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Previous volumes (2010-2021): 250 € / year (4 issues)
Acarologia, CBGP, CS 30016, 34988 MONTFERRIER-sur-LEZ Cedex, France
ISSN 0044-586X (print), ISSN 2107-7207 (electronic)

The digitalization of Acarologia papers prior to 2000 was supported by Agropolis Fondation under the reference ID 1500-024 through the « Investissements d’avenir » programme (Labex Agro: ANR-10-LABX-0001-01)

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New water mites of Torrenticolidae (Acari, Hydrachnidia) from Jiangxi Province, P. R. China

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Original research

ABSTRACT

Three torrenticolid species new to science, i.e. Monatrichides trilaminatus sp. nov., Torrenticola lushanensis sp. nov., and T. planusirostrum sp. nov. are described from Jiangxi Province, P. R. China. M. trilaminatus sp. nov. can be distinguished by the shoulder and frontal platelets fused together and formed into a pair of platelets; infracapitular bay U-shaped, extremely deep and narrow; the tip of coxae I with a small rectangle extension. T. lushanensis sp. nov. can be distinguished by epimeroglandularia 4 at the same level as the 4th pair of acetabula; anal pore on the same line with ventroglandularia 2, and posterior to ventroglandularia 1. T. planusirostrum sp. nov. can be distinguished by infracapitular dorsal apodeme almost absent, ventral apodeme blunt and long, rostrum flat and parallel to the ventral apodeme. Detailed descriptions and illustrations of these species are given in this paper.

Keywords torrenticolid mite; taxonomy; running waters; China

Introduction

The water mite fauna of Jiangxi Province, P. R. China is mainly studied by Chungen Wen (Nanchang University, Nanchang, P. R. China), who described 12 species of Unionicola and two species of Limnesia with his colleagues (Jin et al. 2010). In addition, Vidrine (Louisiana State University, Los Angeles, USA), Xiaoping Wu (Nanchang University, Nanchang, P. R. China) and others colleagues described two species of Unionicola (Vidrine et al. 2008), in addition Ding et al. (2019a) (Guizhou University, Guizhou, P. R. China) described one more species of Unionicola. This paper adds three new species of Torrenticolidae. Up to now, the total number of water mites from Jiangxi Province is 20 (including the species here described).

Materials and methods

Water mites were collected, preserved, cleaned and mounted following Jin (1997) and Ding (2019b). The following abbreviations are used (Jin 1997; Goldschmidt 2007; Zhang 2018): aL = apical length; Ap = anal pore; bs = basal segment of chelicera; Cx-I–Cx-IV = coxae I–IV; dL = dorsal length; I-L-1–6, etc. = first leg’s segment 1–6, etc.; L = length; mL = medial length; GUGC = Institute of Entomology, Guizhou University, Guiyang, China; P-1–5 = palp segment 1–5; vL = ventral length; W = width. The chaetotaxy used follows Jin (1997): A2 = postantennal glandularia; D1–D5 = dorsoglandularia 1–4; E2, E4 = epimeroglandularia 2, 4; L4–L4 = lateroglandularia 1–4; O2 = postocularia; V1–V4 = ventroglandularia 1–4. Abbreviations
of dorsal plate arrangements follow Wiles (1997): 4+1 = five plates: four anterior platelets and a single large dorsal plate; 1+2 = three plates: the frontal and shoulder platelets of each side are fused to each other but are separated from the large dorsal plate.

Specimens were observed under Leica DM3000 microscope; illustrations were collected under Leica DM3000 microscope and modified with Adobe Photoshop CS6.

Specimens were measured by Nikon DS-Ri2. The measurements follow Goldschmidt (2007). Numbers of specimens were listed as males/females/deutonymphs mounted. All measurements are given in micrometers (μm). The examined specimens are kept in GUGC.

Taxonomy

Family Torrenticolidae Piersig, 1902
Genus Monatractides (K. Viets, 1926)

Monatractides trilaminatus sp. nov.

Zoobank: 912FE8BD-2C65-4854-9D06-6279CDB557B1 (Figures 1–4)

Material examined — Holotype male, No. JX-TO-20190701, Guanshan National Nature Reserve, Jiangxi Province, P. R. China (28°35′16″N, 114°33′14″E, 471 m a.s.l.), collected by Haitao Li and Min Ao, 3 July 2018. Paratype: 2/4/0, No. JX-TO-20190702 – JX-TO-20190707, same data as holotype.

Diagnosis — Dorsal plate 1+2: shoulder platelets on each side fused with frontal platelets to form a pair of elongated platelets (Figure 1A). Infracapitular bay U-shaped, extremely deep and narrow, the tip of Cx-I with a small rectangle extension; genital field elongated and oval, L/W ratio 1.2, genital flaps with 13 pairs of setae at the margins.

Description

Male (n = 3) – Idiosoma elliptical, L 1143 (916–1160), W 940 (830–940), L/W ratio 1.2 (1.1–1.3). Dorsal plate 1+2 (Figure 1A), dorsal shield L 1010 (887–1010), W 932 (760–932), dorsal plate L 911 (775–911), anterior plate (shoulder + frontal platelets) L 506 (506–596), W 167 (167–198). The tip of Cx-I with a small rectangle extension; infracapitular bay U-shaped, extremely deep and narrow, depth 278 (278–293); Cx-I L 470 (425–470), mL 165 (148–165), Cx-II+III mL 29 (29–59); genital field elongated and oval, L 237 (236–249), W 184 (158–188), L/W ratio 1.3 (1.3–1.5), distance between genital field and Ap 237 (174–247), genital flaps with 13 pairs of setae at the margins; E4 at the same level as the 4th pair of acetabula; Ap away from the line of primary sclerotization and anterior to V2, posterior to V1 (Figure 1B). P-1 with one dorsal seta; P-2 with five dorsal and one ventral setae; P-3 with two dorsal and one large thick ventral setae; P-4 with one small dorsal, two ventral and one mediostial setae (Figure 1D). Gnathosoma vL 224 (224–272), dL 179 (179–198); chelicera bs L 249 (242–256), claw L 32 (29–32); dorsal apodeme long, twice of ventral apodeme (Figure 1E). Ejaculatory complex (Figure 1C), L 320 (291–320), aL 207 (185–208). L of palp segments: P-1, 35 (34–37); P-2, 74 (74–84); P-3, 52 (52–57); P-4, 72 (71–73); P-5, 33 (33–34). dL of leg segments: I-L-1–6: 96 (92–96), 132 (99–132), 104 (104–112), 131 (130–132), 128 (113–128), 117 (105–119); II-L-1–6: 93 (77–105), 143 (143–156), 94 (94–98), 147 (141–151), 161 (137–165), 163 (152–163); III-L-1–6: 99 (78–102), 166 (139–182), 116 (110–125), 167 (158–175), 183 (165–191), 170 (163–170); IV-L-1–6: 138 (138–151), 171 (171–179), 171 (171–175), 211 (211–220), 216 (212–223), 217 (216–217).

Female (n = 4) – Body features same as the male except: E4 at the same level as the 6th pair of acetabula; Ap away from the line of primary sclerotization and closed to the line of V1 (Figure 3B). The ventral apodeme longer (almost twice of male) (Figure 3D). Idiosoma L 1275 (826–1275), W 1061 (758–1061), L/W ratio 1.3 (1.2–1.3). Dorsal shield L 1137 (773–1137),
Figure 1. *Montractides trilaminatus* sp. nov., male: A = dorsal view; B = ventral view; C = ejaculatory complex; D = palp; E = infracapitulum and chelicera. Scale bars = 100 μm.
Figure 2  *Montractides trilaminatus* sp. nov., male: A = Leg-I; B = Leg-II; C = Leg-III; D = Leg-IV-1–3; E = Leg-IV-4–6. Scale bars = 100 μm.
Figure 3 Monastractides trilaminatus sp. nov., female: A = dorsal view; B = ventral view; C = palp; D = infracapitulum and chelicera. Scale bars = 100 μm.

**Monatractides trilaminatus** sp. nov., female: A = Leg-I; B = Leg-II; C = Leg-III; D = Leg-IV-1–3; E = Leg-IV-4–6. Scale bars = 100 μm.

Habitat — Streamlet, about 2–3 m wide, 0.3 m depth, with many small stones at the bottom and opulent sunlight.

Remarks — *Monatractides trilaminatus* sp. nov. can be distinguished by the shoulder and frontal platelets fused together and forming a pair of platelets but separated from the large dorsal plate. This character is also found in other species of *Monatractides*, i.e. *M. hesperia* (Lundblad, 1941) (Lundblad 1941), *M. veracruzensis* (Cook, 1980) (Cook 1980), *M. sahuli* Pešić & Smit,
2011 (Pešić and Smit 2011), and *M. acutiscutatus* (K. Viets, 1914) (Pešić and Smit 2014). But *M. hesperia* and *M. veracruzensis* can be easily distinguished by: infracapitular bay V-shaped in these two species, U-shaped in the other species. *M. sahuli* differs from *M. trilaminatus* and *M. acutiscutatus* by Ap on the line of primary sclerotization. At the same time, *M. trilaminatus* differs from *M. acutiscutatus* in $E_4$ at the same level as the 4th pair of acatabula in male, the 6th pair in female (the 5th pair in *M. acutiscutatus*).

**Etymology** — The specific epithet is masculine in gender and derived from Latin words, *triplex* (*we used tri-*) = three and *laminae* = platelets, in reference to three dorsal platelets.

**Distribution** — China (Jiangxi).

### Genus *Torrenticola* Piersig, 1896

### Subgenus *Torrenticola* Piersig, 1896

*Torrenticola lushanensis* sp. nov.

Zoobank: C9833D7C-3471-4870-8801-E0EDE1D330A9

(Figures 5–8)

**Material examined** — Holotype male, No. JX-TO-20190708, Lushan, Jiangxi Province, P. R. China (29°33′29″N, 116°0′28″E, 1021 m a.s.l.), collected by Haitao Li, Min Ao, 6 July 2019. Paratype: 0/1/0, No. JX-TO-20190709, same data as holotype.

**Diagnosis** — Idiosoma elliptical, L/W ratio 1.5. Dorsal plate 4+1; $E_4$ at the same level as the 4th pair of acatabula; the line of primary sclerotization absent, and Ap on the same line with $V_2$, and posterior to $V_1$; P-4 with two separated ventral extensions, each with one long seta.

**Description**

**Male** (n = 1) — Idiosoma elliptical, L 791, W 545, L/W ratio 1.5. Dorsal plate 4+1 (Figure 5A), dorsal shield L 635, W 493, dorsal plate L 591, frontal platelets L 144, W 58, shoulder platelets L 195, W 61. Infracapitular bay U-shaped and wide, depth 172; Cx-I L 333, mL 169, Cx-II+III mL 67; genital field L 173, W 132, distance between genital field and Ap 131; genital field elongated and oval, L/W ratio 1.3, genital flaps with eight pairs of setae at the margins; $E_4$ at the same level as the 4th pair of acatabula; the line of primary sclerotization absent, and Ap on the same line with $V_2$, and posterior to $V_1$ (Figure 5B). P-1 with one dorsal seta; P-2 with three dorsal setae, and one ventral seta on the ventral prolongation; P-3 with two dorsal setae and one ventrodorsal prolongation with one long seta; P-4 with two separated ventral extensions, each with one long seta (Figure 5C). Gnathosoma vL 349, dL 277; dorsal and ventral apodemes short, especially the ventral one; chelicera bs L 393, claw L 43. Ejaculatory complex (Figure 5D): L 197, al 163. dL of palp segments: P-1, 48; P-2, 91; P-3, 50; P-4, 99; P-5, 20. Legs (Figure 6): dL of leg segments: I-L-1–6: 59, 78, 90, 106, 100, 107; II-L-1–6: 68, 82, 85, 102, 123, 131; III-L-1–6: 67, 86, 85, 108, 147, 151; IV-L-1–6: 126, 116, 127, 157, 144, 164.

**Female** (n = 1) — Body features same as the male except: P-2 with longer ventrodorsal prolongation; P-4 with one long and two short setae on the ventral extensions. Idiosoma L 817, W 557. Dorsal shield L 658, W 489, dorsal plate L 616, frontal platelets L 147, W 50, shoulder platelets L 189, W 64; Cx-I L 329, mL 113, Cx-II+III mL 93; genital field L 172, W 124, distance between genital field and Ap 145. Gnathosoma vL 357, dL 282; infracapitular bay depth 221; chelicera bs L 387, claw L 48; L of palp segments: P-1, 50; P-2, 95; P-3, 57; P-4, 107; P-5, 21. L of leg segments: I-L-1–6: 43, 62, 91, 102, 110, 99; II-L-1–6: 54, 104, 79, 102, 120, 117; III-L-1–6: 69, 77, 86, 130, 153, 148; IV-L-1–6: 122, 99, 120, 143, 151, 138.

**Habitat** — Streamlet, about 1–2 m wide, 0.3–0.4 m depth, located between two mountains.

**Remarks** — Due to the shape of dorsal shield, ventral plate and infracapitular bay; and rostrum slightly curved towards the dorsum, *Torrenticola lushanensis* sp. nov. is similar to *T. columbiana* Goldschmidt, 2007 (Goldschmidt 2007). Though there are obvious differences in: (1) P-2 long and nearly equal in length to P-4 in the new species, P-2 longer than P-4 in *T. columbiana*; (2) the ventral extensions of P-2, 3 blunt in this new species, but pointed in *T.
Figure 5 *Torrenticola lushanensis* sp. nov., male: A = dorsal view; B = ventral view; C = palp; D = ejaculatory complex; E = infracapitulum and chelicera. Scale bars = 100 μm.
columbiana; (3) $D_2$ on the same level with the muscle scar in this new species, but anterior to the muscle scar in *T. columbiana*.

**Etymology** — The specific epithet is named after the place (Lushan) where this new species was collected.

**Distribution** — China (Jiangxi).

**Torrenticola planusirostrum sp. nov.**

Zoobank: 604AA808-586D-477D-BF09-1887A5B92411

(Figure 9)

**Material examined** — Holotype female, No. JX-TO-20190710, Yueliangwan Mountain Park, Jiangxi Province, P. R. China (28°45′10″N, 115°44′20″E, 119 m a.s.l.), collected by Haitao Li and Min Ao, 11 July 2019.

**Diagnosis** — Idiosoma elliptical, L/W ratio 1.4. Dorsal plate 4+1 (Figure 9A); $E_4$ at the same level as the 4th pair of acetabula; the line of primary sclerotization absent, and Ap posterior to $V_j$ and $V'_j$; P-1 and P-2 dorsal setae absent, P-2 with a ventral seta on the ventral prolongation; dorsal apodeme almost absent, ventral apodeme blunt and long; rostrum flat and parallel to the
Figure 7 Torrenticola lushanensis sp. nov., female: A = dorsal view; B = ventral view; C = palp; D = infracapitulum and chelicera. Scale bars = 100 μm.
Torrenticola lushanensis sp. nov., female: A = Leg-I; B = Leg-II; C = Leg-III; D = Leg-IV-1–4; E = Leg-IV-5, 6. Scale bars = 100 μm.

**Description**

Female (n = 1) – Idiosoma elliptical, L 589, W 428, L/W ratio 1.4. Dorsal plate 4+1 (Figure 9A), dorsal shield L 453, W 378, dorsal plate L 409, frontal platelets L 109, W 61, shoulder platelets L 182, W 75. Infracapitular bay U-shaped and wide, depth 134; Cx-I L 247, mL 115, Cx-II+III mL 26; genital field L 171, W 151, distance between genital field and Ap 94; Genital field L/W ratio 1.1; E4 at the same level as the 4th pair of acetabula; the line of primary sclerotization absent, and Ap posterior to V1 and V2, (Figure 9B). P-1 and P-2 dorsal setae absent, P-2 with one ventral seta on the ventrodistal prolongation; P-3 with two dorsal setae and one ventrodistal prolongation with one long seta on it; P-4 with one dorsal seta and two ventral setae (Figure 9C). Gnathosoma (Figure 9D) dorsal apodeme almost absent, ventral apodeme blunt and long, rostrum flat and parallel to the ventral apodeme; vL 256, dl 211, chelicer abs L 249, claw L 44. L of palp segments: P-1, 43; P-2, 102; P-3, 66; P-4, 86; P-5, 10. Legs (Figure 9E–H): L of leg segments: I-L-1–6: 40, 53, 46, 60, 62, 74; II-L-1–6: 40, 60, 46, 61, 62, 78;
Figure 9 Torrenticola planusirostrum sp. nov., female: A = dorsal view; B = ventral view; C = palp; D = infracapitulum and chelicera; E = Leg-I; F = Leg-II; G = Leg-III; H = Leg-IV. Scale bars = 100 μm.*# Acknowledgements

Gu X. et al. (2020), Acarologia 60(2): 488-500; DOI 10.24349/acarologia/20204381
III-L-1–6: 43, 77, 49, 63, 80, 91; IV-L-1–6: 87, 86, 77, 102, 112, 104.

Male – Unknown.

Habitat — Ditch, about 1 m wide, 0.2–0.3 m depth, with many small stones at the bottom.

Remarks — *Torrenticola planusirostrum* sp. nov. is characterized by dorsal apodeme almost absent, ventral apodeme blunt and long, rostrum flat and parallel to the ventral apodeme. In addition, P-1 and P-2 dorsal setae absent. Although we only have one specimen, because of its unique gnathosoma shape, we considered this is a new species.

Etymology — The specific epithet is neuter in gender and derived from Latin words, *planus* = flat, and *rostrum* = beak and refers to flat rostrum, parallel to the ventral apodeme; used as a noun in apposition.

Distribution — China (Jiangxi).

Acknowledgements

Special thanks owe to Haitao Li and Min Ao (Institute of Entomology, Guizhou University, P. R. China) for collections of specimens, Zhuhui Ding (Institute of Entomology, Guizhou University, P. R. China) for providing advice on drawing, Lan Jia (Department of Plant Protection, Guizhou University, P. R. China) for the measurement of the specimen data. The research was supported by Guizhou Graduate Research Fund Project No. Qianjiangao YJSCXJH [2019]105; National Natural Science Foundation of China No. 31772421, 31750002; Guizhou Science and Technology Project No. Qiankehe Pingtai Rencai [2017]5788; Xinyao Gu was supported by the scholarship from China Scholarship Council (CSC201906670003).

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