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Two new planthopper species (Hemiptera, Fulgoroidea, Caliscelidae) collected in pitfall traps in Zambia

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Abstract

Two new species of planthoppers in the family Caliscelidae (Hemiptera: Fulgoroidea) are described from Zambia, i.e., *Afronaso spinosa* **sp. n.** and *Calampocus zambiaensis* **sp. n.** All specimens are flightless males and nearly all were collected from baited pitfall traps (except for one specimen collected from a yellow pan trap), suggesting that they live near to or on the ground.

Key words: taxonomy, Caliscelini, Africa, baited traps

Introduction

The systematics of the planthopper family Caliscelidae Amyot & Serville has been recently well documented (Gnezdilov & Wilson 2006, 2011, Gnezdilov 2008, 2011a,b, 2013, 2014, 2015, Gnezdilov & Bourgoin 2009). The family comprises two subfamilies: i) Caliscelinae Amyot & Serville with two tribes (Caliscelini and Pettonotellini Emeljanov) and ii) Ommatidiotinae Fieber with three tribes (Ommatidiotini and Augilini Baker and Adenissini Dlabola). The two subfamilies were separated by nymphal characters in the key by Gnezdlov & Wilson (2006) and by adult characters in the key by Gnezdilov and Bourgoin (2009).

In the Afrotropical Region (*sensu* Gnezdilov & Bourgoin 2009; including Sudan, Yemen, Oman, Saudi Arabia and Africa) 32 species were recorded: three species in Ommatidiotinae (Augilini and Adenissini) and 29 species in Caliscelinae (Caliscelini) (Gnezdilov & Bourgoin 2009). From the more restricted Afrotropical region, i.e., African countries south of the Sahara, 23 species were recorded which were all Caliscelinae except two species from Madagascar belonging to Ommatidiotinae (*Signoreta victorina* Gnezdilov & Bourgoin, 2009 and *Cano merinus* Gnezdilov, 2011a). In the present paper two more species of Caliscelini from Africa (Zambia) are described as new.

Tropical Caliscelidae, many of which are flightless, are very rare in collections and similarly very little is known of their ecology. A few are known to live on low growing plants (i.e. bamboo, *Calligonum, Phragmites* and *Ephedra*), two African species have been collected at ground level from a pitfall trap (*Calampocus sphaeroides* Gnezdilov & Bourgoin and *Calampocus pallens* Gnezdilov) and one species has been collected from a litter extraction trap (*Afronaso gryphus* Gnezdilov & Bourgoin) (Gnezdilov & Bourgoin 2009). Additionally, *Adenissus riadicus* Dlabola from the United Arab Emirates has been collected in water traps placed on the ground (Gnezdilov & Wilson 2011). Therefore, it is of some interest that the two species described here were collected in baited pitfall traps. It is not known whether these were attracted by the bait (dung and carrion) or fell into the traps by chance. Thus further research into behaviour and ecology of this group is required.

This is the second record of the family Caliscelidae from Zambia after *Rhinoploeus iwa* Gnezdilov & Bourgoin.

Materials and methods

The genital segments of the examined specimens were macerated in 10% KOH, washed and stored in glycerine.

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For drawing purposes, dissections were placed in glycerine jelly and drawn with the aid of a light microscope and camera lucida. Photographs of the specimens were taken using a Leica stereo microscope and a Canon EOS77D camera. All images were processed using HELICON FOCUS (v. 6.5, Helicon 2000-2015) and ADOBE PHOTOSHOP CS6 (v.13.0, Adobe 2012) softwares. The terminology used follows that of Gnezdilov and Bourgoin (2009) and Gnezdilov *et al.* (2014). The specimens examined are deposited in the Natural History Museum, London (NHM) and the Zoological Institute, Russian Academy of Sciences, Saint Petersburg, Russia (ZIN).

Taxonomy

Subfamily Caliscelinae

Diagnosis. Usually brachypterous. First metatarsomere apex with one lateral spine on each side (Fig. 2F) (also in macropterous Ommatidiotinae) or sometimes with additional spines in between (Gnezdilov and Bourgoin 2009) or setae in between the spines (Fig. 3E); immature with sensory pits lacking setiform sensillae on their border (Gnezdilov and Wilson 2006). An additional character for Caliscelinae given by Gnezdilov and Bourgoin (2009, in key) was that the aedeagus is "more or less reduced", however it is not fully clear what this refers to.

Remarks. The subfamily contains two tribes: i) Caliscelini, the only tribe that occurs in Africa (see Introduction) and ii) Pettonotellini Emeljanov (new name for Peltonotidae Fieber) that is distinguished by the adult stage retaining sensory pits (Gnezdilov 2013).

Tribe Caliscelini

***Afronaso spinosa* sp. n.**
(Figs 1, 2)

Description. Length. Male: 2.9–3.4mm (mean 3.1mm, 5 specimens)

Colour (male, Fig. 1A–C). Generally black to blackish brown. Metope, including proboscis, with yellowish marking at base. Coryphe, pronotum and scutellum medially and costal area of fore wings with dark pits. Anteclypeus and rostrum yellowish brown except apically. Hind legs with yellowish brown markings at dorsal surface of femora, tibiae, base of first tarsomere and on third tarsomere. Coxae and trochanters of all legs with brown or yellowish patches. Propleura brown dorsally, yellowish ventrally. Abdominal tergites with longitudinal irregular yellowish lines medially to last tergite. Abdominal sternites edged with yellow posteriorly and a thin light brown longitudinal stripe medially reaching to tip of abdomen. Thickness and intensity of yellow markings varies with some specimens almost completely black or blackish brown.

Habitus. Coryphe and metope joined at about 150° angle (Fig. 2A). Coryphe hexagonal with lateral margin angled to fore margin; posterior margin straight; slightly depressed each side of mid-line (Fig. 1C). Metope completely visible from above, greatly extended into a finger-like proboscis, cylindrical except slightly laterally compressed at apex, variably tapering to rounded apex in dorsal view, tip medially carinate and sometimes indistinctly laterally carinate, carinae joining at tip; transversely striate basally; strong lateral ledge from below antennae and around eye (Fig. 2A). Postclypeus large and swollen. Rostrum with apical segment quadrate in lateral view; pre-apical segment three times longer than apical segment. Antennal pedicel with rounded apical process (Fig. 2B). Pronotum short, shorter than coryphe, flat, without carinae, anterior margin convex and posterior margin straight. Scutellum twice as long as pronotum, without carinae but with a faint median ridge. Brachypterous with fore wings reaching to second visible abdominal tergite, venation obscure (Fig. 1A). Fore legs with laterally flattened femur and tibiae. Anterior-dorsal margin of tibiae expanded leaf-like, posterior-ventral margin of femur also relatively well expanded (Fig. 2C,D). Hind tibia with single lateral spine (Fig. 2F). First metatarsomere approximately as long as second and third metatarsomeres combined, first and second apically with two lateral spines either side of a pad with small pimples (Fig. 2F).

Male genitalia. Anal tube (10^{th} segment) rounded and slightly longer than wide in dorsal view, gradually tapering to blunt apex in lateral view (Fig. 2E). Pygopher very short with hind margin concave, without processes

(Fig. 2H). Style broad in lateral view, upturned apically and produced into an elongate acute processes (capitulum), without lateral tooth, caudo-dorsal angle widely rounded (Fig. 2G). Aedeagus surrounded by weakly sclerotized hood-like phallobase, the latter forming a more strongly sclerotized ring around aedeagus from which a dorsally projecting strut arises from each side, extended caudally as a pair of broad, laterally compressed asymmetrical lobes, more strongly sclerotized posteriorly, ventro-posterior corner of lobes with several thick black spines. Aedeagus elongate, distal part cylindrical, dorso-ventrally flattened in anterior part, ending in a small nose-like process at the posterior end (in lateral view), with two subapical recurved ventral processes (Fig. 2I,J).

Type material examined. Holotype ♂, pinned, with genitalia in a separate microvial: "Zambia, Nkwaji, riverine forest, dung pitfall trap, 20 Oct.–3 Nov. 2013, R. Smith, H. Takano, L. Chmurova and L. Smith" (NHM). Paratypes. 6 ♂, the same data as the holotype, except 1 ♂ from "carrion pitfall" and 3 ♂ from "dry evergreen forest" (NHM).

Additional material examined. 1 ♂: "Zambia, Nkwaji, open dambo savannah, yellow pan trap, Oct. 2013, R. Smith, H. Takano, L. Chmurova and L. Smith, (NHM). 1 ♂, same data except: "pitfall trap, 20 Oct.–3 Nov. 2013" (ZIN).

Etymology. This species is named after the spines on the phallobase lobes of the penis.

Remarks. This species can be distinguished by the strongly recurved ventral aedeagal processes and the several thick black spines on the caudal lobes of the phallobase, the latter similar to those found in *Gwurra aphrodite* Linnavuori (see Gnezdilov & Bourgoin 2009, Fig. 93-94). The species does not run easily to a genus in the key given by Gnezdilov & Bourgoin (2009). It runs to the first part of couplet 7 as its fore tibia are expanded but this choice leads only to two genera neither of which resemble our species. Disregarding this couplet, the species runs to *Afronaso* Jacobi which is very similar externally but lacks the features of the male genitalia noted above. We therefore tentatively include the species in *Afronaso* but conclude that it could be placed into a new genus or subgenus in the future.

Calampocus zambiaensis sp. n.

(Figs 1, 3)

Description. Length. ♂: 2.1–2.7mm (mean 2.4mm, 2 specimens)

Colour. (♂, Fig. 1D–F). General coloration black to blackish brown. Fore and middle legs yellowish brown; hind legs darker brown becoming yellowish brown toward tips of tibiae and tarsi. All legs with spinal apices black.

Habitus. Coryphe and metope joined at about 90° angle (Fig. 3A). Coryphe hexagonal with lateral margin angled to fore margin; posterior margin straight; slightly depressed each side of mid-line. Metope strongly angled ventrally to face, rugose, without carinae (Fig. 1E). Postclypeus large and swollen with a longitudinal medial ridge, fairly smooth. Rostrum with apical segment quadrate in lateral view, one-third length of pre-apical segment. Antennal pedicel with rounded apical process (Fig. 3B). Pronotum shorter than coryphe, anterior margin very slightly convex, posterior margin straight, smooth. Scutellum smooth, very tip covered in transverse wrinkles. Coryphe, pronotum and scutellum fairly smooth with a few indistinct pits. Brachypterous with fore wings reaching hind margin of the second visible abdominal tergite, venation obscure (Fig. 1D). Fore tibia quadrate in cross section (Fig. 3D). Hind tibia with single lateral spine (Fig. 2G). The first metatarsomere approximately as long as the second and the third metatarsomeres combined, the first and the second apically with two lateral spines either side of a pad with small pimples (Fig. 2G).

Male genitalia. Anal tube (10th segment) rounded and slightly longer than wide in dorsal view, gradually tapering to blunt apex in lateral view (Fig. 3K). Pygopher very short with hind and fore margin concave, without processes (Fig. 3I). Style broad in lateral view, upturned apically and produced into an elongate acute processes (capitulum), without lateral tooth, caudo-dorsal angle widely rounded (Fig. 3H). Aedeagus surrounded by weakly sclerotized hood-like phallobase, extended caudally as a pair of broad, laterally compressed asymmetrical lobes. Aedeagus complex, with a dorsal and ventral lobe the latter with a pair of elongate, acuminate, spirally curved hooks, right hook running underneath the phallobase and protruding from its ventral margin, left hook curved dorsally beneath and above phallobase (Fig. 3J, L).

Type material examined. Holotype ♂, pinned, with genitalia in a separate microvial: "Zambia, Hillwood, termite hills, dung pitfall trap, 21–28 Oct. 2013, R. Smith, H. Takano, L. Chmurova and L. Smith", (NHM).

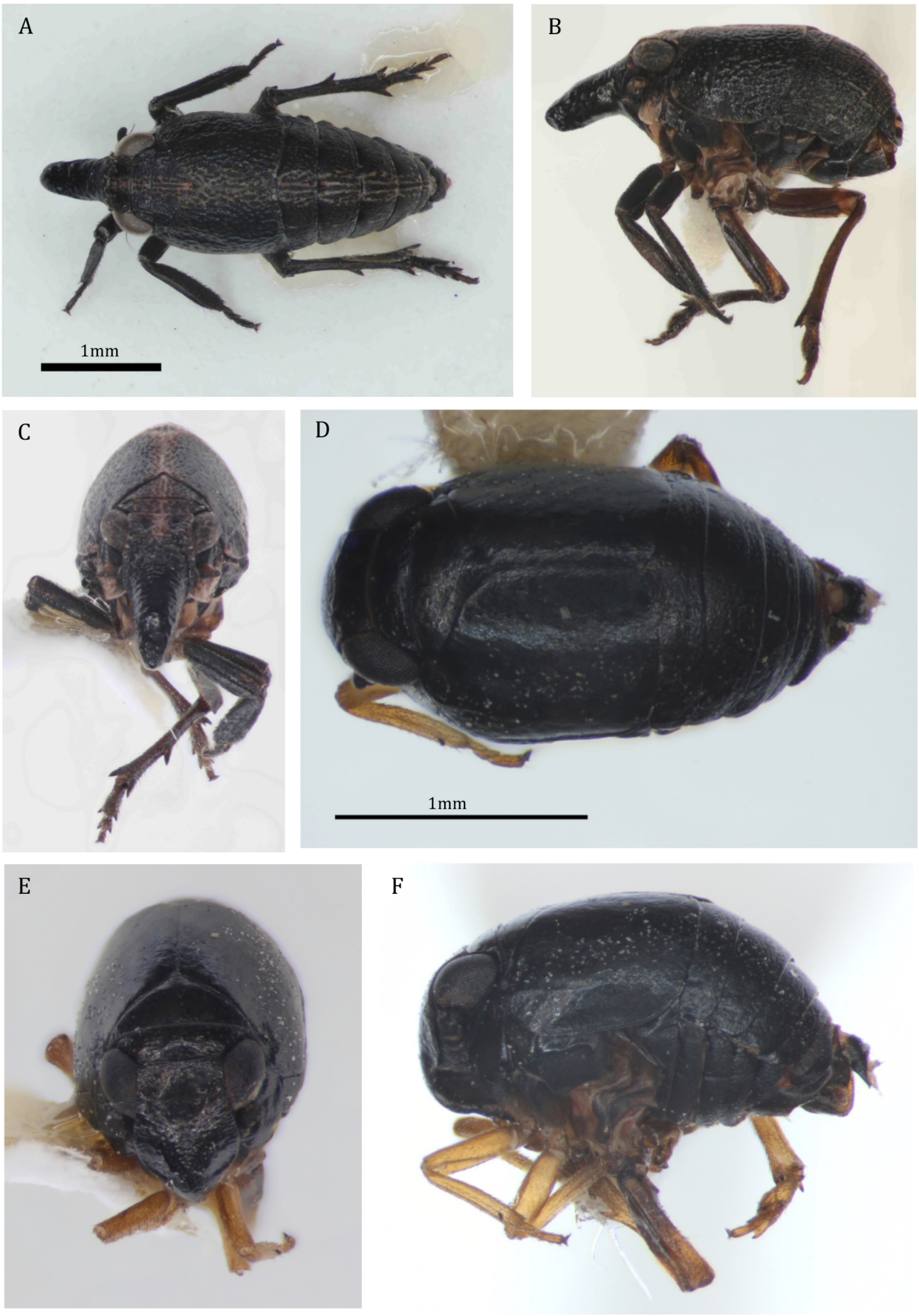

FIGURE 1. Habitus of new Caliscelidae. A–C, *Afronaso spinosa* **sp. n.** (male): A, dorsal view; B, lateral view; C, frontal view. D-F, *Calampocus zambiaensis* **sp. n.** (male): D, dorsal view; E, frontal view; F, lateral view.

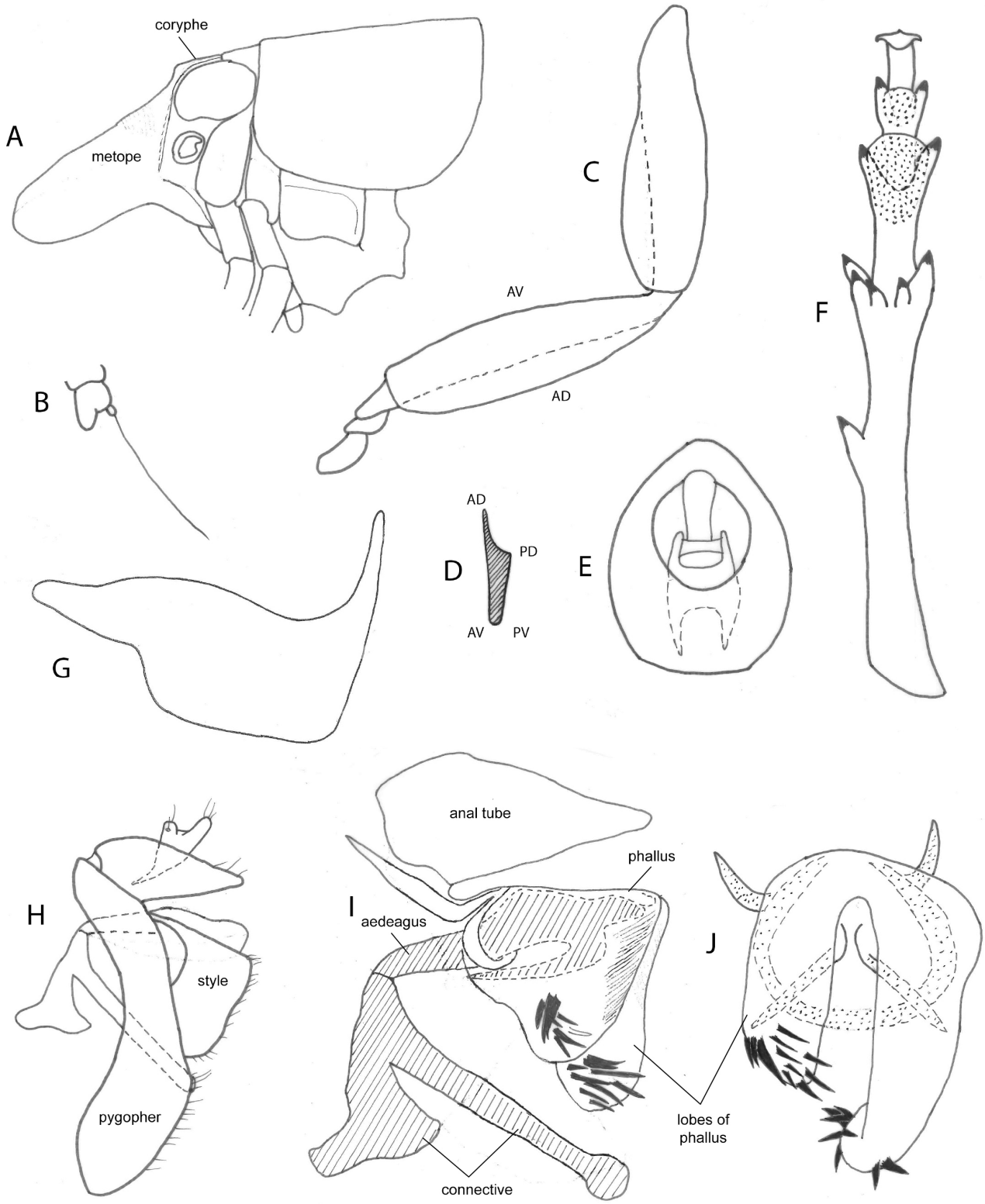

FIGURE 2. *Afronaso spinosa* **sp. n.** (male): A, head and thorax, lateral view; B, antenna; C, front leg, lateral view (AV = anterior-ventral margin, AD = anterior-dorsal margin); D, cross-section of front tibia (AV = anterior-ventral margin, AD = anterior-dorsal margin, PV = posterior-ventral margin, PD = posterior-dorsal margin); E, anal tube, dorsal view; F, hind tibia and tarsomeres, ventral view; G, style, lateral view; H, genital capsule, lateral view; I, penis, connective and anal tube, lateral view, left side; J, penis, ventral view.

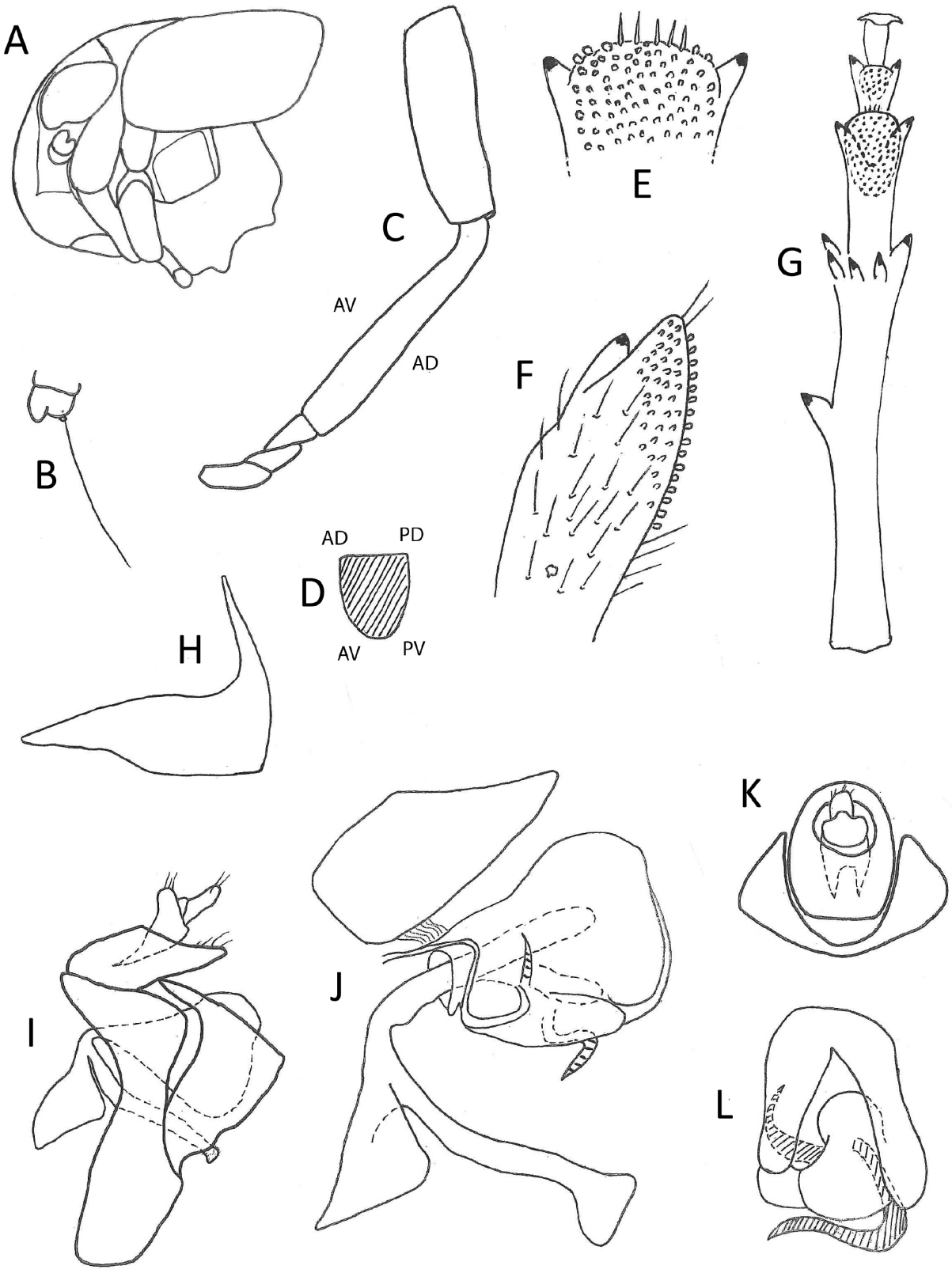

FIGURE 3. *Calampocus zambiaensis* **sp. n.** (male): A, head and thorax, lateral view, B, antenna; C, front leg, lateral view (AV = anterior-ventral margin, AD = anterior-dorsal margin); D, cross-section of front tibia (AV = anterior-ventral margin, AD = anterior-dorsal margin, PV = posterior-ventral margin, PD = posterior-dorsal margin); E, apex of first tarsomere pad, ventral view; F, first tarsomere pad, lateral view; G, hind tibia and tarsomeres, ventral view; H, style; I, genital capsule, lateral view; J, penis, connective and anal tube, lateral view, left side; K, pygofer and anal tube, dorsal view; L, penis, ventral view.

Paratypes. 2 ♂, same data as holotype (NHM).

Etymology. This species is named after the country of collection.

Remarks. In Gnezdilov & Bourgoin's (2009) key this species runs to couplet 14 as the male has a globular head etc. The three genera under this couplet (the monotypic *Calampocus* Gnezdilov & Bourgoin and *Issopulex* China & Fennah and *Savanopulex* Dlabola with two species) all have the male similar in appearance to our species, i.e. shiny black and globular. However, our species has features in common with both parts of couplet 14, i.e., the ventral aedeagal hooks are spirally curved as in *Calampocus sphaeroides* Gnezdilov & Bourgoin but it is similar to the other two genera in lacking a single spine between the outer metatarsomere spines (Fig. 2F) and the phallobase lacking a large basal process. Other differences between the three genera were summarised by Gnezdilov (2009), i.e., *Savanopulex* is characterised by an indistinct (weak) sublateral carinae on the metope (Gnezdilov & Bourgoin 2009; fig. 25) and *Issopulex gloriosus* is characterised by a peculiar shagreen surface of the metope, coryphe, pro- and meso- notum (Gnezdiov 2014; figs .1, 3, 5, 7). We therefore tentatively place the new species in *Calampocus* noting that although the aedeagal hooks are similarly curved, the left aedeagal hook curves upwards rather than downwards and the lateral phallobase lobes are larger (as in *Afronaso*) and lack denticles.

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