



## First collection of Torrenticolidae (Hydrachnidiae, Acari) from Yintiaoling National Nature Reserve, China, with descriptions of two new species

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### Abstract

Torrenticolid mites (Hydrachnidiae, Acari) are presented from Yintiaoling National Nature Reserve, China. *Torrenticola multiserrater* Gu & Guo **sp. nov.**, and *T. pseudoalargada* Gu & Guo **sp. nov.** are described and illustrated as new to science; *T. siamis* Pešić & Smit, 2009 and *T. nipponica* (Enami, 1940) are reported as new records for Chongqing's fauna. Meanwhile, this is the first report of Torrenticolidae from Chongqing, China.

**Key words:** Torrenticolid mite, taxonomy, new taxa, China

### Introduction

The water mites family Torrenticolidae belongs to Lebertioidea (Hydrachnidiae, Acari), one of the most abundant groups in species diversity in water mites (Krantz & Walter 2009). Up to now, the world's total number of known torrenticolid species is 618 (Gu *et al.* 2019c, 2022a, b, c; Gu & Guo 2019; Pešić *et al.* 2019, 2020a, b, 2022). As of October 2022, there are 54 known species of Torrenticolidae in China, accounting for 8.74% of the total number of this family in the world. These 54 known species are distributed in Zhejiang, Jilin, Yunnan, Hunan, and other regions, but none in Chongqing by now. So, there is still a developmental unbalance of research level between different regions.

Yintiaoling National Nature Reserve is located in Wuxi County in the northeast of Chongqing, with a total area of 22423.1 hm<sup>2</sup>. The main protected objects are forest vegetation and species diversity (Chen & Xiong 2022). A survey of torrenticolid mites in Yintiaoling was carried out in August 2022. And four species were found, of which two species, *Torrenticola multiserrater* Gu & Guo **sp. nov.** and *T. pseudoalargada* Gu & Guo **sp. nov.** are new to science, and two species, *T. siamis* Pešić & Smit, 2009 and *T. nipponica* (Enami, 1940), are new records for Chongqing's fauna. Meanwhile, it is the first report of Torrenticolidae in Chongqing.

### Material and methods

#### Samples collections

Water mites were collected with a dip net of 250  $\mu$ m mesh width, then sifted by two stacked sieves (mesh size 4 mm above, 250  $\mu$ m below) to remove the coarse sediment and keep the fine fraction (Jin 1997, Ding *et al.* 2019). Specimens were preserved in Koenike's fluid.

### Specimens treatments and identification

Specimens were picked out from Koenike's fluid and cleaned in Lundblad fluid (8-12 hours). Finally, specimens were mounted in gelatin mounting fluid (Jin 1997). Specimens were observed under Leica DM3000 microscope; illustrations were collected under Leica DM3000 microscope and modified with Adobe Photoshop CS6. Specimens were measured by a Nikon ECLIPSE Ni microscope (with Nikon DS-Ri2 camera). The measurements follow Goldschmidt (2007).

### Abbreviations

The following abbreviations are used (Jin 1997, Goldschmidt 2007): 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; P-1–5 = palp segment 1–5; vL = ventral length; W = width. The chaetotaxy and nomenclature of glandularia used is modified from Jin (1997):  $A_2$  = postantennal glandularia;  $D_1$ – $D_4$  = dorsoglandularia 1–4;  $C_2$ ,  $C_4$  = coxoglandularia 2, 4;  $L_1$ – $L_4$  = lateroglandularia 1–4;  $O_2$  = postocularia;  $V_1$ – $V_4$  = ventroglandularia 1–4. Abbreviations of dorsal plate arrangements follow Wiles (1997): 4+1 = five plates; four anterior platelets and one single large dorsal plate; 2+2p+1 = five plates with the posterior pair of anterior platelets partially fused to the dorsal plate.

Numbers of specimens were listed as males/females/deutonymphs mounted. All measurements are given in micrometers ( $\mu\text{m}$ ). The examined specimens are kept in the Institute of Entomology, Guizhou University, Guiyang, China.

## Taxonomy

### Family Torrenticolidae Piersig, 1902

### Genus *Torrenticola* Piersig, 1896

#### *Torrenticola multiserrater* Gu & Guo sp. nov. (Figures 1–4)

**Type Materials. Holotype** male: No. CQ-TO-2022081101, China, Chongqing, Wuxi County, Yintiaoling National Nature Reserve, Linkouzi (31°28'35"N, 109°53'18"E, 1250 m a.s.l.), collected by Yuhao Zhang, 11-VIII-2022.

**Paratypes:** 1/3/0, No. CQ-TO-2022081102–CQ-TO-2022081105, same data as holotype.

**Diagnosis.** Dorsal plate arrangement: 4+1; P-2 with five dorsal setae, a jagged serrated extension on ventrum, and one ventral seta at the base of ventral extension; P-3 with an obvious serrated terminal-margin, one serrated ventral extension, and three dorsal and one ventral setae.

**Description. Male (n = 2):** Idiosoma elliptical, L 733 (730), W 442 (432), L/W ratio 1.66 (1.69). Dorsal plate arrangement: 4+1 (Fig. 1A); dorsal shield L 598 (576), W 392 (385), dorsal plate L 532 (519), frontal platelets L 150 (122), W 60 (65), shoulder platelets L 180 (177), W 70 (70). Infracapitular bay V-shaped, L 121 (117); Cx-I L 246 (235), mL 126 (120), Cx-II+III mL 117 (127); genital field elliptical, L 138 (129), W 101 (97);  $C_4$  at the same level as the 4<sup>th</sup> pair of acetabula;  $V_1$  anterior to  $V_2$ ,  $V_2$  almost at the same level of Ap (Fig. 1B). Gnathosoma: dL 218 (225), vL 299 (305); rostrum long and dorsal apodeme short and blunt, ventral apodeme long and blunt; chelicera bs L 302 (301), claw L 43 (44) (Fig. 1D). Palp (Fig. 1C): P-1 short, with one dorsodistal seta; P-2 with five dorsal setae, and one ventral seta at the base of a jagged serrated extension; P-3 with an obvious serrated terminal-margin, one serrated ventral extension, and three dorsal and one ventral setae; P-4 with one thin dorsal seta and three ventral setae on two ventral extensions. L of palp segments: P-1, 31 (28); P-2, 78 (79); P-3, 52 (55); P-4, 115 (101); P-5, 14 (13). Legs (Fig. 2): L of leg segments: I-L-1–6: 30 (29), 54 (59), 62 (63), 71 (73), 85 (92), 86 (93); II-L-1–6: 28 (30), 70 (78), 54 (59), 69 (74), 78 (80), 67 (86); III-L-1–6: 34 (37), 82 (81), 57 (58), 79 (82), 92 (99), 92 (100); IV-L-1–6: 88 (91), 97 (94), 88 (98), 110 (120), 121 (128), 110 (114). Ejaculatory complex (Fig. 1E), L 158 (148), aL 105 (-).

**Female (n = 3).** Body features same as the male except genital field pentagonal (Fig. 3B). Idiosoma L 753 (725–753), W 464 (449–464), L/W ratio 1.6 (1.61–1.62). Dorsal shield L 607 (600–607), W 399 (399–409), L/W ratio 1.5 (1.48–1.52); dorsal plate L 543 (534–543), frontal platelets L 134 (134–148), W 53 (53–61), L/W ratio 2.5 (2.4–2.5). Infracapitular bay depth 132 (124–132); Cx-I L 258 (254–258), mL 123 (123–129), Cx-II + III mL 97 (97–103). Genital field L 156 (156–157), W 138 (138–140), L/W ratio 1.11 (1.11–1.13); distance between genital

field and Ap 175 (164–175). Gnathosoma vL 323 (297–323), dL 231 (231–268), chelicera bs L 315 (315–335), claw L 45 (40–45). L of palp: P-1, 30 (30–32); P-2, 83 (81–83); P-3, 53 (53–58); P-4, 93 (88–93); P-5, 14 (13–14). L of leg segments: I-L-1–6: 32 (32–34), 76 (76–81), 62 (62–65), 76 (76–79), 86 (87–96), 87 (87–97); II-L-1–6: 31 (31–34), 76 (75–76), 59 (59–60), 69 (69–72), 80 (80–85), 84 (84–85); III-L-1–6: 35 (32–35), 86 (67–86), 59 (59–61), 87 (84–87), 98 (94–98), 88 (88–94); IV-L-1–6: 90 (90–97), 101 (97–101), 96 (96–101), 120 (117–120), 129 (123–129), 104 (104–116).

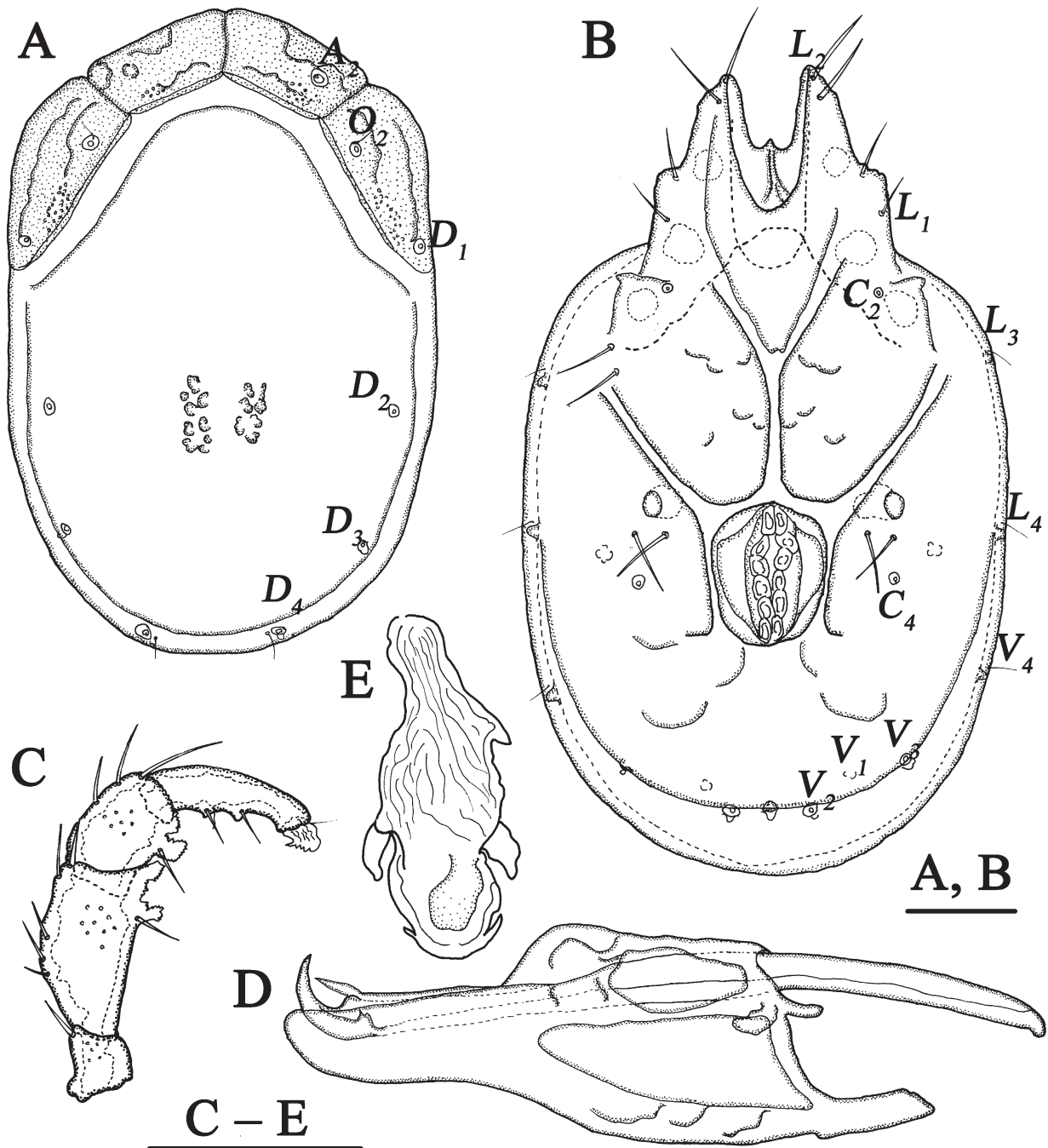
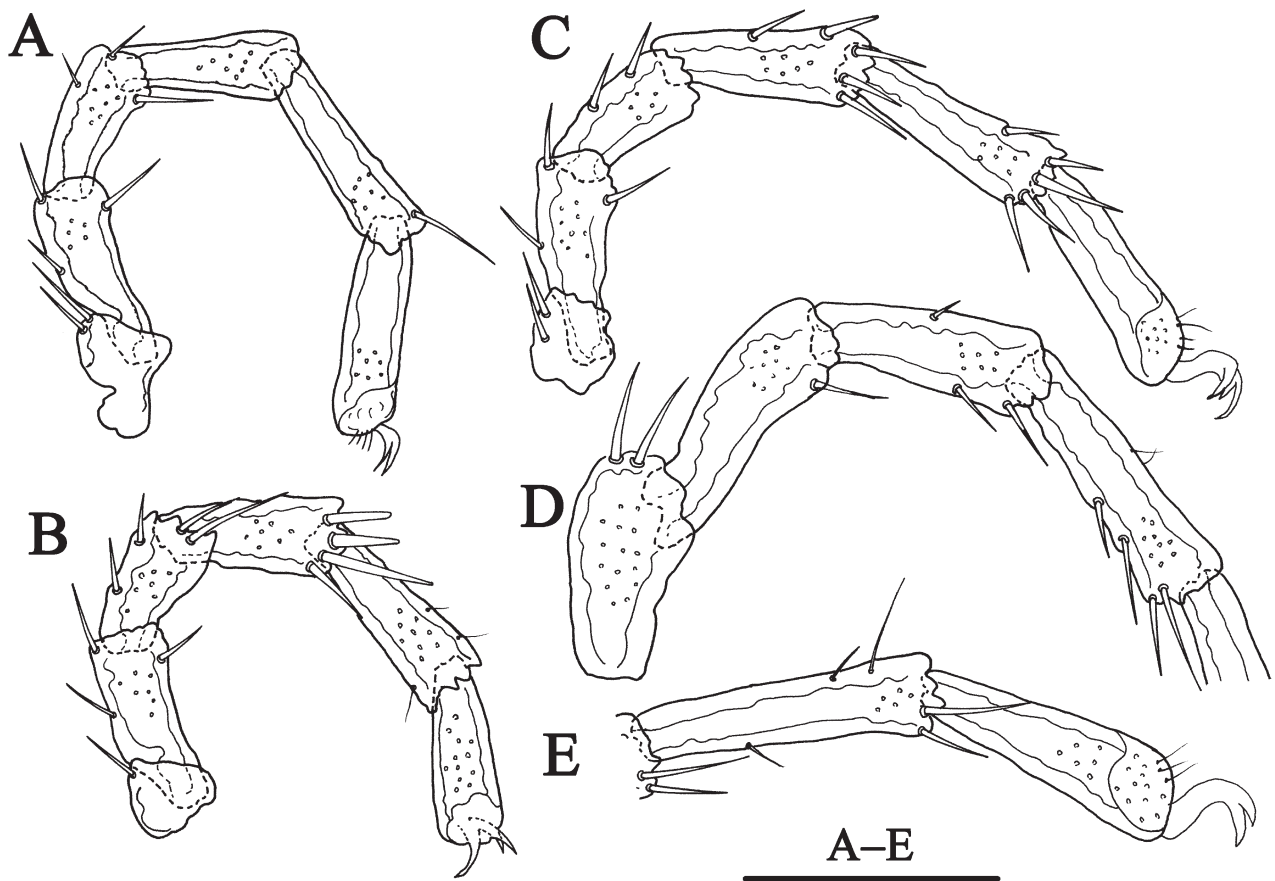


FIGURE 1. *Torrenticola multiserrater* Gu & Guo sp. nov., male: A = dorsal view; B = ventral view; C = palp; D = infracapitulum and chelicera; E = ejaculatory complex. Scale bars = 100  $\mu$ m.



**FIGURE 2.** *Torrenticola multiserrater* Gu & Guo 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  $\mu$ m.

**Habitat.** Streamlet, about 0.3–0.5 m in depth, with many small stones at the bottom.

**Remarks.** Plap with serrated ventral extensions was also found in a small number of torrenticolid mites, such as *T. dentifera* Wiles, 1991 (Gu *et al.* 2020b), *T. dentipalpis* Jin, 1997 (Jin 1997), *T. alargada* Goldschmidt, 2007 (Goldschmidt 2007) and *T. turkestanica* (Sokolow, 1926) (Pešić & Smit 2009). However, the aforementioned torrenticolid mites only have a regular (rod-shaped or rectangular) ventral extension on P-2. *T. multiserrater* Gu & Guo sp. nov., can be distinguished from other members of the genus by P-2 with a jagged serrated extension on ventrum, which like a flower cluster or coral, and one ventral seta at the base of ventral extension; P-3 with an obvious serrated terminal-margin, one serrated ventral extension, and three dorsal setae and one ventral seta (Figs. 1C, 3C).

**Etymology.** The specific name, *multiserrater*, is a combination from the Latin words: “*multi-*” and “*serrated*”, referring to this species having multiple serrated extensions, forming a jagged serrated extension on ventrum (Figs. 1C, 3C); used as a noun in apposition.

**Distribution.** Known only on the type locality (Wuxi, Chongqing of China).

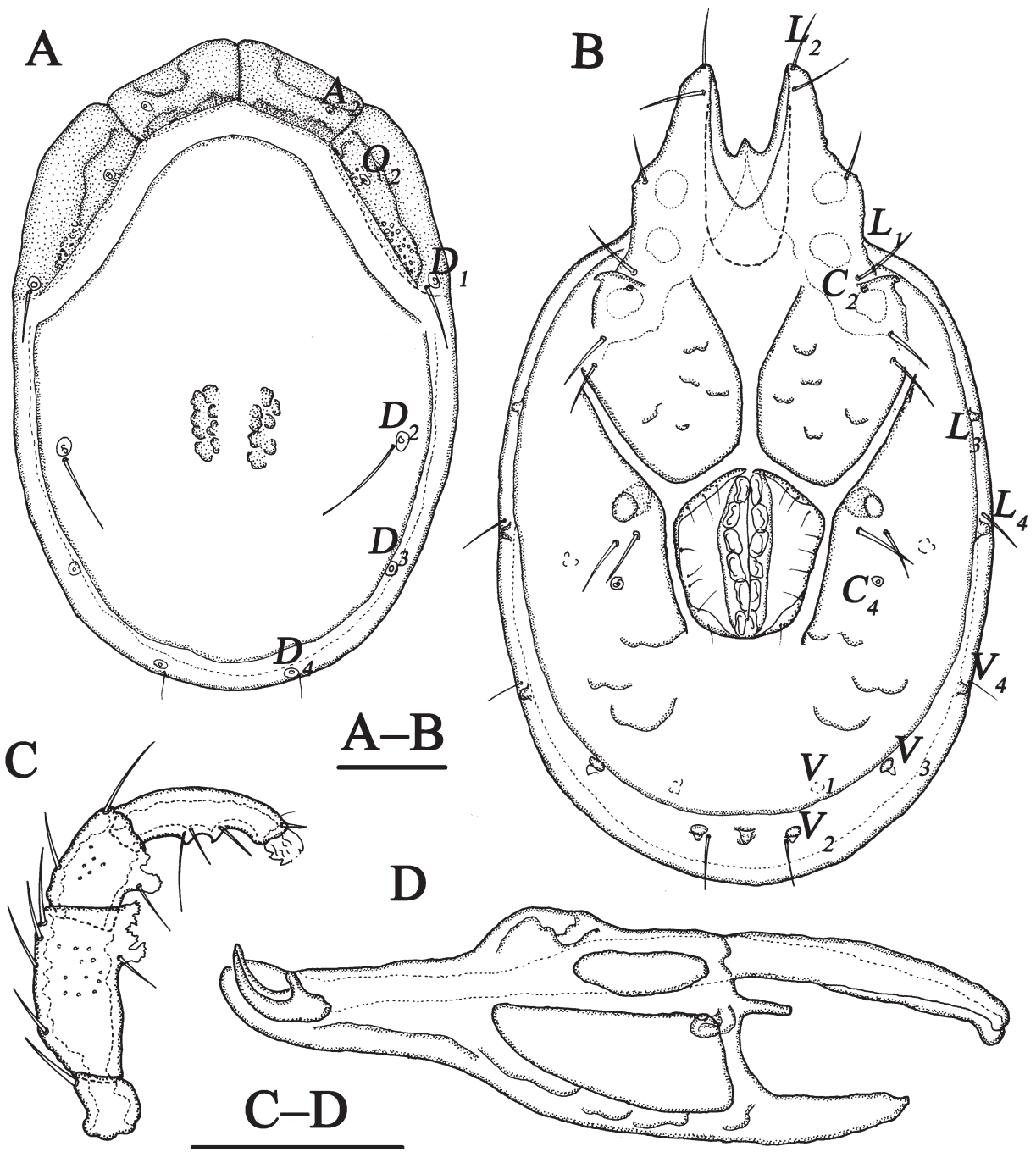


FIGURE 3. *Torrenticola multiserrater* Gu & Guo sp. nov., female: A = dorsal view; B = ventral view; C = palp; D = infracapitulum and chelicera. Scale bars = 100  $\mu$ m.



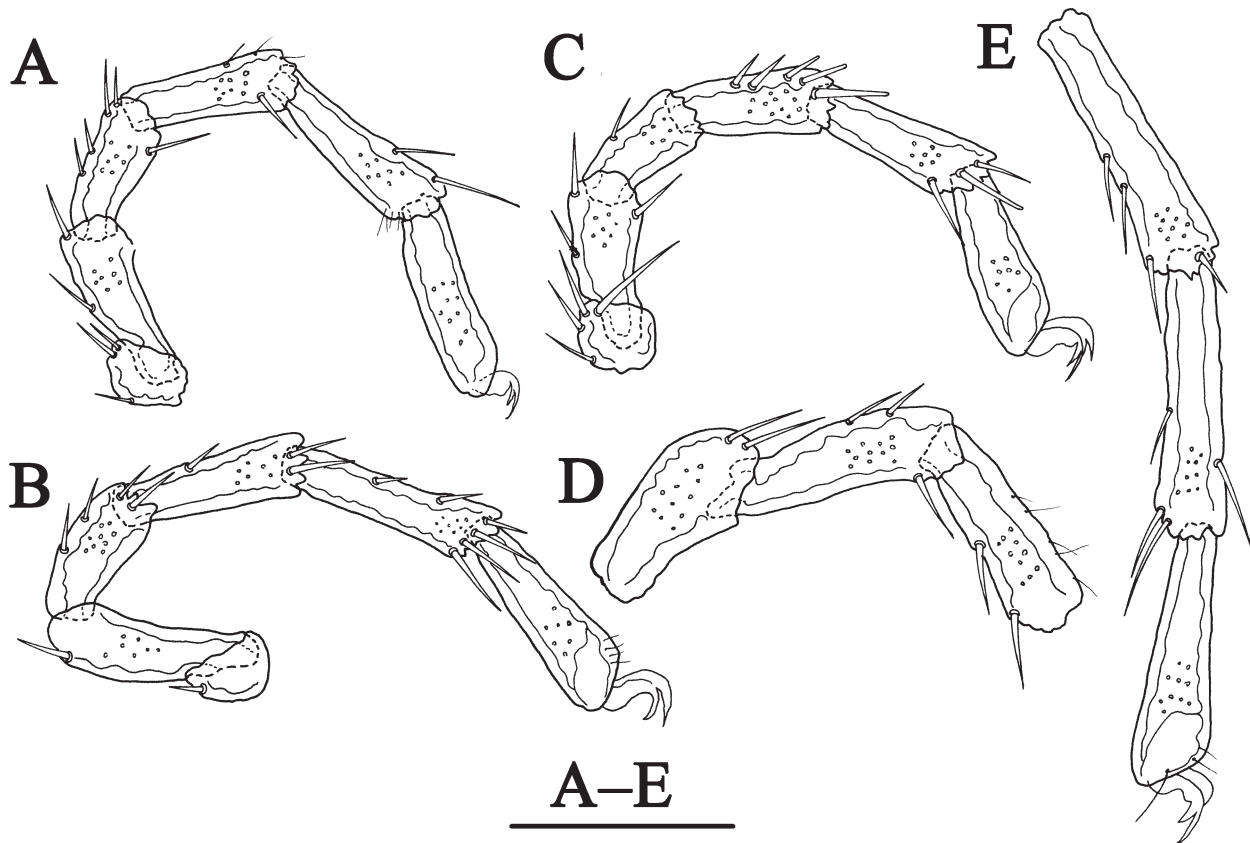


FIGURE 4. *Torrenticola multiserrater* Gu & Guo sp. nov., female: A = Leg-I; B = Leg-II; C = Leg-III; D = Leg-IV-1-3; E = Leg-IV-4-6. Scale bars = 100  $\mu$ m.

#### *Torrenticola pseudoalargada* Gu & Guo sp. nov. (Figures 5-8)

**Type Materials. Holotype** male: No. CQ-TO-2022081301, China, Chongqing, Wuxi, Yintiaoling National Nature Reserve, Lanying Grand Canyon (31°26'19"N, 109°50'46"E, 870 m a.s.l.), collected by Yuhao Zhang, 13-VIII-2022. **Paratypes:** 1/3/0, No. CQ-TO-2022081106 – CQ-TO-2022081109, Yintiaoling National Nature Reserve, Linkouzi (31°28'35"N, 109°53'18"E, 1250 m a.s.l.), collected by Yuhao Zhang, 11-VIII-2022.

**Diagnosis.** Dorsal plate arrangement: 4+1; Infracapitular bay U-shaped; P-2 with four dorsal setae, and one ventral seta at the base of a serrated extension; P-3 with one serrated rectangular extension on ventrum, at the base of which with one ventral seta; P-4 with two dorsal setae, and two setae on two ventral extensions.

**Description. Male (n = 2):** Idiosoma elliptical, L 690 (813), W 438 (538), L/W ratio 1.6 (1.5). Dorsal plate arrangement: 4+1 (Fig. 5A); dorsal shield L 558 (626), W 391 (467), dorsal plate L 526 (571), frontal platelets L 118 (129), W 53 (65), L/W ratio 2.2 (2.0); shoulder platelets L 169 (202), W 61 (85), L/W ratio 2.8 (2.4). Infracapitular bay U-shaped, L 131 (156); Cx-I L 256 (300), mL 126 (144), Cx-II+III mL 78 (112); genital field ellipse, L 152 (185), W 106 (140);  $C_4$  at the same level as the 4<sup>th</sup> pair of acetabula; the posterior margin of Cx-IV relatively indistinct;  $V_1$  anterior to  $V_2$ ,  $V_2$  almost at the same level of Ap (Fig. 5B). Gnathosoma: dL 206 (266), vL 281 (350); rostrum long and dorsal apodeme short, ventral apodeme long and blunt; chelicera bs L 281 (356), claw L 41 (47), (Fig. 5D). Palp (Fig. 5C): P-1 short, with one dorsodistal seta; P-2 with four dorsal setae, and one ventral seta at the base of a serrated extension; P-3 with two dorsal setae and one serrated rectangular extension on ventrum, at the base of which with one ventral seta; P-4 with two dorsal setae, and two ventral setae on two ventral extensions. L of palp segments: P-1, 30 (39); P-2, 85 (105); P-3, 52 (55); P-4, 63 (70); P-5, 15 (19). Legs (Fig. 6): L of leg segments: I-L-1-6: 33 (36), 78 (84), 66 (72), 70 (88), 79 (97), 80 (91); II-L-1-6: 31 (36), 77 (89), 57 (69), 79 (83), 87 (99), 94 (101); III-L-1-6: 45 (42), 78 (94), 65 (72), 90 (101), 106 (118), 108 (117); IV-L-1-6: 89 (98), 87 (104), 95 (116), 124 (133), 136 (137), 123 (131). Ejaculatory complex (Fig. 5E), L 156 (-), aL 118 (-).

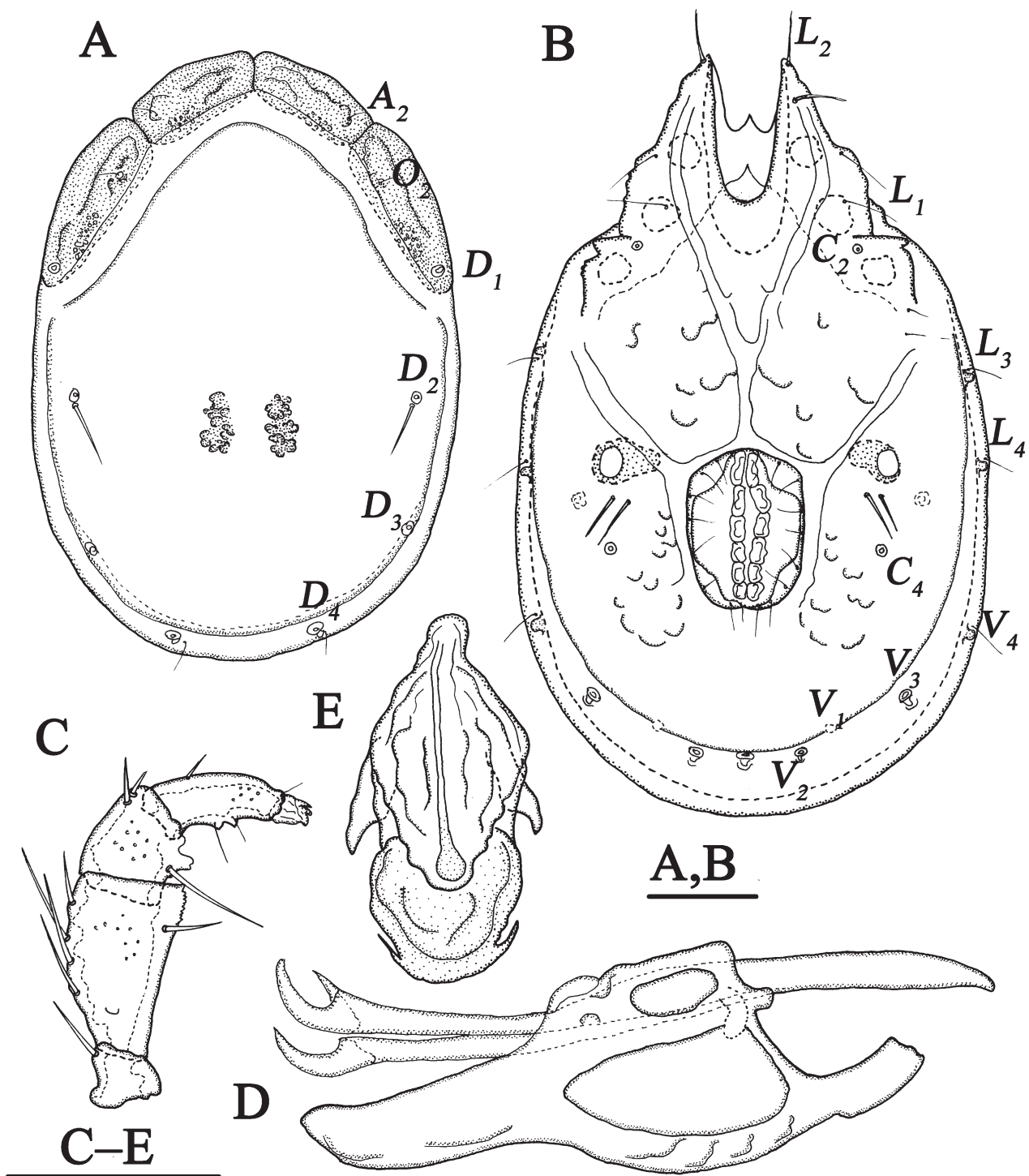


FIGURE 5. *Torrenticola pseudoalargada* Gu & Guo sp. nov., male: A = dorsal view; B = ventral view; C = palp; D = infracapitulum and chelicera; E = Ejaculatory complex. Scale bars = 100  $\mu$ m.

**Female (n = 3).** Body features same as the male except: genital field pentagonal;  $C_4$  at the same level as the 4<sup>th</sup> pair of acetabula; the posterior margin of Cx-IV relatively obvious (Fig. 7B); P-3 with three dorsal setae (Fig. 7C). Idiosoma L 937 (771–937), W 627 (502–627), L/W ratio 1.49 (1.49–1.54). Dorsal shield L 738 (621–738), W 556 (453–556), L/W ratio 1.3 (1.3–1.4); dorsal plate L 675 (568–675), frontal platelets L 178 (130–178), W 71 (57–71), L/W ratio 2.5 (2.3–2.5), shoulder platelets L 218 (171–218), W 90 (60–90). Infracapitular bay depth 174 (153–174); Cx-I L 348 (293–348), mL 171 (142–171), Cx-II + III mL 76 (48–76). Genital field L 191 (161–191), W 178 (134–178), L/W ratio 1.1 (1.1–1.2); distance between genital field and Ap 202 (177–202). Gnathosoma vL

412 (308–412), dL 309 (231–309), chelicera bs L 433 (330–433), claw L 53 (51–53). L of palp: P-1, 43 (34–43); P-2, 125 (95–125); P-3, 66 (55–66); P-4, 81 (66–81); P-5, 13 (13–17). L of leg segments: I-L-1–6: 43 (30–43), 100 (85–100), 85 (70–85), 94 (76–94), 112 (81–112), 101 (81–101); II-L-1–6: 40 (34–40), 96 (85–96), 79 (64–79), 99 (83–99), 114 (88–114), 112 (99–112); III-L-1–6: 40 (35–40), 108 (83–108), 85 (69–85), 122 (98–122), 139 (115–139), 129 (122–129); IV-L-1–6: 120 (101–120), 102 (102–118), 122 (113–122), 157 (132–157), 159 (143–159), 144 (139–144).

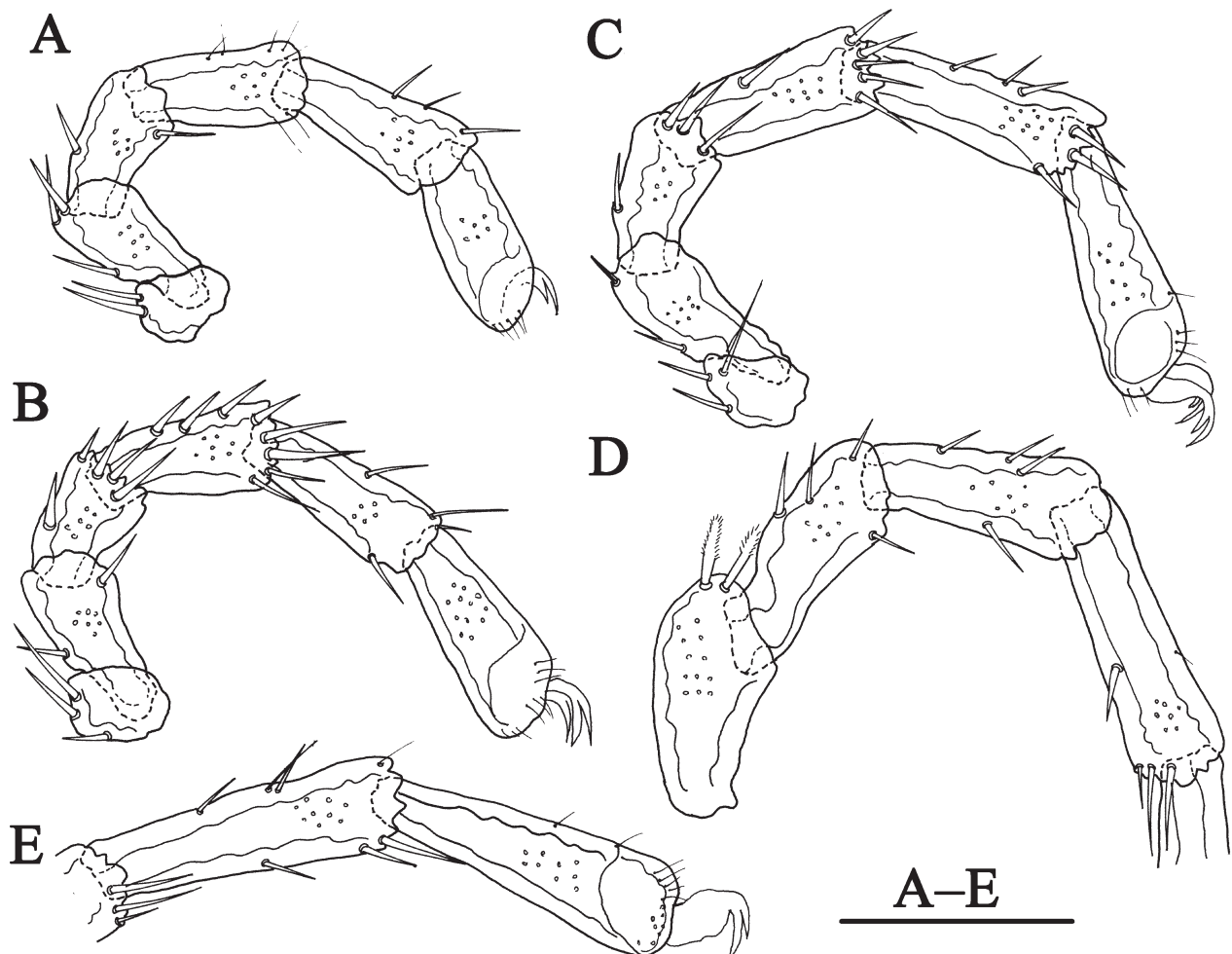
**Habitat.** Streamlet, about 0.3–0.5 m in depth, is so clear that you can see many small stones at the bottom.

**Remarks.** The present species is similar to *T. alargada* Goldschmidt, 2007, a species from Latin American (Goldschmidt 2007). Both species have a serrated ventral extension on P-2, two setae-bearing projections on ventral margin of P4, and a similar gnathosoma. The new species differs from *T. alargada* in: (1) *T. pseudoalargada* Gu & Guo **sp. nov.** with a U-shaped infracapitular bay, but V-shaped in *T. alargada*; (2) *T. pseudoalargada* Gu & Guo **sp. nov.** without color pattern, but posterior two-thirds of dorsal plate red to pale reddish in *T. alargada*; (3) P-4 with two ventral setae in *T. pseudoalargada* Gu & Guo **sp. nov.**, but with four ventral setae in *T. alargada*.

In addition, the new species resembles *T. malaisei* (Lundblad, 1941) (Wiles 1997; Pešić *et al.* 2012) in: P-3 with a short, subrectangular, apically serrated ventrodistal projection, and a long seta laterally at the base of the projection and a comparatively short P-4. But two species have obvious differences in: (1) P-2 with a flat blade-like ventral extension in *T. malaisei* but with a serrated extension in *T. pseudoalargada*; (2) posterior suture line of Cx-IV obvious and long in *T. malaisei* but retrogressive in *T. pseudoalargada*; (3) Cx-I-II exceeding to the anterior margin of idiosoma in *T. malaisei*, but only Cx-I and Cx-II exceeding to it in *T. pseudoalargada*.

**Etymology.** This species is named after its similar species, *T. alargada*. And the specific name, *pseudoalargada*, is from the Latin affix: “pseudo-”, which means fake or simulated; used as a noun in apposition.

**Distribution.** Known only on the type locality (Wuxi, Chongqing of China).



**FIGURE 6.** *Torrenticola pseudoalargada* Gu & Guo **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  $\mu$ m.



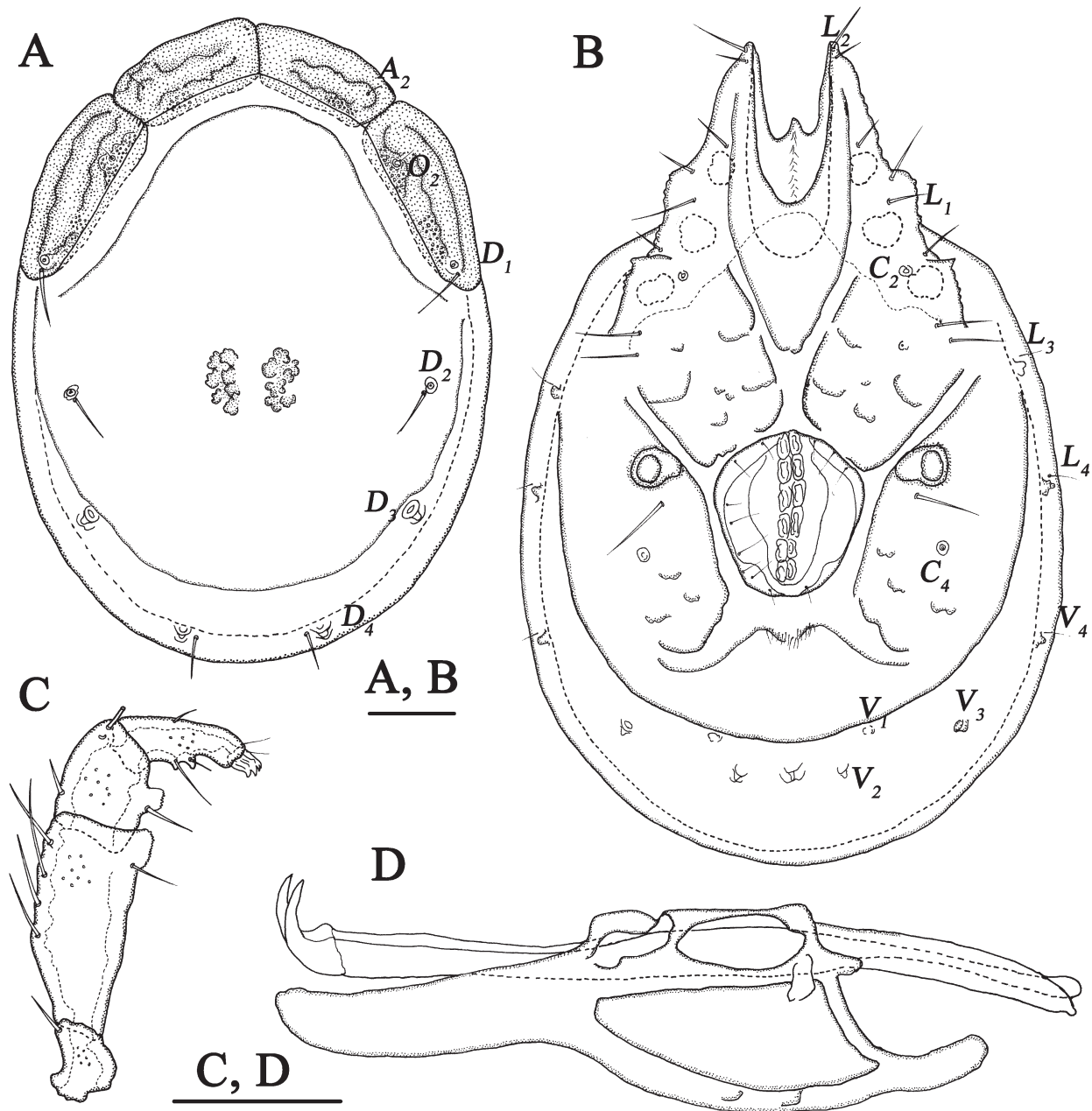


FIGURE 7. *Torrenticola pseudoalargada* Gu & Guo sp. nov., female: A = dorsal view; B = ventral view; C = palp; D = infracapitulum and chelicera. Scale bars = 100  $\mu$ m.

***Torrenticola nipponica* (Enami, 1940)**

*Atractides nipponicus* Enami 1940: 221.

*Torrenticola nipponica*: Chung & Kim 1995: 27; Pešić *et al.* 2013: 30; Gu *et al.* 2018: 1973.

**Diagnosis.** Idiosoma oval, purple or reddish; antero-medial platelets rectangular oval; P-2 with three to five thick and long setae, one dorsal short-thin seta, and with a ventral prolongation bearing a long seta; P-3 with two or three dorsal setae, and a ventral prolongation bearing a long seta; P-4 with four fine dorsal setae and two ventral prolongations bearing one long and three short setae.

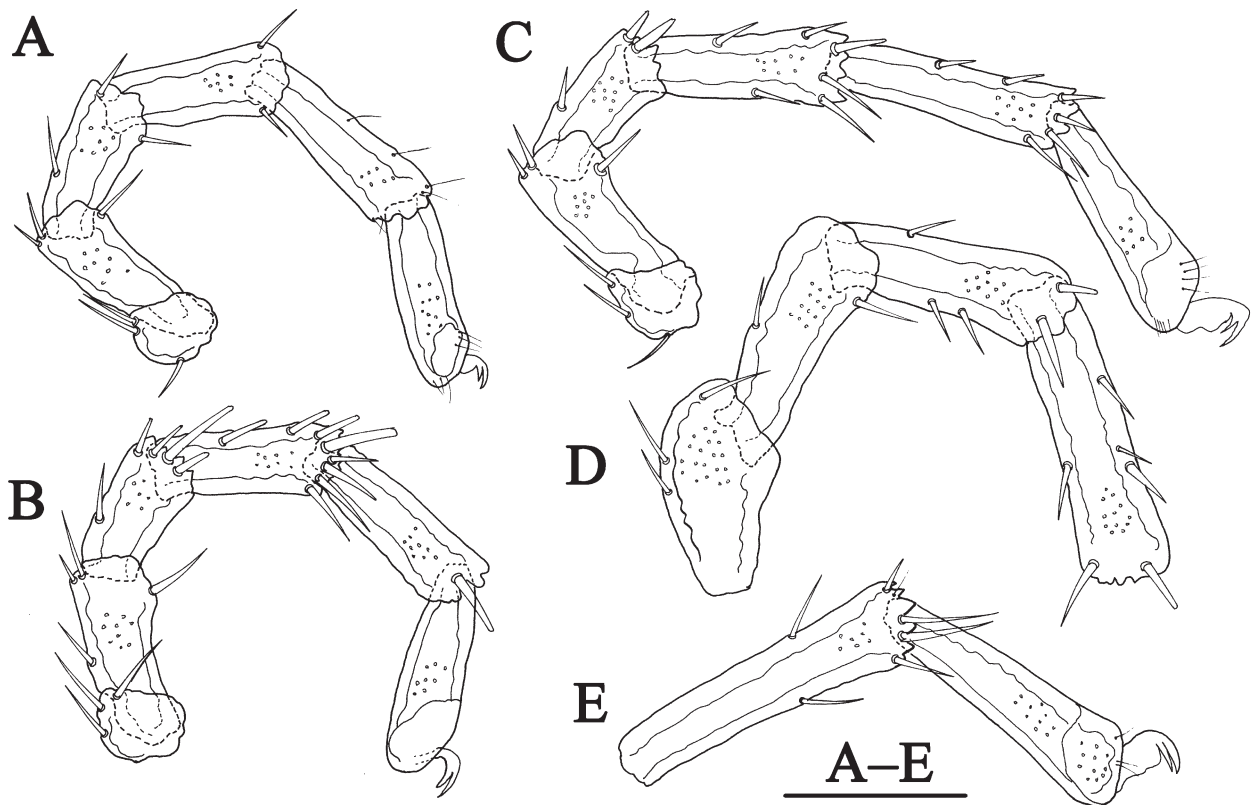
**Material examined.** 1/2/0 (CQ-TO-2022081302— CQ-TO-2022081304), China, Chongqing, Wuxi, Yintiaol-

ing National Nature Reserve, Lanying Grand Canyon (31°26'19"N, 109°50'46"E, 870 m a.s.l.), 13-VIII-2022, collected by Yuhao Zhang.

**Habitat.** Streamlet, about 0.3–0.5 m in depth, with many small stones at the bottom.

**Remarks.** Those specimens match the general morphology of *T. nipponica*, a species from Japan (Enami 1940). And *T. nipponica* was reported as a newly recorded from China in 2018 (Gu *et al.* 2018). Those specimens from Chongqing show a general conformity with the populations from Guizhou:  $C_4$  on the same line with the 4<sup>th</sup> pair of acetabula in the male, and the 5<sup>th</sup> pair in the female; dorsal plate with a colour pattern, hour-glass-shaped with pale “shoulder-patches”.

**Distribution.** China (Guizhou (Gu *et al.* 2018), Chongqing), Japan (Enami 1940), South Korea (Chung & Kim 1995, Pešić *et al.* 2013), and Russia (Pešić *et al.* 2013).



**FIGURE 8.** *Torrenticola pseudoalargada* Gu & Guo 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  $\mu$ m.

### *Torrenticola siamis* Pešić & Smit, 2009

*Torrenticola siamis* Pešić & Smit, 2009: 35; Gu *et al.* 2019b: 105.

**Diagnosis.** Cx-II+III mL short; Cx-IV not extended posterior to the genital field; male genital field rectangular, ejaculatory complex conventional in shape; deep capitulum with a short rostrum (Pešić & Smit 2009).

**Material examined.** 1/1/0 (CQ-TO-2022081305, CQ-TO-2022081306), China, Chongqing, Yintiaoling National Nature Reserve, Lanying Grand Canyon (31°26'19"N, 109°50'46"E, 870 m a.s.l.), collected by Yuhao Zhang, 13-VIII-2022.

**Habitat.** Streamlet.

**Remarks.** The specimens from Yintiaoling National Nature Reserve show general agreement with the types of *T. siamis* Pešić & Smit, 2009 (Pešić & Smit 2009; Gu *et al.* 2019b), with no obvious differences present.

**Distribution.** China (Guizhou (Gu *et al.* 2019b), Chongqing); Thailand (Pešić & Smit 2009)

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## References

- Chen, F. & Xiong, C. (2022) Newly recorded ferns from Yintiaoling National nature reserve of Chongqing. *Tillage and Cultivation*, 2022, 42 (03), 95–99 + 102. [in Chinese]
- Chung, K.S. & Kim, I.H. (1995) Water Mites from Chindo Island. *The Korean Journal of Systematic Zoology*, 11, 27–37.
- Ding, Z.H., Guo, J.J., Yi, T.C. & Jin, D.C. (2019) Description of four new species of the genus *Neumania* Lebert, 1879 (Acari, Hydrachnidia, Unionicolidae) from China. *Systematic & Applied Acarology*, 24 (12), 2503–2526. <https://doi.org/10.11158/saa.24.12.15>
- Enami, M. (1940) Water mites from Izu. I. Rheophilous water mites from river Inôzawa. To hoku Daigaku. Science reports of Tôhoku University (Series 4, Biology), 15, 203–259.
- Goldschmidt, T. (2007) Studies on Latin American water mites of the genus *Torrenticola* Piersig, 1896 (Torrenticolidae, Hydrachnidia, Acari). *Zoological Journal of the Linnean Society*, 150, 443–678. <https://doi.org/10.1111/j.1096-3642.2007.00305.x>
- Gu, X.Y., Jin, D.C., Yi, T.C. & Guo, J.J. (2018) Chinese water mites of the genus *Torrenticola* Piersig, 1896 (Acari, Hydrachnidia, Torrenticolidae), with descriptions of two new species and a new record from Foding Mountain. *Systematic & Applied Acarology*, 23 (10), 1972–1985. <https://doi.org/10.11158/saa.23.10.9>
- Gu, X.Y. & Guo, J.J. (2019) Five new species of genera *Torrenticola* and *Monatractides* (Acari, Hydrachnidia, Torrenticolidae) from Hainan Island, China. *Systematic & Applied Acarology*, 24 (10), 2460–2482. <https://doi.org/10.11158/saa.24.12.12>
- Gu, X.Y., Jin, D.C., Yi, T.C. & Guo, J.J. (2019a) Taxonomic notes on genus *Monatractides* K. Viets 1926 (Acari, Hydrachnidia, Torrenticolidae) from China. *International Journal of Acarology*, 45 (5), 293–306. <https://doi.org/10.1080/01647954.2019.1622593>
- Gu, X.Y., Jin, D.C., Yi, T.C. & Guo, J.J. (2019b) Contributions to the knowledge of Torrenticolid water mites (Acari: Hydrachnidia) in Doupengshan, China. *Zootaxa*, 4695 (2), 101–121. <https://doi.org/10.11646/zootaxa.4695.2.1>
- Gu, X.Y., Jin, D.C., Yi, T.C. & Guo, J.J. (2019c) Research status and its analysis of family Torrenticolidae taxonomy (Acari, Hydrachnidia, Lebertioidea), In: Jin, D.C. (Ed.), *The second international conference on insect pest management*. Guiyang, Guizhou University Publishing House, pp. 292–293.
- Gu, X.Y., Jin, D.C. & Guo, J.J. (2020a) Four new species of torrenticolid water mites with a newly recorded subgenus from Yunnan, China (Acari, Hydrachnidia, Torrenticolidae). *Systematic & Applied Acarology*, 25 (8), 1495–1507. <https://doi.org/10.11158/saa.25.8.11>
- Gu, X.Y., Jin, D.C. & Guo, J.J. (2020b) Three new species and one new record of Torrenticolidae (Acari, Hydrachnidia) from Wuyishan with an updated key for Chinese fauna. *European Journal of Taxonomy*, 625, 1–23. <https://doi.org/10.5852/ejt.2020.625>
- Gu, X.Y., Jin, D.C. & Guo, J.J. (2020c) New water mites of Torrenticolidae (Acari, Hydrachnidia) from Jiangxi Province, P.R. China. *Acarologia*, 60 (2), 488–500. <https://doi.org/10.24349/acarologia/20204381>
- Gu, X.Y., Lan Jia, Jin, D.C. & Guo, J.J. (2020d) Contributions to Chinese fauna of Torrenticolidae Piersig, 1902 (Acari, Hydrachnidia), with the description of three new species. *ZooKeys*, 955, 97–111. <https://doi.org/10.3897/zookeys.955.52584>
- Gu, X.Y., Lan Jia, Jin, D.C. & Guo, J.J. (2020e) Four new species of *Torrenticola* (Acari, Hydrachnidia, Torrenticolidae) from Northeastern China. *Zootaxa*, 4779 (2), 245–259. <https://doi.org/10.11646/zootaxa.4779.2.6>
- Gu, X.Y., Jin, D.C. & Guo, J.J. (2022a) Three species of Torrenticolidae (Acari: Hydrachnidia) with a newly recorded subgenus from Hainan Island, China. *International Journal of Acarology*, 48 (6), 486–493. <https://doi.org/10.1080/01647954.2022.2097309>
- Gu, X.Y., Xiao, H.C., Jin, D.C. & Guo, J.J. (2022b) Integrative approach of morphology and geometric morphometrics to species delimitation in Torrenticolidae (Acari, Hydrachnidia). *Zoological Systematics*, 47 (2), 117–131.
- Gu, X.Y., Zheng, Y.L., Li, H.T. & Guo, J.J. (2022c) A case of integrative taxonomy based on traditional morphology, molecular systematics and geometric morphometrics in the taxonomy of Torrenticolidae (Acari, Hydrachnidia). *Systematic & Ap-*

*plied Acarology*, 27 (5), 905–921.

<https://doi.org/10.11158/saa.27.5.6>

- Jin, D.C. (1997) *Hydrachnellae-morphology systematics a primary study of Chinese fauna*. Science and Technology Publishing House, Guiyang, 356 pp. [in Chinese]
- Pešić, V., Chatterjee, T., Das, M.K. & Bordoloi, S. (2013) A new species of water mite (Acari, Hydrachnidia) from Assam, India, found in the gut contents of the fish *Botia dario* (Botiidae). *Zootaxa*, 3746 (3), 454–462.  
<https://doi.org/10.11646/zootaxa.3746.3.4>
- Krantz, G.W. & Walter, D.E. (2009) *A Manual of Acarology*. 3<sup>rd</sup> Edition. Lubbock, Texas Tech University Press, 807 pp.
- Pešić, V., Chatterjee, T., Kumar D.M. & Bordoloi S. (2012) Two rare water mite species (Acari, Hydrachnidia) from the streams of the Indian eastern Himalayan region. *Systematic & Applied Acarology*, 17 (4), 458–464.  
<https://doi.org/10.11158/saa.17.4.15>
- Pešić, V. & Smit, H. (2009) Water mites of the family Torrenticolidae Piersig, 1902 (Acari: Hydrachnidia) from Thailand, Part I. The genera *Torrenticola* Piersig, 1896, *Neoattractides* Lundblad, 1941 and *Pseudotorrenticola* Walter, 1906. *Zootaxa*, 1982 (1), 38–62.  
<https://doi.org/10.11646/zootaxa.1982.1.2>
- Pešić, V., Smit, H. & Bahuguna, P. (2019) New records of water mites (Acari: Hydrachnidia) from the Western Himalaya with the description of four new species. *Systematic & Applied Acarology*, 24 (1), 59–80.  
<https://doi.org/10.11646/zootaxa.1982.1.2>
- Pešić, V., Saboori A., Jovanović M., Manović, A., Bańkowska, A. & Zawal, A. (2020a) *Torrenticola dowlingi* sp. nov. a new water mite from Iran based on morphometrical and molecular data (Acariformes, Hydrachnidia, Torrenticolidae), *International Journal of Acarology*, 46 (5), 298–303.  
<https://doi.org/10.1080/01647954.2020.1802513>
- Pešić, V., Smit, H., S. Negi, Bahuguna, P. & Dobriyal, A.K. (2020b) Torrenticolid water mites of India with description of three new species (Acari, Hydrachnidia, Torrenticolidae). *Systematic & Applied Acarology*, 25 (2), 255–267.  
<https://doi.org/10.11158/saa.25.2.7>
- Pešić, V., Smit, H. & Gurung M.M. (2022) Torrenticolid water mites of Bhutan. Genera *Torrenticola* Piersig, 1896 and *Neoattractides* Lundblad, 1941 (Acari: Hydrachnidia: Torrenticolidae). *Acarologia*, 62 (3), 821–860.  
<https://doi.org/10.24349/xn0u-5px2>
- Wiles, P.R. (1997) Asian and Oriental Torrenticolidae Piersig, 1902 (Acari: Hydrachnidia: Lebertioidea): a revision of the family and description of new species of *Torrenticola* Piersig and *Pseudotorrenticola* Walter, from Southeast Asia. *Journal of Natural History*, 31, 191–236.  
<https://doi.org/10.1080/00222939700770121>