

A comprehensive morphological descriptions of three marine water mites (Acari: Hydrachnidia: Pontarachnidae) from Hainan Island, China

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Original research

ABSTRACT

This paper provides redescriptions of three pontarachnid species collected from the marine littoral of Hainan Island, China, *i.e.* *Litarachna curtialpis* Smit, 2003, *L. thetis* Pešić & Smit, 2016, and *Pontarachna australis* Smit, 2003. *Litarachna curtialpis* and *L. thetis* are recorded new for the Chinese fauna. Detailed morphological characters, including idiosoma coloration, gnathosomal structure, cheliceral claws, palps, and legs, were examined using optical microscopy and scanning electron microscopy (SEM).

Keywords new records; micrography; morphology; SEM; *Litarachna*; *Pontarachna*

Introduction

The pontarachnid mites are the only family of the true water mites occurring in the marine habitats (Chatterjee *et al.* 2019). A few species are not directly marine, but inhabit nearby estuary or lakes (Cook 1986, 1996; Smit 2007; Pešić 2013). The family Pontarachnidae contains only two genera, *i.e.* *Pontarachna* Philippi, 1840 and *Litarachna* Walter, 1925, with 30 and 24 species respectively (Chatterjee *et al.* 2019; Montes-Ortiz *et al.* 2021).

Many experts use “peculiar” to describe this group because the presence of so-called “wheel-like acetabula” (Cook 1996; Smit and Alberti 2010; Chatterjee *et al.* 2019). Cook (1996) was aware of the significant phylogenetic value of this character. Smit and Alberti (2010) did careful observations with the help of SEM and TEM, and believed that this organ was used for osmoregulation. However, they were uncertain whether the wheel-like acetabula were homologues of the acetabula of freshwater mites. Taxonomists have paid more attention to the description of this character, but some other characters have not been given enough attention, especially the mouth parts. This to some extent limits our understanding of this group.

In China, three species have been reported, *i.e.* *Litarachna hongkongensis* Smit, 2002 (Hong Kong), *Pontarachna formosae* Lohmann, 1909 (Taiwan) and *Pontarachna australis* Smit, 2003 (Taiwan) (Pešić *et al.* 2008; Chatterjee *et al.* 2019; Jin *et al.* 2024). After recent collections from Hainan Island, we obtained three species, *i.e.* *Litarachna curtialpis* Smit, 2003, *Litarachna thetis* Pešić & Smit, 2016 and *Pontarachna australis* Smit, 2003. More detailed characters were observed by camera, optical microscope and SEM, which will be discussed in this paper.

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Material and methods

The collection and preservation of water mites and preparation of slides followed Gu *et al.* (2021). Micrographs of living watermite were taken by a Canon EOS R8 digital camera with a Mitutoyo Plan NIR 10 lens, a Godox MF12 flash was used as the light source. Helicon Focus (vers. 8.1.0) was used for image stacking. All optical microscope images, examinations and measurements (given in μm) were made with a Nikon Ni-E (with Nikon DS-Ri2 camera). The measurements method of idiosoma, genital field, excretory pore, gnathosoma, chelicera, palp and legs followed Li *et al.* (2024). The treatments of SEM (scanning electron microscope) referred to Li *et al.* (2022). All images were modified and grouped into plates in Adobe Photoshop CS6.

The terminology and abbreviations used were updated from Jin (1997): a.s.l. = above sea level, A_1 = preantennal glandularia, A_2 = postantennal glandularia, Ae = anterior extension, C_2 and C_4 = coxoglandularia 2 and 4, Cx-I-IV = coxae I-IV, El_1 = the first pair of eye lenses, El_2 = the second pair of eye lenses, D_1 - D_4 = dorsoglandularia 1-4, I-L-1-6, *etc.* = the first-sixth segment of the first leg, *etc.*, L = length, L_1 - L_4 = lateroglandularia 1-4, Ma = medial apodeme, O_1 = preocularia, O_2 = postocularia, P-1-5 = the first-fifth segments of the palp (from most proximal to most distal), So_1 - So_5 = slit organs 1-5, V_1 - V_4 = ventroglandularia 1-4, W = width, Wa = wheel-like acetabula.

The material is deposited in the Institute of Entomology, Guizhou University, Guiyang, P. R. China (GUGC).

Systematics

Family Pontarachnidae Koenike, 1910

Genus *Litarachna* Walter, 1925

Litarachna curtipalpis Smit, 2003 (Figs 1-10, 24A-B)

Material examined

4♂, 4♀, Lingshui Li Autonomous County, Hainan Province, P. R. China (18.41°N, 110.06°E, 2.8 m a.s.l.) (Fig. 1A), leg. Hai-Tao Li & Lu-Ping Zhao, 17-II-2025, Slides No. HN-PO-2025021701-2025021708.

Habitat

Coastal tidal flats, depth of water 0.5m, with a large amount of organic detritus at the bottom. (Fig. 1B-D).

Diagnosis

Coxal field pink; first coxal plates separated medially; suture lines of Cx-II/III, and Cx-III/IV incomplete; a pair of lateral platelets with three pores posterior to the gonopore; a pair of wheel-like acetabula posteriorly to the genital field; P-2 having a large protrusion without seta on the ventral margin; two long fine setae near a stout seta at the middle of the ventral margin of P-4.

Male — Genital field with a sclerotized ring with a long anterior extension, and numerous (approximately 100) perigenital setae surrounding this ring.

Female — Pregenital sclerite arrow-shaped; postgenital sclerite lunate; an extra pair of wheel-like acetabula located posterior to the genital field.

Description

Living specimen: oval body color usually brownish-red (Fig. 2A, E-F), occasionally red (Fig. 2C-D), eye pigment obvious, coxal field pink (Fig. 2B).

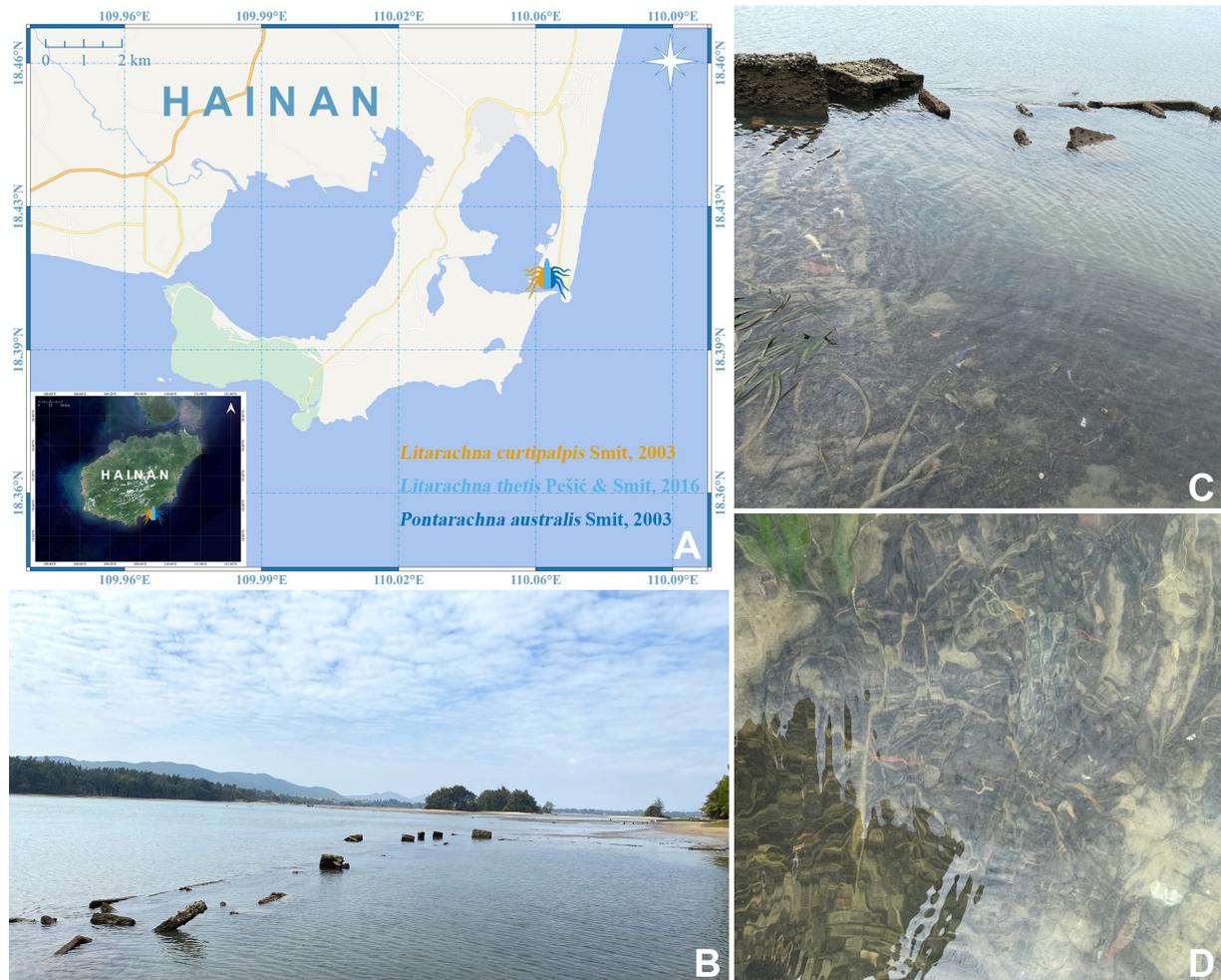


Figure 1 Locality and habitat of three pontarachnid mites, littoral of Lingshui Li Autonomous County, Hainan Province, P. R. China (18.41°N, 110.06°E, 2.8 m a.s.l.).

Male (n=4) — In dorsal view: A_1 not visible; two pairs of $E1$ rounded (Fig. 3D), lying beneath the integument; idiosoma without sclerites (Fig. 3A). In ventral view: Cx-I separated medially; suture lines of Cx-II/III, and Cx-III/IV incomplete; medial apodeme of Cx-IV longer than lateral apodeme, C_4 in the middle between the apodemes; rounded V_3 much larger than other glandularia, without accompanying seta (Fig. 4C); genital field with a sclerotized ring bearing 4–5 pairs of setae and with a long anterior extension (Fig. 4A); numerous perigenital setae surrounded the genital field (Fig. 3E); a pair of lateral platelets with three pores posterior to the gonopore; a pair of wheel-like acetabula posteriorly of the genital field (Fig. 3B, E).

Gnathosoma not fused with ACG with a short rostrum bearing two pairs of setae, apodeme located inside the idiosoma and appearing trapezoid in ventral view (Fig. 3F–G). Chelicera consisting of two segments (Fig. 3I); cheliceral claw having a narrow groove with fence-like structure, and dense minute seta-like projections in medial view (Fig. 5B); many teeth ventrally in lateral view (Fig. 5C). Palp five-segmented (Fig. 6A, E); P-1 with one dorsal seta; P-2 with 4–5 dorsal setae, and a large protrusion without seta ventrally (Fig. 6B, F); dorsal P-3 with a fine seta terminally; two long fine setae near a stout seta at the middle of the ventral margin of P-4, and a fine anteroventral seta (Fig. 6C, G); stout P-5 bearing six setae in total, with two stout claws, and two seta-like claws (Fig. 6D, H).

All legs simple, without modifications; claws well-developed and trifid, some nicks on the

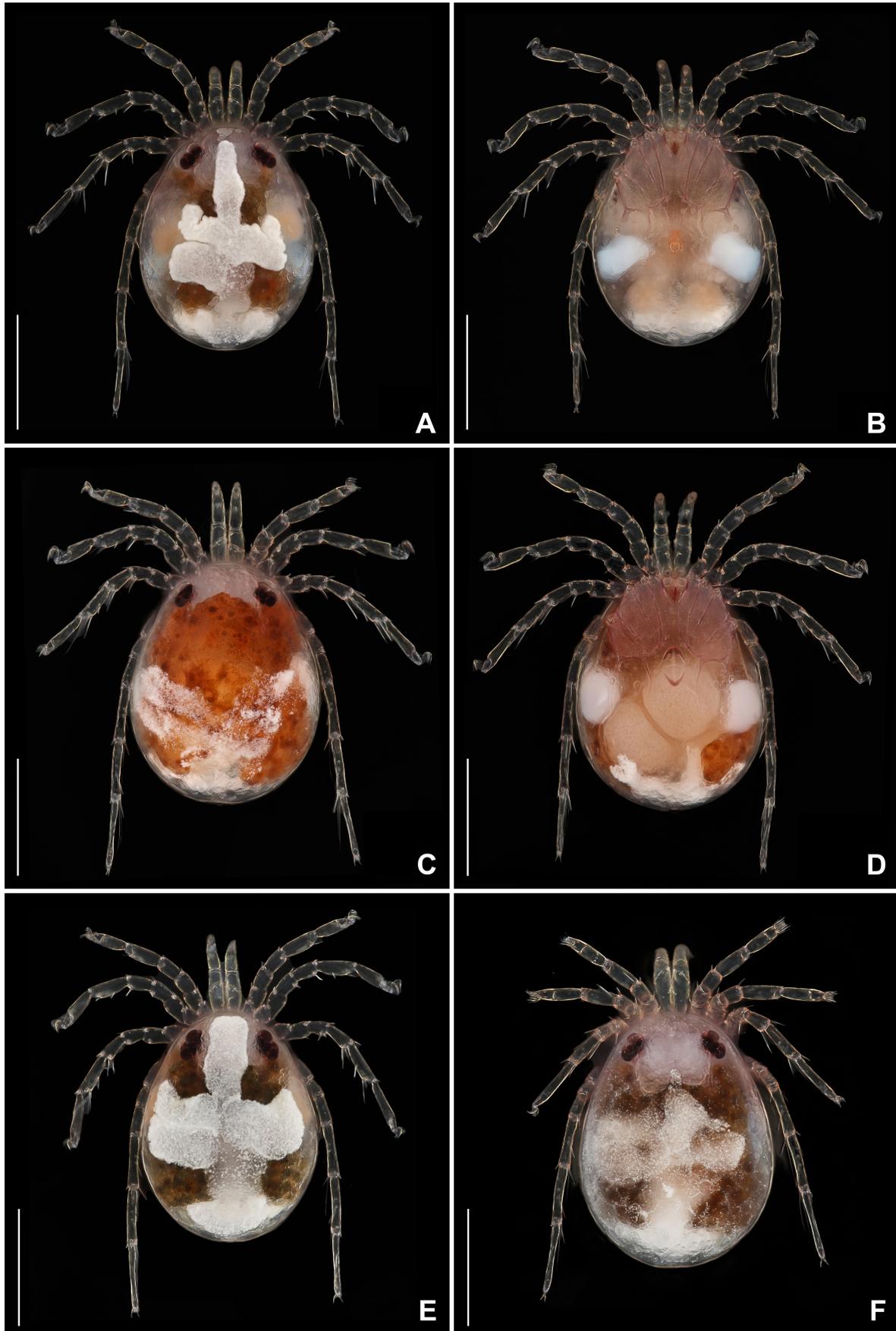


Figure 2 Micrographs of *Litarachna curtispalis* Smit, 2003 habitus: (A) ♂ dorsal view; (B) ♂ ventral view; (C) ♀ dorsal view; (D) ♀ ventral view; (E) ♂ dorsal view; (F) ♀ dorsal view. Scale bars = 200 µm.

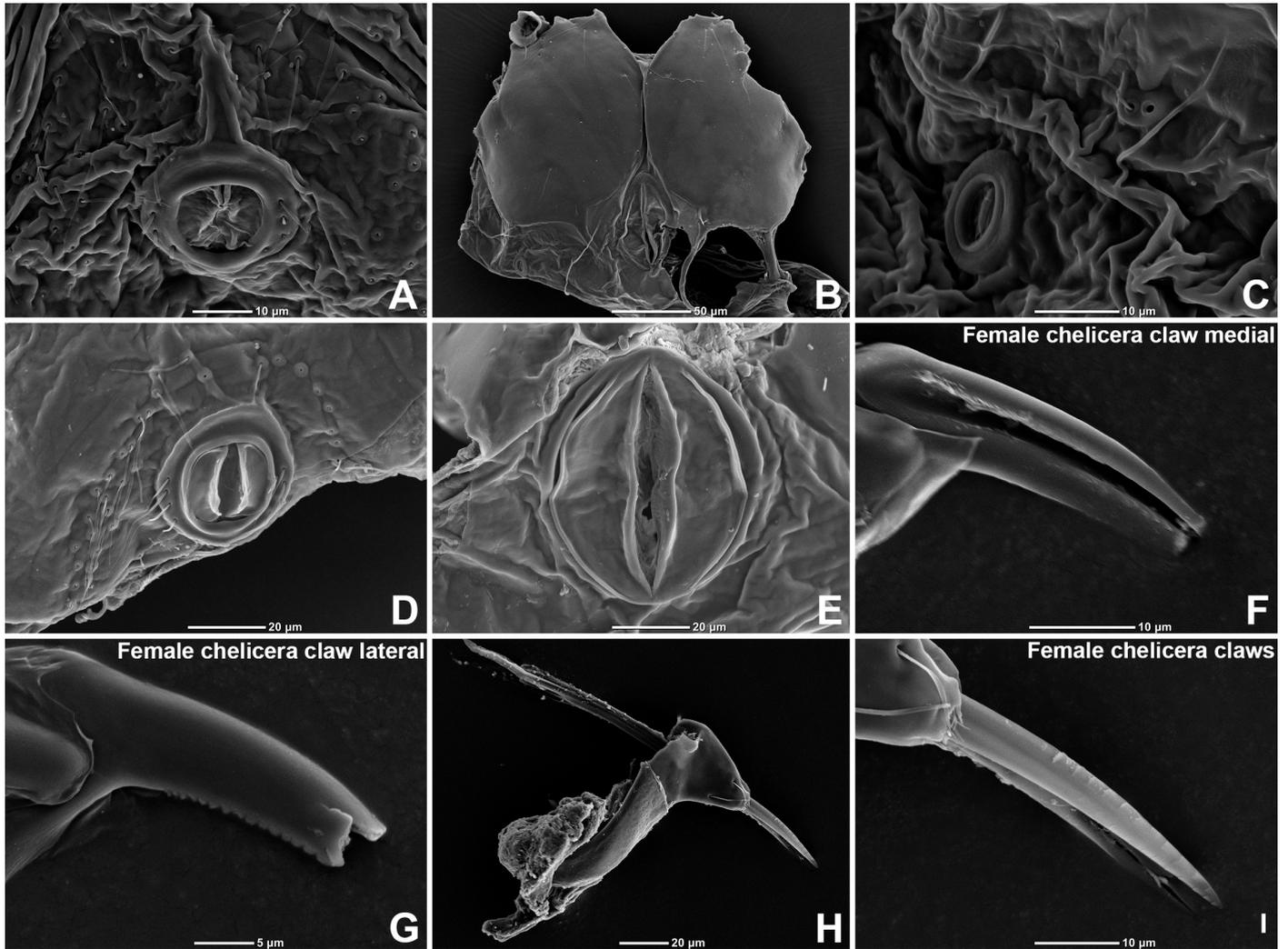


Figure 4 *Litarachna curtipalpis* A–C, *Litarachna thetis* D–G, *Pontarachna australis* H–I, SEM photographs: (A) ♂ genital field; (B) ♀ coxal groups; (C) ♀ V_3 ; (D) ♂ genital field; (E) ♀ genital field; (F) ♀ medial chelicera claw; (G) ♀ lateral chelicera claw; (H) ♀ gnathosoma + cheliceral claws; (I) ♀ terminal of cheliceral claws.

dorsal surface (Figs 5I; 7C, I; 8D). I–II–L with terminal “swimming setae” of the fourth and fifth segments (Fig. 7A–B, G–H); III–IV–L–4–5 with one and two terminal swimming setae, respectively (Figs 5G–H, 8).

Female (n=4) — In most aspects similar to male (Figs 9, 10). Sexual dimorphism exhibited in the following characters. Genital field situated between Cx–IV, pregenital sclerite arrow-shaped, postgenital sclerite lunate (Fig. 9E). An extra pair of wheel-like acetabula compared to males, located posterior to the genital field (Fig. 9B).

Measurements

Male (n=4) and **Female** (n=4) — See Table 1 for details.

Remarks

The diagnostic characters of the specimens from this study match the description of *L. curtipalpis* (Fig. 24A–B), a species known from Western Australia and Singapore (Smit 2003, 2009). However, this conclusion is only temporary, as the two localities are far apart. In the

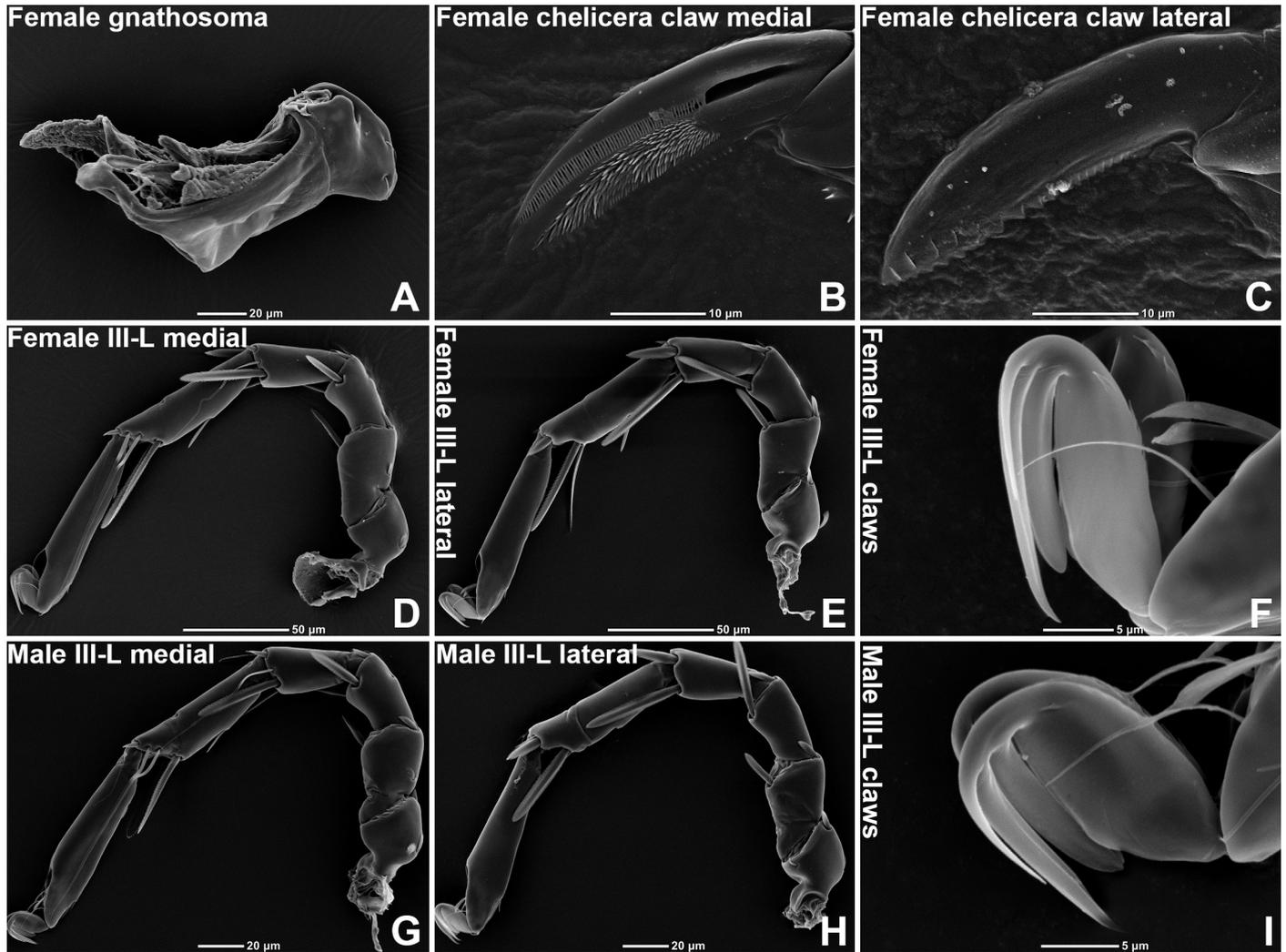


Figure 5 *Litarachna curtipalpis*, (A–F) ♀, (G–I) ♂, SEM photographs, captions as shown in each photos.

future, DNA barcoding based research may provide us with new insights.

***Litarachna thetis* Pešić & Smit, 2016 (Figs 11–19)**

Material examined

1♂, 3♀, Lingshui Li Autonomous County, Hainan Province, P. R. China (18.41°N, 110.06°E, 2.8 m a.s.l.) (Fig. 1A), leg. Hai-Tao Li & Lu-Ping Zhao, 17-II-2025, Slides No. HN-PO-2025021709–2025021712.

Habitat

Same as *Litarachna curtipalpis*.

Diagnosis

Coxal field amber-colored; Cx-I separated medially; suture lines of Cx-II/III incomplete, suture lines of Cx-III/IV complete; V_3 almost at the same level of the two pairs of wheel-like acetabula; P-2 with a shallow anteroventral extension; the two long ventral setae of P-4 not lying at the same level; claws of legs well-developed, usually five-branched, but sometimes 4-

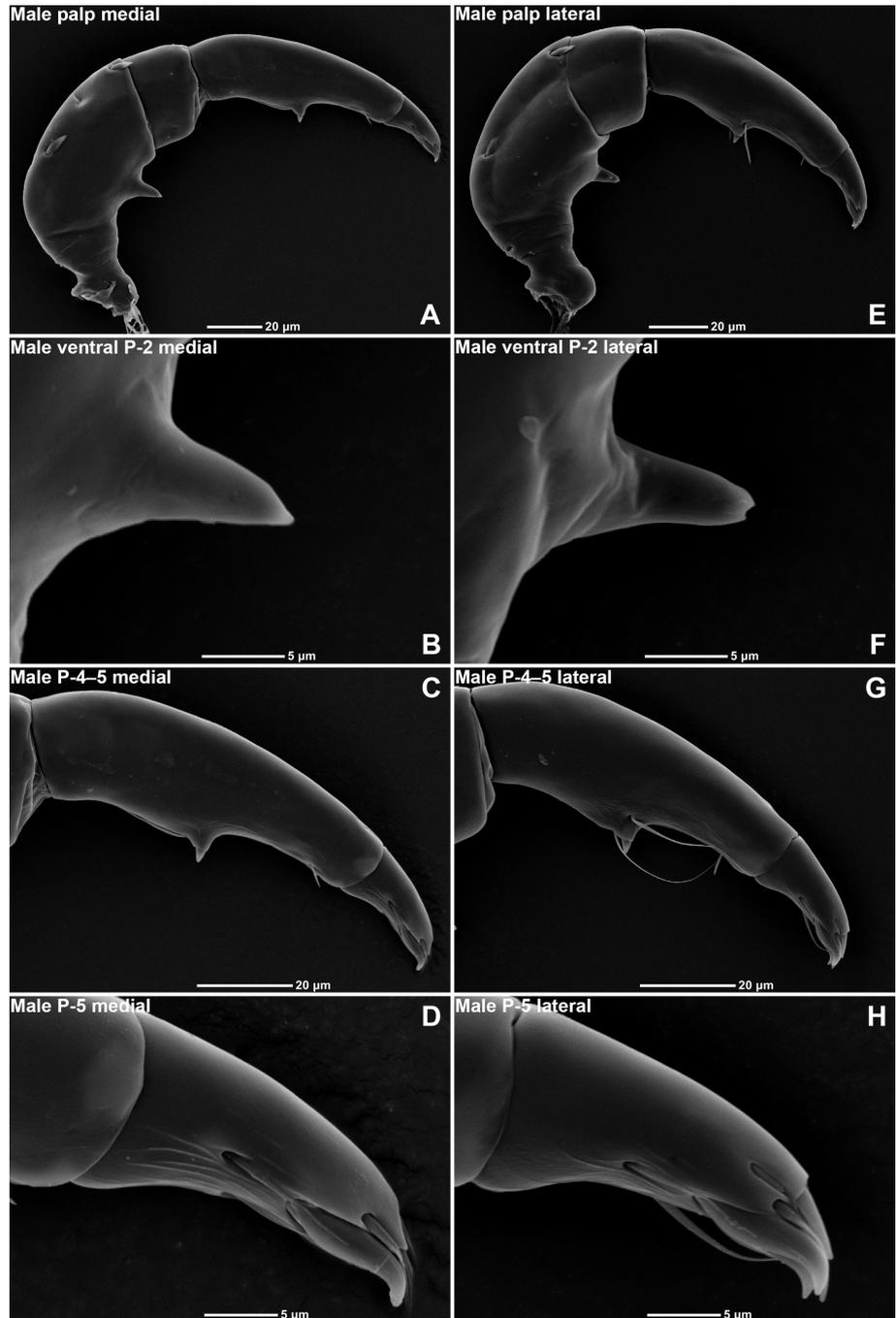


Figure 6 *Litarachna curtispis* ♂, characters of palps, SEM photographs, captions as shown in each photos.

or 6-branched.

Male — Genital field with a sclerotized ring bearing four pairs of setae with an anterior extension, and numerous perigenital setae (approximately 130).

Female — Genital field situated between Cx-IV.

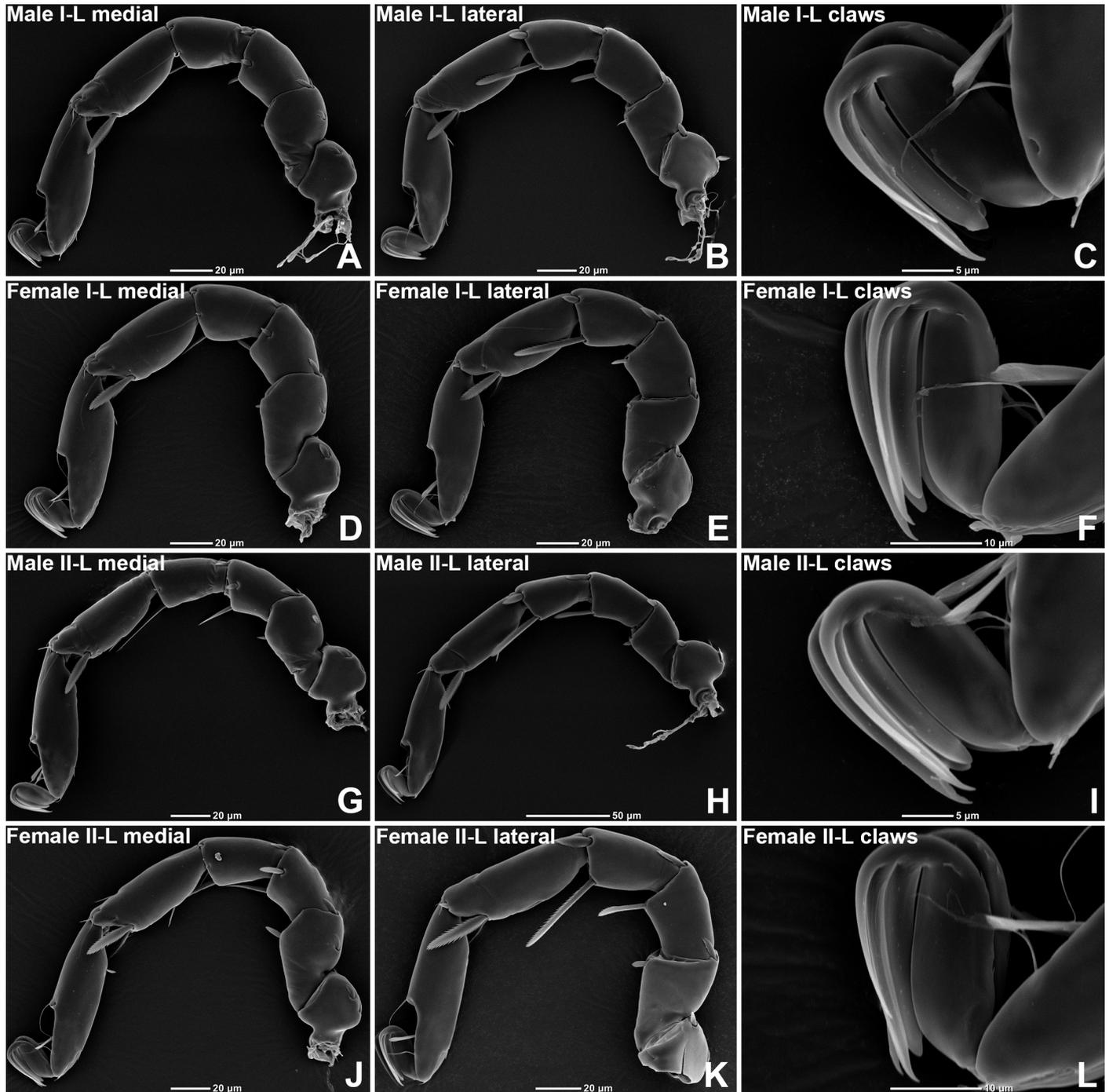


Figure 7 *Litarachna curtipalpis*, characters of I–II-L, (A–C, G–I) ♂, (D–F, J–L) ♀, SEM photographs, captions as shown in each photos.

Description

Living specimen: rounded body color red, eye pigment obvious, coxal field amber-colored (Fig. 11).

Male (n=1) — In dorsal view: A_1 not visible; E_1 larger than E_2 (Fig. 12D), lying beneath the integument; idiosoma without sclerites (Fig. 12A). In ventral view: Cx-I separated medially; suture lines of Cx-II/III incomplete, suture lines of Cx-III/IV complete; medial

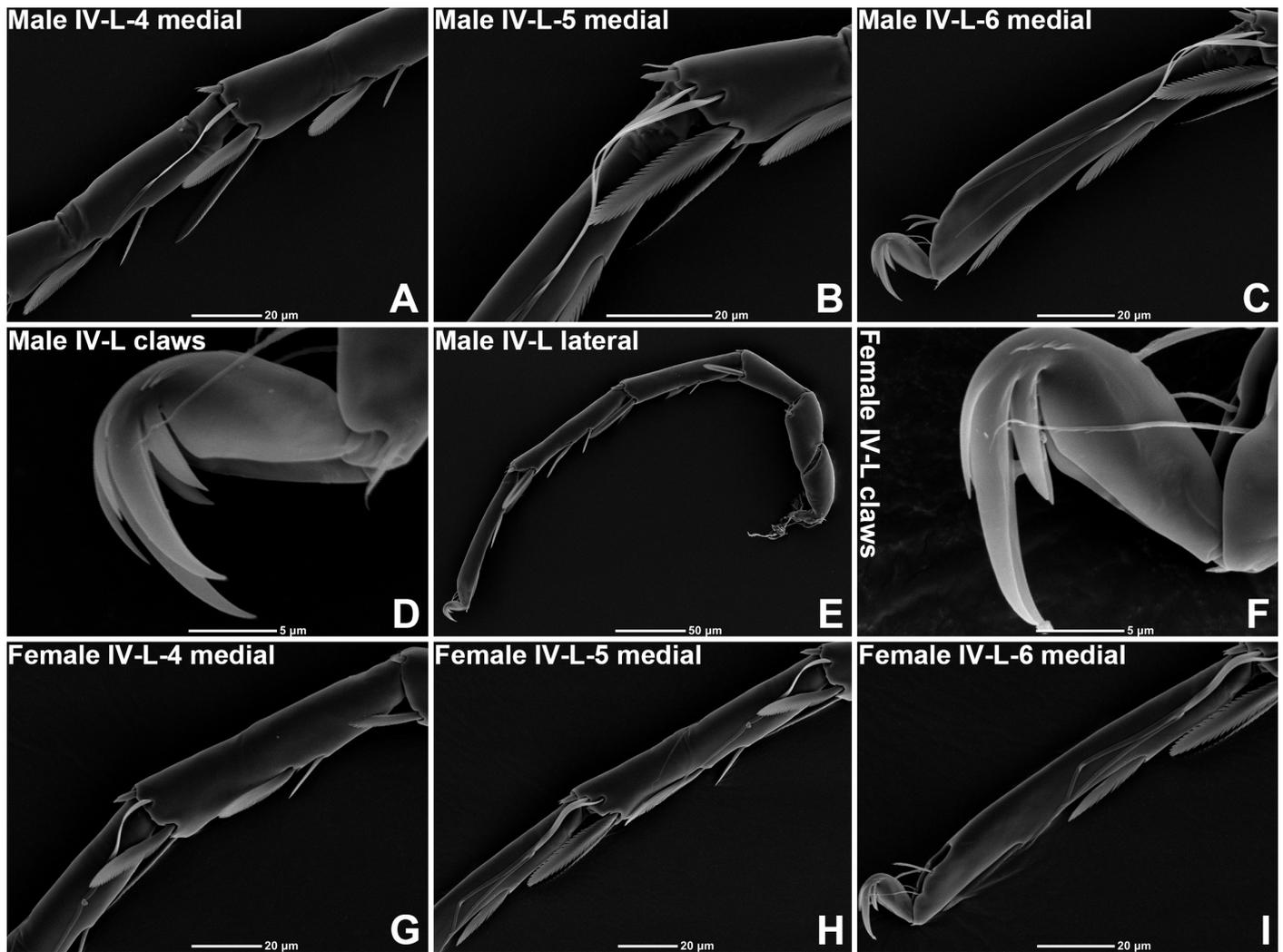


Figure 8 *Litarachna curtipalpis*, characters of IV-L, (A–E) ♂, (F–I) ♀, SEM photographs, captions as shown in each photos.

apodeme of Cx-IV longer than lateral apodeme, C_4 close to the tip of the lateral apodeme; V_3 much larger than other glandularia, almost at the same level of the two pairs of wheel-like acetabula; genital field with a sclerotized ring bearing four pairs of setae with an anterior extension, and numerous perigenital setae (approximately 130) (Figs 4D, 12E); two pairs of wheel-like acetabula posteriorly of the genital field (Fig. 12B).

Gnathosoma not fused with ACG, with a short rostrum and two pairs of setae, apodeme located inside the idiosoma and appearing as a rectangle in the ventral view (see Fig. 18H–I of the female). Chelicera consisting of two segments (Fig. 12G); cheliceral claw having a deep groove, and a few teeth in medial view (see Fig. 4F of the female), and many teeth ventrally (see Fig. 4G of the female). Palp five-segmented (Fig. 12F); P-1 with one dorsal seta (Fig. 13A, E); P-2 with four dorsal setae, and a shallow anteroventral extension (Fig. 13B, F); P-3 dorsally with a fine terminal seta; two long ventral setae of P-4 not lying at the same level, and three dorsal setae located terminally (Fig. 13C, G); P-5 with six setae in total (Fig. 13D, H).

All legs simple, without modifications; claws well-developed, usually five-branched, but sometimes 4- or 6-branched, some nicks on the dorsal surface (Figs 14–16C, F; 17J, K). Only one “swimming setae” (but it’s not sure if it’s strictly speaking a swimming seta, as it’s noticeably thinner than the swimming setae of III–IV-L) on I-L-5 and II-L-5 (Figs 14–15A, D);

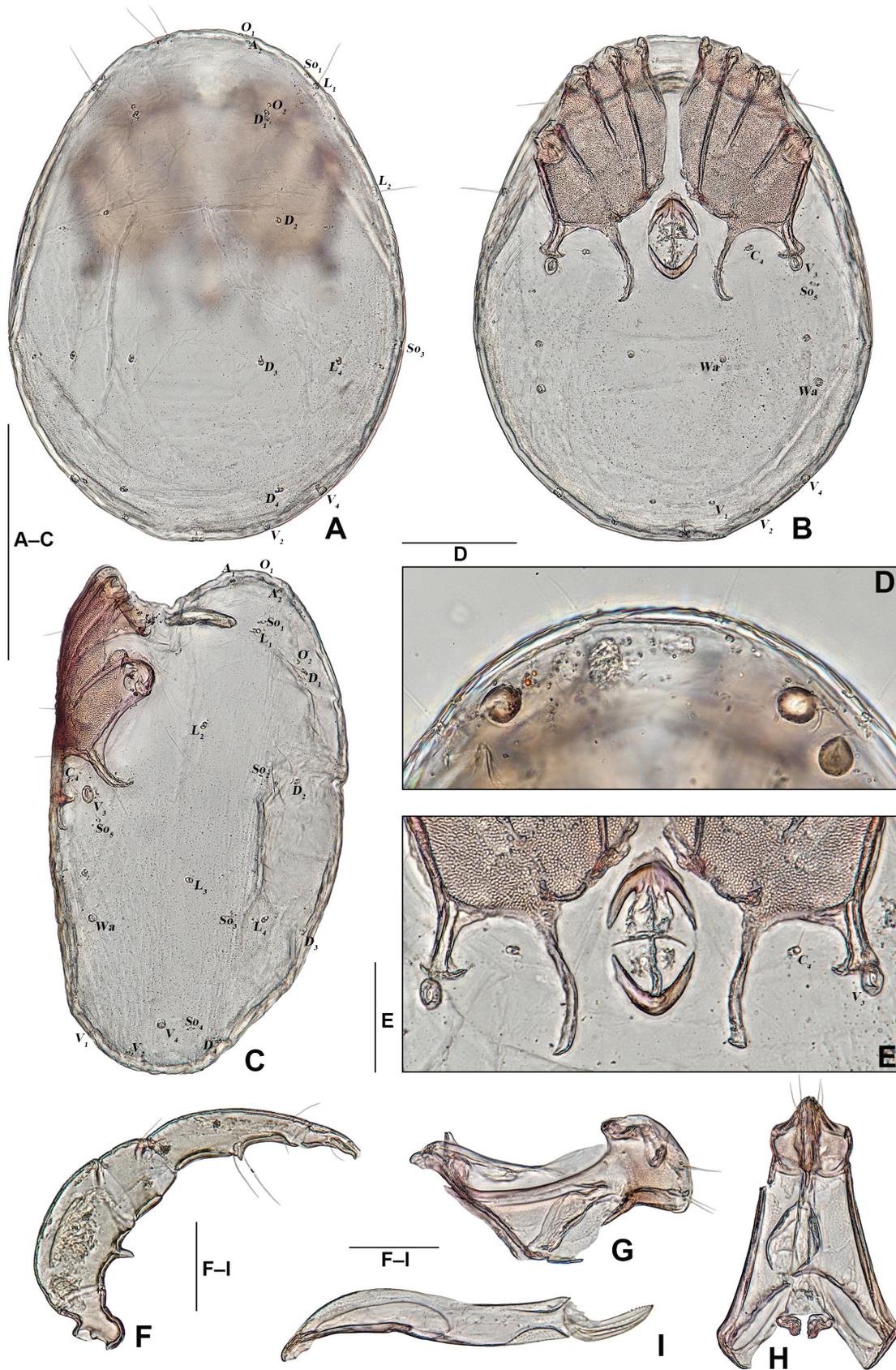


Figure 9 *Litarachna curtialpis* ♀ (HN-PO-2025021705). Optical microscope photographs: (A) Dorsal view of idiosoma; (B) Ventral view of idiosoma; (C) Lateral view of idiosoma; (D) Eye lenses; (E) Genital field; (F) Lateral view of palp; (G) Lateral view of gnathosoma; (H) Ventral view of gnathosoma; (I) Lateral view of chelicera. Scale bar A–C = 200 µm; scale bars D, E, F–I = 50 µm.

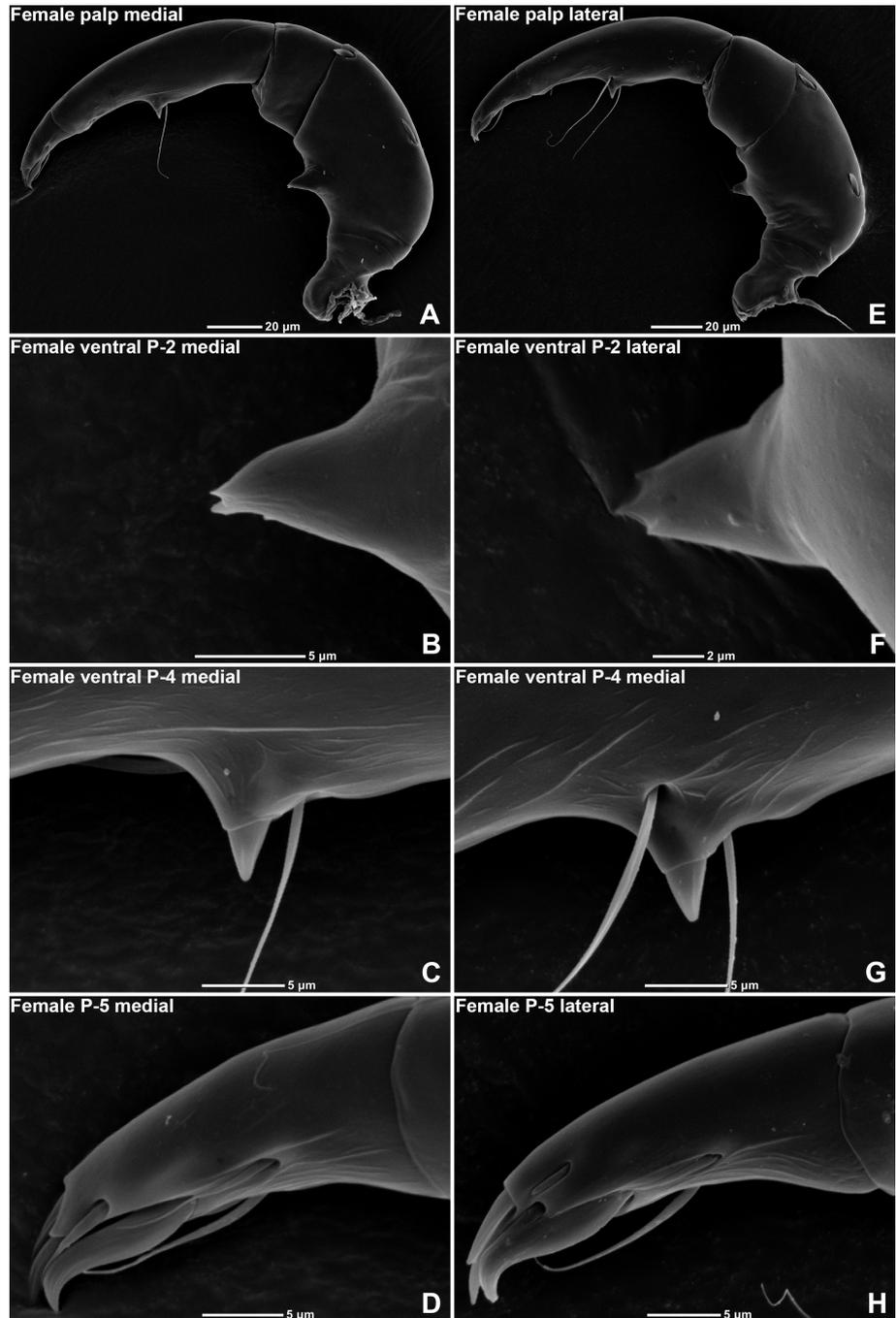


Figure 10 *Litarachna curtipalpis* ♀, characters of palps, SEM photographs, captions as shown in each photos.

III–IV–L–4–5 with one and two terminal swimming setae, respectively (Figs 16A, D; 17A–C).

Female (n=3) — In most aspects similar to male (Figs 18–19). Genital field situated between Cx-IV and medial apodemes of Cx-IV longer than lateral apodemes, pregenital sclerite arrow-shaped, postgenital sclerite lunate (Fig. 18E).

Measurements

Male (n=1) and **Female** (n=3) — See Table 2 for details.

Remarks

In most aspects, e.g. (1) Cx-I separated medially, suture lines of Cx-II/III incomplete and suture lines of Cx-III/IV complete, (2) P-2 with shallow anteroventral extension and (3) two long ventral setae of P-4 not lying at the same level, the specimens from this study match the description of *L. thetis*, a species known from South Korea and Japan (Pešić and Smit 2016). However, it is worth mentioning that the shallow anteroventral extension of P-2 of

Table 1 Measurements of *Litarachna curtipalpis*.

	S1 ♂	S2 ♂	S3 ♂	S4 ♂	S5 ♀	S6 ♀	S7 ♀	S8 ♀
Idiosoma L/W	389/297	378/302	392/352	354/316	392/329	380/310	368/287	413/351
E1	/	/	/	/	/	16	15	17
E2	/	/	/	/	/	14	13	14
Coxal field L	196	192	198	187	202	219	191	209
Cx-IV Ma L	48	48	46	36	54	60	45	50
Sclerotized ring L/W	46/28	44/26	43/30	48/31	/	/	/	/
Sclerotized ring Ae L	25	25	26	25	/	/	/	/
Pregenital sclerite W	/	/	/	/	39	44	35	41
Postgenital sclerite W	/	/	/	/	37	42	36	41
Gonopore L	14	14	12	16	43	44	39	45
Gnathosoma L	/	/	135	/	/	/	/	156
Chelicera base L	134	133	133	/	161	161	/	156
Chelicera claw L	40	38	41	/	/	50	/	46
P-1 dL/W	14/22	15/23	15/25	15/25	15/27	20/27	13/23	16/27
P-2 dL/W	78/41	77/38	83/46	77/40	84/42	92/48	80/42	89/48
P-3 dL/W	27/35	27/34	28/37	26/34	31/38	35/41	26/36	31/40
P-4 dL/W	81/24	81/23	83/25	78/25	89/25	93/28	81/26	91/26
P-5 dL/W	26/10	25/12	30/14	27/13	29/13	29/14	29/14	28/13
P-2 Pr	8	10	11	9	11	9	11	13
I-L-1-6 dL	38/49/39/45/66/76	38/45/40/46/61/76	40/52/42/48/66/78	39/50/41/44/60/75	38/52/42/48/62/76	40/56/42/50/67/82	39/48/40/44/58/79	39/59/43/48/70/80
II-L-1-6 dL	39/51/41/47/67/85	39/51/40/47/66/81	39/53/40/49/63/88	39/50/42/42/64/81	39/54/42/46/71/83	41/55/46/53/75/86	39/49/40/45/62/80	44/54/48/51/72/85
III-L-1-6 dL	41/51/39/52/76/96	42/49/38/51/74/92	41/57/46/52/76/100	41/49/41/48/73/92	44/58/43/50/74/97	46/54/49/51/81/105	41/50/40/48/73/86	41/56/39/54/76/99
IV-L-1-6 dL	68/59/56/94/98/112	65/65/55/93/97/101	71/64/55/96/97/106	64/61/56/85/94/104	65/64/57/92/101/113	70/69/59/98/104/118	65/59/57/95/94/104	67/68/60/98/106/120

Table 2 Measurements of *Litarachna thetis* (L-S1–L-S4) and *Pontarachna australis* (P-S1–P-S2).

	L-S1 ♂	L-S2 ♀	L-S3 ♀	L-S4 ♀	P-S1 ♂	P-S2 ♀
Idiosoma L/W	424/385	533/458	/	448/394	347/284	453/376
Coxal field L	264	295	285	259	214	228
Cx-IV Ma L	57	63	57	46	63	67
Sclerotized ring L/W	59/36	/	/	/	46/45	/
Sclerotized ring Ae L	19	/	/	/	/	/
Pregenital sclerite W	/	54	53	46	/	43
Postgenital sclerite W	/	49	51	45	/	44
Gonopore L	28	49	52	42	27	56
Gnathosoma L	/	/	152	/	/	/
Chelicera base L	136	174	167	148	131	152
Chelicera claw L	34	47	48	42	134	156
P-1 dL/W	17/31	18/33	19/38	16/31	15/19	20/20
P-2 dL/W	85/51	101/60	106/60	94/52	42/24	50/27
P-3 dL/W	45/41	45/50	43/52	43/44	39/21	48/26
P-4 dL/W	110/22	137/25	128/24	111/21	56/17	60/17
P-5 dL/W	46/12	51/17	50/17	44/17	19/8	22/10
I-L-1-6 dL	48/61/54/65/94/104	54/72/65/73/100/112	53/72/59/68/99/105	48/64/55/63/89/101	34/49/39/39/56/74	42/53/45/44/60/79
II-L-1-6 dL	53/63/57/71/98/117	56/74/64/78/112/122	48/71/63/73/109/116	51/61/55/67/87/111	38/54/36/45/66/81	41/52/48/46/73/83
III-L-1-6 dL	58/66/55/76/112/126	60/66/67/86/124/135	61/70/66/83/119/131	55/64/55/72/104/122	43/53/46/55/86/95	48/58/49/56/91/99
IV-L-1-6 dL	92/79/63/106/123/123	108/98/77/120/139/140	103/91/73/113/133/132	95/81/61/101/124/125	68/57/52/87/97/98	67/72/56/98/102/106

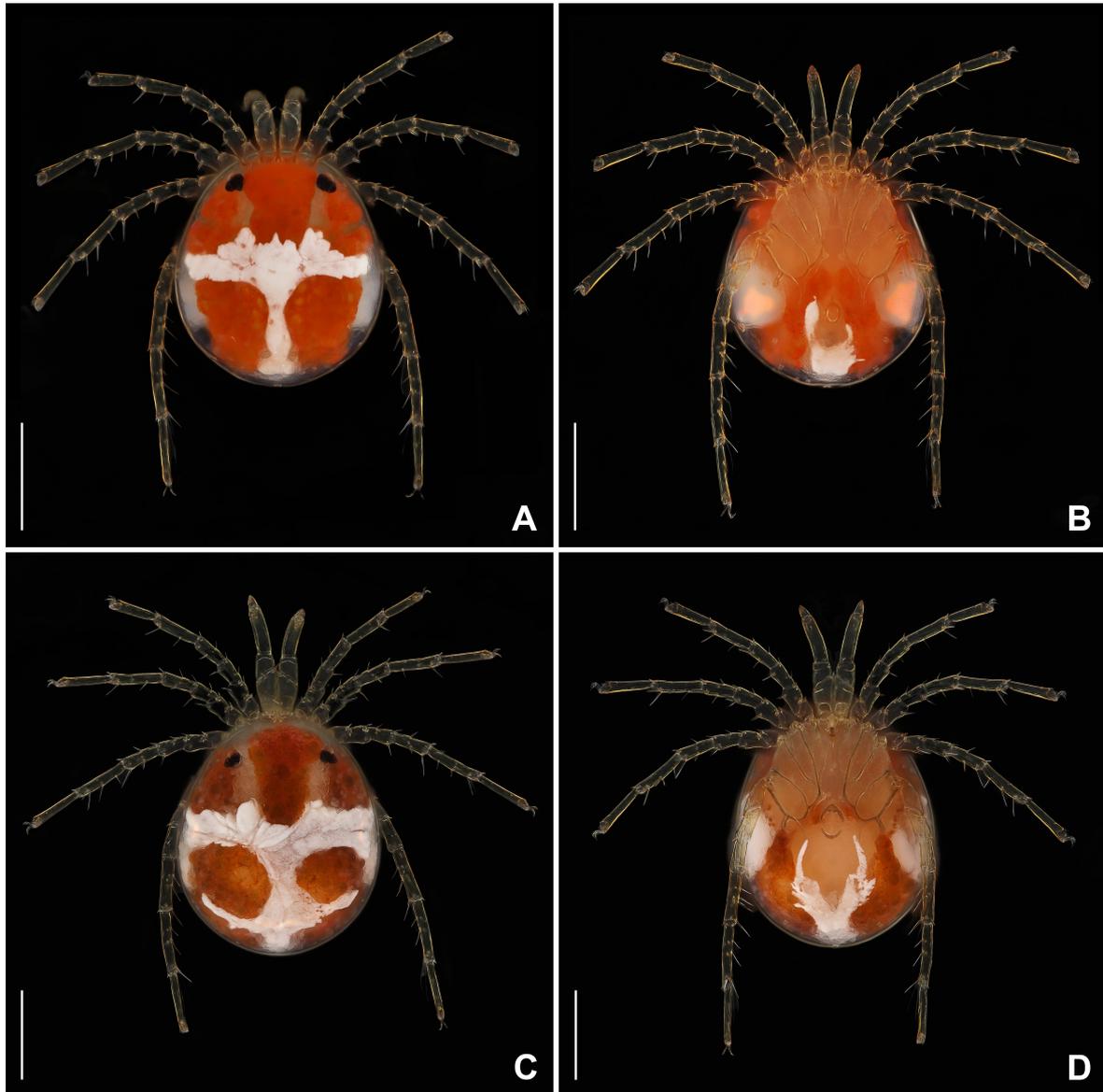


Figure 11 Micrographs of *Litarachna thetis* Pešić & Smit, 2016 habitus: (A) ♂ dorsal view; (B) ♂ ventral view; (C) ♀ dorsal view; (D) ♀ ventral view. Scale bars = 200 μm .

our specimens is more obvious than in the original descriptions. Different geographical populations may be a reasonable explanation for this phenomenon. For the time being we assign our specimens to this species, but more research is needed, especially with molecular techniques.

Genus *Pontarachna* Philippi 1840

***Pontarachna australis* Smit, 2003 (Figs 20–23)**

Material examined

1♂, 1♀, Lingshui Li Autonomous County, Hainan Province, P. R. China (18.41°N, 110.06°E, 2.8 m a.s.l.) (Fig. 1A), leg. Hai-Tao Li & Lu-Ping Zhao, 17-II-2025, Slides No. HN-PO-2025021713–2025021714.

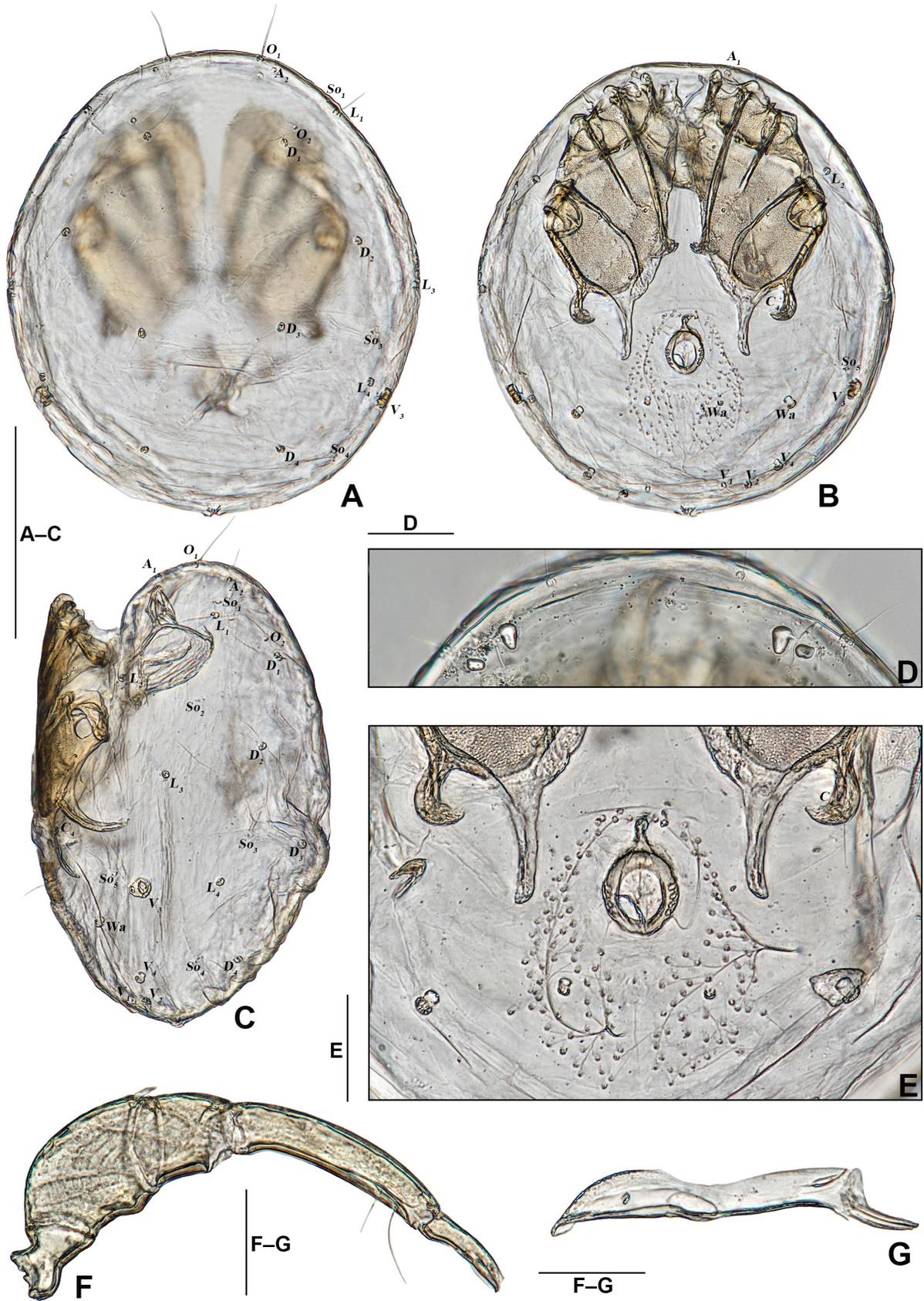


Figure 12 *Litarachna thetis* ♂ (HN-PO-2025021709). Optical microscope photographs: (A) Dorsal view of idiosoma; (B) Ventral view of idiosoma; (C) Lateral view of idiosoma; (D) Eye lenses; (E) Genital field; (F) Lateral view of palp; (G) Lateral view of chelicera. Scale bar A–C = 200 µm; scale bars D, E, F–G = 50 µm.

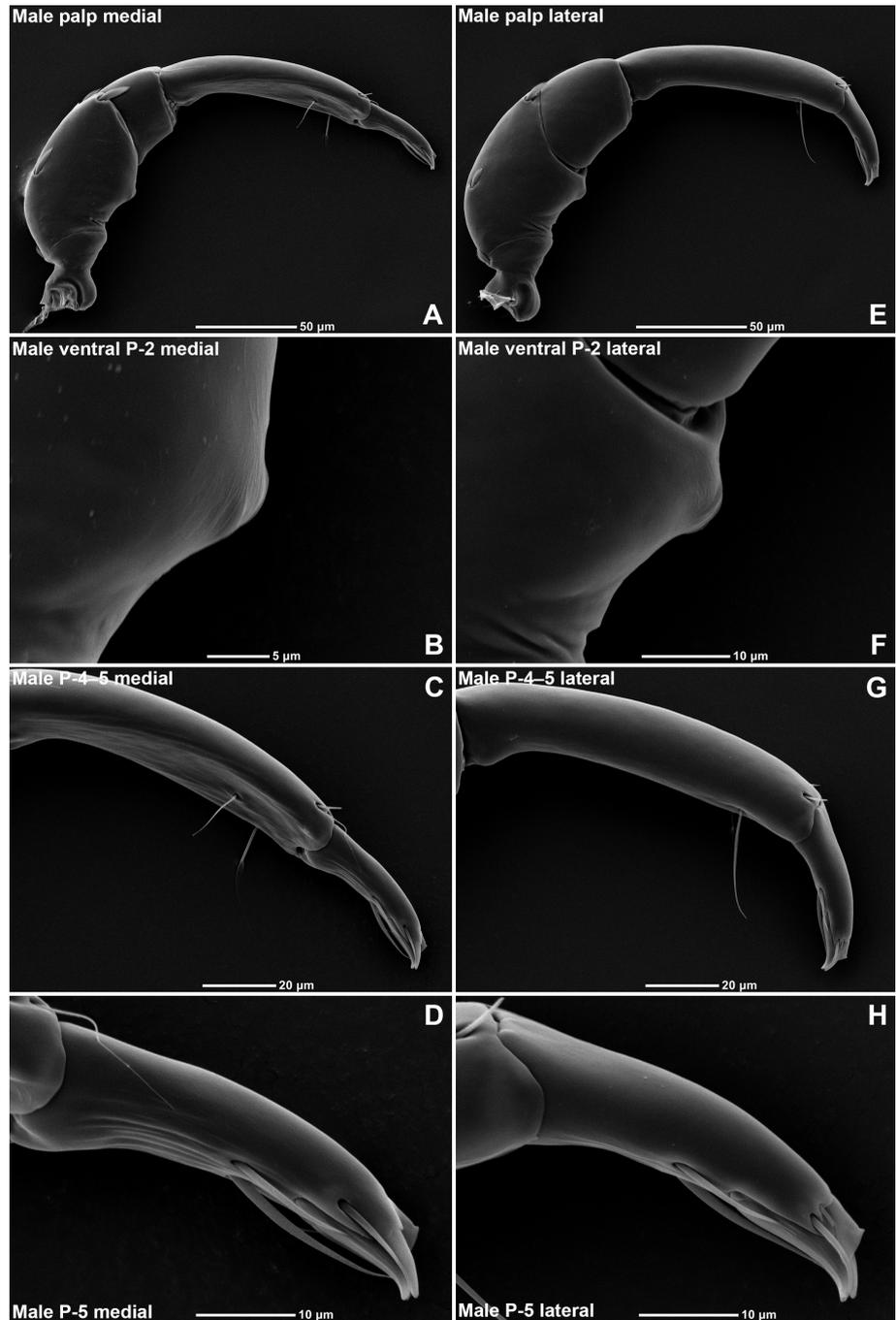


Figure 13 *Litarachna thetis* ♂, characters of palps, SEM photographs, captions as shown in each photos.

Habitat

Same as *L. curtipalpis*.

Diagnosis

L_4 close to D_3 ; Cx-I separated medially; two pairs of small wheel-like acetabula located posteriorly to the genital field; cheliceral claw stylet-like; P-2 without sclerotized ventral

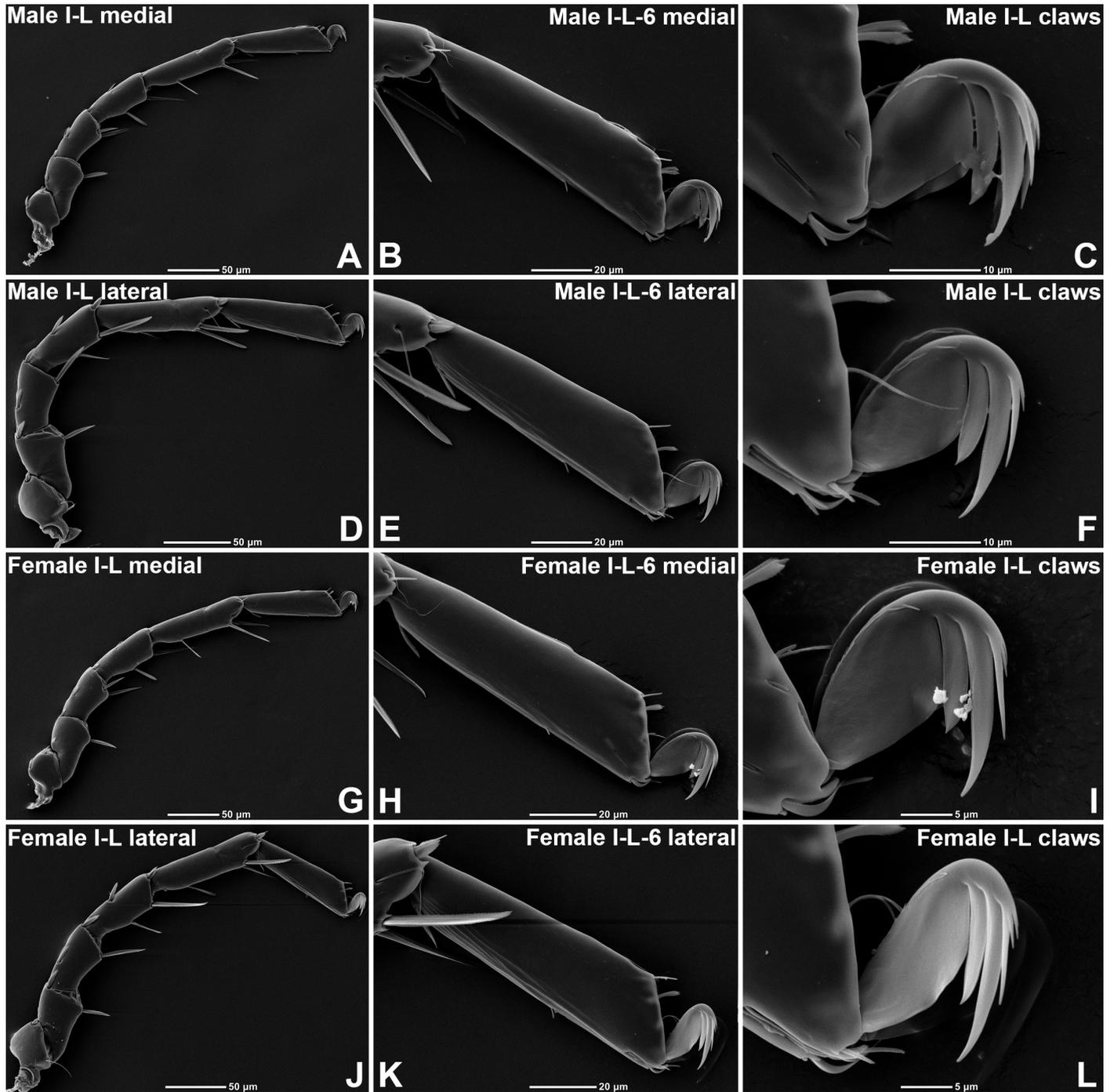


Figure 14 *Litarachna thetis*, characters of I-L, (A–F) ♂, (G–L) ♀, SEM photographs, captions as shown in each photos.

extension; P-4 ventrally straight, without setal tubercles.

Male — Genital field consisting of a sclerotized ring, without an anterior extension, with 12–16 setae.

Female — Genital field partially located between medial posterior apodemes of Cx-IV, postgenital sclerite with one pair of small wheel-like acetabula.

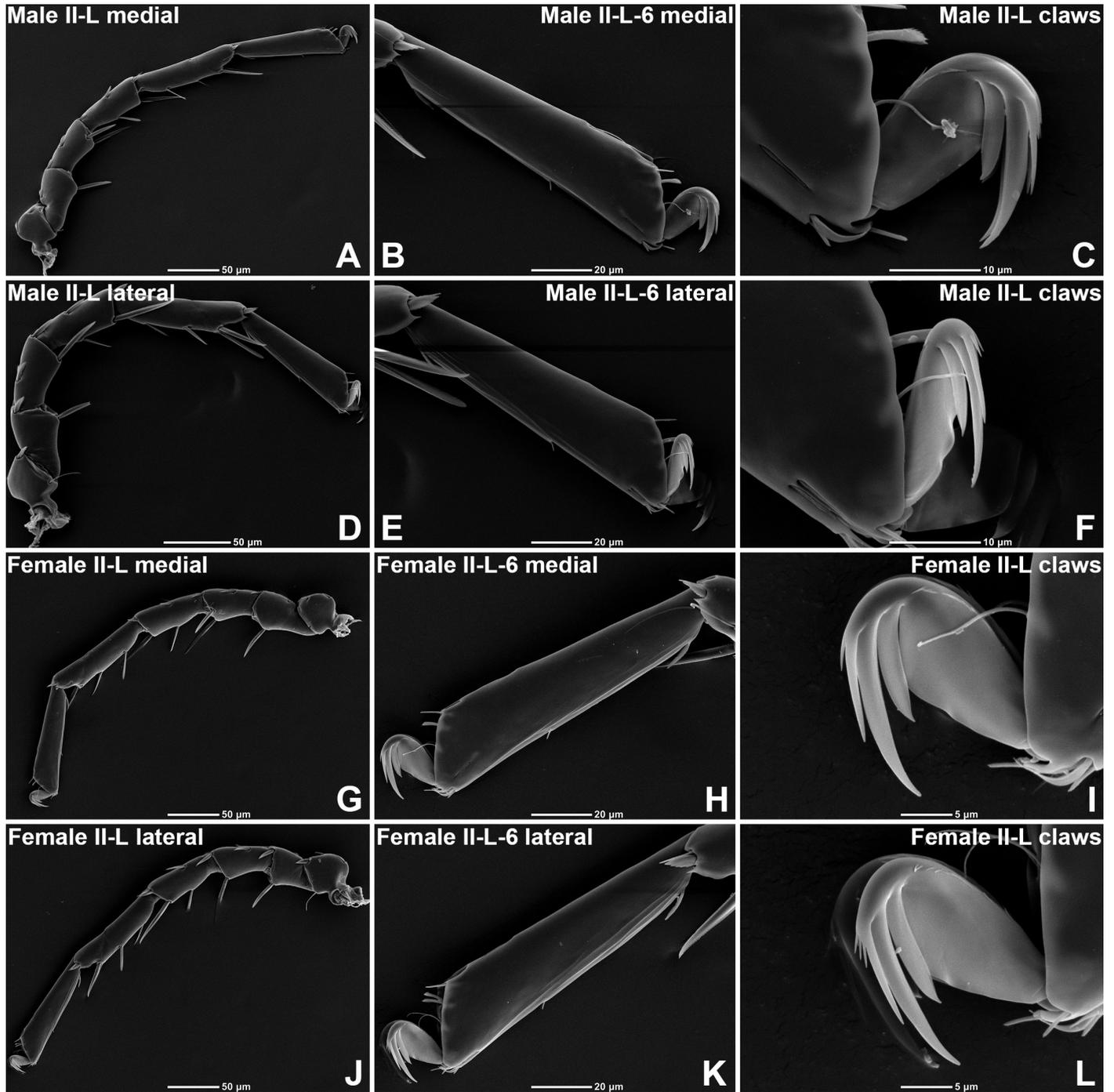


Figure 15 *Litarachna thetis*, characters of II-L, (A–F) ♂, (G–L) ♀, SEM photographs, captions as shown in each photos.

Description

Female (n=1) — In dorsal view: $E1_1$ slightly larger than $E1_2$ (Fig. 20D), lying beneath the integument; L_4 close to D_3 ; idiosoma without sclerites (Fig. 20A). In ventral view: Cx-I separated medially; suture lines of Cx-II/III incomplete; suture lines of Cx-III/IV posteriorly ending in long apodemes; medial apodeme of Cx-IV longer than lateral apodeme, C_4 located postlaterally the lateral apodeme; V_3 larger than other glandularia, almost at the same level

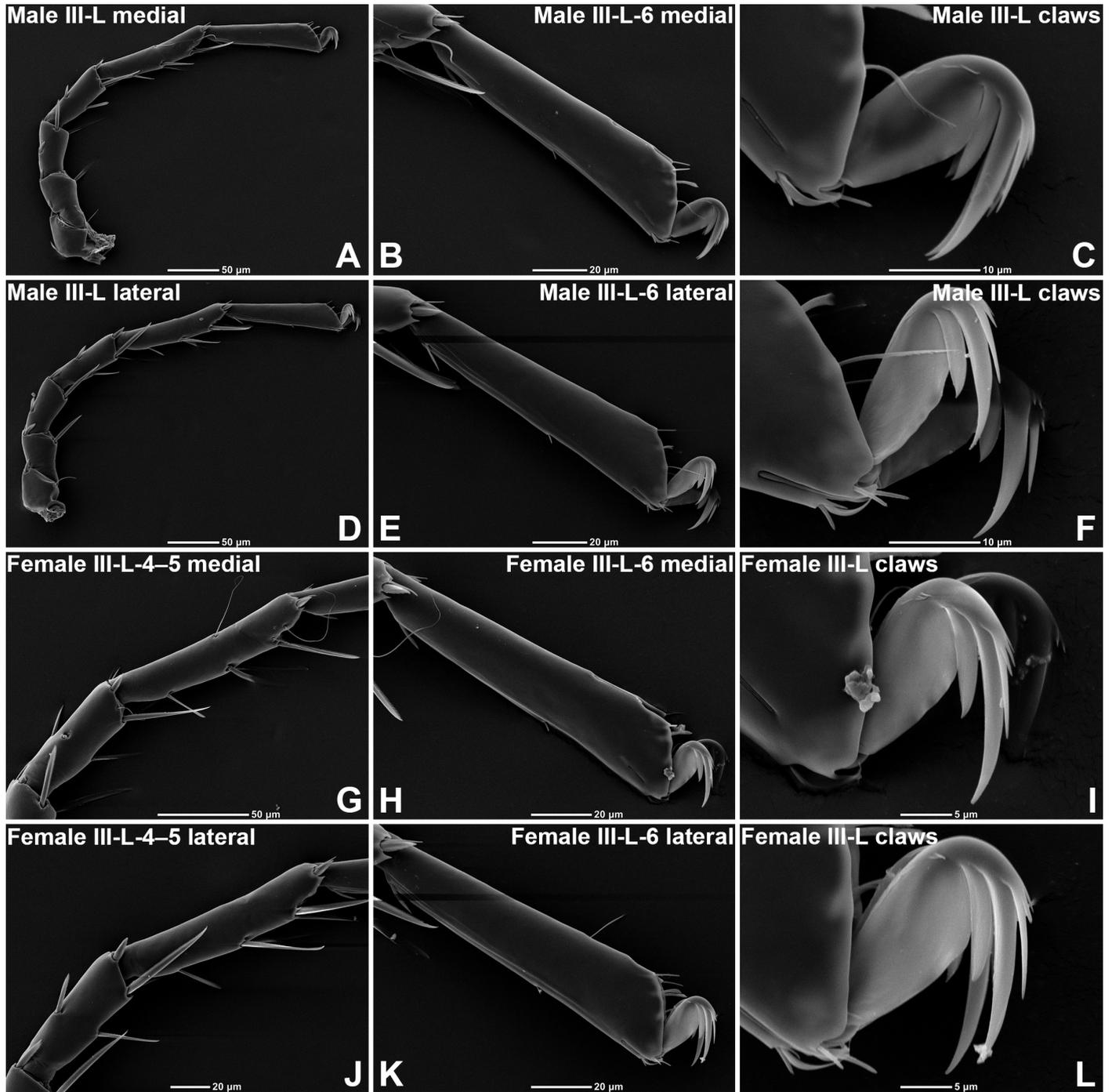


Figure 16 *Litarachna thetis*, characters of III-L, (A–F) ♂, (G–L) ♀, SEM photographs, captions as shown in each photos.

as postgenital sclerite; genital field partially located between medial posterior apodemes of Cx-IV, postgenital sclerite with one pair of small wheel-like acetabula (Figs 20E); two pairs of small wheel-like acetabula (sensu Cook 1996) or specialized glandularia (sensu Tuzovskij 1978) located posteriorly to the genital field (Fig. 20B).

Gnathosoma not fused with ACG, with a short rostrum and bearing two pairs of setae (Fig. 4H). Chelicera consisting of two segments (Fig. 20G); cheliceral claw stylet-like, having a groove medially and some teeth laterally (Fig. 4I). Palp five-segmented (Fig. 20F); P-1 with

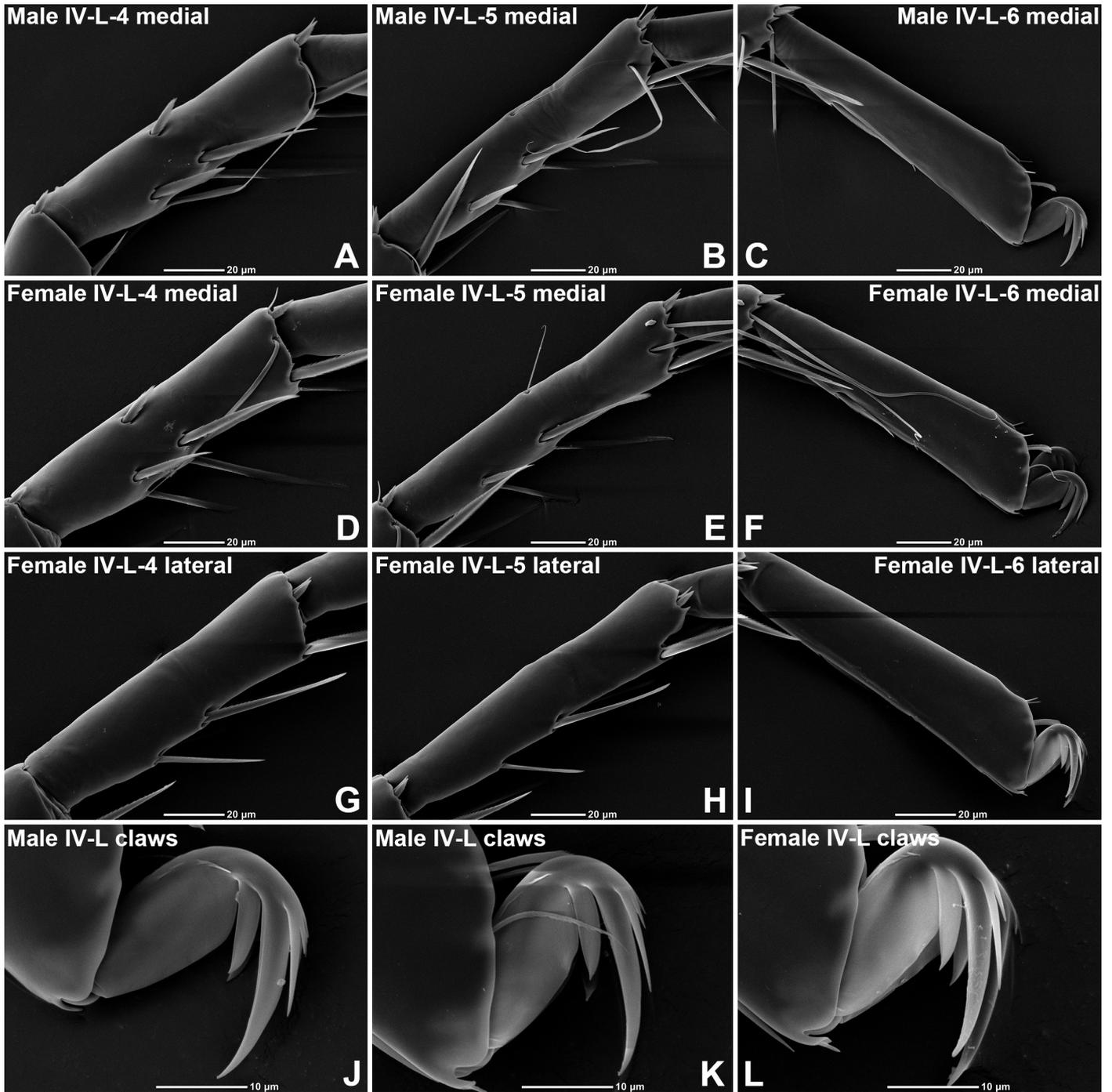


Figure 17 *Litarachna thetis*, characters of IV-L, (A–C, J, K) ♂, (D–I, L) ♀, SEM photographs, captions as shown in each photos.

one dorsal seta; P-2 with four dorsal setae, without sclerotized extension ventrally (Fig. 21B, F); P-3 with a fine dorsal seta; P-4 ventrally straight, without setal tubercles, and with two long subterminal setae (Fig. 21C, G); P-5 tapering (Fig. 21D, H).

All legs simple, without modifications; claws well-developed, four-branched (Fig. 22I). “Swimming setae” (but it’s not sure if these are strictly speaking swimming setae, as they are noticeably thinner than the swimming setae of III–IV-L) occurring terminally of I–II-L-4–5 (Fig. 22A–D); III–IV-L-4–5 with one and two terminal swimming setae respectively (Fig.

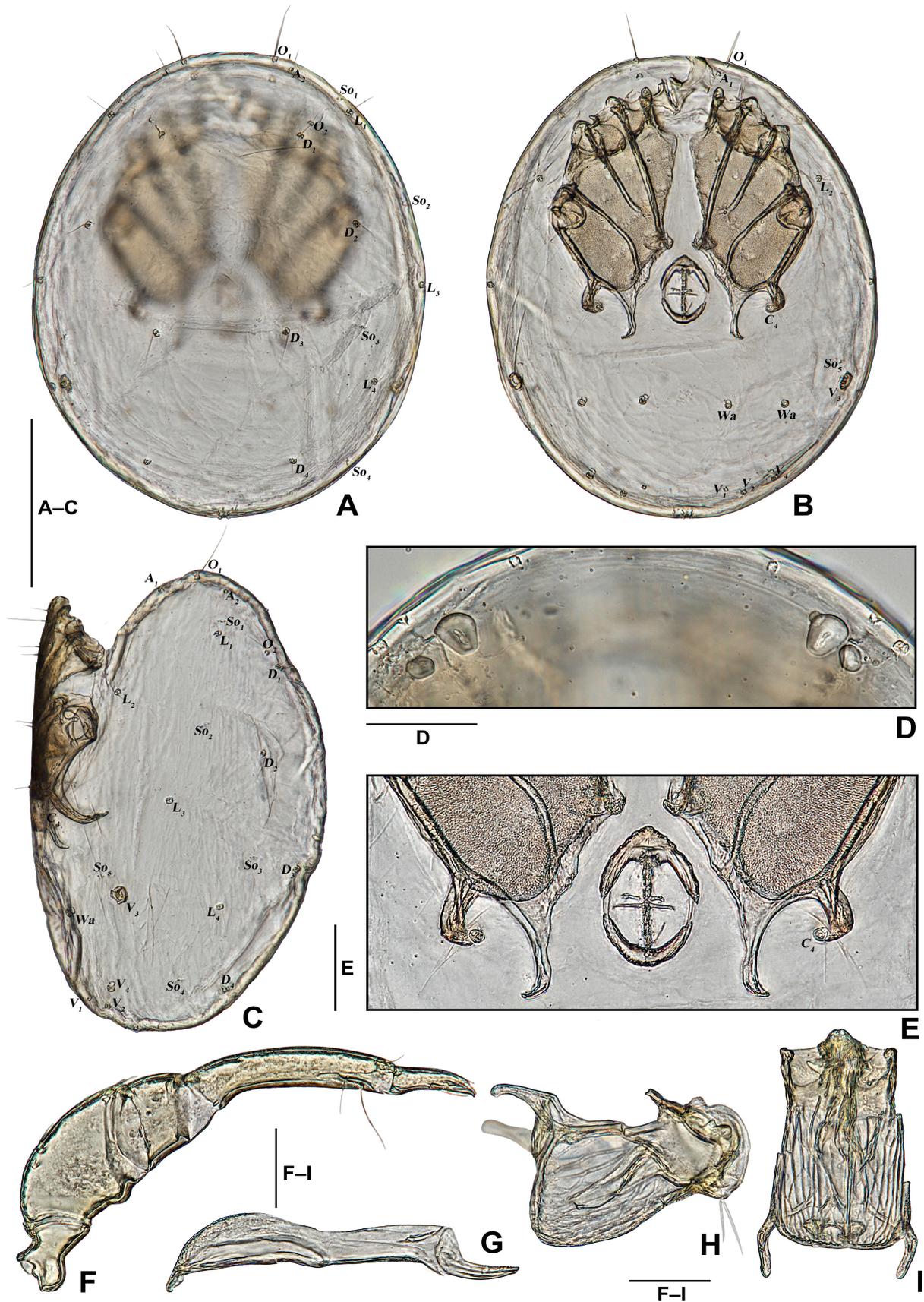


Figure 18 *Litarachna thetis* ♀ (HN-PO-2025021710). Optical microscope photographs: (A) Dorsal view of idiosoma; (B) Ventral view of idiosoma; (C) Lateral view of idiosoma; (D) Eye lenses; (E) Genital field; (F) Lateral view of palp; (G) Lateral view of chelicera; (H) Lateral view of gnathosoma; (I) Ventral view of gnathosoma. Scale bar A–C = 200 μm; scale bars D, E, F–I = 50 μm.

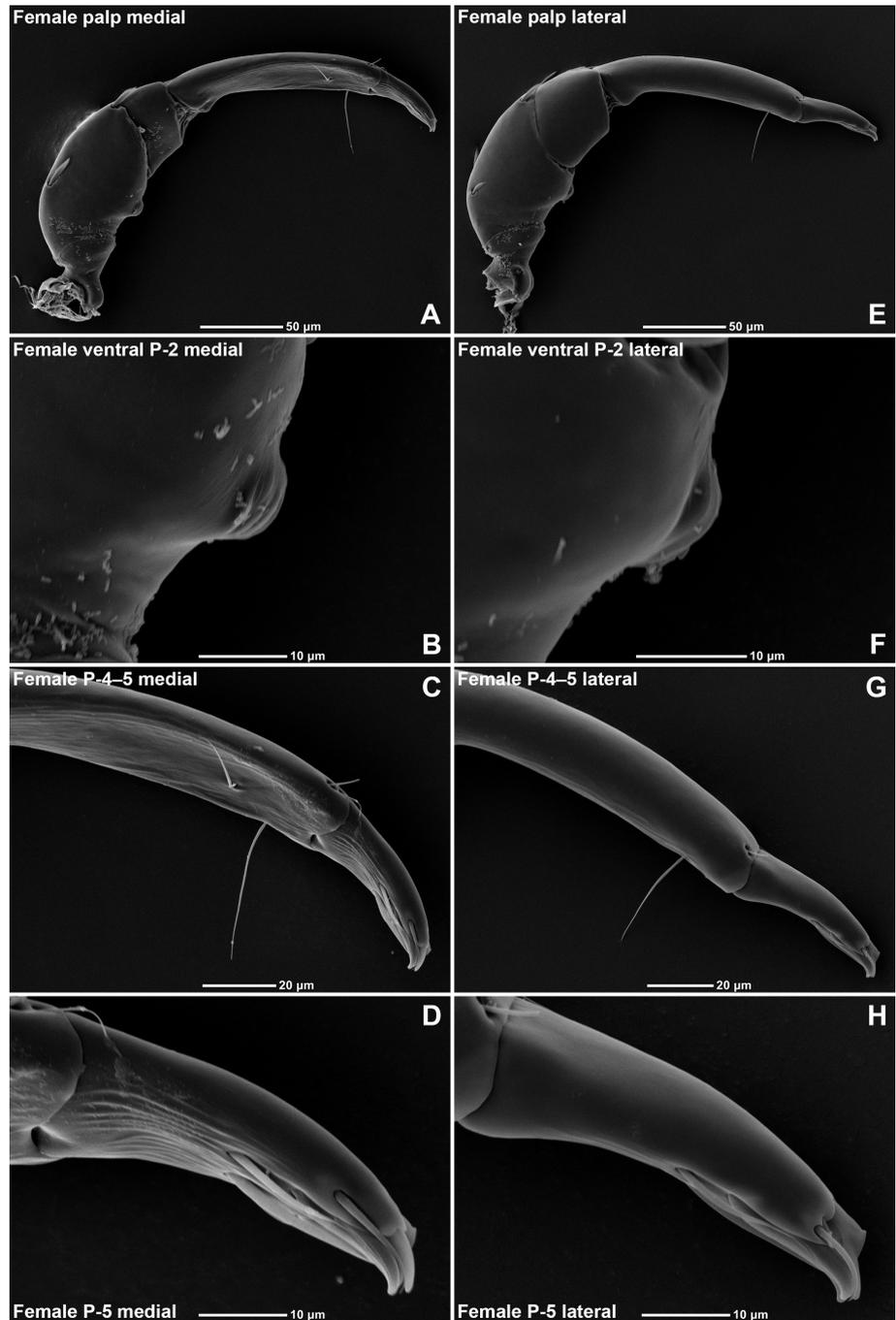


Figure 19 *Litarachna thetis* ♀, characters of palps, SEM photographs, captions as shown in each photos.

22E–L).

Male (n=1) — In most aspects similar to female (Fig. 23). Genital field consisting of a sclerotized ring, without anterior extension, and with 12 setae on the left side and 16 setae on the right side. (Fig. 23E).

Measurements

Male (n=1) and **Female** (n=1) — See Table 2 for details.

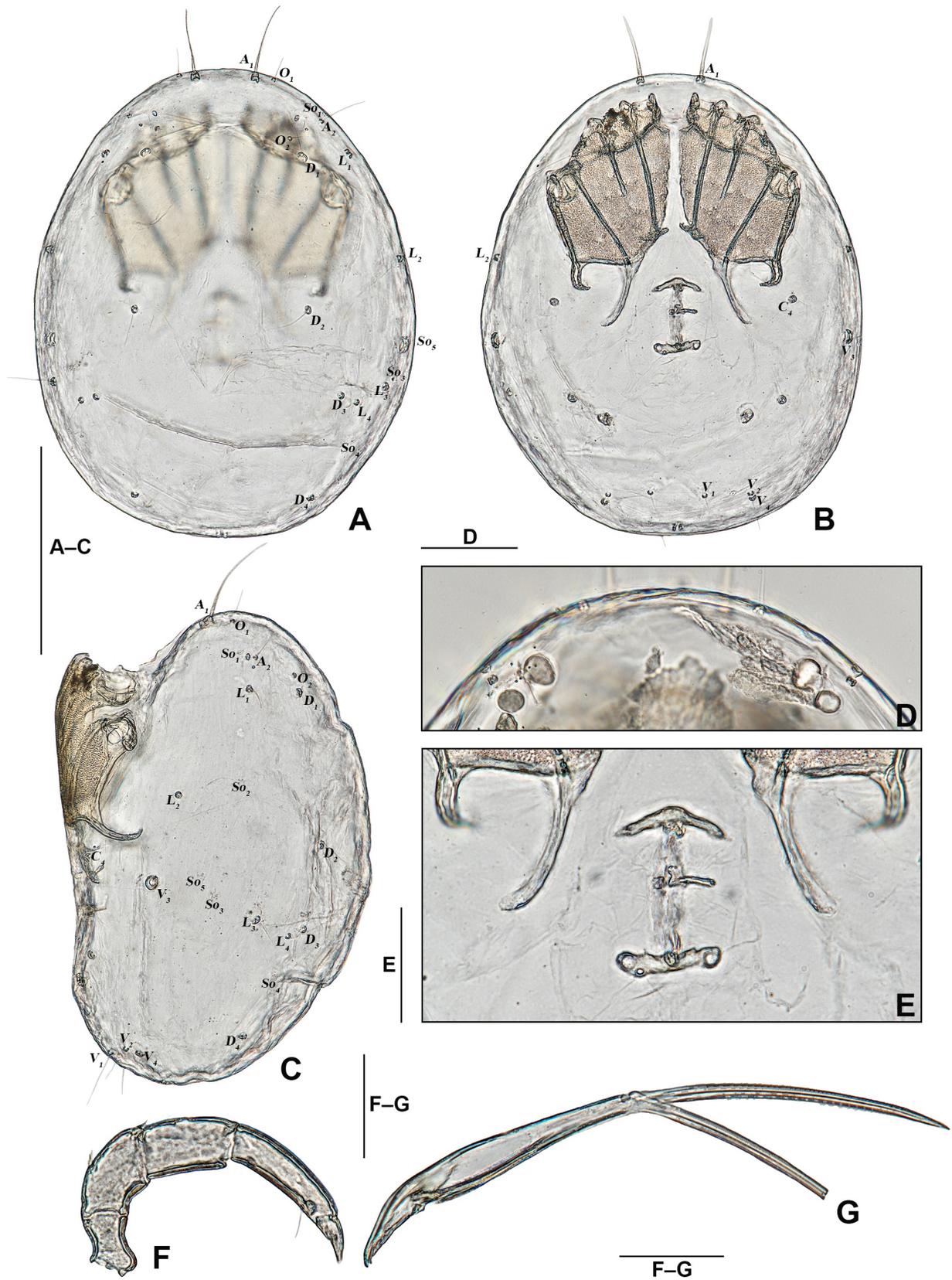


Figure 20 *Pontarachna australis* ♀ (HN-PO-2025021714). Optical microscope photographs: (A) Dorsal view of idiosoma; (B) Ventral view of idiosoma; (C) Lateral view of idiosoma; (D) Eye lenses; (E) Genital field; (F) Lateral view of palp; (G) Lateral view of chelicera. Scale bar A–C = 200 µm; scale bars D, E, F–G = 50 µm.

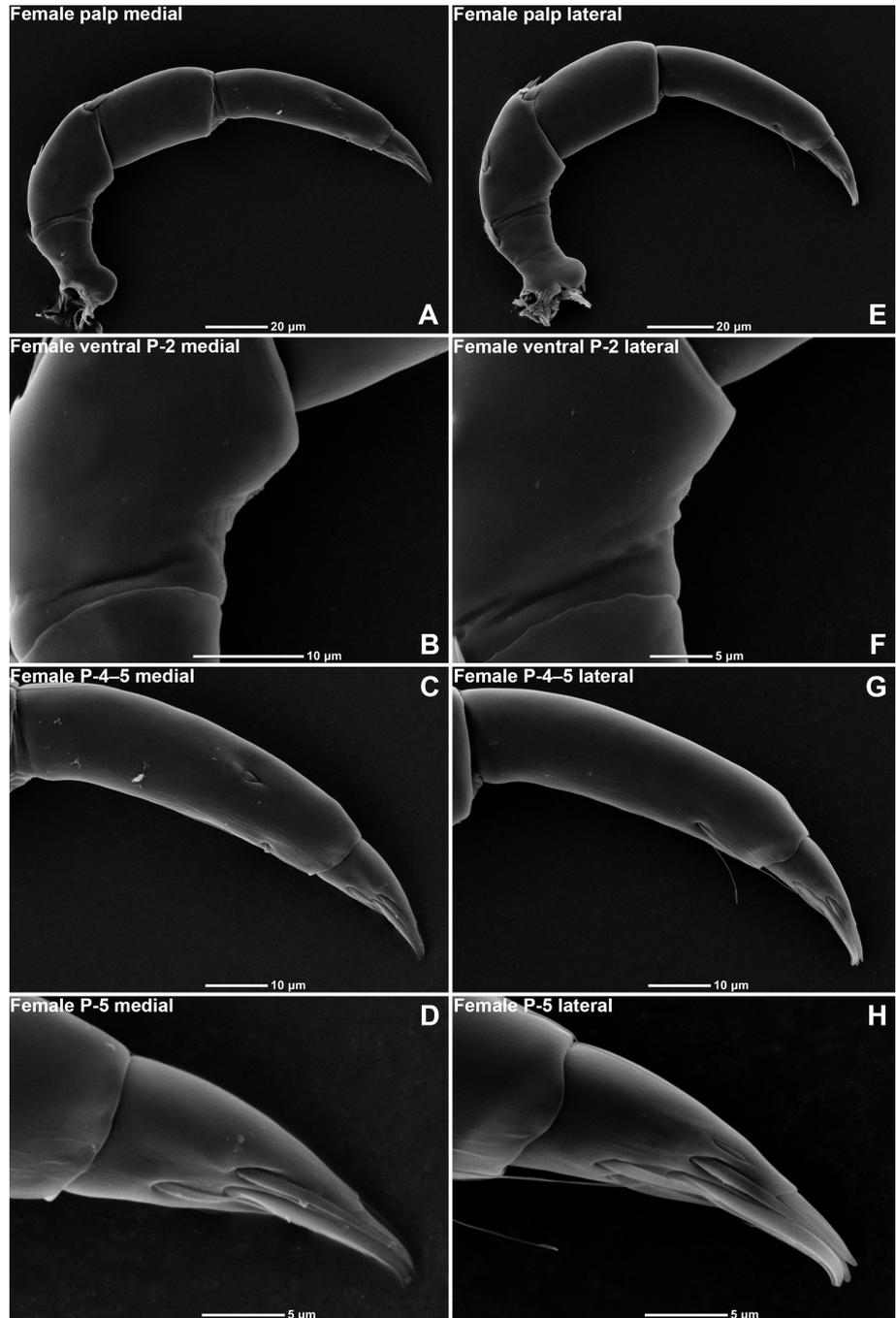


Figure 21 *Pontarachna australis* ♀, characters of palps, SEM photographs, captions as shown in each photos.

Remarks

Pontarachna australis was described from a single female from Western Australia (Smit 2003). Pešić *et al.* (2008) collected this species from Taiwan and added the description of the male. Due to our specimens have following characters: (1) two pairs of small wheel-like acetabula or specialized glandularia located posteriorly of the genital field; (2) the male genital field consisting of a sclerotized ring, without an anterior extension; (3) the female genital field partially located between the medial posterior apodemes; (4) the postgenital sclerite with one

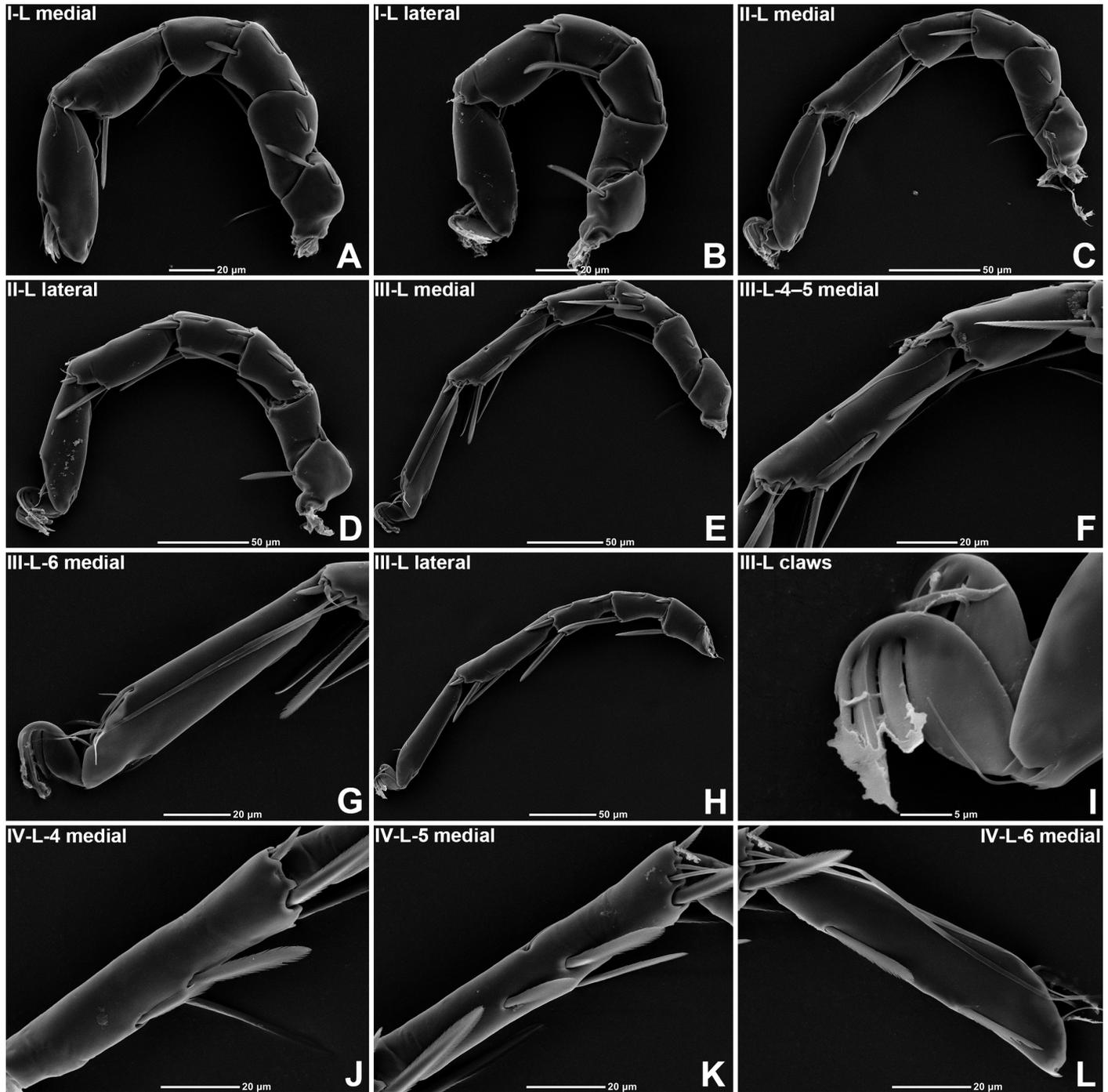


Figure 22 *Pontarachna australis* ♀, characters of I–IV-L, SEM photographs, captions as shown in each photos.

pair of small wheel-like acetabula; and (5) a similarly shaped palp (Fig. 24C), we assign our specimens to *P. australis*.

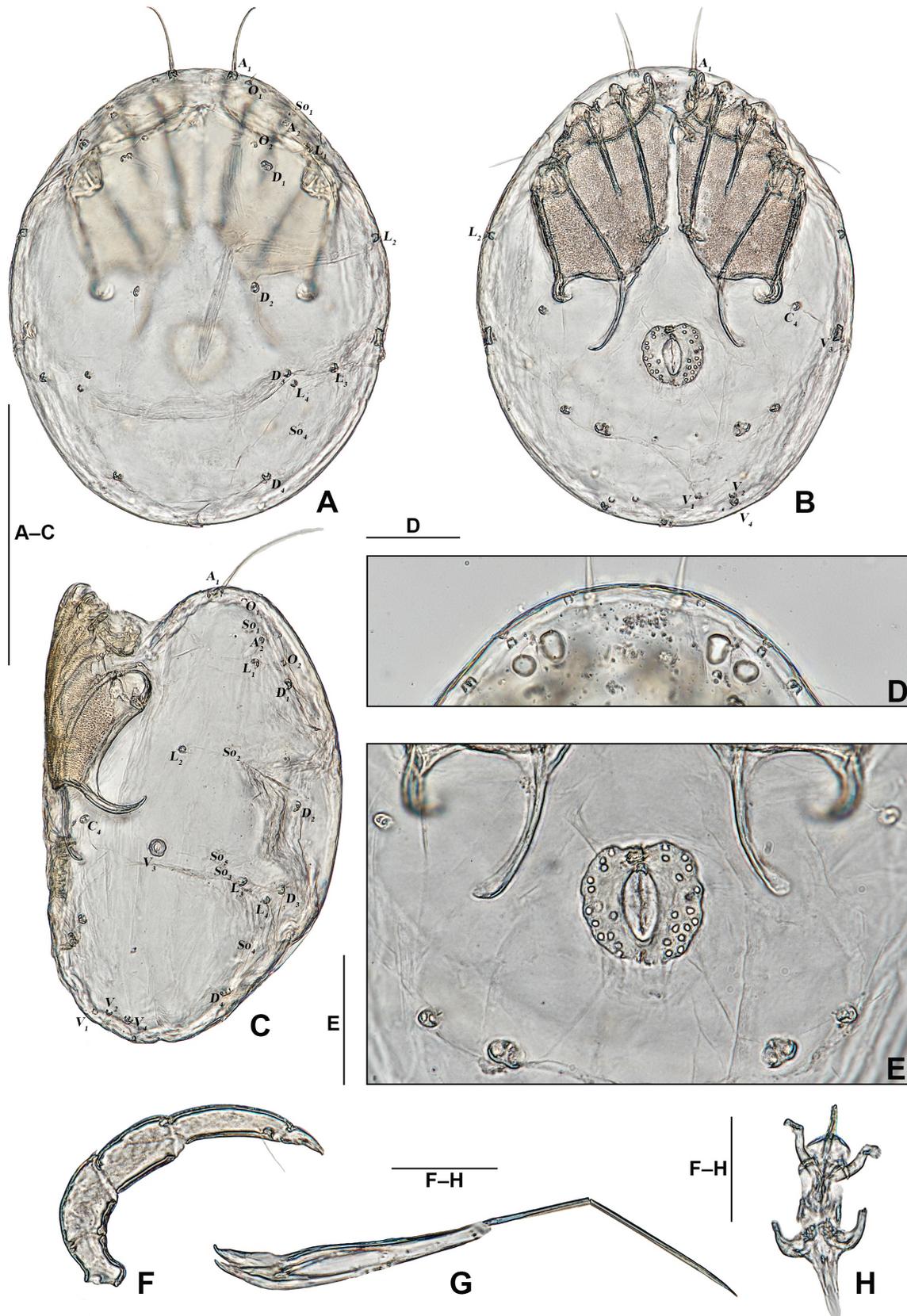


Figure 23 *Pontarachna australis* ♂ (HN-PO-2025021713). Optical microscope photographs: (A) Dorsal view of idiosoma; (B) Ventral view of idiosoma; (C) Lateral view of idiosoma; (D) Eye lenses; (E) Genital field; (F) Lateral view of palp; (G) Lateral view of chelicera; (H) Ejaculatory complex. Scale bar A–C = 200 µm; scale bars D, E, F–H = 50 µm.



Figure 24 Paratypes from Naturalis Biodiversity Center, (A–B) *Litarachna curtipalpis* ♀, (C–D) *Pontarachna australis* ♀, optical microscope photographs: (A) Lateral view of palp; (B) Lateral view of I-L; (C) Lateral view of palps and gnathosoma; (D) Lateral view of I-L-6. Scale bar A = 50 µm; scale bar B = 100 µm; scale bar C = 20 µm; scale bar D = 50 µm.

Discussion

We used camera, optical microscope and SEM to make a comprehensive description of three species from Hainan. Except *P. australis* these species have been reported from Taiwan by Pešić *et al.* (2008). The remaining two, *i.e.* *L. curtipalpis* Smit, 2003 and *L. thetis* Pešić & Smit, 2016, are recorded new for Chinese fauna.

Cook (1974) divided *Litarachna* into two subgenera based on the fusion between Cx-I, but as more species were recorded later on, this system was abandoned (Cook 1986). We found that the characters of the currently known species in this genus can be divided into two groups: (1) incomplete suture lines of Cx-III/IV + gnathosoma as a trapezoid in the ventral view + P-4 with a setal tubercle, (2) complete suture lines of Cx-III/IV + gnathosoma as a rectangle in the ventral view + P-4 without a setal tubercle. Therefore, the taxonomy of this genus needs further research involving molecular techniques.

In addition, we examined the cheliceral claw of three species using SEM. They are different in shape and medial surface, *i.e.* *P. australis* is stylet-like and without seta-like projections, *L. curtipalpis* is “normal” and with dense seta-like projections, *L. thetis* is “normal” and without seta-like projections. These very strong differences in the structure of the mouth parts of these three species investigated are strongly indicating completely different dietary habits of

these cohabiting species. Unfortunately, respective detailed descriptions of the mouth parts are lacking for other species of the family. Nevertheless, our results show the great potential of these characters for revisional studies. Moreover, further research should include as well molecular studies in order to provide data for phylogenetic studies.

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References

- Chatterjee T., Schizas N.V., Pešić V. 2019. A checklist of Pontarachnidae (Acari: Hydrachnidia) and notes on distributional patterns of the species. *Zootaxa*, 4619(3): 527-544. <https://doi.org/10.11646/zootaxa.4619.3.6>
- Cook D.R. 1974. Water mite genera and subgenera. *Memoirs of the American Entomological Institute*, 21: 1-860.
- Cook D.R. 1986. Water mites from Australia. *Memoirs of the American Entomological Institute*, 40: 1-568.
- Cook D.R. 1996. A freshwater species of *Pontarachna*, (Acari: Pontarachnidae) from South Africa with a discussion of genital acetabula in the family. *Anales del Instituto de Biología, Universidad Nacional Autónoma de México, Serie Zoología*, 67(2): 259-264.
- Gu X.Y., Li H.T., Jin D.C., Guo J.J. 2021. Collection and Preservation of Water Mites and Preparation of Slide Specimens. *Bio-101* e1010676. [in Chinese]
- Montes-Ortiz L., Goldschmidt T., Vásquez-Yeomans L., Elías-Gutiérrez M. 2021. A new species of *Litarachna* Walter, 1925 (Acari: Hydrachnidia: Pontarachnidae) from Corozal Bay (Belize), described based upon morphology and DNA barcodes. *Acarologia*, 61(3): 602-613. <https://doi.org/10.24349/r7no-Ludg>
- Jin D.C. 1997. Hydrachnellae-Morphology, Systematics, a primary study of Chinese fauna. Guizhou Science and Technique Publish House, Guiyang. 356pp [in Chinese, with English abstract].
- Jin D.C., Yi T.C., Zhang X., Gu X.Y., Ding Z.H., Li H.T., Zheng Y.L., Zhang Y.H., Jia L., Guo J.J. 2024. Review of progress in the taxonomy of water mites from China II (Acari: Hydrachnidia). *Systematic & Applied Acarology*, 29(11): 1472-1496. <https://doi.org/10.11158/saa.29.11.3>
- 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>
- Li H.T., Smit H., Gu X.Y., Jin D.C., Guo J.J. 2024. The first records of the subfamily Euthyadinae K. Viets, 1931 (Acari, Hydrachnidia, Hydryphantidae) from China with description of one new species. *Acarologia*, 64(1): 105-122. <https://doi.org/10.24349/eahs-q4xf>
- Pešić V. 2013. A new marine water mite species (Acari, Hydrachnidia, Pontarachnidae) from a coastal lake in Southeast Madagascar. *Marine Biology Research*, 9(3): 333-336. <https://doi.org/10.1080/17451000.2012.739697>
- Pešić V., Chatterjee T., Chan B.K.K., Ingole B. 2008. Marine water mites (Acari: Hydrachnidia: Pontarachnidae) from Taiwan, Korea and India, with the first description of the male of *Pontarachna australis* Smit, 2003. *Systematic & Applied Acarology*, 13: 70-74. <https://doi.org/10.11158/saa.13.1.8>
- Pešić V., Smit H. 2016. On the identity of *Litarachna divergens* Walter, 1925 (Acari, Hydrachnidia: Pontarachnidae), with description of one new species. *Marine Biodiversity*, 46(1): 51-57. <https://doi.org/10.1007/s12526-015-0316-x>
- Smit H. 2003. Five new species of the water mite family Pontarachnidae from Western Australia (Acari: Hydrachnidia). In: Wells, F.E., Walker, D.I. & Jones, D.S. (Eds.), *The Marine Flora and Fauna of Dampier, Western Australia*. Western Australian Museum, Perth, pp. 547-562.

- Smit H. 2007. *Litarachna brasiliensis* n. sp., the first member of the water mite family Pontarachnidae (Acari: Hydrachnidia) from South America. *Systematic & Applied Acarology*, 12: 141-146.
<https://doi.org/10.11158/saa.12.2.8>
- Smit H. 2009. Water mites of the family Pontarachnidae from Singapore, with a description of one new species (Acari: Hydrachnidia). *Raffles Bulletin of Zoology*, 22: 203-205.
- Smit H., Alberti G. 2010. The water mite family Pontarachnidae, with new data on its peculiar morphological structures (Acari: Hydrachnidia). In: Sabelis M.W. & Bruin J. (Eds.), *Trends in Acarology. Proceedings of the 12th International Congress*. Springer Verlag, Amsterdam, pp. 71-79.
https://doi.org/10.1007/978-90-481-9837-5_11