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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. *Monatractides 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
Zoobank http://zoobank.org/C934DBD1-32C4-4AC0-95EC-CA0CC4D555C1

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): A_2 = postantennal glandularia; D_1–D_4 = dorsoglandularia 1–4; E_2, E_4 = epimeroglandularia 2, 4; L_1–L_4 = lateroglandularia 1–4; O_2 = postocularia; V_1–V_4 = ventroglandularia 1–4. Abbreviations

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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)

Diagnosis: see Wiles 1997: 202.

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; E_4 at the same level as the 4th pair of acetabula; Ap away from the line of primary sclerotization and anterior to V_2, posterior to V_1 (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 mediodistal 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: E_4 at the same level as the 6th pair of acetabula; Ap away from the line of primary sclerotization and closed to the line of V_1 (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),

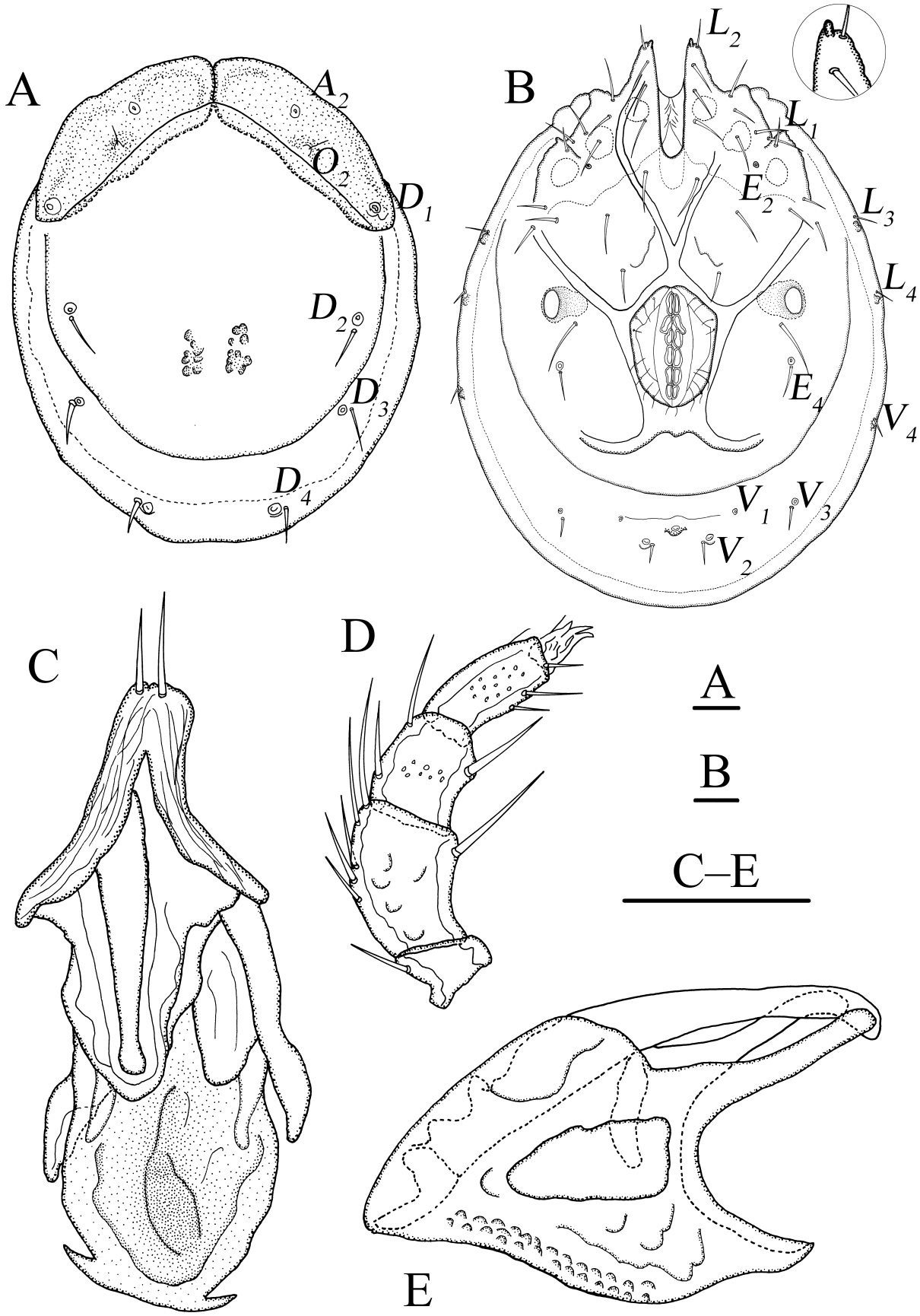


Figure 1 *Monatractides trilaminatus* **sp. nov.**, male: A = dorsal view; B = ventral view; C = ejaculatory complex; D = palp; E = infracapitulum and chelicera. Scale bars = 100 μm.

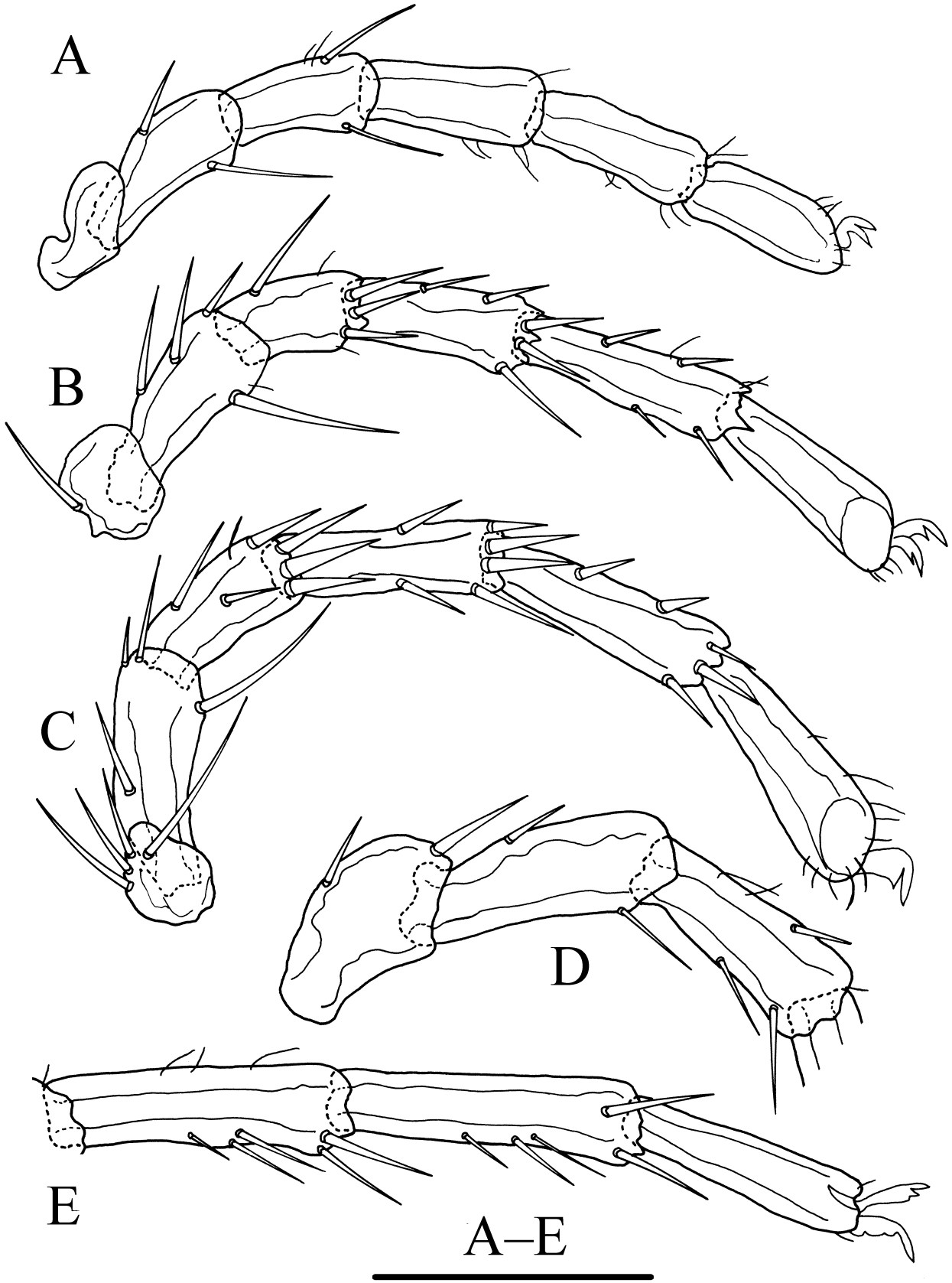


Figure 2 *Monatractides trilaminatus* **sp. nov.**, male: A = Leg-I; B = Leg-II; C = Leg-III; D = Leg-IV-1–3; E = Leg-IV-4–6. Scale bars = 100 μm.

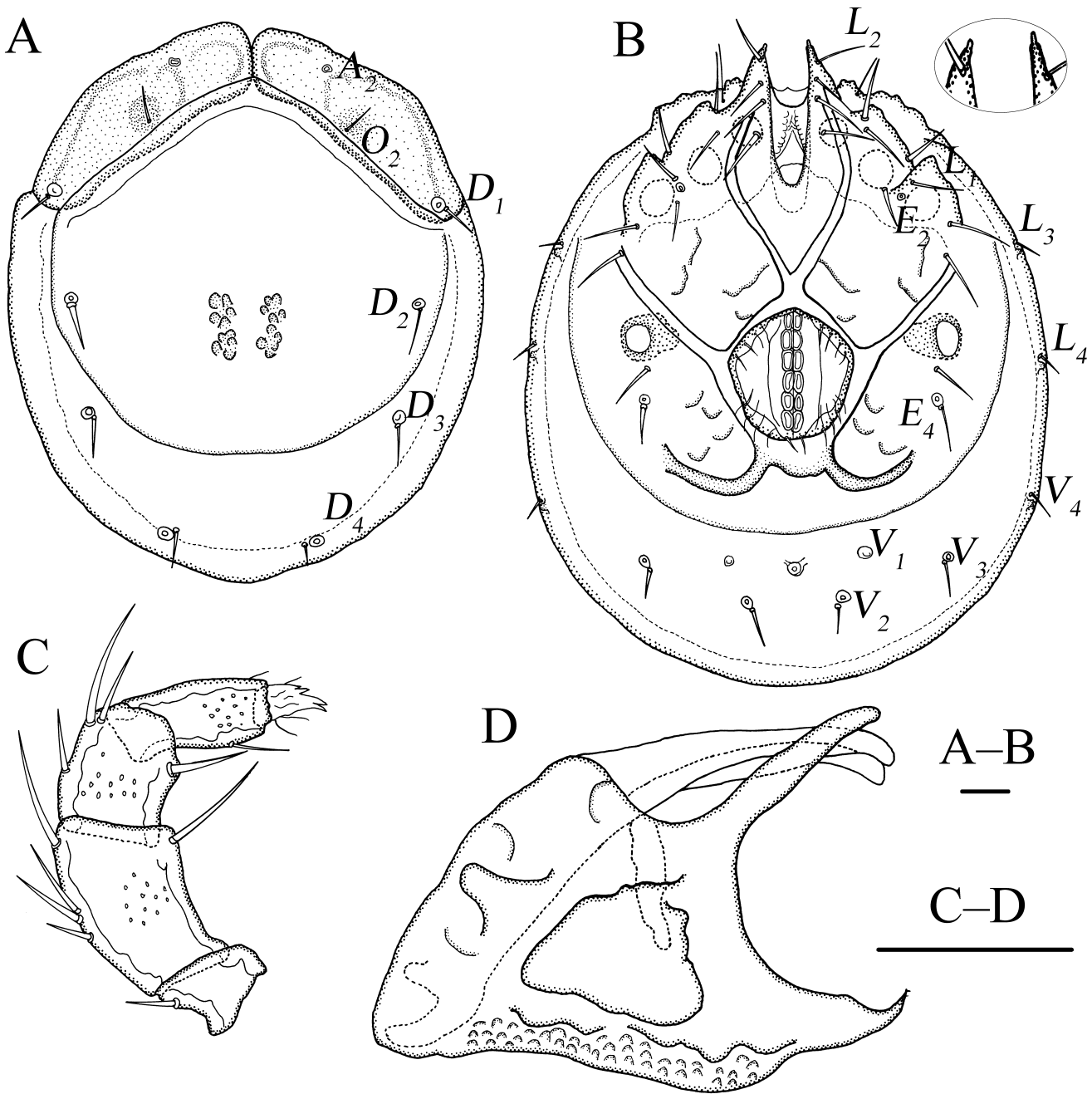


Figure 3 *Monatractides trilaminatus* **sp. nov.**, female: A = dorsal view; B = ventral view; C = palp; D = infracapitulum and chelicera. Scale bars = 100 µm.

W 969 (700–969), dorsal plate L 1046 (674–1046), anterior plate (shoulder + frontal platelets) L 580 (489–612), W 193 (167–193). Infracapitular bay depth 308 (245–308); Cx-I L 466 (377–466), mL 141 (122–165), Cx-II+III mL 28 (16–40); genital field L 253 (243–271), W 231 (213–231), distance between genital field and Ap 269 (136–269). Gnathosoma vL 259 (230–274), dL 190 (169–190); chelicera bs L 251 (245–272), claw L 32 (31–35). L of palp segments: P-1, 38 (34–38); P-2, 94 (79–94); P-3, 58 (50–63); P-4, 79 (72–81); P-5, 31 (31–33). dL of leg segments: I-L-1–6: 95 (86–95), 141 (104–150), 114 (97–115), 139 (124–156), 136 (118–164), 119 (105–157); II-L-1–6: 110 (97–110), 155 (133–165), 99 (92–115), 162 (130–

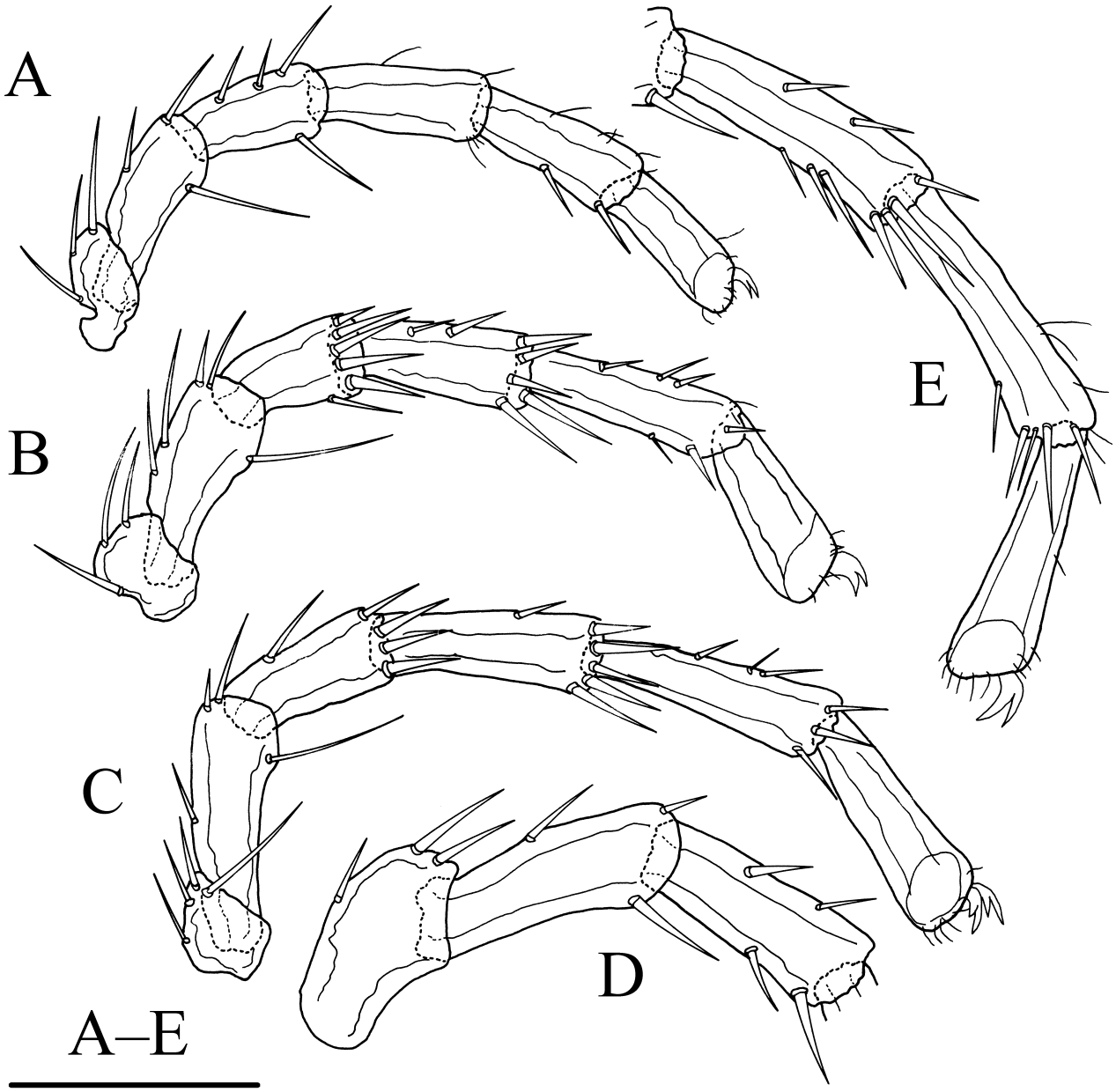


Figure 4 *Monatractides trilaminatus* **sp. nov.**, female: A = Leg-I; B = Leg-II; C = Leg-III; D = Leg-IV-1–3; E = Leg-IV-4–6. Scale bars = 100 μm.

162), 175 (129–175), 151 (111–164); III-L-1–6: 110 (86–110), 169 (144–185), 137 (111–146), 188 (162–188), 196 (179–196), 190 (160–193); IV-L-1–6: 168 (78–168), 195 (148–195), 199 (165–199), 230 (201–230), 236 (208–236), 196 (132–221).

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 acetabula 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 acetabula; 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 acetabula; 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 ventrodistal 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, 174, 164.

Female (n = 1) – Body features same as the male except: P-2 with longer ventrodistal 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.*

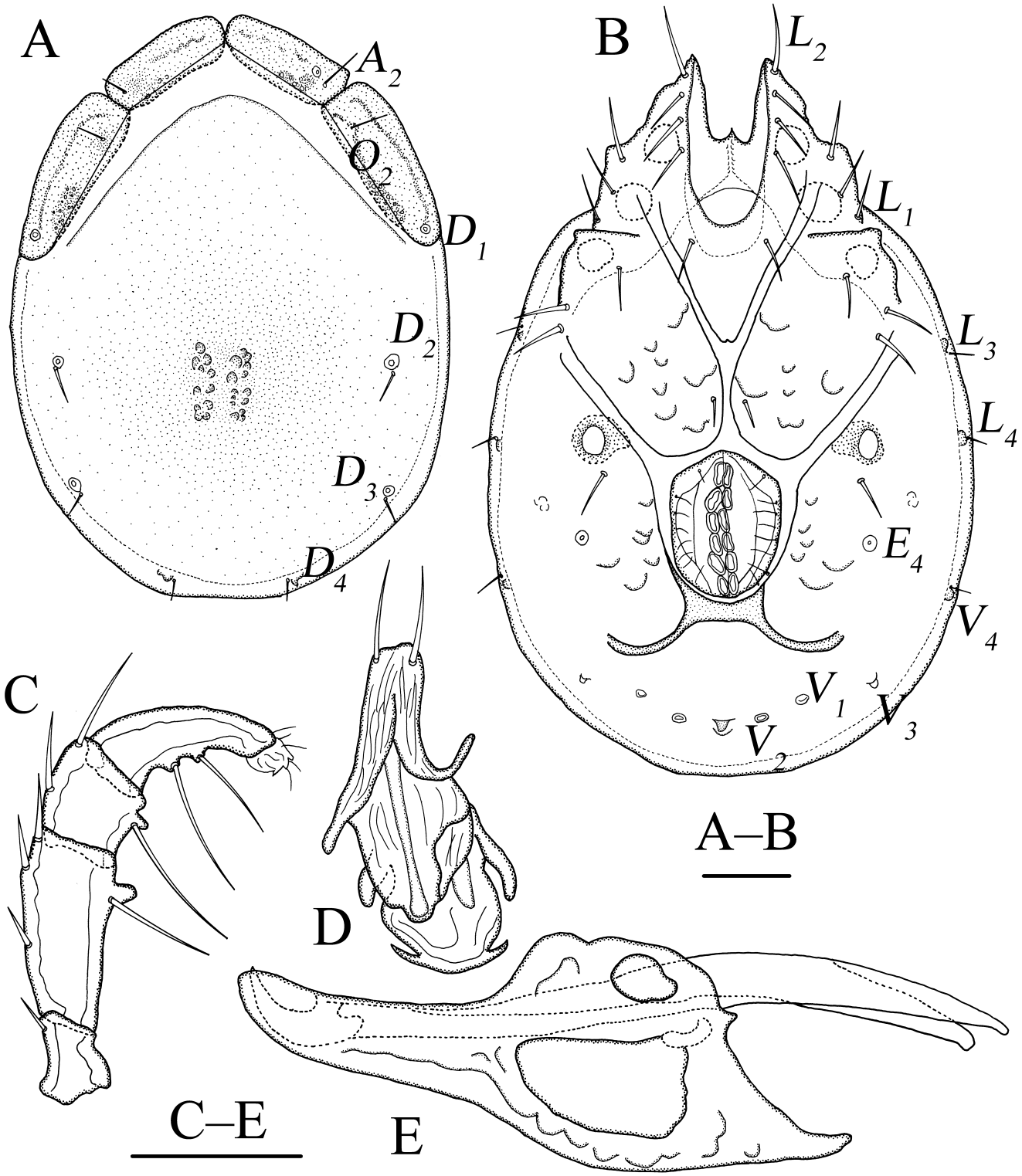


Figure 5 *Torrenticola lushanensis* **sp. nov.**, male: A = dorsal view; B = ventral view; C = palp; D = ejaculatory complex; E = infracapitulum and chelicera. Scale bars = 100 μm.

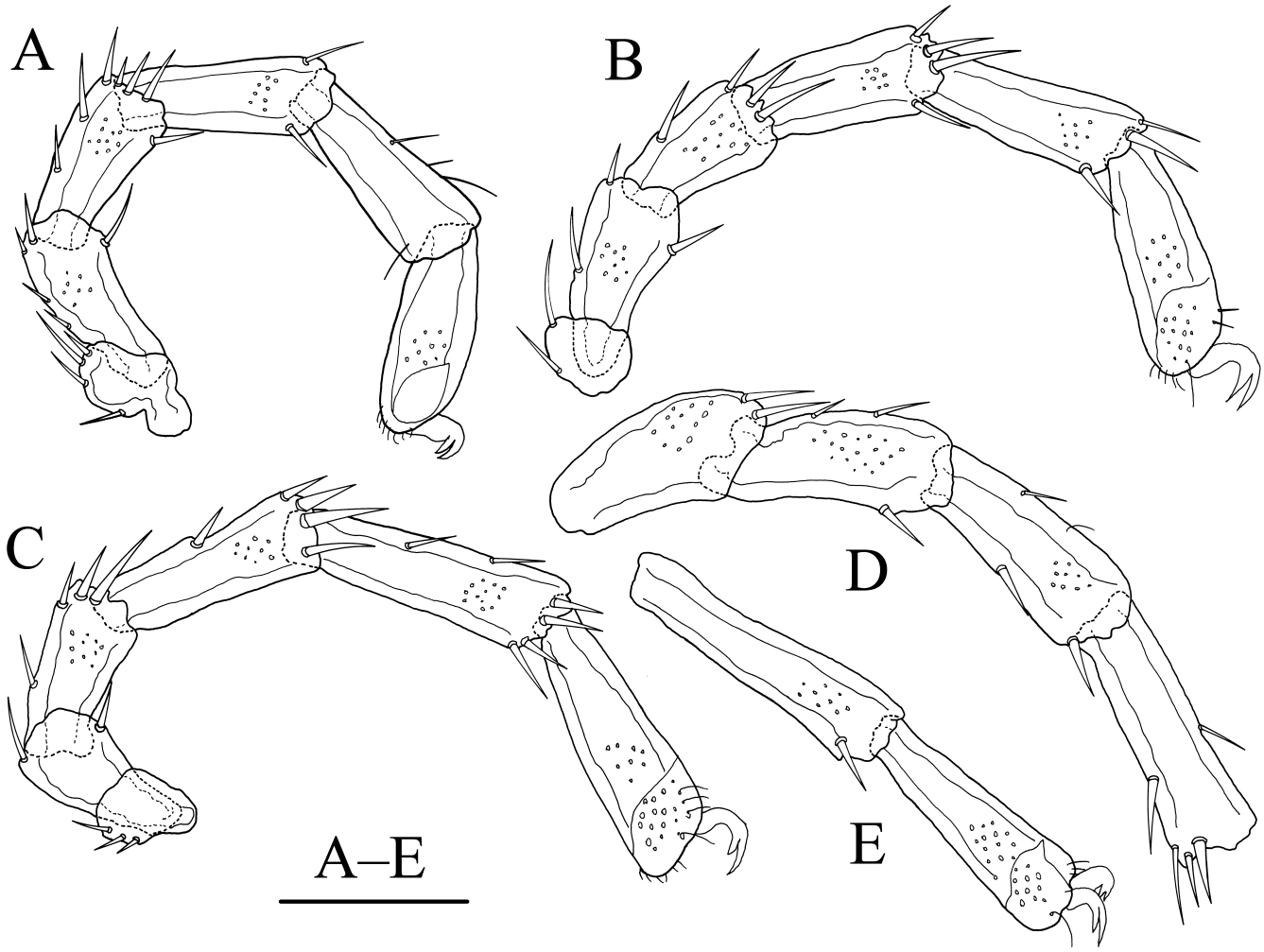


Figure 6 *Torrenticola lushanensis* **sp. nov.**, male: A = Leg-I; B = Leg-II; C = Leg-III; D = Leg-IV-1–4; E = Leg-IV-5, 6. Scale bars = 100 μm.

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: 604AAB08-586D-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_1 and V_2; 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

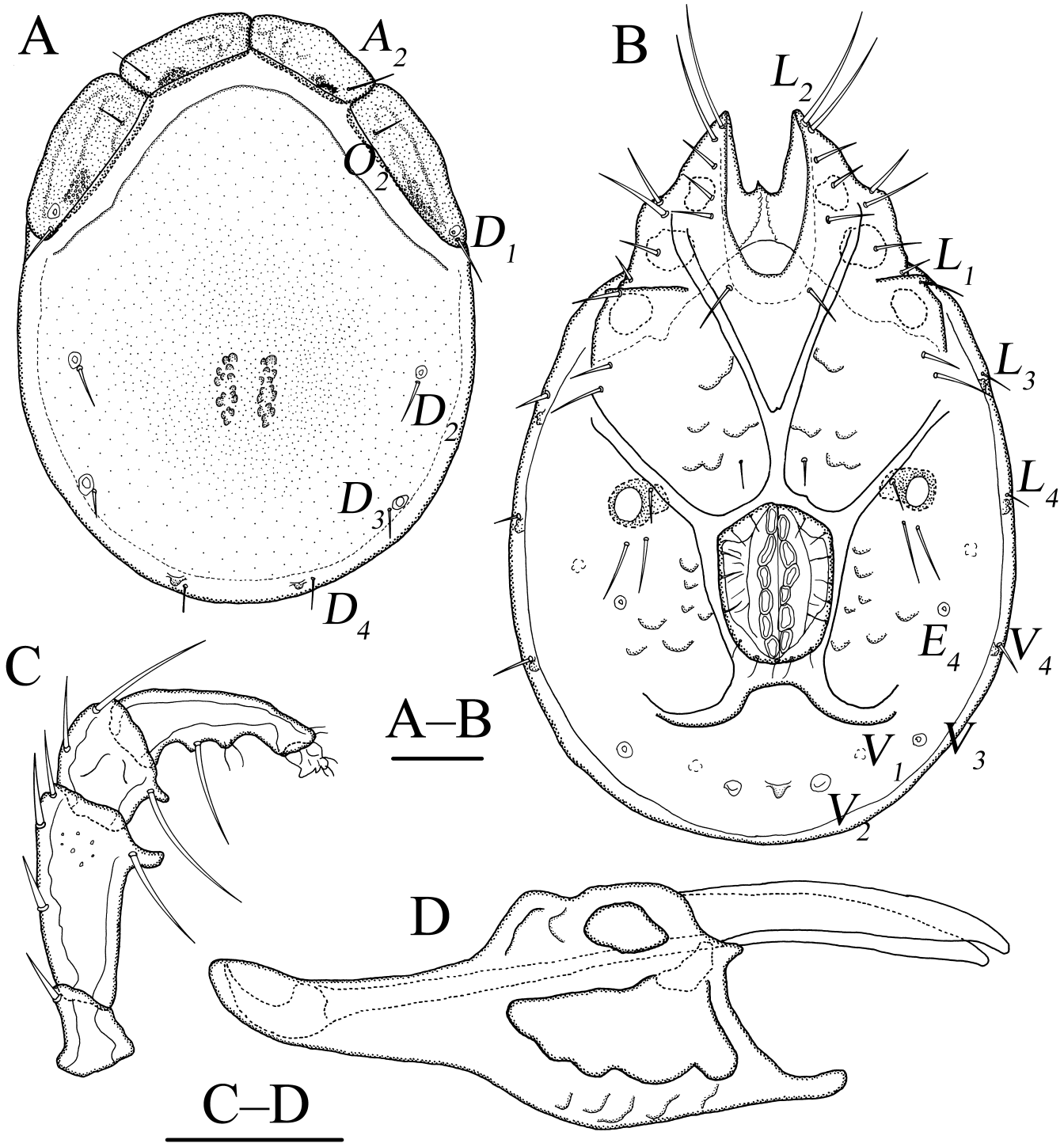


Figure 7 *Torrenticola lushanensis* **sp. nov.**, female: A = dorsal view; B = ventral view; C = palp; D = infracapitulum and chelicera. Scale bars = 100 μm.

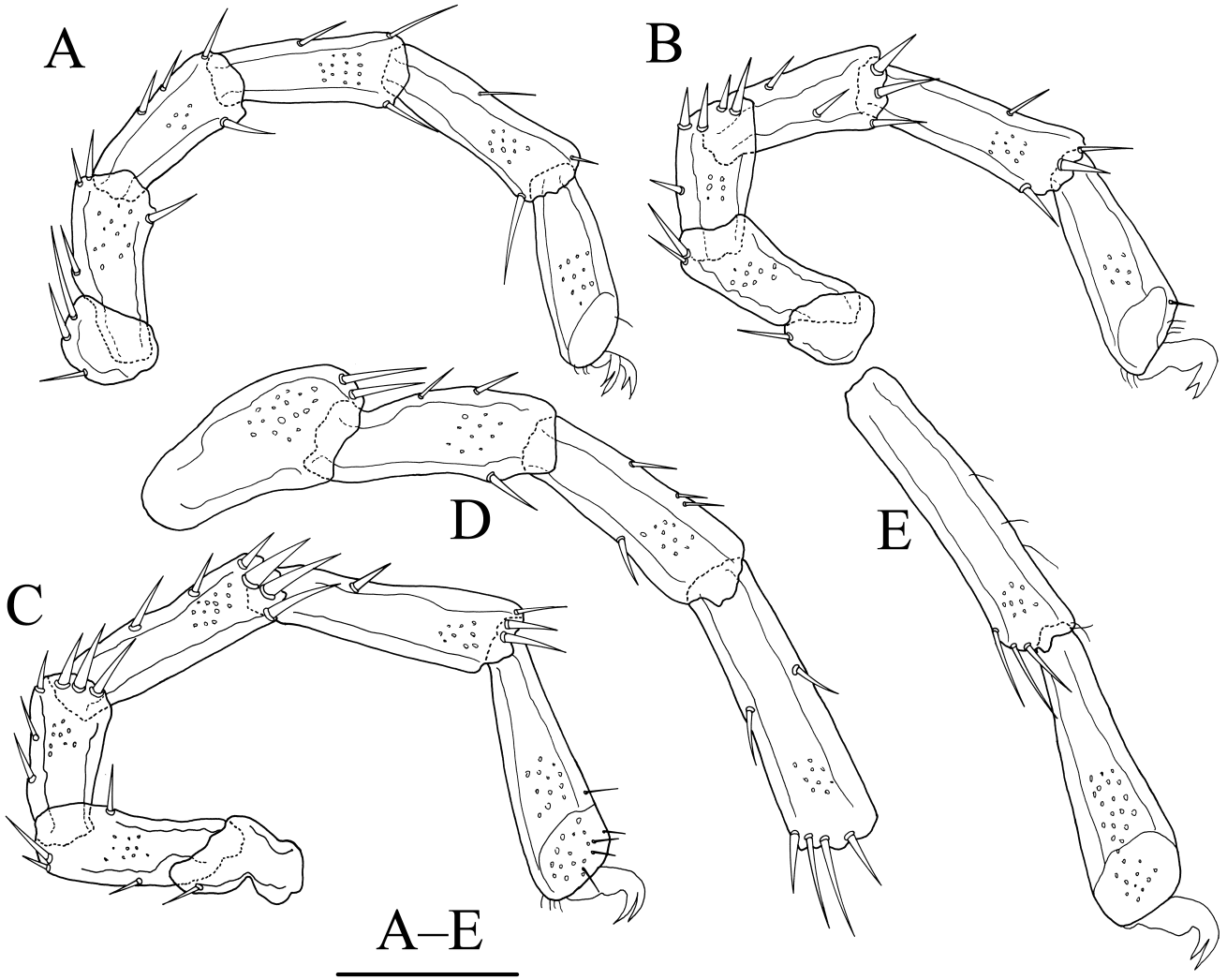


Figure 8 *Torrenticola lushanensis* **sp. nov.**, female: A = Leg-I; B = Leg-II; C = Leg-III; D = Leg-IV-1–4; E = Leg-IV-5, 6. Scale bars = 100 μm.

ventral apodeme.

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; E_4 at the same level as the 4th pair of acetabula; the line of primary sclerotization absent, and Ap posterior to V_1 and V_2, (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, chelicera bs 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;

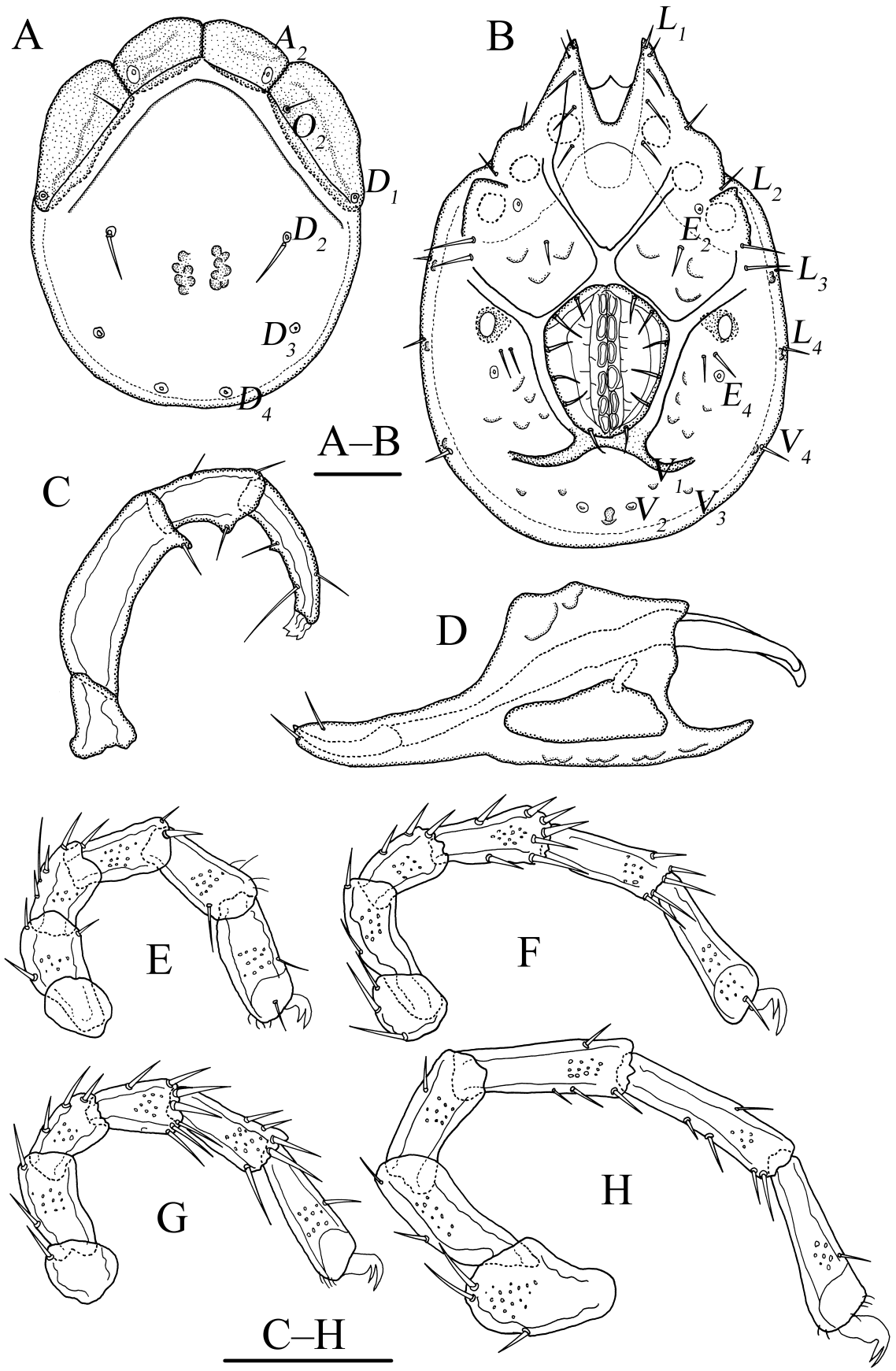


Figure 9 *Torrenticola planusirostrum* **sp. nov.**, female: A = dorsal view; B = ventral view; C = palp; D = infracapitulum and chelicera; E = Leg-I; F = Leg-II; G = Leg-III; H = Leg-IV. Scale bars = 100 µm.*# Acknowledgements

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).

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