

A NEW SPECIES OF TRIGONUPODA (MESOSTIGMATA: UROPODINA) FROM VIETNAM

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A new species *Trigonuopoda (Latipilitrigo) foliata* sp. n. was recorded in material collected from soil and leaf-litter in Bidoup Nui Ba National Park in Vietnam. This paper presents an illustrated description of the female and male of this species along with comparisons with closely related species.

Key words: Acari, mites, new species, taxonomy, rain forest, biodiversity.

INTRODUCTION

The tortoise mites of the suborder Uropodina are one of the most diverse groups of mesostigmatic mites with a total number of nearly 2000 known species (WIŚNIEWSKI & HIRSCHMANN 1993, MAŠÁN 2001). They are very abundant in forest litter, but can also be found in large numbers in moss, under stones, in ant nests, in the nests and burrows made by vertebrates, and in dung and carrion. Most appear to be predators that feed on nematodes or other small invertebrates, but others may feed on living and dead fungi and plant tissue (LINDQUIST *et al.* 2009, HALLIDAY 2015).

Southeast Asia is considered to have one of the highest levels of mite diversity globally, being characterized by high levels of both species richness and endemism. However, uropodid mites are not very well known in this region (e.g., Vietnam), and there has been little research on this group of arthropods there. The first species of Uropodina from Vietnam was described by BERLESE (1913) more than 100 years ago, and only 41 species of Uropodina have been reported in that country (WIŚNIEWSKI 1993, KONTSCHÁN & STARÝ 2011).

During recent field research in Vietnam, a previously unknown species of *Trigonuopoda* was collected. This article presents the description of this new species and compares it with other similar species.

MATERIAL AND METHODS

The material was collected from soil and leaf-litter in Bidoup Nui Ba National Park in Vietnam. Specimens were cleared in lactic acid solution and mounted in Hoyer's medium (WALTER & KRANTZ 2009). Illustrations were made by using an Olympus CX31 phase contrast microscope equipped with a drawing tube. Illustrations were prepared with CorelDRAW X7 and plates were compiled using Adobe Photoshop® software. Measurements were made from slide-mounted specimens, and presented as ranges (min.–max.) in micrometres.

The length of the genital shield was measured along the midline from the anterior margin to the posterior margin, and the width at its widest point. The length of the middle cheliceral segment was measured from the base to the apex of the fixed digit. The length of the fixed digit was taken from the anterior level of the nodus to the apex, and that of the movable digit from the base to apex. Idiosomal and gnathosomal setae were measured from the bases of their insertions to their tips, legs I–IV with coxa but without pretarsal ambulacrum. The type specimens are preserved as permanent slides and will be deposited in the Natural History Museum in London (UK).

RESULTS

TRÄGÅRDH (1952) described the new genus *Trigonuropoda* and designated *Urodinychus polyphemus* Vitzthum, 1935 as its type species. HIRSCHMANN (1975a–f) revised the genus and described many new species, and a number of further new species have been described since that time. Almost 90 species of *Trigonuropoda* are now known, mainly from tropical regions in Africa, Australia, Oceania, South America and several Asian countries (WIŚNIEWSKI 1993, KONTSCHÁN 2006a, b, 2008, 2012, 2013, KONTSCHÁN and STARÝ 2011, 2013). Most species have been described from New Guinea (28 species), Sri Lanka (13), Cuba (11) and the Philippines (11) (HIRAMATSU 1979, 1980, 1981, HIRAMATSU & HIRSCHMANN 1977, 1983, HIRSCHMANN 1975d, f; HIRSCHMANN & HIRAMATSU 1990, KONTSCHÁN 2013, KONTSCHÁN & STARÝ 2013). They are most often found in tropical forests, litter, dry leaves, rotting wood, and moss (WIŚNIEWSKI & HIRSCHMANN 1993).

Hirschmann (1975a–f) divided the genus *Trigonuropoda* into seven species groups based on the shape of the peritreme, the pattern of ornamentation of the posterior part of the dorsal shield, the number of marginal setae, the presence of a pronounced depression in the anterior dorsal shield, and a swollen hump in the posterior part of the dorsal shield – the *cubabaloghia*, *difoveolata*, *latipilis*, *polyphemus*, *crucistructura*, *trichokaszabia*, and *trichotuberculata* groups.

Later HIRSCHMANN (1979) published a new classification of the Uropodina with re-defined families and genera, including the creation of the family Trigonuropodidae. In this classification system he used three different categories: “Ganggattung”, “Stadiengattung” and “Stadiengruppen”, which are here interpreted as genus, subgenus, and species-group respectively. HIRSCHMANN (1979) divided the genus *Trigonuropoda* into seven subgenera (*Baloghiatrigon* Hirschmann, 1979, *Foveolatatrigon* Hirschmann, 1979, *Latipi-*

litrigon Hirschmann, 1979, *Trigonuopoda* Trägårdh, 1952, *Structuratrigon* Hirschmann, 1979, *Kaszabiatrigon* Hirschmann, 1979, and *Tuberculatatrigen* Hirschmann, 1979), which were based on the earlier division of the genus into seven groups of species. HIRSCHMANN (1990) then abandoned the use of subgenera and reverted to a classification based on species groups. He merged the *latipilis* species-group into the *difoveolata* species-group, and that structure was maintained in the next publication (WIŚNIEWSKI & HIRSCHMANN 1993).

HALLIDAY (2015) recognised *Baloghiatrigen*, *Foveolatatrigen*, *Kaszabiatrigon*, *Latipilitrigen*, *Structuratrigon*, *Trigonuopoda*, and *Tuberculatatrigen* as available names that could be applied to taxa at the genus or subgenus level. They are here treated as subgenera.

Key to subgenera of *Trigonuopoda*, based on HIRSCHMANN (1975d, 1979)

1. Anterior loop of petritreme directed forward 2
- Anterior loop of petritreme directed backward 5
2. Inner edge of the posterior part of the dorsal shield not crenulated, number of marginal setae 50–70 *Baloghiatrigen*
- Inner edge of the posterior part of the dorsal shield crenulated, number of marginal setae no more than 40 3
3. Anterior part of dorsal shield without depression and posterior part of dorsal shield without bulge (hump) *Foveolatatrigen*
- Anterior part of dorsal shield with depression or posterior part of dorsal shield with bulge (hump) 4
4. Anterior part of dorsal shield without depression, but posterior part of dorsal shield with bulge (hump) *Latipilitrigen*
- Anterior part of dorsal shield with depression, but posterior part of dorsal shield without bulge (hump) *Trigonuopoda*
5. Anterior part of dorsal shield without depression *Structuratrigon*
- Anterior part of dorsal shield with depression 6
6. Additional setae (in depression) on anterior part of dorsal shield are scarcely wider than dorsal setae, “chitinous bridge” on depression uniform, undivided *Tuberculatatrigen*
- Additional setae (in depression) on anterior part of dorsal shield are distinctly wider than dorsal setae, “chitinous bridge” of depression divided into two or three sections *Kaszabiatrigon*

Trigонуropoda (Latipilitrigon) Hirschmann, 1979

Trigонуropoda (Latipilitrigon) Hirschmann, 1979b: 61.

Trigонуropoda latipilis species group Hirschmann, 1975d: 55.

Type species. *Trigонуropoda latipilis* Hirschmann, 1975g: 80, by original designation.

Subgenus diagnosis. Species of the subgenus *Latipilitrigon* are easy to separate from the other species of *Trigонуropoda* on the basis of the following combination of characteristics: (1) the inner margin of the marginal shield is undulate, (2) anterior pit is absent on the dorsal idiosoma, and (3) caudal area is elevated from the neighbouring regions of the dorsal shield with 4–6 setae of a different type. The shape of the idiosoma oval, posterior margin rounded. The number of dorsal setae, excluding the marginal setae, is about 40. Varied types of setae, although most often are simple.

Ornamentation of genital shield foveate or reticulate. Peritreme M-shaped, the anterior loop of the peritreme facing the front part of the idiosoma. Conspicuous characters are Y-shaped first hypostomal *h1*, usually several times longer than *h2*. Setae *h3* simple, several times longer than *h2*. Corniculi short, horn-like. Chelicera – the fixed digit is noticeably longer than the movable digit, and the nodus is also visible.

***Trigонуropoda (Latipilitrigon) foliata* sp. n.**

<http://zoobank.org/5A684CB3-6FBC-4290-A988-9A4D202FAF7E>

(Figs 1–10)

Material examined – Holotype: female, Southern Vietnam, Lam Dong Province, Bidoup Nui Ba National Park, mixed pine-dominated forest (12°10'–12°11'N 108°40'–108°41'E), soil, leaf-litter, altitude 1533 m, 6th December, 2013, coll. A. E. Anichkin and S. G. Ermilov. Paratypes. Two females and two males, same data as holotype.

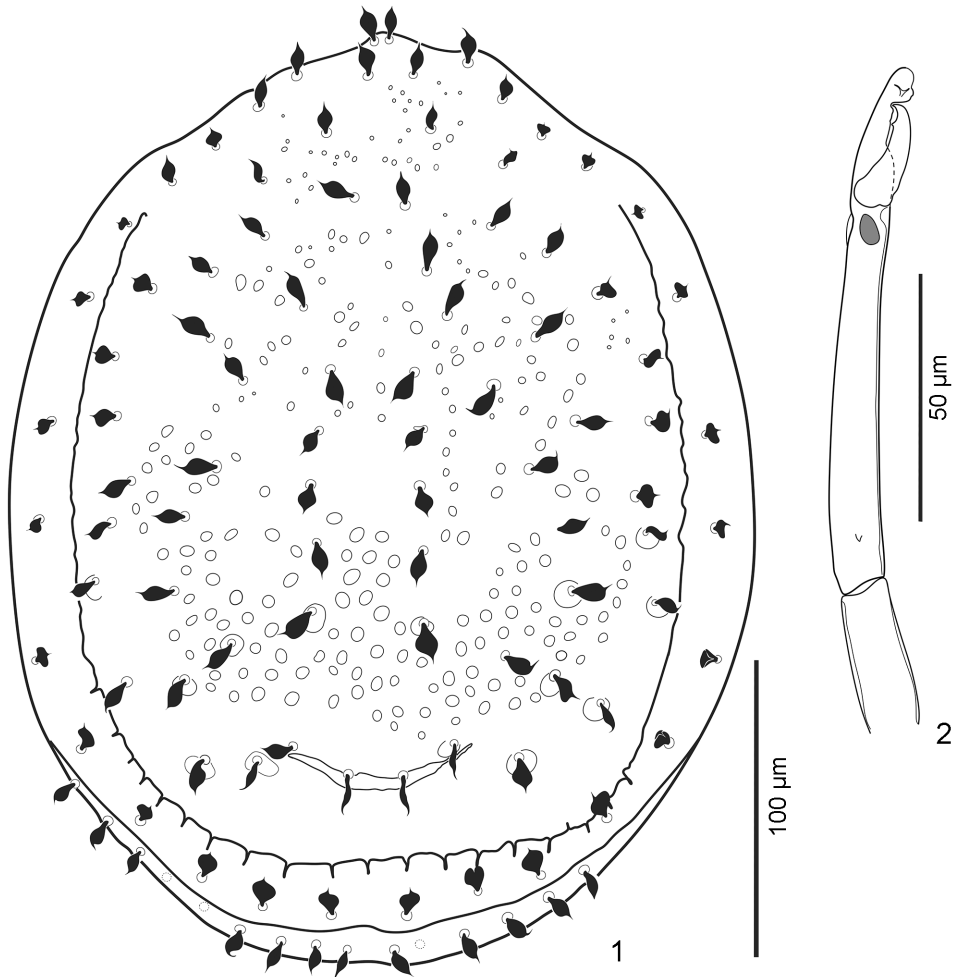
Description of female (n = 3) – Dorsal idiosoma (Fig. 1). Length of idiosoma 285–290 µm, width 230–234 µm (holotype 290 × 231). The dorsal side is oval-shaped and highly convex. The dorsal shield sculptured is foveate with sparse oval pores on the whole surface except a smooth lateral region. Dorsal setae lanceolate (leaf-form), ± 40 pairs, arranged in longitudinal rows (cosmotrichia-type). Marginal shield united anteriorly with a dorso-central region, with a dozen pairs of setae. In the posterior part of the dorsal shield a strongly sclerotized roller (bulge) with four setae of a different type.

Ventral idiosoma (Fig. 3). Tritosternal base narrow (12 µm), lacinia three-branched and pilose (median c. 20 µm and laterals 10 µm), lateral branches narrow and shorter than bifurcate median branch. Intercoxal region smooth, with three pairs of sternal setae (as microsetae), setae *st1* – 3–4 µm long, *st2* – 4–5 µm, *st3* – 4–5 µm and *st4* – 7–8 µm. Genital shield (epigynium) 83–87 µm long, 51–53 µm width (holotype 85 × 53 µm), with rounded anterior margin and flat posterior margin, extending mid-level coxa IV. Surface foveate with small alveolar pits, covered with small, deep oval pits; diameter of pits larger on posterior half than anterior. Below the genital shield, there is a distinct foveolate structure with two types of setae – three pairs of simple (27–36 µm) and eight pairs of lanceolate

setae (10–12 μm). Peri-anal setae also lanceolate, but distinctly shorter (5 μm). Pedofossae of legs I–IV present, rounded. Peritremes long, prestigmatal part with a bend near stigma and with a long angle of $\sim 90^\circ$, poststigmatal part straight.

Gnathosoma. Epistome narrow, lateral margins bearing small denticles (Fig. 4). Corniculi horn-like and weakly sclerotized, internal malae with pilose margins. Hypostomal setae *h1* flage-shape (27–30 μm), *h2* short thickened and serrate (5 μm), *h3* simple (16–19 μm), palpcoxal setae *pc* flattened and serrated (14 μm). Deutosternal groove smooth, lateral margins with a few denticles between insertion of *h2* and *h3* (Fig. 5). Fixed digit of a chelicera is long (24–27 μm – from base of nodus to the apex) with 5–6 small median teeth located on a base. Movable digit is shorter (19–22 μm – from base to apex), with a tiny median tooth and without a conspicuous arthrodistal process (Fig. 2).

Legs (Figs 6–9). Tarsi I–IV each with a pair of weak claws and pulvillus. Lengths of legs: leg I: 153–166 μm , leg II: 120–127 μm , leg III: 127–135 μm , leg IV: 134–144 μm .



Figs 1–2. *Trigonuropoda (Latipilitrigo) foliata* sp. n.: female, 1 = dorsal idiosoma, 2 = chelicera

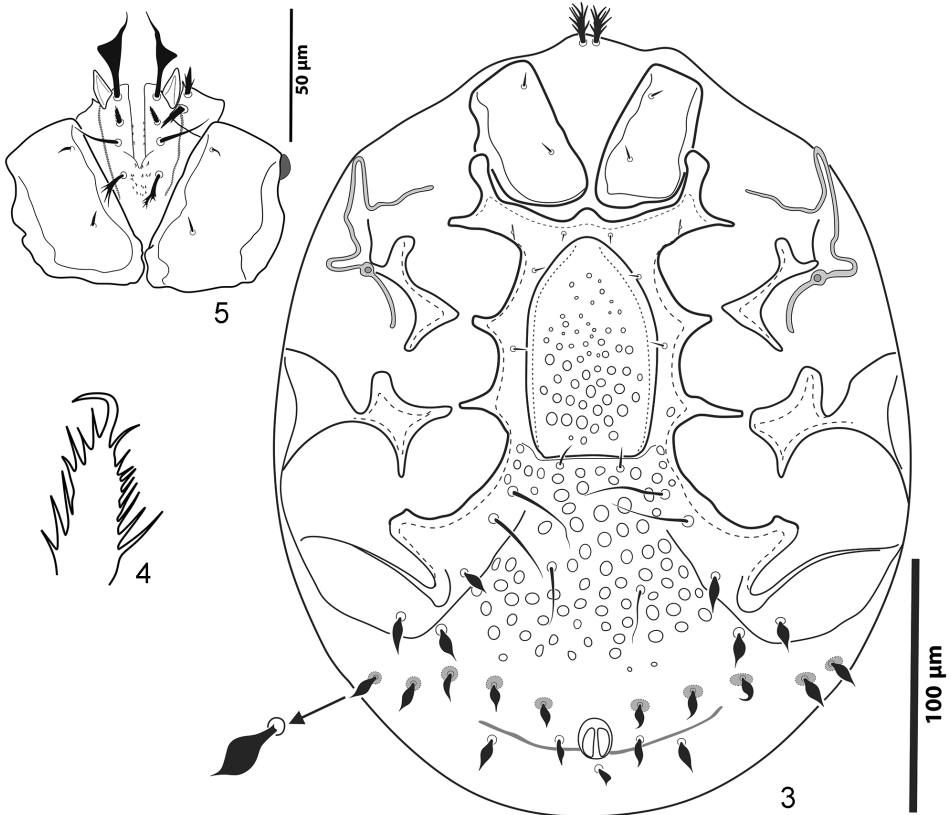
Description of male (n = 2) (Fig. 10) – Length of idiosoma 282–290 μm , width 222–235 μm . Sculpture and chaetotaxy of the dorsal shield as in female.

Ventral idiosoma. Intercostal region foveate, covered with alveolar pits. Five pairs of sternal setae present, setae *st1–st4* (μm) situated on the anterior region of a genital opening, setae *st5* situated at the level of the posterior margin of a genital opening. Genital opening smooth and rounded in outline (25–30 μm) located at the height of IV coxae. Below are three pairs of simple setae 30–35 μm) and nine pairs of lanceolate setae (8–10 μm). Peri-anal setae slightly smaller 5 μm).

Legs. Tarsi I–IV each with a pair of weak claws and pulvillus. Lengths of legs: leg I: 172–189 μm , leg II: 145–152 μm , leg III: 128–135 μm , leg IV: 148–155 μm .

Etymology – The name “*foliata*” refers to the leaf-like setae.

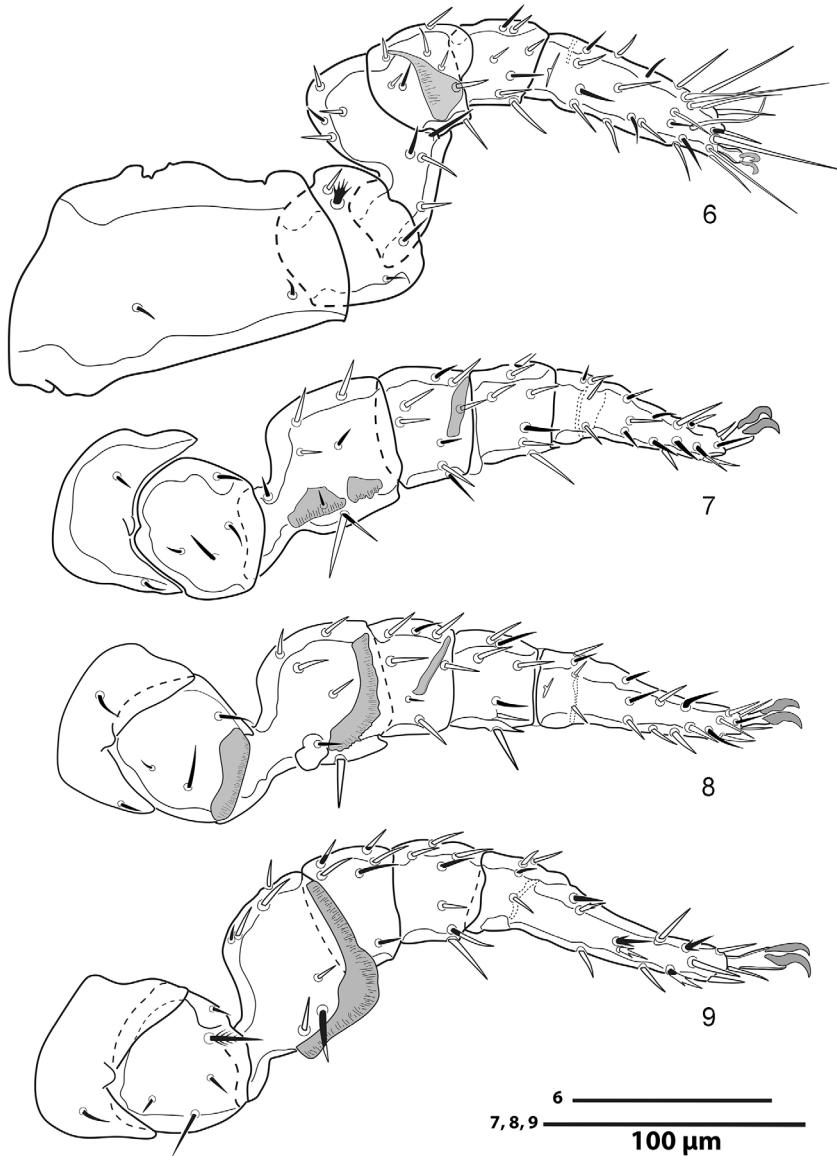
Remarks – *Trigonuropoda (Latipilitrigo) foliata* sp. n. is somewhat similar to species such as *T. (L.) latipilis* Hirschmann, 1975, *T. (L.) magnaporula* Hirschmann, 1975, *T. (L.) nonpolyphenus* Hirschmann, 1975 and *T. (L.) tuberculata* Hirschmann, 1975. The dorsal shield of all these species is foveate, and the hypostome or



Figs 3–5. *Trigonuropoda (Latipilitrigo) foliata* sp. n.: female, 3 = ventral idiosoma, 4 = epistome, 5 = hypostome

chelicera is also similar. The main difference, however, lies in the type of setae, because in *T. (L.) foliata* the dorsal setae and most of the ventral setae are lanceolate, leaf-shaped, while in other species the setae are simple or serrate.

The most similar species to *T. (L.) foliata* is *T. (L.) magnaporula*. They have similar setae *st1*–*st3*, ornamentation of the genital shield, and a similar shape



Figs 6–9. *Trigonuopoda (Latipilitricon) foliata* sp. n., legs of female: 6 = I leg, 7 = II leg, 8 = III leg, 9 = IV leg

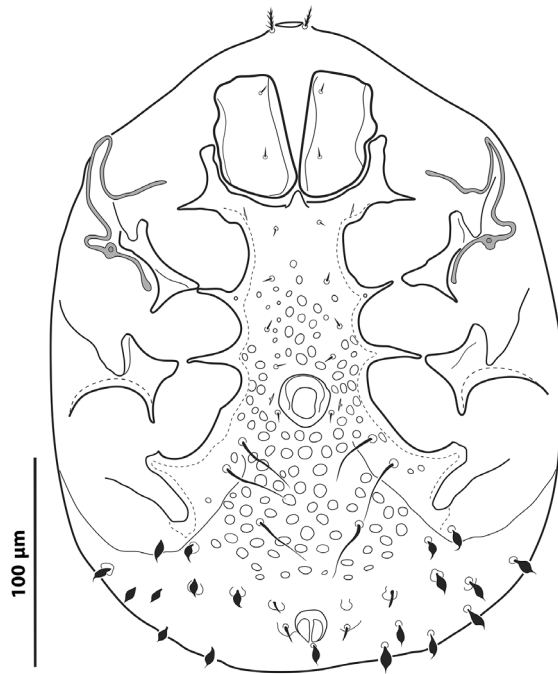


Fig. 10. *Trigonuropoda (Latipilitrigo) foliata* sp. n., male, ventral idiosoma

of the bulge on the posterior part of the dorsal shield. They differ not only in the type of setae, but also in many other features. The shape of the idiosoma is different, because *T. (L.) foliata* is regularly oval, while in *T. (L.) magnaporula* it is evidently narrowed in the anterior part. The shape of the peritreme is different in both species, e.g. in *T. (L.) foliata* the post-stigmal section is relatively short, while in *T. (L.) magnaporula* it is significantly longer.

DISCUSSION

So far, all subgenera and species in the genus *Trigonuropoda* are very characteristic and distinctly different from each other. Therefore, it is not difficult to describe new species and make a comparative analysis. However, as new species are described, it will be necessary in the short time soon to revise and describe in detail the species previously described by Hirschmann and co-authors.

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Acknowledgements – The authors would like to express deepest appreciation to Dr. Bruce Halliday (CSIRO Ecosystem Sciences, Canberra Australia) and anonymous reviewer for their substantive discussion and support in improving the publication.

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Revised version submitted April 5, 2023; accepted May 11, 2023; published June 30, 2023