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Two new species of *Ademula* McAtee & Malloch (Hemiptera: Reduviidae: Emesinae) from China with an updated key to the Oriental species

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Abstract. Two new species of the thread-legged bug genus *Ademula* McAtee & Malloch, 1926 (Hemiptera: Reduviidae: Emesinae: Emesini, formerly Ploiariolini) from China, *A. callipennis*, new species, and *A. corniculata*, new species, are described and illustrated in the present paper. COI barcodes of these two new species and an updated key to the Oriental species of *Ademula* are provided. The distribution of *Ademula* in East and Southeast Asia is briefly discussed.

Key words. Heteroptera, Ploiariolini, taxonomy, DNA barcoding, East Asia, Oriental Region

INTRODUCTION

The emesine genus *Ademula* McAtee & Malloch, 1926 is a small group of 14 species currently placed in the tribe Emesini but was formerly in Ploiariolini (Maldonado, 1990; Rédei, 2005; Standring et al., 2023). Members of *Ademula* are small-sized and usually pale-coloured species with variable colour patterns on legs and forewings, and can be recognised within the tribe by the following combination of characters: the posterior pronotal lobe has a well-developed lateral carina; the scutellum and the abdominal tergite I each bears a spine-like process; the metanotum is rounded apically or has a small process; the fore tarsus is three-segmented; the fore wing has a single discal cell, and a single vein (M + Cu) is extending basally from the cell (McAtee & Malloch, 1926; Wygodzinsky, 1966; Ishikawa & Yasunaga, 2004; Ishikawa & Miyamoto, 2012). *Ademula* has an apparently disjunct distribution in the Old World, with five species known in the Afrotropical Region, four in the Australasian Region, and another five in the Oriental Region (Rédei, 2005). Biological information on species of *Ademula* is limited, but our field observations show that some specimens rest on the underside of leaves and can be collected by net sweeping across the canopy. The systematic relationships of *Ademula* have hitherto been poorly investigated. An unidentified species was involved in a molecular phylogenetic study on the Emesine complex recently, where Ploiariolini was considered a junior synonym of a more extended Emesini, showing a close relationship between *Ademula* and *Malacopus* Stål, 1860 (Standring et al., 2023).

In the present study, we describe two new species of *Ademula* from southwestern China. DNA barcodes from the cytochrome c oxidase subunit I gene (COI) as well as illustrations of habitus and several diagnostic characters of the two new species are provided. A key to the Oriental species of *Ademula* is updated, and the distribution of the genus in East and Southeast Asia is briefly discussed.

MATERIAL AND METHODS

Type specimens of the new species described in this study are deposited in the Entomological Museum of China Agricultural University, Beijing, China (CAU). For comparative study and construction of the key to species, specimens of *Ademula* spp. deposited in the Natural History Museum, London, UK (BMNH) were also examined.

Morphological and taxonomic study. Male genitalia were soaked in hot 20% lactic acid solution for approximately ten minutes to remove soft tissue, rinsed in distilled water, and dissected under a Nikon SMZ745 stereoscopic microscope. Dissected genitalia were placed in a vial containing glycerol and, after examination, pinned under the corresponding specimen.

Photographs were taken using a Canon 7D Mark II digital camera with a Canon macro lens EF 100 mm and MP-E 65 mm for habitus, and an Olympus BX51 microscope for dissected body parts. Figures were stacked with Helicon Focus version 5.3 and assembled by Adobe Photoshop CC 2020.

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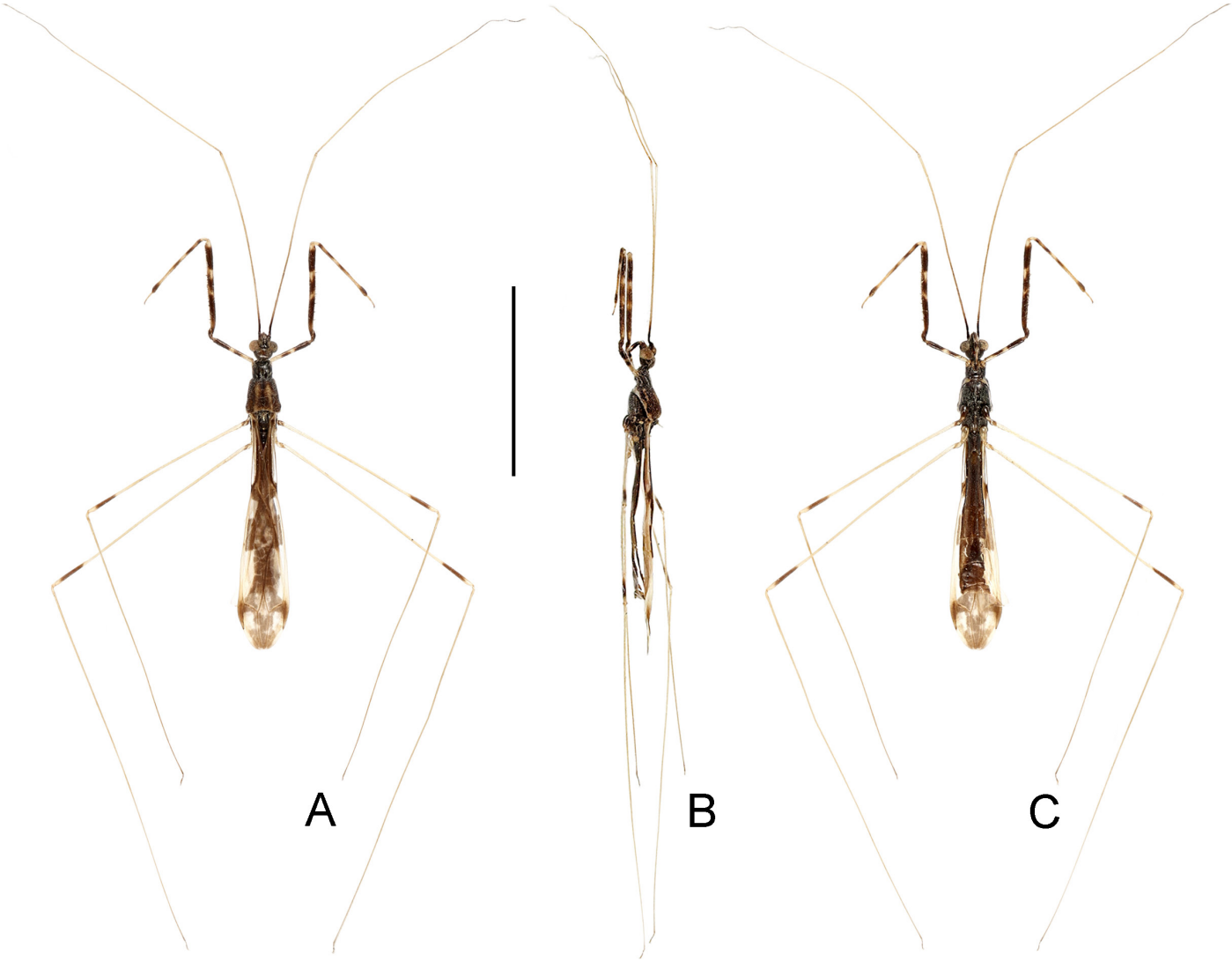

Fig. 1. *Ademula callipennis*, new species, holotype, male, habitus. A, dorsal view; B, lateral view; C, ventral view. Scale bar = 3.0 mm.

Measurements were obtained using a calibrated micrometer. Morphological terminology mainly follows Wygodzinsky (1966) and Weirauch (2008).

DNA extraction and sequencing. A sex-unspecified specimen of *A. callipennis*, new species (from Tibet, China) and a female specimen of *A. corniculata*, new species (from Yunnan, China) were used for DNA extraction. Total genomic DNA was extracted from thoracic muscle tissues using DNeasy Blood and Tissue Kit (Qiagen). DNA barcode sequences of a 658 bp COI fragment were amplified by polymerase chain reaction (PCR) with primers UCOIF (5′-TTTCHACNAACCATAAGGAYATTGG-3′ forward) and UCOIR (5′-TANACTTCTGGGTGTCCAAAAAATCA-3′ reverse), and obtained by Sanger sequencing. PCRs were conducted following the protocols in Chen et al. (2022). Amplification results were visualised via gel electrophoresis with GenRed gel staining and UV illuminator. Sequences were submitted to GenBank.

RESULTS

Ademula callipennis, new species

(Figs. 1–3)

Type material. Holotype (male): CHINA. Tibet: Nyingchi, Medog, Hanmi, 2,250 m, 14 August 2015, Zhuo Chen & Jianyun Wang, by light trap (CAU).

Additional specimen examined. CHINA. Tibet: Nyingchi, Medog, Hanmi, 6 August 2011, Jianyun Wang & Hailin Yang (1 sex-unspecified ex. due to abdomen missing, CAU, in ethanol).

Diagnosis. Recognised within the genus by the following combination of characters: head wider than long (Fig. 2A); anterior pronotal lobe blackish brown, posterior pronotal lobe dark brown with one pair of longitudinal orangish stripes (Fig. 2A); metanotum with small erect process (Fig. 2A, B); fore femur 12 times as long as its maximum width, with three broad dark annuli (Fig. 2D); mid and hind femora each with one subapical dark annulus only (Fig. 1A, C); posteromedial process of pygophore wide, flattened,

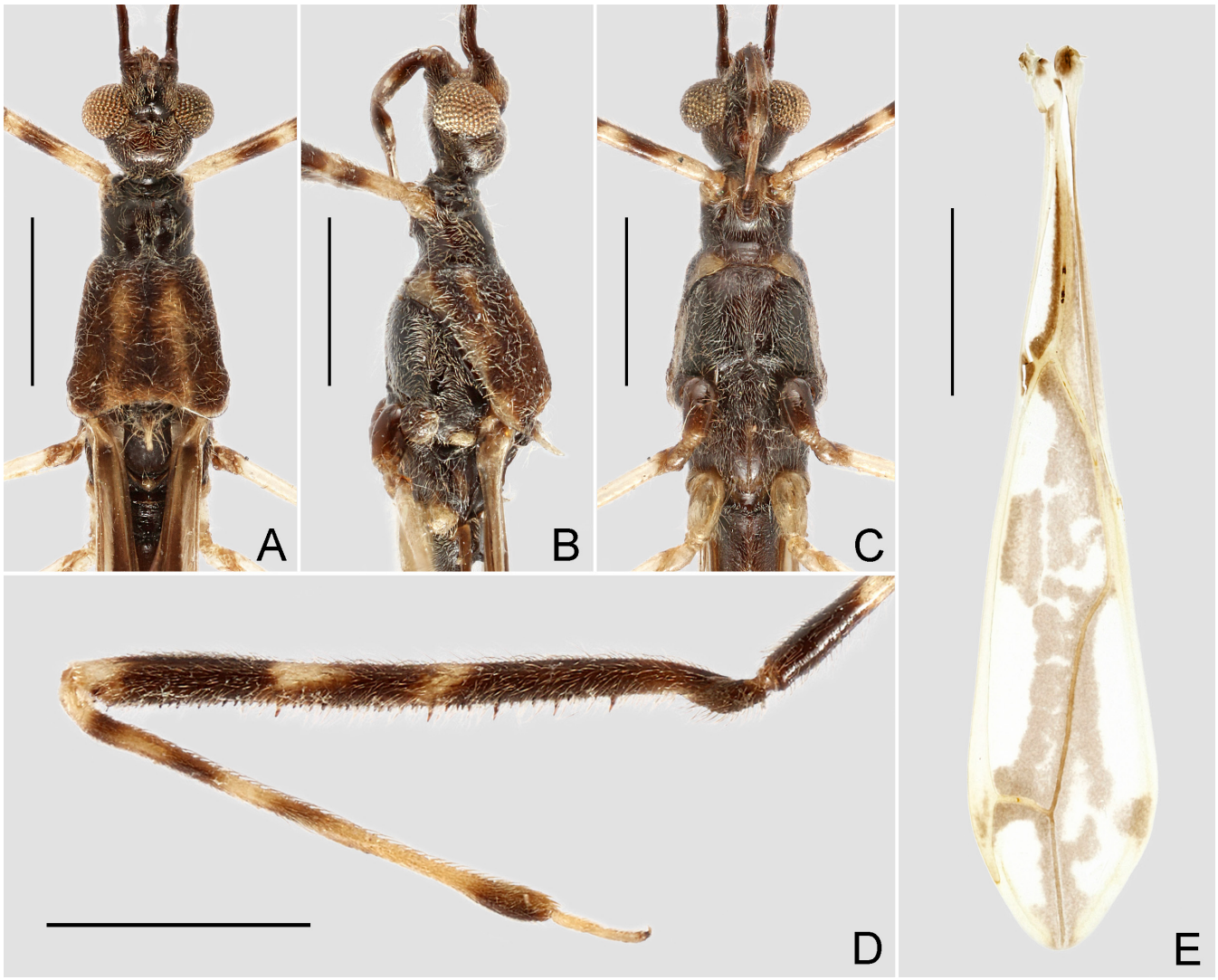

Fig. 2. *Ademula callipennis*, new species, holotype, male: A–C, anterior part of body; D, fore leg; E, fore wing. A, D, E, dorsal view; B, lateral view; C, ventral view. Scale bars = 1.0 mm.

lamelliform (Fig. 3A–C); phallotheca with highly-elevated dorsal crest-like sclerotisation (Fig. 3H); vesica arms short and relatively thick (Fig. 3G–I).

DNA barcode. OQ571472.

Description. Macropterous male (Fig. 1). Colouration. Generally blackish brown. Anteocular region of head with dorsolateral orangish spot. Antennal scape blackish brown basally, gradually lightened towards apex of segment, yellowish brown apically; pedicel yellowish brown; flagellomeres pale brown. Labium with apical half of visible segments I and II as well as segment III yellowish brown. Pronotum with posterior lobe dark brown, with paired longitudinal stripes on disc and lateral carina orangish, lateral and posterior margins yellow (Fig. 2A, B). Proepisternum, proepimeron, spine-like process of scutellum and metanotum, mesepimeron, posterior margin of meso- and metapleura yellowish brown. Fore coxa with basal third and medial annulus yellowish brown; femur with medial and submedial annuli as well as apex yellowish brown, subbasal annulus pale brown, indistinct (Fig. 2D); tibia yellowish brown, with subbasal, submedial and medial annuli as well as apex dark brown (Fig. 2D); tarsus yellowish brown. Mid leg yellowish brown, with coxa, trochanter, extreme base and subapical annulus dark brown. Hind leg yellowish brown, with coxa, trochanter and extreme base of femur pale brown, subapical annulus of femur dark brown. Fore wing pale yellowish, with blackish basal spots, numerous dark spots and areas in characteristic arrangement (Fig. 2E).

Vestiture. Body surface dull, densely covered with decumbent, short, whitish pubescence on head, thorax, legs and abdomen; head and thorax with a number of sparse, suberect to erect, long pubescence; antennal scape with many sparse, erect, long pubescence, pedicel and flagellomeres with dense, decumbent, very short pubescence; fore coxa, trochanter and femur with dense, suberect, relatively long pubescence; fore tibia with one row of decumbent, short setae on ventral surface.

Structure. Head (Fig. 2A–C) short and wide, 0.95 times as long as width across eyes; anteocular region as long as postocular, anteriorly declivent, with antennifer elevated. Eye (Fig. 2A–C) large, strongly protruding laterally, remote from ventral head margin in lateral view; width across eyes 3.2

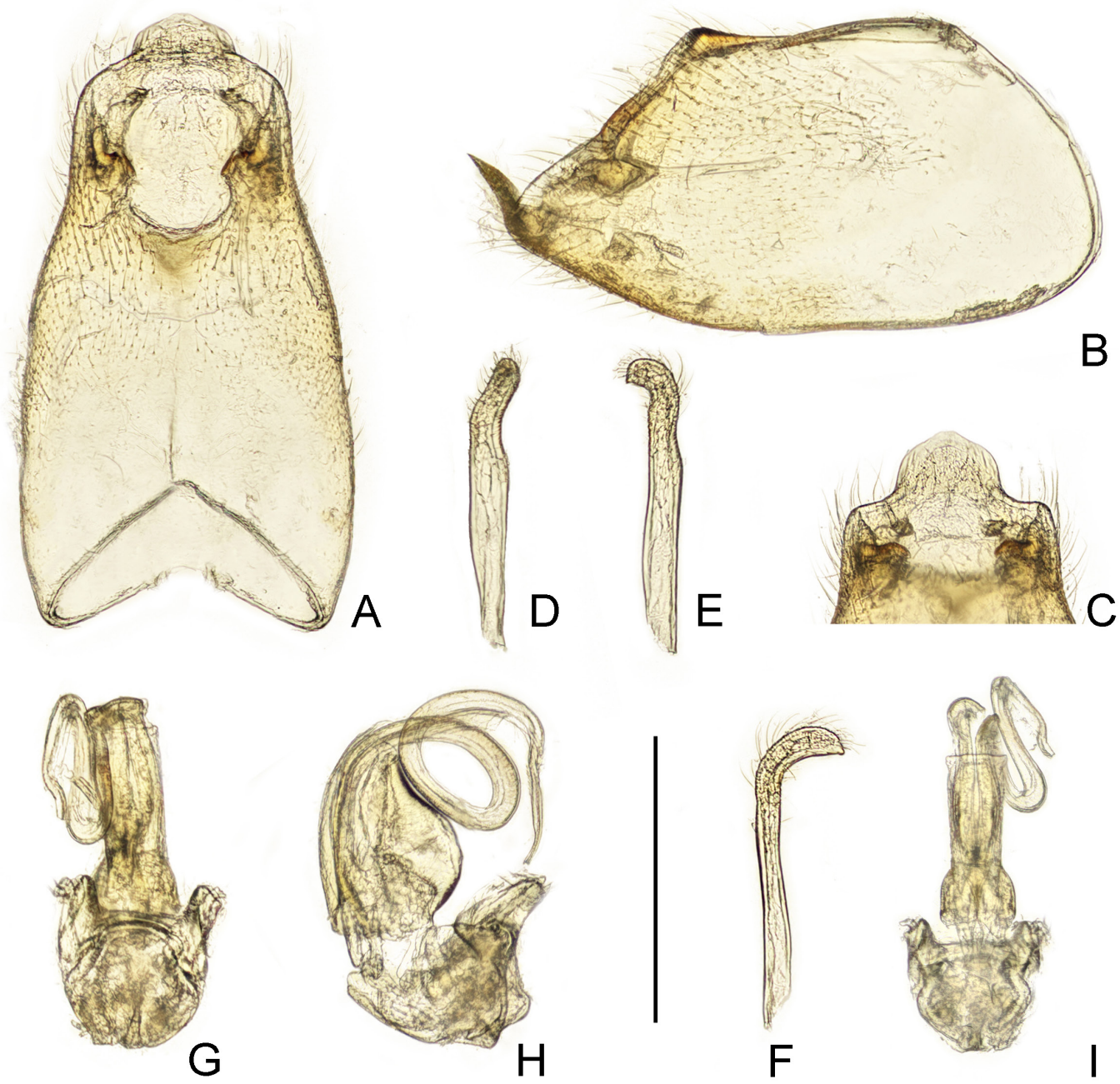

Fig. 3. *Ademula callipennis*, new species, holotype, male genitalia: A, B, pygophore; C, projection on superoposterior margin of pygophore; D–F, paramere; G–I, phallus. A, C, G, dorsal view; B, H, lateral view; I, ventral view. Scale bar = 0.5 mm.

times as broad as interocular space. Antennal scape slightly longer than pedicel, basiflagellomere 2.3 times as long as distiflagellomere. Labium (Fig. 2B, C) slender, strongly curved; visible segment I 1.6 times as long as segment II, reaching midpoint of eye; segment III 1.4 times as long as segment II, tapering.

Pronotum (Fig. 2A, B) 1.2 times as long as width across humeral angles; anterior lobe short, about half as long as posterior lobe, with medial longitudinal furrow not reaching anterior margin, anterior margin weakly concave, lateral margin nearly straight; posterior lobe with rounded humeral angle, posterior margin broadly concave. Scutellum (Fig. 2A, B) short and wide, with oblique spine-like process. Metanotum (Fig. 2A, B) with small erect process.

Fore leg (Fig. 2D) relatively slender; coxa cylindrical, about half as long as femur; trochanter unarmed; femur subcylindrical, 12 times as long as its maximum width, 1.2 times as long as tibia, armed ventrally with two series of spiniferous processes; anteroventral series composed of a number of small processes; posteroventral series composed of five relatively large processes and a number of smaller ones; tibia slender and straight, widened apically; tarsus short, tarsomere I subequal to combined length of tarsomeres II and III. Mid and hind legs long and slender; mid and hind tibiae 1.6 times as long as respective femur.

Fore wing (Fig. 2E) elongate, surpassing apex of abdomen in midline.

Abdomen elongate and slender. Abdominal tergite I with nearly erect spine-like process.

Male genitalia: Pygophore (Fig. 3A, B) elongate oval, apical half narrower; posteromedial process wide, flattened, lamelliform (Fig. 3C); transverse bridge wide. Paramere (Fig. 3D–F) slender, straight on basal two thirds and curved on apical third. Phallus (Fig. 3G–I) stout; articulatory apparatus wide, basal plate arms separated, basal plate bridge slender, dorsal connectives very short; phallotheca weakly sclerotised, with highly-elevated dorsal crest-like sclerotisation; vesica arms relatively thick, gradually narrowing towards apex, with tiny serrate-like denticles on apical fourth.

Female unknown.

Measurements [in mm, male (n = 1)]. Length of body: to apices of forewings 8.40, to apex of abdomen 7.90; length of head 0.75; length of anteocular region 0.20; length of postocular region 0.20; width across eyes 0.80; interocular space 0.25; length of antennal segments I–IV = 4.80, 4.60, 1.60, 0.70; length of visible labial segments I–III = 0.40, 0.25, 0.35; length of pronotum 1.20; length of anterior pronotal lobe 0.40; length of posterior pronotal lobe 0.80; maximum width of anterior pronotal lobe 0.55; maximum width of posterior pronotal lobe 1.00; length of fore coxae, femora, tibiae, tarsi = 1.20, 2.40, 2.00, 0.30; maximum width of fore femora 0.20; length of mid femora, tibiae, tarsi = 4.60, 7.40, 0.30; length of hind femora, tibiae, tarsi = 6.20, 10.00, 0.30; length of forewings 6.30; length of abdomen 5.10; maximum width of abdomen 0.80.

Etymology. The specific epithet is derived from Latin calli- (meaning beautiful) and -pennis (meaning wings), referring to the impressive yellow and dark brown colour patterns on the fore wing of this new species. The specific epithet is an appositive noun.

Distribution. China—Tibet: Nyingchi (Medog).

Bionomics. The holotype of this new species was collected by a light trap.

Comparative notes. Among the Asian species of the genus, *A. callipennis*, new species, is mostly similar to *A. aemula* Rédei, 2005 (from China) by having relatively large body size and darker colouration, and their fore femur is 12 times as long as its maximum width and has three dark annuli. The new species differs from the latter by the following characters: head wider than long (vs. longer than wide in *A. aemula*); pronotum with anterior lobe uniformly blackish brown, posterior lobe dark brown with one pair of longitudinal orangish stripes (vs. pronotum brown with medial longitudinal dark brown stripe, anterior lobe darkened on both sides in *A. aemula*); metanotum with a small erect process (vs. lacking such process in *A. aemula*); fore femur dark-coloured at base, light-coloured parts between dark annuli narrow (vs. fore femur light-coloured at base, light-coloured parts between dark annuli wide in *A. aemula*); fore tibia with three dark annuli on basal half (vs. with one subbasal dark annulus only in *A. aemula*); mid and hind femora with subapical dark annulus only (vs. with subapical dark annulus and two incomplete additional annuli in *A. aemula*); different colour patterns on fore wing; posteromedial process of pygophore wide, flattened, lamelliform (vs. short, narrow, spine-like in *A. aemula*); paramere slender (vs. ovally widened on apical half and narrowed distally in *A. aemula*); phallotheca with highly-elevated dorsal crest-like sclerotisation (vs. such sclerotisation much lower in *A. aemula*); vesica arms short and thick (vs. long and slender in *A. aemula*).

Ademula corniculata, new species

(Figs. 4–6)

Type material. Holotype (male): CHINA. Yunnan: Xishuangbanna, Mengla, Wangtianshu, 11 May 2009, Xiushuai Yang (CAU). Paratypes: CHINA. Yunnan: same collection data as holotype (1 male, 1 female, CAU); same locality as holotype, 15 April 2015, Hangrui Liu & Yisheng Zhao (1 male, 1 female, CAU); Xishuangbanna, Mengla, Bubeng, 11 May 2009, Hu Li & Liangming Cao (1 female, CAU).

Diagnosis. Recognised within the genus by the following combination of characters: postocular region of head with small dorsal median process (Fig. 5B, E, G); antennal scape with dark brown subbasal and subapical annuli (Fig. 4A, C, D, F); posterior pronotal lobe with contrasting light and dark colour patterns (Fig. 5A, D); fore femur 10 times as long as its maximum width, with three broad dark annuli (Fig. 5H); mid and hind femora with one subapical broad dark annulus and three narrow additional ones (Fig. 4A, C, D, F); fore wing with nearly percurrent greyish brown to brown stripes (Fig. 5I).

DNA barcode. OQ571473.

Description. Macropterous male (Fig. 4A–C) and female (Fig. 4D–F). Colouration. Generally pale yellowish brown, with variable dark colour patterns. Head with lateral side of antennifer, anteclypeus, mandibular plate, gena and posterior half of postocular region dark brown (Fig. 5A–F). Antennal scape with extreme base, subbasal and subapical annuli, extreme apex dark brown; pedicel brown, with one subbasal light-coloured annulus, extreme base and apex slightly darker; flagellomeres pale brown. Labium with apical half of visible segments I and II dark brown, apical half of segment III brown (Fig. 5B, C, E, F). Pronotum yellowish brown to brown; anterior lobe with anterior margin, midline and lateral sides extensively dark brown to blackish brown; posterior lobe with anterior margin, midline, longitudinal stripes on anterior half and annular markings on posterior half dark brown (Fig. 5A, D). Prosternum with anterior margin and groove blackish brown. Scutellum (except spine-like process) blackish brown; mesopleuron blackish brown, with indistinct pale brown spot at middle; mesosternum dark brown, with large yellowish patch at middle (expect midline of posterior half). Metanotum dark brown, with midportion paler; metapleuron blackish brown, with posterior margin yellowish; metasternum dark brown, with large rounded

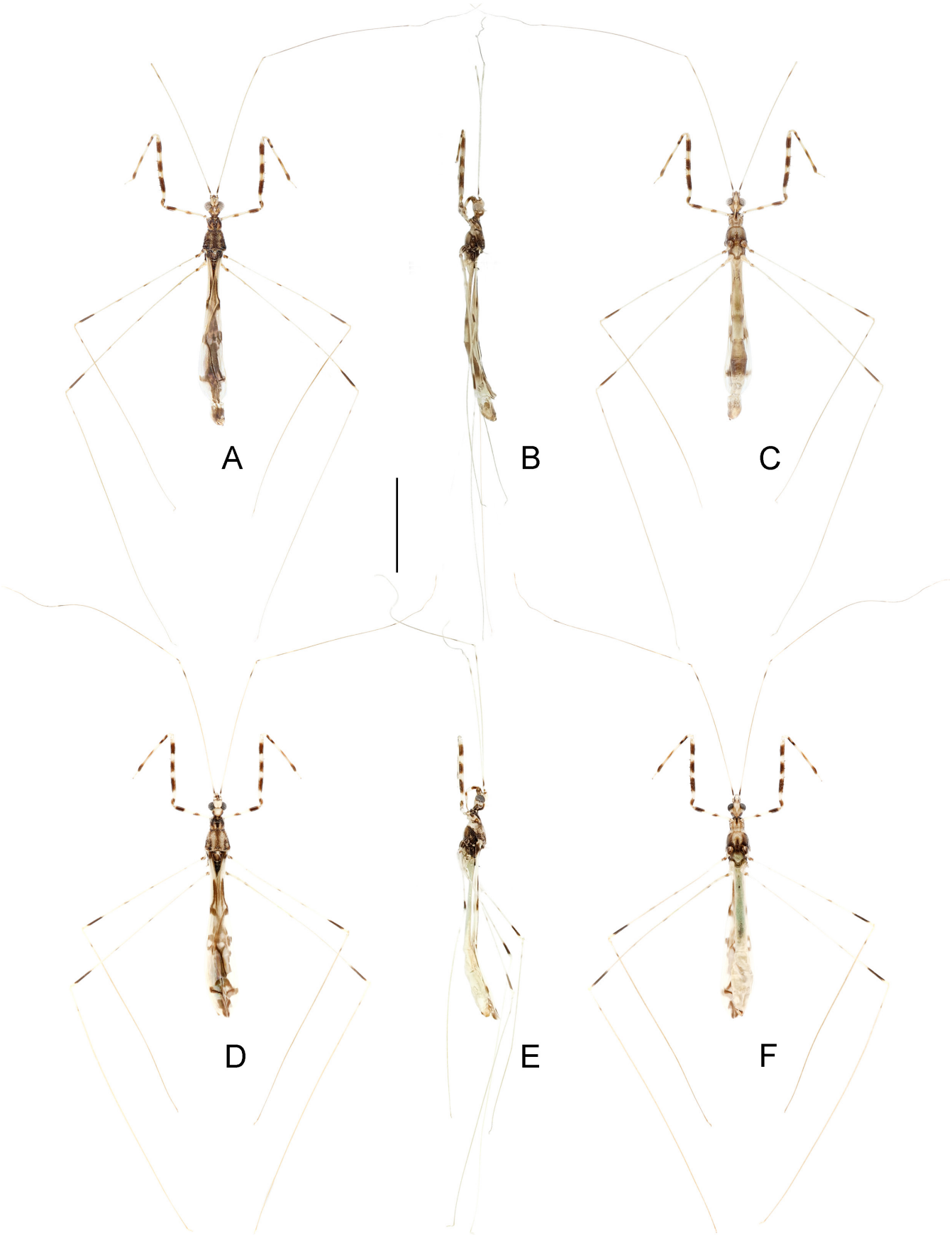

Fig. 4. *Ademula corniculata*, new species, habitus: A–C, holotype, male; D–F, paratype, female. A, D, dorsal view; B, E, lateral view; C, F, ventral view. Scale bar = 3.0 mm.

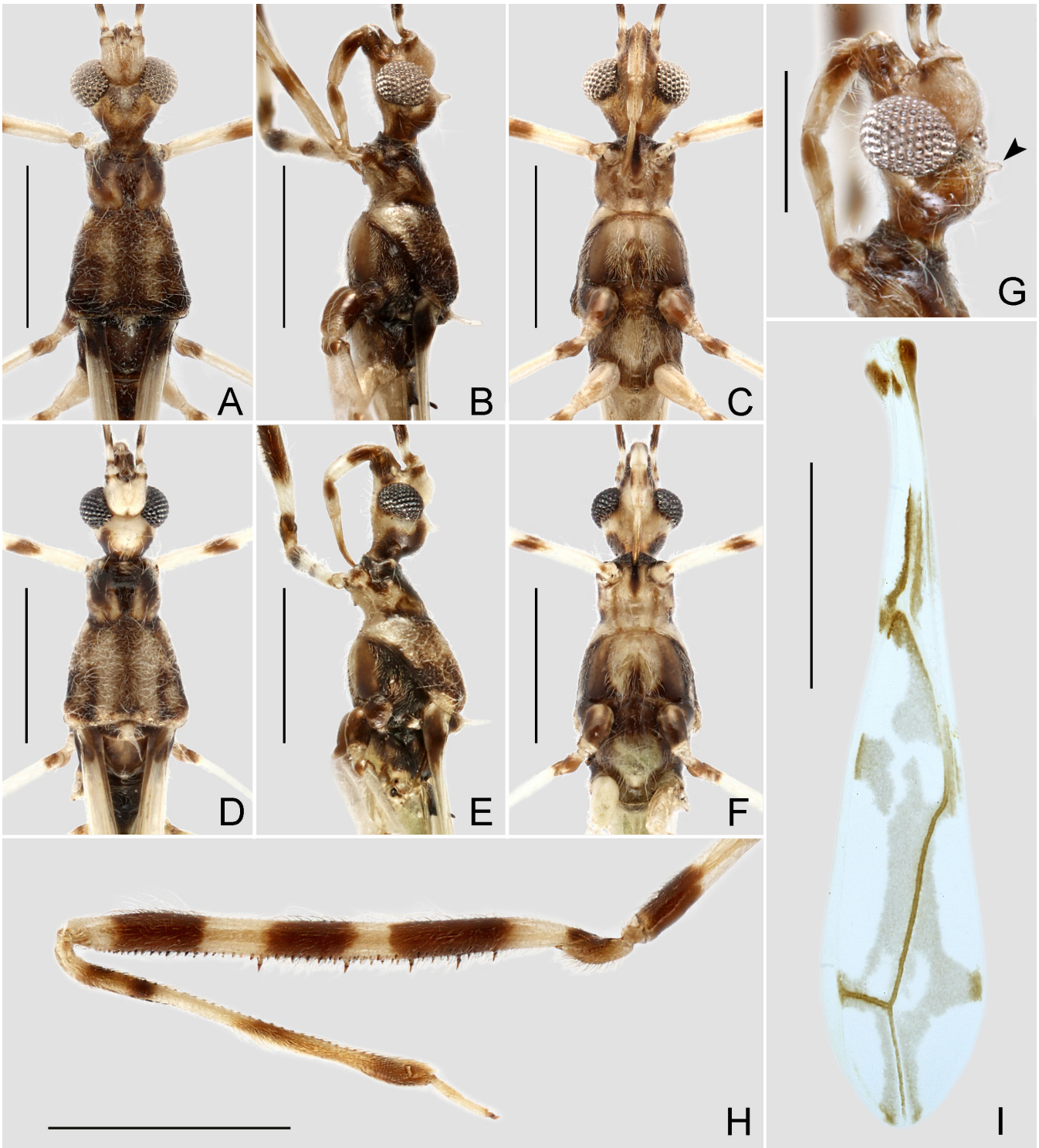

Fig. 5. *Ademula corniculata*, new species: A–C, G–I, holotype, male; D–F, paratype, female. A–F, anterior part of body; G, head, showing dorsal process on postocular region; H, fore leg; I, fore wing. A, D, H, I, dorsal view; B, E, G, lateral view; C, F, ventral view. Scale bars: A–F, H = 1.0 mm; G = 0.5 mm; I = 1.5 mm.

yellowish patch at middle. Fore coxa with extreme base and medial annulus brown, apical annulus dark brown; trochanter brown; femur with extreme base as well as subbasal, medial and subapical annuli dark brown (Fig. 5H); tibia with two nearly contiguous subbasal annuli dark brown, apical half yellowish brown, medial annulus and apex brown (Fig. 5H). Mid coxa and trochanter, extreme base and three narrow annuli of mid and hind femora, subbasal annulus of mid and hind tibiae brown; subapical annulus of mid and hind femora dark brown; mid and hind tibiae pale yellowish brown basally, gradually darkened towards apex of segment, yellowish brown apically. Fore wing pale yellowish, with dark brown basal spots and nearly percurrent greyish brown to brown stripes (Fig. 5I). Abdominal tergite I blackish brown.

Vestiture. Body surface dull, densely covered with decumbent, short, whitish pubescence on head, thorax, legs and abdomen; head and thorax with a number of sparse,

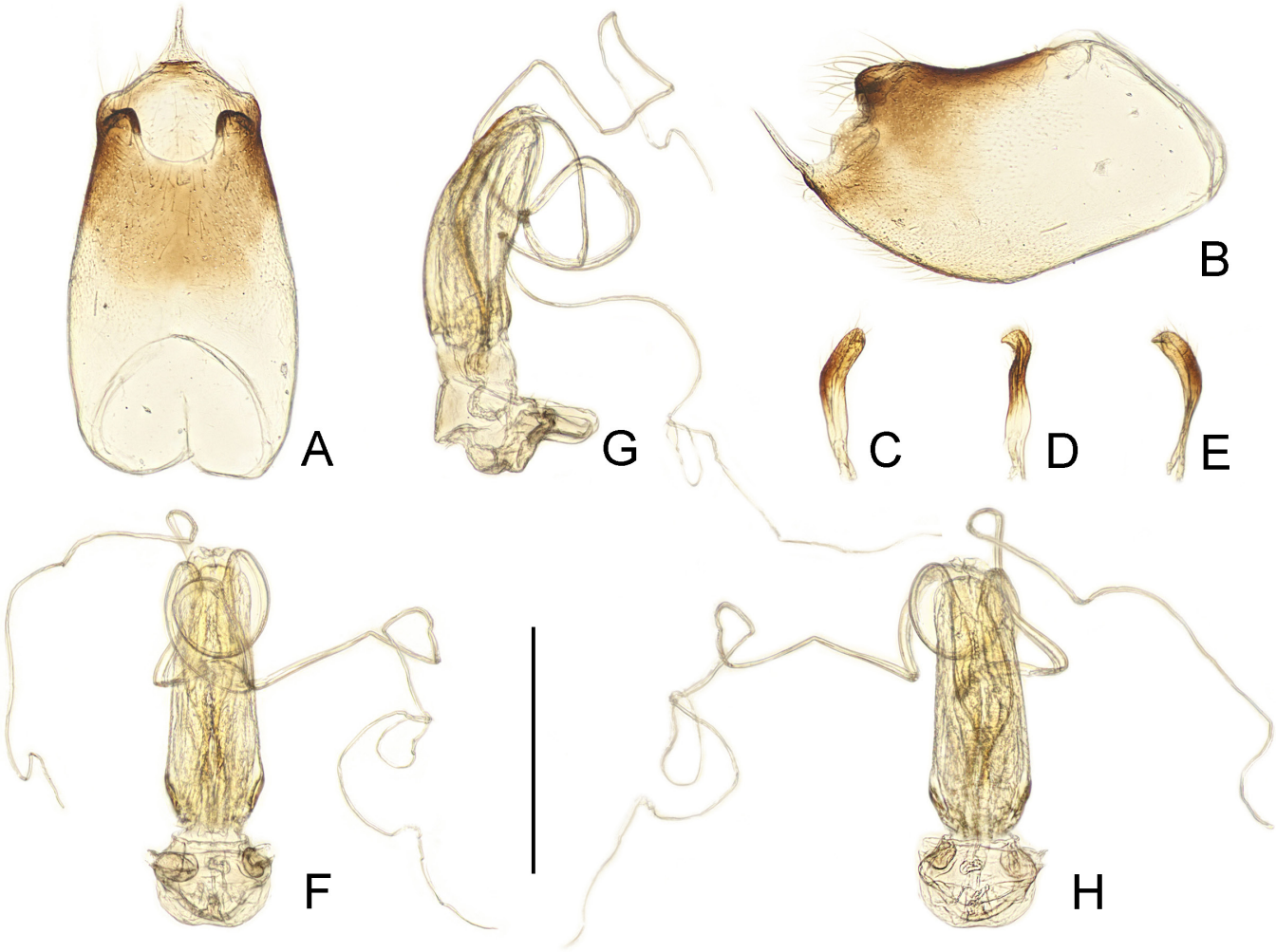

Fig. 6. *Ademula corniculata*, new species, paratype, male genitalia: A, B, pygophore; C–E, paramere; F–H, phallus. A, F, dorsal view; B, G, lateral view; H, ventral view. Scale bar = 0.5 mm.

suberect to erect, long pubescence; antennal scape with many sparse, erect, long pubescence, pedicel and flagellomeres with dense, decumbent, very short pubescence; fore coxa, trochanter and femur with dense, suberect, relatively long pubescence; fore tibia with one row of decumbent, short setae on ventral surface.

Structure. Head (Fig. 5A–G) short, 1.05 (male) or 1.25 (female) times as long as width across eyes; anteocular region as long as postocular, anteriorly declivent, with antennifer elevated; postocular with small dorsal process at middle (Fig. 5G), lateral margin abruptly (male) or gradually (female) convergent. Eye (Fig. 5A–F) large, strongly protruding laterally, remote from ventral head margin in lateral view; width across eyes 3.5 (male) or 3.1 (female) times as broad as interocular space. Antennal scape nearly as long as pedicel, basiflagellomere 2.4 times as long as distiflagellomere. Labium (Fig. 5B, C, E–G) slender, strongly curved; visible segment I 1.6 times as long as segment II, reaching midpoint of eye; segment III nearly as long as segment I, tapering.

Pronotum (Fig. 5A, B, D, E) 1.1 (male) or 1.2 (female) times as long as width across humeral angles; anterior lobe short, about half as long as posterior lobe, with medial longitudinal furrow not reaching anterior margin, anterior margin weakly concave, lateral margin weakly convex; posterior lobe with rounded humeral angle, posterior margin broadly concave at midportion. Scutellum (Fig. 5A, B, D, E) short and wide, with erect spine-like process. Metanotum rounded apically.

Fore leg (Fig. 5H) relatively slender; coxa cylindrical, 0.6 times as long as femur; trochanter unarmed; femur subcylindrical, 10 times as long as its maximum width, 1.25 (male) or 1.3 (female) times as long as tibia, armed ventrally with two series of spiniferous processes; anteroventral series composed of a number of small processes; posteroventral series composed of five relatively large processes and a number of smaller ones; tibia slender and straight, slightly widened apically; tarsus short, tarsomere I subequal to combined length of tarsomeres II and III. Mid and hind legs long and slender; mid and hind tibiae 1.5 times as long as respective femur.

Fore wing (Fig. 5I) elongate, not reaching (male) or slightly surpassing (female) apex of abdomen in midline.

Abdomen elongate and slender. Abdominal tergite I with oblique spine-like process.

Male genitalia: Pygophore (Fig. 6A, B) elongate oval, apical half narrower, posteromedial process short, narrow, apically acute; transverse bridge wide. Paramere (Fig. 6C–E) short, curved, apically subpointed. Phallus (Fig. 6F–H) relatively elongate; articulatory apparatus wide, basal plate arms separated, basal plate bridge slender, dorsal connectives very short; phallotheca weakly sclerotised, tubular; vesica arms long and slender, gradually narrowing towards apex, apical parts filiform.

Female genitalia: Valvifer I wide, with truncated apex; valvula I small, apically blunt, with a number of long setae; styloids wide, slightly emarginated at midpoint.

Measurements [in mm, male (n = 3) / female (n = 3)]. Length of body: to apices of forewings 6.70 / 7.00, to apex of abdomen 6.80–7.40 / 6.90; length of head 0.70–0.75 / 0.75–0.80; length of anteocular region 0.20 / 0.20; length of postocular region 0.20 / 0.20; width across eyes 0.70 / 0.60–0.65; interocular space 0.20 / 0.20; length of antennal segments I–IV = 4.70 / 4.40–4.50, 4.70 / 4.40–4.50, 1.80 / 1.65, 0.75 / 0.70; length of visible labial segments I–III = 0.40 / 0.40, 0.25 / 0.25, 0.40 / 0.40; length of pronotum 0.90 / 0.90–1.00; length of anterior pronotal lobe 0.30 / 0.30; length of posterior pronotal lobe 0.60 / 0.60–0.70; maximum width of anterior pronotal lobe 0.45–0.50 / 0.50; maximum width of posterior pronotal lobe 0.80 / 0.80; length of fore coxae, femora, tibiae, tarsi = 1.20 / 1.20, 2.00 / 2.00, 1.60 / 1.50, 0.30 / 0.30; maximum width of fore femora 0.20 / 0.20; length of mid femora, tibiae, tarsi = 4.40–4.50 / 4.40–4.50, 6.60–6.70 / 6.50–6.70, 0.20 / 0.20; length of hind femora, tibiae, tarsi = 5.70–5.80 / 5.70, 8.40–9.00 / 8.40–8.70, 0.20 / 0.20; length of forewings 4.70–4.90 / 5.20–5.30; length of abdomen 4.50–5.20 / 4.70–4.80; maximum width of abdomen 0.60 / 0.65–0.80.

Etymology. The specific epithet is derived from Latin corniculata (meaning horned), referring to the small median conical process on the head of this new species.

Distribution. China—Yunnan: Xishuangbanna (Mengla).

Bionomics. Specimens of this new species were collected by sweeping nets across canopy.

Comparative notes. *Ademula corniculata*, new species, differs from all other congeners by having a small dorsal process on its head, which is lacking in other species. This new species resembles *A. nubecula* McAtee & Malloch, 1926 due to the nearly percurrent dark stripes on the fore wings. It can be furtherly separated from the latter by the following characters: body size larger, 6.8–7.4 mm in length (vs. 5.5 mm in *A. nubecula*); antennal scape with dark-coloured annuli (vs. without such annuli in *A. nubecula*); posterior pronotal lobe with contrasting light and dark colour patterns (vs. nearly uniformly dark brown in *A. nubecula*); fore femur with three dark annuli (vs. with four dark annuli in *A. nubecula*); pygophore with posteromedial process acute at apex (vs. blunt in *A. nubecula*).

Key to the Oriental species of *Ademula* McAtee & Malloch, 1926

[Modified after Wygodzinsky (1966) and Rédei (2005)]

1. Fore wing with nearly percurrent dark stripes not intersected by reticulating whitish lines 2
– Fore wing with dark markings intersected by reticulating whitish lines 3
2. Postocular region of head with small dorsal process; antennal scape with dark annuli; fore femur with three dark annuli ..... *A. corniculata*, new species
– Postocular region of head unarmed; antennal scape lacking dark annulus; fore femur with four dark annuli ..... *A. nubecula* McAtee & Malloch
3. Fore femur relatively stout, less than 10 times as long as its maximum width, with four dark annuli; subapical annulus of mid and hind femora very narrow, almost imperceptible ..... *A. reticulata* McAtee & Malloch
– Fore femur slender, at least 10 times as long as its maximum width, with three or four dark annuli; subapical annulus of mid and hind femora wider, well visible 4
4. Fore femur 12 times as long as its maximum width, with three dark annuli 5
– Fore femur 10–11 times as long as its maximum width, with four dark annuli 6
5. Posterior pronotal lobe brown, with longitudinal medial dark brown stripe; mid and hind femora with one subapical annulus and two incomplete additional annuli ..... *A. aemula* Rédei
– Posterior pronotal lobe dark brown, with one pair of longitudinal submedian orangish stripes; mid and hind femora with one subapical annulus only ..... *A. callipennis*, new species
6. Fore femur 11 times as long as its maximum width; mid and hind femora with one subapical annulus only; spots on fore wing large, not numerous, scattered ..... *A. abluta* McAtee & Malloch
– Fore femur 10 times as long as its maximum width; mid and hind femora with one indistinct subapical annulus and three additional annuli; spots on fore wing large and small, numerous, occupying a larger total surface ..... *A. contaminata* Distant

DISCUSSION

The described species of *Ademula* and their known distribution are listed in Table 1, showing the disjunct distribution of this genus in the Old World. The five species previously reported from the Oriental Region are mainly distributed in Southeast Asia (the Malay Peninsula, Borneo, Java, and the Philippines), and some additional records from southern China and Sri Lanka. *Ademula abluta* has also been reported from the Ryukyu Islands (Ishikawa & Yasunaga, 2004). The records of this genus from the mainland of Asia are scarce, with only *A. nubecula* recorded from Yunnan, China (Hsiao & Ren, 1981). The two new species described in this study increase our understanding of the diversity of Oriental *Ademula*. The discovery of *A. callipennis*, new species, from Tibet, China represents the first record of the genus north of the Himalayas, and also the northernmost distribution record of the genus. The morphological similarity between *A. callipennis*, new species, and *A. aemula* indicates their potential affinity, but this requires further evaluations. *Ademula corniculata*, new species, is the second species found in Yunnan, China after *A. nubecula*, and it may also occur in the northern part of the Indochinese Peninsula. The

Table 1. Described species of *Ademula* and their known distribution (AF: Afrotropical; AU: Australasian; OR: Oriental; PA: Palearctic).

Species	Distribution	Reference
Ademula abluta McAtee & Malloch, 1926	OR: Malay Peninsula, Philippines; PA: Japan	Wygodzinsky (1966); Ishikawa & Yasunaga (2004)
Ademula aemula Rédei, 2005	OR: southern China	Rédei (2005)
Ademula austrina Wygodzinsky, 1956	AU: Australia	Wygodzinsky (1966)
Ademula callipennis, **new species**	OR: southern China	present study
Ademula comorensis Villiers, 1970	AF: Comoro Islands	Villiers (1970)
Ademula contaminata (Distant, 1903)	OR: Malay Peninsula, Sri Lanka	Wygodzinsky (1966)
Ademula corniculata, **new species**	OR: southern China	present study
Ademula distincta Usinger, 1946	AU: Mariana Islands	Wygodzinsky (1966)
Ademula francinae Villiers, 1970	AF: Madagascar	Villiers (1970)
Ademula ghanaensis Villiers, 1982	AF: Ghana	Villiers (1982)
Ademula gressitti Wygodzinsky & Usinger, 1960	AU: Caroline Islands	Wygodzinsky (1966)
Ademula nubecula McAtee & Malloch, 1926	OR: Borneo, southern China	Wygodzinsky (1966); Hsiao & Ren (1981)
Ademula pauliani (Villiers, 1949)	AF: Côte d'Ivoire, Sierra Leone	Wygodzinsky (1966)
Ademula peregrina Wygodzinsky, 1966	AF: Madagascar	Wygodzinsky (1966)
Ademula reticulata McAtee & Malloch, 1926	OR: Borneo, Java, Singapore	Wygodzinsky (1966)
Ademula reticulatoides Wygodzinsky & Usinger, 1960	AU: Caroline Islands	Wygodzinsky (1966)

above discoveries indicate the potential diversity of *Ademula* in southern China and the Indochinese Peninsula, and there is no doubt that more species could be discovered in East and Southeast Asia by future field investigations.

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LITERATURE CITED

Chen Z, Liu Y, Wu Y, Lee M, Li H & Cai W (2022) A survey of the tribe Ectinoderini (Hemiptera: Reduviidae: Harpactorinae) of China, with the description of a new *Ectinoderus* species. Journal of Asia-Pacific Entomology, 25(4): 101974.

Distant WL (1903) Report on the Rhynchota. Part I. Heteroptera. In: Annandale N & Robertson HC (eds.) Fasciculi Malayenses. Anthropological and Zoological Results of an Expedition to Perak and the Siamese Malay States, 1901–1902. Zoology, Part II. University Press of Liverpool by Longmans, Green & Co., London, pp. 219–272.

Hsiao TY & Ren SZ (1981) Reduviidae. In: Hsiao TY, Ren SZ, Zheng LY, Jing XL, Zou HG & Liu SL (eds.) A Handbook for the Determination of the Chinese Hemiptera-Heteroptera (II). Science Press, Beijing, pp. 390–538.

Ishikawa T & Miyamoto S (2012) Family Reduviidae Latreille, 1807. Assassin bugs. In: Ishikawa T, Takai M & Yasunaga T (eds.) A Field Guide to Japanese Bugs – Terrestrial Heteropterans. Volume 3. Zenkoku Noson Kyoiku Kyokai Publishing Co. Ltd., Tokyo, pp. 231–288.

Ishikawa T & Yasunaga T (2004) New records of two assassin bug genera (Heteroptera, Reduviidae, Emesinae) from Japan, with description of a new species. Japanese Journal of Systematic Entomology, 10(1): 1–6.

Maldonado JC (1990) Systematic Catalogue of the Reduviidae of the World (Insecta: Heteroptera). Special Edition, Caribbean Journal of Science, Mayagüez, Puerto Rico, 694 pp.

McAtee WL & Malloch JR (1926) Philippine and Malayan Ploiariinae (Hemiptera, Reduviidae). Philippine Journal of Science, 30(1): 117–152, pls. 1–4.

Rédei D (2005) Additional notes on the thread-legged assassin bug fauna of Taiwan, with description of a new species (Heteroptera: Reduviidae: Emesinae). Journal of Asia-Pacific Entomology, 8(2): 127–132.

Standring S, Forero D & Weirauch C (2023) Untangling the assassin's web: Phylogeny and classification of the spider-associated Emesine complex (Hemiptera: Reduviidae). Systematic Entomology, Early View: https://doi.org/10.1111/syen.12603.

Usinger RL (1946) Hemiptera. Heteroptera of Guam. In: Insects of Guam. II. Bernice P. Bishop Museum, Honolulu, pp. 11–103.

Villiers A (1949) Révision des Émésides africains [Hémiptères Réduviides]. Mémoires du Muséum National d'Histoire Naturelle (N.S.), 23(2): 257–392.

Villiers A (1970) Nouveaux Hémiptères Reduviidae de Madagascar et des Comores. Annales de la Société Entomologique de France (N.S.), 6(4): 809–824.

Villiers A (1982) Hémiptères Reduviidae africains. Localisations et descriptions. II. Emesinae. Revue française d›Entomologie (N.S.), 4(1): 27–39.

Weirauch C (2008) Cladistic analysis of Reduviidae (Heteroptera: Cimicomorpha) based on morphological characters. Systematic Entomology, 33: 229–274.

Wygodzinsky PW (1966) A monograph of the Emesinae (Reduviidae, Hemiptera). Bulletin of the American Museum of Natural History, 133: 1–614.

Wygodzinsky PW & Usinger RL (1960) Heteroptera: Reduviidae. Insects of Micronesia, 7(5): 231–283.