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## Research article

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# New species of genus *Atractides* Koch, 1837 (Acari: Hydrachnidiae, Hygrobatidae) from Qinghai, China

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**Abstract.** The paper deals with five new species of the genus *Atractides* Koch, 1837 (Acari: Hydrachnidiae, Hygrobatidae) collected from Qinghai Province, P.R. China, *Atractides* (*Atractides*) *biprojectus* Zhang, Li & Guo sp. nov., *Atractides* (*Atractides*) *smiti* Zhang, Li & Guo sp. nov., *Atractides* (*Atractides*) *menyuanensis* Zhang, Li & Guo sp. nov., *Atractides* (*Atractides*) *longiprojectus* Zhang, Li & Guo sp. nov. and *Atractides* (*Atractides*) *xianmiensis* Zhang, Li & Guo sp. nov. All the new species are described and illustrated in detail, and all the type specimens are deposited in the Institute of Entomology, Guizhou University, Guiyang, China (GUGC).

**Keywords.** Water mite, *Atractides*, new species, taxonomy, Qinghai-Tibet Plateau.

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## Introduction

*Atractides* Koch, 1837 are reported in all biogeographical areas except for Australia and Antarctica (Cook 1974; Gerecke 2003). Most species are known from the northern Hemisphere, and only found in clean waters where the substratum is well preserved, so they are probably sensitive to many forms of human impact (Gerecke 2003; Pešić & Smit 2011; Gülle *et al.* 2015).

Currently, the genus *Atractides* has four subgenera (*Atractides* Koch, 1837; *Tympanomegapus* Thor, 1923; *Polymegapus* K. Viets, 1926; *Maderomegapus* Lundblad, 1941), and about 405 species have been described from all over the world (K.O. Viets 1987; Gerecke 2003; Pešić *et al.* 2018; Pešić & Smit 2018, 2021a, 2021b; Smit 2020; Gülle *et al.* 2021; <http://www.watermite.org/>). Based on previous information, two subgenera and 18 species of *Atractides* have been reported for the Chinese fauna: *Atractides* s. str. with 14 species and *Tympanomegapus* Thor, 1923 with 4 species (Jin 1997; Yi *et al.* 2010; Wang & Jin 2012, 2013; Wang *et al.* 2015).

The Qinghai Province lies in the west of China, on the Qinghai-Tibet Plateau. The Qinghai-Tibet Plateau is the highest and largest plateau in the world, which has a wide range of geological, topographical and climatic gradients. Therefore, there is a greater biodiversity than in the surrounding lowlands and other high elevation regions (Sun *et al.* 2014). Through a joint investigation of water mites in Qinghai Province, five new species are found: *Atractides (Atractides) biprojectus* Zhang, Li & Guo sp. nov., *Atractides (Atractides) smiti* Zhang, Li & Guo sp. nov., *Atractides (Atractides) menyuanensis* Zhang, Li & Guo sp. nov., *Atractides (Atractides) longiprojectus* Zhang, Li & Guo sp. nov. and *Atractides (Atractides) xianmiensis* Zhang, Li & Guo sp. nov. All the new species are described and illustrated in detail.

## Material and methods

Specimens in this study were all collected by Hai-Tao Li from Qinghai Province, P.R. China. Water mites were collected by hand netting, sorted on the spot from the living material, preserved in Koenike's fluid and dissected following Jin (1997) under a Motic SMZ-168 stereo microscope. Specimens were observed under a Nikon Ni-E microscope (with a Nikon DS-Ri2 camera). All illustrations were edited with Adobe Photoshop CC2018.

All measurements are given in micrometers ( $\mu\text{m}$ ) following Gerecke (2003). Terms are modified from Jin (1997) and Gerecke (2003).

The following abbreviations are used:

a.s.l.	=	above sea level
$A_1$	=	preantennal glandularia
$A_2$	=	postantennal glandularia
Ac	=	acetabulum (pl. acetabula, numbered 1 to 3)
ACG	=	anterior coxal group (Cx-I+Cx-II)
Ap	=	acetabular plates
$C_1-C_4$	=	coxoglandularia 1–4
Cx-I–IV	=	coxae I–IV
$D_1-D_4$	=	dorsoglandularia 1–4
dL	=	dorsal length
HB	=	central height
IL	=	lateral length
I-L-1–6, etc.	=	the first–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	=	the first–fifth segment of palp
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

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

## Results

Class Arachnida Lamarck, 1801  
Order Trombidiformes Reuter, 1909  
Superfamily Hygrobatoidea Koch, 1842  
Family Hygrobatidae Koch, 1842  
Genus *Atractides* Koch, 1837  
Subgenus *Atractides* Koch, 1837

*Atractides (Atractides) biprojectus* Zhang, Li & Guo sp. nov.  
urn:lsid:zoobank.org:act:06CA408F-1FC6-4FD0-AA2A-E94B784621C0  
Figs 1–3

## Diagnosis

### Male

Dorsal muscle attachment unsclerotized. I-L-5 longish, S-1 and S-2 with blunt tips and with a narrow setal interspace between them; I-L-6 curved. Ac in an obtuse triangle,  $V_1$  separated from  $V_2$ . P-2 and P-3 with a ventral projection respectively; P-4 divided by two long ventral hairs in sectors 2:3:1, sword seta between two ventral hair insertions and near the terminal.

### Female

Similar to male. Ventral projection of P-2 not obvious, and P-3 ventral margin nearly straight.

## Etymology

The Latin prefix ‘*bi-*’ means two, in the male of the new species P-2 and P-3 are with a ventral projection respectively.

## Type material

### Holotype

CHINA • ♂; Qinghai Province, Huangnan Tibetan Autonomous Prefecture, Zeku County, Maixiu Town; 35°18'64" N, 101°52'32" E; 3201 m a.s.l.; 17 Jul. 2020; Hai-Tao Li leg.; running water; GUGC, Slide No. QH-HY-2020071701.

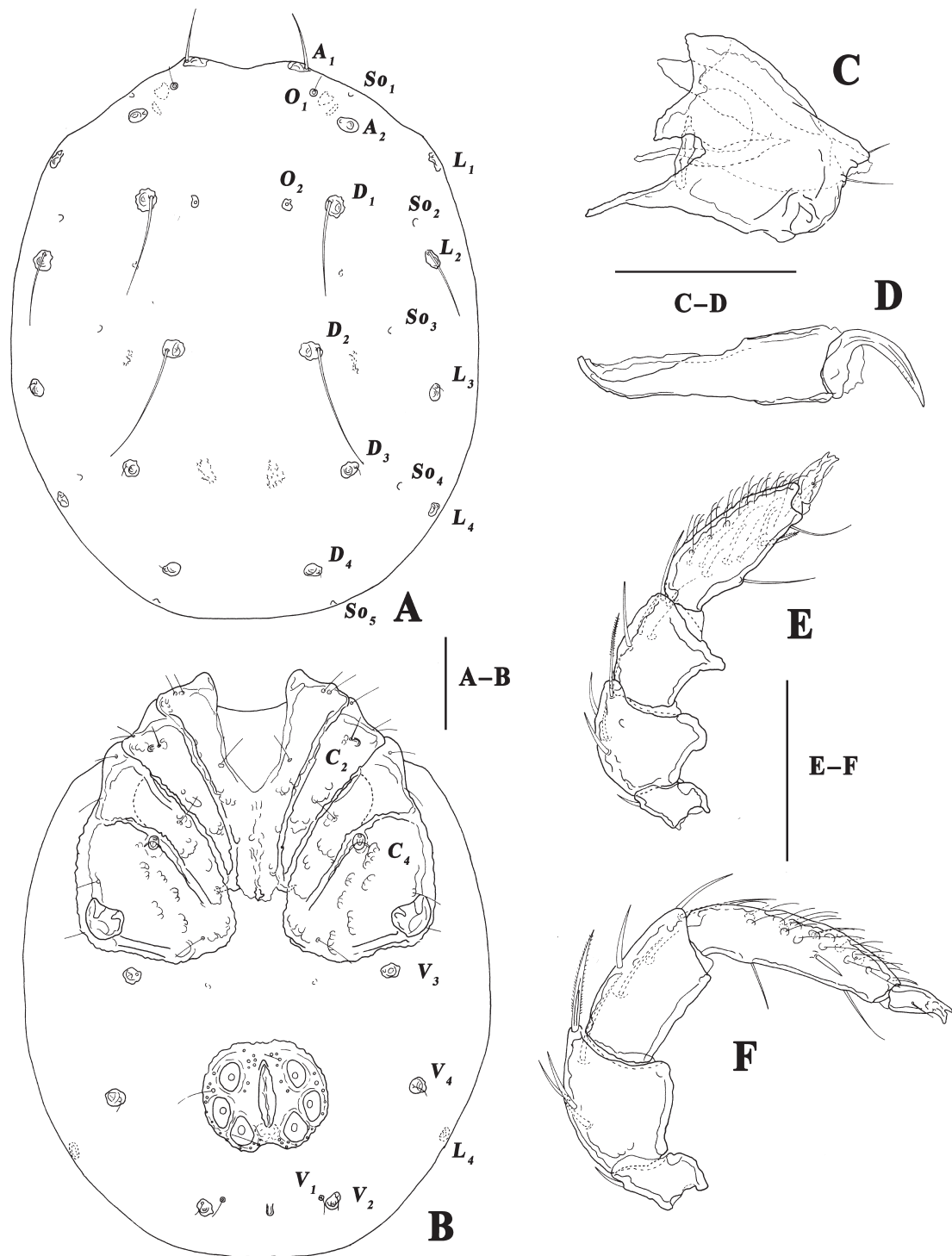
### Paratypes

CHINA • 3 ♂♂; same collection data as for holotype; GUGC, Slides No. QH-HY-2020071702 to 2020071704 • 1 ♀; same collection data as for holotype; GUGC, Slide No. QH-HY-2020071705.

## Description

### Male (n = 4)

Idiosoma oval; dorsal muscle attachment unsclerotized,  $O_2$  and  $D_1$  at the same level; setae of  $D_1$  and  $D_2$  longer than others, setae of  $D_2$  reaching to  $D_3$ ; all slit organs visible,  $So_1$  near the eye capsule and at



**Fig. 1.** *Atractides (Atractides) biprojectus* Zhang, Li & Guo sp. nov. A–E. Holotype, ♂ (GUGC, Slide No. QH-HY-2020071701). F. Paratype, ♀ (GUGC, Slide No. QH-HY-2020071705). A. Idiosoma, dorsal view. B. Idiosoma, ventral view. C. Gnathosoma. D. Chelicera. E. Palp. F. Palp. Scale bars = 100 µm.

the level of  $O_1$ ,  $So_2$  in front of  $L_2$ ,  $So_3$  near  $D_2$ ,  $So_4$  at the middle of  $D_3$  and  $L_4$ ;  $So_5$  behind  $D_4$  (Fig. 1A). ACG fused together and with a suture, PCG separated; apodemes from ACG not reaching to Cx-IV. Acetabula three pairs and in an obtuse triangle;  $V_1$  separated from  $V_2$ ;  $V_3$  and  $V_4$  forming a trapezoid,  $V_4$  at the same level as the middle of Ap (Fig. 1B). Palp five-segmented; P-2 and P-3 with a ventral projection respectively; P-4 with numerous dorsal hairs, and divided by two long ventral hairs in sectors 2:3:1, sword seta between two ventral hair insertions and near the terminal (Fig. 1E). I-L-5 longish, S-1 and S-2 both with blunt tips and with a narrow setal interspace between them; I-L-6 curved (Fig. 3A).

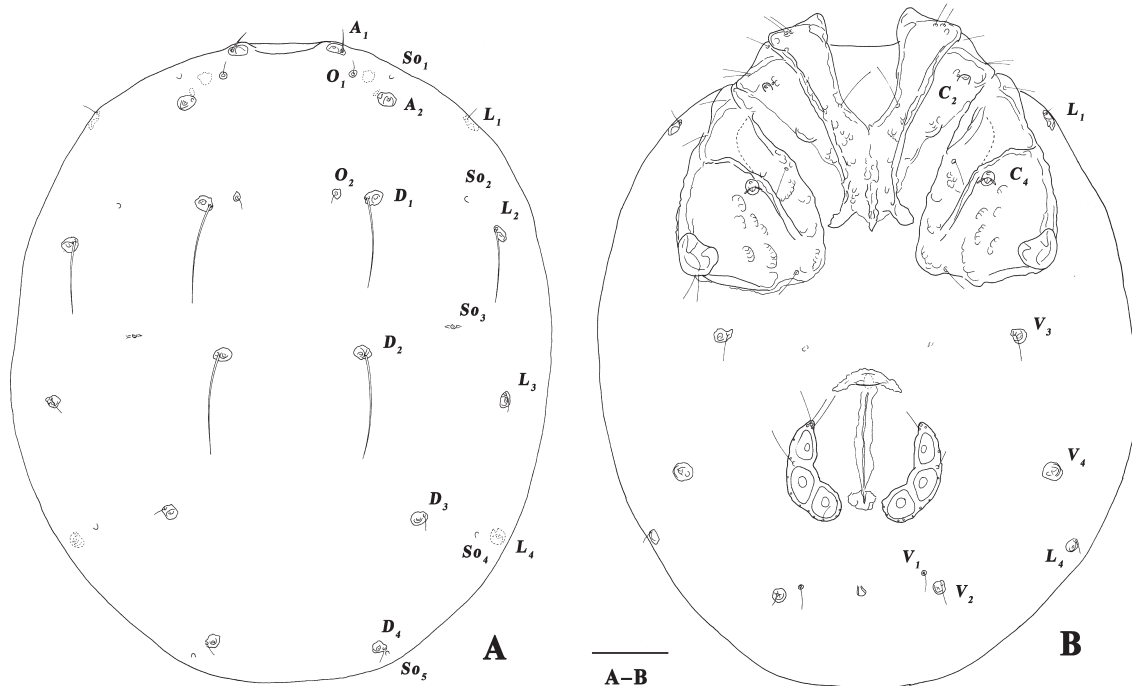
**Female (n = 1)**

Similar to male (Fig. 2). Setae of D1 and D2 shorter than that in male (Fig. 2A); ventral projection of P-2 not obvious, and P-3 ventral margin nearly straight (Fig. 1F).

**Measurements**

**Male (n = 4)**

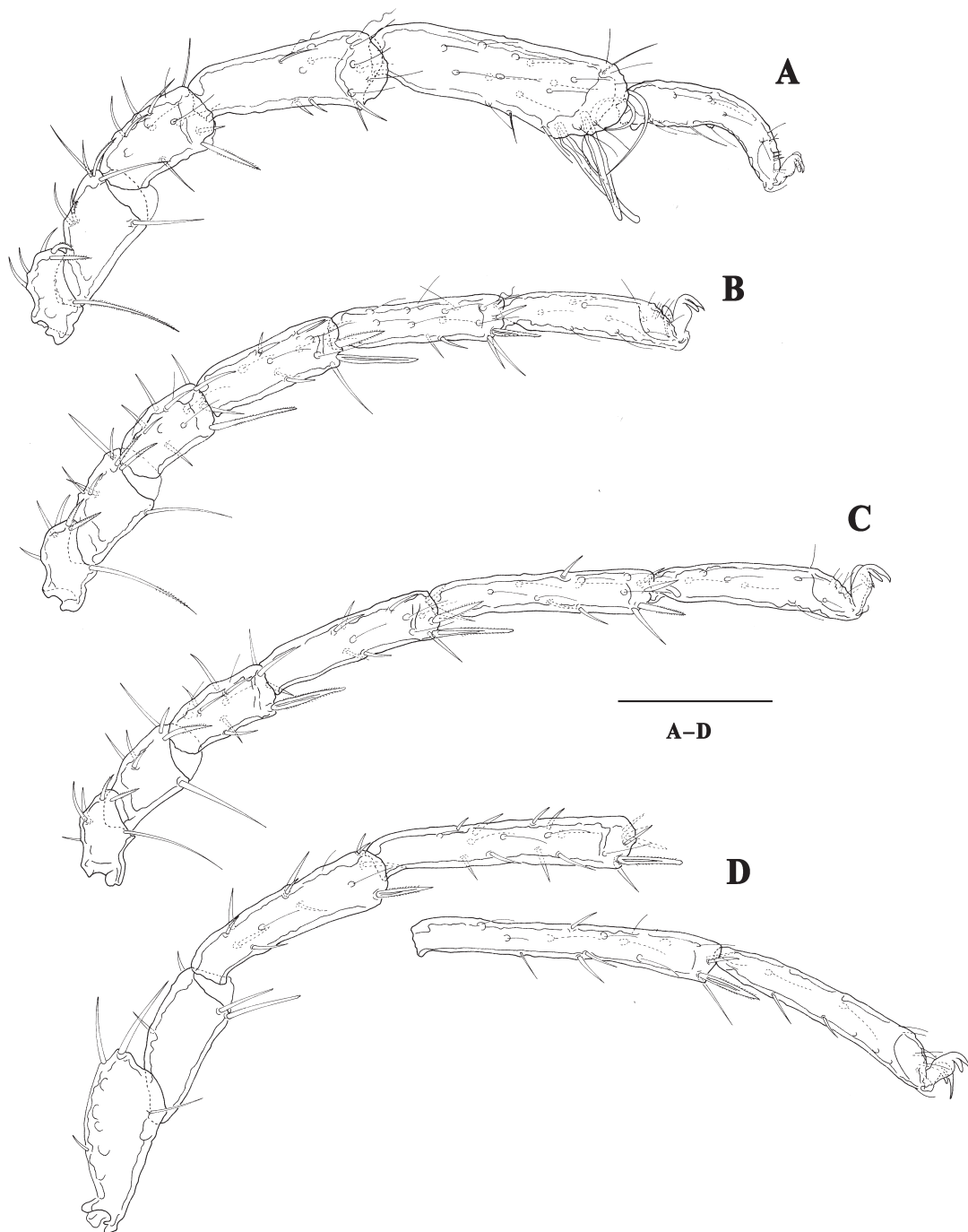
Idiosoma L 641 (585–645), W 546 (443–546); coxal field L 316 (314–325), Cx-III W 333 (333–347), ACG IL 237 (234–239), mL 125 (107–125), W 268 (268–284); infracapitular bay L 123 (118–127); genital field L 120 (119–120), Ac1–3 L 34 (33–38), 34 (34–42), 37(37–40); chelicera L 205 (204–207); infracapitulum L 159 (140–177); palp dL: P-1 29 (29–32), P-2 74 (68–74), P-3 62(59–66), P-4 95(95–99), P-5 27 (27–29); legs segments: I-L-1 dL 48 (46–52), I-L-2 dL 93 (89–93), I-L-3 dL 80 (78–80), I-L-4 dL 119 (119–125), I-L-5 dL 163 (163–176), HB 53 (53–60), I-L-6 dL 119 (119–122), HB 22 (21–22), S-1 L 90 (78–90), S-2 L 74 (74–75); dL: II-L-1 47 (47–50), II-L-2 82 (74–82), II-L-3 71 (70–74), II-L-4 92 (92–102), II-L-5 116 (116–120), II-L-6 124 (124–127); dL: III-L-1 56 (53–57), III-L-2 90 (81–90), III-L-3 75 (73–77), III-L-4 124 (124–125), III-L-5 146 (146–154), III-L-6 141 (133–147); dL: IV-L-1 117 (117–120), IV-L-2 105 (102–113), IV-L-3 138 (135–138), IV-L-4 174 (174–180), IV-L-5 199 (199–208), IV-L-6 163 (162–170).



**Fig. 2.** *Atractides (Atractides) biprojectus* Zhang, Li & Guo sp. nov. **A–B.** Paratype, ♀ (GUGC, Slide No. QH-HY-2020071705). **A.** Idiosoma, dorsal view. **B.** Idiosoma, ventral view. Scale bar = 100  $\mu$ m.

**Female** (n = 1)

Idiosoma L 902, W 721; coxal field L 390, Cx-III W 477, ACG IL 272, mL 137, W 355; infracapitular bay L 165; gonopore L 146, Ap L 140, Ac1–3 L 43, 47, 47; chelicera L 267; infracapitulum L 222; palp dL: P-1 38, P-2 84, P-3 84, P-4 123, P-5 34; legs segments: I-L-1 dL 64, I-L-2 dL 113, I-L-3 dL 114, I-L-4 dL 176, I-L-5 dL 242, HB 77, I-L-6 dL 171, HB 26, S-1 L 120, S-2 L 106; dL: II-L-1 72, II-L-2



**Fig. 3.** *Atractides (Atractides) biprojectus* Zhang, Li & Guo sp. nov., holotype, ♂ (GUGC, Slide No. QH-HY-2020071701). **A–D.** I–L–IV–L. Scale bar = 100  $\mu$ m.

98, II-L-3 96, II-L-4 135, II-L-5 153, II-L-6 162; dL: III-L-1 69, III-L-2 100, III-L-3 107, III-L-4 168, III-L-5 193, III-L-6 181; dL: IV-L-1 153, IV-L-2 141, IV-L-3 184, IV-L-4 231, IV-L-5 267, IV-L-6 211.

### Remarks

The new species *Atractides (Atractides) biprojectus* sp. nov. is similar to *Atractides yzdensis* Pešić, Smit & Saboori, 2021 in the following points: (1) male P-2 and P-3 with ventral projections; (2) setae S-1 and S-2 separated, with a narrow setal interspace; (3)  $V_1$  separated from  $V_2$ . However, *A. (A.) biprojectus* differs from *A. yzdensis* in following aspects: (1) P-4 sword seta between two ventral hair insertions in *A. (A.) biprojectus*, but slightly proximal to posteroventral hair in *A. yzdensis*; (2) apodemes from ACG not reaching to Cx-IV in *A. (A.) biprojectus*, but reaching to Cx-IV in *A. yzdensis*; (3) genital field of *A. (A.) biprojectus* much rounder than that of in *A. yzdensis* (Pešić *et al.* 2021).

*Atractides (Atractides) smiti* Zhang, Li & Guo sp. nov.  
urn:lsid:zoobank.org:act:D2DA763A-88E0-4432-810F-76BC5FBF1F3B  
Figs 4–5

### Diagnosis

Muscle attachments between  $D_3$  sclerotized. I-L-5 longish, S-1 and S-2 both with blunt tips and with a narrow setal interspace between them; I-L-6 curved. Ac in an obtuse triangle;  $V_1$  fused to  $V_2$ , excretory pore surrounded by sclerotized ring. P-2 and P-3 ventral margin slightly straight; P-4 divided by two ventral hairs in sectors 3:3:2, sword seta at the middle of P-4.

### Etymology

The species is named after Dr Harry Smit in appreciation of his contributions to the taxonomy of water mites.

### Type material

#### Holotype

CHINA • ♂; Qinghai Province, Huangnan Tibetan Autonomous Prefecture, Zeku County, Maixiu Town; 35°18'64" N, 101°52'32" E; 3201 m a.s.l.; 17 Jul. 2020; Hai-Tao Li leg.; running water; GUGC, Slide No. QH-HY-2020071706.

### Description

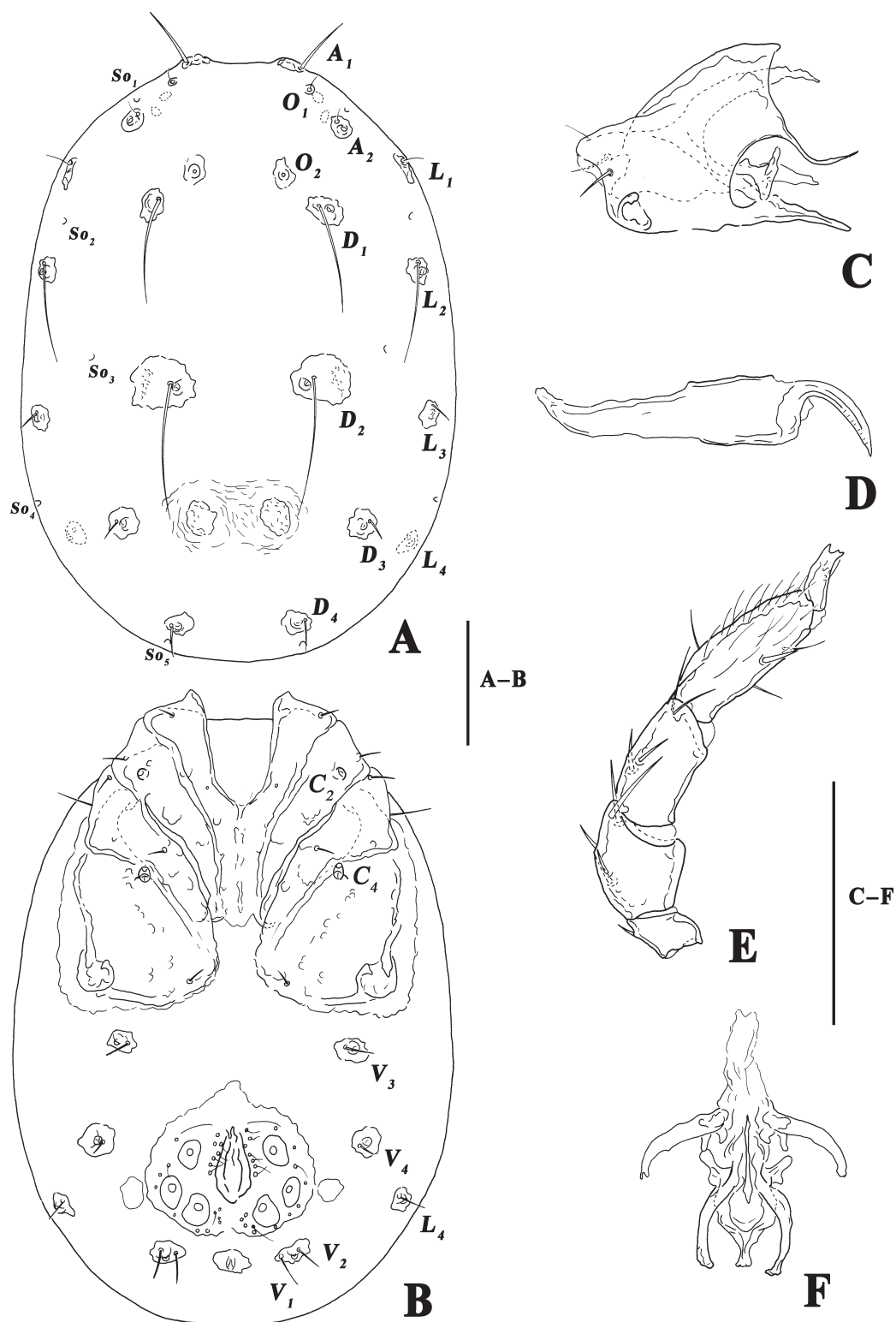
#### Male

Idiosoma oval;  $O_2$  and  $L_1$  at the same level; setae of  $D_1$  about two thirds of the distance from  $D_1$  to  $D_2$ ; setae of  $D_2$  reaching to the level of  $D_3$ ; muscle attachments between  $D_3$  sclerotized; all setae surrounded by sclerites;  $So_1$  in front of  $A_2$ ,  $So_2$  at the same level as  $D_1$ ,  $So_3$  near  $D_2$ ,  $So_4$  at the same level as  $D_3$ ,  $So_5$  behind  $D_4$  (Fig. 4A). ACG fused together and with a suture, apodemes of ACG reaching to Cx-III; genital field with a development sclerotization, the anterior part of Ap with a projection, Ac in an obtuse triangle, Ac2 near Ac3 rather than Ac1, Ac3 the biggest;  $V_1$  fused to  $V_2$ ,  $V_3$  and  $V_4$  forming a trapezoid,  $V_4$  at the same level as the anterior of acetabular plate; excretory pore surrounded by sclerotized ring (Fig. 4B). Palp five-segmented; P-2 and P-3 ventral margins slightly straight; P-4 with numerous dorsal hairs, and divided by two ventral hairs in sectors 3:3:2, sword seta at the middle of P-4 (Fig. 4E). I-L-5 longish, S-1 and S-2 both with blunt tips and with a narrow setal interspace between them; I-L-6 curved (Fig. 5A).

### Measurements

#### Male (n = 1)

Idiosoma L 513, W 369; coxal field L 264, Cx-III W 164, ACG IL 175, mL 103, W 216; infracapitular bay L 97; genital field L 131, Ac1–3 L 26, 28, 27; chelicera L 145; infracapitulum L 125; palp dL: P-1 23, P-2 49, P-3 49, P-4 70, P-5 26; legs segments: I-L-1 dL 38, I-L-2 dL 74, I-L-3 dL 67, I-L-4 dL 107,



**Fig. 4.** *Atractides (Atractides) smiti* Zhang, Li & Guo sp. nov., holotype, ♂ (GUGC, Slide No. QH-HY-2020071706). **A.** Idiosoma, dorsal view. **B.** Idiosoma, ventral view. **C.** Gnathosoma. **D.** Chelicera. **E.** Palp. **F.** Ejaculatory complex. Scale bars = 100  $\mu$ m.



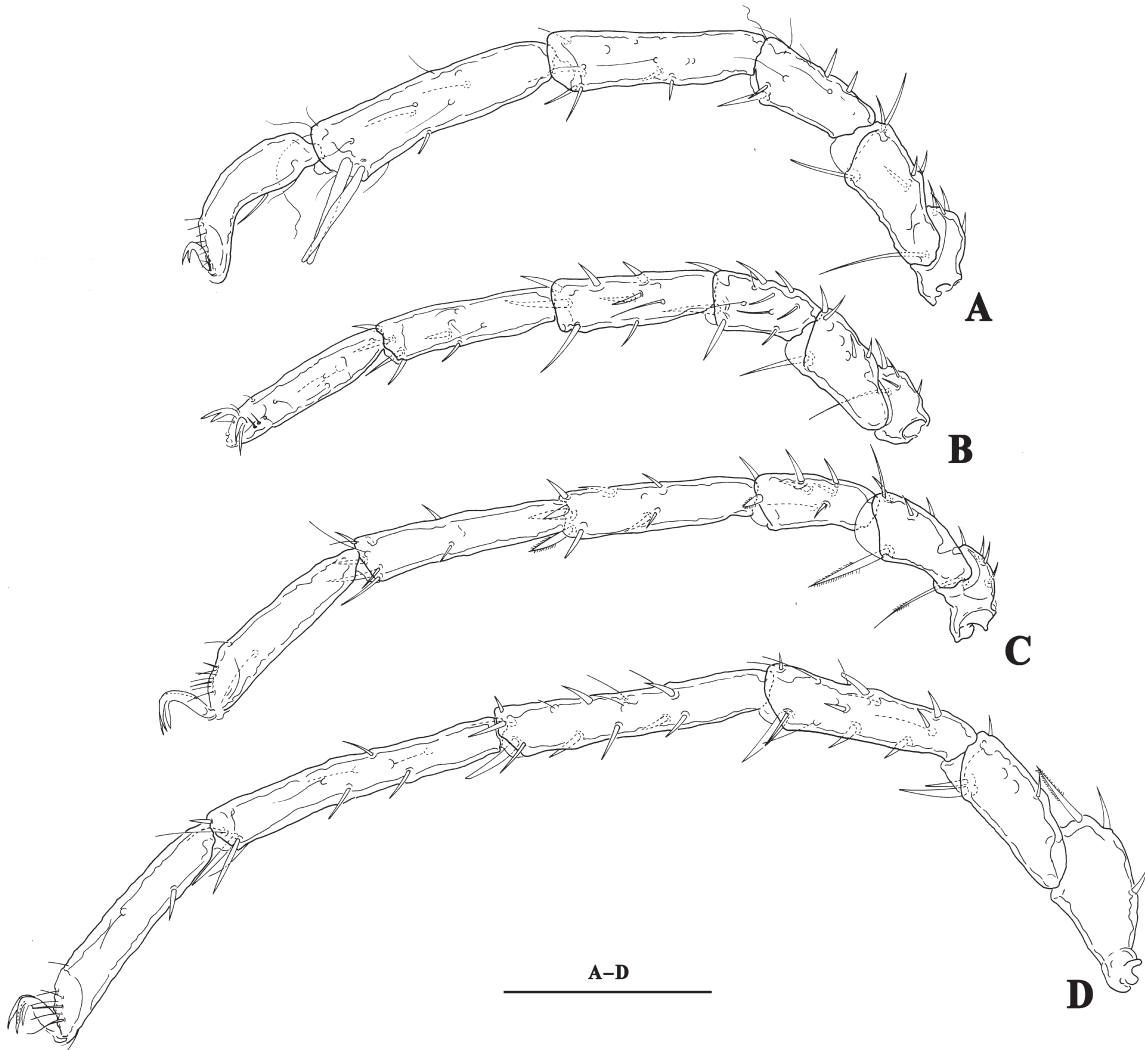
I-L-5 dL 122, HB 37, I-L-6 dL 72, HB 19, S-1 L 54, S-2 L 60; dL: II-L-1 32, II-L-2 61, II-L-3 57, II-L-4 82, II-L-5 85, II-L-6 91; dL: III-L-1 36, III-L-2 64, III-L-3 61, III-L-4 95, III-L-5 106, III-L-6 103; dL: IV-L-1 70, IV-L-2 83, IV-L-3 107, IV-L-4 138, IV-L-5 148, IV-L-6 129.

**Female**

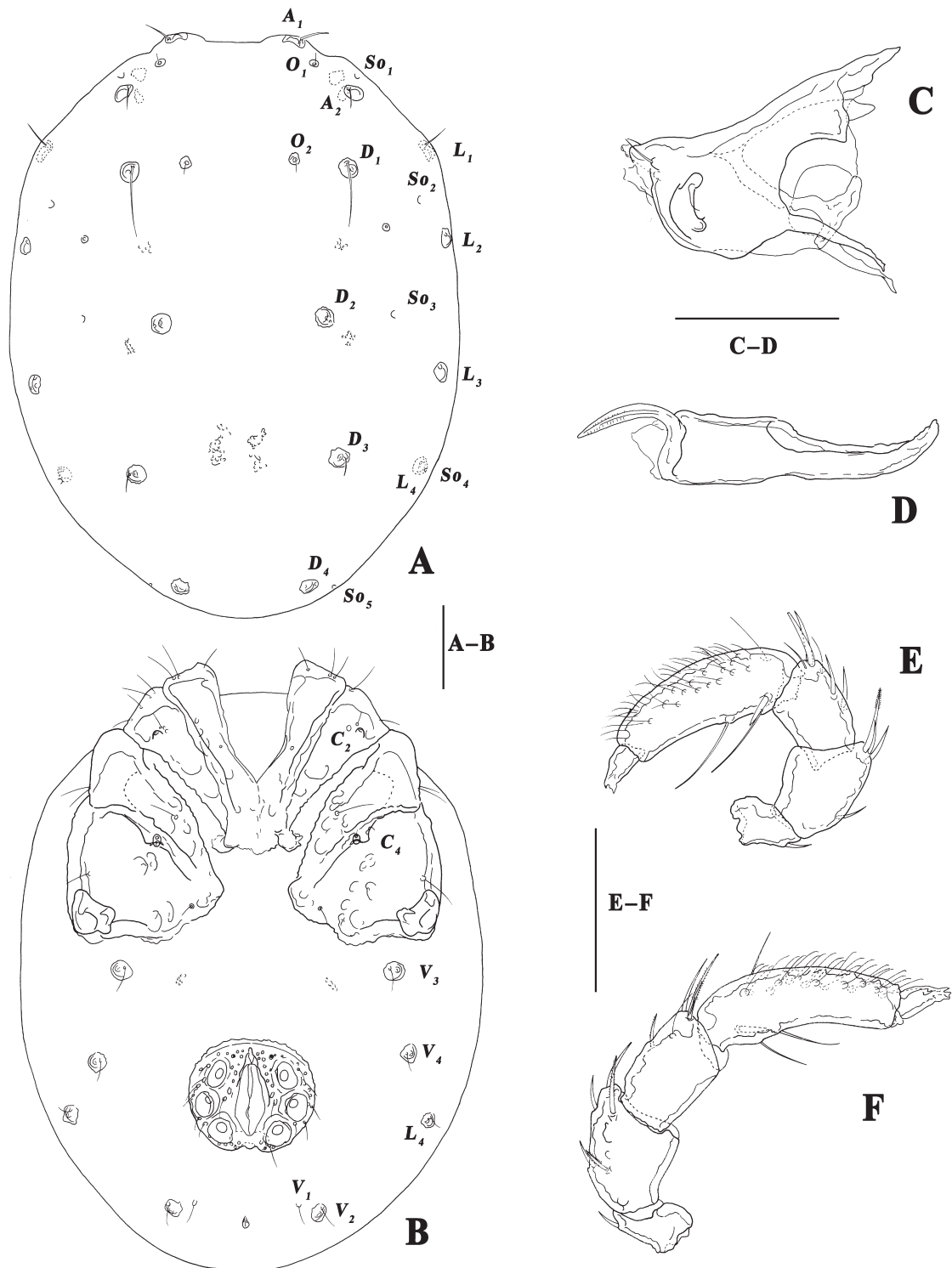
Unknown.

**Remarks**

The new species *Atractides (Atractides) smiti* sp. nov. is similar to *Atractides protendens* K.O. Viets, 1955 in the following points: (1) P-2 and P-3 ventral margins slightly straight; (2) S-1 and S-2 with a narrow setal interspace between them; (3) the anterior part of Ap with a projection; (4) apodemes of ACG reaching to Cx-III. However, *A. (A.) smiti* differs from *A. protendens* in the following aspects: (1)  $V_1$  fused to  $V_2$  in *A. (A.) smiti*, but not fused in *A. protendens*; (2) excretory pore surrounded by sclerotized ring in *A. (A.) smiti*, but smooth in *A. protendens*; (3) the I-L-6 of *A. (A.) smiti* more curved than that of *A. protendens* (Gerecke 2003).



**Fig. 5.** *Atractides (Atractides) smiti* Zhang, Li & Guo sp. nov., holotype, ♂ (GUGC, Slide No. QH-HY-2020071706). A–D. I-L–IV-L. Scale bar = 100  $\mu$ m.



**Fig. 6.** *Atractides (Atractides) menyuanensis* Zhang, Li & Guo sp. nov. A–E. Holotype, ♂ (GUGC, Slide No. QH-HY-2020072901). F. Paratype, ♀ (GUGC, Slide No. QH-HY-2020072902). A. Idiosoma, dorsal view. B. Idiosoma, ventral view. C. Gnathosoma. D. Chelicera. E. Palp. F. Palp. Scale bars = 100 µm.

*Atractides (Atractides) menyuanensis* Zhang, Li & Guo sp. nov.  
urn:lsid:zoobank.org:act:C836E7CF-0A50-4334-AA1D-DDE500DDBCF8  
Figs 6–8

### Diagnosis

Dorsal muscle attachment unsclerotized. I-L-5 longish, S-1 close to S-2. I-L-6 curved. Ac in an obtuse triangle;  $V_1$  separated from  $V_2$ . P-2 ventral margin slightly convex; P-3 ventral margin nearly straight; two long hairs on the ventral surface of P-4 near the base, sword seta near the base. Ac in a weakly curved line in female.

### Etymology

The new species is named after the name of Menyuan Hui Autonomous County where the specimens were collected.

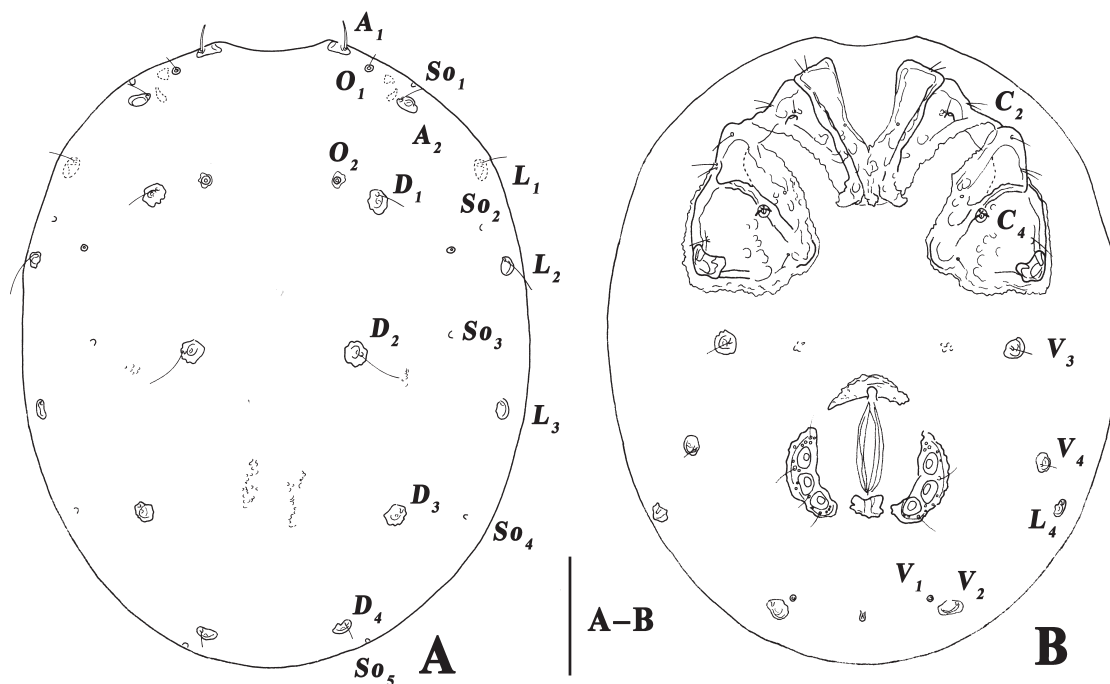
### Type material

#### Holotype

CHINA • ♂; Qinghai Province, Haibei Tibetan Autonomous Prefecture, Menyuan Hui Autonomous County; 37°31'31" N, 101°21'09" E; 2427 m a.s.l.; 29 Jul. 2020; Hai-Tao Li leg.; running water; GUGC, Slide No. QH-HY-2020072901.

#### Paratypes

CHINA • 5 ♀♀; same collection data as for holotype; GUGC, Slides No. QH-HY-2020072902 to 2020072906.

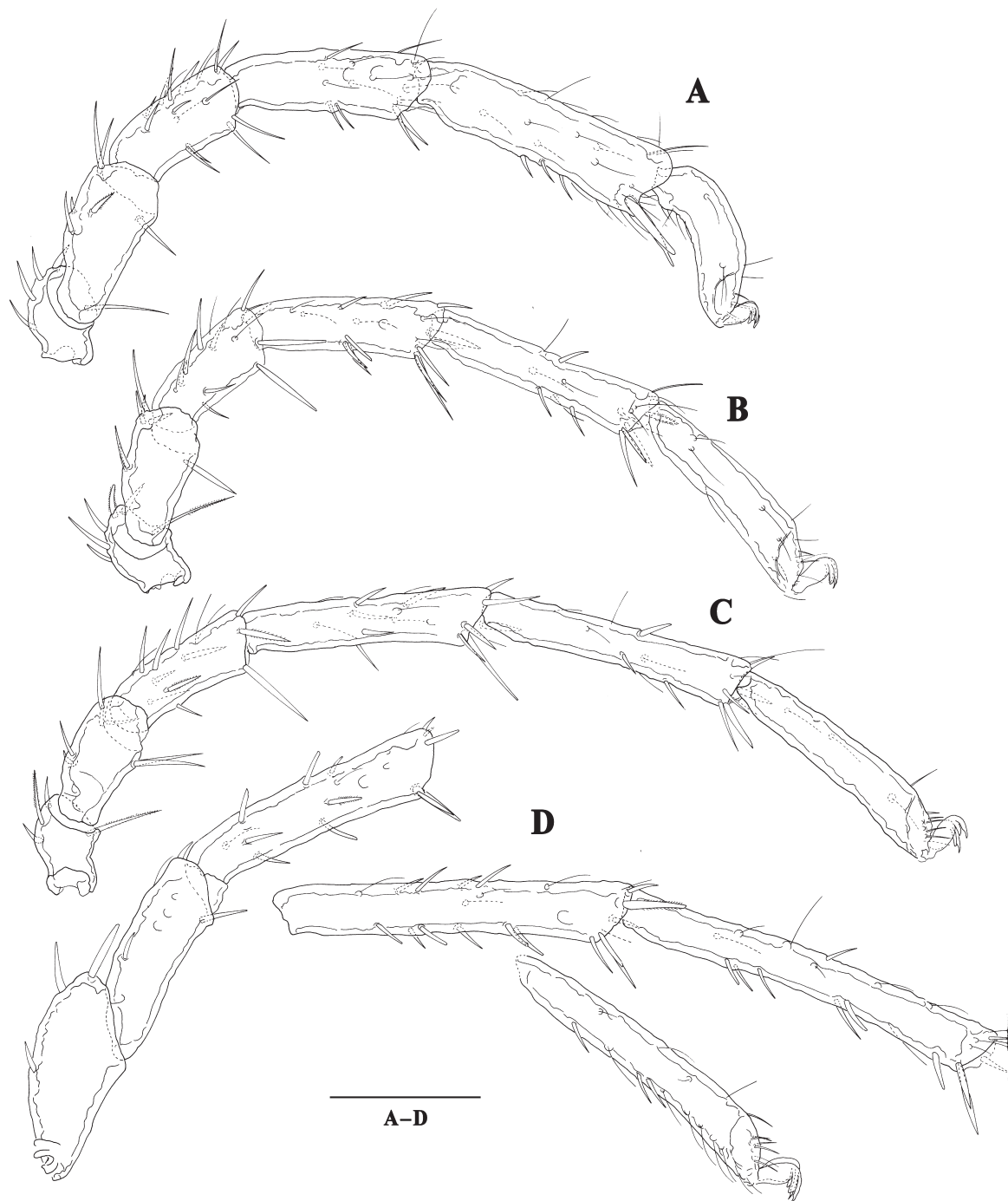


**Fig. 7.** *Atractides (Atractides) menyuanensis* Zhang, Li & Guo sp. nov., paratype, ♀ (GUGC, Slide No. QH-HY-2020072902). **A.** Idiosoma, dorsal view. **B.** Idiosoma, ventral view. Scale bars = 100  $\mu$ m.

## Description

### Male (n = 1)

Idiosoma oval, dorsal muscle attachment unsclerotized; all slit organs visible,  $So_1$  near the eye capsule,  $So_2$  near  $L_2$ ,  $So_3$  at the level of  $D_2$ ,  $So_4$  at the level of  $D_3$ ,  $So_5$  on the outside of  $D_4$  (Fig. 6A). ACG fused together and with a suture, PCG separated; apodemes from ACG not reaching to PCG; Ac in an obtuse



**Fig. 8.** *Atractides (Atractides) menyuanensis* Zhang, Li & Guo sp. nov., holotype, ♂ (GUGC, Slide No. QH-HY-2020072901). **A–D.** I–L–IV–L. Scale bar = 100  $\mu$ m.

triangle;  $V_1$  separated from  $V_2$ ;  $V_3$  and  $V_4$  forming a trapezoid,  $V_4$  at the same level as the anterior of acetabular plate (Fig. 6B). Palp five-segmented; P-2 ventral margin slightly convex; P-3 ventral margin nearly straight; P-4 with numerous dorsal hairs, two long hairs on the ventral surface of P-4 near the base, sword seta near the base (Fig. 6E). I-L-5 longish, S-1 close to S-2; I-L-6 curved (Fig. 8A).

#### Female (n = 5)

Similar to male (Figs 6F, 7). Idiosoma oval; ACG and PCG significantly smaller than the male; Ac in a weakly curved line (Fig. 7B).

#### Measurements

##### Male (n = 1)

Idiosoma L 708, W 582; coxal field L 352, Cx-III W 415, ACG IL 232, mL 92, W 323; infracapitular bay L 146; genital field L 141, Ac1-3 L 35, 35, 38; chelicera L 223; infracapitulum L 210; palp dL: P-1 37, P-2 70, P-3 63, P-4 122, P-5 31; legs segments: I-L-1 dL 57, I-L-2 dL 106, I-L-3 dL 101, I-L-4 dL 139, I-L-5 dL 182, HB 50, I-L-6 dL 102, HB 32, S-1 L 58, S-2 L 58; dL: II-L-1 57, II-L-2 95, II-L-3 93, II-L-4 135, II-L-5 158, II-L-6 157; dL: III-L-1 55, III-L-2 102, III-L-3 114, III-L-4 165, III-L-5 191, III-L-6 180; dL: IV-L-1 118, IV-L-2 138, IV-L-3 181, IV-L-4 240, IV-L-5 272, IV-L-6 217.

##### Female (n = 5)

Idiosoma L 1074 (1050–1113), W 935 (868–935); coxal field L 385 (385–432), Cx-III W 575 (550–585), ACG IL 248 (248–299), mL 111 (111–130), W 373 (373–417); infracapitular bay L 130 (105–163); gonopore L 168 (161–190), Ap L 157 (145–171), Ac1-3 L 38 (34–48), 39 (39–49), 37 (32–48); chelicera L 264 (253–283); infracapitulum L 215 (214–244); palp dL: P-1 46 (40–46), P-2 75 (75–86), P-3 66 (66–80), P-4 126 (121–145), P-5 37 (36–37); legs segments: I-L-1 dL 62 (62–77), I-L-2 dL 106 (106–136), I-L-3 dL 107 (107–126), I-L-4 dL 153 (151–176), I-L-5 dL 200 (200–233), HB 53 (53–59), I-L-6 dL 120 (120–132), HB 31 (31–36), S-1 L 63 (62–68), S-2 L 63 (62–69); dL: II-L-1 61 (61–72), II-L-2 93 (93–109), II-L-3 109 (98–124), II-L-4 144 (142–163), II-L-5 168 (168–204), II-L-6 170 (170–191); dL: III-L-1 67 (65–84), III-L-2 102 (102–116), III-L-3 119 (115–137), III-L-4 178 (178–203), III-L-5 208 (206–233), III-L-6 200 (190–212); dL: IV-L-1 149 (129–149), IV-L-2 159 (156–179), IV-L-3 202 (191–234), IV-L-4 261 (252–294), IV-L-5 286 (276–321), IV-L-6 232 (223–255).

#### Remarks

The new species *Atractides (Atractides) menyuanensis* sp. nov. is similar to *Atractides algeriensis* Lundblad, 1942 in the following points: (1) apodemes from ACG not reaching to Cx-IV; (2) P-2 ventral margin slightly convex, P-3 ventral margin nearly straight; (3) Ac in a weakly curved line in female. However, *A. (A.) menyuanensis* differs from *A. algeriensis* in following aspects: (1) two long hairs on the ventral surface of P-4 near the base, sword seta near the base in *A. (A.) menyuanensis*, but the ventral surface of P-4 divided by two long ventral hairs in 1:1:1, sword seta at the middle of P-4 in *A. algeriensis*; (2) S-1 much more close to S-2 in *A. (A.) menyuanensis* than in *A. algeriensis*; (3) I-L-6 of *A. algeriensis* much longer and more slender than that of *A. (A.) menyuanensis* (Gerecke 2003).

*Atractides (Atractides) longiprojectus* Zhang, Li & Guo sp. nov.

urn:lsid:zoobank.org:act:A043146A-40FB-45E2-888A-3613E5A14165

Figs 9–10

#### Diagnosis

Dorsal muscle attachment unsclerotized, setae of  $D_1$  and  $D_2$  significantly longer than others, setae of  $D_1$  nearly reaching to  $D_2$ , setae of  $D_2$  extending beyond  $D_3$ . I-L-5 longish, S-1 and S-2 with a narrow setal interspace between them, S-1 longer than S-2. I-L-6 straight. Ac in a weakly curved line;  $V_1$  separated

from  $V_2$ , P-2 with an unobvious ventral projection; P-3 ventral margin slightly convex; the ventral edge of P-4 divided by two long hairs in 2:1:2, sword seta at two thirds of P-4.

### Etymology

The Latin prefix ‘*longi-*’ means long, ACG of the female of this new species is with a particularly long hind projection.

### Type material

#### Holotype

CHINA • ♀; Qinghai Province, Haibei Tibetan Autonomous Prefecture, Menyuan Hui Autonomous County, Quankou Town; 37°31'31" N, 101°81'12" E; 2691 m a.s.l.; 29 Jul. 2020; Hai-Tao Li leg.; running water; GUGC, Slide No. QH-HY-2020072907.

#### Paratypes

CHINA • 2 ♀♀; same collection data as for holotype; GUGC, Slides No. QH-HY-2020072908, 2020072909.

### Description

#### Female (n = 3)

Idiosoma oval, dorsal muscle attachment unsclerotized;  $O_2$  and  $D_1$  at the same level; setae of  $D_1$  and  $D_2$  significantly longer than others, setae of  $D_1$  nearly reaching to  $D_2$ , setae of  $D_2$  extending beyond  $D_3$ ; all slit organs visible,  $So_1$  near the eye capsule,  $So_2$  at the same level as  $D_1$ ,  $So_3$  near  $D_2$ ,  $So_4$  in front of  $L_p$ ,  $So_5$  behind of  $D_4$  (Fig. 9A). Coxal group occupying a half of ventral surface, projections from ACG extending to Cx-IV; Ac in a weakly curved line;  $V_1$  separated from  $V_2$ ;  $V_3$  and  $V_4$  forming a rectangle,  $V_4$  at the same level as the anterior of acetabular plate (Fig. 9B). Palp five-segmented; P-2 with an unobvious ventral projection; P-3 ventral margin slightly convex; P-4 with numerous dorsal hairs, the ventral edge of P-4 divided by two long hairs in 2:1:2, sword seta at two thirds of P-4 (Fig. 9E). I-L-5 longish, S-1 and S-2 with a narrow setal interspace, S-1 longer than S-2. I-L-6 straight (Fig. 10A).

### Measurements

#### Female (n = 3)

Idiosoma L 530 (530–663), W 419 (419–547); coxal field L 320 (320–361), Cx-III W 353 (353–406), ACG IL 244 (244–295), mL 126 (126–163), W 297 (296–336); infracapitular bay L 143 (133–151); gonopore L 98 (98–118), Ap L 120 (118–128), Ac1–3 L 35 (35–41), 39 (39–45), 30 (30–38); chelicera L 251 (251–275); infracapitulum L 227 (226–239); palp dL: P-1 35 (32–35), P-2 68 (68–79), P-3 75 (75–82), P-4 106 (106–110), P-5 27 (27–31); legs segments: I-L-1 dL 45 (45–53), I-L-2 dL 103 (100–113), I-L-3 dL 103 (96–112), I-L-4 dL 153 (152–163), I-L-5 dL 166 (166–180), HB 37 (37–39), I-L-6 dL 134 (134–144), HB 34 (34–37), S-1 L 57 (57–72), S-2 L 47 (46–54); dL: II-L-1 53 (53–56), II-L-2 96 (89–104), II-L-3 96 (92–102), II-L-4 130 (130–141), II-L-5 140 (140–153), II-L-6 141 (140–152); dL: III-L-1 53 (51–59), III-L-2 87 (79–106), III-L-3 101 (101–115), III-L-4 154 (153–168), III-L-5 178 (170–189), III-L-6 163 (160–178); dL: IV-L-1 108 (108–120), IV-L-2 141 (135–141), IV-L-3 182 (178–195), IV-L-4 219 (219–239), IV-L-5 246 (234–255), IV-L-6 204 (197–218).

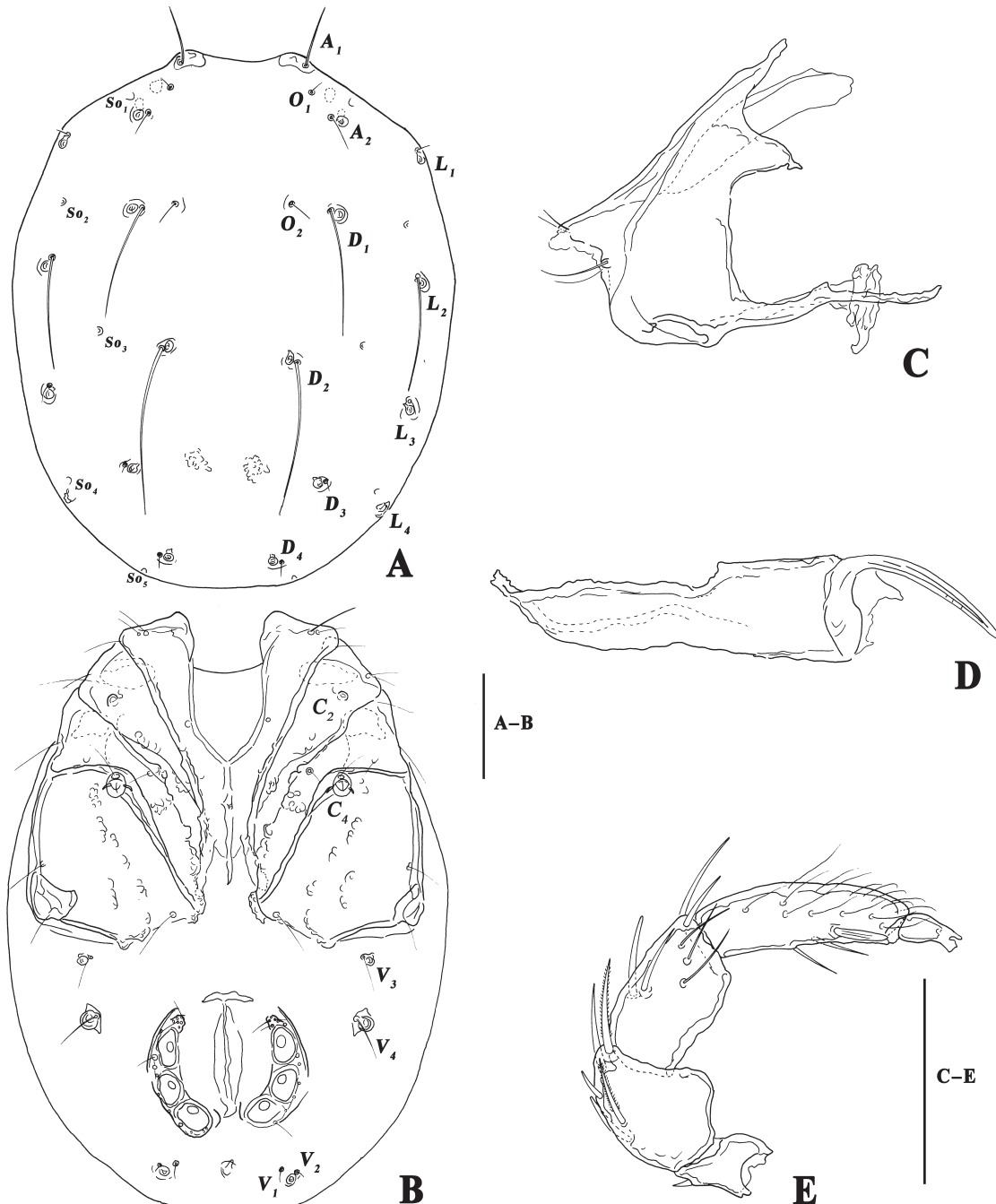
#### Male

Unknown.

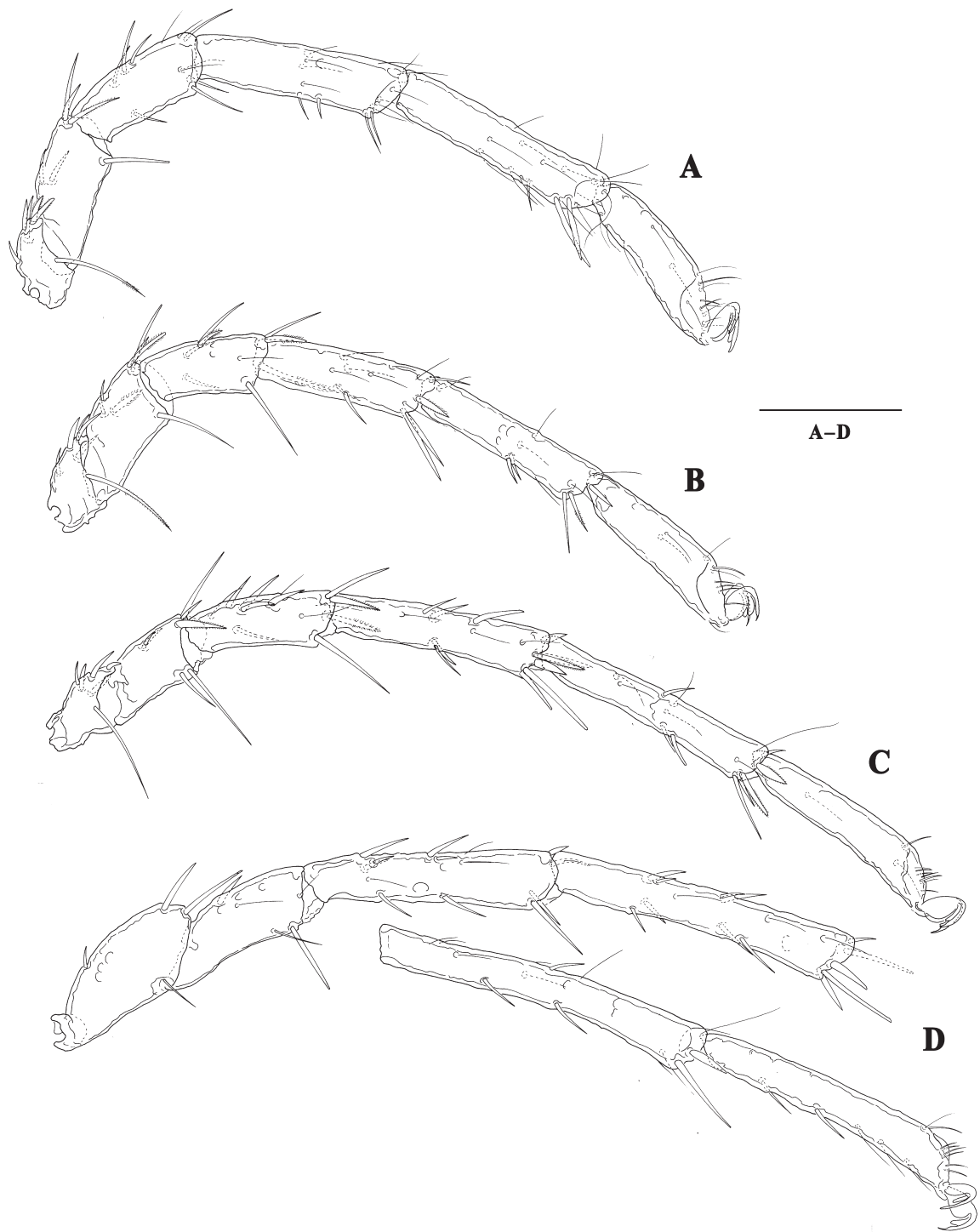
### Remarks

The new species *Atractides (Atractides) longiprojectus* sp. nov. is similar to *Atractides inflatipalpis* K. Viets, 1950 in the following points: (1)  $V_1$  separated from  $V_2$ ; (2) S-1 longer than S-2; (3) P-2

with an unobvious ventral projection. However, *A. (A.) longiprojectus* differs from *A. inflatipalpis* in the following aspects: (1) P-3 ventral margin slightly convex in *A. (A.) longiprojectus*, but straight in *A. inflatipalpis*; (2) I-L-6 straight in *A. (A.) longiprojectus*, but curved in *A. inflatipalpis*; (3) the pregenital sclerite of *A. inflatipalpis* in female much bigger than *A. (A.) longiprojectus* (Gerecke 2003).



**Fig. 9.** *Atractides (Atractides) longiprojectus* Zhang, Li & Guo sp. nov., holotype, ♀ (GUGC, Slide No. QH-HY-2020072907). **A.** Idiosoma, dorsal view. **B.** Idiosoma, ventral view. **C.** Gnathosoma. **D.** Chelicera. **E.** Palp. Scale bars = 100 µm.



**Fig. 10.** *Atractides (Atractides) longiprojectus* Zhang, Li & Guo sp. nov., holotype, ♀ (GUGC, Slide No. QH-HY-2020072907). **A–D.** I-L–IV-L. Scale bar = 100  $\mu$ m.



*Atractides (Atractides) xianmiensis* Zhang, Li & Guo sp. nov.  
urn:lsid:zoobank.org:act:FB29B7EB-1A14-450E-80E2-4795C3B299EA

Figs 11–13

## Diagnosis

### Male

Dorsal muscle attachment unsclerotized. I-L-5 longish, S-1 and S-2 both with blunt tips and with a setal interspace between them; I-L-6 straight. Ac in an obtuse triangle;  $V_1$  separated from  $V_2$ . P-2 and P-3 with a ventral projection respectively, P-4 with numerous dorsal hairs, ventral hairs long, one at the middle of the surface, and the other one at the terminal of lateral edge, sword seta at the middle of P-4.

### Female

Ac in a weakly curved line. P-2 with a ventral projection, P-3 ventral margin slightly convex, P-4 divided by two ventral hairs in sectors 1:1:1.

## Etymology

The new species is named after the name of the Xianmi National Nature Reserve where the specimens were collected.

## Type material

### Holotype

CHINA • ♂; Qinghai Province, Xianmi National Nature Reserve; 37°10'56" N, 102°20'03" E; 2949 m a.s.l.; 29 Jul. 2020; Hai-Tao Li leg.; running water; GUGC, Slide No. QH-HY-2020072910.

### Paratypes

CHINA • 3 ♂♂; same collection data as for holotype; GUGC, Slides No. QH-HY-2020072911 to 2020072913 • 2 ♀♀; same collection data as for holotype; GUGC, Slides No. QH-HY-2020072914, 2020072915.

## Description

### Male (n = 4)

Idiosoma oval, dorsal muscle attachment unsclerotized;  $So_1$  near eye capsule;  $So_2$  at the same level as  $D_1$ ;  $So_3$  at the same level as  $D_2$ ;  $So_4$  in front of  $L_4$ ;  $So_5$  behind  $D_4$  (Fig. 11A). ACG fused together and with a suture, apodemes of ACG well developed, and reaching to Cx-III; Ac in an obtuse triangle, Ac3 biggest;  $V_1$  separated far from  $V_2$ ,  $V_3$  and  $V_4$  forming a rectangle,  $V_4$  at the same level as the anterior part of acetabular plate (Fig. 11B). Palp five-segmented; P-2 and P-3 with a ventral projection respectively, P-4 with numerous dorsal hairs, ventral hairs long, one at the middle of the surface, and the other one at the terminal of lateral edge, sword seta at the middle of P-4 (Fig. 11E). I-L-5 longish, S-1 and S-2 with blunt tips and with a setal interspace between them; I-L-6 straight (Fig. 13A).

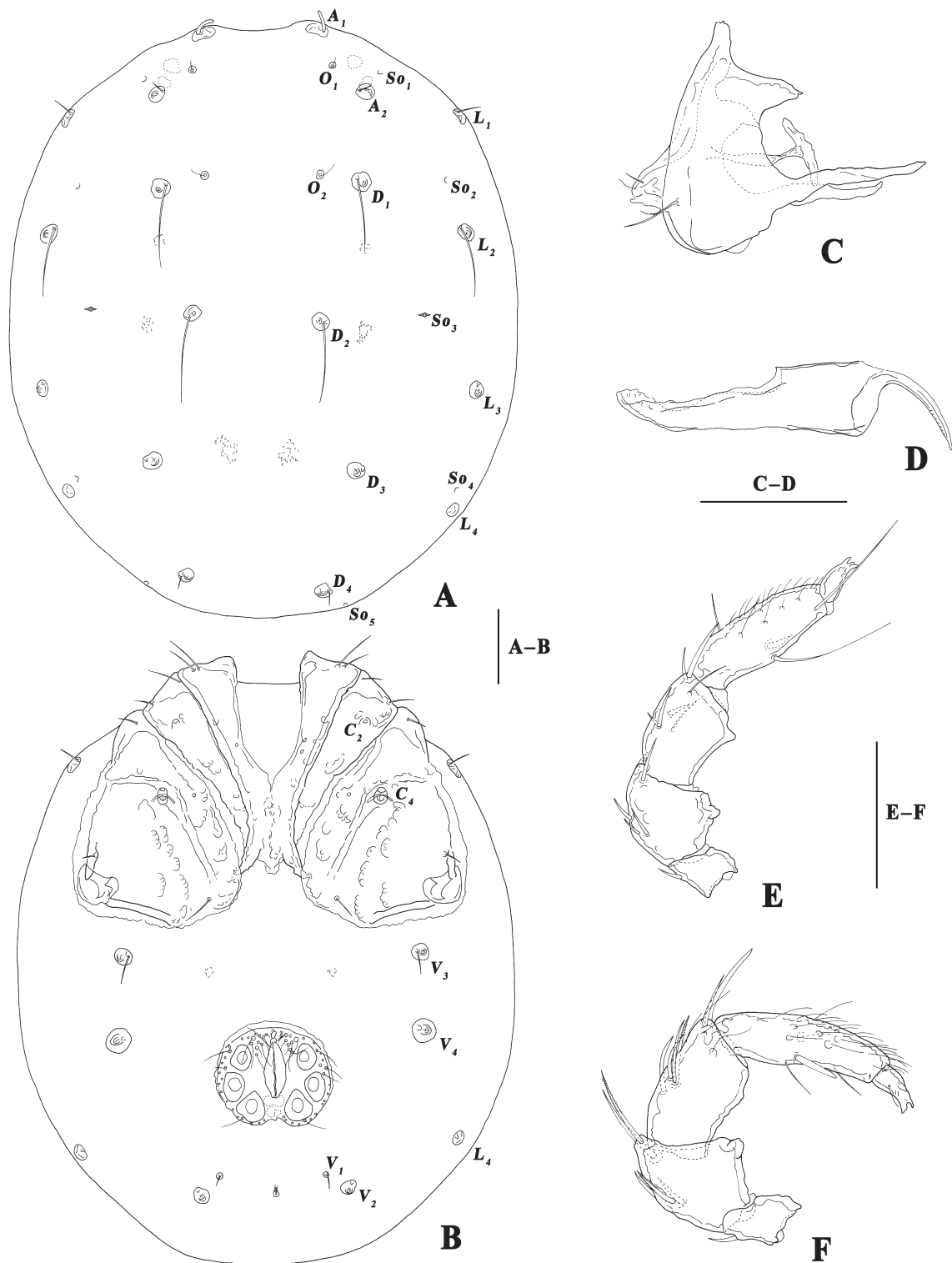
### Female (n = 2)

Similar to male (Fig. 12). Ac in a weakly curved line (Fig. 12B). P-2 with a ventral projection, P-3 ventral margin slightly convex, P-4 divided by two ventral hairs in sectors 1:1:1 (Fig. 11F).

## Measurements

### Male (n = 4)

Idiosoma L 724 (724–896), W 605 (605–734); coxal field L 351 (351–395), Cx-III W 426 (426–483), ACG IL 251 (251–287), mL 131 (131–159), W 329 (329–372); infracapitular bay L 132 (132–160); genital field L 131 (131–144), Ac1–3 L 39 (36–41), 32 (32–43), 36 (36–46); chelicera L 227 (227–267); infracapitulum L 207 (207–239); palp dL: P-1 30 (30–37), P-2 69 (69–80), P-3 76 (76–89), P-4 107



**Fig. 11.** *Atractides (Atractides) xianmiensis* Zhang, Li & Guo sp. nov. A–E. Holotype, ♂ (GUGC, Slide No. QH-HY-2020072910). F. Paratype, ♀ (GUGC, Slide No. QH-HY-2020072914). A. Idiosoma, dorsal view. B. Idiosoma, ventral view. C. Gnathosoma. D. Chelicera. E. Palp. F. Palp. Scale bars = 100  $\mu$ m.

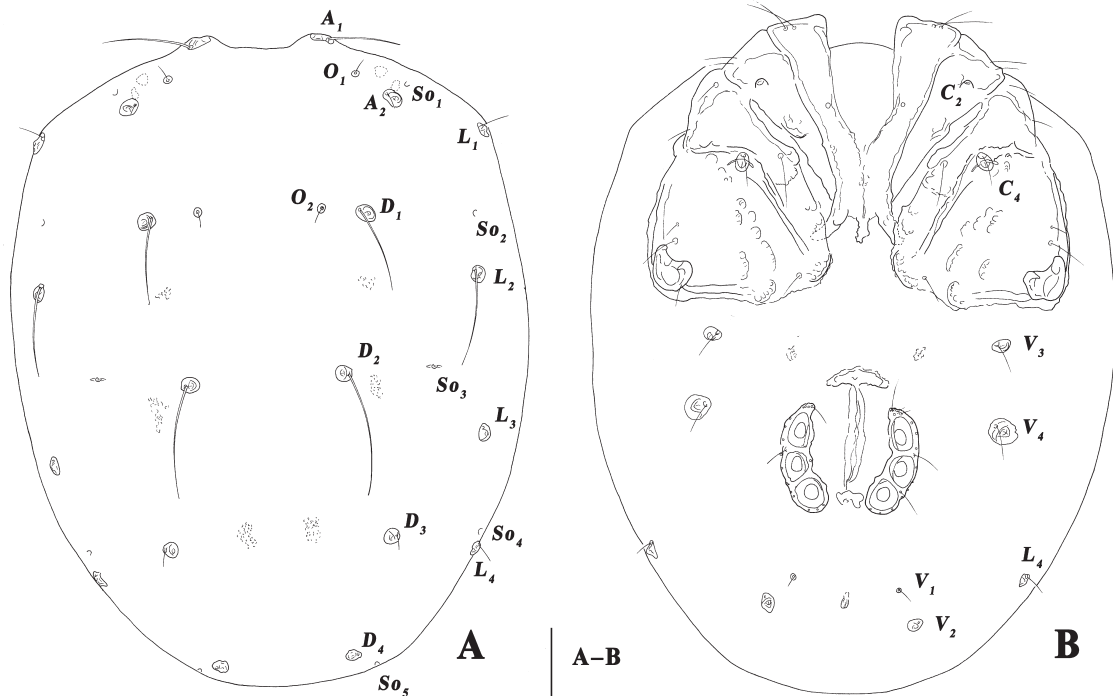
(107–121), P-5 34 (33–34); Legs segments: I-L-1 dL 47 (47–56), I-L-2 dL 107 (107–126), I-L-3 dL 110 (110–125), I-L-4 dL 165 (165–191), I-L-5 dL 188 (188–214), HB 42 (42–46), I-L-6 dL 145 (145–160), HB 34 (32–34), S-1 L 67 (67–73), S-2 L 58 (58–65); dL: II-L-1 55 (47–59), II-L-2 94 (94–108), II-L-3 100 (100–113), II-L-4 141 (141–162), II-L-5 161 (161–184), II-L-6 154 (154–174); dL: III-L-1 54 (51–63), III-L-2 93 (93–112), III-L-3 109 (109–124), III-L-4 166 (166–191), III-L-5 194 (194–226), III-L-6 178 (178–200); dL: IV-L-1 131 (129–137), IV-L-2 154 (154–161), IV-L-3 187 (187–211), IV-L-4 240 (240–274), IV-L-5 260 (260–303), IV-L-6 224 (224–246).

**Female (n = 2)**

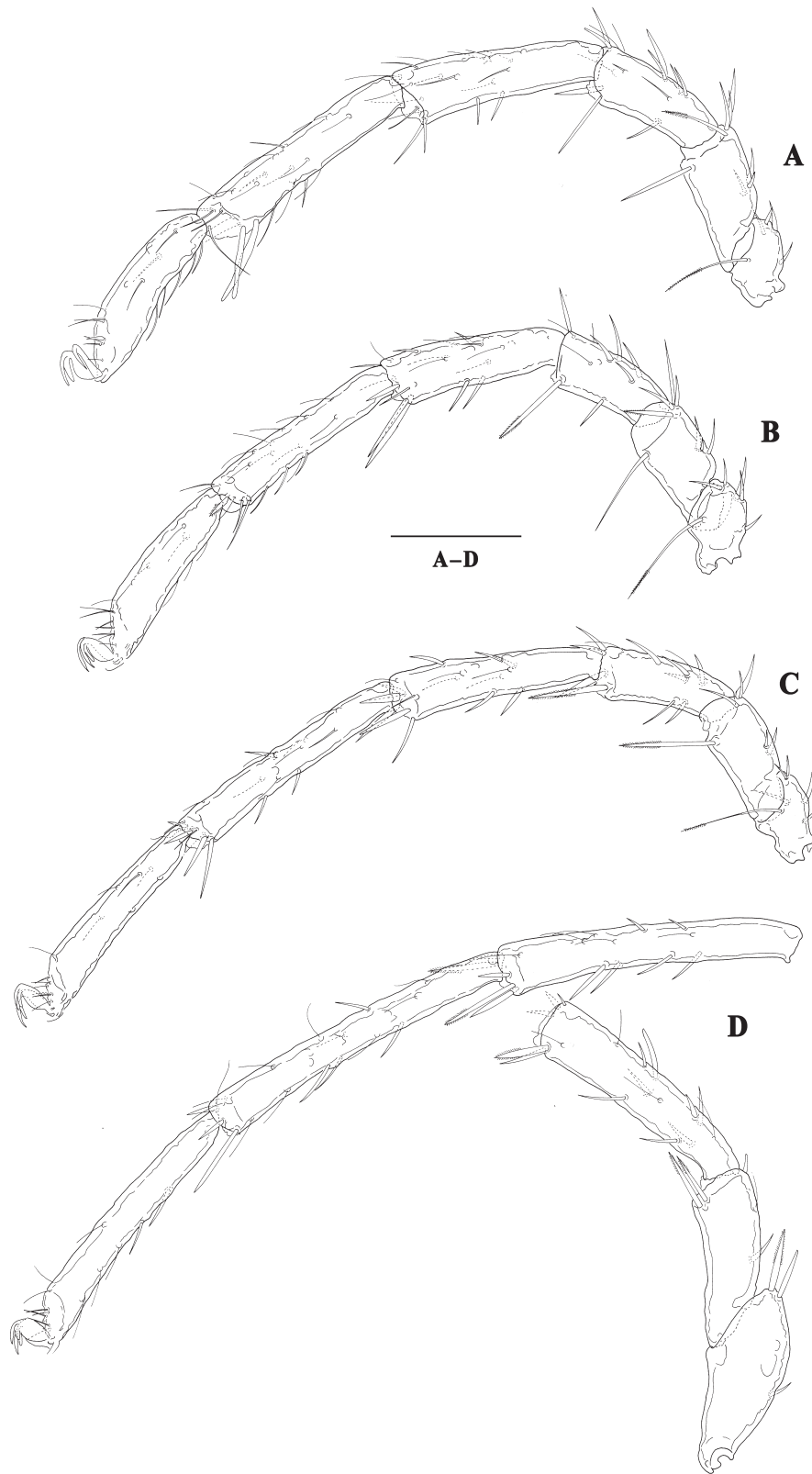
Idiosoma L 925 (1215), W 754 (1042); coxal field L 403 (422), Cx-III W 515 (576), ACG IL 303 (323), mL 133 (131), W 405 (403); infracapitular bay L 180 (179); gonopore L 145 (190), Ap L 156 (156), Ac1–3 L 49 (48), 43 (45), 43 (46); chelicera L 291 (297); infracapitulum L 269 (268); palp dL: P-1 36 (46), P-2 84 (88), P-3 97 (103), P-4 124 (123), P-5 36 (39); legs segments: I-L-1 dL 59 (64), I-L-2 dL 122 (136), I-L-3 dL 131 (141), I-L-4 dL 193 (205), I-L-5 dL 220 (227), HB 47 (47), I-L-6 dL 165 (173), HB 39 (35), S-1 L 87 (78), S-2 L 74 (72); dL: II-L-1 64 (50), II-L-2 108 (106), II-L-3 121 (133), II-L-4 166 (180), II-L-5 188 (200), II-L-6 175 (186); dL: III-L-1 54 (68), III-L-2 114 (112), III-L-3 131 (142), III-L-4 198 (212), III-L-5 233 (241), III-L-6 208 (215); dL: IV-L-1 150 (160), IV-L-2 162 (174), IV-L-3 211 (228), IV-L-4 270 (293), IV-L-5 246 (314), IV-L-6 211 (265).

**Remarks**

The new species *Atractides (Atractides) xianmiensis* sp. nov. is similar to *Atractides inflatus* Walter, 1925 in the following points: (1) P-2 and P-3 of the male both with a ventral projection respectively; (2)  $V_1$  not fused to  $V_2$ ; (3) S-1 and S-2 both with blunt tips and with a setal interspace between them; (4) Ac in an obtuse triangle in the male and in a weakly curved line in the female. However, *A. (A.) xianmiensis*



**Fig. 12.** *Atractides (Atractides) xianmiensis* Zhang, Li & Guo sp. nov., paratype, ♀ (GUGC, Slide No. QH-HY-2020072914). **A.** Idiosoma, dorsal view. **B.** Idiosoma, ventral view. Scale bar = 100 µm.



**Fig. 13.** *Atractides (Atractides) xianmiensis* Zhang, Li & Guo sp. nov., holotype, ♂ (GUGC, Slide No. QH-HY-2020072910). **A–D.** I–L–IV–L. Scale bar = 100  $\mu$ m.

differs from *A. inflatus* in the following aspects: (1) apodemes of ACG in female well developed and reaching to Cx-III in *A. (A.) xianmiensis*, but not reaching to Cx-III in *A. inflatus*; (2) I-L-6 straight in *A. (A.) xianmiensis*, but curved in *A. inflatus* (Gerecke 2003).

## Discussion

Due to the soft body wall and few specialized structures, there are only a few taxonomic features that can be used for species identification in *Atractides*, which might cause confusion in the taxonomy of these species. So it is of great importance to search for new taxonomic features in *Atractides*. Jin (1997) mentioned that the relative position of glandularia is different in various groups of water mites, and Ramírez-Sánchez *et al.* (2016) also mentioned that glandularia in Arrenuridae Thor, 1900 could be potential taxonomic characters. So the relative position of glandularia may be among the new taxonomic features that can be used in the taxonomy of *Atractides*. For example, the coxae group and palps of *Atractides (Atractides) biprojectus* sp. nov. and *Atractides (Atractides) xianmiensis* sp. nov. are similar in morphology, but the relative position of  $V_3$  in relation to  $V_4$  and  $V_4$  in relation to the genital field in *A. (A.) biprojectus* is significantly different from that in *A. (A.) xianmiensis*. Therefore, it is suggested to mention the relative position of glandularia on the body wall when describing and drawing species of *Atractides*.

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