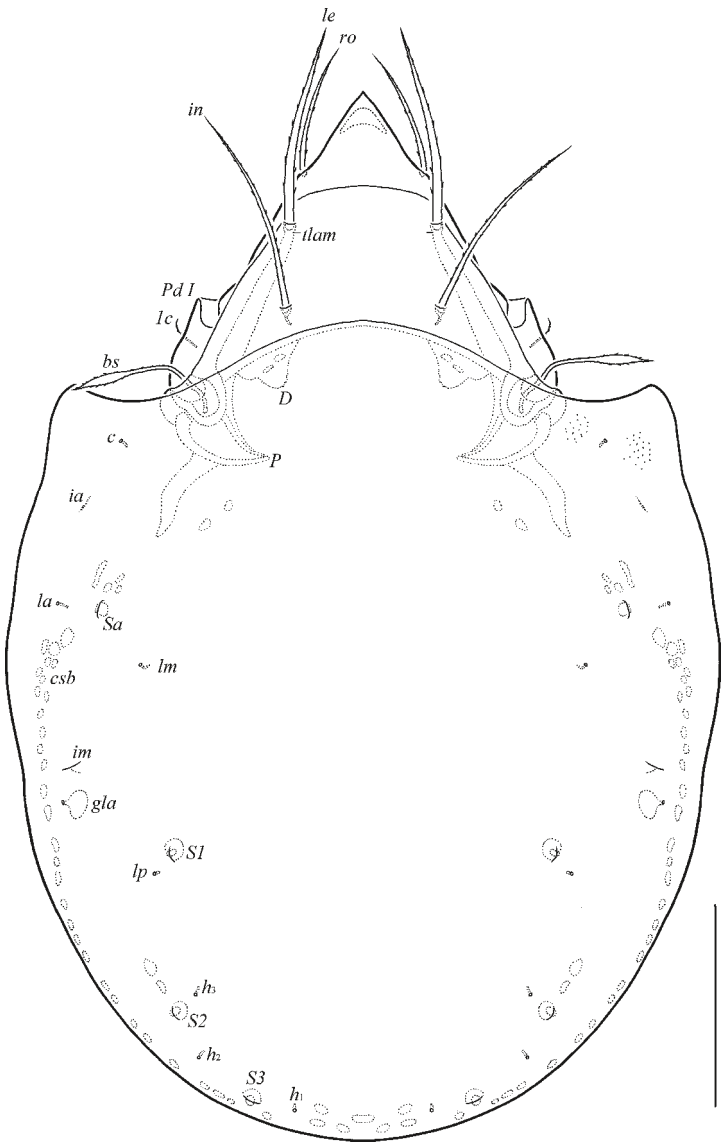


Fig. 1. *Perscheloribates hanoiensis* spec. nov., adult: Dorsal view, legs not illustrated. Scale bar = 100 µm.

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".

Morphological terminology used in this paper follows that of F. Grandjean (see Travé & Vachon 1975 for references), Norton (1977) for leg setal nomenclature, and Norton & Behan-Pelletier (2009), for overview.

The following abbreviations are used: *lam* – lamella; *tlam* – translamella; *slam* – sublamella; *plam* – prolamella; *Al* – sublamellar porose area; *kf* – lateral keel-shaped ridges; *rp* – rostrophragma; *ro*, *le*, *in*, *bs*, *ex* – rostral, lamellar, interlamellar, bothridial and exobothridial setae, respectively; *bo* – bothridium; *D* – dorsophragma; *P* – pleurophragma; *c*, *la*, *lm*, *lp*, *h*, *p* – notogastral setal alveoli; *Sa*, *S1*, *S2*, *S3* – notogastral sacculi; *ia*, *im*, *ip*, *ih*, *ips* – notogastral lyrifissures; *gla* – opisthonotal gland opening; *cs* – circumgastric scissure; *csb* – circumgastric sigillar band; *h*, *m*, *a* – subcapitular setae; *or* – adoral seta; *v*, *l*, *d*, *cm*, *acm*, *ul*, *sul*, *vt*, *lt* – palp setae; *cha*, *chb* – cheliceral setae; *cht* – dorsoparaxial cheliceral

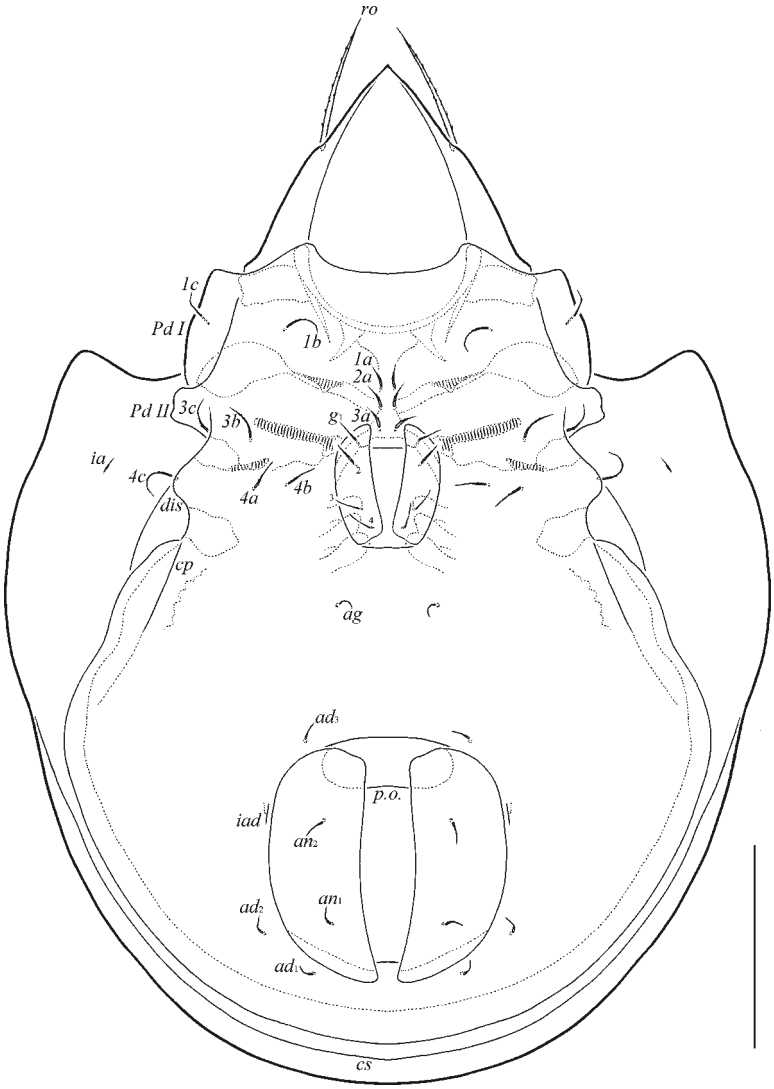


Fig. 2. *Perscheloribates hanoiensis* spec. nov., adult: Ventral view, gnathosoma and legs not illustrated. Scale bar = 100 µm.

tooth; *Tg* – Trägårdh's organ; *Pd I*, *Pd II* – pedotecta I, II, respectively; *1a*, *1b*, *1c*, *2a*, *3a*, *3b*, *3c*, *4a*, *4b*, *4c* – epimeral setae; *dis* – discidium; *cp* – circumpedal carina; *g*, *ag*, *an*, *ad* – genital, aggenital, anal and adanal setae, respectively; *iad* – adanal lyrifissure; *Amar* – marginal porose area; *p.o.* – preanal organ; *Tr*, *Fe*, *Ge*, *Ti*, *Ta* – leg trochanter, femur, genu, tibia, tarsus, respectively; *p.a.* – leg porose area; ω, σ, φ – solenidia; ε – leg famulus; *v*, *ev*, *bv*, *l*, *d*, *ft*, *tc*, *it*, *p*, *u*, *a*, *s*, *pv*, *pl* – leg setae.

The following collections are used: SMNH – Senckenberg Museum of Natural History, Görlitz, Germany; TSUMZ – Tyumen State University Museum of Zoology, Tyumen, Russia.

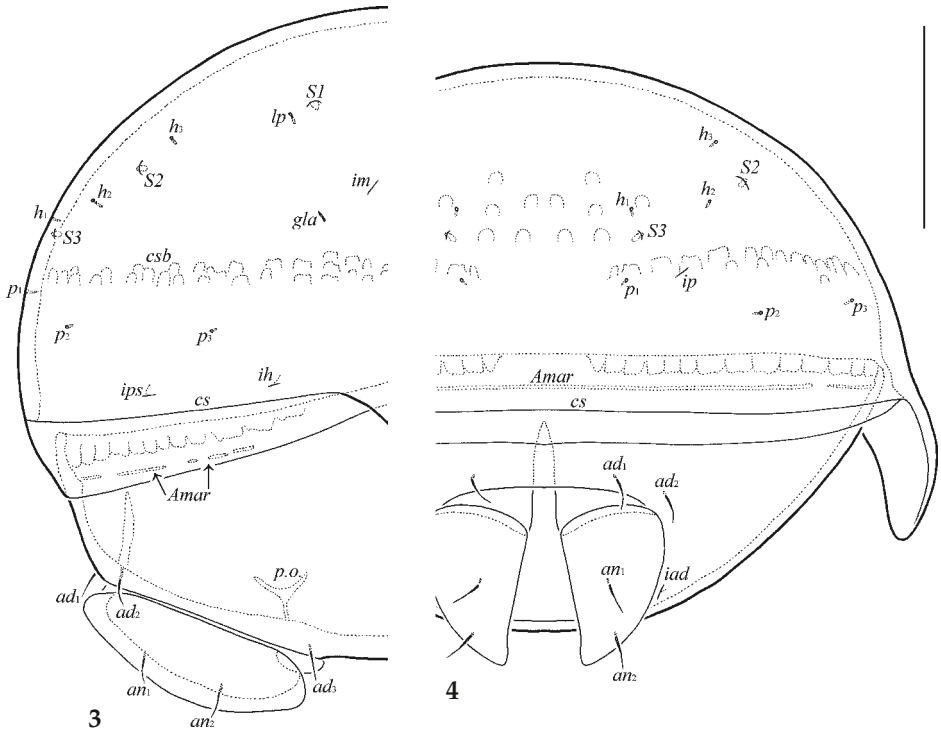
Systematics

Family Scheloribatidae Grandjean, 1933
Genus *Perscheloribates* Hammer, 1973

Perscheloribates hanoiensis spec. nov.

Figs 1–10

Diagnosis. Body size: 464–531 × 332–365. Rostrum pointed. Prolamellae complete. Translamellar line represented by two rudimentary parts. Rostral, lamellar and interlamellar setae long, setiform, barbed,



Figs 3–4. *Perscheloribates hanoiensis* spec. nov., adult: **3.** Posterior part of body, lateral view. **4.** Posterior view, part of left half not illustrated. Scale bar = 100 µm.

ro shortest, *in* longest, *le* distinctly thicker than others. Bothridial setae spindle-form, barbed. Notogastral setae represented by alveoli. Distance of notogastral saccules *S1–S1* similar to *S2–S2*. Subcapitular setae *a* and *m* smooth, shorter and thinner than barbed *h*. Circumpedal carinae short. Marginal porose area represented several parts. Leg tarsi I with 19 setae (*l"* absent).

Description

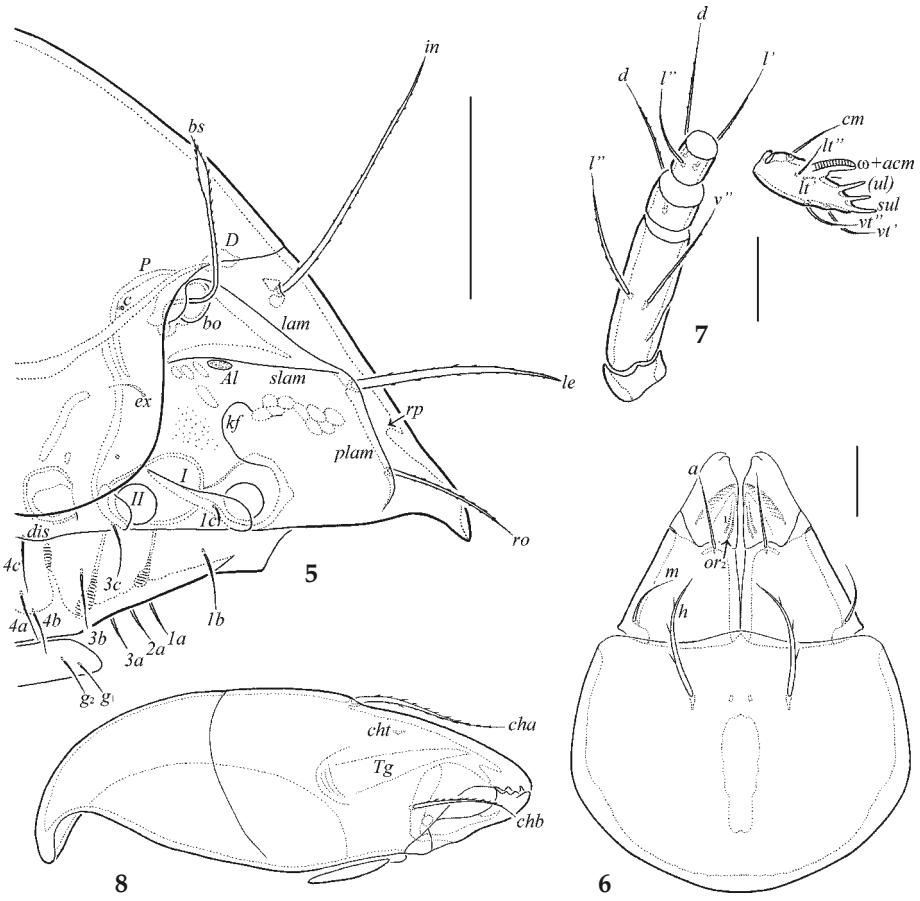
Measurements. Body length: 464 (holotype, female), 464–531 (five paratypes: three females and two males); notogaster width: 332 (holotype), 332–365 (five paratypes). No clear differences between females and males in body size.

Integument. Body colour light brown. Body surface and legs microfoveolate (visible under high magnification). Lateral parts of prodorsum between sublamellae and acetabula I, II microgranulate.

Prodorsum (Figs 1, 2, 5). Rostrum pointed. Lamellae located dorsolaterally, about half of prodorsum (measured in lateral view). Prolamellae complete, curving distally to lateral parts of the prodorsum. Sublamellae thin, about length of lamellae. Translamellar line represented by two very short, rudimentary parts near lamellae. Sublamellar porose areas oval (12 × 4–8). Rostral (69–73), lamellar (98–106) and interlamellar (135–143) setae setiform, barbed, *le* distinctly thicker than others. Bothridial setae (86–94) spindle-form, barbed, with long stalk and shorter, lanceolate head having thin apex. Anterocentral transverse ridge (between rostral and lamellar setae) and lateral keel-shaped ridges well-developed. Sejugal porose areas not visible. Exobothridial setae (16–20) setiform, thin, slightly barbed. Dorsophragmata semi-oval.

Notogaster (Figs 1, 3–5). Anterior notogastral margin convex medially. Ten pairs of notogastral setae represented by alveoli. Four pairs of saccules with small openings and drop-like channels. Distance *S1–S1* similar to *S2–S2*. Setae *lm* inserted posteromedial to *Sa*, *lp* posterior to *S1*. All lyrifissures distinct, *im* located anterolateral to *S1* and distanced from them, *ip* lateral to p_1, *ih* and *ips* distanced from each other. Opisthonotal gland openings located posterior to *im*. Circumgastric scissure and circumgastric sigillar band distinct.

Gnathosoma (Figs 6–8). Subcapitulum longer than wide (106–110 × 82–86). Subcapitular setae

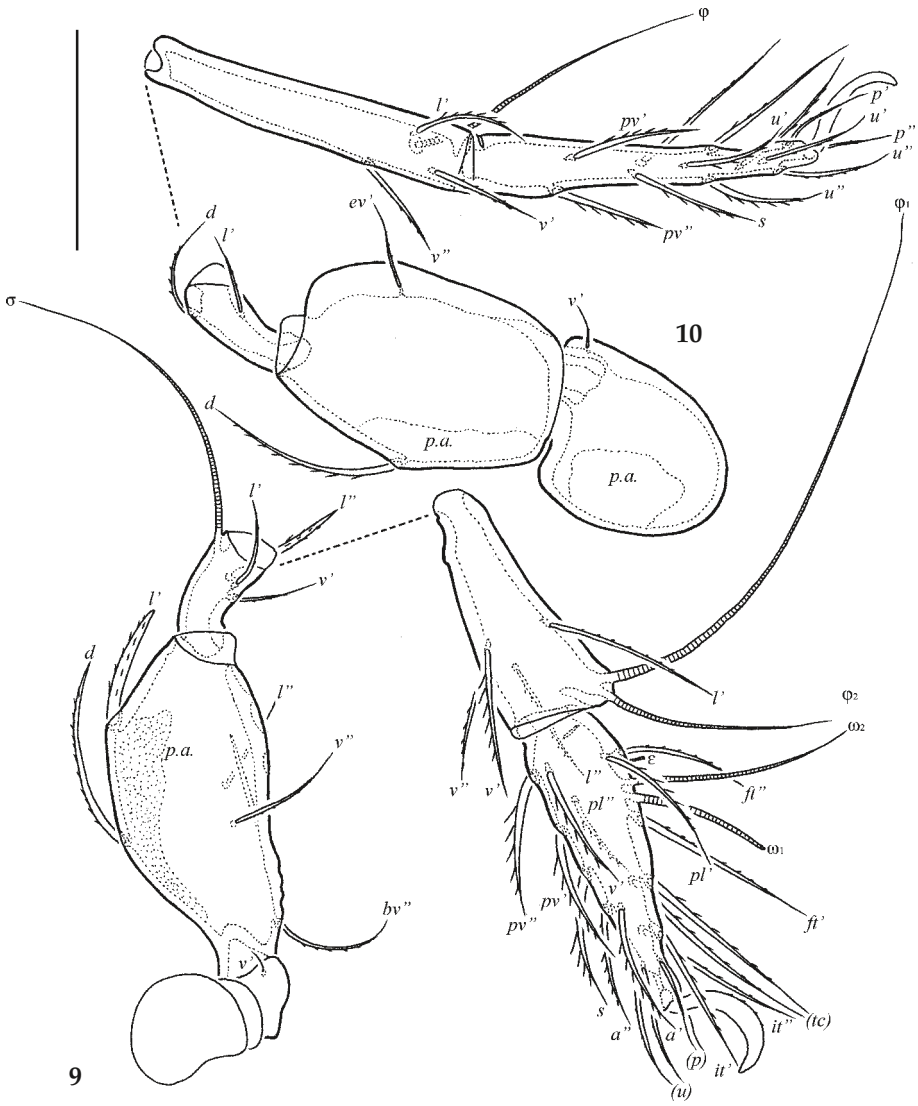


Figs 5–8. *Perscheloribates hanoiensis* spec. nov., adult: **5.** Anterior part of body, lateral view, gnathosoma and legs not illustrated. **6.** Subcapitulum, ventral view. **7.** Palp, right, antiaxial view. **8.** Chelicera, right, antiaxial view. Scale bars = 100 µm (5), = 17 µm (6,7,8).

setiform, *a* (16–18) and *m* (12–14) smooth, shorter and thinner than sparsely ciliate *h* (30–32). Two pairs of adoral setae (8) setiform, smooth. Palps (length 69–77) with typical setation 0–2–1–3–9(+ω). Postpalpal setae (4) spiniform, smooth. Chelicerae (length 114–118) with dorsoparaxial, triangular tooth and two setiform, barbed setae, *cha* (32–36) longer than *chb* (22–28). Trägårdh's organ of chelicerae elongate triangular.

Epimeral and lateral podosomal regions (Figs 2, 5). Epimeral setal formula: 3–1–3–3. Setae setiform, thin, barbed, *1b*,*3b*,*3c*,*4c* (28–30) longer than *4a*,*4b* (20–22) and *1a*,*2a*,*3a*,*1c* (16–18), setae *1a*,*2a*, *3a* slightly thicker than others. Setae *1c* inserted ventrolaterally on pedotecta I. Pedotecta I and II represented by small laminae, *Pd II* quadrangular in ventral view. Discidia well-developed, elongate triangular, rounded distally. Circumpedal carinae short, with reduced posterior parts, anteriorly directed to acetabula IV.

Anogenital region (Figs 2–5). Four pairs of genital setae (g_1, 18–20; g_2–g_4, 16–18) setiform, sparsely barbed. One pair of aggenital (16–18), two pairs of anal (16–18) and three pairs of adanal (16–18) setae setiform, smooth. Adanal lyrifissures located close and parallel to anal plates. Adanal setae ad_1 in posterolateral, ad_2 in lateral, ad_3 in preanal positions. Marginal porose area present, represented several narrowly oval and band-like parts. Preanal organ goblet-like. Ovipositor is typical for Scheloribatidae (Ermilov 2010): elongated (143–151 × 53–57), blades (61–65) shorter than length of distal section (beyond middle fold; 82–86). Each of the three blades with four setae, $\psi_1 \approx \tau_1$ (28–32) setiform, longer than thorn-like $\psi_2 \approx \tau_a \approx \tau_b \approx \tau_c$ (12), all smooth. Six coronal setae spiniform (2).



Figs 9–10. *Perscheloribates hanoiensis* spec. nov., adult: **9.** Leg I, left, paraxial view. **10.** Leg IV, left, antiaxial view. Scale bar = 50 μm.

Table 1. Leg setation and solenidia of adult *Perscheloribates hanoiensis* spec. nov. [Roman letters refer to normal setae, Greek letters refer 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.]

Leg	Tr	Fe	Ge	Ti	Ta
I	*v′*	*d,(l),bv″,v″*	*(l),v′,σ*	*(l),(v),φ1,φ2*	*(ft),(tc),(it),(p),(u),(a),s,(pv),v′,(pl),ε,ω1,ω2*
II	*v′*	*d,(l),bv″,v″*	*(l),σ*	*(l),(v),φ*	*(ft),(tc),(it),(p),(u),(a),s,(pv),ω1,ω2*
III	*l′,v′*	*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)*

Legs (Figs 9–10). Claw of tarsi strong, serrate dorsally. Tibiae I and II with one tubercle ventrobasally. All femora rounded ventrodistally. Porose areas on femora I–IV and on trochanters III, IV and ventral porose areas in basal parts of tarsi and distal parts of tibiae slightly visible. Formulas 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. Famulus of tarsi I short, erect, slightly dilated and truncated distally, inserted posterior to solenidion ω_2.

Type deposition. The holotype (ethanol with drop of glycerol) is deposited in SMNH; five paratypes (ethanol with drop of glycerol) are deposited in TSUMZ.

Etymology. The specific name *hanoiensis* refers to the city of Hanoi (Northern Vietnam), where the new species was collected.

Remarks. *Perscheloribates hanoiensis* spec. nov. is morphologically most similar to *P. crassisetosus* Ermilov, Rybalov & Franke, 2011 from Ethiopia (see Ermilov et al. 2011) in having lamellar setae distinctly thicker than rostral and interlamellar setae, but differs by the pointed rostrum (versus rounded) and spindle-form bothridial setae (versus with asymmetrically dilated heads).

Also, the new species is morphologically similar to *P.* (*Oxyscheloribates*) *aculeatus* Hammer, 1961 from Peru (see Hammer, 1961) in having pointed rostrum, but differs by the minute rostral point (versus rostral point clearly elongated) and spindle-form bothridial setae having thin apex (versus fusiform without thin apex), and the absence of notogastral setae p_1 (versus p_1 comparatively long).

Distribution and ecology of *Perscheloribates* in Vietnam

Five species (see data on the new species in the Material and methods section) of *Perscheloribates* (all from the nominative subgenus) are known in Vietnam. *Perscheloribates lanceolatus* (Aoki, 1984) was registered from soil of tropical forests in the Red River Delta (Northern Vietnam) (Vu et al. 2008); *P. luminosus* (Hammer, 1961) was found in litter and soil of mixed pine forests in Bi Dup–Nui Ba National Park (Southern Vietnam) (Ermilov & Anichkin 2014) and in leaf litter and soil of primary foggy forest and mosses on the solitary tree in Tam Dao National Park (Northern Vietnam) (personal data); *P. luteus* (Hammer, 1962) was recorded from soil of tropical forests in the Red River Delta (Northern Vietnam) (Vu et al. 2012) and Phong Nha–Khe Bang (Central Vietnam) (Nguyen & Vu 2012); *P. minutus* (Pletzen, 1965) was collected in secondary tropical forest without designation of sample and biotope (Golosova 1983), from litter and soil of mixed pine forests in Bi Dup–Nui Ba National Park (Southern Vietnam) (Ermilov & Anichkin 2014), and from leaf litter and soil of primary foggy forest in Tam Dao National Park (Northern Vietnam) (personal data).

Acknowledgements

We cordially thank two anonymous reviewers for valuable comments. The project was supported by the Russian Science Foundation (project 14-14-01134) and Academy of Sciences of the Czech Republic, under Research Plan No. AV0Z606960521.

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