

Revision of *Acanthocyrtus* (Collembola: Entomobryidae), with description of a new genus from eastern Asia

FENG ZHANG^{1,2}, LOUIS DEHARVENG², PENELOPE GREENSLADE³ and JIAN-XIU CHEN^{1*}

¹Department of Biological Science and Technology, Nanjing University, 22 Hankou Road, Nanjing 210093, China

²UMR 5202 CNRS, Origine, Structure et Evolution de la Biodiversité, CP50 Museum National d'Histoire Naturelle, Paris 75005, France

³School of Botany and Zoology, Australian National University, GPO Box, Australian Capital Territory 0200, Australia

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In this paper, we reassess the status of the two genera of scaled Entomobryinae with dental spines (*Acanthocyrtus* and *Acanthurella*) and we erect a new genus (*Sinhomidia*) on the basis of scale morphology and scale distribution. Scales are partially pointed in *Acanthocyrtus* and all rounded in *Acanthurella*. The new genus, *Sinhomidia*, has pointed scales, but lacks dental scales contrary to *Acanthurella* and *Acanthocyrtus*; in addition, it exhibits a unique dorsal macrochaetotaxy. Three new species of *Acanthocyrtus* are described (*Acanthocyrtus yolngui* sp. nov., *Acanthocyrtus loftyensis* sp. nov., *Acanthocyrtus barrowensis* sp. nov.) and two are redescribed [*Acanthocyrtus spinosus* (Schött, 1917), *Acanthocyrtus lineatus* Womersley, 1934]. One species (*Acanthocyrtus bicolor* Yosii, 1965) of the genus is redescribed and transferred to the new genus *Sinhomidia*. A key to the scaled Entomobryinae genera with dental spines and a key to the eight known *Acanthocyrtus* species are provided.

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ADDITIONAL KEYWORDS: Australia – chaetotaxy – China – keys to species and genera – *Sinhomidia* gen. nov.

INTRODUCTION

Börner (1906) erected *Acanthurella*, based on the presence of dental spines, as a subgenus of *Lepidocyrtus* for his new species, *Lepidocyrtus* (*Acanthurella*) *braueri* Börner, 1906 from the Seychelles. In 1925, Handschin raised *Acanthurella* to generic rank and established another genus, *Acanthocyrtus*, for *Lepidocyrtus* (*Lepidocyrtoides*) *spinosus* Schött, 1917 from Australia that also had spines on the dens. He separated the two genera by the morphology of the fourth antennal segment, annulated in *Acanthocyrtus*, but lacking annulations in *Acanthurella*. In the same year, Schött (1925), agreeing with Handschin, pointed out that *Acanthocyrtus* was characterized by multiple

rows of dental spines, pointed scales, a retractile antennal segment (Ant.) IV bulb, and a two-jointed tibiotarsi, characters that were not present in *Acanthurella*. Later, several authors (Womersley, 1930, 1939; Yoshii & Greenslade, 1994) emphasized the multiple rows of dental spines in *Acanthocyrtus* versus the single row in *Acanthurella*; this character state is however often difficult to assess if the dental spines are arranged sparsely or irregularly (Figs 6E, 10Q).

Yet, the difference between the two genera were clearly recognized by earlier authors, especially on the ground of scale morphology (Schött, 1925; Bonet, 1930). This character is now used at suprageneric level, unambiguously placing these genera in two different tribes, as implicitly carried out by Yoshii (1982, 1989) who put *Acanthocyrtus* in Seirini,

*Corresponding author. E-mail: xtmt.d.zf@gmail.com

considered *Acanthurella braueri* as species inquirenda, and placed all *Acanthurella* species into *Lepidocyrtus s.l.* hence in Lepidocyrtini. Greenslade (1994) considered these genera as distinct in her catalogue of Australian Collembola.

Confusion arose from the work of Denis (1941), who didn't clarify the scale morphology it has today, and synonymized the two genera. Salmon (1964) also didn't recognize scale morphology as important, and followed Denis' conception. Soto-Adames *et al.* (2008), although they used scale morphology to separate the scaled Entomobryidae tribes, placed *Acanthurella* as a possible synonym of *Acanthocyrtus*. The confusion brought by Denis is cleared in the present paper.

Fifteen species are currently recognized in the two genera. Characters which are commonly used to separate the two genera are shown in Table 1 for each known species. The original generic status and geographical distribution of each species are also given.

MATERIAL AND METHODS

Specimens were mounted under a coverslip in Hoyer's solution, and were studied under a Leica Digital Module Light B (DMLB) microscope. Photographs were taken under a Leica Digital Module R (DMR) microscope using a mounted Leica DFC420 digital camera, and were enhanced with Photoshop CS2 (Adobe Inc.). Most materials are deposited in the South Australian Museum, Adelaide, South Australia, Australia (SAMA). Specimens of *Sinhomidia bicolor* (Yosii) are deposited in the Department of Biological Science and Technology, Nanjing University, Nanjing, China.

TAXONOMY

The type species of both genera, *Acanthocyrtus spinosus* and *Acanthurella braueri*, were examined. Because of variability in the arrangement of dental spines, in this paper we use instead the morphology of body scales as diagnostic features to separate the genera. Scales are partially or all pointed and coarsely striate in *Acanthocyrtus* (a character of Seirini), and all rounded and finely striate in *Acanthurella* (a character of Lepidocyrtini). All species of the two genera are found predominately in tropical areas.

Although the key characters for *Acanthurella halei* Womersley, 1937 are not available, we retain it in its original genus for possessing a single row of dental spines. *Acanthocyrtus hamatus* Salmon, 1951 is transferred to *Acanthurella* because it possesses rounded scales with fine striations, long macrochaetae on the thoracic collar and a short additional basal spine on mucro, the latter usually occurs only in some *Lepidocyrtus* species. *Acanthurella lepidornatus* Handschin, 1930 was transferred to *Lepidocyrtus* (*Acrocyrtus*) by Yoshii (1982) because it has only three spines (actually spiny setae) on the dental lobe and no further spines on the dens. Later, it was designated as the type species of the subgenus *Allocyrtus* by Yoshii & Suhardjono (1989). Whether *Allocyrtus* is a valuable genus or a simple species-group remains to be established, but we agree that the species with three spiny setae grouped on the basis of the dens, which are rather frequent in south-east Asia, are definitely not *Acanthurella*. *Acanthurella amethystina* Handschin, 1925 was considered as a coloured form of *Acanthurella javanus* Börner, 1906 by Yoshii (1989); we checked related materials and maintain it as a valid taxon. A subsequent paper will deal with the genus *Acanthurella* in more detail.

We erect a new genus, *Sinhomidia* gen. nov., for *Acanthurella bicolor* Yosii, 1965 because of the absence of dental scales and its unique dorsal macrochaetotaxy, particularly in the anterior row of eyebrow-like macrochaetae on abdominal segment (Abd.) IV. This genus resembles *Homidia* in having a similar pattern of dorsal cephalic chaetotaxy, in the arrangement of Abd. IV macrochaetae, labial triangular setae, and its larger subapical mucronal tooth. The new genus differs from *Homidia* in possessing scales which are absent in *Homidia*.

The three genera, *Acanthocyrtus*, *Acanthurella*, and *Sinhomidia* belong to the tribes Seirini, Lepidocyrtini, and Willowsiini, respectively (Yoshii, 1989).

GENUS ACANTHOCYRTUS HANDSCHIN, 1925

Type species: Lepidocyrtus (Lepidocyrtoides) spinosus Schött, 1917

Acanthocyrtus spinosus: Handschin, 1925

Type locality: Ravenshoe (formerly Cedar Creek), Atherton tableland, North Queensland, Australia.

KEY TO GENERA OF THE SUBFAMILY ENTOMOBRYINAE SENSU SOTO-ADAMES *ET AL.* (2008)

WITH SCALES AND DENTAL SPINES

1. Dental scales absent.....*Sinhomidia* gen. nov.
- Dental scales present.....2
2. Body scales all rounded and finely striate; few macrochaetae on dorsal body except collar.....*Acanthurella*
- Body scales mainly pointed and coarsely striate; numerous macrochaetae on whole body.....*Acanthocyrtus*

Table 1. Generic characters, distribution, and original genus for all species currently recognized as belonging to either *Acanthurella* and *Acanthocyrtus* with revised generic placement according to this paper

Species	Original genus	Rows of dental spines	Body scales	Ant. IV bulb	Region	Revised status
<i>amethystina</i> Handschin, 1925	<i>Acanthurella</i>	Single	Rounded	Absent	Indonesia	<i>Acanthurella</i>
<i>bicolor</i> Yosii, 1965	<i>Acanthocyrtus</i>	Single?	Pointed	Present	East China	<i>Sinhomidia</i>
<i>braueri</i> Börner, 1906	<i>Lepidocyrtus</i>	single	Rounded	Absent	Seychelles (Africa)	<i>Acanthurella</i>
<i>brunnea</i> Handschin, 1930	(<i>Acanthurella</i>)	Single	Rounded	?	Philippines	<i>Acanthurella</i>
<i>croceus</i> Womersley, 1930	<i>Acanthocyrtus</i>	Multiple	Pointed	Absent	Guyana	<i>Acanthocyrtus</i>
<i>glauca</i> Schött, 1925	<i>Acanthurella</i>	Single	Rounded	Absent	Malaysia	<i>Acanthurella</i>
<i>guianensis</i> Womersley, 1930	<i>Acanthocyrtus</i>	Multiple	Pointed	Absent	Guyana	<i>Acanthocyrtus</i>
<i>halei</i> Womersley, 1937	<i>Acanthurella</i>	Single	?	?	Australia	<i>Acanthurella</i> ?
<i>hamatus</i> Salmon, 1951	<i>Acanthocyrtus</i>	Multiple	Rounded	Absent	Singapore	<i>Acanthurella</i>
<i>javanus</i> Börner, 1906	<i>Lepidocyrtus</i>	Single	Rounded	Absent	Southeast Asia	<i>Acanthurella</i>
<i>lepidornata</i> Handschin, 1930	(<i>Acanthurella</i>)	3 spines on dental lobe	Rounded	?	Philippines	<i>Lepidocyrtus</i>
<i>lineatus</i> Womersley, 1934	<i>Acanthocyrtus</i>	Multiple?	Pointed	Present	Australia	<i>Acanthocyrtus</i>
<i>marginalis</i> Salmon, 1956	<i>Acanthocyrtus</i>	Multiple	Some pointed	Present	Africa	<i>Acanthocyrtus</i>
<i>spinus</i> Schött, 1917	<i>Lepidocyrtus</i>	Multiple	Some pointed	Present	Australia	<i>Acanthocyrtus</i>
<i>zonata</i> Schött, 1925	(<i>Lepidocyrtoides</i>) <i>Acanthurella</i>	Single	Rounded	Absent	Malaysia	<i>Acanthurella</i>

Ant., antennal segment.

Diagnosis: The genus is characterized by four-segmented antennae, eight + eight eyes, scales on body, scales and spines on dens, clavate tenent hairs on tibiotarsus, bidentate mucro with a basal spine, papillate male genital plate, two–three–two bothriotrichia on Abd. II–IV, respectively, and modified accessory microchaetae of the bothriotrichial complex. Some or most scales are pointed and coarsely striate as is typical for Seirini. It is close to *Lepidosira* or *Lepidocyrtoides* in scale morphology, body chaetotaxy, claw, and trochanteral organ morphology but differs in the presence of dental spines.

DIVERSITY, GEOGRAPHICAL DISTRIBUTION, AND ECOLOGY

Eight species in this genus have been described so far, one from Central Africa, two from Guiana, and the other five from Australia (Fig. 1). Most species are found in tropical areas except for *A. loftyensis* sp. nov., from Mount Lofty, South Australia, which has a Mediterranean-type climate. *Acanthocyrtus barroensis* sp. nov. is the first *Acanthocyrtus* species reported from Barrow Island, near the north-west coast of Western Australia with a wet/dry tropical climate. All species appear to be regional endemics except for *Acanthocyrtus spinosus*, because of uncertainty regarding some earlier records. As epedaphic species, they are active on the soil surface in forest leaf litter.

ANALYSIS OF TAXONOMIC CHARACTERS AND VARIABILITY

Colour pattern: In the past, colour pattern was considered one of the most important taxonomic characters for this genus before chaetotaxy was widely applied in taxonomy. Nevertheless, the distribution of pigment in *Acanthocyrtus* is a useful diagnostic character and fairly constant. Variation is mainly in the intensity of pigment and the size of pigments patches.

Scales: Some or all scales are pointed with coarse striations (Figs 5J, 6G, I, 7N, 8L, 9Q). Ant. I and II (except in *Acanthocyrtus croceus*), head, dorsum of body, leg, and ventral side of furcula are usually covered with scales. Ventral scales on dens are narrower than those on the body (Figs 6H, 7O, 8M).

Ant. IV apical bulb: The Ant. IV apical retractile bulb occurs in three forms: absent, unilobed (entire) or bilobed (Fig. 9B). It is a constant character intraspecifically but is sometimes difficult to observe.

Interocular chaetotaxy: Most species have a maximum of six setae within the eye patch named as setae p, q, r, s, t, and v (Mari-Mutt, 1986) (Fig. 2). Seta p is longer and stronger than the other setae; seta v is often absent; if present, it is never a scale as in *Lepidocyrtus*. Additional setae to p, q, r, s, t, and v are only present in *Acanthocyrtus spinosus*.

Cephalic dorsal chaetotaxy: The cephalic dorsal chaetotaxy is shown in Figure 3. The sutural setae (S), Gr. I, and Gr. II show useful taxonomical variation. S₀ is always present; group S has a maximum of six setae; and Gr. I and II have two or four, and four or five setae, respectively.

Labial chaetotaxy: Setae M₁M₂RRsELL (Gisin, 1964) at most are present on the labium (Fig. 8D). All are ciliate. The second seta M₂ is usually smaller than M₁. Supplementary seta to R (Rs) exist only in the species *Acanthocyrtus yolngui* sp. nov. and *Acanthocyrtus loftyensis* sp. nov.

Body chaetotaxy: The body chaetotaxy (Fig. 4) is a valuable character in *Acanthocyrtus* as in most Entomobryidae genera. Here, we adopt the nomenclatural system of Szeptycki (1979). The number and position of macrochaetae from thoracic segment (Th.) III to Abd. III are fairly constant, but some variation exists on Th. II and Abd. IV.

Th. II (Fig. 4A) – the number and arrangement of mediomedial (Mm) macrochaetae (sets of m1 and m2) on the mesotum occur in various patterns; m1 and m2 are present in all species except in *Acanthocyrtus spinosus* (m1 absent). All macrochaetae in this area are extremely stable intraspecifically but may differ between species. p5 is absent in *Acanthocyrtus spinosus* and *Acanthocyrtus lineatus*. Sets of mediosublateral (Ms) setae m4 and m4p are also taxonomically valuable.

Th. III (Fig. 4B) – some macrochaetae (p1, p2, p3, m5, a6, p5, p6, and m6) on the metanotum are always present in each species; m4 occurs in *Acanthocyrtus spinosus* and *Acanthocyrtus lineatus*; p4, m5i, and a6i are present only in *Acanthocyrtus lineatus*.

Abd. I (Fig. 4C) – most species in the genus have four macrochaetae (m2, m3, m4, and m5); the only exception is *Acanthocyrtus spinosus* that has two (m3 and m4).

Abd. II (Fig. 4D) – two sets of macrochaetae occur: a2–m3–m3e and m3–m3e–m3ep; m6 is always a microchaetae with an adjacent setula.

Abd. III (Fig. 4E) – the lateral setae are taxonomically useful in this segment; am6, pm6, p6, m7, and p7 always occur, but m7 and p7 are often transformed into microchaetae. a2 and a3 are consistently

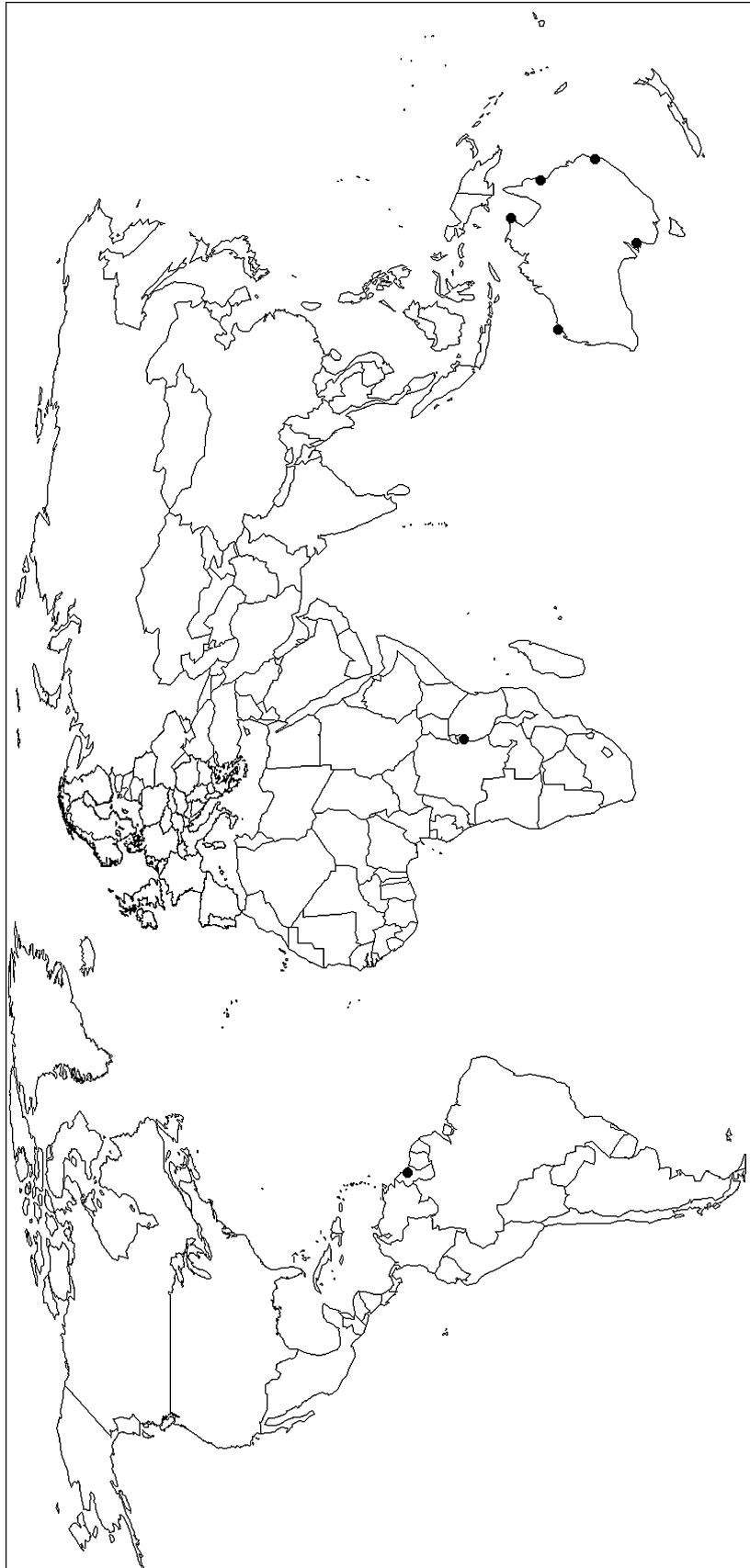


Figure 1. Biogeographical map of species distribution of *Acanthocyrtus*.

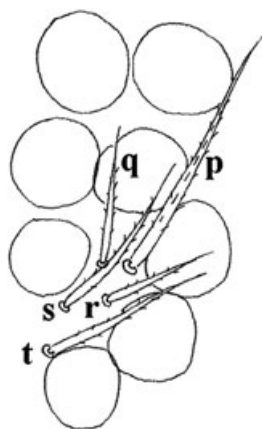


Figure 2. Interocular chaetotaxy.

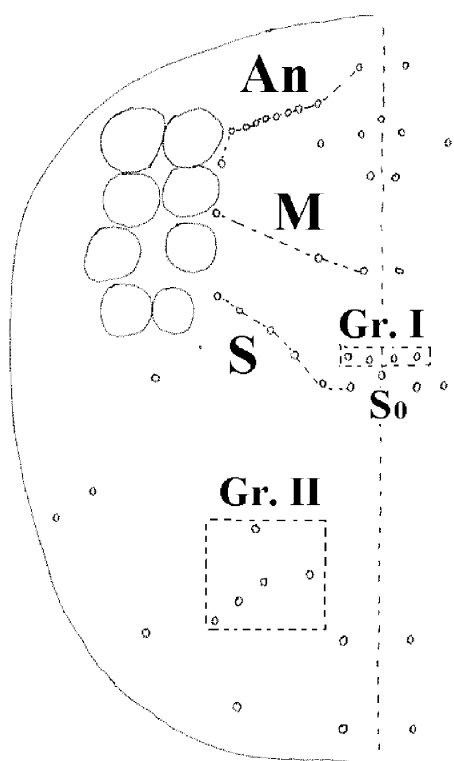


Figure 3. Cephalic dorsal chaetotaxy (Mari-Mutt, 1986).

modified microchaetae; m3 in *Acanthocyrtus lineatus* is relatively further from bothriotrichia m2 than in other *Acanthocyrtus* species.

Abd. IV (Fig. 4F) – although the arrangement and variation of macrochaetae on Abd. IV is more complex than those on other segments, we consider it as a reliable feature, particularly the posteromedial setae [area pM (postero-medial) in Szeptycki's (1979) system]. The two bothriotrichia in *Acanthocyrtus spinosus* and *Acanthocyrtus lineatus* are more posterior than in other species.

Accessory microchaetae of the bothriotrichial complex (Figs 7J, 8I, 9L) – these are distinctly thickened, as in all species of the *Lepidosira*-group, and some are fan-shaped as are those in *Lepidocyrtini*. It is difficult to determine their homology without further studies on postembryonic development (Szeptycki, 1979).

Trochanteral organ: The spiny setae of the trochanteral organ are numerous and arranged in a quadrilateral pattern (Figs 7H, 9I). The number of spiny setae changes with development, so a range is given in the descriptions.

Claw: The unguis has one basal small outer, two lateral, and three or four inner teeth. Their number, shape, and position are useful for classification. All species possess a lanceolate unguiculus with a smooth or serrate outer edge. Tenent hairs are clavate except in *Acanthocyrtus marginalis*, and usually shorter than the unguis.

Dental spines: The dental spines of all species are arranged in multiple rows and there is no obvious morphological difference in spines amongst species.

Mucro: *Acanthocyrtus barrowensis* sp. nov. has a much larger apical tooth than the other species, and a long basal spine reaching midway between the subapical and apical tooth (Fig. 9P). Other species have two subequal teeth and a basal spine reaching the apex of the subapical tooth.

ACANTHOCYRTUS SPINOSUS (SCHÖTT, 1917) (FIG. 5)

Lepidocyrtus (Lepidocyrtoides) spinosus Schött, 1917

Acanthocyrtus spinosus: Handschin, 1925

Type locality: Ravenshoe, Atherton Tableland, Queensland, Australia.

Material examined: male and four females on slides and three in alcohol, Australia: Queensland: Atherton Tableland, 17°38' S, 145°29' E, 4.ii.1988, collected by D. Rentz; two females on slides and seven in alcohol, Australia: Queensland: Atherton Tableland, 17°38' S, 145°29' E, 14.iii.1988, collected by D. Rentz.

Description: Body length up to 3.6 mm.

Colour pattern. Ground colour pale yellow in alcohol. Antennae light. Dark blue pigments distributed on whole head, lateral part darker than central. Irregular patches present on body laterally from Th. II to Abd. V. Each leg pigmented from coxa to femur;

KEY TO SPECIES OF THE GENUS ACANTHOCYRTUS

1. Tenent hair pointed.....*Acanthocyrtus marginalis*
 Tenent hair clavate.....2
2. Mucronal basal spine reaching midway between subapical tooth and apical tooth.....*Acanthocyrtus barrowensis* sp. nov.
 Mucronal basal spine just reaching the apex of subapical tooth.....3
3. Antennae subequal to or longer than body length.....4
 Antennae much shorter than body length.....6
4. Ant. IV annulated, apical bulb present.....*Acanthocyrtus lineatus*
 Ant. IV not annulated, apical bulb absent.....5
5. Whole femora pigmented; antennae with just distal portion of fourth segment pigmented.....*Acanthocyrtus guianensis*
 Distal portion of femora and distal portion of each antennal segment pigmented.....*Acanthocyrtus croceus*
6. Abd. I with two macrochaetae.....*Acanthocyrtus spinosus*
 Abd. I with four macrochaetae.....7
7. Dorsal head with two in Gr. I and three sutural macrochaetae.....*Acanthocyrtus yolngui* sp. nov.
 Dorsal head with four in Gr. I and four sutural macrochaetae.....*Acanthocyrtus loftyensis* sp. nov.

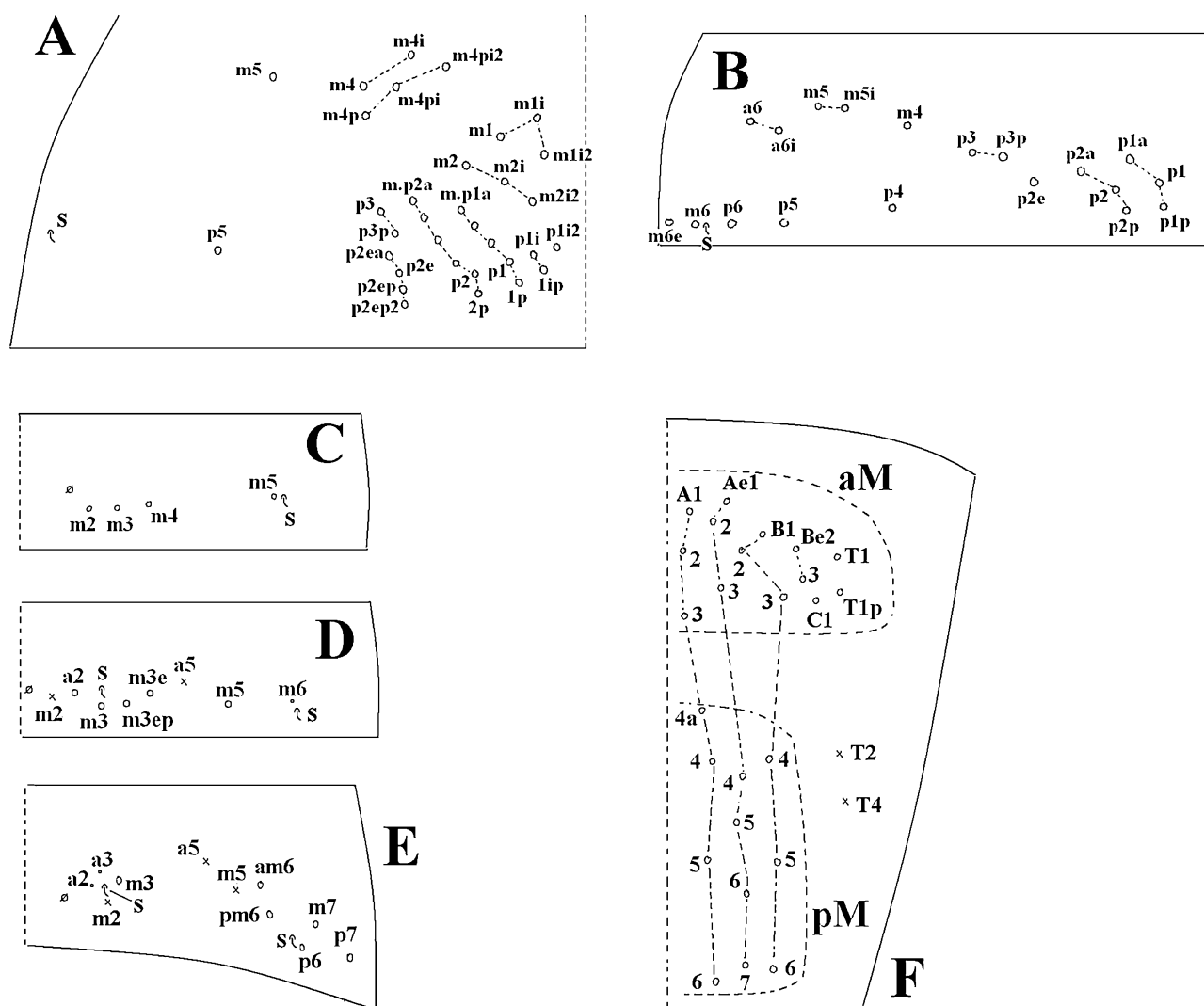


Figure 4. Dorsal body chaetotaxy. A, thoracic segment (Th.) II. B, Th. III. C, abdominal segment (Abd.) I. D, Abd. II. E, Abd. III. F, Abd. IV.

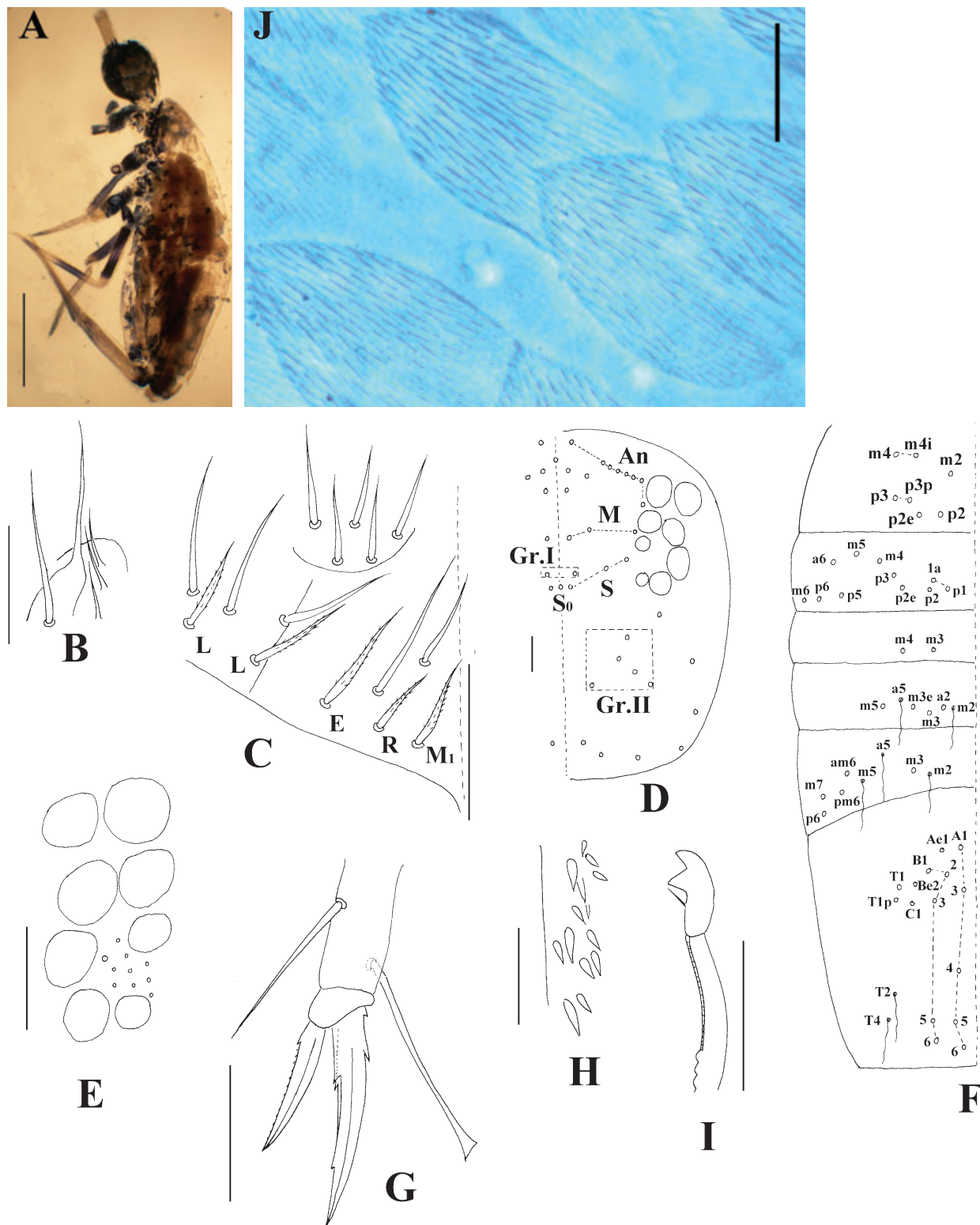


Figure 5. *Acanthocyrthus spinosus* (Schött). A, colour pattern. B, maxillary outer lobe. C, labial triangular setae. D, cephalic dorsal chaetotaxy. E, interocular setae. F, dorsal macrochaetotaxy. G, hind claw. H, dental spines. I, mucro. J, body scales. Scale bars: A and F = 1 mm; B–E and H–J = 50 µm.

one dark blue band on middle of hind tibiotarsus. Furcula slightly pigmented with manubrial base darker (Fig. 5A).

Head. Ant. II–IV not seen. Eyes eight + eight, G and H (Guthrie, 1906) smaller and subequal. Prelabral and labral setae four/five, five, four, prelabral setae ciliate. Labral papilla absent. Subapical seta of maxillary outer lobe long, subequal in length to and thicker than apical one; three smooth hairs on sublobal plate (Fig. 5B). Basal setae of labium as M₁RELL, all finely ciliate (Fig. 5C). Cephalic dorsal chaetotaxy with seven antennal (An), three median (M), three sutural (S) macrochaetae, two macrochaetae in Gr. I, and five macrochaetae in Gr. II (Fig. 5D). Interocular area with about ten ciliate setae (Fig. 5E).

Thorax and legs. Dorsal macrochaetae shown in Figure 5F. Th. II with one mediocentral (m2), two mediosublateral (m4 and m4i) and four posterior macrochaetae (p2–3, p2e, and p3p) on each side. Th. III with 11 macrosetae, three of them (p5, p6, and m6) on posterior lateral margin; m5i and a6i absent.

Tibiotarsus with inner differentiated setae finely ciliate, the distal one smooth; inner outstanding macrochaetae tapered only at tip. Unguis with one outer, two lateral, and three inner teeth, all tiny; outer one near base; lateral ones at 0.25× distance from base, inner pair with tip reaching 0.33× internal length of claw, and distal one 0.70× distance from base. Unguiculus slender and acuminate with outer edge serrate. Tenent hair clavate and subequal to unguis (Fig. 5G).

Abdomen. Abd. IV four times as long as Abd. III along dorsal midline. Dorsal macrochaetae shown in Figure 5F. Abd. I with two macrochaetae (m3 and m4) in one row on each side. Abd. II with three dorsocentral (a2, m3, and m3e) and one lateral (m5) macrochaetae. Abd. III with one dorsocentral (m3) and four lateral (am6, pm6, p6, and m7) macrochaetae. Abd. IV with 15 dorsocentral macrochaetae (A1, A3–6, B1–3, B5–6, Ae1, Be2, C1, T1, and T1p) on each side. Furcal segmental ratio of manubrium to dens plus mucro = 1 : 1.3. Manubrium ventrally covered with scales and ciliate setae. Dens with spines (Fig. 5H) and scales, distal smooth part 1.5 times mucro in length. Mucro bidentate, apical tooth subequal to subapical one; basal spine short with tip reaching apex of subapical tooth (Fig. 5I).

Body scales. Most scales pointed and coarsely striate; present on head and body, Ant. I and II, whole leg, and ventral side of furcula (Fig. 5J).

Ecology: In leaf litter and on and under bark of tropical sclerophyll eucalypt woodland and rainforest.

Remarks: Yoshii & Greenslade (1994) redescribed this species and considered *Acanthocyrtus* as a member of Seirinae (Seirini *sensu* Soto-Adames *et al.*, 2008). We

agree with their redescription and have added more details on dorsal chaetotaxy, the maxillary outer lobe, and interocular setae.

ACANTHOCYRTUS LINEATUS WOMERSLEY, 1934
(FIG. 6)

Type locality: Brisbane, Queensland, Australia.

Material examined: Female, Australia: Queensland: Griffith University: Nathan Campus: Toohey forest, 27°28'S, 153°01'E, vii–viii.1993, collected by D. Rodgers.

Description: Body length up to 1.6 mm.

Colour pattern with single longitudinal stripe on body. Ground colour pale yellow on slide (Fig. 6A).

Head. Antenna 4.5 times as long as cephalic diagonal, subequal to body length. Ratio of segments of antennae I : II : III : IV = 1 : 1.64 : 1.73 : 2.64. Antennal apical bulb distinct and entire. Eyes eight + eight, G and H smaller. Prelabral and labral setae four/five, five, four, prelabral setae ciliate. Basal setae of labium as M₁RELL. Cephalic dorsal chaetotaxy not clearly seen. Interocular area with setae p, q, r, s, t, v (Fig. 6B).

Thorax and legs. Dorsal macrochaetae shown in Figure 6C. Th. II with two mediomedial (m1 and m2), two mediosublateral (m4 and m4i) and eight posterior macrochaetae on each side. Th. III with 15 macrosetae; p4, m4, m5i, and a6i present.

Tibiotarsus with inner differentiated setae finely ciliate, the distal one smooth; inner outstanding macrochaetae tapered only at tip. Unguis with two lateral and three inner teeth; inner pair with tip reaching 0.45× internal length of claw, and distal one 0.70× distance from base. Unguiculus slender and acuminate. Tenent hair clavate, longer than unguis (Fig. 6D).

Abdomen. Abd. IV ten times as long as Abd. III along dorsal midline. Dorsal macrochaetae shown in Figure 6C. Abd. I with four macrochaetae (m2, m3, m4, and m5) in one row on each side. Abd. II with three dorsocentral (a2, m3, and m3e) and one lateral (m5) macrochaetae. Abd. III with one dorsocentral (m3) and three lateral (am6, pm6, p6) macrochaetae. Abd. IV with 15 dorsocentral macrochaetae (A1–6, Ae1–3, B1–3, B5–6, and Be3) on each side. Furcal segmental ratio of manubrium to dens plus mucro = 1 : 1.38. Manubrium ventrally covered with scales and ciliate setae. Dens with scales and spines arranged sparsely (Fig. 6E), distal smooth part 2.48 times mucro in length. Mucro bidentate, apical tooth subequal to subapical one; basal spine short with tip reaching apex of subapical tooth (Fig. 6F).

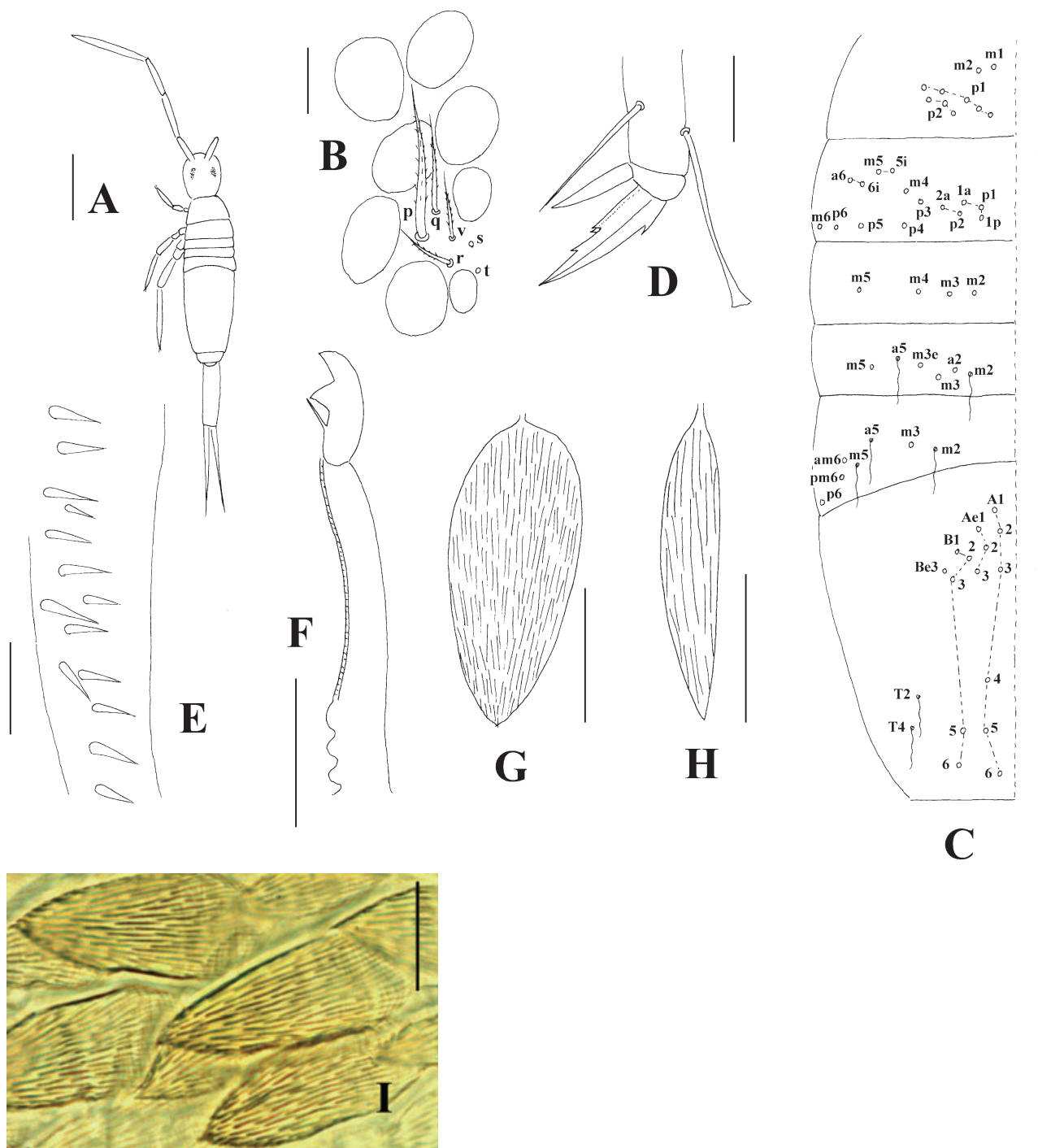


Figure 6. *Acanthocryptus lineatus* Womersley. A, habitus. B, interocular setae. C, dorsal body chaetotaxy. D, hind claw. E, dental spines. F, mucro. G, I, body scales. H, scales on dens. Scale bars: A and C = 0.5 mm; B, D–I = 25 μ m.

Body scales. Scales coarsely striate and leaf-like with pointed tip (Fig. 6G, I), and other scales on ventral dens obviously narrower (Fig. 6H); scales present on head and body, Ant. I and II, whole leg, ventral tube and ventral side of furcula.

Ecology: Found in eucalypt woodland leaf litter and base of tussocks of kangaroo grass (*Themeda triandra*); sandstone vegetation with stringybarks which are uncommon regionally; no eucalypts nearby.

Remarks: *Acanthocyrtus lineatus* was first described by Womersley (1934) from Queensland. Our specimens agree with the original description in having long antennae, Ant. IV apical bulb, claw structure, dental spines, bidentate mucro, and shape of scales. The long antennae subequal to the body length is the most obvious feature to separate it from other species of *Acanthocyrtus*. We add here many details of the dorsal chaetotaxy, interocular setae, and morphological structures of scales. More details such as cephalic dorsal chaetotaxy cannot be provided until more specimens are found.

***ACANTHOCYRTUS YOLNGUI* ZHANG SP. NOV. (FIG. 7)**

Type material: HOLOTYPE: female, Australia: Northern Territory: Gove Peninsula, 12°17'S, 136°49'E, iii.1996, collected by D. Hinz. PARATYPES: three females, same data as holotype.

Description: Body length up to 2.4 mm.

Colour pattern. Ground colour pale yellow in alcohol. Antennae light. Eye patches dark blue. Blue pigment and irregular patch present along lateral margins. Base of leg and manubrium slightly pigmented (Fig. 7A).

Head. Antenna about 2.5 times as long as cephalic diagonal. Ratio of segments of antennae I: II: III: IV = 1: 1.8: 1.4: 2.0. Antennal apical bulb absent.

Eyes eight + eight, G and H smaller and subequal. Labral papilla absent. Prelabral and labral setae four/ five, five, four, all smooth. Lateral process of labial palp slightly curved, as thick as normal setae, with tip obviously not reaching apex of labial papilla (Fig. 7B). Subapical seta of maxillary outer lobe large, subequal in length to and thick as apical one; three smooth hairs on sublobal plate (Fig. 7C). Basal setae of labium as M_1M_2RELL ; all finely ciliate; M_2 much smaller than others (Fig. 7D). Cephalic dorsal chaetotaxy with seven to eight An, three M, and three S macrochaetae, two macrochaetae in Gr. I and five macrochaetae in Gr. II. Interocular area as setae p, q, r, s, t, v (Fig. 7E).

Thorax and legs. Dorsal macrochaetae shown in Figure 7F. Th. II with five mediomedial (m1, m1i, m1i2, m2, and m2i), two medio sublateral (m4 and m4i) 14–18 posterior macrochaetae on each side; p2ea often absent. Th. III with 12 macrosetae; a5i and a6i absent.

Trochanteral organ with about 40 smooth spiny setae (Fig. 7H). Tibiotarsus with inner differentiated setae finely ciliate, the distal one smooth; inner out-standing macrochaetae tapered only at tip. Unguis with one outer, two lateral, and four inner teeth, all tiny; outer one near base, lateral one at 0.25× dis-

tance from base, inner pair with tip reaching 0.30–0.35× internal length of claw, median one at 0.69–0.74×, and distal one 0.90× distance from base. Unguiculus slender and acuminate. Tenent hair clavate and subequal to unguis (Fig. 7I).

Abdomen. Abd. IV 4.0–5.5 times as long as Abd. III along dorsal midline. Dorsal macrochaetae shown in Figure 7G. Abd. I with four dorsocentral macrochaetae (m2, m3, m4, and m5) in one row on each side. Abd. II with three dorsocentral (m3, m3e, and m3ep) and one lateral (m5) macrochaetae. Abd. III with one dorsocentral (m3) and four lateral (am6, pm6, p6, and m7) macrochaetae. Abd. IV usually with 13 dorsocentral macrochaetae (A1, A3, A5–6, Ae1, Ae3–4, Ae6–7, B3, B5–6, Be1) on each side; Ae5 rarely present. Accessory microchaetae of bothriotrichial complexes on Abd. II–IV ciliate, broadly modified, or fan-shaped (Fig. 7J). Tenaculum with four + four teeth and one large striate seta. Ventral tube anteriorly with three large ciliate setae and about 17 ciliate setae of different sizes on each side; each lateral flap with five smooth and seven ciliate setae (Fig. 7K). Furcal segmental ratio of manubrium to dens plus mucro = 1: 1.1–1.4. Manubrium ventrally covered with scales and ciliate setae. Dens with spines (Fig. 7L) and scales, distal smooth part 1.5 times mucro in length. Mucro bidentate, apical tooth subequal to subapical one; basal spine short with tip reaching apex of subapical tooth (Fig. 7M).

Body scales. Scales coarsely striate, mostly round or truncate, and a few pointed (Fig. 7N); present on head and body, Ant. I and II, whole leg, and ventral side of furcula; scales on dens pointed and narrower than body scales (Fig. 7O).

Ecology: Collected from pitfalls in eucalypt tall open forest, typically dominated by Darwin woollybutt (*Eucalyptus miniata*) and Darwin stringybark (*Eucalyptus tetrodonta*), with smaller areas of monsoon rainforest and eucalypt woodland.

Etymology: The name acknowledges the indigenous people of the region where this species occurs.

Remarks: The new species can be easily distinguished from other known *Acanthocyrtus* species by the colour pattern, dorsal chaetotaxy, and short lateral process of the labial palp. Cephalic sutural setae are fewer than in other species (three versus four or six). The positions of Ae6 and Ae7 are comparatively more anterior to their normal position.

***ACANTHOCYRTUS LOFTYENSIS* ZHANG SP. NOV. (FIG. 8)**

Type material: HOLOTYPE: female on slide, Australia: South Australia: Mt Lofty, Summit, 700 m a.s.l. 34°58'S, 138°42'E, 29.vii.1978, collected by

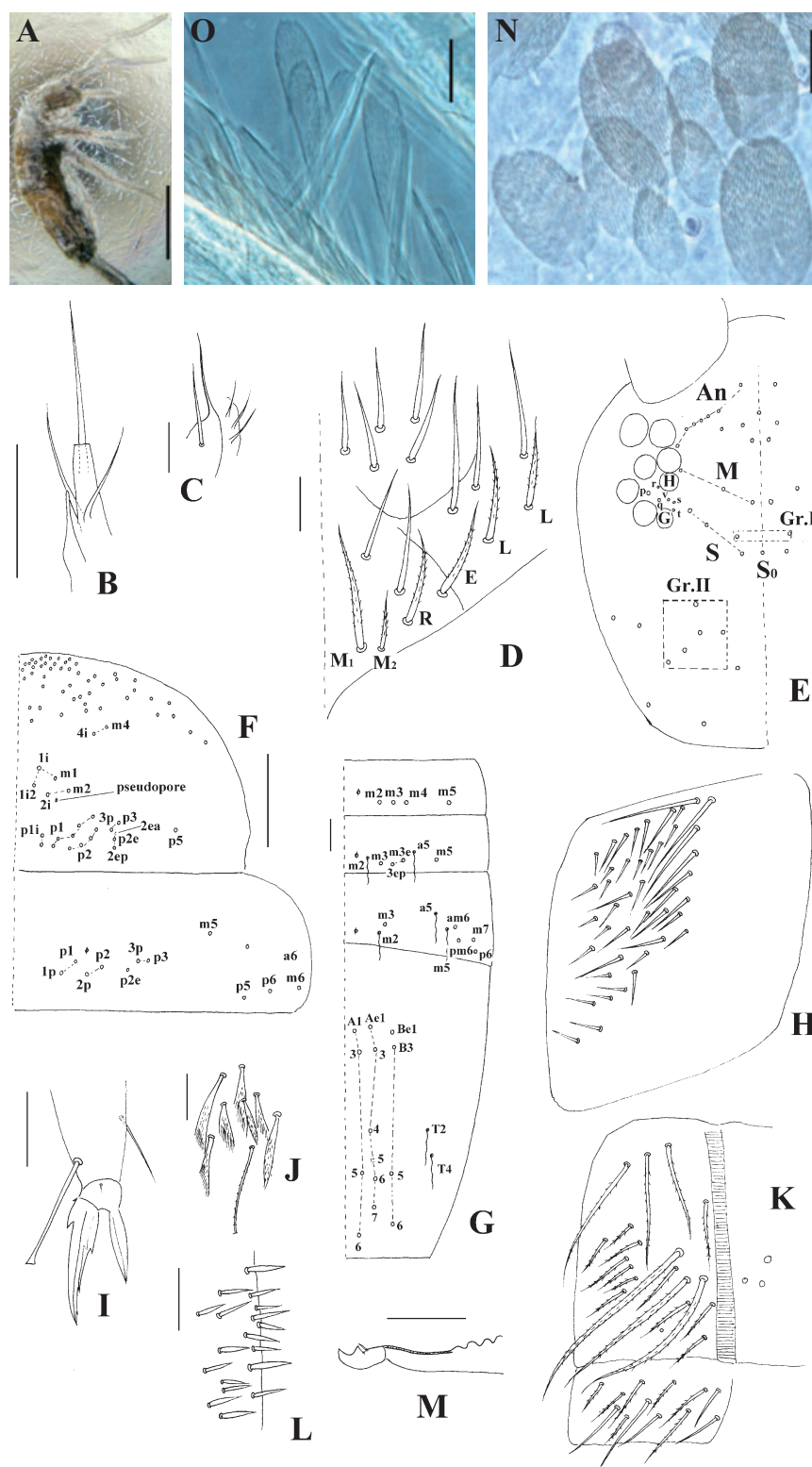


Figure 7. *Acanthocyrtus yolngui* sp. nov. A, colour pattern. B, lateral process of labial palp. C, maxillary outer lobe. D, labial triangular setae. E, cephalic dorsal chaetotaxy. F, thoracic chaetotaxy. G, abdominal chaetotaxy. H, trochanteral organ. I, hind claw. J, bothriotrichial complex on abdominal segment (Abd.) II centrally. K, anterior face of ventral tube. L, dental spines. M, mucro. N, body scales. O, scales on dens. Scale bars: A = 1 mm; B–D, H–O = 25 µm; E–G = 100 µm.

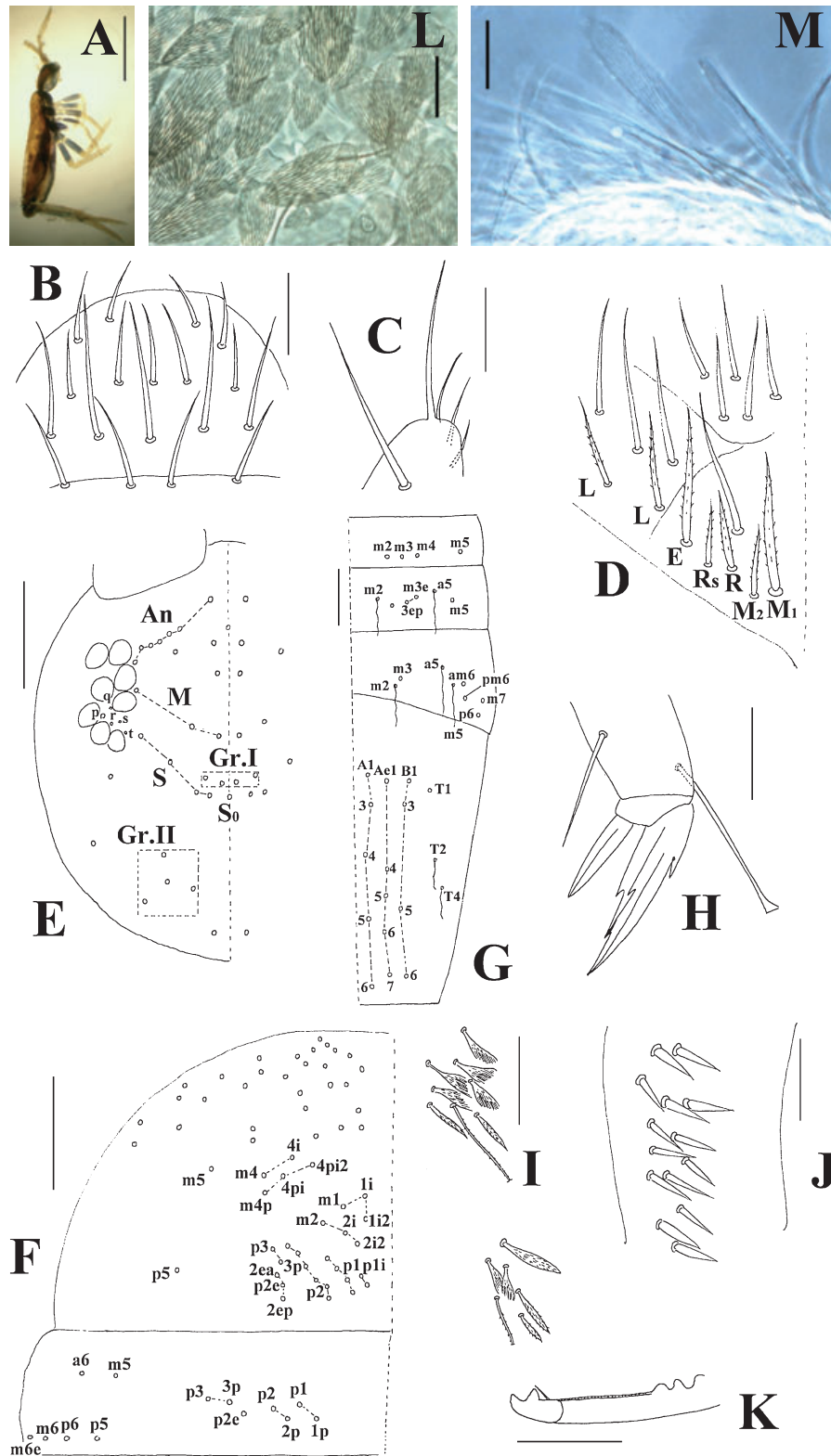


Figure 8. *Acanthocyrtus loftyensis* sp. nov. A, colour pattern. B, prelabral and labral setae. C, maxillary outer lobe. D, labial triangular setae. E, cephalic dorsal chaetotaxy. F, thoracic chaetotaxy. G, abdominal chaetotaxy. H, hind claw. I, bothriotrichial complexes on abdominal segment (Abd.) IV. J, dental spines. K, mucro. L, body scales. M, scales on dens. Scale bars: A = 1 mm; B–D and H–M = 25 μ m; E–G = 100 μ m.

P. Greenslade. PARATYPES: one female on slide and two in alcohol, same data as holotype.

Description: Body length up to 2.2 mm.

Colour pattern. Ground colour pale yellow in alcohol. Antennae light except blue Ant. I. Eye patches dark blue. Legs pigmented from coxa to femur. Irregular patches present along lateral margins of body from Th. II to Abd. IV. Manubrium laterally dark blue (Fig. 8A).

Head. Antenna about 2.2–2.5 times as long as cephalic diagonal. Ratio of segments of antennae I : II : III : IV = 1 : 1.7 : 1.5 : 1.9. Antennal apical bulb absent.

Eyes eight + eight. Labral papillae absent. Prelabral and labral setae four/five, five, four, all smooth; three media setae of the first row are larger than others (Fig. 8B). Subapical seta of maxillary outer lobe large, subequal in length to, and thick as apical one; three smooth hairs on sublobal plate (Fig. 8C). Basal setae of labium as MmRR_sELL; all finely ciliate (Fig. 8D). Cephalic dorsal chaetotaxy with seven to eight An, three M, and four S macrochaetae, four macrochaetae in Gr. I and four macrochaetae in Gr. II. Interocular area with setae p, q, r, s, t (Fig. 8E).

Thorax and legs. Dorsal macrochaetae shown in Figure 8F. Th. II with six mediomedial (m1, m1i, m1i2, m2, m2i, and m2i2), five mediosublateral (m4, m4i, m4p, m4pi, and m4pi2) 18–19 posterior macrochaetae on each side; plia often absent. Th. III with 13 macrosetae; a5i and a6i absent.

Trochanteral organ with many smooth spiny setae. Tibiotarsus with inner differentiated setae finely ciliate, the distal one smooth; inner outstanding macrochaetae tapered only at tip. Unguis with one outer, two lateral, and three inner teeth; lateral one at 0.33× distance from base, inner pair with tip reaching 0.47× internal length of claw, and distal one 0.74× distance from base. Unguiculus slender and acuminate. Tenent hair clavate and subequal to unguis (Fig. 8H).

Abdomen. Abd. IV 7–10 times as long as Abd. III along dorsal midline. Dorsal macrochaetae shown in Figure 8G. Abd. I with four dorsocentral macrochaetae (m2, m3, m4, and m5) in one row on each side. Abd. II with three dorsocentral (m3, m3e, and m3ep) and one lateral (m5) macrochaetae. Abd. III with one dorsocentral (m3) and four lateral (am6, pm6, p6, and m7) macrochaetae. Abd. IV with about 15 dorsocentral macrochaetae on each side; Ae5 and A4 often absent. Accessory microchaetae of bothriotrichial complexes on Abd. II–IV ciliate, broadly modified or fan-shaped (Fig. 8I). Tenaculum with four + four teeth and one large striate seta. Furcal segmental ratio of manubrium to dens plus mucro = 1 : 1.1–1.3. Manubrium ventrally covered with scales and ciliate setae.

Dens with spines (Fig. 8J) and scales, distal smooth part 1.3–1.5 times mucro in length. Mucro bidentate, apical tooth subequal to subapical one; basal spine short with tip reaching apex of subapical tooth (Fig. 8K).

Body scales. Scales present on head and body, Ant. I and II, whole leg, ventral tube, and ventral side of furcula. Most scales coarsely striate and leaf-like with pointed tip (Fig. 8L), scales on dens ventrally distinctly narrower (Fig. 8M).

Ecology: Found in leaf litter of tall eucalypt stringy bark open forest, where a Mediterranean-type climate predominates.

Etymology: The new species is named after the type locality.

Remarks: *Acanthocyrtus loftyensis* can be easily distinguished from other known *Acanthocyrtus* species by colour pattern, dorsal chaetotaxy, the presence of Rs on labial base, and absence of seta v in eyepatch. It is most similar to *Acanthocyrtus yolngui* in dorsal chaetotaxy, bidentate mucro, and labral setae. It can be separated from it by pigmented leg, presence of Rs on labial base, four sutural, four in Gr. I and four macrochaetae in Gr. II, on head, presence of seta v in the interocular area and m2i2 on Th. II.

ACANTHOCYRTUS BARROWENSIS ZHANG SP. NOV.

(FIG. 9)

Type material: HOLOTYPE: female on slide, Australia: Western Australia: Barrow Island, 20°48'S, 115°23'E, vi.2005, collected by S. Callan. PARATYPES: six females on slides, same data as holotype. Additional records: male and two females on slides, Australia: Western Australia: Barrow Island, 20°48'S, 115°23'E, 8.iii.2006, collected by S. Callan.

Description: Body length up to 2.7 mm.

Colour pattern. Ground colour pale yellow in alcohol. Eye patches dark blue. Blue pigment present on Ant. I and II, base of leg, and manubrium (Fig. 9A).

Head. Antenna 2.8–3.4 times as long as cephalic diagonal. Ratio of segments of antennae I : II : III : IV = 1 : 1.6–2.0 : 1.4–1.7 : 2.1–2.4. Antennal apical bulb bilobed (Fig. 9B).

Eyes eight + eight. Labral papillae absent. Prelabral and labral setae four/five, five, four, all smooth; three median setae of the first row are larger than others (Fig. 9C). Lateral process of labial palp slightly curved, as thick as normal setae, with tip just reaching apex of labial papilla (Fig. 9D). Subapical seta of maxillary outer lobe large, subequal in length to and

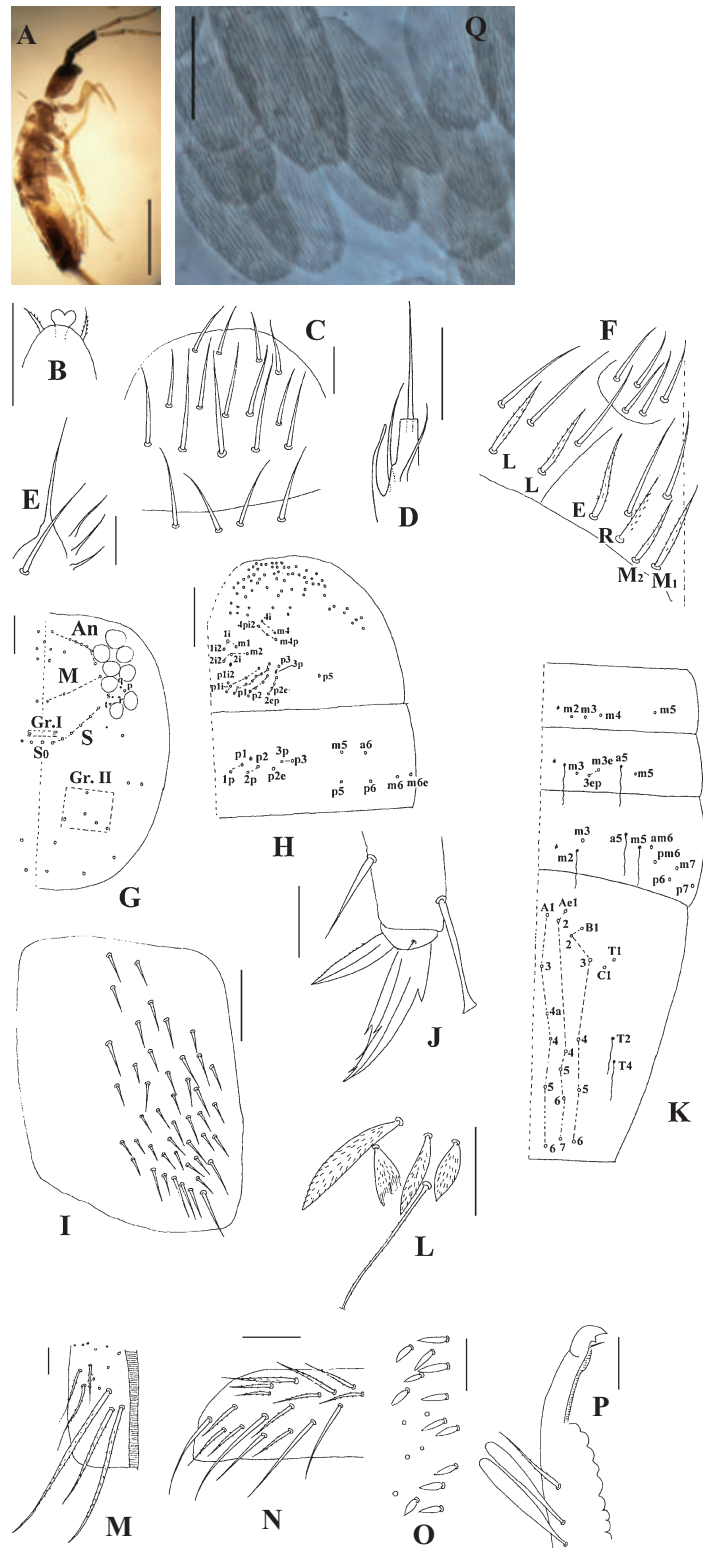


Figure 9. *Acanthocyrtus barrowensis* sp. nov. A, colour pattern. B, antennal segment (Ant.) IV apical bulb. C, prelabral and labral setae. D, lateral process of labial palp. E, maxillary outer lobe. F, labial triangular setae. G, cephalic dorsal chaetotaxy. H, thoracic chaetotaxy. I, trochanteral organ. J, hind claw. K, abdominal chaetotaxy. L, bothriotrichial complex on abdominal segment (Abd.) III centrally. M, anterior face of ventral tube. N, lateral palp. O, dental spines. P, mucro. Q, body scales. Scale bars: A = 1 mm; B–G, I–J, L–Q = 25 µm; H and K = 100 µm.

thick as apical one; three smooth hairs on sublobal plate (Fig. 9E). Basal setae of labium as M_1M_2RELL ; all finely ciliate (Fig. 9F). Cephalic dorsal chaetotaxy with six to eight An, three M, and six S macrochaetae; S_0 present; two macrochaetae in Gr. I and five in Gr. II. Interocular area with setae p, q, r, s, t (Fig. 9G).

Thorax and legs. Dorsal macrochaetae shown in Figure 9H. Th. II with six mediomedial (m_1 , m_{1i} , m_{1i2} , m_2 , m_{2i} , and m_{2i2}), five mediosublateral (m_4 , m_{4i} , m_{4p} , m_{4pi} , and m_{4pi2}), 26–33 posterior macrochaetae on each side; p_{3p} and p_{1i2} often absent. Th. III with 13 macrosetae; a_{5i} and a_{6i} absent.

Trochanteral organ with 39–58 smooth spiny setae (Fig. 9I). Tibiotarsus with inner differentiated setae finely ciliate, the distal one smooth; inner outstanding macrochaetae tapered only at tip. Unguis with one outer, two lateral, and four inner teeth; outer one near base, lateral one at $0.25\times$ distance from base, inner pair with tip reaching $0.58\text{--}0.62\times$ internal length of claw, median one at $0.78\times$ and distal one $0.89\times$ distance from base. Unguiculus slender and acuminate with outer edge serrate. Tenent hair strong clavate and shorter than unguis (Fig. 9J).

Abdomen. Abd. IV 4.4–7.2 times as long as Abd. III along dorsal midline. Dorsal macrochaetae shown in Figure 9K. Abd. I with four dorsocentral macrochaetae (m_2 , m_3 , m_4 , and m_5) in one row on each side. Abd. II with three dorsocentral (m_3 , m_{3e} , and m_{3ep}) and one lateral (m_5) macrochaetae. Abd. III with one dorsocentral (m_3) and five lateral (am_6 , pm_6 , p_6 , m_7 , and p_7) macrochaetae. Abd. IV usually with about 19 dorsocentral macrochaetae on each side; Ae_2 and A_4a sometimes absent. Accessory microchaetae of bothriotrichial complexes on Abd. II–IV ciliate, broadly modified or fan-shaped (Fig. 9L). Tenaculum with four + four teeth and one large striate seta. Ventral tube anteriorly with three large ciliate setae and numerous ciliate setae of different sizes on each side (Fig. 9M); each lateral flap with five smooth and about 12 ciliate setae (Fig. 9N). Furcal segmental ratio of manubrium to dens plus mucro = $1 : 1.3\text{--}1.5$. Manubrium ventrally covered with scales and ciliate setae. Dens with spines (Fig. 9O) and scales, distal smooth part 1.8 times mucro in length. Mucro bidentate, apical tooth obviously larger than subapical one; basal spine long with tip reaching beyond apex of subapical tooth but not to the apical one (Fig. 9P).

Body scales. Scales coarsely striate, most round or truncate, and some pointed (Fig. 9Q); present on head and body, Ant. I and II, whole leg, and ventral side of furcula; scales on dens narrower than on body.

Ecology: Collected from pitfalls in hummock grassland (*Triodia* spp.) with some scattered low shrubs and herb.

Etymology: The new species is named after the type locality.

Remarks: The new species from Barrow Island can be separated from other *Acanthocyrtus* species by its unique mucro with long basal spine, more abundant sutural setae on head and on Th. II, long, narrow distal teeth on unguis, and shorter tenent hair. It is most close to *Acanthocyrtus yolngui* in labial chaetotaxy (M_1M_2RELL), two in Gr. I and five in Gr. II on dorsal head, presence of p_5 on Th. II, chaetotaxy of Th. III, Abd. I–II and central Abd. III, trochanteral organ, and morphology of dental spines; it differs from *Acanthocyrtus yolngui* in six sutural setae, longer lateral process of labial palp, shorter tenent hair on leg, absence of p_5 on Th. II, presence of p_8 on Abd. III, more macrochaetae (A_4a , A_4 , $B_1\text{--}2$, B_4 , C_1 , T_1) on Abd. IV, and smaller subapical tooth on mucro.

SINHOMIDIA ZHANG GEN. NOV.

Type species: *Acanthocyrtus bicolor* Yosii, 1965

Type locality: Wulai, Taiwan, China.

Diagnosis: The genus is characterized by eight + eight eyes, pointed scales with coarse striations present on body but absent on dens, presence of dental spines, clavate tenent hair, bidentate mucro with a basal spine and larger subapical tooth, two–three–two bothriotrichia on Abd. II–IV, slightly modified accessory microchaetae of bothriotrichial complex, and a row of anterior eyebrow-like macrochaetae on Abd. IV. As a member of Willowsiini *sensu* Yoshii (1989) by the absence of scales on dens, it resembles *Homidia* in dorsal cephalic chaetotaxy, eyebrow-like macrochaetae on Abd. IV, smooth setae E and L_1 on labial base and larger subapical tooth on mucro; it differs from *Homidia* by the presence of scales on the body; it differs from the other seven genera of Willowsiini in the presence of dental spines, and also differs from members of Seirini in the absence of dental scales.

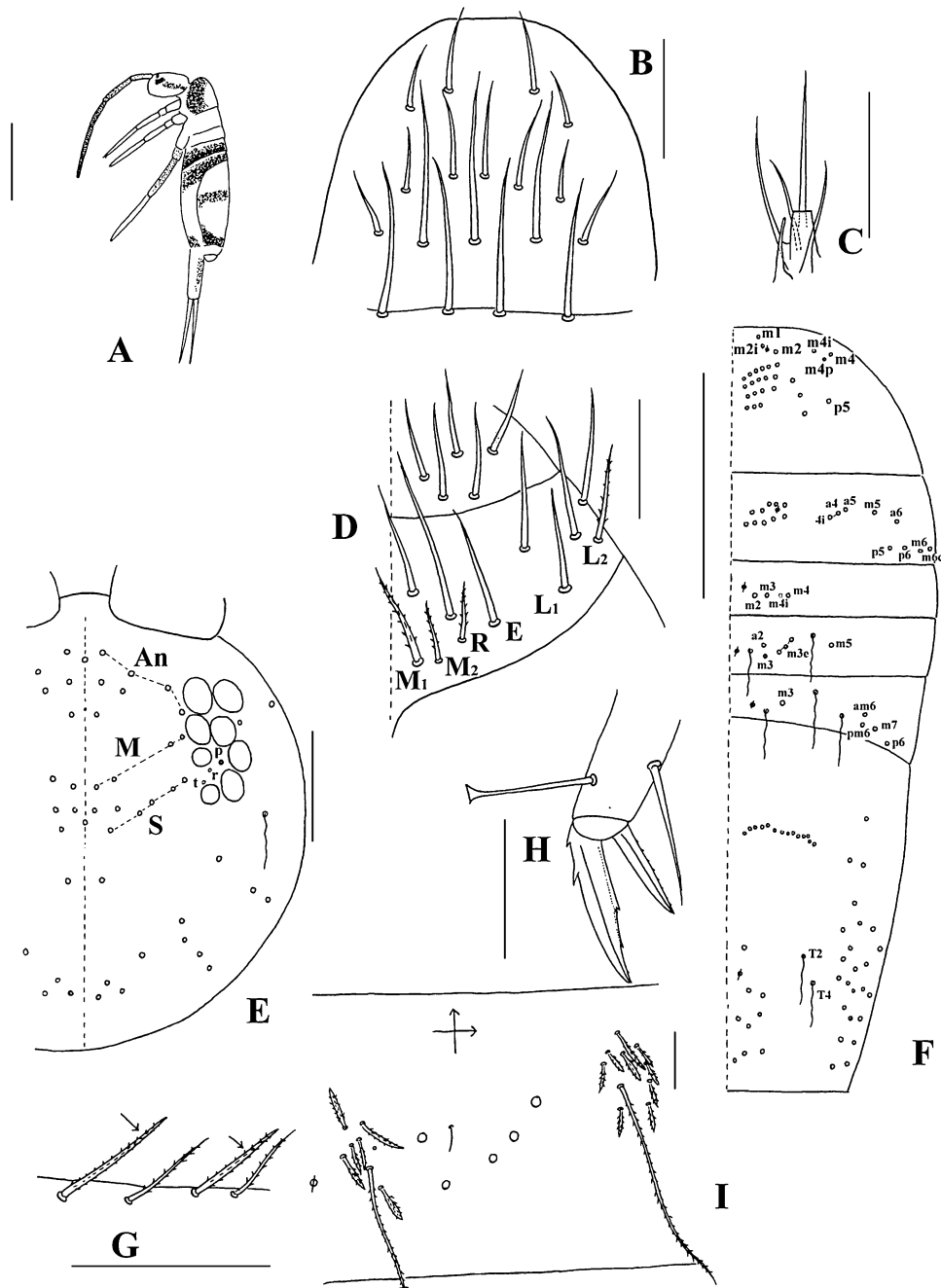
Etymology: The new genus is named after *Homidia*, one genus widely distributed in China, for the many shared features.

SINHOMIDIA BICOLOR (YOSII, 1965) (FIG. 10)

Acanthocyrtus bicolor Yosii, 1965

Type locality: Wulai, Taiwan, China.

Specimens examined: Female, China: Anhui: Huangshan Mountain, $29^{\circ}42'N$, $118^{\circ}18'E$, 5.ix.1999, collection number 9106, collected by Ma Yitong; three



females, Anhui: Qimen: Penglong: Likou Village, 29°51'N, 117°43'E, 16.viii.2004, collection number 9205, Qu Jiqiang and Zhang Feng; two females, Anhui: Yixian: Mukeng, 29°56'N, 117°56'E, 20.viii.2004, Qu

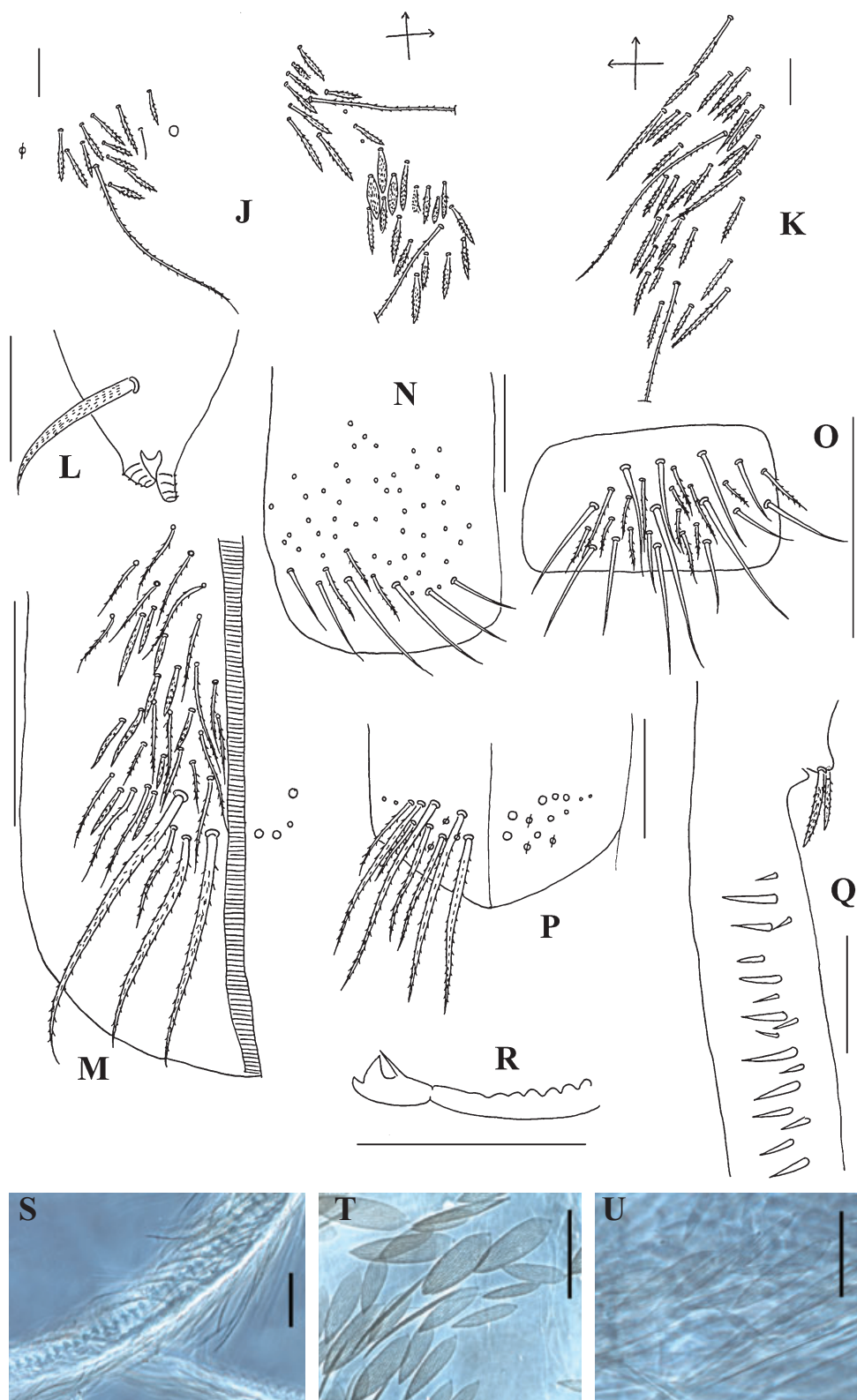


Figure 10. *Continued*

Description: Body length up to 3.2 mm.

Colour pattern. Ground colour pale yellow in alcohol. Eye patches dark purple. Antennae pigmented and gradually darker towards tip of each segment. Deep purple pigment present on mesothorax laterally, whole Abd. II and III, Abd. IV medially and posteriorly, and manubrium. Hind leg with scattered pigment but femur and tibiotarsus pale (Fig. 10A).

Head. Eyes eight + eight, G and H smaller and subequal. Antenna 2.7–3.6 times as long as cephalic diagonal. Ratio of segments of antennae I : II : III : IV = 1.0 : 1.3–1.7 : 1.0–1.6 : 1.8–3.2. Antenna I and II scaled. Ant. IV annulated and bilobed.

Labral papillae absent. Prelabral and labral setae four/five, five, four; prelabral setae smooth; the three media setae of the first row distinctly larger than others (Fig. 10B). Lateral process straight, as thick as normal setae, with tip just not reaching apex of same labial papilla (Fig. 10C). Basal setae of labium as M1M2REL1L2; M2 and R are two microchaetae; E and L1 smooth (Fig. 10D). Cephalic dorsal chaetotaxy as four An, four M, five S macrochaetae; interocular area with setae prt (Fig. 10E).

Thorax. Dorsal macrochaetae shown in Figure 10F. Th. II – all the macrochaetae displaced anteriorly from the normal position; 16–19 posterior; three (m1, m2, and m2i) mediomedial; 3 (m4, m4i, and m4p) mediosublateral. Th. III – 9–11 central; m5i and a6i absent.

Trochanteral organ with numerous smooth spiny setae. Tibiotarsus with inner differentiated setae ciliate, the distal one smooth. Tibiotarsal inner outstanding macrochaetae acuminate but tapered only at tip (Fig. 10G). Unguis with one outer, two lateral, and four inner teeth; outer one small near the base of unguis, and much smaller than lateral ones; paired inner teeth with tip reaching 0.31–0.48× internal length of claw, median one at 0.61–0.73×, and distal one at 0.87–0.91× distance from base. Unguiculus acuminate with outer edge slightly serrate. Tenent hair clavate, slightly longer than unguiculus and shorter than unguis (Fig. 10H).

Abdomen. Abd. III 8–11 times as long as Abd. III along dorsal midline. Dorsal chaetotaxy and corresponding bothriotrichial complex shown in Figure 10F, I–K. Abd. I – four (m2, m3, m4, and m4i) on each side; m4i sometimes absent. Abd. II – five central and one (m5) lateral. Abd. III – one (m3) dorsocentral and four (am6, pm6, p6, and m7) lateral. Abd. IV – in all 27–34 dorsocentral and about 23 lateral, 13–16 macrochaetae present in one row anteriorly. The bothriotrichial complex of Abd. II–IV is well developed; consisting of numerous accessory microchaetae, ranging from only slightly modified microchaetae to modified setulae, or few small scales

(Fig. 10, I–K). Tenaculum with four + four teeth and one large striate seta (Fig. 10L). Ventral tube anteriorly with three + three large and many small ciliate setae and translucent scale-like setae (Fig. 10M); posteriorly with six apical smooth setae besides numerous ciliate setae of different sizes (Fig. 10N); lateral flap with 14 smooth and about 14 ciliate setae (Fig. 10O). Furcal segmental ratio of manubrium to dens plus mucro = 1 : 1.17–1.33. Manubrium covered with scales and ciliate setae ventrally, and only ciliate setae dorsally. Manubrial plaque with three larger, seven smaller setae, and three pseudopores (Fig. 10P). Dens with spines arranged in one row (Fig. 10Q); scales absent (Fig. 10S). Smooth portion of dens shorter than mucro in length. Mucronal apical tooth smaller than antiapical one. Mucronal basal spine short with tip just beyond apex of anteapical tooth (Fig. 10R). Male genital plate not seen.

Body scales. Scales narrow, pointed and fusiform with coarse striations (Fig. 10T), present on Ant. I–II, head, thorax, abdomen, manubrium ventrally; scales on ventral manubrium much narrower than those on body (Fig. 10U).

Ecology: Found in leaf litter, debris, and rotten logs of evergreen broad-leaved forest, where a subtropical monsoon climate predominates.

Remarks: *Acanthocyrtus bicolor* was originally described by Yosii (1965) from juvenile individuals, and redescribed by Lee & Park (1989) from adults in the type locality. Our specimens agree with the above authors' descriptions in all examined features (body colour pattern, dorsal chaetotaxy, dental spines, mucro). We add more details on the lateral process of labial palp, setae on labial base, complete dorsal chaetotaxy, lateral flap, and manubrial plaque.

The macrochaetae on Abd. IV are anteriorly arranged in an unusual transverse row of setae as in the case of the genus *Homidia*. The macrochaetae on the central thorax are abundant with complex patterns so that it was not possible to determine their homology.

COMMENTS

The present paper clarifies the confusion on the classification of the genera *Acanthocyrtus* and *Acanthurella*, and emphasizes their systematic positions. Yoshii & Greenslade (1994) examined the type species *Acanthocyrtus spinosus*, and placed *Acanthocyrtus* in Seirinae (Seirini *sensu* Soto-Adames *et al.*, 2008); here, our study of more species in this genus confirms their point. The recent paper (Soto-Adames *et al.*, 2008) did not indicate the relationship between

Acanthocyrtus and *Acanthurella*, and doubted that they were synonymous. Our re-examination of the type species of *Acanthurella* demonstrates that it belongs to Lepidocyrtini, a tribe completely different from Seirini. The newest classification of Entomobryidae also did not resolve the relationships of the groups relevant to *Lepidocyrtus s.l.*, including *Acanthurella*; the presence of a pointed dental tubercle in *Acanthurella braueri* implies that it is more close to *Lepidocyrtus* species (*Acrocyrtus*-group) from south-east Asia.

ACKNOWLEDGEMENTS

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REFERENCES

- Bonet F. 1930.** Sur quelques Collembolés de l'Inde. *Eos* **6**: 249–273.
- Börner C. 1906.** Das System der Collembolen nebst Beschreibung neuer Collembolen des Hamburger Naturhistorischen Museums. *Mitteilungen Naturhistorisches Museum Hamburg* **23**: 147–188.
- Denis JR. 1941.** Catalogue des Entomobryens Siraformes et Lepidocyrtiformes. *Bulletin Scientifique de Bourgogne* **9**: 41–118.
- Gisin H. 1964.** European Collembola. VII. *Revue Suisse de Zoologie* **71**: 649–678.
- Greenslade P. 1994.** Collembola. In: Houston WWK, ed. *Zoological catalogue of Australia. Volume 22. Protura, Collembola, Diplura*. Melbourne: CSIRO Australia, 19–138.
- Guthrie JE. 1906.** Studies of Collembolan eye. *Proceedings of Iowa Academy of Science* **13**: 239–243.
- Handschin E. 1925.** Beiträge zur Collembolenfauna der Sundainseln. *Treubia* **6**: 225–270.
- Handschin E. 1930.** Philippine Collembola II. *The Philippine Journal of Science* **42**: 411–428.
- Lee BH, Park KH. 1989.** Systematic studies on Chinese Collembola (Insecta), I. Four new species and three new records of Entomobryidae from Taiwan. *Chinese Journal of Entomology* **9**: 263–282.
- Mari-Mutt JA. 1986.** Puerto Rican species of Lepidocyrtus and Pseudosinella (Collembola: Entomobryidae). *Caribbean Journal of Science* **22**: 1–48.
- Salmon JT. 1951.** Some Collembola from Malaya. *Proceedings of the Royal Entomological Society of London Series B* **20**: 131–141.
- Salmon JT. 1956.** Contribution à l'étude de la faune entomologique du Ruanda-Urundi (Mission P. Basilevsky 1953): LXXIX. Collembola. *Sciences Zoologiques* **8**: 9–40.
- Salmon JT. 1964.** *An index to the Collembola. Volumes 1 & 2.* Wellington: The Society Victoria University of Wellington, 1–144, 145–644.
- Schött F. 1917.** Results of Mr. E. Mjöberg's Swedish scientific expeditions to Australia 1910–1913. *Arkiv För Zoologi* **11**: 1–60.
- Schött F. 1925.** Collembola from Mount Murid and Mount Dulit in Northern Sarawak. *Sarawak Museum Journal* **3**: 107–127.
- Soto-adames FN, Barra JA, Christiansen KA, Jordana R. 2008.** Suprageneric Classification of Collembola Entomobryomorpha. *Annals of the Entomological Society of America* **101**: 501–513.
- Szeptycki A. 1979.** *Morpho-systematic studies on Collembola. IV. Chaetotaxy of the Entomobryidae and its phylogenetical significance.* Kraków, Poland: Polska Akademia Nauk, 1–216.
- Womersley H. 1930.** On the Apterygota collected in British Guiana by the Oxford University Expedition of 1929. *Annals and Magazine of Natural History* **6**: 305–317.
- Womersley H. 1934.** A preliminary account of the Collembola – Arthropleona of Australia II (Entomobryoidea). *Transactions of the Royal Society of South Australia* **58**: 86–138.
- Womersley H. 1937.** New species and records of Australian Collembola. *Transactions of the Royal Society of South Australia* **61**: 154–157.
- Womersley H. 1939.** *Primitive insects of South Australia: Silverfish, springtails and their allies.* Adelaide: Frank Trigg, Government Printer, 1–322.
- Yosii R. 1965.** On some Collembola of Japan and adjacent countries. *Contributions from the Biological Laboratory Kyoto University* **19**: 1–71.
- Yoshii R. 1982.** Lepidocyrtid Collembola of Sabah. *Entomological Report from the Sabah Forest Research Centre* **5**: 1–47.
- Yoshii R, Greenslade P. 1994.** Reconnaissance of some entomobryid Collembola of Australia. *Acta Zoologica Asiae Orientalis* **3**: 1–22.
- Yoshii R, Suhardjono YR. 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.