



This work is licensed under a Creative Commons Attribution Licence (CC BY 4.0).

## Research article

[urn:lsid:zoobank.org/pub:86D073C6-481E-4929-B978-100C36A911B6](https://zoobank.org/pub:86D073C6-481E-4929-B978-100C36A911B6)

# Two new species of *Lepidocyrtus* Bourlet s. lat. (Collembola: Entomobryidae) from China

Yitong MA

School of Life Science, Nantong University, Nantong, Jiangsu 226000, P.R. China.

Email: [mayitong@ntu.edu.cn](mailto:mayitong@ntu.edu.cn)

[urn:lsid:zoobank.org/author:50F82475-5B63-461D-BC1D-555FE4BF7C09](https://zoobank.org/author:50F82475-5B63-461D-BC1D-555FE4BF7C09)

**Abstract.** Two new species of the genus *Lepidocyrtus* Bourlet, 1839 from southern China are described here: *L. (Acrocyrtus) huizhouensis* sp. nov. from Guangdong Province and *L. (Setogaster) wanningensis* sp. nov. from Hainan Province. *Lepidocyrtus (Acrocyrtus) huizhouensis* sp. nov. is the fourth species of the subgenus reported from China and *L. (Setogaster) wanningensis* sp. nov. is the first report of the subgenus from China.

**Keywords.** Lepidocyrtinae, taxonomy, chaetotaxy, southern China.

Ma Y. 2019. Two new species of *Lepidocyrtus* Bourlet s. lat. (Collembola: Entomobryidae) from China. *European Journal of Taxonomy* 565: 1–21. <https://doi.org/10.5852/ejt.2019.565>

## Introduction

*Lepidocyrtus* Bourlet, 1839 s. lat., the second largest genus of the subfamily Lepidocyrtinae Wahlgren, 1906, is characterized by having four-segmented antennae, 8+8 eyes, a bidentate mucro with a basal spine, finely ciliate scales and often the absence of dental spines. It contains eight subgenera (Cipola *et al.* 2018) and their main differences are listed in Table 1.

The subgenus *Acrocyrtus* Yosii, 1959 is characterized by the presence of pointed basal tubercles on the dentes and of ciliate scales on body (Xu *et al.* 2013). Among the 28 species of the subgenus, 18 were described or reported from Southeast Asia, including Malaysia, Singapore, Indonesia and Vietnam. Five are from India and three from Oceania. Three are from China: *L. (A.) heterolepis* (Yosii, 1959) from Taiwan and Hongkong, and *L. (A.) finis* Xu *et al.*, 2013 and *L. (A.) zhujiensis* Xu *et al.*, 2013 from Zhejiang Province.

The basal dental tubercles of the subgenus *Setogaster* Salmon, 1951 are rounded and scales are often absent on antennae I and II and the legs (Cipola *et al.* 2018). Among the 15 species of the subgenus, five were described from Singapore and Indonesia. Four are from Brazil and Peru, three from India, two from America and one from Rwanda (Bellinger *et al.* 1996–2019). No reports exist for China. In this paper, two new species of the genus *Lepidocyrtus* are described from southern China: *L. (Acrocyrtus) huizhouensis* sp. nov. from Guangdong Province and *L. (Setogaster) wanningensis* sp. nov. from Hainan Province.

## Material and methods

Specimens were cleared and mounted under a coverslip in Marc André II solution and were studied with a Leica DM2500 microscope. Photographs were taken with a mounted Leica DFC300 FX digital camera and enhanced in Photoshop CS2 (Adobe Inc.). The nomenclature of the dorsal chaetotaxy of the head follows Jordana & Baquero (2005) and that of the interocular chaetae follows Mari-Mutt (1986). Labial chaetae are designated following Gisin (1967) and the labial papillae and maxillary palp following Fjellberg (1999). Tergal chaetae of the body are designated using the system of Szeptycki (1979) and specialized chaetae (S-chaetae) using Zhang & Deharveng (2015).

## Abbreviations

Abd. = abdominal segment  
Ant. = antennal segment  
mac = macrochaeta(e)  
mic = microchaeta(e)  
ms = specialized S-microchaeta(e) (microsensillum, -a)  
NTU = Nantong University  
S-chaeta(e) = specialized chaeta(e) (including ms)  
Th. = thoracic segment

## Results

Class Collembola Lubbock, 1873  
Order Entomobryomorpha Börner, 1913  
Family Entomobryidae Schäffer, 1896  
Subfamily Lepidocyrtinae Wahlgren, 1906  
Genus *Lepidocyrtus* Bourlet, 1839  
Subgenus *Acrocyrtus* Yosii, 1959

## Diagnosis

Scales present on body; mucro bidentate and accessory spinelet may be present; pointed tubercles present and spines absent on dens.

*Lepidocyrtus (Acrocyrtus) huizhouensis* sp. nov.

[urn:lsid:zoobank.org:act:84932A79-4AF3-4A55-B732-77B63164F3AC](https://zoobank.org/act:84932A79-4AF3-4A55-B732-77B63164F3AC)

Figs 1–9, Table 2

## Diagnosis

Blue pigment distributed on antennae, head, body tergites, manubrium, femora and tibiotarsi. Irregular patches present on Th. II–III. Scales present on Ant. I–II, femora and tibiotarsi. Ant. III with 6 to 11 rods distally. Labial chaetae M and R ciliate, m, e, l<sub>1</sub> and l<sub>2</sub> smooth. Frontal area of dorsal head with several clubbed chaetae. C1 on Abd. IV smooth mic. Subapical tooth of mucro much smaller than apical tooth.

## Etymology

Named after the type locality, Huizhou City.

## Type material

### Holotype

CHINA: ♀; Guangdong Province, Huizhou City, Longmen County, Shangping Village; 23°38'31.31" N, 113°50'38.68" E; in litter; collection no. 1125; 24 Aug. 2010; Yitong Ma leg.; with aspirator; on slide; NTU.



**Table 1.** Main differences to separate the eight subgenera (Cipola *et al.* 2018) of *Lepidocyrtus* Bourlet, 1839 s. lat.: *Acrocyrtus* Yosii, 1959 (= *Carocyrtus* Yoshii & Suhardjono, 1989 and *Onerocyrtus* Yoshii & Suhardjono, 1989), *Allocyrtus* Yoshii & Suhardjono, 1989, *Ascocyrtus* Yosii, 1963 (= *Dahlcyrtus* Yoshii & Suhardjono, 1989), *Cinctocyrtus* Yoshii & Suhardjono, 1989, *Fractocyrtus* Cipola & Bellini, 2018, *Lanocyrtus* Yoshii & Suhardjono, 1989, *Lepidocyrtus* Bourlet, 1839 and *Setogaster* Salmon, 1951.

Subgenus	Dental tubercle	Basal dental spines	Mucronal spinelet	Scales on Ant. I–II	Scales on legs	Apical bulb on Ant. IV
<i>Acrocyrtus</i>	pointed	–	–/+	+ (sometimes –)	+ (sometimes –)	–
<i>Allocyrtus</i>	rounded	3	–	–	–	–
<i>Ascocyrtus</i>	rounded	–	–	–/+	–/+	–
<i>Cinctocyrtus</i>	rounded	–	–/+	–	–	+
<i>Fractocyrtus</i>	truncated	>10	+	–	–	–
<i>Lanocyrtus</i>	–	–	–	–	–	–/+
<i>Lepidocyrtus</i>	–	–	–	+	+	–/+
<i>Setogaster</i>	rounded	–	+	– (sometimes +)	– (sometimes +)	–

Notes: – absent; + present; –/+ absent or present.

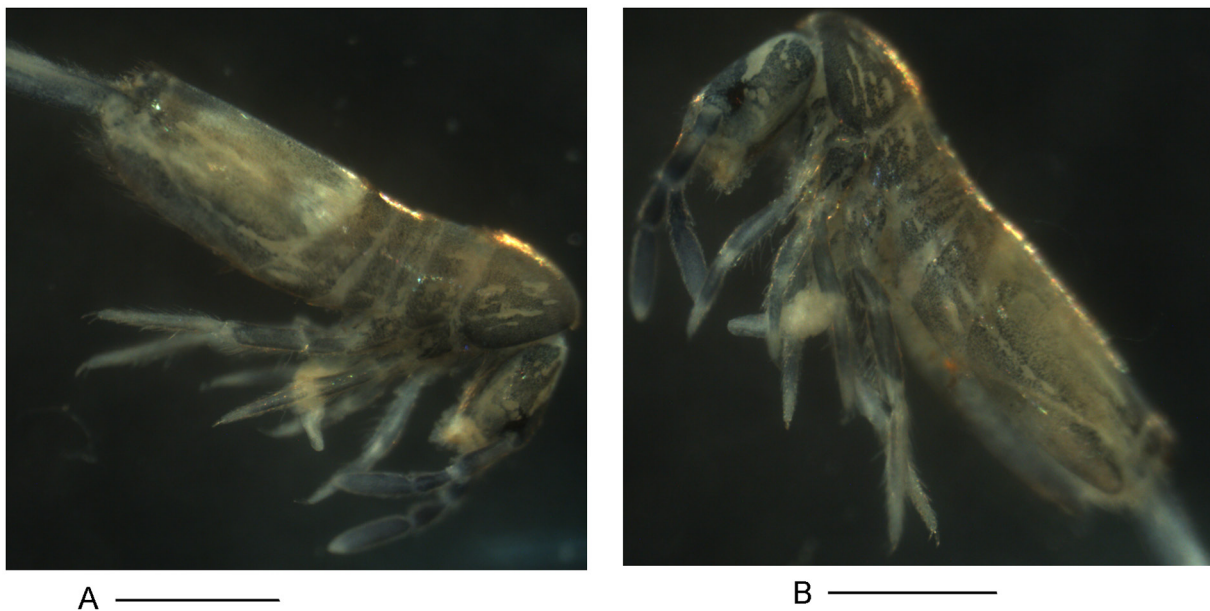
#### Paratypes

CHINA: 2 ♀♀; same collection data as for holotype; on slides; NTU.

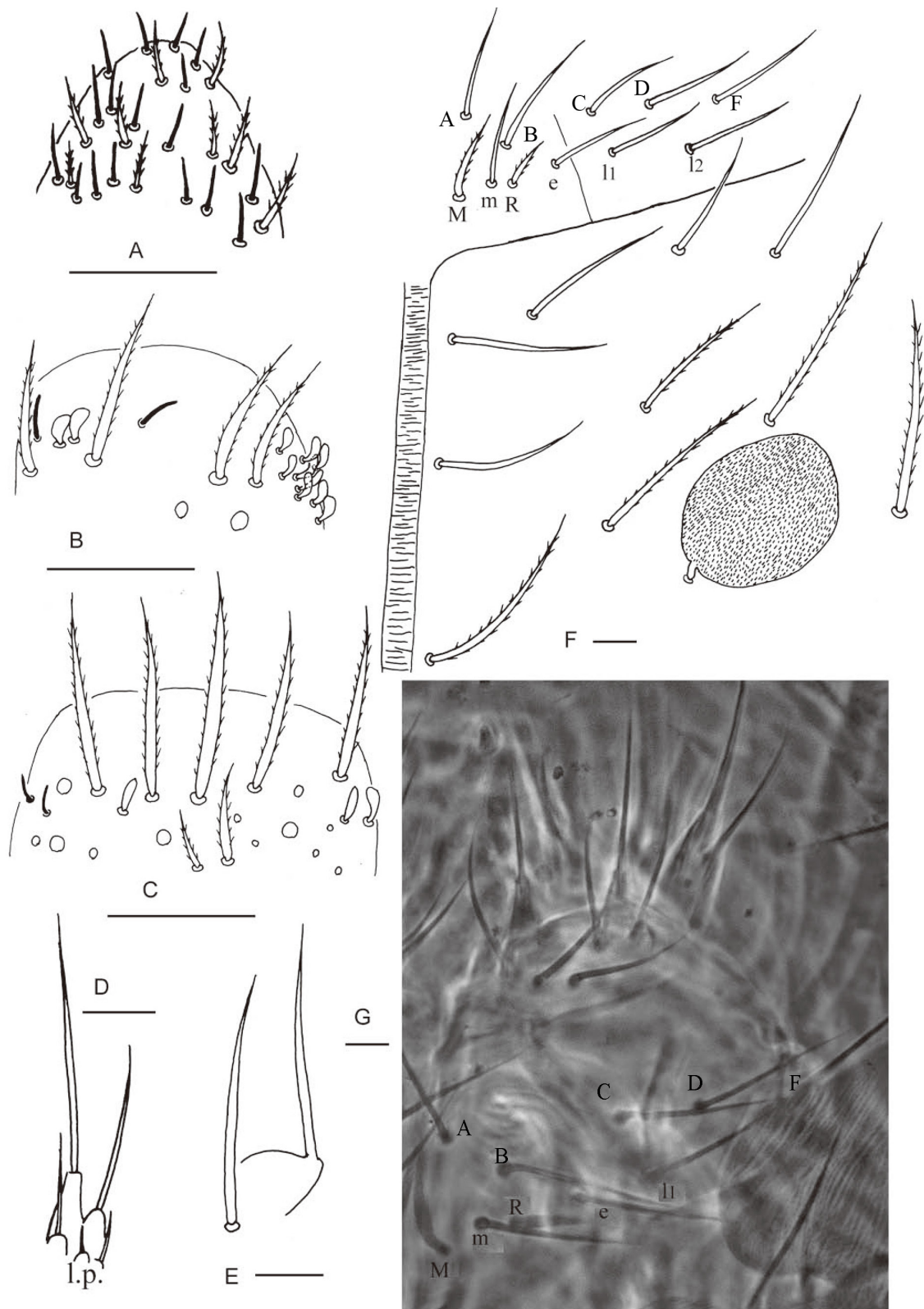
#### Description

MEASUREMENTS. Body (head + trunk) length up to 2.07 mm, holotype 2.07 mm long.

COLOUR. Body completely dark blue with depigmented spots; anterior head, distal collophore and dens depigmented; eyepatches dark (Fig. 1A–B).



**Fig. 1.** *Lepidocyrtus* (*A.*) *huizhouensis* sp. nov. **A–B.** Habitus. Scale bars: 500  $\mu$ m.

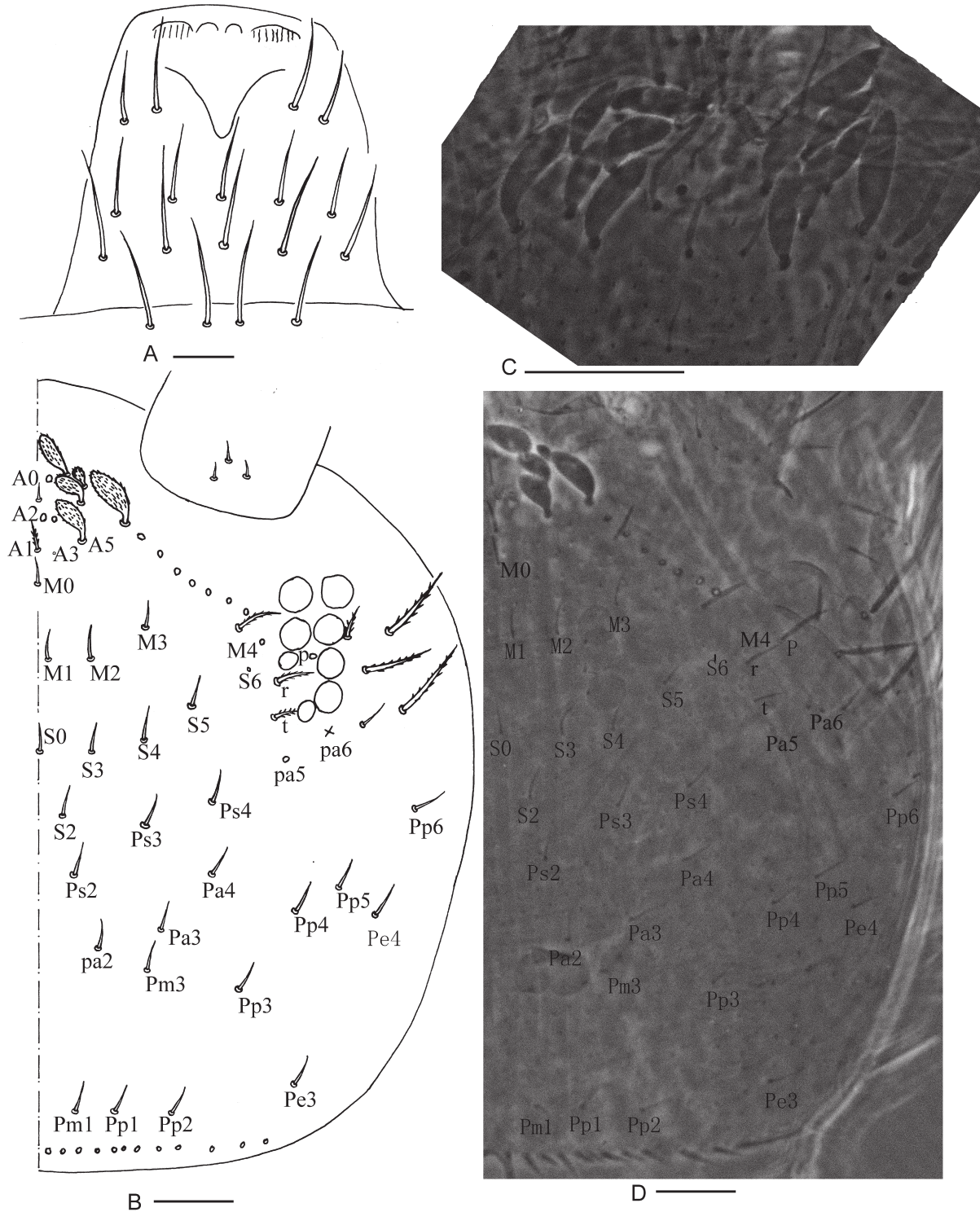


**Fig. 2.** *Lepidocyrtus (A.) huizhouensis* sp. nov. **A.** Apex of Ant. IV (left side). **B.** Distal part of Ant. III (lateral side). **C.** Distal part of Ant. II (left side). **D.** Lateral process of labial palp (right side). **E.** Maxillary outer lobe (left side). **F.** Labial and mental chaetotaxy (right side). **G.** Labial palp and labium (right side). Scale bars: 20 µm.

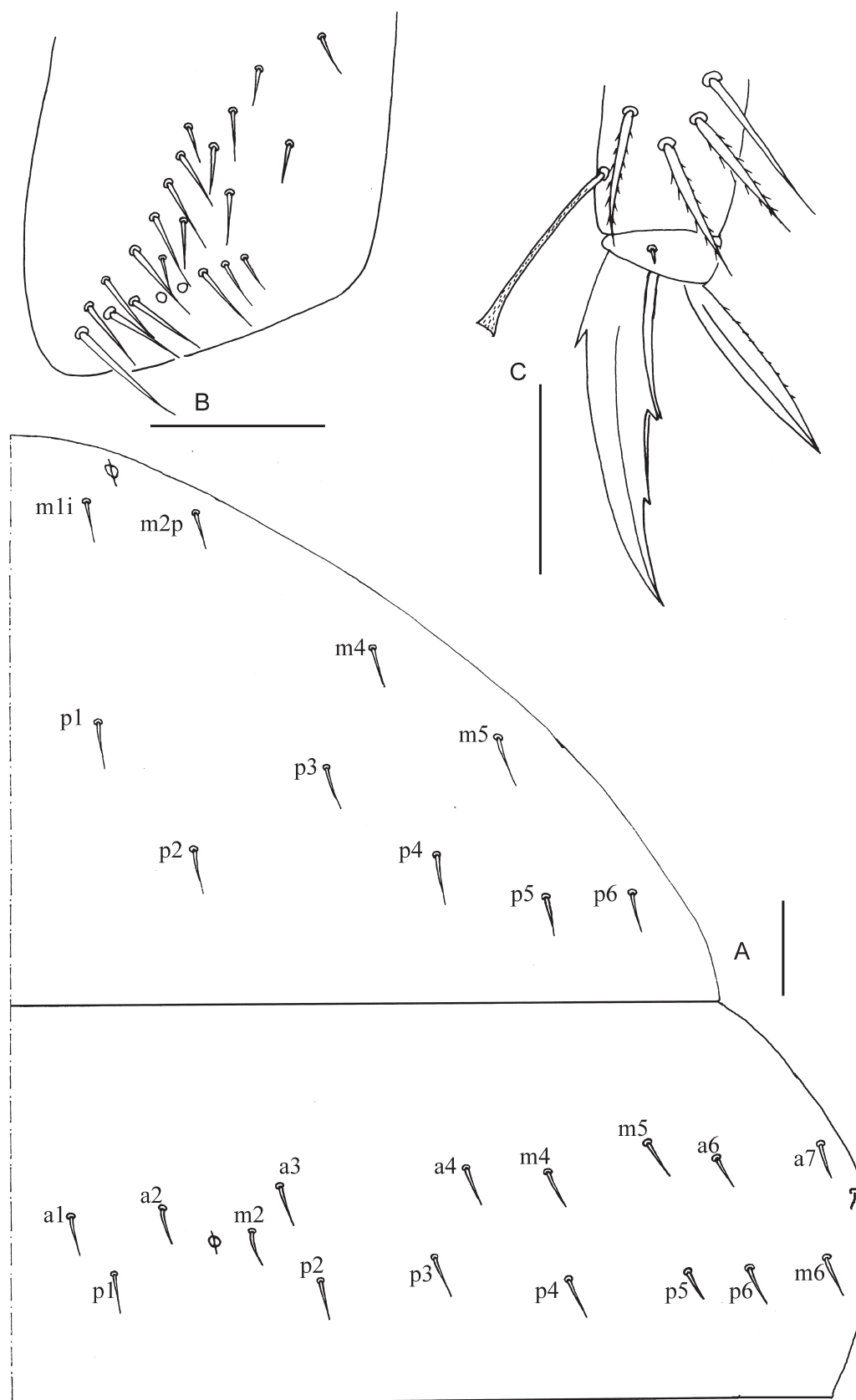


SCALES. Scales ciliate, oval to circular, present on Ant. I–II, both sides of head, thoracic and abdominal tergites, femora and tibiotarsi, and ventral side of furcula. Other appendages without scales.

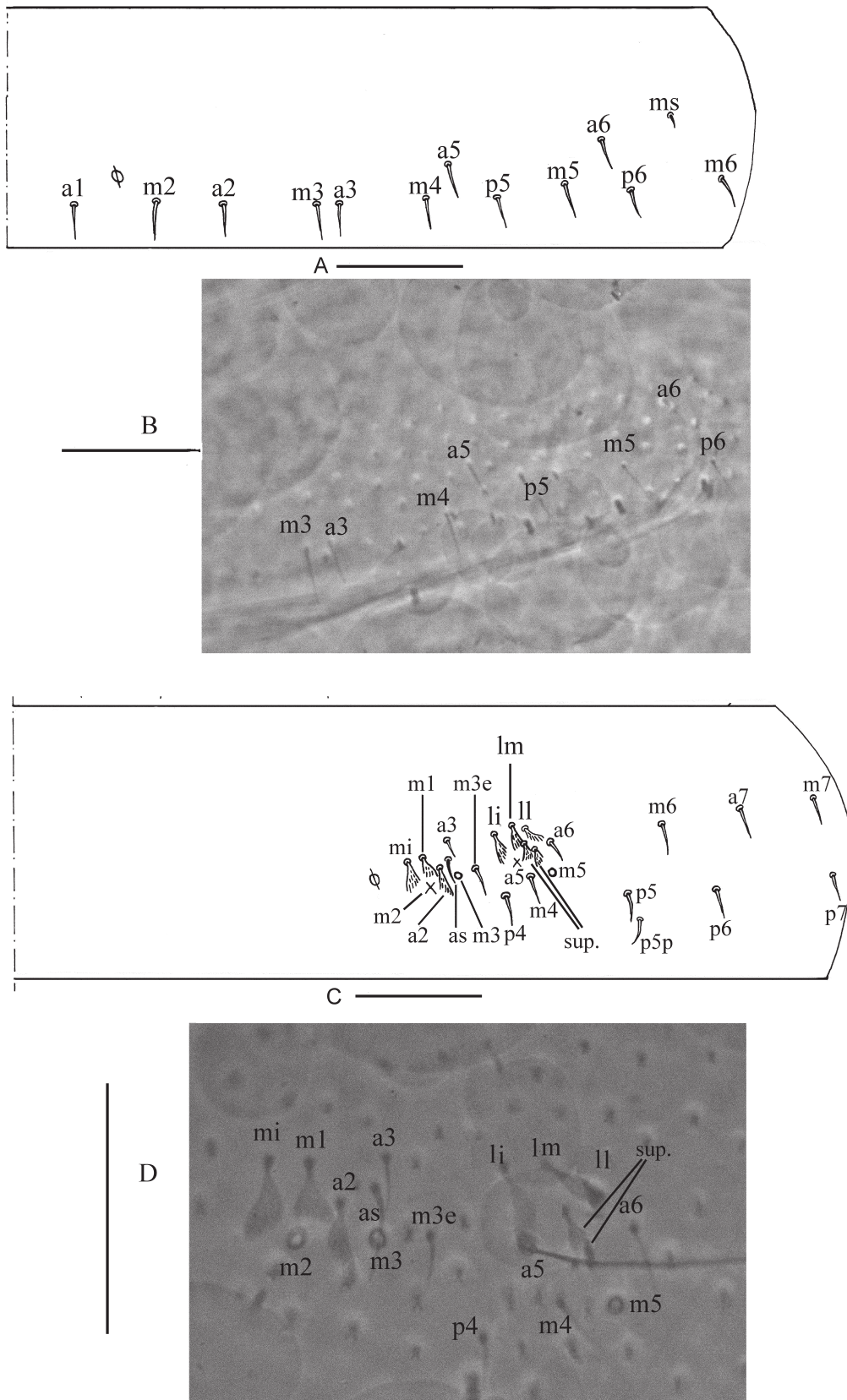
HEAD. Antenna 0.33–0.35 times as long as body. Antennal segment ratio of I:II:III:IV = 1.00:2.00–2.62:1.64–2.09:3.29–4.20, in holotype 1.00:2.27:1.73:3.36. Ant. IV without apical bulb (Fig. 2A).



**Fig. 3.** *Lepidocytrus* (*A.*) *huizhouensis* sp. nov. **A.** Labrum. **B.** Dorsal chaetotaxy of head (right side). **C.** Anterior part of dorsal head. **D.** Dorsal chaetotaxy of head (right side). Scale bars: 20  $\mu$ m.



**Fig. 4.** *Lepidocyrtus* (*A.*) *huizhouensis* sp. nov. **A.** Chaetotaxy of Th. II–III (right side). **B.** Trochanteral organ. **C.** Hind foot complex (anterior view). Scale bars: 30  $\mu$ m.



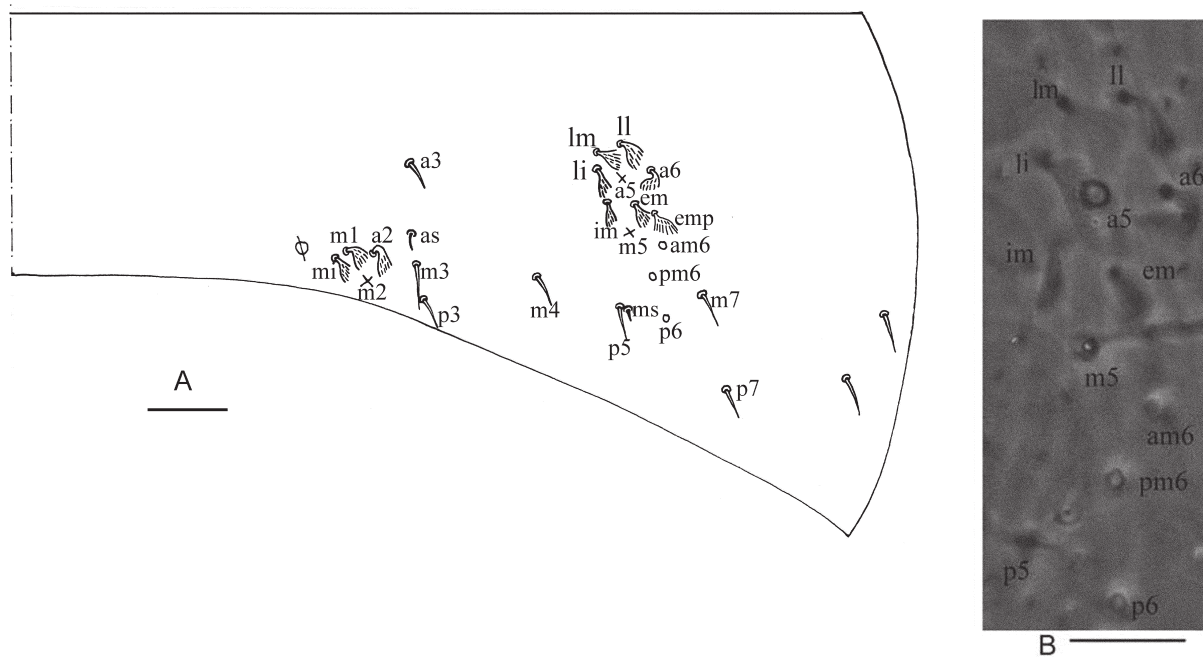
**Fig. 5.** *Lepidocyrtus (A.) huizhouensis* sp. nov., dorsal chaetotaxy (right side). **A–B.** Abd. I. **C–D.** Abd. II. Scale bars: 50  $\mu$ m.



Ant. III with 6 to 11 rods distally (Fig. 2B). Ant. II with 3 rods distally (Fig. 2C). Ant. I with 3 dorsal spiny mic (Fig. 3B). Lateral process (l.p.) of labial palp straight, tip apically pointed and not reaching apex of papilla E (Fig. 2D). Subapical chaeta of maxillary outer lobe subequal to apical one, appendages on sublobal plate not clearly seen (Fig. 2E). Labial chaetae MmRel<sub>1,2</sub>, M and R ciliate, others smooth; M and R 0.81–0.83 and 0.47–0.54 times as long as m, respectively (Fig. 2F–G). Labral chaetae 4/5, 5, 4, all smooth; labral papillae 4, inner papillae apically rounded, outer papillae truncate (Fig. 3A). Frontal area of dorsal head with 5+5 or 6+7 clubbed chaetae (Fig. 3B–D). Head dorsal chaetotaxy with 6 median (M), 6 sutural (S), 3 interocular, 3 postsutural (Ps), 5 postoccipital anterior (Pa), 2 postoccipital medial (Pm), 6 postoccipital posterior (Pp) and 2 postoccipital external (Pe) mic (Fig. 3B, D).

THORAX. Th. II protruded over head and thorax, without mac. Chaetotaxy of anterior part of Th. II not clearly seen, 6 (p1–6) mic on posterior part. Th. III with 16 (a1–4, a6–7, m2, m4–6, p1–6) smooth mic (Fig. 4A). Trochanteral organ with 23 smooth, spiny chaetae (Fig. 4B). Tenent hair weakly ciliate, shorter than inner side of unguis, with tip strongly clavate. Unguis with 3 inner teeth, basal pair located at a distance of 0.34–0.45 from base of inner edge of unguis, distal one smaller than basal pair and at a distance of 0.63–0.72 from base. Unguiculus acuminate, with outer edge serrate (Fig. 4C).

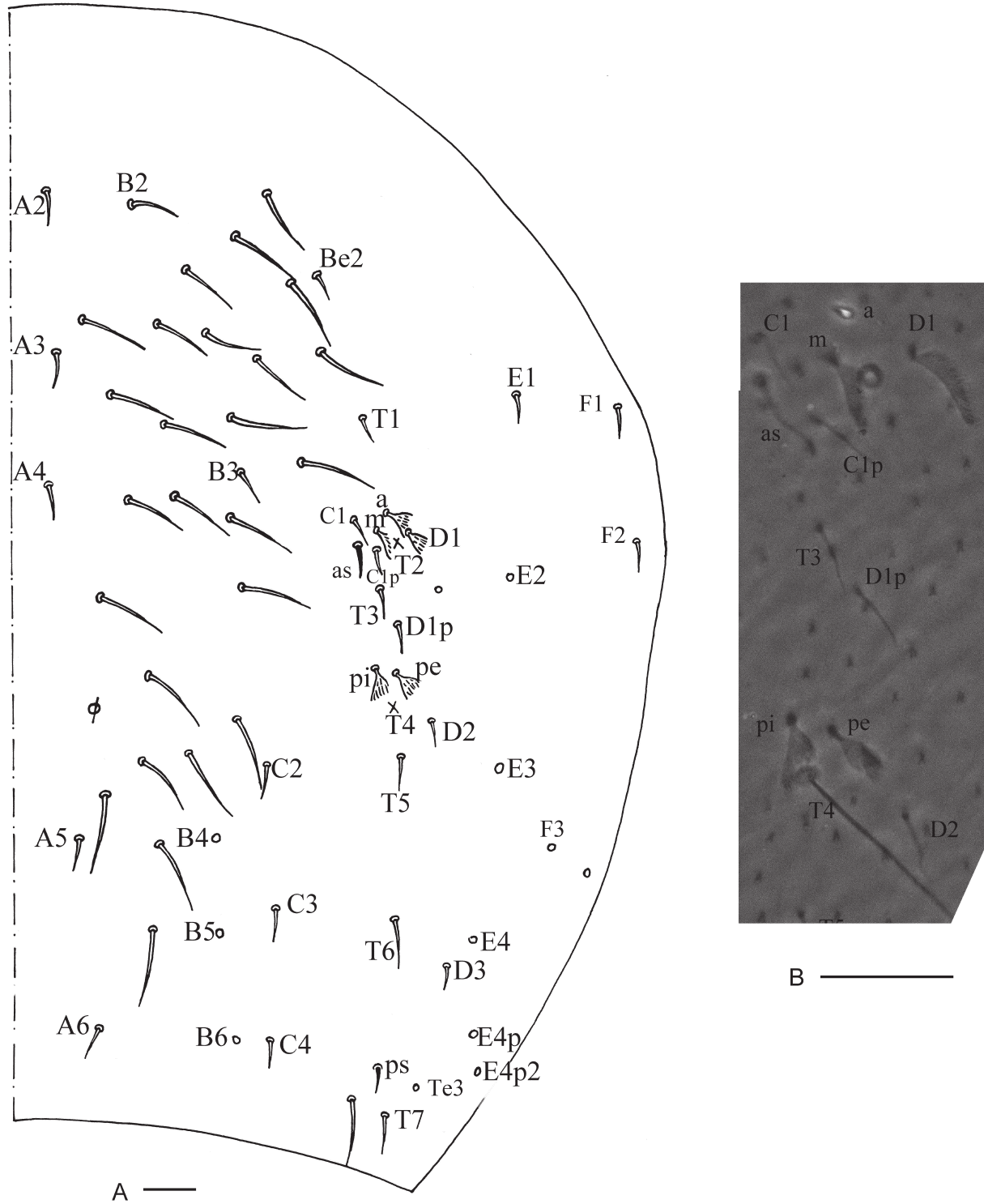
ABDOMEN. Abd. IV 4.00–6.25 times as long as Abd. III along dorsal midline, in holotype 4.21 times. Abd. I with 1 ms and 12 (a1–3, a5–6, m2–6, p5–6) mic (Fig. 5A–B). Abd. II with 1 central S-chaeta (as), 12 (a3, a6–7, m3e, m4, m6–7, p4–7, p5p) mic, 8 (mi, m1, a2, li, lm, ll, 2 supplements) ciliate, accessory fan-shaped chaetae and 2 (m3 and m5) ciliate mac (Fig. 5C–D). Abd. III with 1 central S-chaeta (as) and 1 lateral ms, 7 (a3, m3–4, m7, p3, p5, p7) mic, 10 (mi, m1, a2, li, lm, ll, a6, im, em, emp sometimes absent) ciliate, accessory fan-shaped chaetae and 3 (am6, pm6, p6) ciliate mac (Fig. 6A–B), a7 absent. Abd. IV with 1 anterior (as) and 1 posterior (ps) short S-chaetae, about 25 median elongate S-chaetae, all black as short S-chaetae, 23 (A2–6, B2–3, C1–4, C1p, D1p, D2–3, T1, T3, T5–7, E1, F1–2) mic, 5 (m, a, D1, pi, pe) ciliate, accessory fan-shaped chaetae, 3 (B4–6) median ciliate mac and 7–9 (E2–4, E4p, E4p2, F3, Te3) lateral ciliate mac (Fig. 7A–B). Abd. V with 3 S-chaetae (Fig. 8A–B).



**Fig. 6.** *Lepidocyrtus (A.) huizhouensis* sp. nov., dorsal chaetotaxy (right side). **A.** Abd. III. **B.** Lateral part of Abd. III. Scale bars: 30  $\mu$ m.

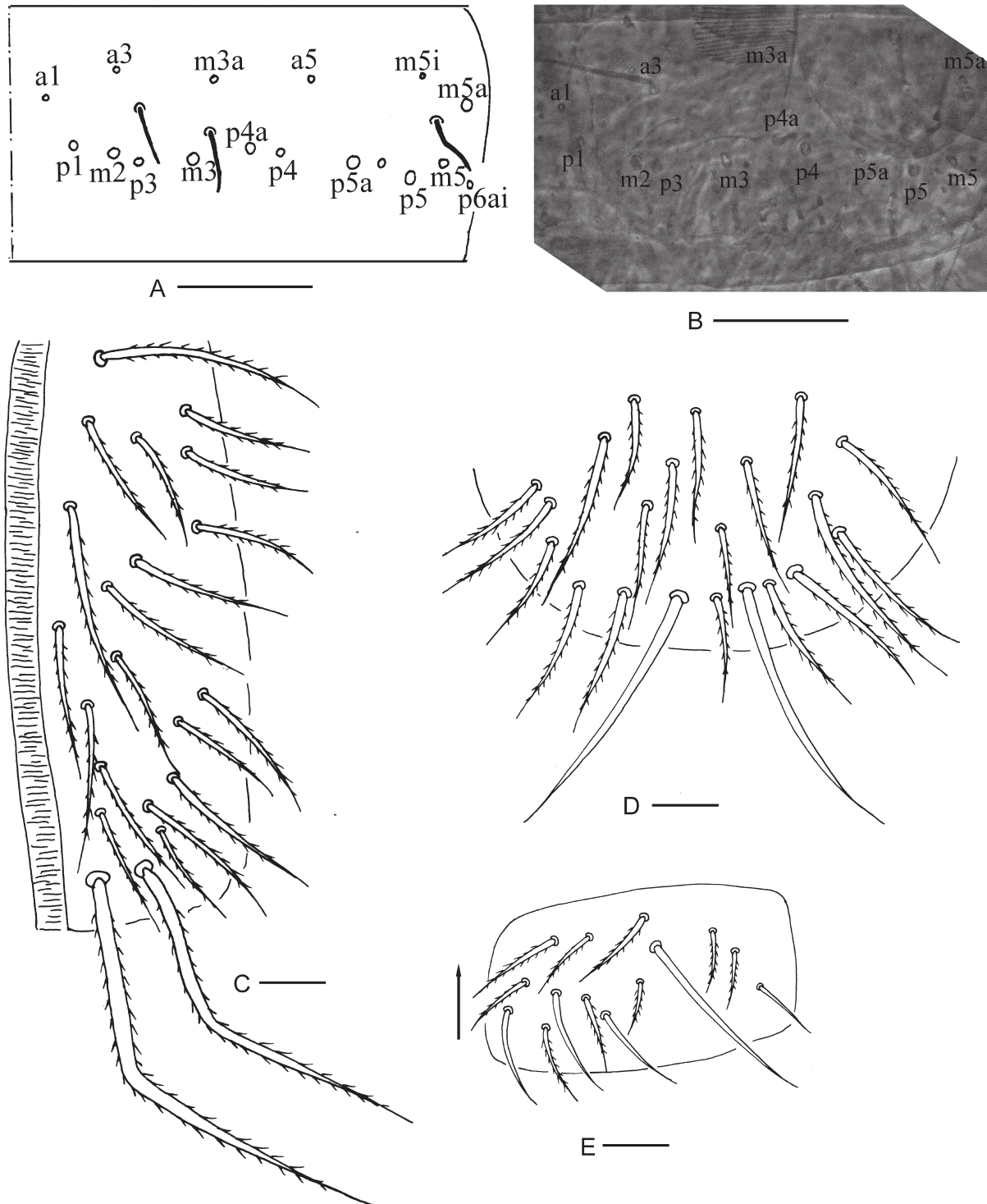


VENTRAL TUBE. Anterior face with 21 ciliate chaetae (Fig. 8C). Posterior face with 1+1 smooth chaetae and 19 ciliate chaetae apically, not clearly seen proximally (Fig. 8D). Lateral flap with 5 smooth and 9 ciliate chaetae (Fig. 8E).



**Fig. 7.** *Lepidocytrus* (*A.*) *huizhouensis* sp. nov., dorsal chaetotaxy (right side). **A.** Abd. IV. **B.** Anterior bothriotrichal complex of Abd. IV. Scale bars: 30  $\mu$ m.

FURCULA. Manubrium ventrally with 3 apical ciliate chaetae per side (Fig. 9A), manubrial plaque (dorsally) with 18–21 ciliate chaetae and 2 pseudopores on each side. Dental tubercle conically pointed (Fig. 9B–C). Distal smooth part of dens about 1.42–1.62 times as long as mucro. Mucro bidentate and



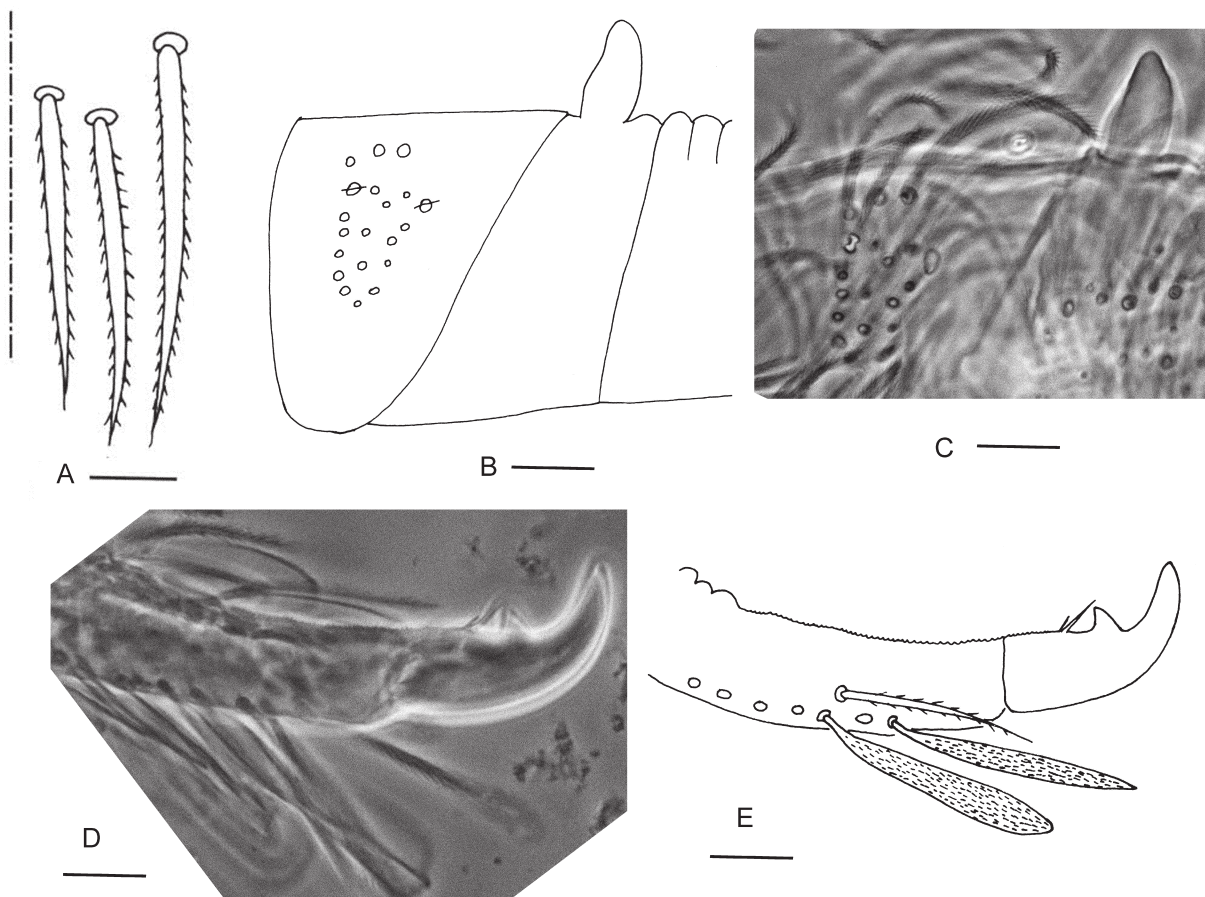
**Fig. 8.** *Lepidocyrtus (A.) huizhouensis* sp. nov. **A–B.** Chaetotaxy of Abd. V (right side). **C.** Anterior face of ventral tube (right side). **D.** Posterior face of ventral tube (apically). **E.** Lateral flap of ventral tube. Scale bars: A–B = 15 µm; C–E = 20 µm.

basal tooth much smaller than apical tooth, basal spine reaching apex of basal tooth with an accessory spinelet (Fig. 9D–E).

### Remarks

Among the 28 species of the subgenus *Acrocyrtus* Yosii, 1959, there are only five which have clubbed chaetae on the frontal area of the dorsal head, i.e., *Lepidocyrtus (Acrocyrtus) heterolepis* Yosii, 1959, *L. (A.) himachalensis* Baquero & Jordana, 2015, *L. (A.) liewthatchimi* Yoshii, 1982, *L. (A.) solomonensis* Yosii, 1960 and *L. (A.) transiens* Yoshii, 1982. The new species also has clubbed chaetae and is most similar to *L. (A.) heterolepis* Yosii, 1959 in colour pattern, but the differences between the two species are great. A spinelet is present and the distribution of smooth chaetae distally on the posterior face of the ventral tube is 1+1 in the former, but a spinelet is absent and there are 3+3 smooth chaetae in the latter.

The new species is also similar to *L. (Lanocyrtus) pallidus* Reuter, 1890 in colour pattern, but a dental tubercle and clubbed chaetae on the frontal area of the dorsal head are present in *L. (A.) huizhouensis* sp. nov., while absent in *L. (L.) pallidus* (Table 2).



**Fig. 9.** *Lepidocyrtus (A.) huizhouensis* sp. nov. **A.** Distal part of ventral manubrium (right side). **B–C.** Manubrial plaque and proximal part of dens (lateral view). **D–E.** Distal part of dens and mucro (lateral view). Scale bars: 20 µm.

**Table 2.** Comparison of *Lepidocyrtus (Acrocyrtus) huizhouensis* sp. nov., *L. (A.) heterolepis* Yosii, 1959 and *L. (Lanocyrtus) pallidus* Reuter, 1890.

Characters	<i>L. (A.) huizhouensis</i> sp. nov.	<i>L. (A.) heterolepis</i> <sup>1,2</sup>	<i>L. (L.) pallidus</i> <sup>3,4</sup>
Clubbed chaetae on frontal area of dorsal head	present	present	absent
Scales on Ant. I–II	present	present	absent
Dental tubercle	present	present	absent
Spinelet on mucro	present	absent	absent
Labial chaetotaxy	MmRel <sub>1,2</sub>	MmRe <sub>1,2</sub>	M <sub>1</sub> M <sub>2</sub> rEL <sub>1</sub> L <sub>2</sub>
Length ratio of R/M on labium	R smaller	subqual	r smaller
Prelabral chaetae	smooth	smoth	ciliate
Smooth chaetae distally on posterior face of ventral tube	1+1	3+3	unknown
Apical tooth and subapical tooth on mucro	subapical tooth much smaller than apical tooth	subapical tooth equal to apical tooth	subapical tooth larger than apical tooth

Notes: <sup>1</sup> Yosii 1959; <sup>2</sup> Yoshii 1982; <sup>3</sup> Mateos & Winkler 2018; <sup>4</sup> Christiansen & Bellinger 1992.

#### Subgenus *Setogaster* Salmon, 1951

#### Diagnosis

Mucro bidentate and accessory spinelet present; round dental tubercles present and spines absent on dens.

#### *Lepidocyrtus (Setogaster) wanningensis* sp. nov.

[urn:lsid:zoobank.org:act:B9E37498-60F4-48B6-824F-26144C2E35A5](https://zoobank.org/act:B9E37498-60F4-48B6-824F-26144C2E35A5)

Figs 10–16, Table 3

#### Diagnosis

Dark blue pigment present on Ant. III–IV and Ant. II distally. Scales present on Ant. I, femora and tibiotarsi. Labial chaeta M<sub>1</sub> ciliate, r reduced, others smooth. C1 on Abd. IV ciliate mac. Dental tubercle rounded.

#### Etymology

Named after the type locality, Wanning City.

#### Type material

##### Holotype

CHINA: ♀; Hainan Province, Wanning City, Shangen Town, Lizhikan Village; 18°58'8.52" N, 110°28'56.28" E; in litter; collection no. 1123; 10 Mar. 2011; Xingna Wang leg.; with aspirator; on slide; NTU.

##### Paratypes

CHINA: 3 ♀♀; same collection data as for holotype; on slides; NTU.



## Description

MEASUREMENTS. Body (head + trunk) length up to 1.84 mm, holotype 1.84 mm long.

COLOUR. Eyepatches dark blue. Blue pigment present on Ant. III–IV and distal part of Ant. II (Fig. 10A).

SCALES. Scales lightly ciliate, oval to circular, present on Ant. I, both sides of head, thoracic and abdominal tergites, femora and tibiotarsi, and ventral side of furcula. Other appendages without scales.

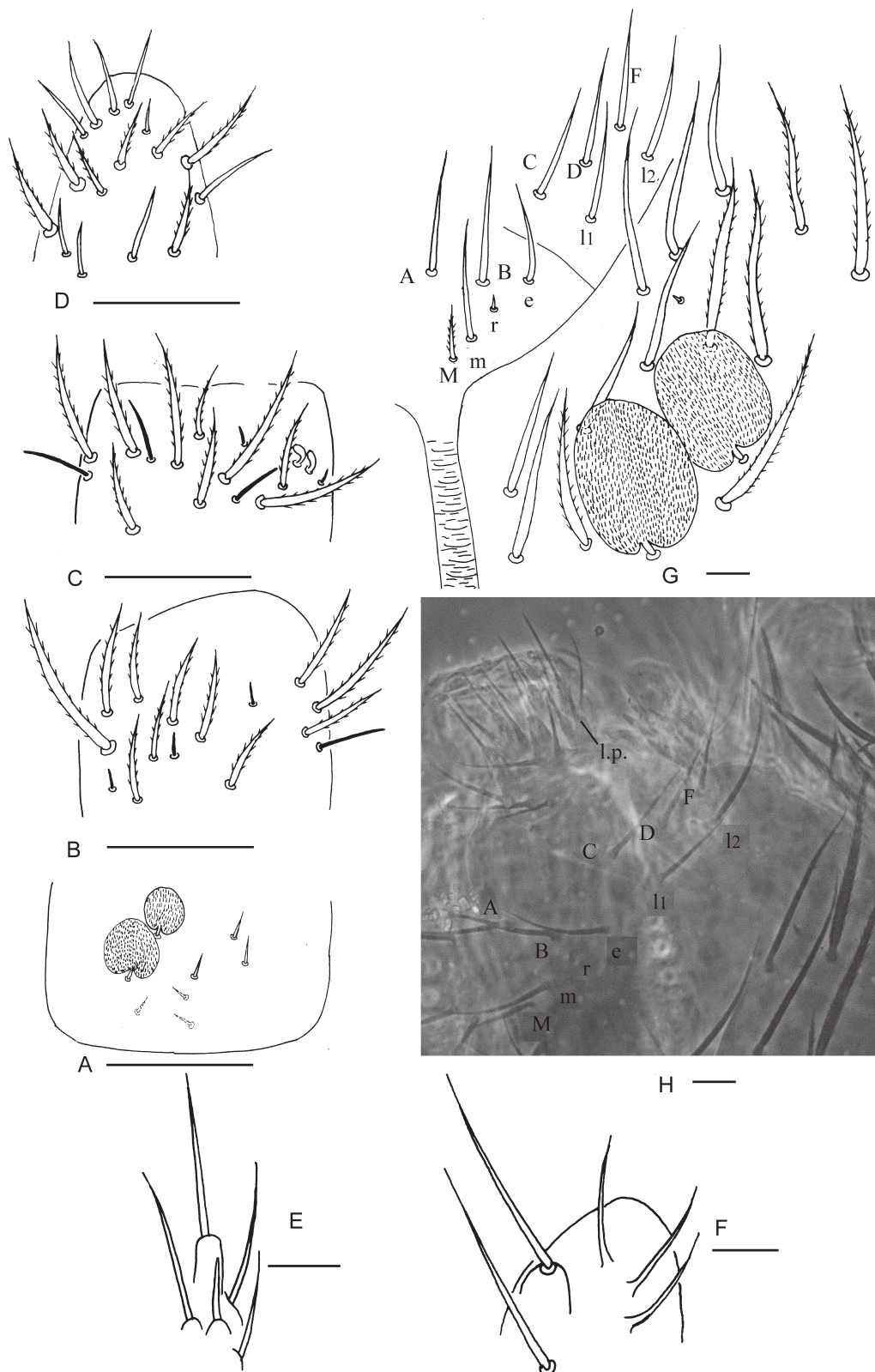
HEAD. Antenna 0.29–0.38 times as long as body. Antennal segment ratio of I:II:III:IV = 1.00:1.79–2.14:2.14–2.67:2.68–3.00, in holotype 1.00:2.01:2.43:2.91. Ant. IV without apical bulb (Fig. 11A). Ant. III with 2 rods distally (Fig. 11B). Ant. II without rods distally (Fig. 11C). Ant. I with 3 dorsal and 3 ventral spiny mic (Fig. 11D). Lateral process (l.p.) of labial palp straight, tip apically pointed and not reaching apex of papilla E (Fig. 11E, H). Subapical chaeta of maxillary outer lobe subequal to apical one, 3 smooth appendages on sublobal plate (Fig. 11F). Labial chaetae  $Mmrel_1$ ,  $l_2$  and M ciliate, other smooth; M 0.45–0.70 times as long as m, chaeta r reduced (Fig. 11G–H). Labral chaetae 4/5, 5, 4, all smooth; labral papillae 4, inner papillae apically rounded, outer papillae truncate (Fig. 12A). Head dorsal chaetotaxy with 6 median (M), 6 sutural (S), 6 interocular and 3 postsutural (Ps) chaetae, posterior part not clearly seen (Fig. 12B).

THORAX. Th. II protruded over head and thorax, without mac. Th. II with 13 (a5, m1–2, m1i, m2p, m4–5, p1–6) mic. Th. III with 16 (a1–4, a6–7, m2, m4–6, p1–6) mic (Fig. 12C). Coxa I with 7 ciliate mac and 2 pseudopores (Fig. 13A). Coxa II with 8 ciliate mac in anterior row, 7 ciliate mac in posterior row and 3 pseudopores (Fig. 13B). Coxa III with 9 ciliate mac and 2 pseudopores (Fig. 13C). Trochanteral organ with 27–38 smooth, spiny chaetae (Fig. 13D). Tenent hair weakly ciliate, slightly shorter than inner side of unguis, with tip strongly clavate. Unguis with 4 inner teeth, basal pair larger, located at a distance of 0.33–0.43 from base of inner edge of unguis, unpaired two subequal, at a distance of 0.65–0.69 and 0.87–0.88 from base, respectively. Unguiculus acuminate with outer edge serrate (Fig. 13E).



A —————

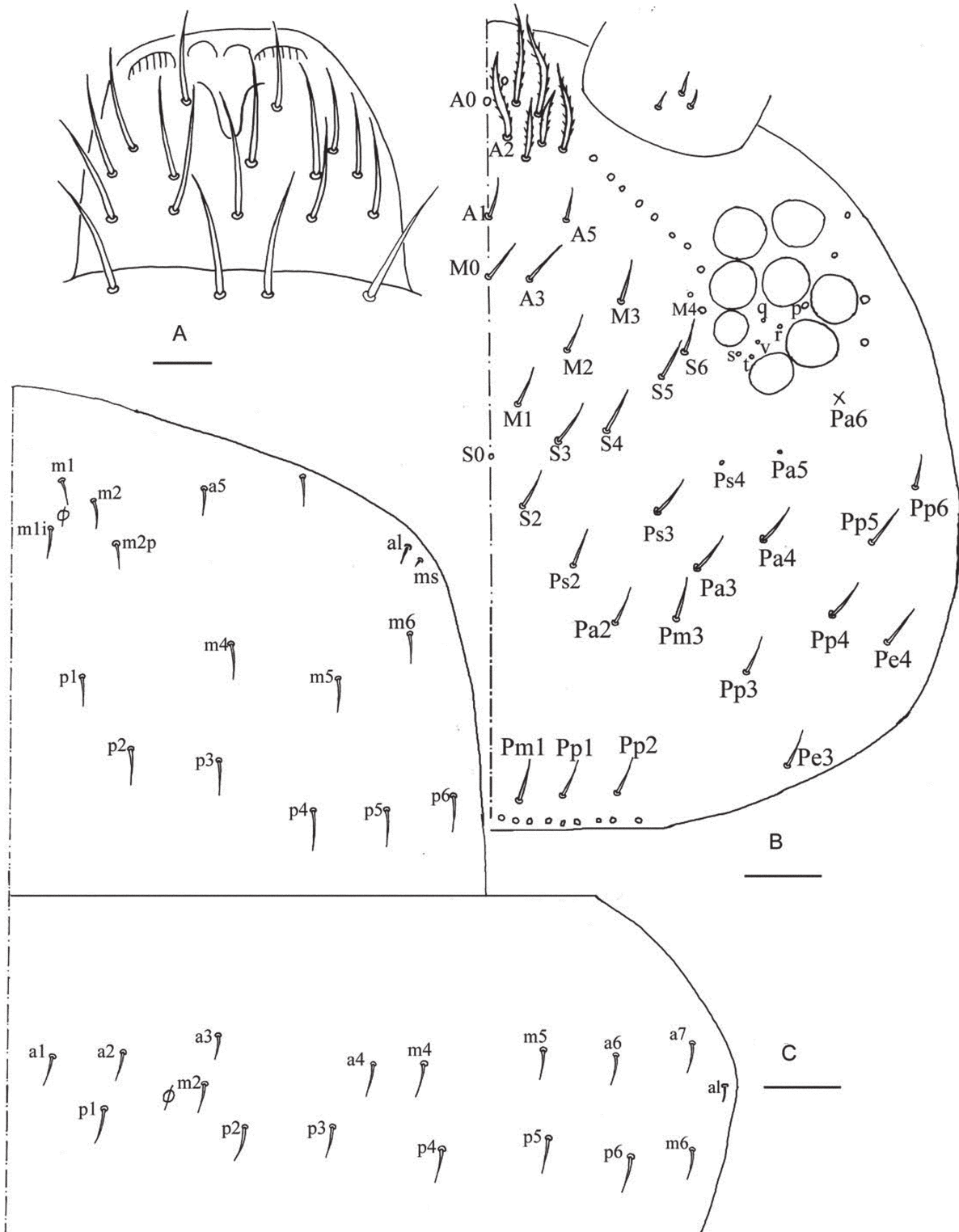
Fig. 10. *Lepidocyrtus* (*S.*) *wanningensis* sp. nov. Habitus. Scale bar: 500  $\mu$ m.



**Fig. 11.** *Lepidocyrtus (S.) wanningensis* sp. nov. **A.** Apex of Ant. IV (left side). **B.** Distal part of Ant. III (lateral side). **C.** Distal part of Ant. II (left side). **D.** Basal part of Ant. I (ventral side). **E.** Lateral process of labial palp (lateral view). **F.** Maxillary outer lobe (left side). **G.** Labial and mental chaetotaxy (right side). **H.** Labial palp and labium (right side). Scale bars: 20  $\mu$ m.



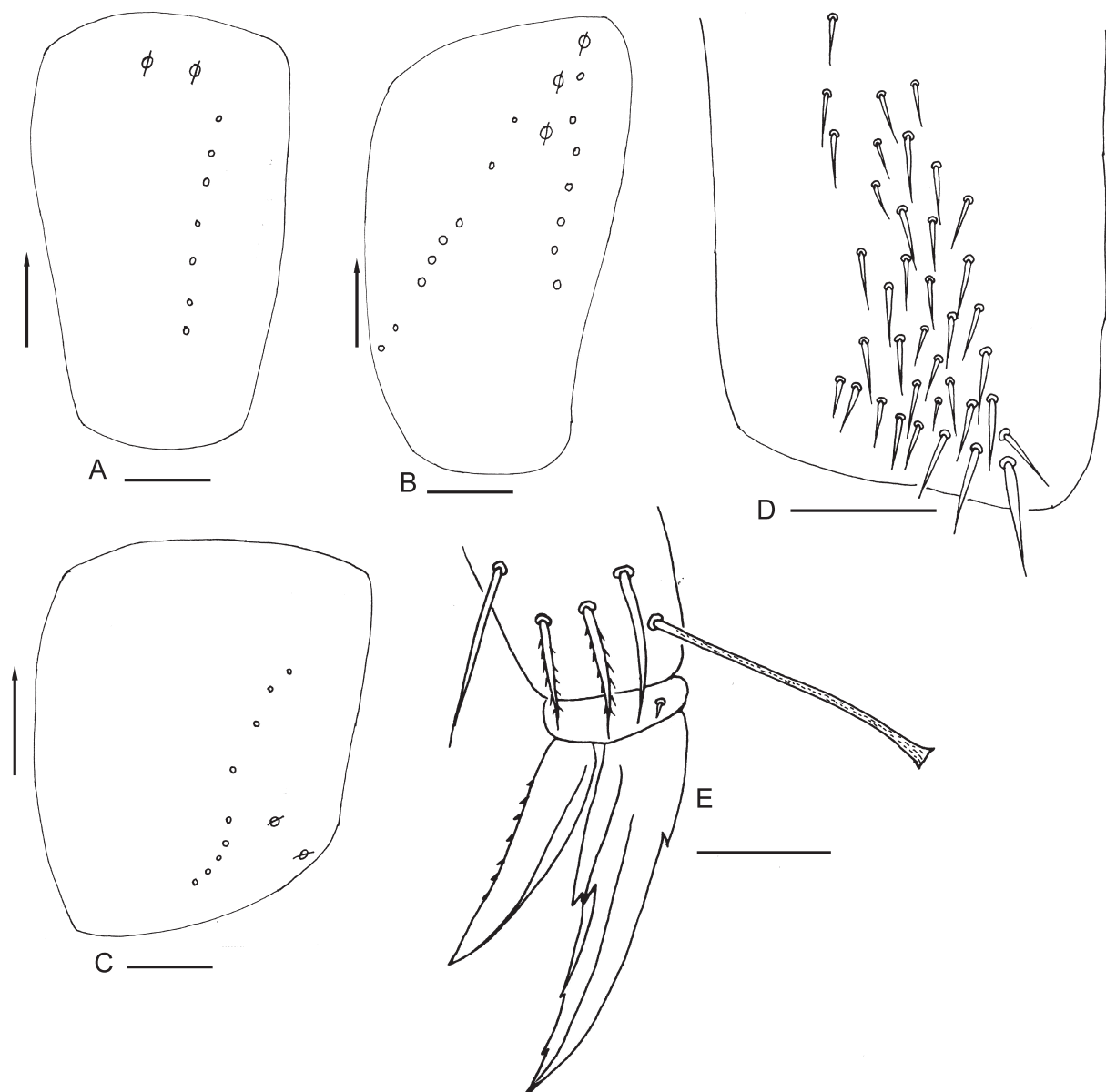
ABDOMEN. Abd. IV 3.05–4.08 times as long as Abd. III along dorsal midline, in holotype 3.62 times. Abd. I with 1 ms and 12 (a1–3, a5–6, m2–6, p5–6) mic. Abd. II with 1 central S-chaeta (as), 9 (a3, a7, m3e, m4, m6, p4–6, p5p) mic, 2 (a2, a6) heavily ciliate mic, 4 (mi, m1, li, lm) ciliate, accessory fan-



**Fig. 12.** *Lepidocyrtus* (*S.*) *wanningensis* sp. nov. **A.** Labrum. **B.** Dorsal chaetotaxy of head (partially, right side). **C.** Chaetotaxy of Th. II–III (right side). Scale bars: 20  $\mu$ m.

shaped chaetae and 2 (m3, m5) ciliate mac. Abd. III with 1 central S-chaeta (as) and 1 lateral ms, 7 (a3, a7, m3–4, m7, p3, p5) mic, 9 (mi, m1, a2, li, lm, ll, a6, im, em) ciliate, accessory fan-shaped chaetae, 1 (am6) ciliate mic and 3 (pm6, p6, p7) ciliate mac (Fig. 14A). Abd. IV with 1 anterior (as) and 1 posterior (ps) short S-chaetae, 6–13 median elongate S-chaetae, all black as short S-chaetae, 21 (A2–6, B2–3, C2–4, C1p, D1p, D3, T1, T3, T5–7, E1, F1–2) mic, 6 (m, a, s, D1, pi, pe) ciliate, accessory fan-shaped chaetae, 4 (B4–6, C1) median ciliate mac and usually 7 (E2–4, E4p, F3, F3p, Te3) lateral ciliate mac (Fig. 15A). Abd. V with 3 S-chaetae (Fig. 16A–B).

VENTRAL TUBE. Anterior face with 28 ciliate chaetae (Fig. 16C). Posterior face with 1+1 smooth chaetae and many ciliate chaetae apically. Lateral flap with 7–14 smooth and 6–18 ciliate chaetae (Fig. 16D).

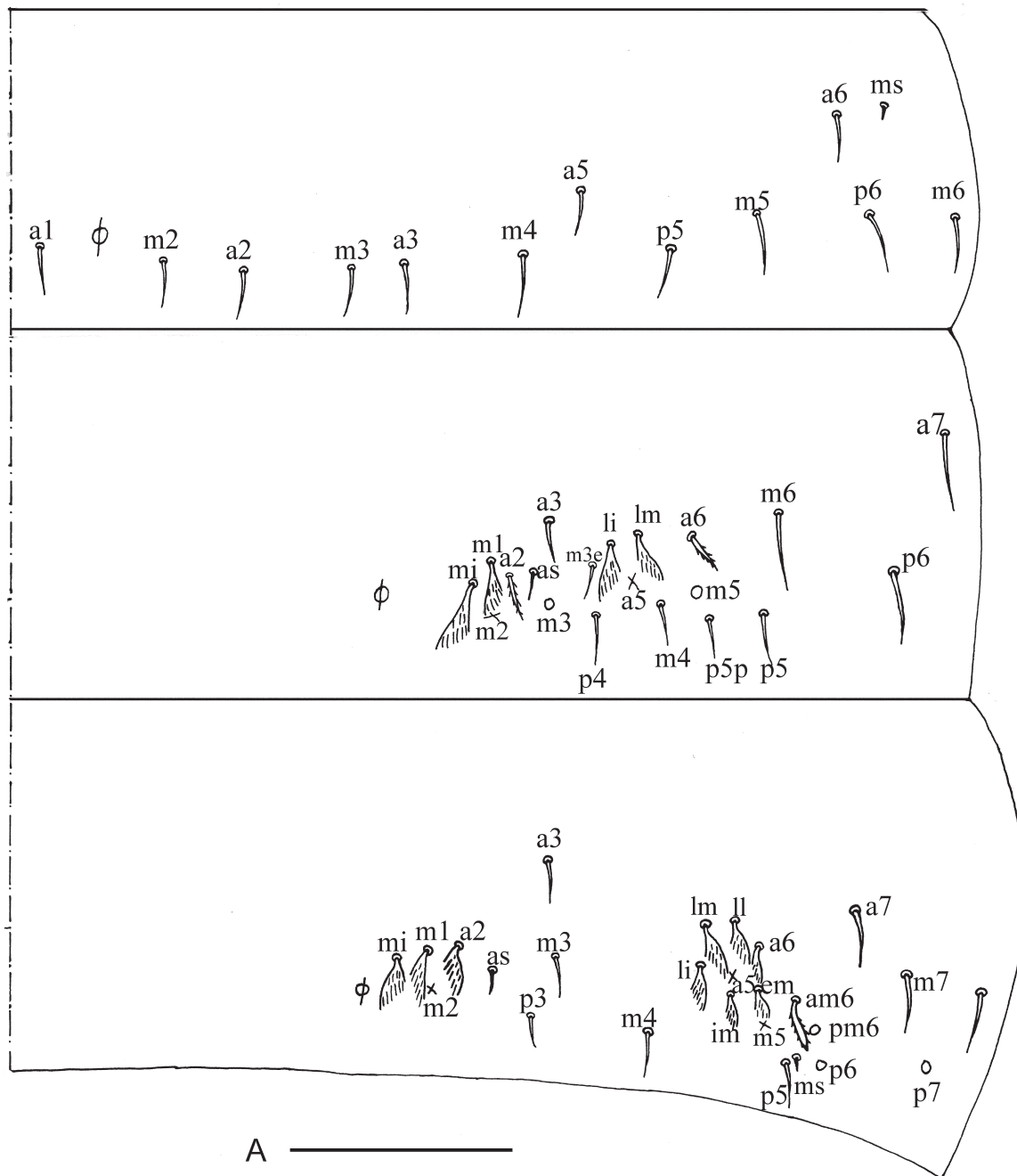


**Fig. 13.** *Lepidocyrtus (S.) wanningensis* sp. nov. **A.** Coxal macrochaetal formula of fore leg. **B.** Coxal macrochaetal formula of middle leg. **C.** Coxal macrochaetal formula of hind leg. **D.** Trochanteral organ. **E.** Hind foot complex (anterior view). Scale bars: 20 µm.

FURCULA. Manubrium ventrally with 3 apical ciliate chaetae per side (Fig. 16E). Manubrial plaque with 8–11 ciliate chaetae and 2 pseudopores on each side. Dental tubercle rounded (Fig. 16F–G). Distal, smooth part of dens about 1.20–1.63 times as long as mucro. Mucro bidentate and subequal, basal spine reaching apex of basal tooth with an accessory spinelet (Fig. 16H).

**Remarks**

The new species is most similar to the species *Lepidocyrtus* (*Setogaster*) *merapicus* Yoshii & Suhardjono, 1989 and *L. (S.) sotoi* Bellini & Godeiro, 2015 in colour pattern since no blue pigment is present on their body tergites, but the colour pattern on the antennae, scales on Ant. I, femora and tibiotarsi, as well as the shapes of the prelabral and labial chaetae and the inner teeth on the unguis are different (Table 3).



**Fig. 14.** *Lepidocyrtus (S.) wanningensis* sp. nov., chaetotaxy of Abd. I–III (right side). Scale bar: 70 μm.

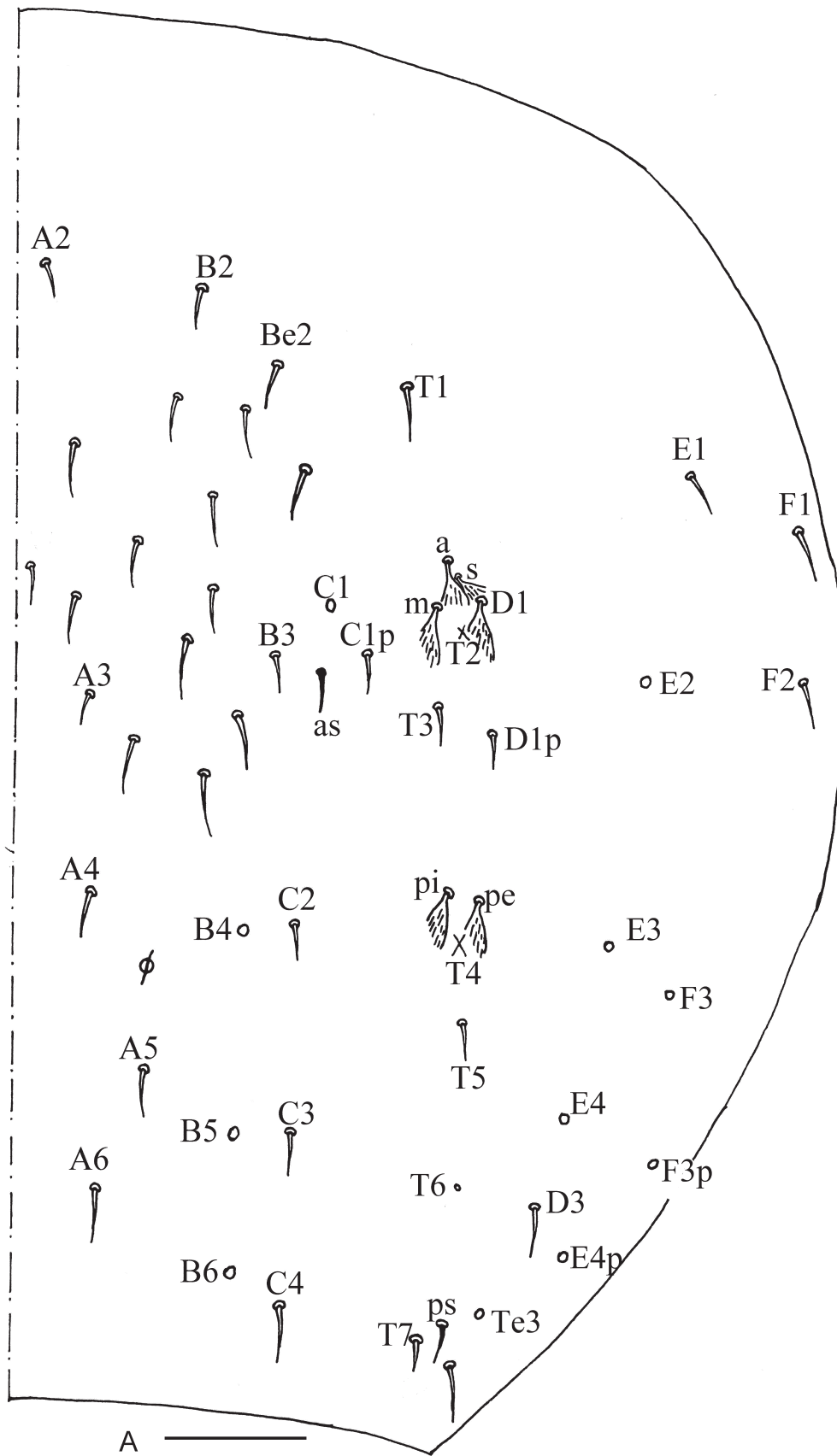
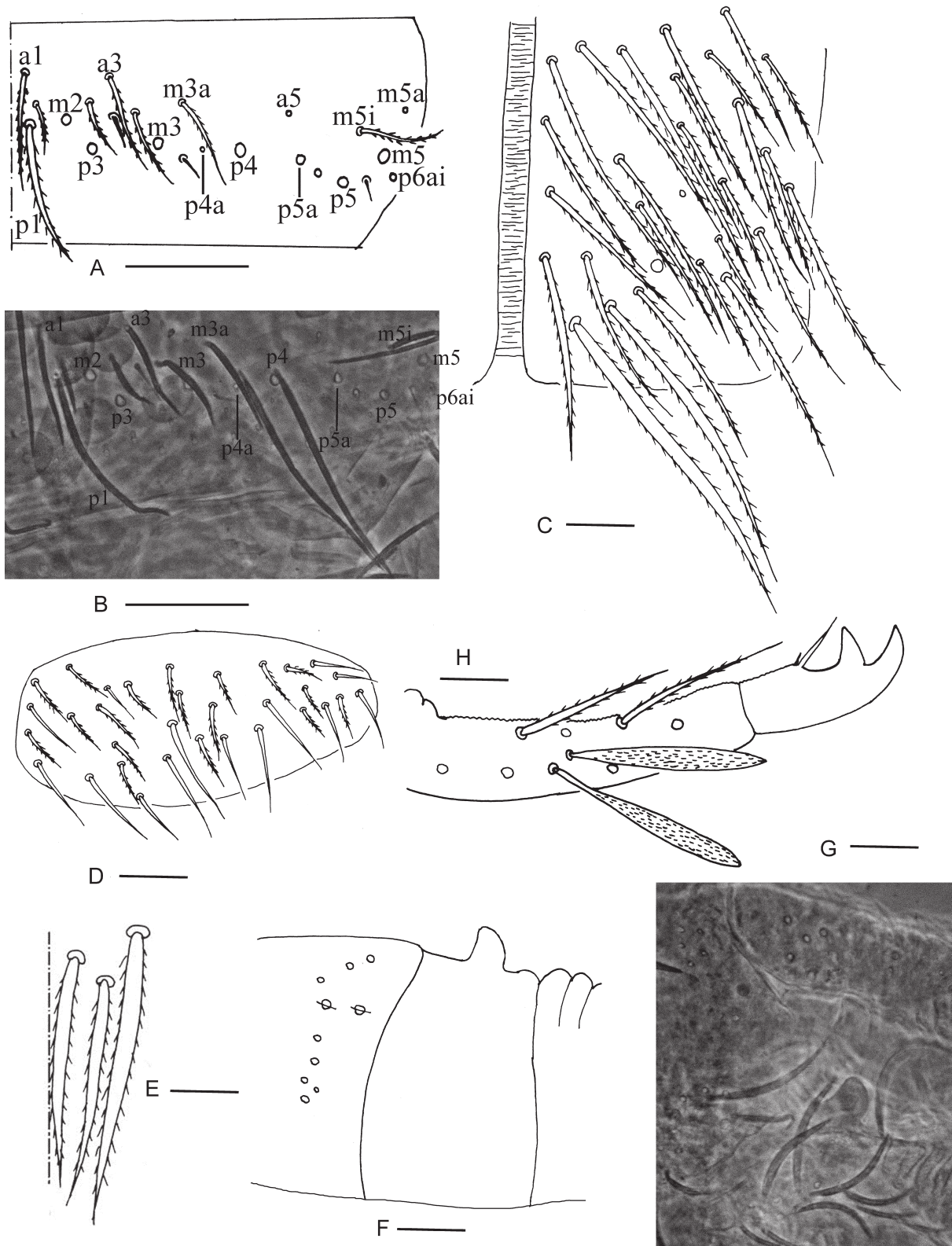


Fig. 15. *Lepidocyrtus (S.) wanningensis* sp. nov., chaetotaxy of Abd. IV (right side). Scale bar: 60  $\mu$ m.



**Fig. 16.** *Lepidocyrtus* (*S.*) *wanningensis* sp. nov. **A–B.** Chaetotaxy of Abd. V (right side). **C.** Anterior face of ventral tube (right side). **D.** Lateral flap of ventral tube. **E.** Distal part of ventral manubrium (right side). **F–G.** Manubrial plaque and proximal part of dens (lateral and dorsal views, respectively). **H.** Distal part of dens and mucro (lateral view). Scale bars: 20  $\mu$ m.

**Table 3.** Comparison of *Lepidocyrtus (Setogaster) wanningensis* sp. nov., *L. (S.) merapicus* Yoshii & Suhardjono, 1989 and *L. (S.) sotoi* Bellini & Godeiro, 2015.

Characters	<i>L. (S.) wanningensis</i> sp. nov.	<i>L. (S.) merapicus</i> <sup>1</sup>	<i>L. (S.) sotoi</i> <sup>2</sup>
Blue pigments on antennae	Ant. III–IV and distal part of Ant. II	distal end of Ant. II–III and half of Ant. IV	entire antenna
Scales on Ant. I, femora and tibiotarsi	present	absent	absent
Prelabral chaetae	smooth	smooth	weakly ciliate
Labial chaetae	Mmrel <sub>1</sub> l <sub>2</sub>	MM(r)el <sub>1</sub> l <sub>2</sub>	MMrEL <sub>1</sub> L <sub>2</sub>
Inner teeth on unguis	4	3	4

Notes: <sup>1</sup> Yoshii & Suhardjono 1989; <sup>2</sup> Bellini *et al.* 2015.

## Discussion

The dental tubercle is a very useful character at the subgeneric level and among the eight subgenera of *Lepidocyrtus* s. lat., only the subgenus *Acrocyrtus* has a pointed dental tubercle. *Lepidocyrtus (Acrocyrtus) huizhouensis* sp. nov. has a pointed dental tubercle and no apical bulb on Ant. IV, which are typical characters of that subgenus. Four subgenera have a rounded dental tubercle, i.e., *Allocyrtus* Yoshii & Suhardjono, 1989, *Ascocyrtus* Yosii, 1963, *Cinctocyrtus* Yoshii & Suhardjono, 1989 and *Setogaster* Salmon, 1951. These subgenera can be distinguished from each other by the basal dental spines, the apical bulb on the antennae and the mucronal spinelet. In *Lepidocyrtus (Setogaster) wanningensis* sp. nov., the apical bulb on the antennae and the basal dental spines are absent, while the mucronal spinelet is present.

## Acknowledgements

Thanks are given to Nikolas G. Cipola for useful suggestions and to the anonymous referees who provided kind advice on this manuscript.

## References

- Bellinger P.F., Christiansen K.A. & Janssens F. 1996–2019. *Checklist of the Collembola of the World*. Available from <http://www.collembola.org> [accessed 20 Feb. 2019].
- Bellini B.C., Cipola N.G. & Godeiro N.N. 2015. New species of *Lepidocyrtus* Bourlet and *Entomobrya* Rondani (Collembola: Entomobryidae: Entomobryidae) from Brazil. *Zootaxa* 4027 (2): 227–242. <https://doi.org/10.11646/zootaxa.4027.2.3>
- Christiansen K.A. & Bellinger P.F. 1992. *Insects of Hawaii 15: Collembola*. University of Hawaii Press, Honolulu.
- Cipola N.G., Morais J.W. & Bellini B.C. 2018. New subgenus and four species of *Lepidocyrtus* Bourlet (Collembola, Entomobryidae, Lepidocyrtinae) from Amazon. *Insect Systematics & Evolution* 50: 189–234. <https://doi.org/10.1163/1876312X-00002184>
- Fjellberg A. 1999. The labial palp in Collembola. *Zoologischer Anzeiger* 237: 309–330.
- Gisin H. 1967. Espèces nouvelles et lignées évolutives de *Pseudosinella* endogés. *Memórias e Estudos do Museu Zoológico da Universidade de Coimbra* 301: 5–25.
- Jordana R. & Baquero E. 2005. A proposal of characters for taxonomic identification of *Entomobrya* species (Collembola, Entomobryomorpha), with description of a new species. *Abhandlungen und Berichte des Naturkundemuseums Goerlitz* 76 (2): 117–134.



- Mari-Mutt J.A. 1986. Puerto Rican species of *Lepidocyrtus* and *Pseudosinella* (Collembola: Entomobryidae). *Caribbean Journal of Science* 22 (1–2): 1–48.
- Mateos E. & Winkler D. 2018. New data clarifying the taxonomy of European members of the *Lepidocyrtus pallidus-serbicus* group (Collembola: Entomobryidae). *Zootaxa* 4429 (3): 548–568. <https://doi.org/10.11646/zootaxa.4429.3.5>
- Salmon J.T. 1951. *Keys and Bibliography to the Collembola*. Victoria University College Wellington, New Zealand.
- Szeptycki A. 1979. *Morpho-Systematic Studies on Collembola. IV. Chaetotaxy of the Entomobryidae and its Phylogenetical Significance*. Polska Akademia Nauk, Zakład Zoologii Systematycznej i Doświadczalnej, Państwowe Wydawnictwo Naukowe, Warsaw and Kraków.
- Xu G.L., Pan Z.X. & Zhang F. 2013. First record of *Acrocyrtus* Yosii, 1959 (Collembola, Entomobryidae) from Chinese mainland. *Zookeys* 260: 1–16. <https://doi.org/10.3897/zookeys.260.3770>
- Yoshii R. 1982. Lepidocyrtid Collembola of Sabah. *Entomological Report from the Sabah Forest Research Centre* 5: 1–47.
- Yoshii R. & Suhardjono Y.R. 1989. Notes on the collembolan fauna of Indonesia and its vicinities. I. Miscellaneous notes, with special references to Seirini and Lepidocyrtini. *Acta Zoologica Asiae Orientalis* 1: 23–90.
- Yosii R. 1959. Studies on the collembolan fauna of Malay and Singapore, with special reference to the genera: *Lobella*, *Lepidocyrtus* and *Callyntrura*. *Contributions from the Biological Laboratory of Kyoto University* 10: 1–65.
- Zhang F. & Deharveng L. 2015. Systematic revision of Entomobryidae (Collembola) by integrating molecular and new morphological evidence. *Zoologica Scripta* 44: 298–311. <https://doi.org/10.1111/zsc.12100>

*Manuscript received: 6 March 2019*

*Manuscript accepted: 21 August 2019*

*Published on: 14 October 2019*

*Topic editor: Gavin Broad*

*Desk editor: Danny Eibye-Jacobsen*

Printed versions of all papers are also deposited in the libraries of the institutes that are members of the *EJT* consortium: Muséum national d'Histoire naturelle, Paris, France; Meise Botanic Garden, Belgium; Royal Museum for Central Africa, Tervuren, Belgium; Royal Belgian Institute of Natural Sciences, Brussels, Belgium; Natural History Museum of Denmark, Copenhagen, Denmark; Naturalis Biodiversity Center, Leiden, the Netherlands; Museo Nacional de Ciencias Naturales-CSIC, Madrid, Spain; Real Jardín Botánico de Madrid CSIC, Spain; Zoological Research Museum Alexander Koenig, Bonn, Germany; National Museum, Prague, Czech Republic.