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Torrenticolid water mites of India with description of three new species (Acari: Hydrachnidia, Torrenticolidae)

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Abstract

Three water mite species of the genera *Torrenticola* (*T. kumari* **sp. nov.** and *T. muranyii* **sp. nov.**) and *Monatractides* (*M. kotschani* **sp. nov.**) are described from the Uttarakhand State of India (Acari: Hydrachnidia, Torrenticolidae). The number of torrenticolid water mites known from India now tallies 33 species. A key for water mite species of the genera *Torrenticola* and *Monatractides* from the Indian Subcontinent is given.

Key words: Acari, Hydrachnidia, India, new species, running waters

Introduction

Torrenticolidae are common and distinctive water mites found worldwide, except in Antarctica. The family includes seven genera, *Torrenticola* Piersig, 1896, *Monatractides* Viets, 1926, *Testudacarus* Walter, 1928; *Pseudotorrenticola* Walter, 1906; *Neotractides* Lundblad, 1941, *Debsacarus* Habeeb, 1974, and *Stygotorrenticola* Pešić & Gerecke, 2014. Most of the torrenticolid mites inhabit lotic habitats (Smith *et al.* 2010, Pešić & Smit 2009a, 2014; Gu *et al.* 2018, 2019; Gu & Guo 2019), often they are the most dominant component in fast flowing streams. Several species are reported to occupy lentic habitats as well (Fischer *et al.* 2015).

To date, 30 species of the family Torrenticolidae have previously been described from India, 16 species of the genus *Monatractides* (Cook 1967; Kumar *et al.* 2006; Pešić *et al.* 2007, 2010, 2019a), 12 species of the genus *Torrenticola* (Cook 1967; Pešić *et al.* 2010, 2012, 2013, 2019a, b), one species of the genus *Testudacarus* (*T. tripeltatus* Walter, 1928) and one species of the genus *Neotractides* (*N. (Allotorrenticola) suvarna* Cook 1967).

The largest number of torrenticolid species (19 spp.) have been recorded from the southern states of India (i.e., Kerala, Maharashtra, Madras—see Pešić *et al.* 2010 for a discussion on water mites of India), south of the large Indo-Gangetic Plain which lack records of torrenticolid mites. On the other hand, 11 species have been recorded north of the Indo-Gangetic Plain, from the Himalayan region which shows distinct differences in the water mite fauna between the western and eastern ranges (Pešić *et al.* 2012). Eight species, i.e., *Torrenticola turkestanica*, *T. uttarakhandensis*, *T. chatterjeei*, *Monatractides angulatus*, *M. garhwaliensis*, *M. tuzovskyi*, *M. cf. oxystomus* and

Testudacarus tripeltatus have been reported from the western part of the Himalayan range. Three species, i.e. *Torrenticola episce* and *T. haliki*, both found in the gut content of the fish of *Botia dario* collected in a floodplain wetland in Assam (Pešić *et al.* 2013), and *T. malaisei* found in a mountain stream (Pešić *et al.* 2012), have been reported from the eastern part of the Himalayas. The fact that the fauna of the water mite family Torrenticolidae of India consist of 33 known species, including three new ones described in this study, very likely does not reflect the real diversity of this group.

The new material of the present study is collected by the junior authors (S.N and P.B.) in 2019 from the western part of Indian Himalayan range, resulted in the finding of three new species of torrenticolid mites (Hydrachnidia, Torrenticolidae). The aim of this paper is to describe this material and give a key for the water mite species of the genera *Torrenticola* and *Monatractides* from the Indian Subcontinent.

Material and Methods

All material was collected in Uttarakhand State of India and was fixed in 70% ethanol. Later on, water mites were transferred to Koenike-fluid and dissected as described elsewhere. Morphological nomenclature follows Gerecke *et al.* (2016). Holotypes of the new species and all non-type material will be deposited in Naturalis Biodiversity Center, Leiden (RMNH).

All measurements are given in μm . Measurements of palp and legs are of dorsal margin. Frontal and shoulder plates are measured on both sides and their values are given as a range. The following abbreviations are used: Ac-1 = first acetabulum; Cx-I = first coxae; Cxgl-4 = coxoglandularia 4; dL = dorsal length; H = height; I-L-4-6 = fourth-sixth segments of first leg; L = length; mL = medial length; P-1-P-5 = palp segments 1-5; Vgl-1 = ventroglandularium 1; vL = ventral length; W = width.

Systematic part

Family Torrenticolidae Piersig, 1902

Genus *Torrenticola* Piersig, 1896

Torrenticola kumari Pešić & Smit sp. nov.

(Figs. 1, 2, 3A–D)

Torrenticola semisuta Pešić *et al.* 2007: figs. 1–8, nec *T. semisuta* (Halík, 1930)

Type series. Holotype male (RMNH), dissected and slide mounted, India, Uttarakhand State, stream Khankara Gad near Govt. Higher Secondary School Khankara, 30°14'42" N, 78°54'55" E, alt. 707 m, 2.xii.2018, leg. Shailza Negi. Paratypes (RNHN): one male, stream Khanda Gad date, 30°12' N, 78°43' E (for sampling place descriptions see: Kumar & Dobriyal 1992), a tributary of Alaknanda River, leg. N. Kumar & K. Kumar, dissected and slide mounted; one male, one female, stream Dhundeshwar Gad, a tributary of Alaknanda River, leg. N. Kumar & K. Kumar, one female dissected and slide mounted (RMNH).

Compared material. *Torrenticola semisuta*, ♂, Malaysia, Jerian stream, Fraser's Hill, 3°43'28.74" N, 101°42'56.1" E, alt. 1011 m, 14.ii.2009 (RMNH).

Diagnosis. Idiosoma large (L ♂ 700, ♀ 770); dorsal shield with colour pattern as illustrated in Fig. 1A–D; P-2 ventrodiscal distally extension slightly curved, ventral seta relatively long.

Description. General features—Idiosoma oval (dorsal shield L/W ratio 1.2–1.3); dorsal shield with a colour pattern as illustrated in Figs. 1A–D; gnathosomal bay U-shaped, proximally rounded; Cxgl-4 subapical; suture lines of Cx-IV distinctly extending posteriorly beyond posterior margin of

genital field, laterally curved; excretory pore and Vgl-2 away from the line of primary sclerotization, excretory pore on the level of Vgl-2; gnathosoma with a curved ventral margin (Fig. 1C); P-2 as long as P-4, P-2 ventral margin straight, ventral seta relatively long, P-2 and P-3 ventrodistal protrusions bluntly pointed, P-2 ventrodistal extension slightly curved distally, P-4 with a well-developed ventral tubercle bearing one longer and three shorter setae (Figs. 1D–E). *Male*—medial suture line of Cx-II+III relatively short; genital field with obtuse, but distinct anterior angles, posteriorly parabola-shaped; ejaculatory complex conventional in shape (with well-developed anterior keel and proximal arms, see Pesic *et al.* 2007, fig. 5). *Female*—genital field pentagonal in shape.

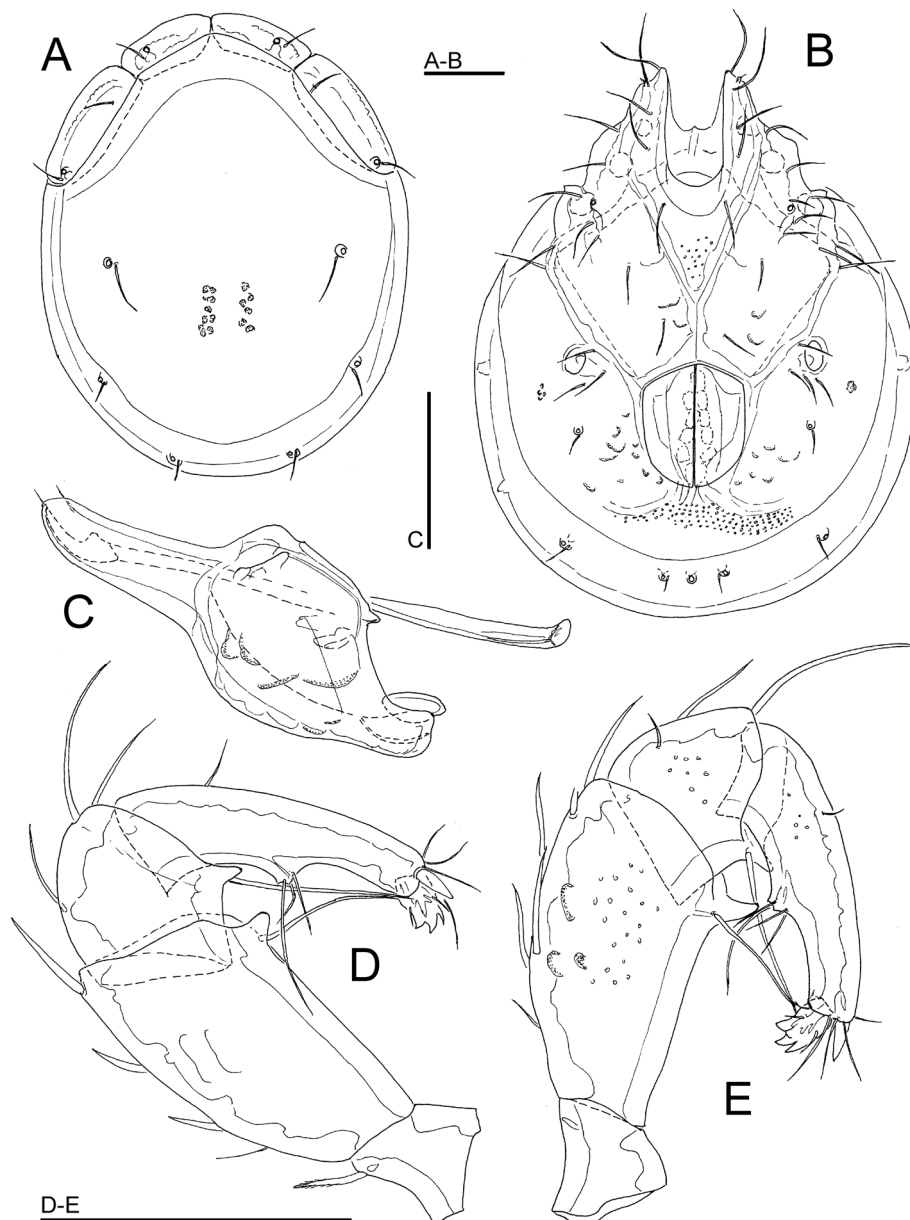


FIGURE 1. *Torrenticola kumari* sp. nov., male, Uttarakhand, stream Khankara Gad: A = dorsal shield; B = idiosoma, ventral view; C = gnathosoma and chelicera; D = palp, medial view; E = palp, lateral view. Scale bars = 100 μ m.

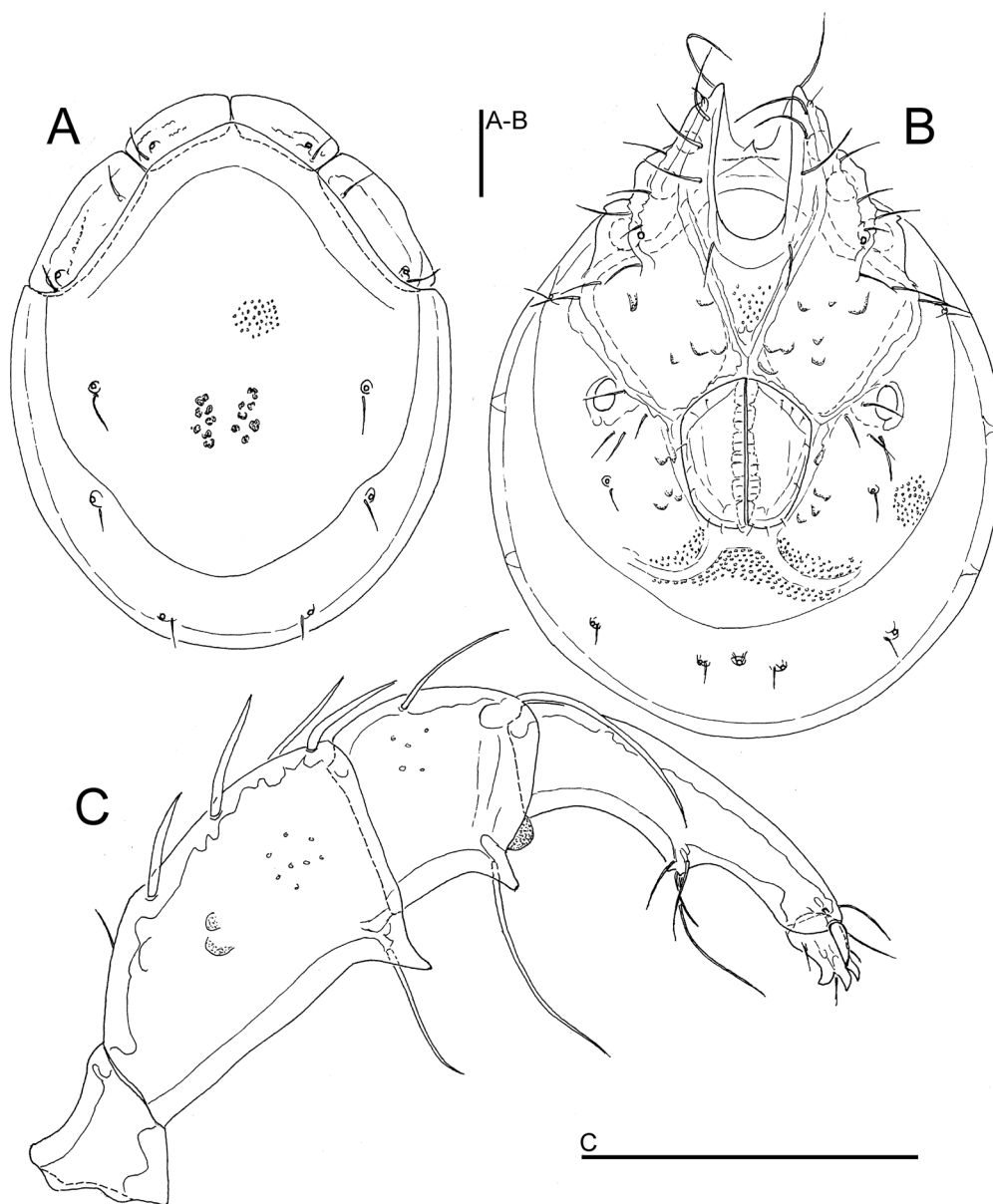


FIGURE 2. *Torrenticola kumari* sp. nov., female, Uttarakhand, stream Dhundeshwar Gad: A = dorsal shield; B = idiosoma, ventral view; C = palp, medial view. Scale bars = 100 μ m.

Measurements. Male (holotype)—Idiosoma (ventral view: Fig. 1B) L 700, W 565; dorsal shield (Figs. 1A) L 580, W 469, L/W ratio 1.24; dorsal plate L 555; shoulder plate L 170–175, W 69–71, L/W ratio 2.39–2.54; frontal plate L 125–134, W 53–56, L/W ratio 2.2–2.5; shoulder/frontal plate L 1.30–1.36. Gnathosomal bay L 153, Cx-I total L 294, Cx-I mL 141, Cx-II+III mL 72; ratio Cx-I L/Cx-II+III mL 2.1; Cx-I mL/Cx-II+III mL 2.0. Genital field L/W 163/127, ratio 1.28; distance genital field-excretory pore 119, genital field-caudal idiosoma margin 169. Gnathosoma vL 294, chelicera L 347; palp total 315, dL/H, dL/H ratio: P-1, 36/30, 1.2; P-2, 105/55, 1.9; P-3, 52/51, 1.02; P-4, 102/33, 3.1; P-5, 20/12, 1.7; L ratio P-2/P-4 1.03. dL of I-L-4-6: 105, 109, 105; I-L-6 H 38; dL/H I-L-6 ratio 2.8.

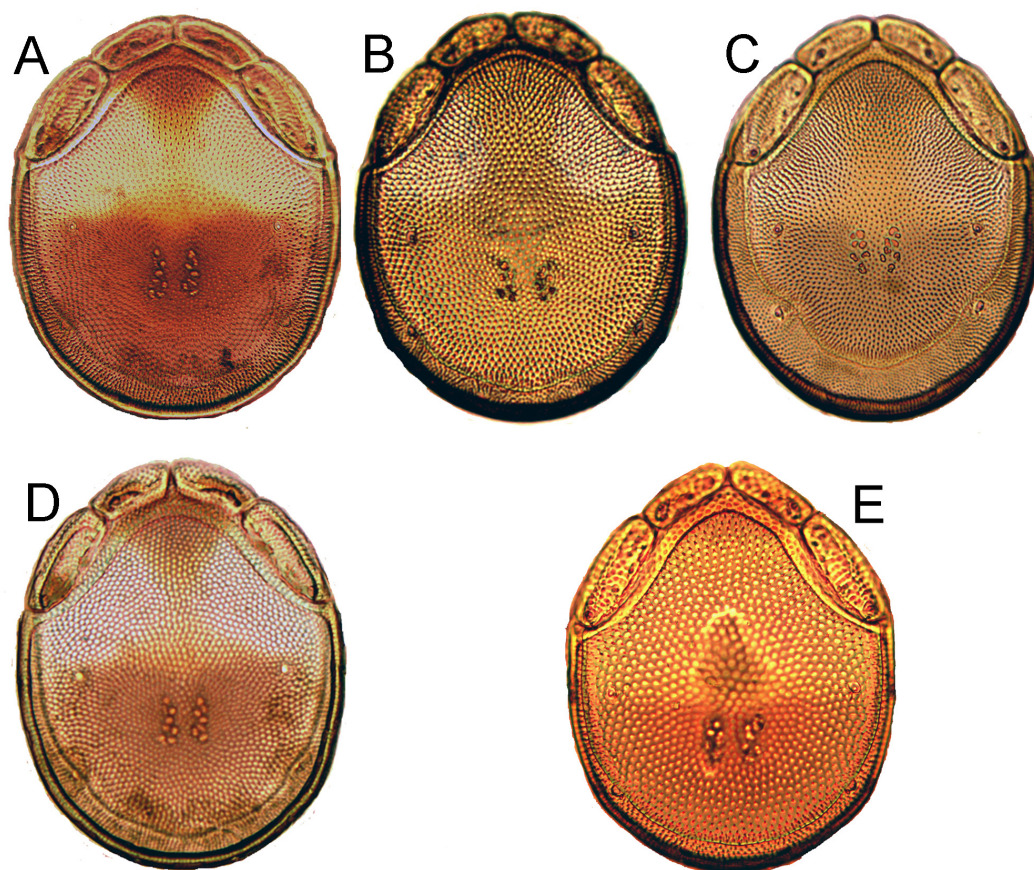


FIGURE 3. Photographs of dorsal shields: **A–D** *Torrenticola kumari* **sp. nov.** (**A–B**, **D** ♂, **C** ♀): **A** holotype, photographed immediately after dissection. **B** holotype, mounted in Hoyer medium. **C** specimen from stream Khanda Gad. **D** specimen from stream Dhundeshwar Gad. **E** *Torrenticola semisuta*, ♂, Malaysia, Jerian stream, photographed immediately after dissection.

Female (paratype from Dhundeshwar Gad, $n = 1$)—Idiosoma (ventral view: Fig. 2B) L 772, W 609; dorsal shield (Figs. 2A) L 656, W 519, L/W ratio 1.27; dorsal plate L 623; shoulder plate L 194–197, W 72–75, L/W ratio 2.6–2.7; frontal plate L 138–141, W 56–58, L/W ratio 2.43–2.44; shoulder/frontal plate L 1.4. Gnathosomal bay L 184, Cx-I total L 322, Cx-I mL 138, Cx-II+III mL 27; ratio Cx-I L/Cx-II+III mL 2.3; Cx-I mL/Cx-II+III mL 5.2. Genital field L/W 172/148, ratio 1.16; distance genital field-excretory pore 153, genital field-caudal idiosoma margin 247. Gnathosoma vL 328, chelicera L 381; palp total 358, dL/H, dL/H ratio: P-1, 42/33, 1.29; P-2, 113/63, 1.81; P-3, 64/56, 1.14; P-4, 116/34, 3.36; P-5, 23/15, 1.56; L ratio P-2/P-4 0.98. dL of I-L-4-6: 110, 114, 106; I-L-6 H 38; dL/H I-L-6 ratio 2.8.

Etymology. The species is named after Dr Neeraj Kumar in appreciation of his work on the water mite fauna of Garhwal Himalaya, India.

Discussion. The specimen from Randi Gad stream matches the description of the specimens from Uttarkhand assigned by Pešić *et al.* (2007) to *T. semisuta* (Halík 1930). The former authors were aware that their specimens differed from the specimen described by Halík (1930) from Pahang, Peninsular Malaysia. However, they considered that their specimens represented an Indian race of *T. semisuta*. The specimens from Khankra Gad and specimens described by Pešić *et al.* (2007) assigned

to *T. semisuta* are here described as new species, *T. kumari* **sp. nov.** The new species from Uttarakhand State can be separated from *T. semisuta* (in parentheses, based on Pešić & Smit 2010) due to the generally larger size (Idiosoma L < 700, genital field L/W ♂ 127/106, ♀ 141/132, palp total L ♂ 285–295, ♀ 314 µm) and a different colour pattern of the dorsal shield (compare figs. 3A–D with 3E).

Distribution. India, Uttarakhand State (“*Torrenticola semisuta*” Pešić *et al.* 2007; this study).

***Torrenticola muranyii* Pešić & Smit sp. nov.**

(Fig. 4)

Type series. Holotype female (RMNH), dissected and slide mounted, India, Uttarakhand State, stream Khankara Gad near Govt. Higher Secondary School Khankara, 30°14'42" N, 78°54'55" E, alt. 707 m, 10.i.2019, leg. Shailza Negi.

Diagnosis (Male unknown). Idiosoma elongated, dorsal shield L/W > 1.3; P-2 with a long tapering blade-like flange extending to the middle of P-2; excretory pore anterior to Vgl-2.

Description. *Female*—Idiosoma elongated-oval (dorsal shield L/W ratio 1.37); dorsal shield without colour pattern; gnathosomal bay U-shaped, proximally pointed; Cxgl-4 subapical; medial suture line of Cx-II+III moderately long; posterior suture lines of Cx-IV extending posteriorly beyond posterior margin of genital field, laterally curved; excretory pore and Vgl-2 well away from the line of primary sclerotization, excretory and Vgl-2 pore away from the line of primary sclerotization, excretory pore anterior to Vgl-2; gnathosomal rostrum long and slender, ventral margin in lateral view curved (Fig. 4C); P-2 with a laterally compressed, longish (> 30% of ventral margin), anteriorly directed ventrodistal extension, P-3 with a short, subrectangular, apically serrated ventrodistal projection, and a long seta laterally at base of projection; P-4 stocky with a well-developed ventral tubercle ending in two tips separated by a concavity, bearing one longer and three shorter setae (Fig. 4D–E).

Measurement—Idiosoma (ventral view: Fig. 4B) L 684, W 466; dorsal shield (Fig. 4A) L 556, W 406, L/W ratio 1.37; dorsal plate L 533; shoulder plate L 150–153, W 56–59, L/W ratio 2.6–2.7; frontal plate L 112–113, W 41–42, L/W ratio 2.7–2.8; shoulder/frontal plate L 1.33–1.36. Gnathosomal bay L 141, Cx-I total L 263, Cx-I mL 122, Cx-II+III mL 53; ratio Cx-I L/Cx-II+III mL 5.0; Cx-I mL/Cx-II+III mL 2.3. Genital field L/W 144/128, ratio 1.12; distance genital field-excretory pore 219, genital field-caudal idiosoma margin 219. Gnathosoma vL 294; palp total 267, dL/H, dL/H ratio: P-1, 31/28, 1.1; P-2, 92/44, 2.1; P-3, 55/40, 1.36; P-4, 70/26, 2.76; P-5, 19/11, 1.72; L ratio P-2/P-4 1.31. dL of I-L: 45, 53, 56, 75, 78, 89; I-L-6 H 30; dL/H I-L-6 ratio 2.97.

Male: unknown.

Etymology. The species is named after Dr Dávid Murányi (Hungarian Natural History Museum, Budapest) in appreciation of his work on the stoneflies including those inhabiting the Indian Subcontinent.

Discussion. With respect to the similar morphology of palp, with a long tapering blade-like flange (*sensu* Wiles 1997) extending to the middle of P-2, the new species from Uttarakhand resembles *Torrenticola malaisei* (Lundblad 1941), *T. lamellifera* (Lundblad 1941), and *T. prionipalpis* (Lundblad 1941). The latter species, known from a single male from a stream in Tenasserim Range (Myanmar), has a small ventral seta on P-2 and a more slender P-4. *Torrenticola malaisei* was described on the basis of a single female from a high-elevation stream (> 2100 m above sea level) in northern Myanmar (Kambaiti), while *T. lamellifera* was described from a single male from a stream in Dawna Hills in eastern Myanmar (Lundblad 1941, 1969). Wiles (1997) re-examined the holotype of the above mentioned species and proposed *T. lamellifera* as a junior synonym of *T.*

malaisei. The latter species was rediscovered by Pešić *et al.* (2012) who collected two males from a high-elevation stream (> 1900 m asl.) in the eastern Himalayan region in India (Arunachal Pradesh).

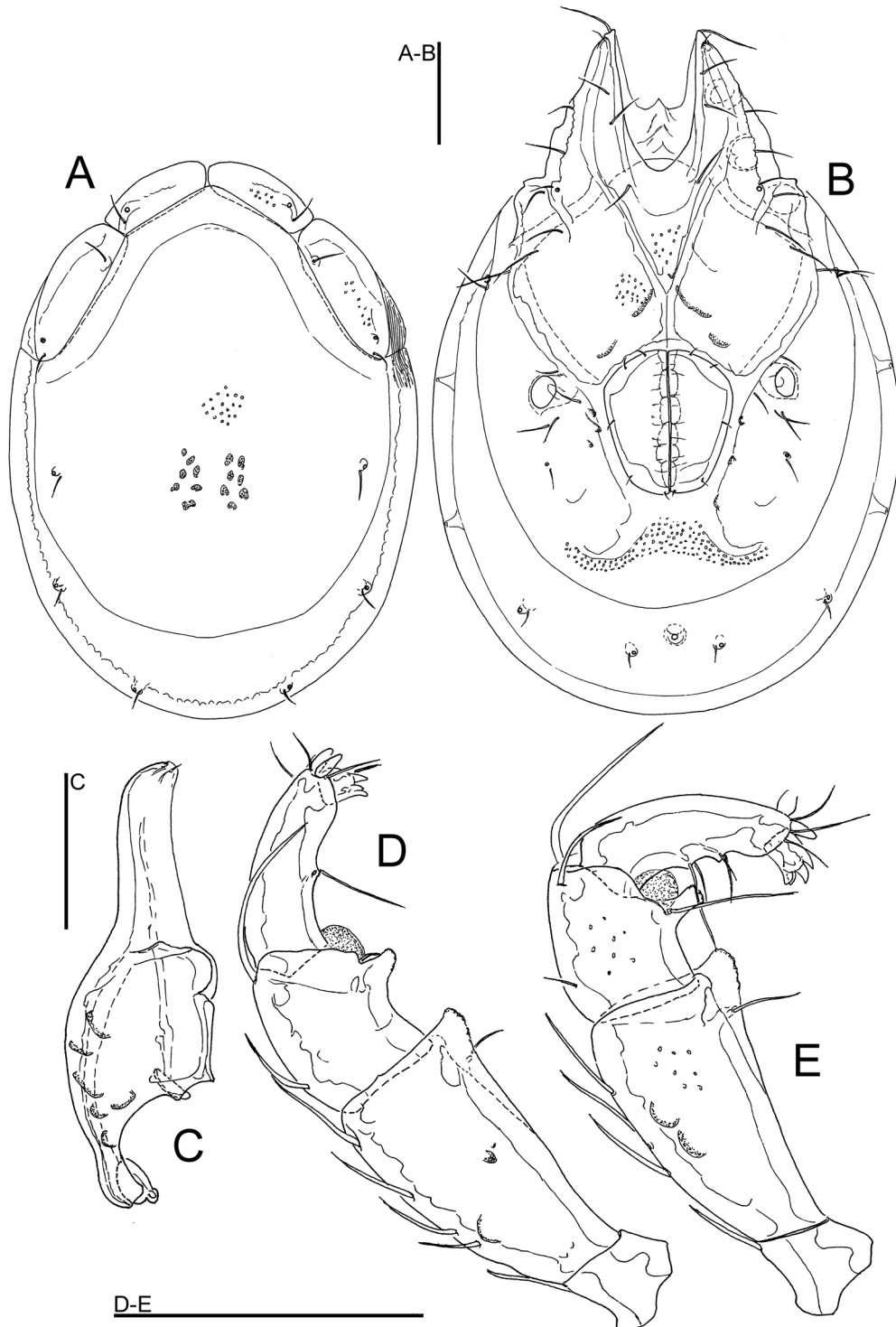


FIGURE 4. *Torrenticola muranyii* sp. nov., female, Uttarakhand, stream Khankara Gad: A = dorsal shield; B = idiosoma, ventral view; C = gnathosoma; D = palp, medial view; E = palp, lateral view. Scale bars = 100 µm.

The latter authors proposed that *T. lamellifera* should stand as separate species differing from *T. malaisei* in a longer and more slender P-4 and Cx-4 posteriorly strongly extending posterior to the genital field.

The new species from Garhwal Himalaya resembles *T. malaisei* in the relatively short and stout P-4 and Cx-4 posteriorly less extending posterior to the genital field. The differences are found in a more roundish dorsal shield (♀ L/W ratio 1.27, from Lundblad 1969) and the excretory pore lying on the same level as, or slightly posterior to Vgl-2 in *T. malaisei* (see Lundblad 1969; Pešić *et al.* 2012).

Distribution. India; known only from the *locus typicus* in Uttarakhand State.

***Monatractides kotschani* Pešić & Smit sp. nov.**

(Fig. 5)

Type series. Holotype male (RMNH), dissected and slide mounted, India, Uttarakhand State, Randi Gad stream Masan Gaon Village, 30°07'21" N, 78°41'29" E, alt. 1200 m, 19.i.2019, leg. Pankaj Bahuguna.

Diagnosis (Female unknown). Posterior margin of gnathosomal bay V-shaped, three pairs of knob-like protrusions at its lateral margins; ventral seta on P-4 short, not reaching distal edge.

Description. Male—Idiosoma oval (dorsal shield L/W ratio 1.19); shoulder plates elongated (L shoulder/frontal plates ratio 1.5); frontal margin medially almost straight between large anterolaterally pointed apodemes (Fig. 5A); Cxgl-4 located far anteriorly, near tips of Cx-I; posterior margin of gnathosomal bay V-shaped, three pairs of knob-like protrusions at its lateral margins (Fig. 5C); suture lines of Cx-IV distinct, originating posterior to the genital field, laterally curved; genital field subrectangular; excretory pore and Vgl-2 separated from the line of primary sclerotization, Vgl-2 posterior to the excretory pore; ejaculatory complex damaged during dissection but conventional in shape (with well-developed anterior keel and proximal arms); gnathosoma as illustrated in Fig. 5F; distal margin of P-3 and P-4 medially and laterally with several pointed extensions; P-4 with two short ventral setae, not reaching distal edge (Fig. 5D–E).

Measurements—Idiosoma (ventral view: Fig. 5C) L 925, W 819; dorsal shield (Fig. 5B) L 819, W 688, L/W ratio 1.19; dorsal plate L 738; shoulder plate L 241/250, W 98/103, L/W ratio 2.3–2.5; frontal plate L 166, W 84, L/W ratio 1.96; shoulder/frontal plate L 1.51–1.54. Gnathosomal bay L 184, Cx-I total L 344, Cx-I mL 158, Cx-II+III mL 122; ratio Cx-I L/Cx-II+III mL 2.18; Cx-I mL/Cx-II+III mL 2.8. Genital field L/W 200/150, ratio 1.33; distance genital field-excretory pore 194, genital field-caudal idiosoma margin 238. Gnathosoma vL 225; chelicera total L 251, L basal segment 203, claw 44, L basal segment/claw ratio 4.6; palp total 279, dL/H, dL/H ratio: P-1, 34/37.5, 0.91; P-2, 84/54, 1.57; P-3, 56/44, 1.27; P-4, 74/32, 2.3; P-5, 31/17, 1.8; L ratio P-2/P-4 1.14. dL of I-L: 72, 92, 122, 152, 142, 138; I-L-6 H 53; dL/H I-L-6 ratio 2.6; dL of IV-L: 138m 147, 194, 250, 269, 259.

Female: unknown.

Etymology. The species is named after Dr Jenő Kotschán (Plant Protection Institute of the Hungarian Academy of Sciences, Budapest) in appreciation of his work on the uropodin mites including those inhabiting the Indian Subcontinent.

Discussion. Due to the presence of knob-shaped protrusions at the margin of the gnathosomal bay, this new species resembles *Monatractides oza* (Cook 1967) known from Maharashtra State of India (Cook 1967) and *M. oxystomus* (K. Viets 1935), the latter reported with a question mark from Uttarakhand (Pešić *et al.* 2019a). Both abovementioned species can be easily separated from the new

species by having one very long ventral seta on P-4, away from distal edge (see Pešić and Smit 2009b). *Monatractides circuloides* (Halík, 1930), a species originally described by Halík (1930) from Malaysia (Perak) is similar in presence of three pairs of knob-shaped protrusions at the margin of the gnathosomal bay, but differs from the new species in that the posterior margin of the gnathosomal bay is rounded, rather than V-shaped as in *M. kotschani* **sp. nov.**

Distribution. India; known only from the *locus typicus* in Uttarakhand State.

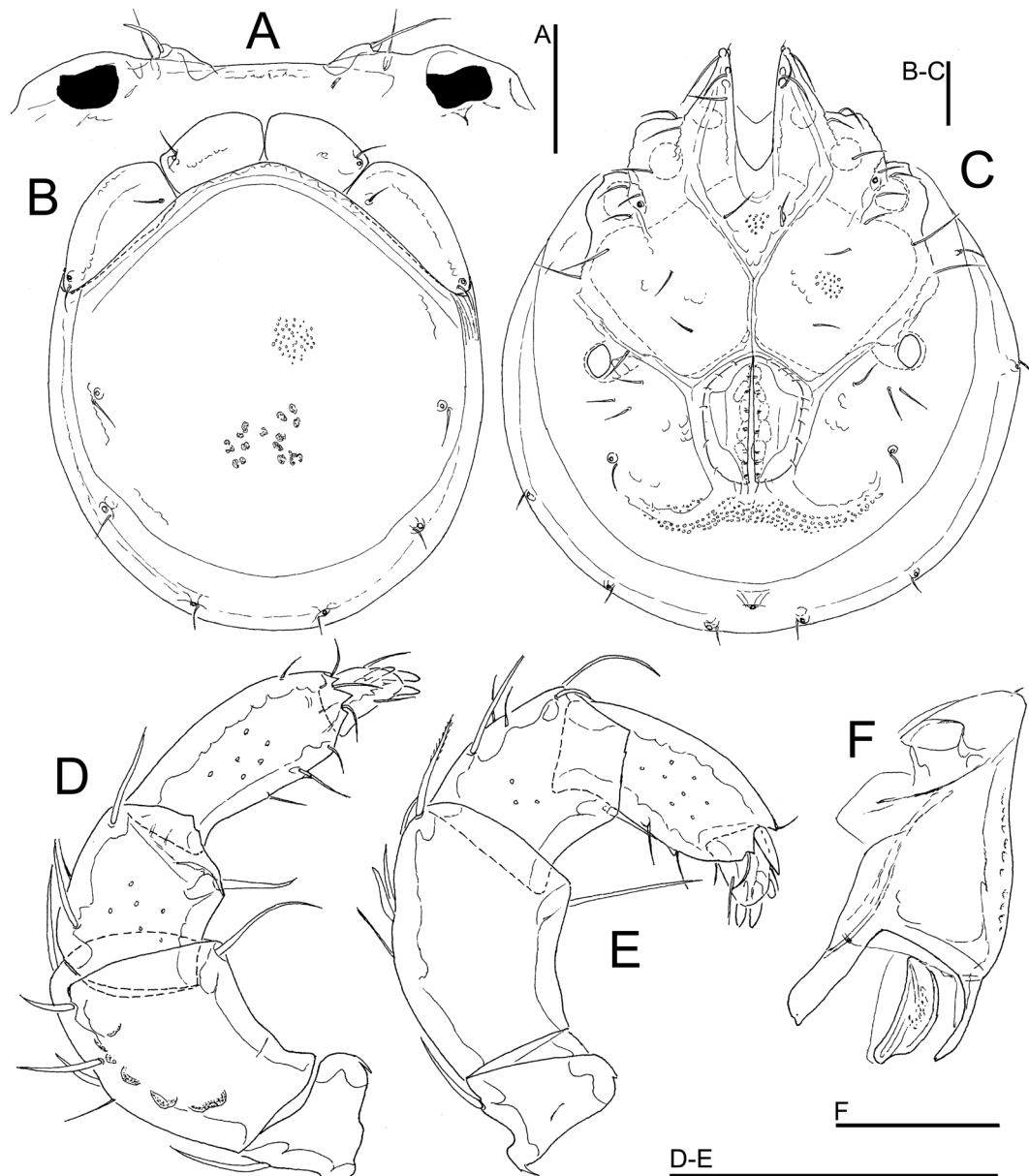


FIGURE 5. *Monatractides kotschani* **sp. nov.**, male, Uttarakhand, stream Randi Gad: A = frontal margin of idiosoma, dorsal view; B = dorsal shield; C = idiosoma, ventral view; D = palp, lateral view; E = palp, medial view; F = gnathosoma. Scale bars = 100 μ m.

Key to the *Torrenticola* species from India

- 1 Dorsal shield with shoulder platelets fused to dorsal plate 2
 - Dorsal shield with shoulder plate separated 5
- 2 Cxgl-4 posterior to Cxgl-2; P-2 with a narrow finger-like extension 3
 - Cxgl-4 subapical; P-2 with a short, broad blade-like distoventral extension *T. indica* Cook, 1967 (Kerala)
- 3 Frontal plates fused to each other; P-4 without ventral denticles
 - *T. chatterjeei* Pešić & Smit, 2019 (Uttarkhand; female unknown)
 - Frontal plates separated, not fused to each other; P-4 with ventral denticles 4
- 4 P-4 with well developed ventral tubercles; suture line of Cx-IV posterior to the genital field less extended; excretory pore slightly anterior to Vgl-2. *T. episce* Pešić et al. 2013 (Assam)
 - P-4 without ventral tubercles; suture line of Cx-IV posterior to the genital field more extended; excretory pore on the same level as Vgl-2. . *T. microdentifera* Cook, 1967 (Maharashtra, Kerala, Madras)
- 5 P-2 with finger or peg-like distoventral extensions 6
 - P-2 with flat blade-like hyaline anterior flange 11
- 6 Cxgl-4 apical, anterior to I-L insertion 7
 - Cxgl-4 shifted posterior to I-L insertion, closer to Cxgl-2 than to tip of Cx-I
 - *T. tetraporella* Cook, 1967 (Maharashtra State; male unknown)
- 7 P-3 ventral margin with small denticles and a proximally-directed projection; dorsal shield with triangular-shaped dark colour pattern, frontal plates wide, L/W ratio 1.6
 - *T. vicista* Cook, 1967 (Kerala; male unknown)
 - P-3 ventral margin without denticles, distoventral projection not directed ventrally; frontal plates and colour pattern various 8
- 8 Cxgl-4 shifted posterior to margin of Cx-I/II, closer to insertion of I-L than to Cx-I tip, ventral projection of P-2 not curved distally. . . *T. uttarkhandensis* Pešić & Smit, 2019 (Uttarkhand State; female unknown)
 - Cxgl-4 closer to Cx-I tip than to insertion of I-L; ventral projection of P-2 curved distally 9
- 9 P-2 distally with strongly protruding ventral extension, ventral seta shorter than ventral extension 10
 - Ventral seta of P-2 longer than ventral extension, ventral projection of P-2 less curved distally
 - *T. kumari* **nov. sp.** (Uttarkhand)
- 10 Suture line of Cx-IV extending far posterior to the genital field; P-2 distoventral projection apically more truncated, nose-shaped. *T. haliki* Pešić & Smit, 2010 (Assam)
 - Suture line of Cx-IV posterior to the genital field less extending; P-2 distoventral projection apically more pointed *T. maharashtrisi* Cook, 1967 (Maharashtra; male unknown).
- 11 P-2 with a long tapering blade-like flange (*sensu* Wiles 1997) extending to the middle of P-2 12
 - Blade-like flange on P-2 not extending to the middle of P-2. 13
- 12 Idiosoma more elongated, dorsal shield L/W > 1.3; excretory pore anterior to Vgl-2
 - *T. muranyii* **sp. nov.** (Uttarkhand; male unknown)
 - Idiosoma less elongated, dorsal shield L/W < 1.3; excretory pore on the same level as, or slightly posterior to Vgl-2 *T. malaisei* (Lundblad, 1941) (Arunachal Pradesh)
- 13 Ventral seta of P-2 lacking, P-3 with a sharp-pointed and distally serrate ventral projection, P-4 slender. .
 - *T. mulherkarae* Cook, 1967 (Kerala; male unknown)
 - P-2 with a ventral seta, P-3 with a subrectangular ventrodistal projection, P-4 stocky
 - *T. turkestanica* (Sokolow, 1926) (Uttarkhand)

Key to the *Monatractides* species from India

- 1 Shoulder plates partially fused with the large dorsal plate; idiosoma elongated, dorsal shield L/W > 3.0 . .
 - *M. sucira* (Cook, 1967) (Kerala; male unknown)
 - Shoulder plates not fused with the large dorsal plate; idiosoma various, but less elongated, dorsal shield L/W > 2.5. 2
- 2 Frontal platelets longer than shoulder platelets, shoulder/frontal plate L ratio < 1.0. 3
 - Frontal platelets shorter than shoulder platelets, shoulder/frontal plate L ratio > 1.0 4

- 3 Large in size and broader (Idiosoma L ♂ 684–745, ♀ 775–836); medial suture line of Cx-II+III in female relatively short *M. pusta* (Cook, 1967) (Maharashtra, Madras)
- Smaller in size and more slender (Idiosoma L ♂ 608–684, ♀ 730–760); medial suture line of Cx-II+III in female relatively long. *M. dadayi* (Cook, 1967) (Maharashtra, Mysore)
- 4 Anterior tip of Cx-I with a knob shaped protrusion, in addition two pairs of knob-shaped protrusions can be present at the lateral margin of gnathosomal bay. 5
- Anterior tip of Cx-I without a knob shaped protrusion 7
- 5 Ventral seta on P-4 relatively short, not reaching distal edge *M. kotschani* **sp. nov.** (Uttarkhand; female unknown)
- Ventral seta on P-4 long, away from distal edge 6
- 6 Frontal plates longer and more slender; distal margins of P-2 and P-3 with pointed extensions *M. oxystomus* (K. Viets, 1945) (Uttarkhand; record with a question mark)
- Frontal plates shorter and broader; distal margins of P-2 and P-3 without pointed extensions. *M. oza* (Cook, 1967) (Maharashtra)
- 7 I-L-6 and II-L-6 greatly expanded, I-L-6 L/W ratio 1.7. *M. sakina* (Cook, 1967) (Kerala)
- I-L-6 and II-L-6 less expanded, I-L-6 L/W ratio < 1.7 8
- 8 Excretory pore and Vgl-1/2 fused with area of primary sclerotization; genital field elongated, L/W 1.8. *M. garhwaliensis* Pesic, N. Kumar & K. Kumar, 2007 (Uttarkhand; male unknown)
- Excretory pore and Vgl-1/2 not fused with area of primary sclerotization; genital field less elongated L/W < 1.8 9
- 9 P-2 and P-3 each bearing a heavy, spine-like seta 10
- P-2 and - 3 with a thin seta 11
- 10 Idiosoma more roundish, dorsal shield L/W 1.3, colour pattern consisting of anterior and posterior purplish patches, shoulder plates greatly swollen anteriorly; P-2-3 more stout. *M. apratima* (Cook, 1967) (Kerala; male unknown).
- Idiosoma elongated, dorsal shield L/W > 1.5, without colour pattern, shoulder plates not swollen anteriorly; P-2-3 more slender *M. tuzovskiyi* Pesic, N. Kumar, K. Kumar & S. Kumar, 2006 (Uttarkhand; male unknown)
- 11 Suture line of Cx-IV posterior to genital field not distinct. *M. yosana* (Cook, 1967) (Maharashtra; male unknown)
- Suture line of Cx-IV posterior to genital field distinct. 12
- 12 Palp short and stocky, P-4 almost equal in length to P-3, P-4 with a long mediobasal seta *M. pinapalpis* (Cook 1967) (Madras)
- Palp comparatively longer and slender, P-4 longer than P-3, P-4 mediobasal seta shorter. 13
- 13 Suture lines of Cx-IV fused medially for a considerable distance posterior to the genital field *M. devatta* (Cook, 1967) (Maharashtra; female unknown).
- Suture lines of Cx-IV posterior to the genital field may be close together, but not fused medially 14
- 14 Lateral margins of genital plates with numerous small setae; dorsal shield with a colour pattern; gnathosomal bay U-shaped, gradually tapering towards the distal end. *M. setivalvata* (Cook, 1967) (Kerala)
- Genital plates without numerous small setae at lateral margins; dorsal colour pattern and shape of gnathosomal bay various 12
- 12 Idiosoma elongated, dorsal shield L/W 1.5–1.6; suture lines of Cx-IV posterior to the genital field close together. *M. parvatiya* (Cook, 1967) (Kerala, Madras)
- Idiosoma less elongated, dorsal shield L/W < 1.5; suture lines of Cx-IV posterior to the genital field distanced from each other. 13
- 13 Gnathosomal bay rounded at its proximal end; P-4 proportionally slender; genital field comparatively smaller *M. nondescripta* (Cook, 1967) (Kerala)
- Gnathosomal bay square at its proximal end; P-4 proportionally thicker; genital field comparatively larger *M. angulatus* (Walter, 1928) (Punjab; male unknown)

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