Dicrotendipes sinicus Lin & Qi, sp. n. (Diptera: Chironomidae)

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Abstract

The name *Dicrotendipes sinicus* was originally proposed in 2018, but the requirements of the International Code of Zoological Nomenclature were not fulfilled to make the name available. We here re-propose the name with full Code compliance and redescribe and illustrate all life stages of the species to make the name available.

Introduction

The name *Dicrotendipes sinicus* was originally proposed in Qi et al. (2018 [online], 2019 [print]), but part of the data required for making the name available appeared in the supporting information, which did not fulfill all relevant requirements of Article 8 in the International Code of Zoological Nomenclature (ICZN 1999, 2012). The name has therefore remained unavailable, which is herewith remedied by re-proposing the name in full Code compliance. Also, we take the opportunity to re-publish the descriptive and pictorial data for all life stages of the species.

Material and Methods

Detailed information on collecting procedures and habitat can be found in Qi et al. (2018). Morphological terminology and abbreviations in the description below follows Sæther (1980). Holotype and paratypes are deposited at the College of Life Sciences, Nankai University, Tianjin, China (NKU) except for one paratype at the NTNU University Museum, Trondheim, Norway (NTNU-VM).

Results

Dicrotendipes sinicus Lin & Qi **sp. n.** (Figs 1–9)

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Type material: Holotype, ♂ & Pe (NKU: J2A19), China: Zhejiang, Zhoushan, Xishan Island, seawater ponds, 29.896°N, 122.305°E, 1 m a.s.l., 5.VI.2012, hand net, leg. X. Qi. Paratypes, China: 9♂♂ (NKU: J2A2, J2A5, J2A6, J2A7, J2A20, J2A26, J2A27, J2A29, J2A33), 1♂ & Pe (NKU: J2A4), 3♀♀ & Pe (NKU. J2A1, J2A28, J2A29), 1P (NKU. J2A22), 2Pe (NKU: J2A6, J2A24), 10L (NKU: J2A7, J2A11, J2A12, J2A13, J2A14, J2A17, J2A18) as holotype; 2♂♂ (NKU & BOLD Sample ID: XS1, XS2), 1♀ (NKU & BOLD Sample ID: XS3), 1L (NKU & BOLD Sample ID: XS4), Zhejiang, Zhoushan, Xishan Island, seawater ponds, 29.896°N, 122.305°E, 1 m a.s.l., 5.VI.2013, hand net, leg. X. Qi; 1♂ (NTNU-VM & BOLD Sample ID: XL554), 1♀ (NKU & BOLD Sample ID: XL557), 3Pe (NKU: XL558, XL559, XL560), Zhejiang, Taizhou, Sanmen, Huaqiaozhen, marine ponds, 28.9375°N, 121.5221°E, 5 m a.s.l., 30.IV.2016, hand net, leg. B.J. Yang.

Etymology: Named after the country of the type locality, China, '*sinicus*'; adjective in nominative case.

Diagnostic characters: Morphological features of the new species do not fit with the generic diagnosis of *Dicrotendipes* and the remaining known genera of Chironomini. Adult male: antenna with ten flagellomeres, lacking plume; eye without microtrichia between ommatidia, without dorsomedial extension; palp with five segments, segment 4 and 5 occasionally slightly fused; brachypterous, shortened wings oar-shaped, with tuft of long setae apically; squama glabrous; acrostichals absent; mid and hind tibiae both with two spurs, and additional few small teeth; inferior volsella extremely long, strongly curved, extending beyond the apex of gonostylus; gonostylus moveable, with a few teeth distally. Adult female: antenna with six flagellomeres, without plume; palp with three segments; acrostichals usually absent, sometimes 1–5; mid tibia with two spurs and few small teeth, hind tibia with one spur and small teeth. Pupa: thoracic horn plumose, divided to numerous fine branches; basal ring larger, kidney-shaped, with two separated tracheal marks; pedes spurii B absent; segments V–VIII with 4 LT. Larva: antenna 5-segmented; mentum with rounded, trifid median tooth and six

pairs of lateral teeth, regularly decreasing in size laterally; premandible with four teeth; ventromental plates strongly curved; body without lateral or ventral tubules.

Description.

Adult male (n = 10, unless otherwise stated). Total length 2.60–4.48, 3.16 mm. Wing length 1.09–1.68, 1.29 mm. Total length/wing length 1.61–3.44, 2.48.

Coloration (Figs 1–2). Head, legs and abdomen brown. Basic color of thorax brown, with darkened patches posteriorly on scutum, scutellum and basal part on postnotum; median region of antepronotum dark brown.

Head (Fig. 2B). Eye glabrous, without dorsomedial extension. Frontal tubercles 5–15, 10 µm long, 5–20, 12 µm wide. Temporal setae 8–11, 9, including 0–3, 2 inner verticals, 1–10, 5, outer verticals and 1–3, 2 postorbitals. Clypeus with 16–26, 21 setae. Tentorium 93–135, 115 µm long, 13–25, 20 µm wide. Palp five-segmented, shortened; segment 3 without subapical sensilla; segment 4 and 5 incompletely fused in some specimens. Palpomere lengths (in µm): 25–50, 40; 40–60, 49; 80–105, 92; 25–60, 49; 30–70, 52.

Antenna (Figs 2A; 6A). Antenna with ten flagellomeres; ultimate flagellomere with several subapical sensilla (Fig. 2A). AR 0.96–1.43, 1.18. Plume absent, but surface of antenna covered with short setae and microtrichia.

Thorax (Figs 2C; 6B). Antepronotal lobes moderately developed, dorsally separated. Scutum not protruding beyond antepronotum, with tubercle. Acrostichals absent; dorsocentrals 9–14, 13; prealars 4–6, 5; scutellars 4–10, 7. Halter large (Fig. 2C).

Wing (Fig. 3A). Reduced in size, oar-shaped, bifurcated and with tuft of long setae apically; venation indistinct in some specimens. Membrane without setae, but with numerous microtrichia. Costa not produced beyond R_{4+5}; R_{2+3} ending close in distal 1/5 between apices of R_1 and R_{4+5}; R_{4+5} ending distal to apex of M_{1+2}; FCu far distal to RM, ending in proximal to apex of R_{4+5}. VR 1.46–1.83, 1.62. Brachiolum with one seta, R with 7–13, 10 setae; R_1 with 8–13, 11 setae; R_{4+5} with 0–1 seta; remaining veins glabrous. Anal lobe small. Squama glabrous.

Legs (Fig. 4A-C, G-I). Fore leg (Fig. 4A) very long relative to mid (Fig. 4B) and hind legs (Fig. 4C); apex of fore tibia (Fig. 4G) without spur; mid tibia (Fig. 4H) with two short, robust spurs and 3–7 teeth; hind tibia (Fig. 4I) with two short, robust spurs and 0–2 teeth, covered with three types of setae, short setae on inner margin, short but stout setae as spines on outer margin and long setae distally; all tarsomeres normally developed on fore leg but reduced on mid and hind legs. Claws normally developed, with a pointed spine. Pulvilli present. Lengths (in µm) and proportions of legs as in Table 1.

Hypopygium (Figs 5C, D; 6C, D). Anal tergite bands strongly developed, fused anteriorly. Anal tergite with 46–62, 50 moderately long setae medially and posteriorly. Anal point robust and broadly rounded, 73–100, 84 µm long, with several moderately long setae. Superior volsella absent. Median volsella broadly digitiform, with 8–13, 10 long setose lamellae, covered with numerous microtrichia. Inferior volsella extremely long, 240–305, 262 µm long, strongly curved, extending beyond apex of gonostylus, distally rounded, with 21–52, 42 setae and numerous microtrichia. Gonocoxite 205–340, 252 µm long. Gonostylus short, 158–195, 172 µm long, with inner margin weakly expanded for some distance in basal 5/7, distally sharply constricted, with 3–5, 4 small apical teeth; moveably inserted on gonocoxite. Transverse sternapodeme 13–23, 20 µm long, without oral projections. Phal-

Table 1. Lengths (in µm) and proportions of legs of *Dicrotendipes sinicus* Lin & Qi **sp. n.**, male (n = 10)

	fe	ti	ta_1	ta_2	ta_3	ta_4
p_1	780-1050, 892	670-875, 750	1100-1425, 1225	690-900, 792	590-770, 680	490-640, 555
p_2	335-570, 489	370-600, 514	115-175, 135	48-63, 54	35-53, 44	30-45, 38
p_3	660-920, 753	540-740, 653	133-170, 151	40-65, 53	40-54, 49	35-53, 39

	ta_5	LR	BV	SV	BR
p_1	200-240, 219	1.57-1.80, 1.64	1.20-1.31, 1.28	1.24-1.47, 1.34	0.79-1.54, 1.02
p_2	35-75, 64	0.19-0.32, 0.27	4.55-6.61, 5.69	5.97-8.97, 7.47	0.53-0.85, 0.68
p_3	63-75, 68	0.20-0.26, 0.23	6.34-8.11, 7.48	8.35-10.22, 9.32	0.46-1.39, 0.73

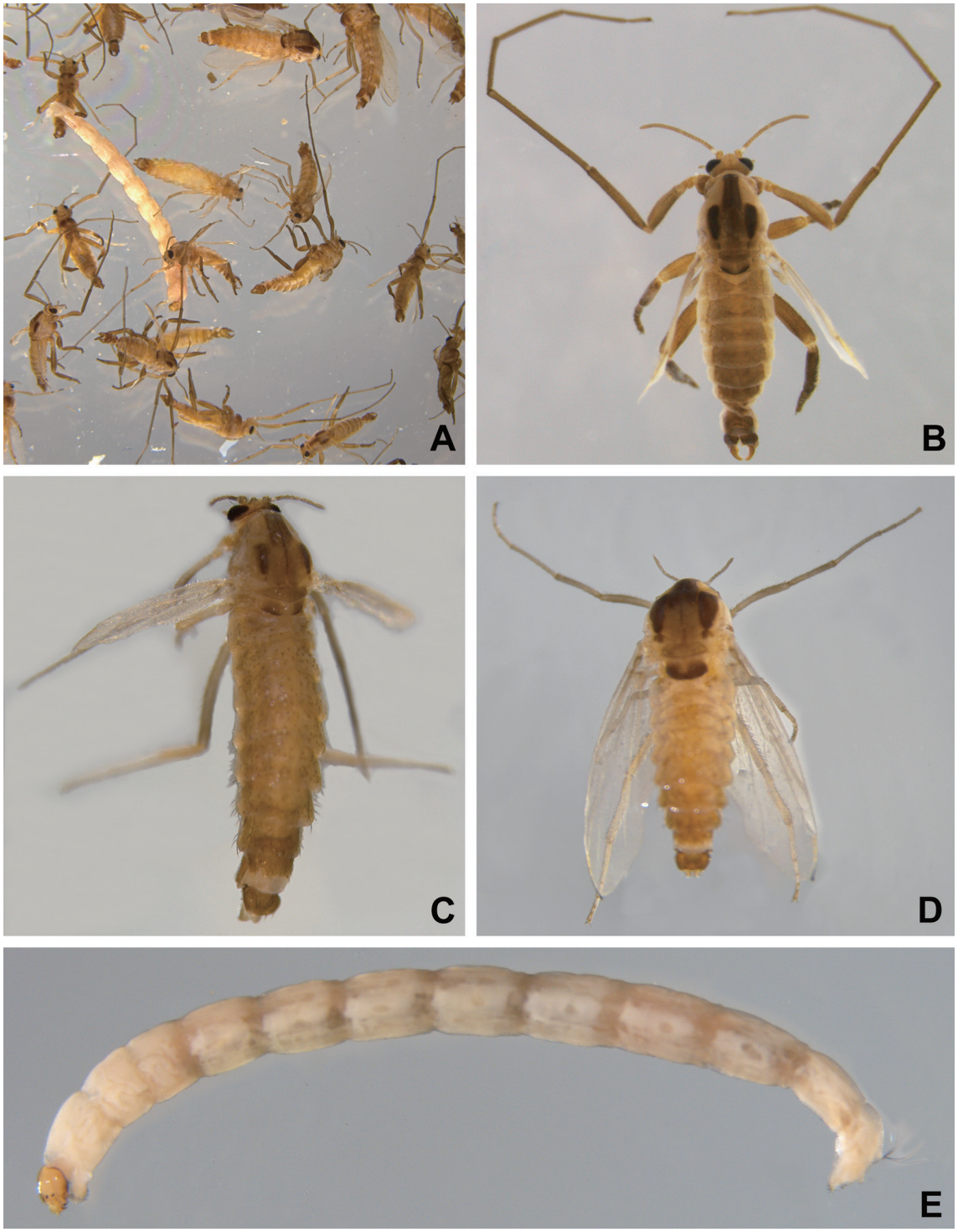

Figure 1. *Dicrotendipes sinicus* Lin & Qi **sp. n.** in 85% ethanol. A, adults and a larva; B, adult male dorsal view; C-D, adult female dorsal view; E, larva lateral view. First published by Qi et al. (2018), Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0).

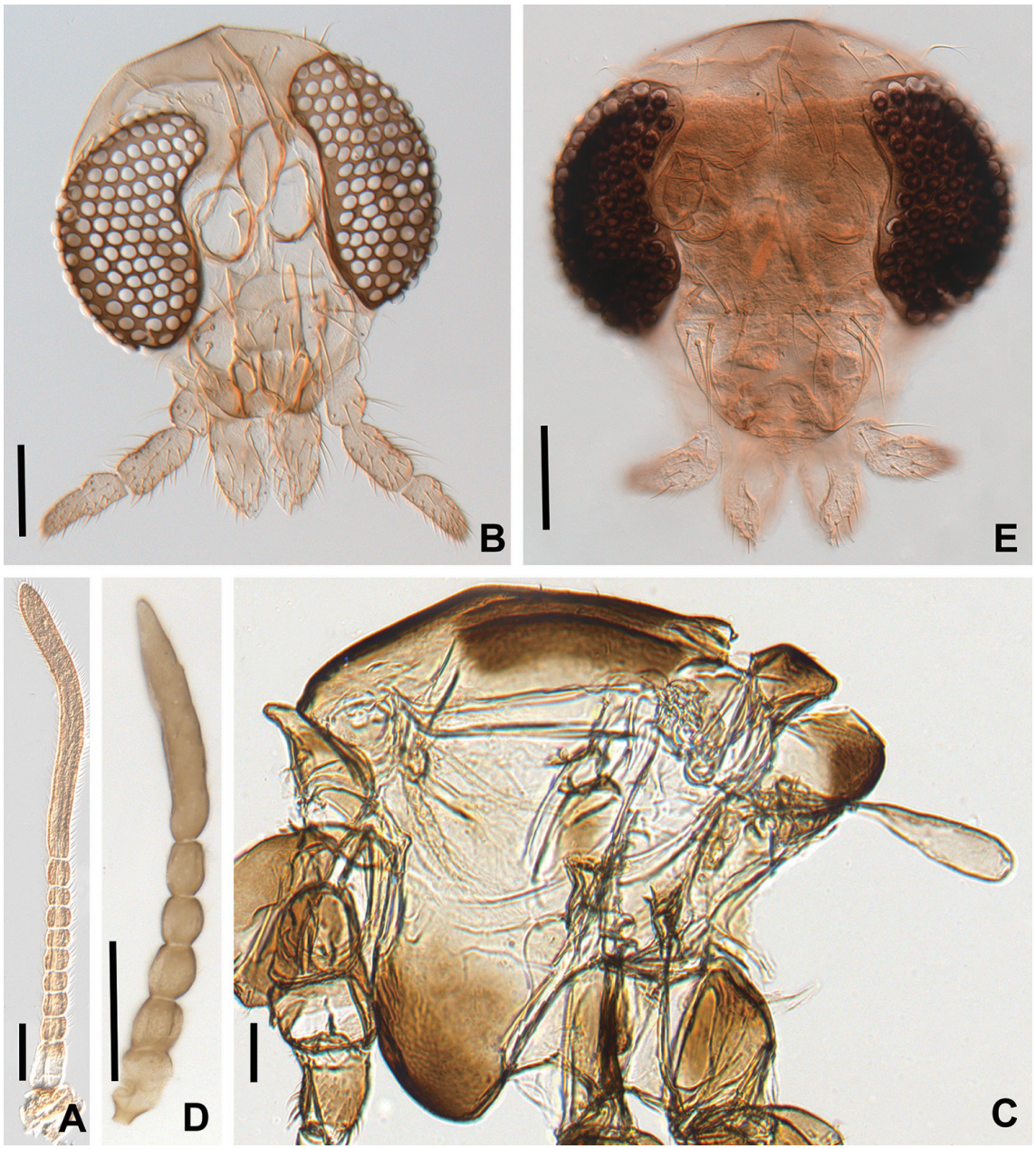

Figure 2. Antenna, head and thorax of *Dicrotendipes sinicus* Lin & Qi **sp. n.** adults. A, adult male antenna; B, adult male head; C, adult male thorax; D, adult female antenna; E, adult female head. Scale bars = 100 µm. First published by Qi et al. (2018), Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0).

lapodeme 145–235, 170 µm long. HR 1.24–1.74, 1.46; HV 1.38–2.59, 1.85.

Adult female (n = 6, unless otherwise stated)

Total length 3.58–5.70, 4.53 mm. Wing length very variable, 1.30–2.33, 1.77 mm. Total length/wing length 1.68–4.30, 2.86.

Coloration (Figs 1C, D). Slightly darker than adult male.

Head (Fig. 2E). Eye glabrous, without extension. Frontal tubercles 8–10, 9 µm long, 18–30, 24 µm wide. Temporal setae 7–9, 8, including 1–2, 2 inner verticals, 4–5, 4 outer verticals and 0–3, 2 postorbitals. Clypeus with 18–30, 21 setae. Tentorium 103–150, 127 µm long, 13–15, 14 µm wide. Palp three segmented, shortened without subapical sensilla (Fig. 2E). Palpomere lengths (in µm): 35–40, 37; 35–50, 41; 70–98, 83.

Antenna (Fig. 2D). Plume absent; with six flagellomeres. Flagellomere length (in µm): 53–70, 59; 35–63, 49; 38–50, 44; 35–45, 40; 38–50, 44; 170–200, 187; AR 0.74–0.80, 0.76.

Thorax (Fig. 7A). Antepronotal lobes moderately developed, dorsally separated. Scutum not

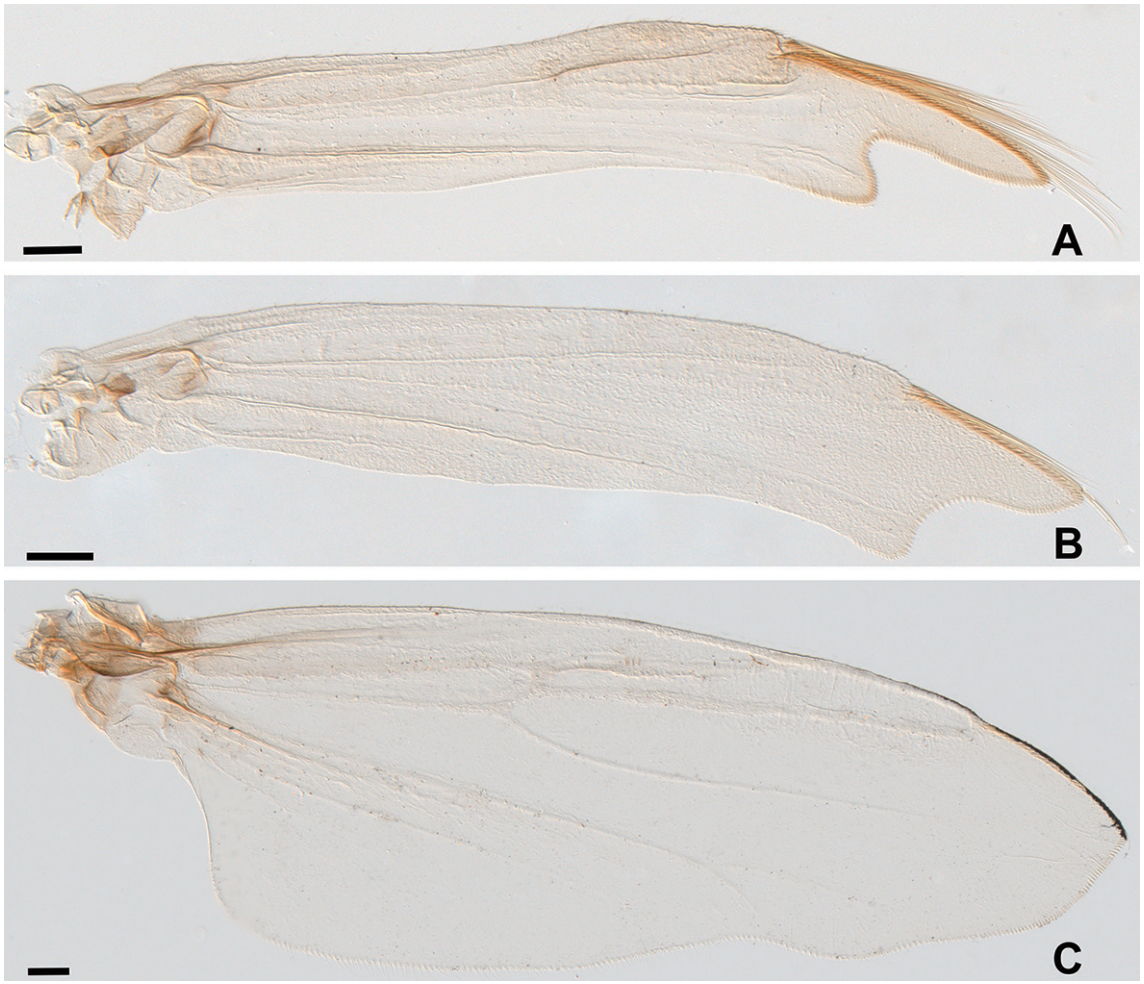

Figure 3. Wings of *Dicrotendipes sinicus* Lin & Qi **sp. n.** adults. A, brachypterous, oar-shaped wing of adult male; B, brachypterous, oar-shaped wing of adult female; C, fully developed wing of adult female. Scale bars = 100 μm. First published by Qi et al. (2018), Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0).

protruding beyond antepronotum, with tubercle. Acrostichals usually absent, sometimes 1–5, 2 (3); dorsocentrals 10–17, 12; prealars 3–9, 6; scutellars 4–14, 10.

Wing (Figs 3B, C). Fully developed, or shortened (brachypterous females), oar-shaped, bifurcated, with tuft of long strong setae apically. Membrane with numerous microtrichia. VR 1.56–1.77, 1.67. Brachiolum with 0–1, 1 seta. R with 6–9, 7 setae; R_1 with 7–9, 8 setae; R_{4+5} with 3–7, 5 setae; remaining veins and cells bare. Squama glabrous. Anal lobe slightly developed.

Legs (Figs 4D-F, J-L). Fore leg (Fig. 4D) very similar to hind legs (Fig. 4F), mid legs (Fig. 4E) shortest; apex of fore tibia (Fig. 4J) without spur; mid tibia (Fig. 4K) with 4–13 small teeth and two short, robust spurs, 15–23, 18 and 10–20, 17 μm long; hind tibia (Fig. 4L) with one robust spur 10–15, 14 and 5–15, 9 small teeth; all tarsomeres normally developed on fore leg but reduced on mid and hind legs. Claws normally developed, with one spine on each side. Pulvilli present. Lengths (in μm) and proportions of legs as in Table 2.

Abdomen (Fig. 7B). Number of setae on tergite I–VIII: 14–30, 19; 27–54, 40; 52–70, 62; 48–96, 64; 48–68, 57; 33–46, 39; 20–24, 22; 7–16, 13. Number of setae on sternites I–VIII: 0; 5–12, 8; 19–30, 23; 21–33, 25; 19–29, 24; 15–36, 23; 2–8, 5; 44–48, 45.

Genitalia (Fig. 7C). Tergite IX without setae; gonocoxite IX with 13–22, 19 setae. Cercus 100–185, 122 μm long, 50–110, 81 μm long, with 27–90, 45 setae. Seminal capsules oval, 165–230, 189 μm long, 110–160, 134 μm wide; spermathecal duct 180–300, 239 μm long. Notum 345–380, 365 μm long.

Pupa (n = 8, unless otherwise stated)

Total length 4.93–6.58, 5.68 mm. Cephalothorax brown, abdomen mostly yellow, but lateral regions

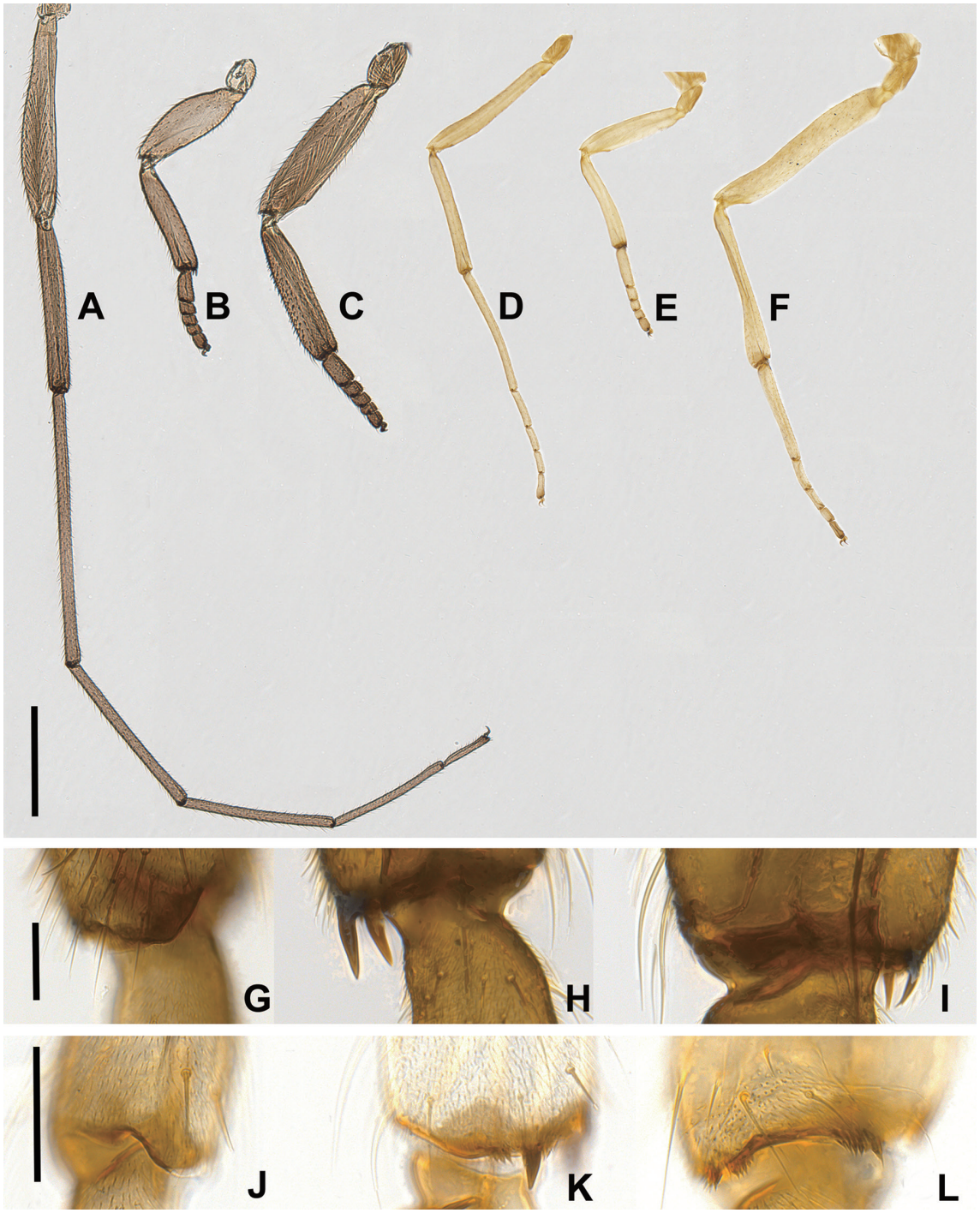

Figure 4. Legs of *Dicrotendipes sinicus* Lin & Qi **sp. n.** adults. A, male fore leg, scale bar = 500 µm; B, male mid leg, scale bar = 500 µm; C, male hind leg, scale bar = 500 µm; D, female fore leg, scale bar = 500 µm; E, female mid leg, scale bar = 500 µm; F, female hind leg, scale bar = 500 µm; G, part of male fore tibia, scale bar = 50 µm; H, part of male mid tibia showing spurs and tooth-shaped combs, scale bar = 50 µm; I, part of male hind tibia showing tooth-shaped combs, scale bar = 50 µm; J, part of female fore tibia, scale bar = 50 µm; K, part of female mid tibia showing spurs and tooth-shaped combs, scale bar = 50 µm; L, part of female hind tibia showing tooth-shaped combs, scale bar = 50 µm.

of segments VI–VIII and anal segment dark brown.

Cephalothorax (Figs 8A-C). Frontal setae 25–63, 41 µm long. Cephalic tubercles present (Fig. 8A). Antepronotum with one median seta, 38–68, 57 µm long. Two precorneals present, 30–55, 45 and 25–45, 35 µm long. Thoracic horn 450–650, 564 µm long, 25–38, 30 µm wide, plumose, divided into numerous fine branches (Fig. 8B); basal ring strongly constricted medially, with 2 separated tracheal marks (Fig. 8C). Anterior dorsocentral seta (Dc_1) 25–50, 39 µm long; Dc_2 48–85, 63 µm long; Dc_3 18–48, 34 µm long; Dc_4 30–70, 41 µm long. Distance between Dc_1 and Dc_2 30–125, 80 µm; between Dc_2 and Dc_3 60–103, 89 µm; between Dc_3 and Dc_4 23–40, 31 µm.

Abdomen (Figs 8D, E). Tergite I without shagreen; II–VI with continuous median, longitudinal field of uniform shagreen; VII bare; VIII with anterior pair of patches of fine shagreen; anal segment bare (Fig. 8D). Hook row continuous, 380–540, 446 µm wide, occupying about 1/2 width of segment. Conjunctives III/IV, IV/V and V/VI with transverse band of fine spinules. Vortex present on segment IV; pedes spurii B absent on segment II. Anal comb (Fig. S8E) of segment VIII dark brown, with strong and short stalk 48–77, 59 µm wide, with 4–6, 6 apical brown pointed spines and several spinules.

Table 2. Lengths (in µm) and proportions of legs of *Dicrotendipes sinicus* Lin & Qi **sp. n.**, female (n = 6)

	fe	ti	ta_1	ta_2	ta_3	ta_4
p_1	460–670, 558	400–540, 468	365–550, 478	110–163, 146	70–105, 91	60–103, 85
p_2	320–450, 399	300–430, 363	83–180, 148	40–60, 50	25–45, 37	35–38, 36
p_3	580–890, 758	500–700, 606	300–450, 378	100–150, 378	83–105, 96	50–75, 62

	ta_5	LR	BV	SV	BR
p_1	80–113, 97	0.91–1.06, 1.02	3.38–3.85, 3.60	2.01–2.44, 2.15	1.13–1.89, 1.47
p_2	50–65, 58	0.28–0.49, 0.40	4.44–5.91, 5.02	4.45–7.47, 5.35	0.75–1.11, 0.92
p_3	65–85, 78	0.59–0.65, 0.62	4.44–5.10, 4.74	3.46–3.79, 3.61	0.82–1.63, 1.17

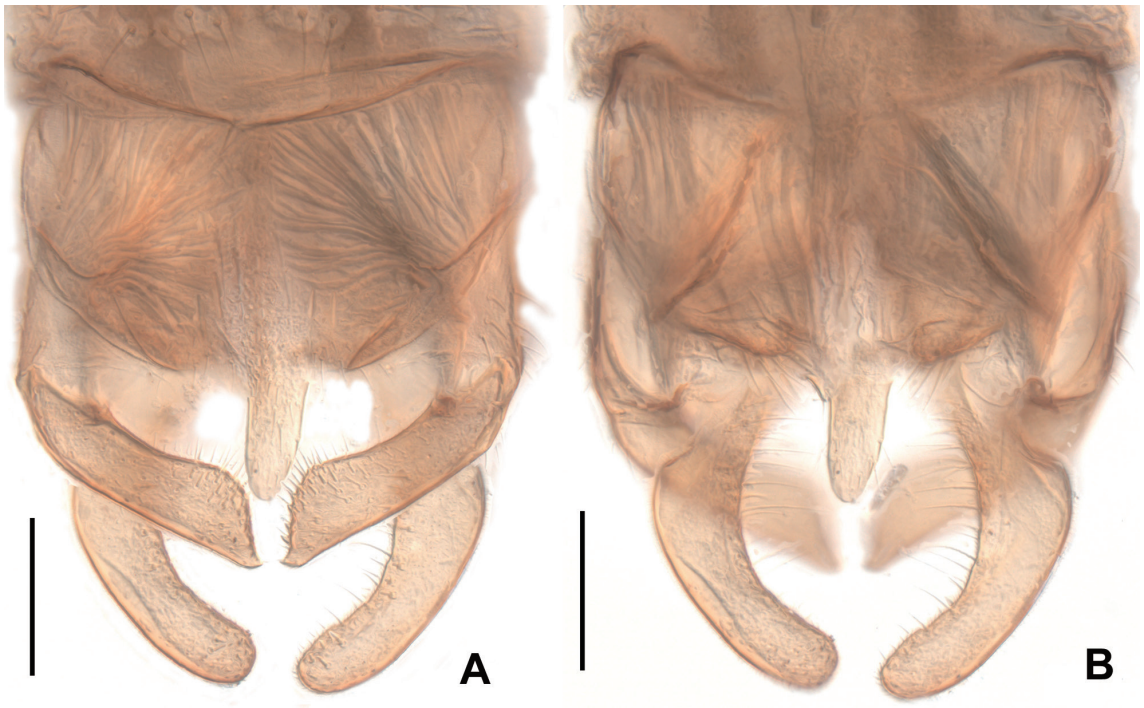

Figure 5. Adult male hypopygium of *Dicrotendipes sinicus* Lin & Qi **sp. n.** A, hypopygium dorsal view; B, hypopygium ventral view. Scale bars = 50 µm. First published by Qi et al. (2018), Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0).

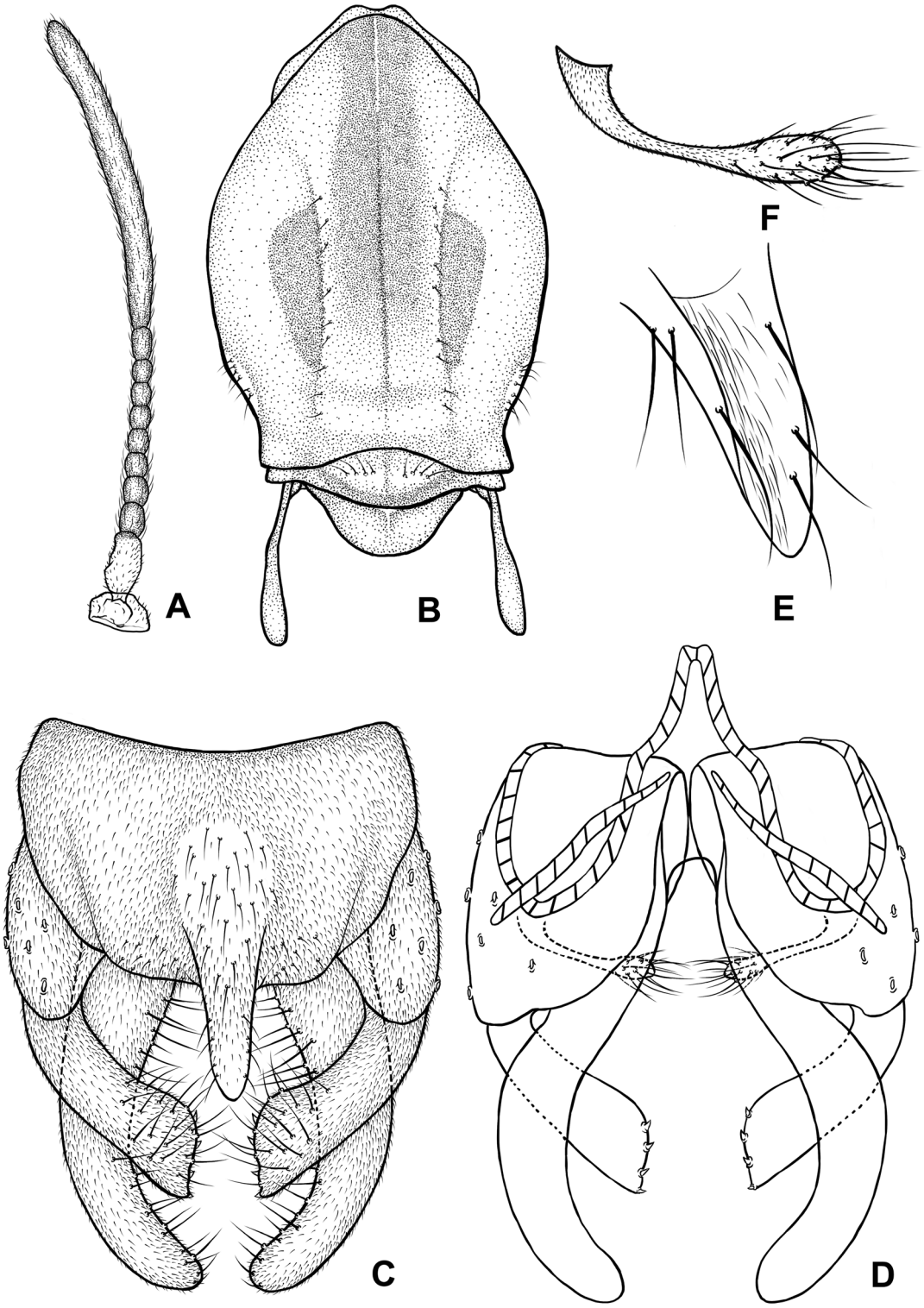

Figure 6. Adult male of *Dicrotendipes sinicus* Lin & Qi **sp. n.** A, antenna; B, thorax; C, hypopygium dorsal view; D, hypopygium ventral view; E, anal point lateral view; F, median volsella. First published by Qi et al. (2018), Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0).

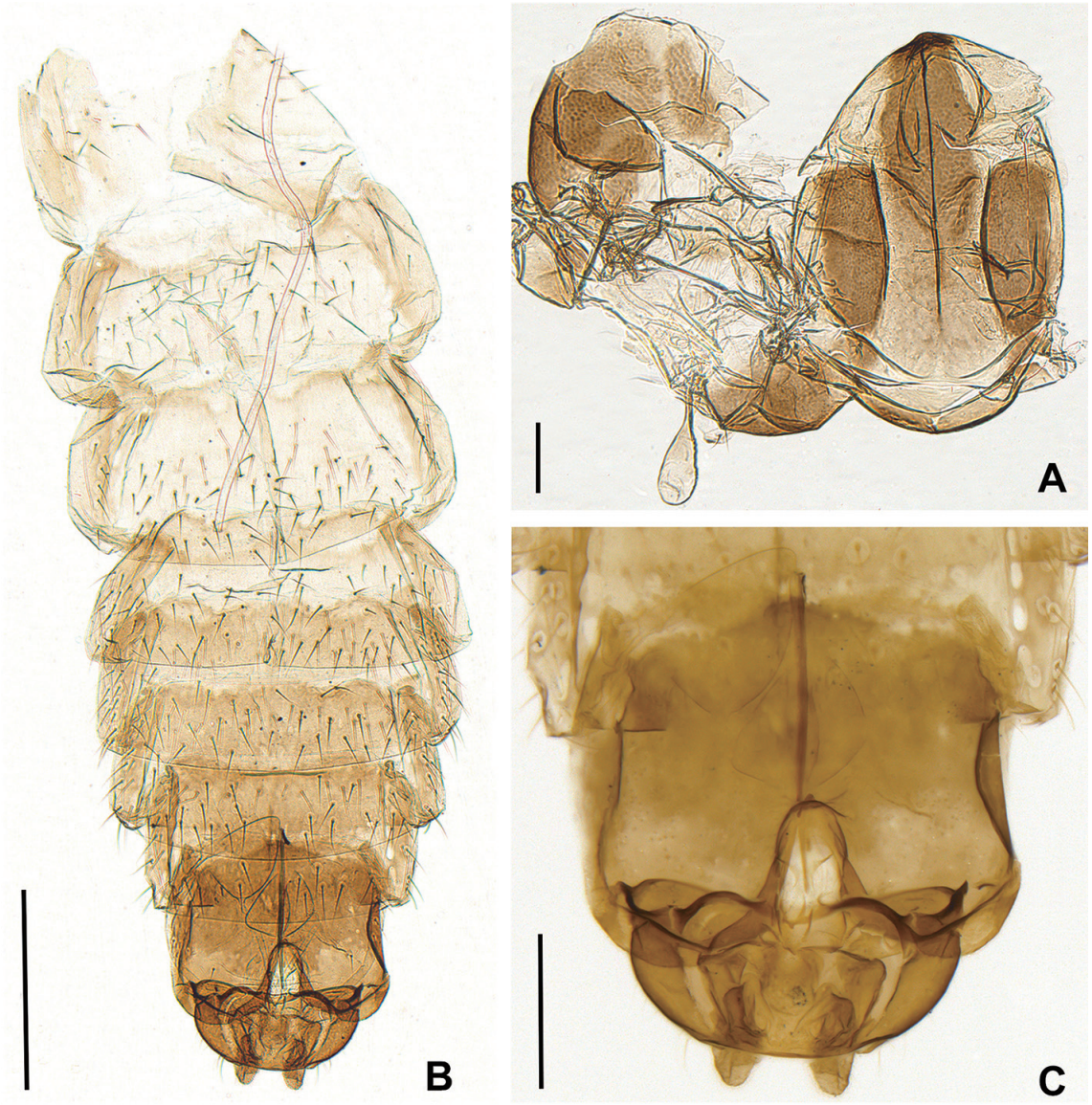

Figure 7. Adult female of *Dicrotendipes sinicus* Lin & Qi **sp. n.** A, thorax dorsal view, scale bar = 200 µm; B, abdomen, scale bar = 500 µm; C, genitalia, scale bar = 200 µm. First published by Qi et al. (2018), Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0).

Abdominal setation. Segment II–III with 2–3, 2 L setae; IV with 2 L setae; V–VIII with 4 L taeniae.

Anal lobe well-developed, with fringe of 43–57, 50 taeniae, 200–500, 393 µm long. Genital sac of male extending beyond anal lobe.

Larva, 4th instar (n = 6, unless otherwise stated)

Body slender (Fig. 1E), length of 4th instar 7.63–8.40, 8.00 mm; head capsule (Fig. 9A) 400–450, 416 µm long, 370–425, 388 µm wide, length/width 1.05–1.09, 1.07; mental and mandibular teeth dark brown.

Dorsal surface of head. With frontal apotome, clypeus, and labral sclerite 2 present.

Antenna (Fig. 9B). With five segments. Antennal segment length (in µm): 50–58, 53; 10–15, 12; 7–8, 8; 6–8, 8; 3–5, 4; AR 1.61–1.70, 1.62. Antennal blade 18–25, 21 µm long. Ring organ situated in proximal 1/2 of basal segment. Seta absent.

Labrum. S I subapically plumose; S II simple; S III and S IV normally developed. Clypeal seta S3 long, simple. Labral lamella normally developed. Pecten epipharyngis simple, consisting of 3–7, 4 robust, blunt teeth. Premandible 60–83, 72 µm long, with 4 teeth; premandibular brush well developed. Maxilla with one long lacinial chaeta, palp normally developed.

Mandible. Mandible 138–155, 146 µm long, 45–63, 52 µm wide, with one ventral apical tooth,

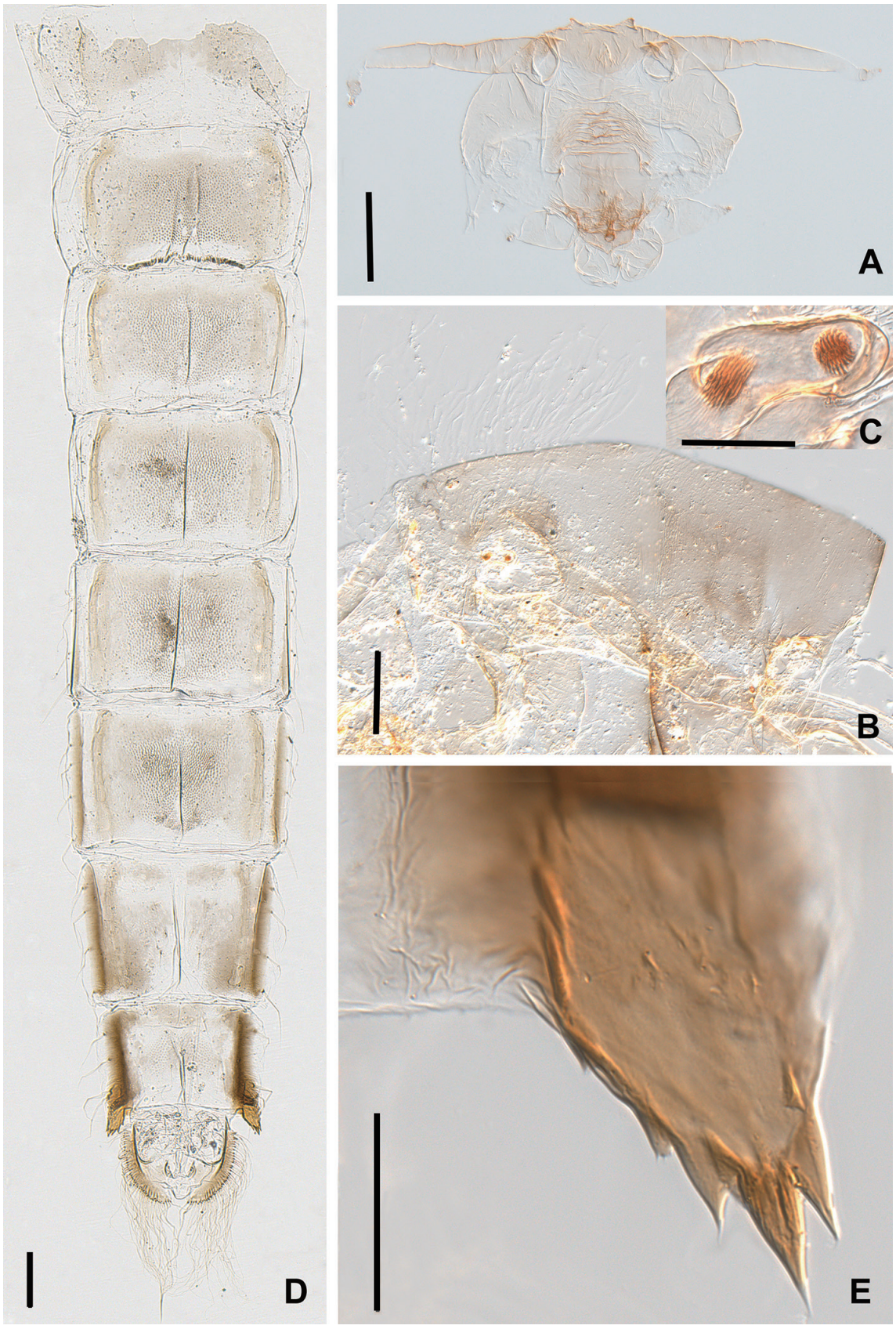

Figure 8. Pupal exuviae of *Dicrotendipes sinicus* Lin & Qi **sp. n.** A, frontal apotome and ocular field, scale bar = 200 µm; B, thorax, scale bar = 200 µm; C, basal ring, scale bar = 50 µm; D, tergites, scale bar = 200 µm; E, posterolateral comb of segment VIII, scale bar = 50 µm. First published by Qi et al. (2018), Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0).

Figure 9. Larval head capsule of *Dicrotendipes sinicus* Lin & Qi **sp. n.** A, whole larval head capsule; B, larval antenna. Scale bars = 50 µm. First published by Qi et al. (2018), Attribution-NonCommercial-NoDerivatives 4.0 International (CC BY-NC-ND 4.0).

three ventral inner teeth, one dorsal, dark apical tooth present; two outer mandibular setae present; seta subdentalis narrow, with pointed apex, 15–20, 17 µm long; seta interna well developed with three main plumose branches with long stalks. Pecten mandibularis well-developed, with eight long lamellae, the longest seta 25–48, 37 µm long.

Mentum. Mentum 115–133, 125 µm wide, with a rounded, trifid median tooth, six pairs of lateral teeth, regularly decreasing in size laterally; ventromental plates 90–108, 101 µm wide, MVR 1.19–1.37, 1.24, medially separated by about twice width of median mental tooth, with distinct striae. Postmentum 183–188, 186 µm long. Seta submenti simple, 50–70, 62 µm long.

Body. Procercus short, 18–50, 33 µm long, always bearing eight long anal setae, the longest seta 350–400, 384 µm long. Lateral and ventral tubules absent. Anal tubules of normal size, digitiform.

Acknowledgements

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References

ICZN = International Commission on Zoological Nomenclature 1999. International Code of Zoological Nomenclature (Fourth edition). International Trust for Zoological Nomenclature, London.

ICZN 2012. Amendment of Articles 8, 9, 10, 21 and 78 of the International Code of Zoological Nomenclature to expand and refine methods of publication. - Zootaxa 3450: 1–7.

Qi, X., Lin, X.L., Ekrem, T., Beutel, R.G., Song, C., Orlov, I., Chen, C.T. and Wang, X.H. 2018 . A new surface gliding species of Chironomidae: An independent invasion of marine environments and its evolutionary implications. - *Zoologica Scripta* 48(1): 81–92. [first published online 13.xii.2018, with issue pagination i.2019]

Sæther, O.A. 1980. Glossary of chironomid morphology terminology (Diptera: Chironomidae). - *Entomologica Scandinavica Supplement* 14: 1–51.

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