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Research article

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Two new species in the genus *Atractides* Koch, 1837 (Acari: Hydrachnidiae: Hygrobatidae), with the first descriptions of the female of two species from China

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Abstract. In this paper, two new species of Acari are described, i.e., *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov. and *Atractides* (*Atractides*) *fodingensis* Zhang & Guo sp. nov. Moreover, the females of *Atractides* (*Atractides*) *bitergumus* Zhang & Guo, 2023 and *Atractides* (*Tympanomegapus*) *tergumus* Zhang & Guo, 2023 from Hainan Province and Guizhou Province of Oriental Region in China are described and illustrated for the first time.

Keywords. Water mite, *Atractides*, new species, taxonomy, China.

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Introduction

Atractides Koch, 1837 is a genus of Hygrobatidae Koch, 1842, and divided into four subgenera: *Atractides* Koch, 1837, *Tympanomegapus* Thor, 1923, *Polymegapus* Viets, 1926, and *Maderomegapus* Lundblad, 1941 (Gerecke 2003; Gerecke *et al.* 2016; Smit 2020). Up to now, there are about 426 species of *Atractides* described all over the world (Lundblad 1969; Imamura 1976; Viets 1987; Conroy & Bilyj 1992; Jin 1997; Pešić 2002; Pešić & Asadi 2002; Gerecke 2003; Tuzovskij 2004, 2010a, 2010b, 2011, 2013; Pešić *et al.* 2004, 2005; Pešić & Smit 2009, 2015a, 2015b, 2018, 2021a, 2021b, 2022; Yi *et al.* 2010; Wang & Jin 2012, 2013; Wang *et al.* 2015; Smit 2020; Zhang *et al.* 2022, 2023; Pešić *et al.* 2023;

http://www.watermite.org/), but only two subgenera (*Atractides* and *Tympanomegapus*) and 25 species have been reported in China. This means that the genus *Atractides* in China is still poorly studied (Lundblad 1969; Imamura 1976; Jin 1997; Yi *et al.* 2010; Wang & Jin 2012, 2013; Wang *et al.* 2015; Zhang *et al.* 2022, 2023).

China covers a huge geographical area and spans two zoogeographical regions: Palaearctic Region and Oriental Region (Zhang 1999). The geographic diversity of China provides abundant habitats for plants and animals, so China is one of the world's "megabiodiversity countries" (Tang *et al.* 2006).

The present study is based on material collected in 2023 from Hainan Province and Guizhou Province of the Oriental Region in China. Four species of the genus *Atractides* are described and illustrated: two species new to science, i.e., *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov. and *A.* (*A.*) *fodingensis* Zhang & Guo sp. nov. The females of *A.* (*A.*) *bitergumus* Zhang & Guo, 2023 and *A.* (*Tympanomegapus*) *tergumus* Zhang & Guo, 2023 are reported and described for the first time.

Material and methods

Water mites were collected by hand netting, sorted on the spot from the living material and preserved in Koenike-fluid. Habitat photos of the collection sites were taken with a Vivo X60 mobile phone. After the specimens were brought back to the laboratory, they were dissected under a Motic SMZ-168 stereo microscope following Jin (1997). Specimens were observed and drawn under a Leica DM3000 microscope, measurements and optical microscope photographs were taken with a Nikon Ni-E microscope (with a mounted Nikon DS-Ri2 camera). Moreover, specimens were also photographed with a JCM6000 Desktop SEM, and the detailed specimens processing and photography methods follow Li *et al.* (2022). A Canon 5D Mark IV digital camera and a Mitutoyo Plan NIR 10*lens with Godox MF12 flash were used to take color pictures of water mites. All illustrations were edited with Adobe Photoshop 2024. All measurements are given in µm.

Abbreviatios for morphological terms and measurements

The terminology and abbreviations used are modified from Jin (1997) and Gerecke (2003).

A_1 = preantennal glandularia
A = postantennal glandularia
Ac = acetabulum (pl. acetabula, numbered 1 to 3)
ACG = anterior coxal group (Cx-I+Cx-II)
C_2, C_4 = coxoglandularia 2, coxoglandularia 4
Cx-I–IV = coxae I–IV
D_1–D_4 = dorsoglandularia 1–4
dL = dorsal length
HB = entral height
IL = lateral length
I-L-1–6, etc. = first to sixth segment of the first leg, etc.
L = length
L_1–L_4 = lateroglandularia 1–4
mL = median length
O_1 = preocularia
O_2 = postocularia
P-1–P-5 = first to fifth segment of palp (from proximal to distal)
PCG = posterior coxal group (Cx-III+Cx-IV)
S-1 = proximal large ventral seta at I-L-5
S-2 = distal large ventral seta at I-L-5

So_1–So_5 = slit organs 1–5
V_1–V_4 = ventroglandularia 1–4
W = width

The holotypes and paratypes are deposited in the Institute of Entomology, Guizhou University, Guiyang, China (GUGC).

Results

Taxonomy

Class Arachnida Lamarck, 1801
Subclass Acari Leach, 1817
Order Trombidiformes Reuter, 1909
Superfamily Hygrobatoidea Koch, 1842
Family Hygrobatidae Koch, 1842
Genus *Atractides* Koch, 1837

Atractides* (*Atractides*) *cardiacus Zhang & Guo sp. nov.
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Figs 1–15, 25

Diagnosis

Male

Apodemes of ACG curved hook-shaped, and posterior margin of Cx-IV almost straight. Anterior margin of genital plate slightly indented, posterior margin slightly convex, three pairs of acetabula forming an obtuse triangle. V_1 separated from V_2, excretory pore smooth. Sword seta on P-4 at same level of proximoventral hair. I-L-6 thick at base, tapering distally.

Female

Similar to male. Ac in weakly curved line, Ac2 at middle of Ac1 and Ac3. Palp more slender than in male.

Etymology

The new species is named after the heart-like genital plate of the male.

Type material

Holotype

P.R. CHINA • ♂; Hainan Province, Qionghai City, Longjiang Town; 19.1730° N, 110.3459° E; 4 m a.s.l.; 11 Apr. 2023; Hai-Tao Li, Yu-Lin Zheng and Yu-Hao Zhang leg.; main river (Wanquan River) with wide surface, slowly flowing, with sandy soil and humus on bottom; slide no. HN-HY-2023041101; GUGC.

Paratypes

P.R. CHINA • 3 ♂♂, 3 ♀♀; same data as for holotype; slides nos. HN-HY-2023041102 to 2023041107; GUGC.

Description

Male (n = 4)

Idiosoma soft and oval; O_1 between A_1 and A_2, but closer to A_1, O_2 between D_1 and at same level of D_1; all slit organs visible, So_1 near A_2, So_2 at same level of D_1 and O_2, So_3 at same level of D_2, So_4 close to L_4, So_5 behind of D_4 (Figs 2A, 6A). ACG fused together and with suture line, apodemes of ACG curved hook shape; PCG separated, posterior margin of Cx-IV almost straight, C_4 near suture line between Cx-III and Cx-IV, suture line of Cx-III and Cx-IV in medial part nearly straight (Fig. 8A). Anterior margin of genital plate slightly indented, posterior margin slightly convex, three pairs of acetabula forming obtuse

Fig. 1. *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov. **A**–**B**. Paratype, ♂ (slide no. HN-HY-2023041102, GUGC). **C**–**D**. Paratype, ♀ (slide no. HN-HY-2023041106, GUGC). **A**. Idiosoma, dorsal view. **B**. Idiosoma, ventral view. **C**. Idiosoma, dorsal view. **D**. Idiosoma, ventral view. Scale bars = 200 μm.

triangle, Ac2 near Ac1 (Fig. 9D). V_1 separated from V_2, V_2 posterior to V_1 (Fig. 8B), V_4 at same level of Ac2, V_3 and V_4 arranged in inverted trapezoid; excretory pore smooth and between V_2 (Figs 2B, 6B).

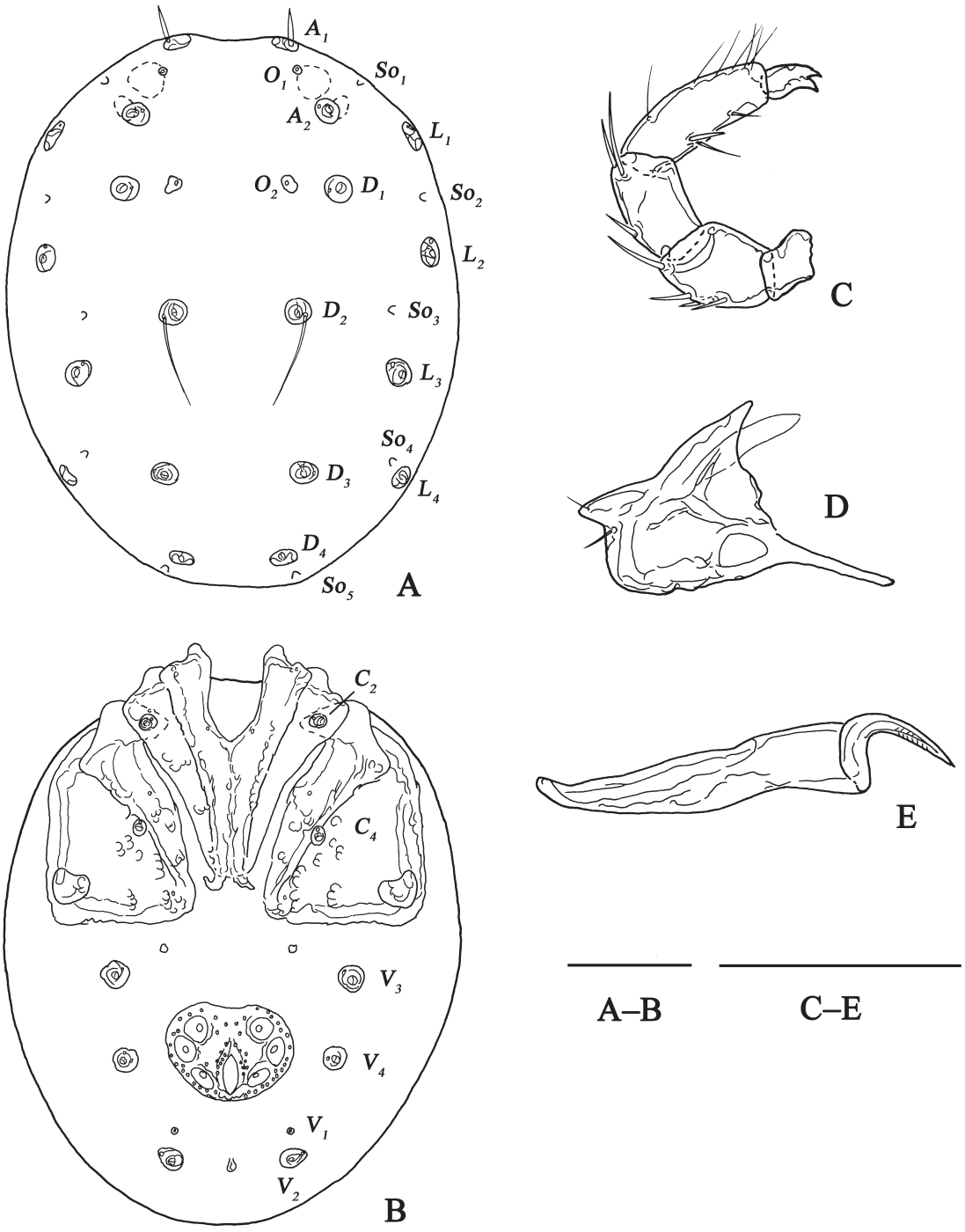

Fig. 2. *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov., holotype, ♂ (slide no. HN-HY-2023041101, GUGC). **A**. Idiosoma, dorsal view. **B**. Idiosoma, ventral view. **C**. Palp. **D**. Gnathosoma. **E**. Chelicera. Scale bars = 100 μm.

Palp five-segmented, without obvious sexual dimorphism; P-1 short, P-2 and P-3 short with straight ventral margin, P-4 with some dorsal hairs and two ventral hairs, dividing P-4 in sectors 3:2:2, sword seta at same level of proximoventral hair (Figs 2C, 9A–B). Ventral margin of I-L-5 slightly longer than dorsal margin, S-1 close to S-2 and S-2 thickens at three-fifth position and then narrows immediately, whip-like seta at anterior distal margin; I-L-6 thick at base, distally tapering. IV-L-5 with swimming seta at distal margin and almost as long as IV-L-6 (Figs 3, 10).

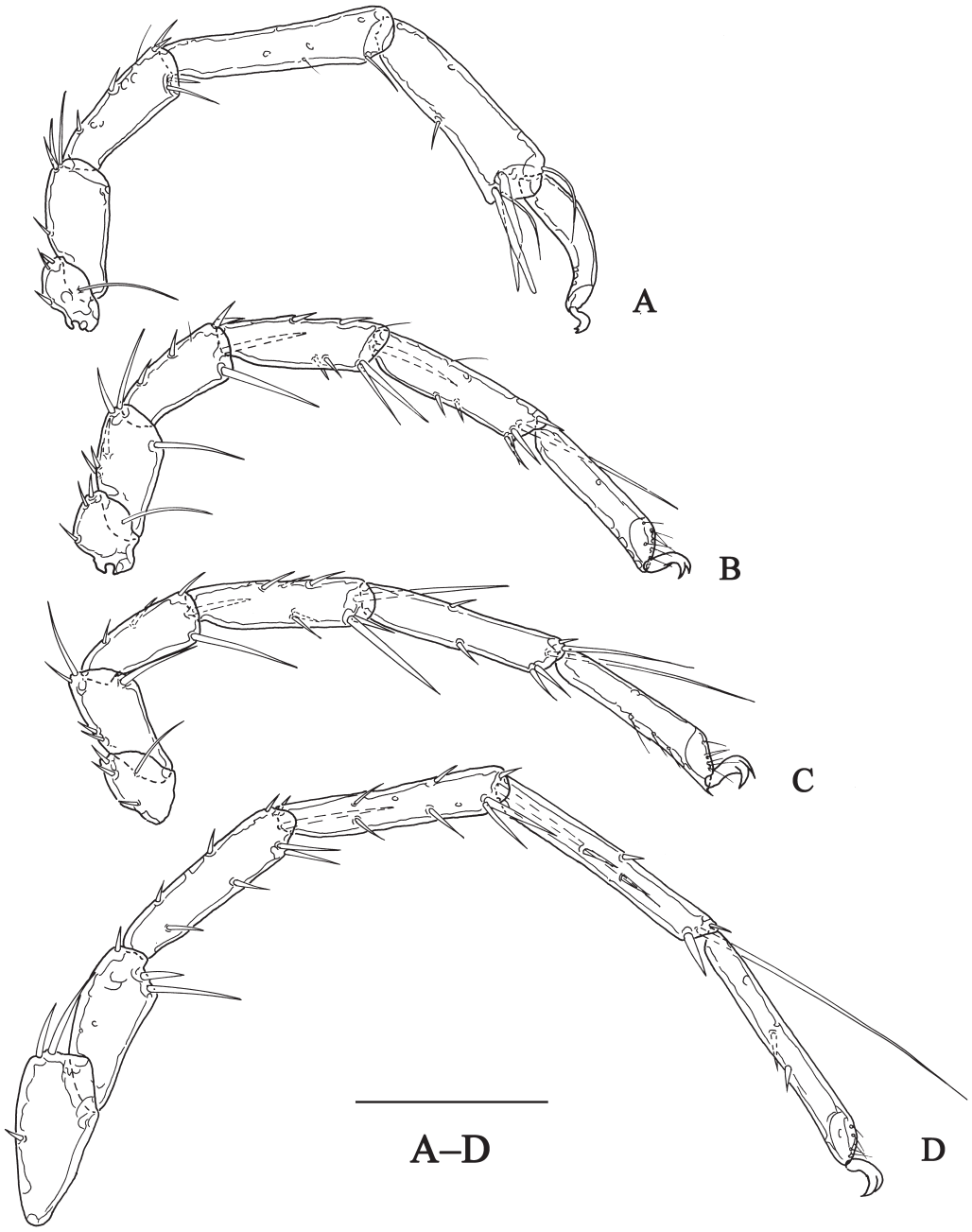

Fig. 3. *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov., holotype, ♂ (slide no. HN-HY-2023041101, GUGC), I-L– IV-L. Scale bar = 100 μm.

Measurements (measurements of paratypes in parentheses). Idiosoma L 450 (420–460), W 385 (371–386); coxal field L 245 (216–245), Cx-III W 263 (238–263), ACG IL 180 (163–180), mL 116 (112–123), W 192 (183–192); gnathosoma bay L 83 (68–83); genital field L 81 (70–82), W 109 (92–109); Ac1–3

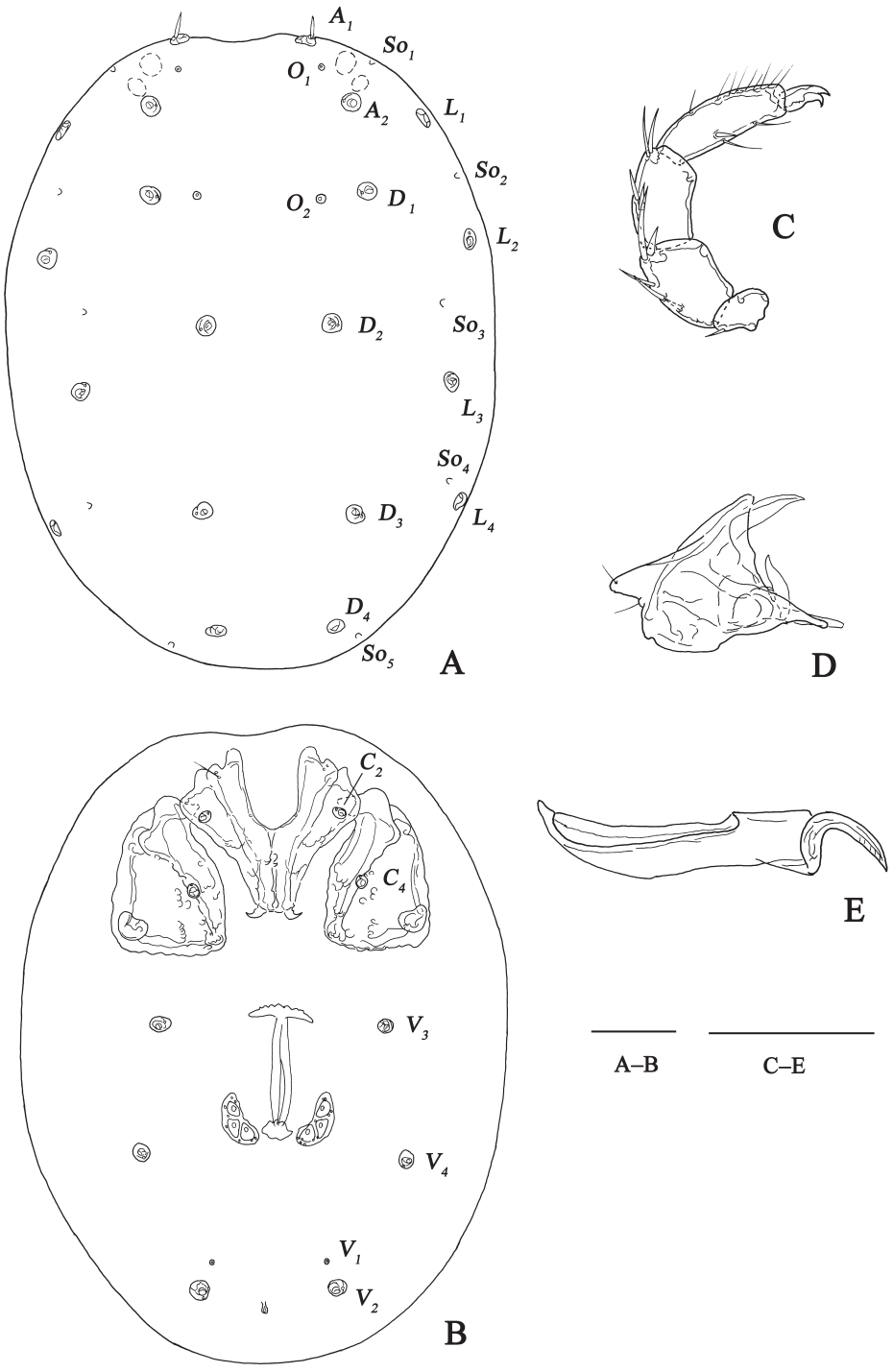

Fig. 4. *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov., paratype, ♀ (slide no. HN-HY-2023041105, GUGC). **A**. Idiosoma, dorsal view. **B**. Idiosoma, ventral view. **C**. Palp. **D**. Pnathosoma. **E**. Chelicera. Scale bars = 100 μm.

L 20 (19–21), 22 (20–22), 24 (21–24); chelicera L 166 (155–171), cheliceral claw L 43 (42–47), basal segment L 126 (123–138); gnathosoma L 136 (131–139); palp dL: P-1 22 (19–22), P-2 51 (48–54), P-3 49 (45–50), P-4 73 (67–74), P-5 27 (24–28); leg segments: I-L-1 dL 39 (36–41), I-L-2 dL 66 (65–73), I-L-3 dL 80 (74–84), I-L-4 dL 125 (115–128), I-L-5 dL 117 (103–117), HB 37 (33–37), I-L-6 dL 65 (65–73), HB 15 (11–15), S-1 L 61 (57–61), W 6 (5–6), S-2 L 57 (55–59), W 7 (6–8); dL: II-L-1 39 (37–43), II-L-2 62 (55–71), II-L-3 68 (60–69), II-L-4 89 (76–90), II-L-5 98 (86–104), II-L-6 85 (82–91); dL: III-L-1 42 (36–46), III-L-2 62 (61–66), III-L-3 67 (64–69), III-L-4 96 (87–96), III-L-5 112 (101–112), III-L-6 108 (95–108); dL: IV-L-1 88 (78–88), IV-L-2 85 (71–85), IV-L-3 106 (102–109), IV-L-4 122 (118–127), IV-L-5 137 (125–139), IV-L-6 134 (118–134).

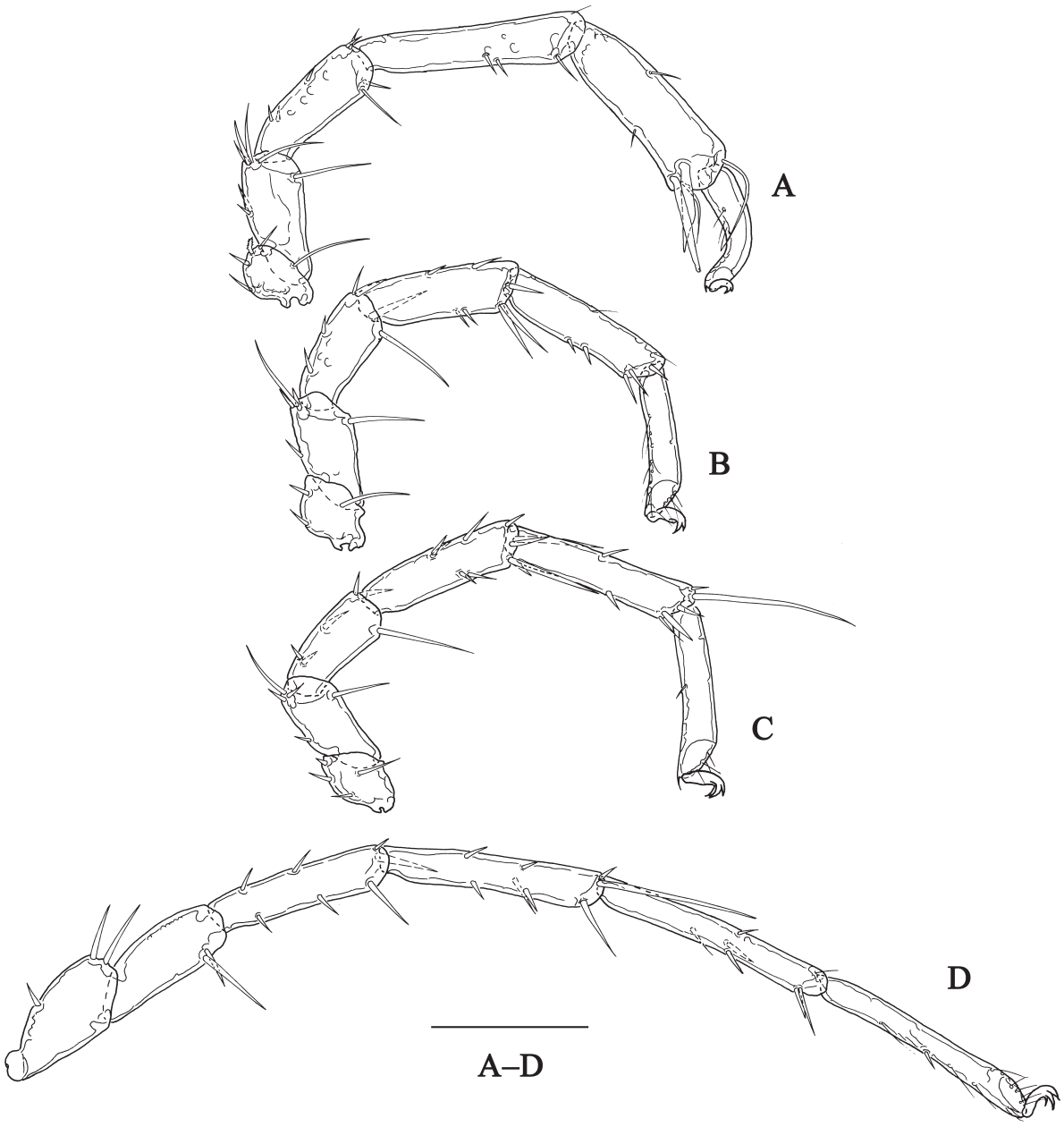

Fig. 5. *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov., paratype, ♀ (slide no. HN-HY-2023041105, GUGC). **A**–**D**. I-L– IV-L. Scale bar = 100 μm.

Female (n = 3)

Similar to male. Ac in weakly curved line, Ac2 at middle of Ac1 and Ac3, V_3 at same level of pregenital sclerite, distance between pregenital sclerite and postgenital sclerite longer, V_3 and V_4 arranged in trapezoid; excretory pore slightly posterior to level of V_2. Palp more slender than in male (Figs 4–5, 7, 12–15).

Measurements (measurements of paratypes in parentheses). Idiosoma L 783 (722–807), W 621 (621–678); coxal field L 254 (254–293), Cx-III W 327 (327–363), ACG IL 176 (176–212), mL 101 (101–115), W 223 (223–259); gnathosoma bay L 97 (97–120); gonopore L 141 (99–141), pregenital sclerite L 79 (61–79), postgenital sclerite L 37 (33–40); Ac1–3 L 22 (22–26), 28 (23–28), 25 (25–28); chelicera L 219 (219–240), cheliceral claw L 58 (58–66), basal segment L 175 (175–186); gnathosoma L 146 (146–184); palp dL: P-1 26 (25–26), P-2 64 (64–77), P-3 65 (65–74), P-4 85 (85–96), P-5 31 (31–34);

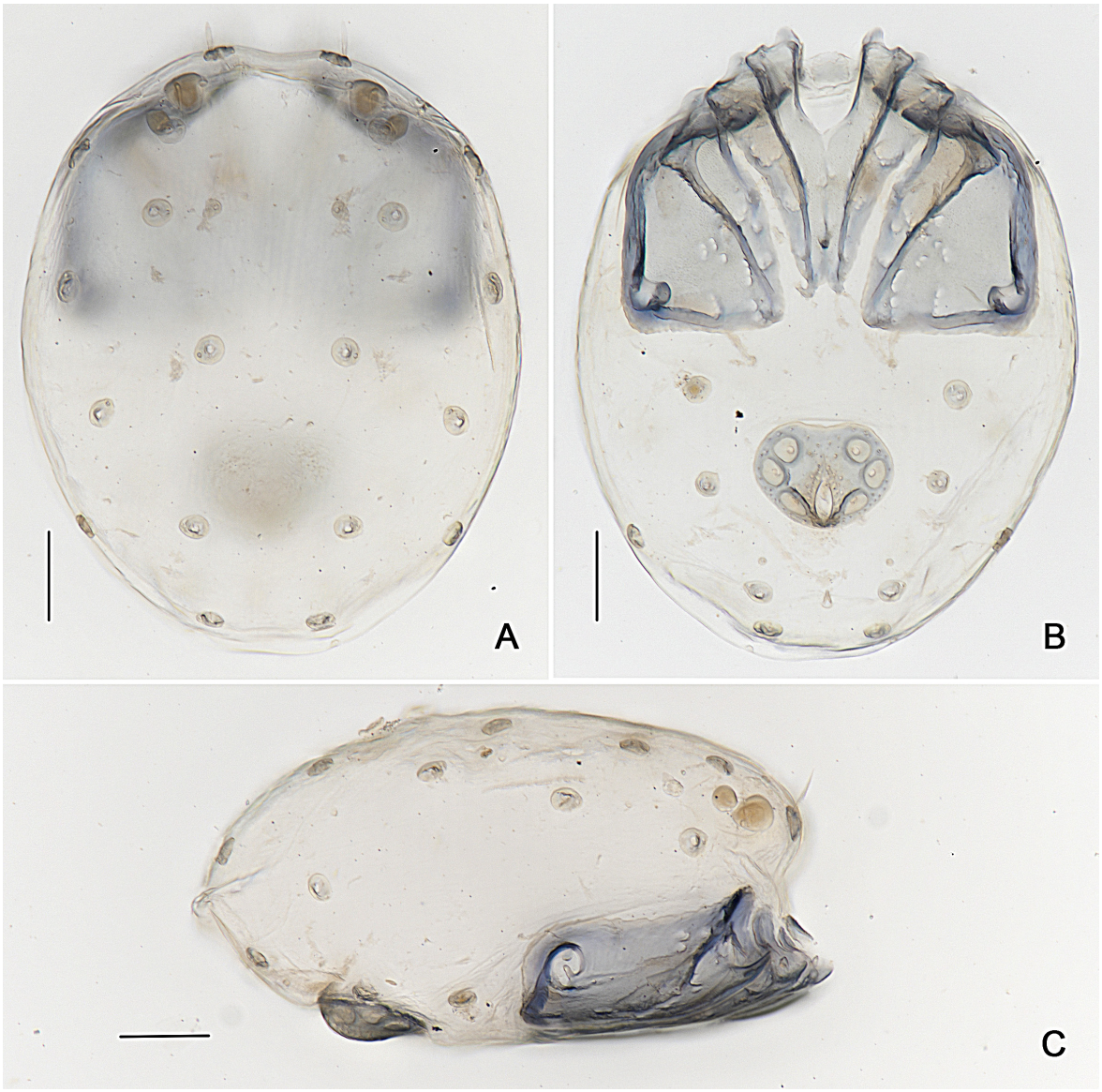

Fig. 6. *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov., holotype, ♂ (slide no. HN-HY-2023041101, GUGC), light microscope photographs. **A**. Idiosoma, dorsal view. **B**. Idiosoma, ventral view. **C**. Idiosoma lateral view. Scale bars = 100 μm.

Fig. 7. *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov., paratype, ♀ (slide no. HN-HY-2023041105, GUGC), light microscope photographs. **A**. Idiosoma, dorsal view. **B**. Idiosoma, ventral view. **C**. Idiosoma lateral view. Scale bars = 100 µm.

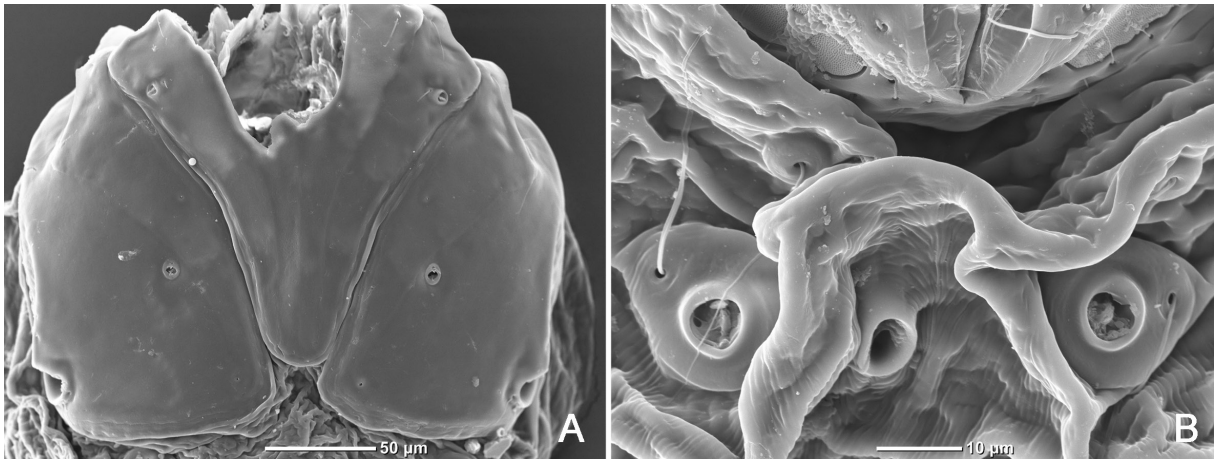

Fig. 8. *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov., paratype, ♂ (slide no. HN-HY-2023041103, GUGC), SEM photographs. **A**. ACG and PCG. **B**. V_1, V_2 and excretory pore.

leg segments: I-L-1 dL 43 (43–48), I-L-2 dL 80 (80–92), I-L-3 dL 95 (95–104), I-L-4 dL 148 (148–168), I-L-5 dL 131 (131–143), HB 44 (44–49), I-L-6 dL 78 (77–85), HB 12 (11–13), S-1 L 63 (63–71), W 6 (6–7), S-2 L 59 (59–68), W 8 (8–10); dL: II-L-1 48 (48–56), II-L-2 70 (70–88), II-L-3 78 (78–87), II-L-4 107 (107–116), II-L-5 115 (115–126), II-L-6 94 (94–104); dL: III-L-1 48 (48–57), III-L-2 71 (71–91), III-L-3 79 (79–87), III-L-4 109 (109–125), III-L-5 125 (125–140), III-L-6 109 (109–122); dL: IV-L-1 87 (87–106), IV-L-2 84 (84–98), IV-L-3 121 (121–133), IV-L-4 146 (146–163), IV-L-5 156 (156–177), IV-L-6 151 (151–154).

Remarks

The new species *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov. is similar to *Atractides putihi* Wiles, 1991 in the following points: (1) the posterior margin of Cx-IV almost straight; (2) V_1 separated from V_2; (3) excretory pore smooth. But *A*. (*A*.) *cardiacus* differs from *A*. *putihi* in the following points: (1) the posterior margin of the new species genital field is narrow, but wider in *A*. *putihi*; (2) the gonopore of the male new species is short but longer in *A*. *putihi* (Pešić & Smit 2009).

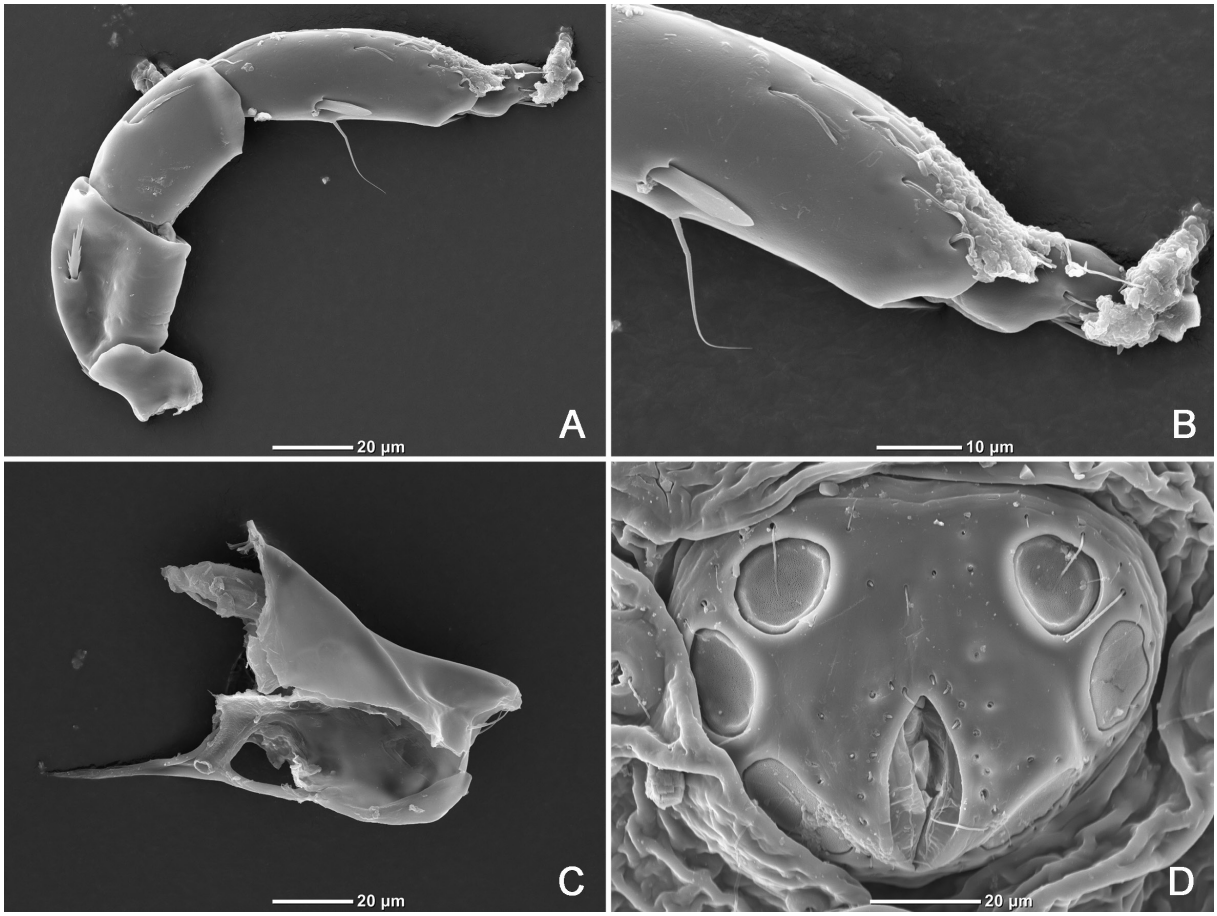

Fig. 9. *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov., paratype, ♂ (slide no. HN-HY-2023041103, GUGC), SEM photographs. **A**. Palp. **B**. Sword seta of P-4. **C**. Gnathosoma. **D**. Genital field.

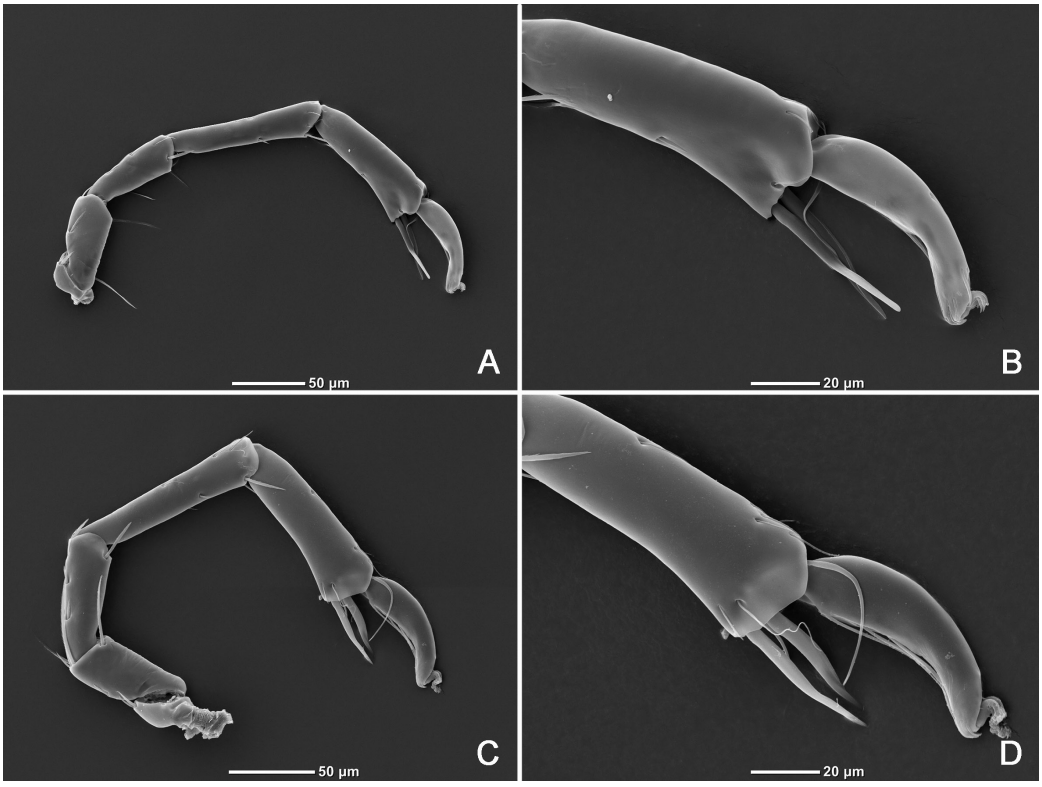

Fig. 10. *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov., paratype, ♂ (slide no. HN-HY-2023041103, GUGC), SEM photographs. **A**. I-L. **B**. I-L-5–6. **C**. I-L. **D**. I-L-5–6.

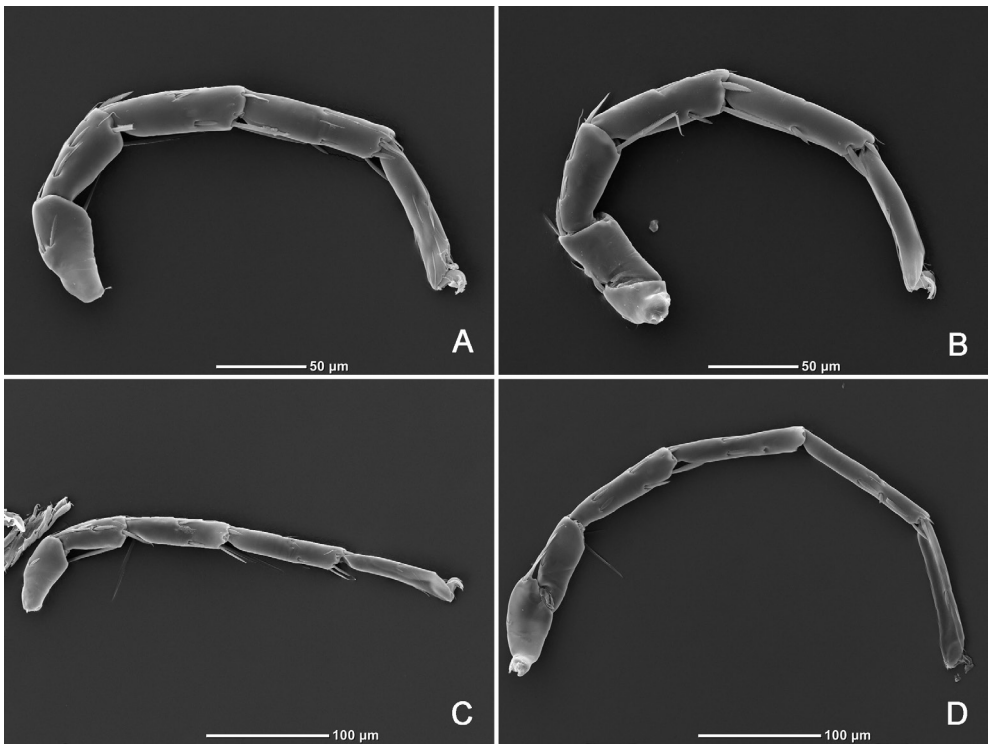

Fig. 11. *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov., paratype, ♂ (slide no. HN-HY-2023041103, GUGC), SEM photographs. **A**. II-L. **B**. II-L. **C**. III-L. **D**. IV-L.

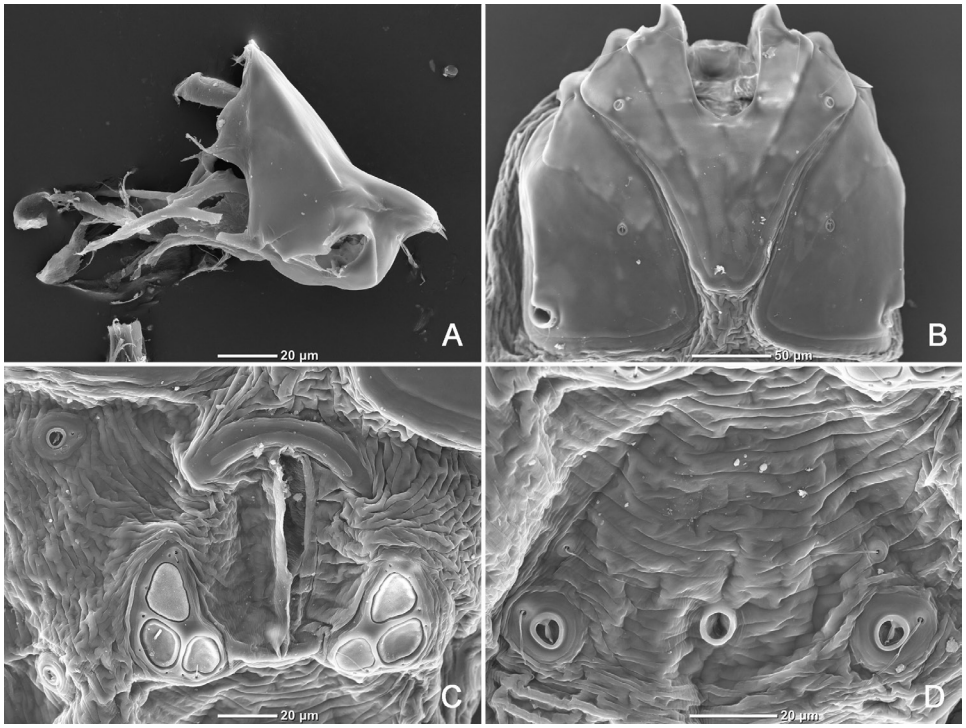

Fig. 12. *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov., paratype, ♀ (slide no. HN-HY-2023041107, GUGC), SEM photographs. **A**. Gnathosoma. **B**. ACG and PCG. **C**. Genital field. **D**. V_1, V_2 and excretory pore.

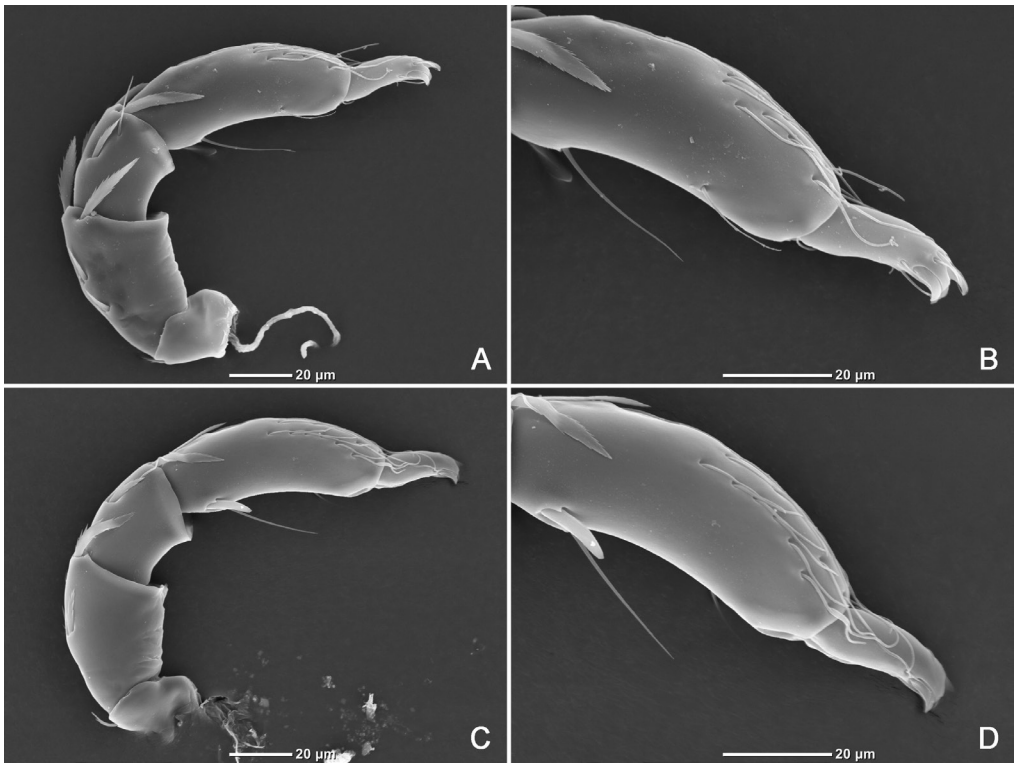

Fig. 13. *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov., paratype, ♀ (slide no. HN-HY-2023041107, GUGC), SEM photographs. **A**. Palp. **B**. P-4 and P-5. **C**. palp. **D**. Sword seta of P-4.

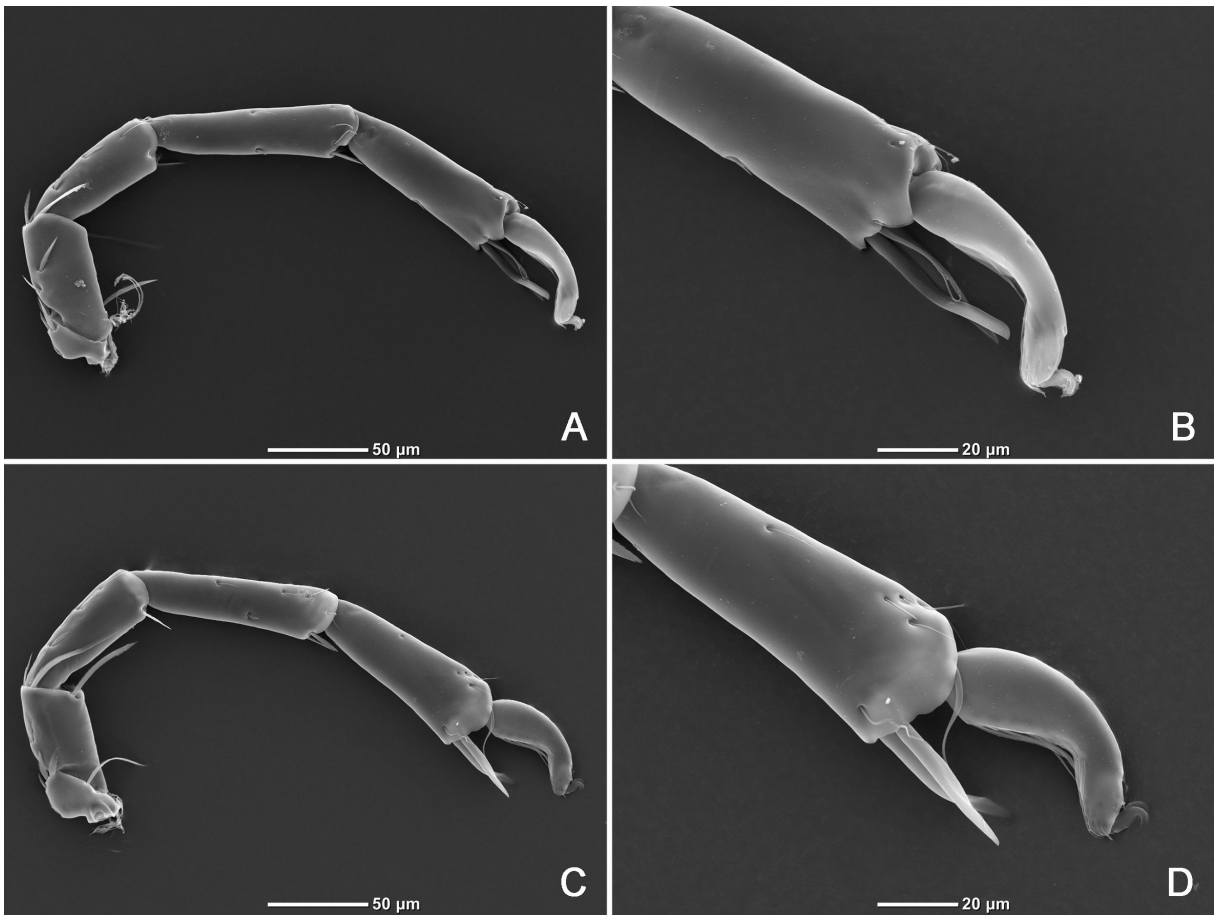

Fig. 14. *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov., paratype, ♀ (slide no. HN-HY-2023041107, GUGC), SEM photographs. **A**. I-L. **B**. I-L-5–6. **C**. I-L. **D**. I-L-5–6.

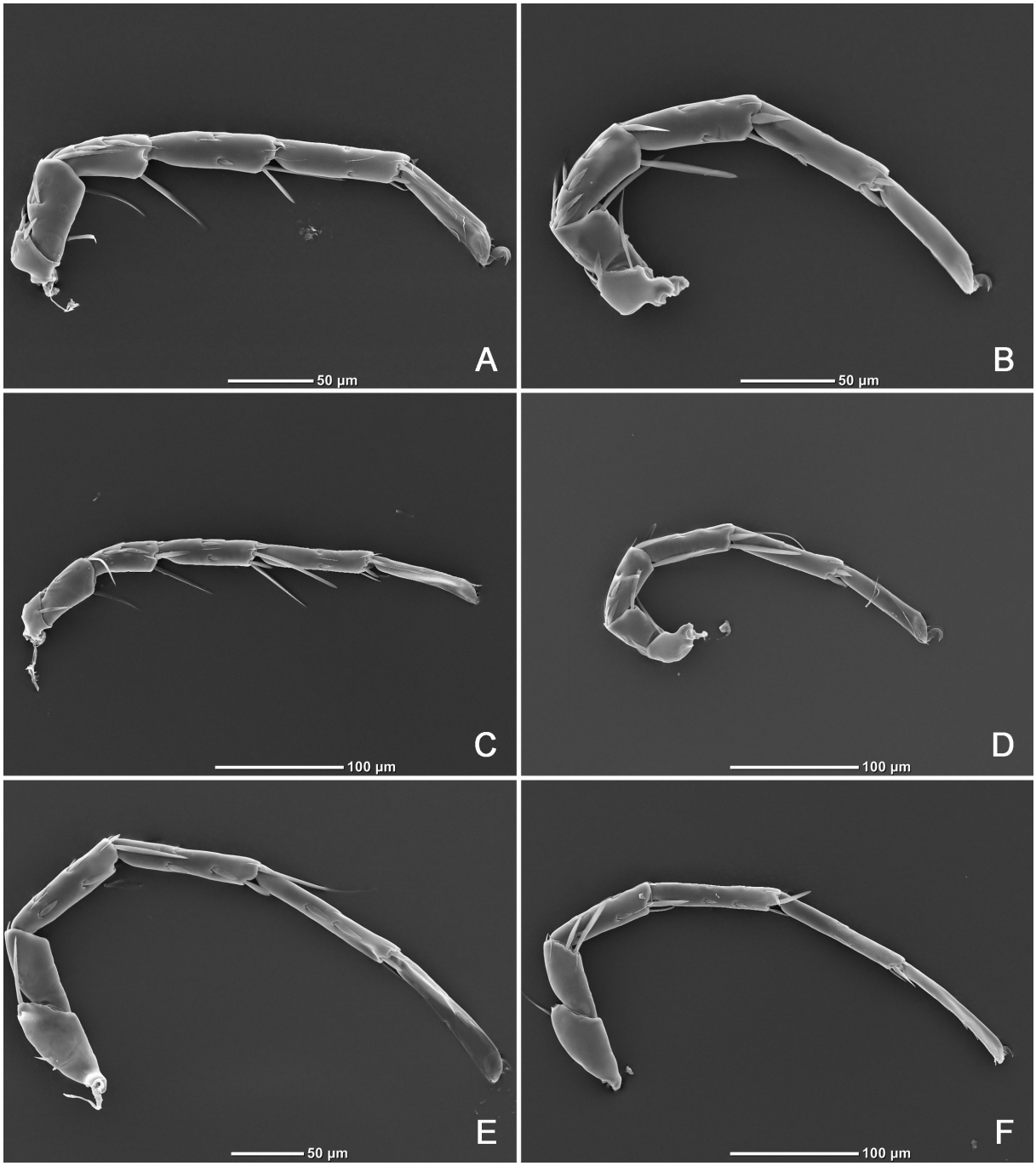

Fig. 15. *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov., paratype, ♀ (slide no. HN-HY-2023041107, GUGC), SEM photographs. **A**. II-L. **B**. II-L. **C**. III-L. **D**. III-L. **E**. IV-L. **F**. IV-L.

Atractides* (*Atractides*) *fodingensis Zhang & Guo sp. nov.
urn:lsid:zoobank.org:act:00A65086-590B-431B-AB50-F7C9A01B8CA8
Figs 16–18

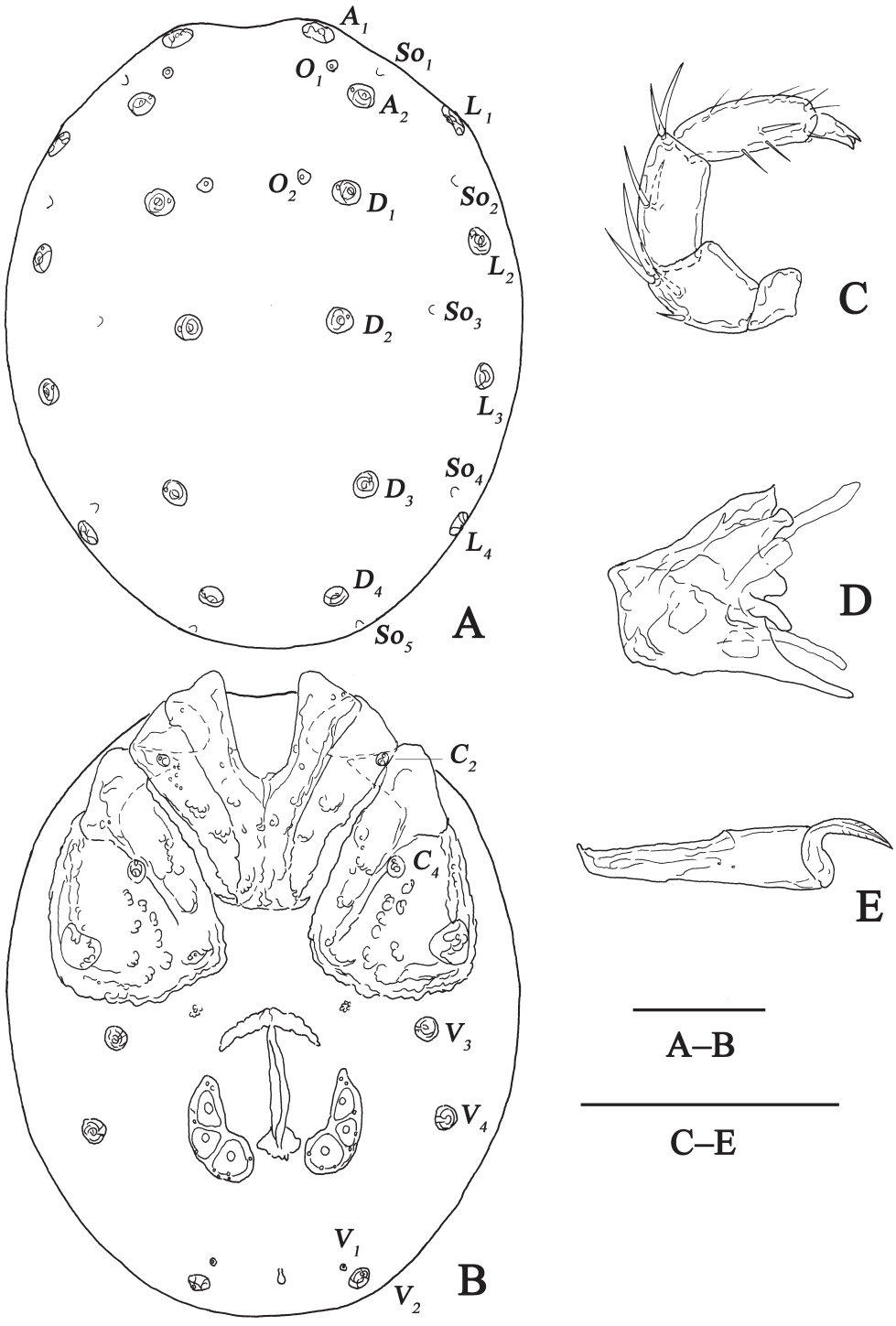

Fig. 16. *Atractides* (*Atractides*) *fodingensis* Zhang & Guo sp. nov., holotype, ♀ (slide no. GZ-HY-2023061901, GUGC). **A**. Idiosoma, dorsal view. **B**. Idiosoma, ventral view. **C**. Palp. **D**. Gnathosoma. **E**. Chelicera. Scale bars = 100 µm.

Diagnosis

The apodemes of ACG almost transverse. Pregenital sclerite relatively large, V_1 separated fro V_2, V_3 at same level of pregenital sclerite and near Cx-IV, excretory pore smooth. P-4 with straight ventral margin and two ventral hairs dividing it in 2:1:2, sword seta at same level of distoventral hair.

Etymology

The new species is named after the Foding Mountain, where the specimens were collected.

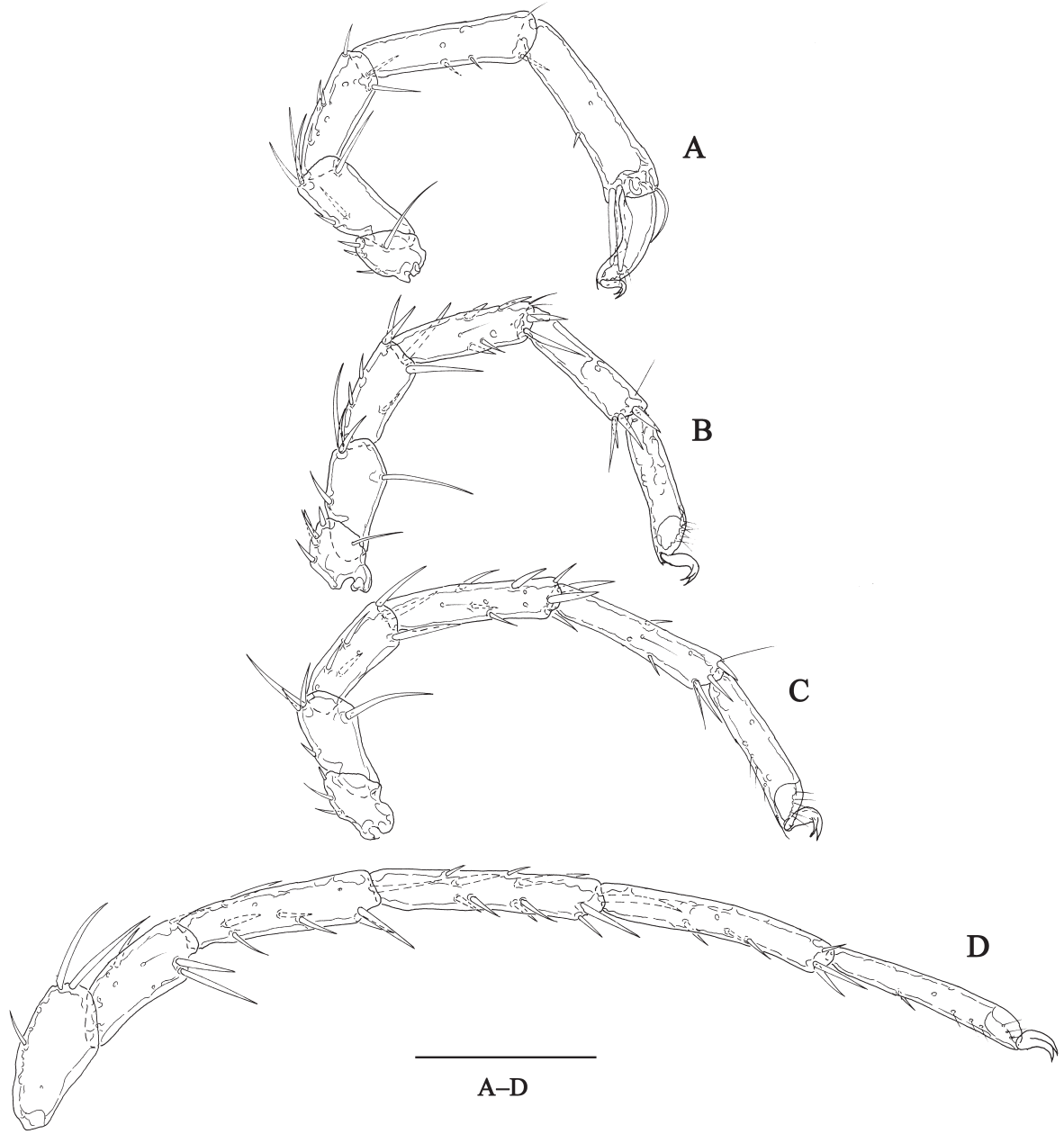

Fig. 17. *Atractides* (*Atractides*) *fodingensis* Zhang & Guo sp. nov., holotype, ♀ (slide no. GZ-HY-2023061901, GUGC). **A**–**D**. I-L– IV-L. Scale bar = 100 μm.

Type material

Holotype

P.R. CHINA • ♀; Guizhou Province, Tongren City, Foding Mountain; 27.3113° N, 108.1363° E; 693 m a.s.l.; 19 Jun. 2023; Ri-Xin Jiang, Ping Li and Lan Jia leg.; waterfall in the mountain, with fast running water, and many plants along the shore; slide no. GZ-HY-2023061901; GUGC.

Paratype

P.R. CHINA • 1 ♀; same data as for holotype; slide no. GZ-HY-2023061902; GUGC.

Description

Female (n = 2)

Idiosoma soft and oval, frontal edge slightly concave; O_1 between A_1 and A_2, O_2 between D_1 and slightly front of D_1; all slit organs visible, So_1 near A_2, So_2 at the middle of L_1 and L_2, So_3 at same level of D_2, So_4

Fig. 18. *Atractides* (*Atractides*) *fodingensis* Zhang & Guo sp. nov., holotype, ♀ (slide no. GZ-HY-2023061901, GUGC), light microscope photographs. **A**. Idiosoma, dorsal view. **B**. Idiosoma, ventral view. **C**. Idiosoma lateral view. Scale bars = 100 µm.

near L_4, So_5 behind of D_4 (Figs 16A, 18A). ACG fused and with suture line, apodemes of ACG almost transverse; PCG separated. Pregenital sclerite relatively large, three pairs of acetabula in weakly curved line, Ac3 largest. V_1 separated from V_2, V_3 at same level of pregenital sclerite and near Cx-IV, V_4 at horizontal line between Ac1 and Ac2, V_3 and V_4 forming trapezoid; excretory pore smooth and between V_2 (Figs 16B, 18B).

Palp five-segmented; P-1 short, P-2 and P-3 without projection, P-4 with straight ventral margin and two ventral hairs, dividing P-4 in 2:1:2, sword seta at same level of distoventral hair (Fig. 16C). Ventral margin of I-L-5 as long as dorsal margin, S-1 close to S-2, S-2 longer and thicker than S-1, ventrally curved whip-like seta at end of I-L-5, and near dorsal slide; I-L-6 stout, thick at its base, tapering towards end (Fig. 17).

Measurements (measurements of paratypes in parantheses). Idiosoma L 495 (443), W 408 (368); coxal field L 295 (264), Cx-III W 252 (289), ACG IL 161 (179), mL 104 (116), W 210 (226); gnathosoma bay L 80 (86); gonopore L 95 (95), pregenital sclerite L 76 (65), postgenital sclerite L 37 (30); Ac1–3 L 31 (33), 23 (31), 29 (34); chelicera L 125 (114), cheliceral claw L 37 (39), basal segment L 94 (96); gnathosoma L 107 (131); palp dL: P-1 22 (25), P-2 46 (49), P-3 54 (59), P-4 57 (63), P-5 23 (23); leg segments: I-L-1 dL 42 (49), I-L-2 dL 60 (68), I-L-3 dL 78 (83), I-L-4 dL 106 (113), I-L-5 dL 117 (124), HB 31 (35), I-L-6 dL 61 (62), HB 12 (14), S-1 L 46 (53), W 6 (8), S-2 L 51 (51), W 7 (12); dL: II-L-1 40 (45), II-L-2 50 (56), II-L-3 62 (66), II-L-4 81 (85), II-L-5 84 (96), II-L-6 83 (88); dL: III-L-1 44 (44), III-L-2 60 (65), III-L-3 69 (76), III-L-4 97 (111), III-L-5 102 (112), III-L-6 90 (105); dL: IV-L-1 85 (93), IV-L-2 79 (78), IV-L-3 110 (117), IV-L-4 129 (137), IV-L-5 132 (143), IV-L-6 115 (130).

Remarks

This new species is similar to *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov. in the following characters: (1) V_1 separated from V_2; (2) excretory pore smooth; (3) I-L-6 stout, thick at its base, tapering towards the end. However, the new species differs from *A.* (*A.*) *cardiacus* in the following aspects: (1) sword seta of P-4 at the same level of distoventral hair in the new species, but at the same level of proximoventral hair in *A* (*A.*) *cardiacus*; (2) ACG and PCG occupy half of the venter in the new species, but ACG and PCG of the female *A* (*A.*) *cardiacus* occupy one third of the ventral view; (3) excretory pore between V_2 in the new species, but slightly behind the parallel line of V_2 in the female *A* (*A.*) *cardiacus*.

Atractides* (*Atractides*) *bitergumus Zhang & Guo, 2023
Figs 19–21, 25

Diagnosis

Genital field with four pairs of acetabula, V_1 fused with V_2, excretory pore surrounded by sclerotized ring and between V_1 and V_2. P-4 with numerous dorsal hairs and two hair-like ventral setae, sword seta near distoventral hair. I-L-5 thicken from base to end, S-2 longer than S-1, both with blunt tips and similar in shape; I-L-6 curved, and distally little thicker than base.

Material examined

P.R. CHINA • 1 ♀; Hainan Province, Qionghai City, Longjiang Town; 19.1730° N, 110.3459° E; 4 m a.s.l.; 11 Apr. 2023; Hai-Tao Li, Yu-Lin Zheng and Yu-Hao Zhang leg.; main river (Wanquan River) with wide surface, slowly flowing, with sandy soil and humus on bottom; slide no. HN-HY-2023041108; GUGC.

Description

Female (n = 1)

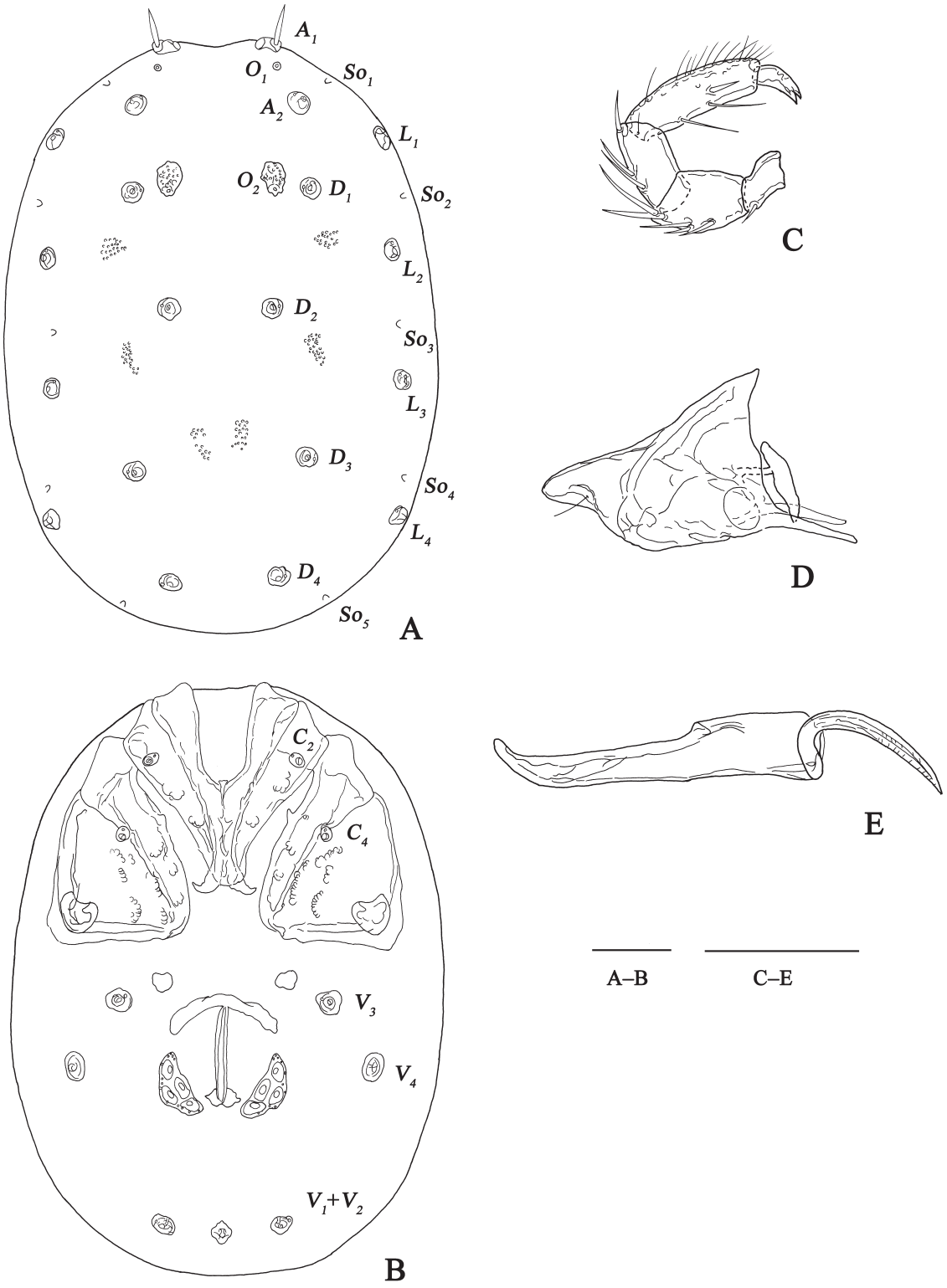

Fig. 19. *Atractides* (*Atractides*) *bitergumus* Zhang & Guo, 2023, paratype, ♀ (slide no. HN-HY-2023041108, GUGC). **A**. Idiosoma, dorsal view. **B**. Idiosoma, ventral view. **C**. Palp. **D**. Gnathosoma. **E**. Chelicera. Scale bars = 100 μm.

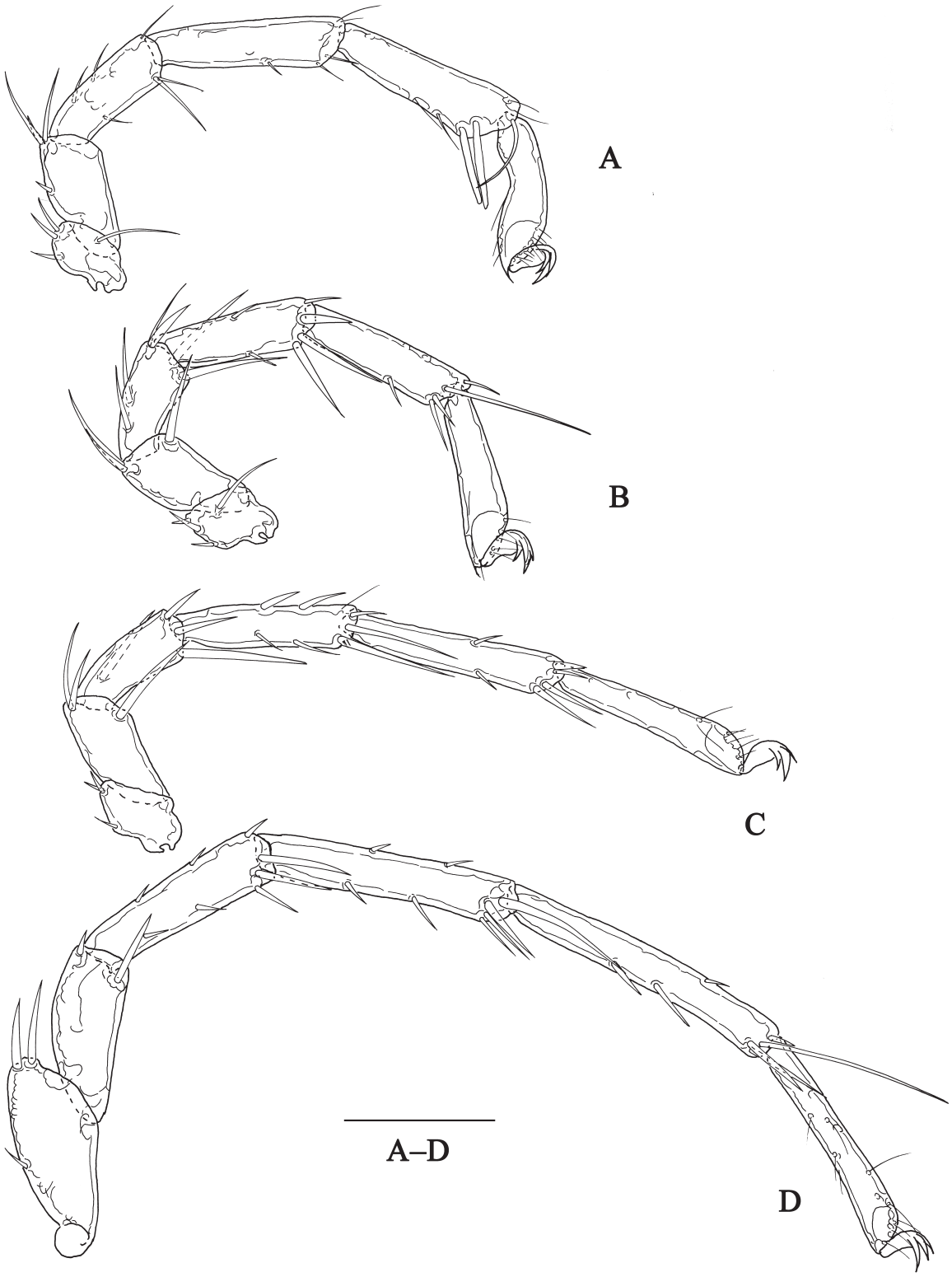

Fig. 20. *Atractides* (*Atractides*) *bitergumus* Zhang & Guo, 2023, paratype, ♀ (slide no. HN-HY-2023041108, GUGC). **A**–**D**. I-L– IV-L. Scale bar = 100 μm.

Idiosoma oval; O_1 between A_1 and A_2 but closer to A_1, O_2 between D_1 and surrounded by pair of platelets; dorsum with three pairs of muscle attachments: pair of muscle attachments between L_2, pair of muscle attachments near D_2, and pair of muscle attachments between D_3; all slit organs visible, So_1 near A_1, So_2 at same level of D_1, So_3 between L_2 and L_3 but closer to L_3, So_4 near L_4, So_5 behind of D_4 (Figs 19A, 21A). ACG fused and with suture line, medial posterior margin of ACG ligulate, apodemes of ACG strong and horn-like; PCG separated, and suture line of Cx-III and Cv-IV nearly straight. Genital field with four pairs of acetabula, pregenital sclerite longer than postgenital sclerite. V_1 fused to V_2, V_4 at same level of Ac1, V_3 near pregenital sclerite, pair of sclerites anterior to pregenital sclerite and approximately between V_3, V_3 and V_4 forming trapezoid; excretory pore surrounded by sclerotized ring and between V_1 and V_2 (Figs 19B, 21B).

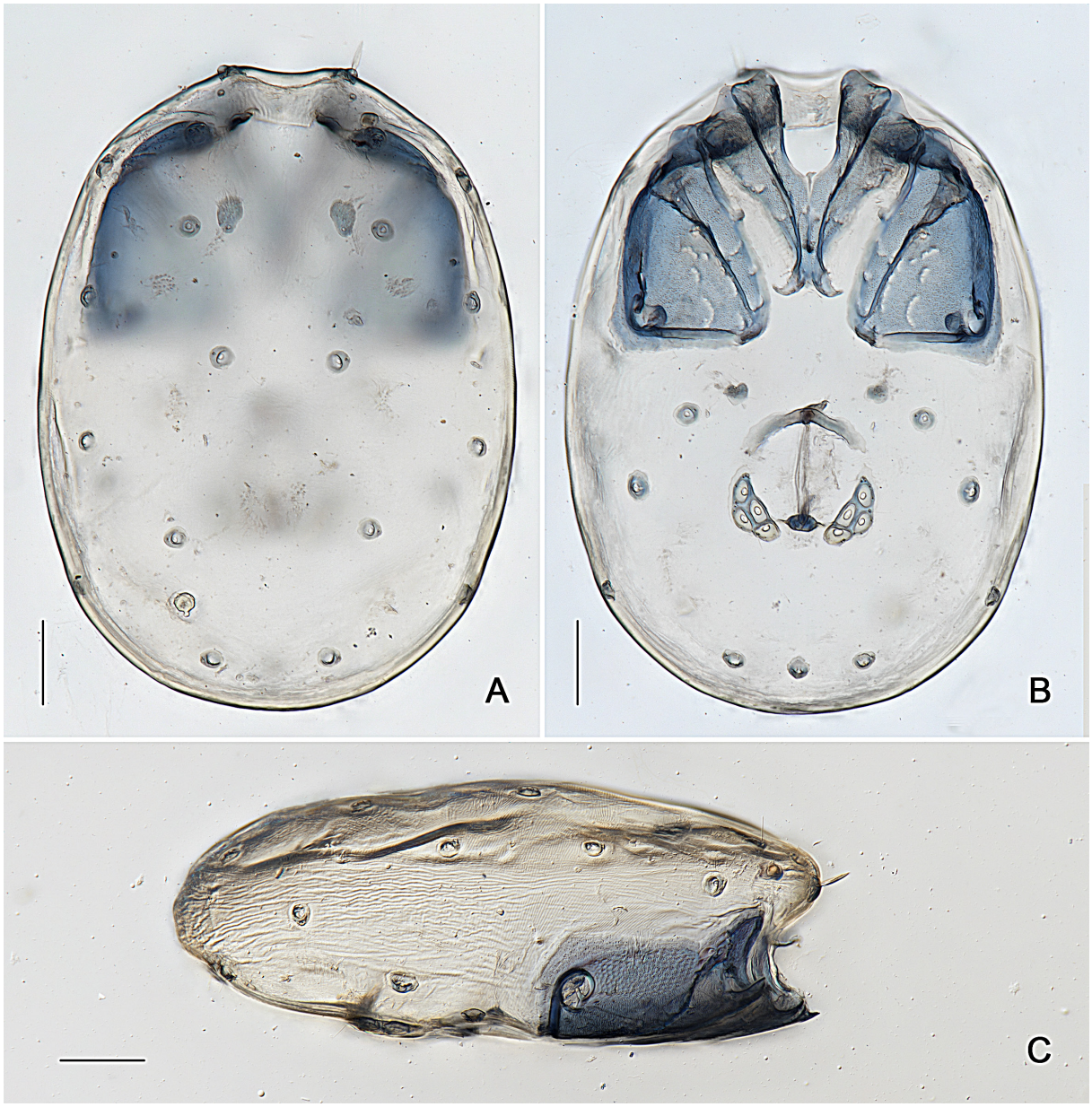

Fig. 21. *Atractides* (*Atractides*) *bitergumus* Zhang & Guo, 2023, paratype, ♀ (slide no. HN-HY-2023041108, GUGC), light microscope photographs. **A**. Idiosoma, dorsal view. **B**. Idiosoma, ventral view. **C**. Idiosoma lateral view. Scale bars = 100 µm.

Palp five-segmented and without obvious sexual dimorphism; P-2 short and stout with straight ventral margin, P-3 straight, P-4 with numerous dorsal hairs and two hair-like ventral setae, ventral sectors 3:2:3, sword seta near distoventral hair (Fig. 19C). I-L-5 thickening from base to end, S-2 longer than S-1, both with blunt tips and similar in shape; I-L-6 curved, and end little thicker than base (Fig. 20).

Measurements. Idiosoma L 745, W 579; coxal field L 330, Cx-III W 390, ACG IL 228, mL 132, W 272; gnathosoma bay L 122; gonopore L 107, pregenital sclerite L 142, postgenital sclerite L 52; Ac1–4 L 29, 29, 29, 30; chelicera L 288, cheliceral claw L 93, basal segment L 202; gnathosoma L 218; palp dL: P-1 30, P-2 66, P-3 63, P-4 97, P-5 36; leg segments: I-L-1 dL 41, I-L-2 dL 78, I-L-3 dL 90, I-L-4 dL 131, I-L-5 dL 130, HB 39, I-L-6 dL 98, HB 23, S-1 L 52 , W 5, S-2 L 51, W 5; dL: II-L-1 55, II-L-2 73, II-L-3 81, II-L-4 108, II-L-5 119, II-L-6 114; dL: III-L-1 56, III-L-2 69, III-L-3 85, III-L-4 122, III-L-5 148, III-L-6 129; dL: IV-L-1 121, IV-L-2 91, IV-L-3 137, IV-L-4 170, IV-L-5 187, IV-L-6 159.

Distribution

China (Hainan Province).

Remarks

Due to the genital field with four pairs of acetabula and similar shape of the palp, chelicera and gnathosoma, the specimen from Hainan Province matches the description of *A*. (*A*.) *bitergumus* Zhang & Guo, 2023.The collection site is very close to type locality, all in Hainan Province (Zhang *et al.* 2023). This is the first description of the female.

Atractides* (*Tympanomegapus*) *tergumus Zhang & Guo, 2023
Figs 22–25

Diagnosis

O_2 slightly anterior to D_1. Genital field with three pairs of acetabula forming triangle, V_1 separated from V_2, excretory pore smooth and slightly posterior to level of V_1 and V_2. P-4 ventral margin straight and divided by two ventral hairs in sectors 3:2:3, sword seta near distoventral hair, P-5 without lateral cheeks. I-L-5 thickens from base to end, S-1 and S-2 both with blunt tips and similar in shape; I-L-6 slightly straight and end little thicker than base.

Material examined

P.R. CHINA • 1 ♂, 2 ♀♀; Hainan Province, Lingshui Li Autonomous County, Diaoluo Mountain National Forest Park; 18.6683° N, 109.9227° E; 84 m a.s.l.; 13 Apr. 2023; Hai-Tao Li, Yu-Lin Zheng and Yu-Hao Zhang leg.; main river (Diaoluo River) 40–50 cm deep, with sand and rotten leaves on bottom, plants around, shore with helophytes (Fig. 25B); slide nos. HN-HY-2023041301 to 2023041303; GUGC.

Description

Female (n = 2)

Idiosoma oval, O_1 posterior to A_1, O_2 slightly anterior to D_1 and on platelets; all slit organs visible, So_1 near A_2, So_2 at same level of D_1, So_3 at same level of D_2, So_4 located in front of L_4, So_5 behind of D_4 and out (Figs 22A, 24A). ACG fused and with suture line, apodemes of ACG strong and horn-like, and interspace between two apodemes; PCG separated, and suture line of Cx-III and Cv-IV nearly straight, C_4 near suture line between Cx-III and Cv-IV. Genital field with three pairs of acetabula forming triangle, V_1 separated from V_2, V_3 close to PCG, V_4 at same level of pregenital sclerite, V_3 and V_4 forming trapezoid, excretory pore smooth and slightly posterior to level of V_1 and V_2 (Figs 22B, 24B).

Palp five-segmented; P-1 elongated, P-2 and P-3 ventral margins more or less straight; P-4 with numerous dorsal hairs, ventral margin straight and divided by two ventral hairs in sectors 3:2:3, sword seta near to distoventral hair, P-5 without lateral cheeks (Fig. 22C). I-L-5 thickens from base to end, S-1 and S-2 both with blunt tips and similar in shape; I-L-6 slightly straight and end little thicker than base (Fig. 23).

Measurements (measurements of other specimens in parentheses). Idiosoma L 730 (746), W 578 (538); coxal field L 384 (366), Cx-III W 408 (410), ACG IL 271 (269), mL 126 (139), W 293 (280); gnathosoma bay L 177 (158); gonopore L 95 (107), pregenital sclerite L 97 (101), postgenital sclerite L 49 (56); Ac1–3 L 30 (33), 36 (34), 29 (34); chelicera L 365 (357), cheliceral claw L 99 (98), basal segment L 291 (283); gnathosoma L 271 (251); palp dL: P-1 71 (60), P-2 69 (70), P-3 73 (64), P-4 107

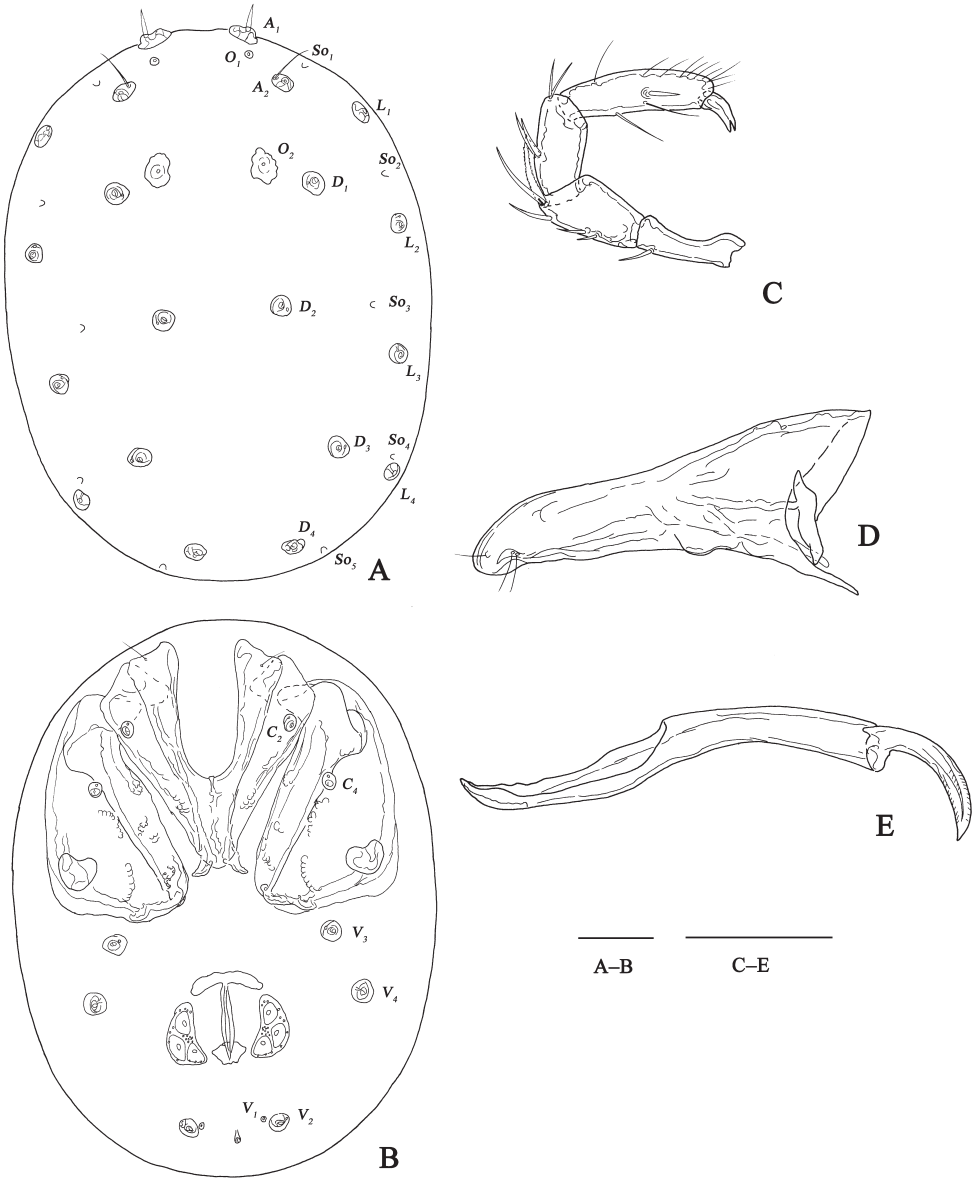

Fig. 22. *Atractides* (*Tympanomegapus*) *tergumus* Zhang & Guo, 2023, paratype, ♀ (slide no. HN-HY-2023041302, GUGC). **A**. Idiosoma, dorsal view. **B**. Idiosoma, ventral view. **C**. Palp. **D**. Gnathosoma. **E**. Chelicera. Scale bars = 100 μm.

(100), P-5 33 (32); leg segments: I-L-1 dL 58 (57), I-L-2 dL 84 (74), I-L-3 dL 100 (93), I-L-4 dL 141 (129), I-L-5 dL 132 (122), HB 37 (35), I-L-6 dL 108 (100), HB 23 (22), S-1 L 39 (37), W 4 (4), S-2 L 41 (39), W 5 (4); dL: II-L-1 64 (58), II-L-2 72 (72), II-L-3 91 (83), II-L-4 117 (104), II-L-5 126 (114), II-L-6 117 (109); dL: III-L-1 62 (61), III-L-2 95 (81), III-L-3 92 (89), III-L-4 125 (114), III-L-5 143

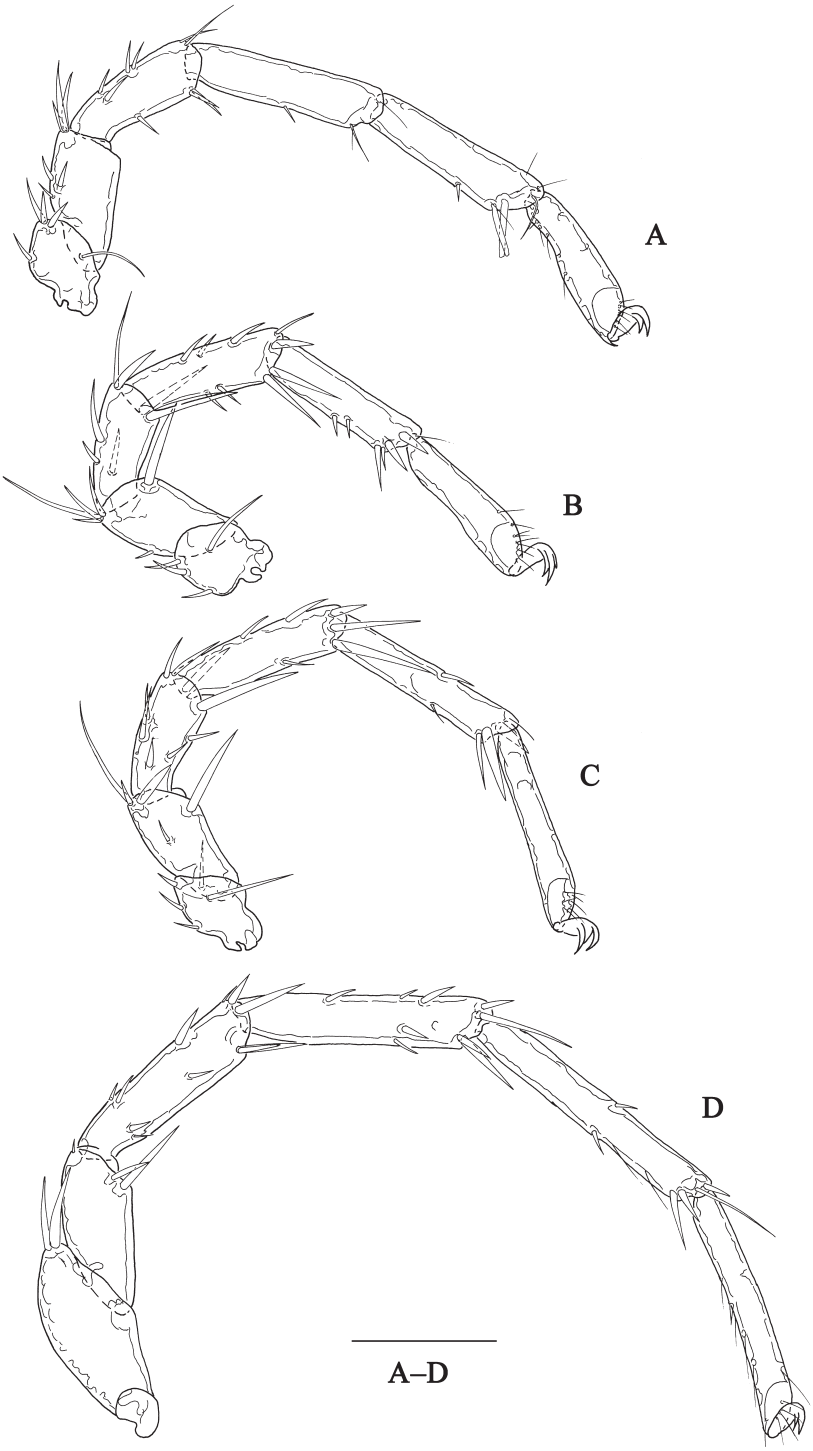

Fig. 23. *Atractides* (*Tympanomegapus*) *tergumus* Zhang & Guo, 2023, paratype, ♀ (slide no. HN-HY-2023041302, GUGC). **A**–**D**. I-L– IV-L. Scale bar = 100 μm.

(139), III-L-6 140 (135); dL: IV-L-1 137 (125), IV-L-2 106 (97), IV-L-3 149 (143), IV-L-4 177 (171), IV-L-5 192 (186), IV-L-6 167 (168).

Distribution

China (Hainan Province).

Remarks

In this study, we collected one male and two females from Diaoluo Mountain National Forest Park, Lingshui Li Autonomous County, Hainan Province, and found that the male matches the description of the male of *A*. (*T*.) *tergumus*. Moreover, the collection site is very close to the site where *A*. (*T*.)

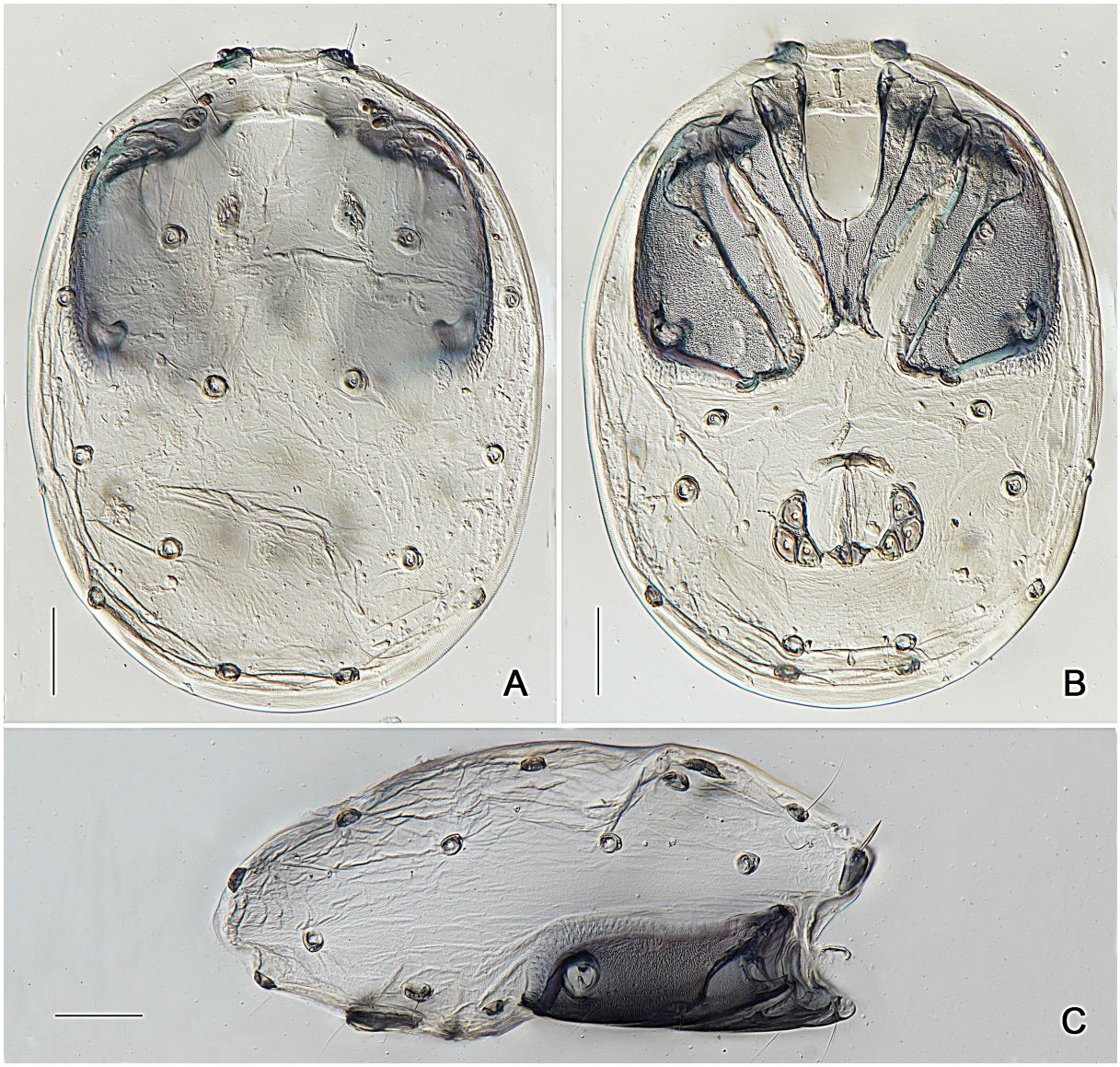

Fig. 24. *Atractides* (*Tympanomegapus*) *tergumus* Zhang & Guo, 2023, paratype, ♀ (slide no. HN-HY-2023041302, GUGC), light microscope photographs. **A**. Idiosoma, dorsal view. **B**. Idiosoma, ventral view. **C**. Idiosoma lateral view. Scale bars = 100 µm.

tergumus was collected. We believe the females we collected belong to *A*. (*T*.) *tergumus,* and this is the first description to the female of the species.

Discussion

The new species *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov. resembles species of *Polymegapus* in the shape of palp, but differs in some features, so it may represent an intermediate species bridging the gap between *Atractides* and *Polymegapus*. In order to solve this doubt, we hope that the introduction of molecular biotechnology in the future can shed light on this question. The species used in molecular biotechnology were also taken from Hainan Province in P.R. China (Smit 2020).

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References

Asadi M., Pešić V. & Etemadi I. 2010. A revised survey of water mites (Acari: Hydrachnidia) from Iran: new synonyms and descriptions of three new species. *Zootaxa* 2628 (1): 43–55. https://doi.org/10.11646/zootaxa.2628.1.3

Conroy J.C. & Bilyj B. 1992. *Atractides* (*Octomegapus*) *elaensis*, a new species of water mite from western Ontario (Acari: Hydrachnellae: Hygrobatidae). *International Journal of Acarology* 18: 89–91. https://doi.org/10.1080/01647959208683937

Gerecke R. 2003. Water mites of the genus *Atractides* Koch, 1837 (Acari: Parasitengona: Hygrobatidae) in the western Palaearctic region: a revision. *Zoological Journal of the Linnean Society* 138: 141–378. https://doi.org/10.1046/j.1096-3642.06-0.00051.x

Gerecke R. 2021. The water mites of the family Hygrobatidae (Acari, Hydrachnidia) in Italy. *Zootaxa* 5009 (1): 1–85. https://doi.org/10.11646/zootaxa.5009.1.1

Fig. 25. Photographs of selected sampling sites. **A**. Longjiang Town, Qionghai City, Hainan Province, Wanquan River. (sampling sites of *Atractides* (*Atractides*) *cardiacus* Zhang & Guo sp. nov. and *A*. (*A*.) *bitergumus* Zhang & Guo, 2023). **B**. Diao Luo Mountain National Forest Park, Lingshui Li Autonomous County, Hainan Province, Diaoluo River (sampling site of *A*. (*Tympanomegapus*) *tergumus* Zhang & Guo, 2023).

Gerecke R., Gledhill T., Pešić V. & Smit H. 2016. *Chelicerata: Acari III. Süßwasserfauna von Mitteleuropa 7/2–3*: 1–429. Springer Verlag, Berlin Heidelberg. https://doi.org/10.1007/978-3-8274-2689-5

Imamura T. 1976. Water mites from Hong Kong. *Proceedings of the Japanese Society of Systematic Zoology* 12: 21–23.

Jin D.C. 1997. *Hydrachnellae-morphology Systematics a Primary Study of Chinese Fauna*. Science and Technology Publishing House, Guiyang. [In Chinese.]

Li H.T., Jin D.C. & Guo J.J. 2022. *Acucapito hainanensis* sp. nov., the first record of the family Acucapitidae Wiles, 1996 (Acari, Hydrachnidia) from China. *Acarologia* 62 (1): 250–261. https://doi.org/10.24349/h7mp-06fx

Lundblad O. 1969. Indische Wassermilben, hauptsächlich von Hinterindien. *Arkiv för Zoologi* 22: 1–126.

Pešić V. 2002. Two interesting species of the genus *Atractides* Koch 1837 (Acari, Actinedida) from Crna Gora (Balkan Peninsula). *Lauterbornia* 44: 65–71.

Pešić V. & Asadi M. 2002. Two new water mite species from Iran of the water mite families Torrenticolidae and Hygrobatidae (Acari: Hydrachnidia). *Zootaxa* 127 (1): 1–7. https://doi.org/10.11646/zootaxa.127.1.1

Pešić V. & Smit H. 2009. New records of water mites of the genus *Atractides* Koch, 1837 (Acari: Hydrachnidia, Hygrobatidae) from Thailand, Malaysia and Sulawesi (Indonesia), with the description of four new species. *Zootaxa* 2240 (1): 1–30. https://doi.org/10.11646/zootaxa.2240.1.1

Pešić V. & Smit H. 2015a. Two new species of the genus *Atractides* Koch, 1837 (Acari: Hydrachnidia: Hygrobatidae) with an updated checklist of the water mites of Thailand. *Systematic and Applied Acarology* 20 (7): 782–788. https://doi.org/10.11158/saa.20.7.6

Pešić V. & Smit H. 2015b. Water mites of the genus *Atractides* Koch, 1837 (Acari: Hydrachnidia: Hygrobatidae) from Ghana. *Zootaxa* 3911 (3): 343–356. https://doi.org/10.11646/zootaxa.3911.3.2

Pešić V. & Smit H. 2018. A checklist of the water mites of Central Asia with description of six new species (Acari, Hydrachnidia) from Kyrgyzstan. *Acarologia* 58 (1): 165–185. https://doi.org/10.24349/acarologia/20184236

Pešić V. & Smit H. 2021a. A new species of the genus *Atractides* Koch, 1837 from Turkey (Acari: Hydrachnidia: Hygrobatidae). *Ecologica Montenegrina* 43: 44–50. https://doi.org/10.37828/em.2021.43.6

Pešić V. & Smit H. 2021b. Water mites of the genus *Atractides* Koch, 1837 from Kyrgyzstan (Acari: Hydrachnidia: Hygrobatidae) with the description of six new species. *Acarologia* 61(2): 332–355. https://doi.org/10.24349/acarologia/20214434

Pešić V. & Smit H. 2022. Two new water mite species from Kyrgyzstan (Acari, Acariformes, Hydrachnidia). *Ecologica Montenegrina* 58: 69–78. https://doi.org/10.37828/em.2022.58.7

Pešić V., Saboori A., Asadi M. & Vafaei R. 2004. Studies on water mites of the family Hygrobatidae (Acari, Hydrachnidia) from Iran, I. The water mite genus *Atractides* Koch, with the description of five new species. *Zootaxa* 495 (1): 1–40. https://doi.org/10.11646/zootaxa.495.1.1

Pešić V., Saboori A., Asadi M. & Vafaei R. 2005. First record of hyporheic water mite species of the genus *Atractides* Koch, 1837 (Acari, Hydrachnidia) from Iran. *Fragmenta Faunistica* 48 (1): 97–100. https://doi.org/10.3161/00159301FF2005.48.1.097

Smit H. 2020. Water mites of the world, with keys to the families, subfamilies, genera and subgenera (Acari: Hydrachnidia): *Monografieën van de Nederlandse Entomologische Vereniging* 12: 465–468. Smit H. & Pešić V. 2014. Water mites from Mount Kinabalu and the Crocker Range, Borneo, Malaysia (Acari: Hydrachnidia), with the description of 34 new species. *Zootaxa* 3876 (1): 1–71.

https://doi.org/10.11646/zootaxa.3876.1.1

Tang Z.Y., Wang Z.H., Zheng C.Y. & Fang J.Y. 2006. Biodiversity in China's mountains. *Frontiers in Ecology and the Environment* 4 (7): 347–352. https://doi.org/10.1890/1540-9295(2006)004[0347:BICM]2.0.CO;2

Tuzovskij P.V. 2004. A new water mite species of the genus *Atractides* Koch from European Russia (Acariformes: Hygrobatidae). *Zoosystematica Rossica* 13 (1): 1–3. https://doi.org/10.31610/zsr/2004.13.1.1

Tuzovskij P.V. 2010a. New water mite species from the genus *Atractides* Koch, 1837 (Acariformes, Hygrobatidae) from Magadan oblast (Russia). *Inland Water Biology* 3: 105–111. https://doi.org/10.1134/S199508291002001X

Tuzovskij P.V. 2010b. Two new water mite species of the genus *Atractides* (Acariformes, Hygrobatidae) from the Northern Caucasus. *Entomological Revue* 90 (2). https://doi.org/10.1134/S0013873810020089

Tuzovskij P.V. 2011. Four new water mite species of the genus *Atractides* Koch (Acari: Hydrachnidia: Hygrobatidae) from Russia. *Zootaxa* 2738 (2738): 41–59. https://doi.org/10.11646/zootaxa.2738.1.3

Tuzovsky P.V. 2013. A new species of the water mite genus *Atractides* Koch (Acariformes, Hydrachnidia, Hygrobatidae) from the eastern Russia. *Acarina* 21 (1): 38–42.

Viets K.O. 1987. Die Milben des Süßwassers (Hydrachnellae und Halacaridae (part.), Acari). II.: Katalog. *Sonderbände des Naturwissenschaftlichen Vereins Hamburg* 8: 1–1012.

Wang Z.Y. & Jin D.C. 2012. Two new species of *Atractides* Koch, 1837 (Acari: Hydrachnida: Hygrobatidae) from Sichuan Province, China. *Entomotaxonomia* 34: 567–573.

Wang Z.Y. & Jin D.C. 2013. A new species of the water mite genus *Atractides* Koch, 1837 (Acarina, Hygrobatidae). *Journal of Guangxi Normal University (Natural Science Edition)* 31: 93–95.

Wang Z.Y., Yi T.C. & Jin D.C. 2015. Descriptions of *Atractides aprojectus* sp. nov. and male of *A. huaxiensis* Yi & Jin (Acari: Hydrachnidia) from China. *Acta Zootaxonomica Sinica* 40: 53–57.

Yi T.C., Jin D.C. & Wang X.J. 2010. Water mites of the subgenus *Tympanomegapus* Thor (Acari: Hygrobatidae: *Atractides*) from China. *International Journal of Acarology* 36: 419–429. https://doi.org/10.1080/01647954.2010.483236

Zhang R.Z. 1999. *Zoogeography of China*. Science Press, Beijing.

Zhang Y.H., Li H.T., Li C.Y. & Guo J.J. 2022. New species of genus *Atractides* Koch, 1837 (Acari: Hydrachnidiae, Hygrobatidae) from Qinghai, China. *European Journal of Taxonomy* 833: 121–142. https://doi.org/10.5852/ejt.2022.833.1889

Zhang Y.H., Li H.T., Zheng Y.L. & Guo J.J. 2023. Two new species and one new record species of genus *Atractides* Koch, 1837 (Hygrobatidae, Hydrachnidiae, Acari) from Hainan, China. *International Journal of Acarology* 49 (2): 95–104. https://doi.org/10.1080/01647954.2023.2202673

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