A new species of Scheloribates (Acari, Oribatida, Scheloribatidae) from Vietnam, with key to the striolatus-group

SERGEY G. ERMILOV1* & JOSEF STARÝ2

1Tyumen State University, Tyumen, Russia
2Biology Centre v.v.i., Academy of Sciences of the Czech Republic, Institute of Soil Biology, České Budějovice, Czech Republic. E-mail: jstary@upb.cas.cz
*Corresponding author: E-mail: ermilovacari@yandex.ru

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Abstract
A new species of oribatid mite, Scheloribates daoensis sp. nov. is described from grass rhizosphere of meadow in the Tam Dao National Park, Northern Vietnam. It is morphologically most similar to S. striolatus Balogh, 1960, but differs by the body size, the morphology of bothridial setae, the length of circumpedal carinae and the distance between sacculi S1–S1. An identification key to known species/subspecies of striolatus-group of Scheloribates is provided.

Key words: Scheloribatidae, systematics, morphology, new species, key, Vietnam.

Introduction
Scheloribates Berlese, 1908 is a largest genus of oribatid mites of the family Scheloribatidae. The genus has several subgenera, and the nominal subgenus is currently comprised of 271 species and 20 subspecies, which have a cosmopolitan distribution, collectively (Subías 2004, updated 2016).

During taxonomic survey of oribatid mites from Northern Vietnam, we found a new species belonging to Scheloribates. Earlier, only 11 species and one subspecies of this genus were reported from this country (e.g. Ermilov et al. 2012; Ermilov & Anichkin 2013, 2014; Ermilov 2015, 2016). The main purpose of the paper is to describe and illustrate a new species and to present an identification key to known representatives of the striolatus-group of Scheloribates.

Material and Methods
Material examined. Holotype (female) and two paratypes (two males): Northern Vietnam, Tam Dao, 950 m a.s.l., meadow, sample (No. VIE-125) of grass rhizosphere, 17.X.1988 (collected by J. Starý & Nguyen Tri Tien).

Methods. 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 ventral plate. Notogastral width refers to the maximum width behind pteromorphs 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. 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. Drawings were made with a camera lucida using a Leica transmission light microscope “Leica DM 2500”.

**Description of new species**

*Scheloribates (Scheloribates) daoensis* sp. nov.  
(Figs 1–11)


**Description. Measurements.** Body of medium size, one female larger than two males. Body length: 531 (holotype, female), 465, 481 (two paratypes, two males); notogastral width: 348 (holotype), 265, 298 (two paratypes).


**Notogaster** (Figs 1, 3, 4). Anterior notogastral margin convex medially. Dorsophragmata (*D*) semiovial. Ten pairs of notogastral setae present, all minute (2), visible only under high magnification (×1000). Four pairs of sacculi (*Sa*, *S1*, *S2*, *S3*) with small openings and channels, distance *S1–S1* longer than *S2–S2*. Setae *lp* inserted medially to *S1*. Lyrifissures (*ia*, *im*, *ip*, *ih*, *ips*) and opisthantonal gland openings (*gla*) clearly visible.


**Anogenital region** (Figs 2, 4). Four pairs of genital (*g1–g4*), one pair of aggenital (*ag*), two pairs of anal (*an1*, *an2*) and three pairs of adanal (*ad1–ad3*) setae similar in length (12–16), setiform, slightly barbed. Adanal lyrifissures (*iad*) located close and parallel to anal plates. Preanal organ (*p.o.*) trapezoid in ventral view.

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Figures 1–3. Scheloribates (Scheloribates) daoensis sp. nov.: 1 — dorsal view; 2 — ventral view (gnathosoma and legs not shown); 3 — posterior view (part of right half not shown); Scale bar 100 μm.
Figures 4–7. Scheloribates (Scheloribates) daoensis sp. nov.: 4 — lateral view (gnathosoma and legs not shown); 5 — subcapitulum, ventral view; 6 — palp, right, antiaxial view; 7 — chelicera, right, antiaxial view. Scale bar 100 μm (4), 20 μm (5, 7, 6).

Legs (Figs 8–11). Median claw thicker than laterals, all serrate on dorsal side; lateral claws each with small tooth ventrodistantly. Dorso-paraxial porose areas (p.a.) on femora I–IV and trochanters III, IV and ventral porose areas in basal parts of tarsi and distal parts of tibiae well 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. Solenidia ω₁ on tarsi I, ω₁ and ω₂ on tarsi II and σ on genua III thickened, blunt-ended, other solenidia longer, setiform. Famuli short, straight, slightly dilated and truncated distally, inserted posterior to solenidia ω₂.
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Figures 8–11. Scheloribates (Scheloribates) daoensis sp. nov.: 8 — leg I, right, antiaxial view; 9 — trochanter, femur and genu of leg II, right, antiaxial view; 10 — trochanter, femur and genu of leg III, left, antiaxial view; 11 — leg IV, left, antiaxial view. Scale bar 50 μm.
Type deposition. The holotype is deposited in the collection of the Senckenberg Institute, Görlitz, Germany; two paratypes are deposited in the collection of the Tyumen State University Museum of Zoology, Tyumen, Russia.

Etymology. The specific name *daoensis* refers to the second part of the name of the Tam Dao National Park, Northern Vietnam, where the new species was collected.

Remarks. *Scheloribates daoensis* sp. nov. is morphologically most similar to *S. striolatus* Balogh, 1960 from Madagascar in having striate notogaster, spindle-form bothridial setae and rudimentary parts of translamellar line. However, the new species differs from the latter by the smaller body size (465–531 \( \times \) 265–348 vs. 700 \( \times \) 498), bothridial setae with apex longer head (vs. apex shorter than head), very short circumpedal carinae (vs. long) and distance between sacculi 5T–5T longer than S2–S2 (vs. shorter).

Table 1. Leg setation and solenidia of *Scheloribates daoensis* sp. nov. [Roman letters refer to normal setae, Greek letters to solenidia (except \( \varepsilon = \) 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. Tr – trochanter, Fe – femur, Ge – genu, Ti – Tibia, Ta – tarsus].

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<tr>
<th>Leg</th>
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<th>Fe</th>
<th>Ge</th>
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<tr>
<td>I</td>
<td>v’</td>
<td>d, (l), bv”, v”</td>
<td>(l), v’, ( \sigma )</td>
<td>(l), (v), ( \varphi_1 ), ( \varphi_2 )</td>
<td>(ft), (tc), (it), (p), (u), (a), s, (pv), v’, (pl). ( \varepsilon ), ( \omega_1 ), ( \omega_2 )</td>
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<td>II</td>
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Striolatus-group in the subgenus Scheloribates

Known species of *Scheloribates* with entire or partially striate (forming sometimes reticulate pattern) notogaster (lines present also on ventral side in some species) can be ascribed to *striolatus*-group (we use this group’s name for the first time). At present, this group can be encompassed 10 species (including present new species) and one subspecies. Some species (e.g. *S. schauenbergi* Mahunka, 1988, *S. rugosus* Hammer, 1958) having stria only on the pteromorphs are not included in this newly proposed group.

Key to known species/subspecies of the *striolatus*-group in the subgenus Scheloribates

<table>
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<tr>
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<th>Only posterior part of notogaster with striate pattern; body size: 457–564 ( \times ) 293–400. ..................................................................................</th>
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<td>3</td>
<td>Eleven pairs of notogastral setae present (( c_1 ) present); body size: 574 ( \times ) 331. ..................................................................................</td>
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<td>4</td>
<td>Heads of bothridial setae slightly dilated, narrowly lanceolate; body size: 575–615 ( \times ) 322–405. ..........................................................</td>
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<td>5</td>
<td>Bothridial setae clavate, with heads rounded distally; notogastral sacculi with long openings; body size: 460 ( \times ) 300. ..................................................................................</td>
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<th>Head</th>
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<td>6</td>
<td>Heads of bothridial setae with well developed distal apex</td>
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<td>7</td>
<td>Heads of bothridial setae without distal apex</td>
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<td>8</td>
<td>Translamellar line complete, with two median arch-like structures; body length: 575</td>
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<td>9</td>
<td>Prodorsum sparsely foveolate; interlamellar setae shorter than lamellar setae; body size: 273 × 121</td>
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<td>Distribution: Philippines</td>
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<td>10</td>
<td>Bothridial setae clavate, with heads rounded distally; body size: 485–545 × 324–424</td>
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<td>Distribution: Philippines</td>
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**Bothridial setae fusiform, with heads narrowed distally; notogastal sacculi with short openings; body size: 540–576 × 370–396.**

... *S. labyrinthicus oscensis* Pérez-Íñigo Jr., Herrero & Pérez-Íñigo, 1987. Distribution: Spain


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