

A revision of the species of the genus *Howickia* (Diptera: Sphaeroceridae) from Papua New Guinea and the Oriental Region, with the description of four new species

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Abstract. The Oriental and Papua New Guinea species of *Howickia* Richards, 1951 (Diptera: Sphaeroceridae) are revised, including *H. vittigera* (Richards, 1973), *H. orientalis* (Papp, 1995), *H. cruspica* Kuwahara & Marshall, 2022, and the following four new species: *H. hirsuta*, new species, *H. kukali*, new species, *H. sumatrana*, new species, and *H. trulliformis*, new species. Three new species groups of *Howickia* are established and diagnosed: the *H. cruspica* species group, the *H. orientalis* species group, and the monotypic *H. vittigera* species group. A key to extra-Australian/New Zealand species of *Howickia* is presented.

Key words. Limosininae, Indonesia, Malaysia, taxonomy, relationships, key

INTRODUCTION

Howickia Richards, 1951 (Sphaeroceridae, Limosininae) is a genus of 68 species (including four newly described species) ranging from Pakistan to New Zealand, with the highest species diversity in Australia. The genus as a whole is diverse in appearance, with several autapomorphic short-winged or wingless species. All species in the genus are characterised by a characteristic tripartite hypandrium (noted as an apomorphy of the genus by Kuwahara & Marshall, 2022) and fully winged species of *Howickia* can be identified by the following combination of characters: (i) mid tibia with paired proximal and distal dorsal bristles; (ii) scutellum broad, usually semicircular; (iii) R_{2+3} distinctly (and usually quite strongly) sinuate; (iv) R_{4+5} straight or gently upcurved; (v) wings slightly infusate to distinctly patterned; (vi) male S5 posteromedially concave; and (vii) female terminalia elongate and telescopic with postabdominal sclerites strongly reduced. The most externally similar genus is *Paralimosina* Papp, 1973, which differs from *Howickia* in lacking strong paired dorsal mid tibial bristles and in having a relatively straight R_{2+3} , a sinuate R_{4+5} , a short (non-telescopic) female terminalia, and a male hypandrium without a posterodorsal apodeme.

The *Howickia* of New Zealand and Australia were recently revised (Marshall et al., 2014, Kuwahara & Marshall, 2022) to include over 60 species, one of which (*H. cruspica* Kuwahara & Marshall, 2022) is here newly recorded from Papua New Guinea. One other described species, *H. vittigera* (Richards, 1973), is known only from Papua New Guinea and three previously described species occur in the Oriental and the Palearctic Regions. We here review the *Howickia* of New Guinea and the Oriental Region (thus all members of the genus outside Australia and New Zealand), with the description of three new species from Papua New Guinea and one from Indonesia and Malaysia.

MATERIAL AND METHODS

Terminology. Morphological terminology follows Cumming & Wood (2017), though terms referring to macrotrichia follow Marshall et al. (2014). The phallus is described in its normal anteriorly directed position, with the dorsal and ventral surfaces referred to as lower and upper, respectively. Abbreviations include CS: costal sector; S: sternite(s); T: tergite(s). The following alpha-3 code acronyms are used in the species key: AUS (Australia); CHN (China); IDN (Indonesia); IND (India); MYS (Malaysia); NPL (Nepal); PAK (Pakistan); PNG (Papua New Guinea); THA (Thailand).

Label data. Label data are given in a standardised format rather than verbatim. Obvious spelling errors on labels were corrected in the data below and short-form words are given in full.

Specimen preparation. Male and female terminalia were prepared by soaking entire abdomens in 10% potassium hydroxide (KOH) at room temperature for 5–10 minutes prior to heating the KOH to boiling point for 15–20 minutes.

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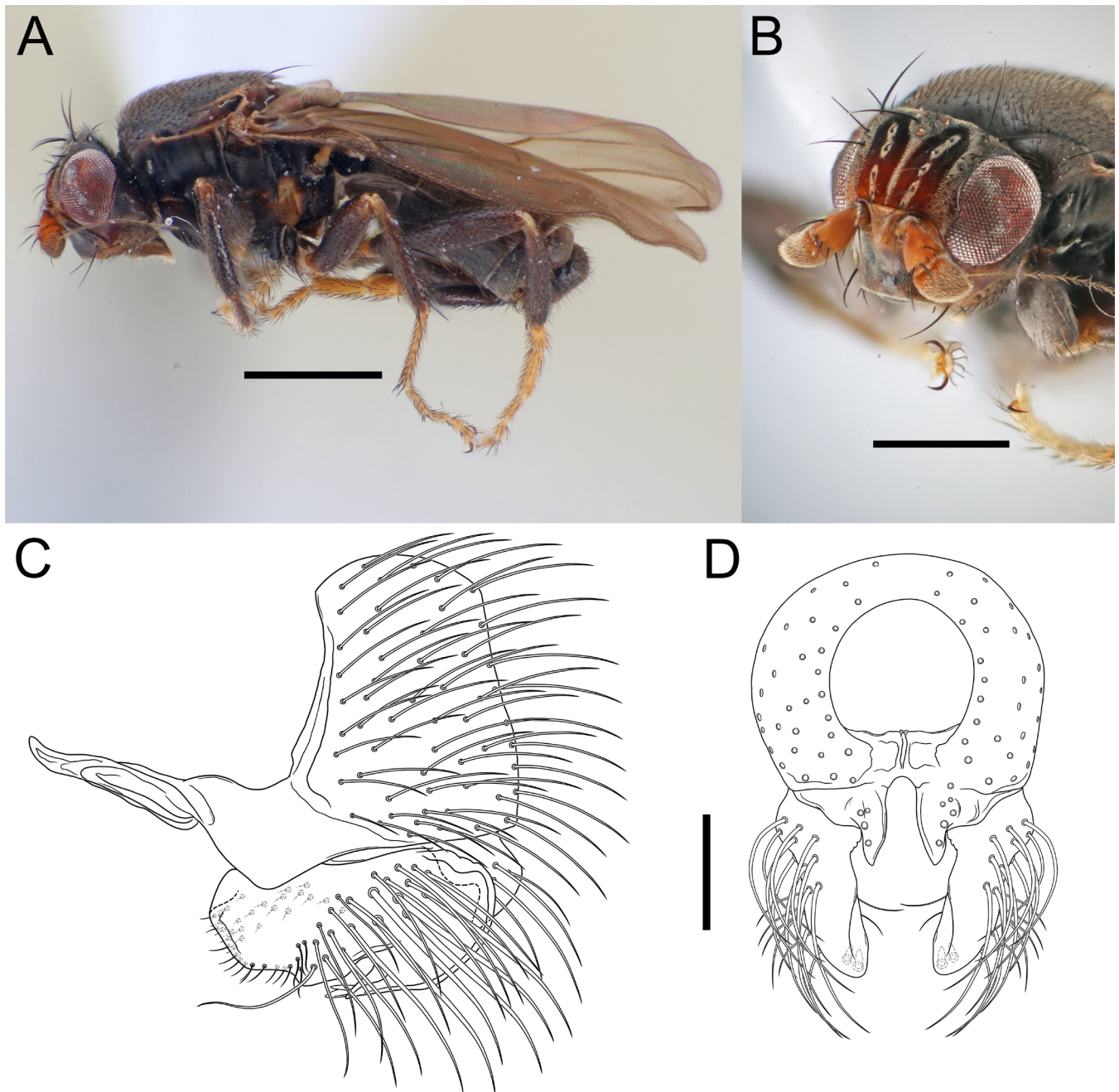


Fig 1. *Howickia orientalis* (Papp, 1995): A, Male habitus, lateral; B, Male head, anterolateral; C, Male terminalia, lateral; D, Male terminalia, posterior. Scale bars (photographs) = 1.0 mm, scale bars (illustrations) = 0.10 mm.

Cleared abdomens were subsequently neutralised in acetic acid for at least 25 minutes at room temperature, then rinsed in deionised water and placed in glycerin for examination. Cleared terminalia are stored in glycerin in genitalia vials pinned below the specimen. Wings were prepared for photography by placing them on a flat microscope slide, adding a drop of ethanol and covering with a glass coverslip. Severed wings were subsequently glued to paper points with the associated specimens.

Photography and illustrations. Habitus and head photographs were taken using a Canon 70D camera with an Infinity Model K2 DistaMax microscope and Achrovid 5x/ Nelsonian objective lens mounted on a Cognisys StackShot rail system and stacked in HeliconFocus. Wing photographs

were taken using a Nikon D70 camera mounted on a Nikon Labophot-2 compound microscope. Genitalia illustrations were made freehand while viewing specimens through a Nikon Labophot compound microscope. Images were compiled, cleaned, and enhanced using Adobe Photoshop Elements 9.

Specimen deposition. Most of the 256 specimens examined in this study are deposited in the University of Guelph Insect Collection, School of Environmental Sciences, University of Guelph, Guelph, Ontario, Canada (DEBU), with some types deposited in the Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Ontario, Canada (CNCI) and the Royal Ontario Museum, Toronto, Ontario, Canada (ROME). The type specimens of the previously described

species are deposited in the Australian Museum, Sydney, New South Wales, Australia (AMSA), Australian National Insect Collection, Canberra, Australian Capital Territory, Australia (ANIC), Hungarian Natural History Museum, Budapest, Hungary (HNHM), and Muséum d'Histoire Naturelle, Genève, Switzerland (MHNG).

TAXONOMY

Family Sphaeroceridae Macquart, 1835

Genus *Howickia* Richards, 1951

Howickia Richards, 1951: 844 (feminine). – Roháček et al., 2001: 149; Marshall et al., 2014: 2; Kuwahara & Marshall, 2022: 18.

Type species. *Apterina trilineata* Hutton, 1901: 93.

Description. *Howickia* can be recognised by the diagnoses and descriptions given in Kuwahara & Marshall (2022), with winged species further diagnosed as follows:

Body length: Males 1.2–5.4 mm, females 1.4–5.5 mm.

Head: Colour dark brown to yellow, frons often with darkened frontal vitta, interfrontal plates, and orbital plates, sometimes with golden microtomentum. Frontal width 1.2–2.4 × frontal height. Interfrontal bristles in 2–4 subequal pairs, sometimes with an additional small anterior pair. Two large laterocline orbital bristles, anterior pair smaller (0.5–0.9 ×) posterior pair; ocellar bristles large and diverging; vertical and occipital bristles large; postocellar bristles small. Vibrissa large, vibrissal angle with 2–4 subvibrissal setulae. Lower half of gena with a larger upcurved seta and several setulae surrounded by a patch of microtomentum. Palpus clavate with 1–2 subapical setae. Antennae divergent; pedicel large, bearing 5–6 stout apical setae; postpedicel slightly pointed dorsoapically; arista long-pubescent. Eye bean-shaped, with a slight concavity posteroventrally; greatest eye diameter 1.7–3.8 × shortest genal diameter; shortest genal height ~ 0.5 × greatest genal height.

Thorax: Colour reddish-brown to black; scutum and scutellum covered in dense brown microtrichia but still shiny. Dorsocentral bristles in 1–5 pairs, separated by 6–12 rows of acrostichal setulae. Two postpronotal bristles, usually with several smaller setulae; two notopleural bristles, anterior bristle slightly larger than posterior; two strong supra-alar bristles; postalar and intra-postalar bristles large. Prosternum usually triangular, but rectangular in *H. vittigera*. Katepisternum with a strong posterior seta. Scutellum broad, usually semicircular, with four large marginal bristles.

Legs: Colour yellow to black, fore tarsomeres sometimes differently coloured from other tarsi. Male fore femora usually swollen, usually with long ventral setae. Dorsal surface of mid tibia with at least two pairs of bristles, usually five (three anterodorsal, two posterodorsal) proximal and four (two anterodorsal, one dorsal, one posterodorsal) distal

bristles; ventral surface usually with a row of usually stout but short setae in the apical third to two-thirds in males (mid femur with two corresponding ventrobasal rows of setae) and (only) a large apical bristle in females. Mid basitarsus usually with a distinctly enlarged subbasal ventral seta. Hind tibia usually with a short, stout apicoventral seta.

Wing/halter: Wing colouration variable, at least lightly infusate, sometimes with distinct patterning. CS2 0.4–1.0 × CS3. R₂₊₃ sinuate, basal curve usually broader than apical curve; R₄₊₅ slightly upcurved, meeting costa just before wing tip; costa ending at or extending slightly beyond apex of R₄₊₅. M₁ usually extending beyond dm-m as a coloured pseudovein; M₄ extending beyond dm-m as a short tubular vein. CuA+CuP usually present as a long, sinuate pseudovein. Alula usually narrow, almost linear. Halter usually white but sometimes black, stem usually darkened.

Male abdomen: T2–5 and S2–4 brown to black, usually well-sclerotised but sometimes with desclerotised margins, and uniformly long-setose in posterior half; S1 reduced to a pair of small, rectangular sclerites. S5 broad, usually rectangular, and variously armed with long setae and/or stout tooth-like setae, usually long-setose posterolaterally. Epandrium rounded, saddle-shaped, and uniformly setose; cercus well developed and forming a subanal plate oriented vertically and projecting ventrally (the *H. orientalis* and *H. vittigera* species groups) or oriented horizontally and thus on the ventral side of the epandrium (the *H. cruspica* species group), with at least one longer seta and several small setulae, cerci often widely separated ventrally, only narrowly connected dorsally; hypandrium tripartite, composed of a long, sinuate, dorsoventrally flattened anterodorsal apodeme, an elongate, Y-shaped posterodorsal apodeme, and a ventral lobe originating between the lateral arms; lateral arms fused to the anterodorsal apodeme and anteroventral corners of the epandrium. Surstylus various, usually multi-lobed with several long setae. Postgonite typically elongate and sinuate. Phallapodeme elongate; basiphallus usually small, sometimes with a distinct epiphallus. Distiphallus usually composed of several sclerites, usually with distinct basal and apical halves, though sometimes more membranous.

Female abdomen: T2–5 and S2–5 brown to black, usually well-sclerotised but sometimes with desclerotised margins, and uniformly long-setose in posterior two-thirds. Postabdomen membranous and telescopic, fitting into segment 5 at rest; everted postabdomen comprising ~ 50% of the total abdominal length. T6–7 and S6–7 reduced to either paired lateral sclerites or bell-shaped medial sclerites. T8 split into two or three pieces, at least a pair of posteriorly-setulose lateral sclerites and usually a bare dorsomedial sclerite. Epiproct usually shield-like or reduced, with a pair of dorsal setae. Cercus microtrichose with several long dorsal, apical, and preapical setae. S8 usually ovoid and microtrichose. Hypoproct usually shield-like, with several posteromedial setulae. Spermathecae (2+1) spherical to ovoid and smooth to transversely grooved, sometimes invaginated apically; stem usually short and sclerotised, connecting to the long, largely membranous spermathecal ducts.

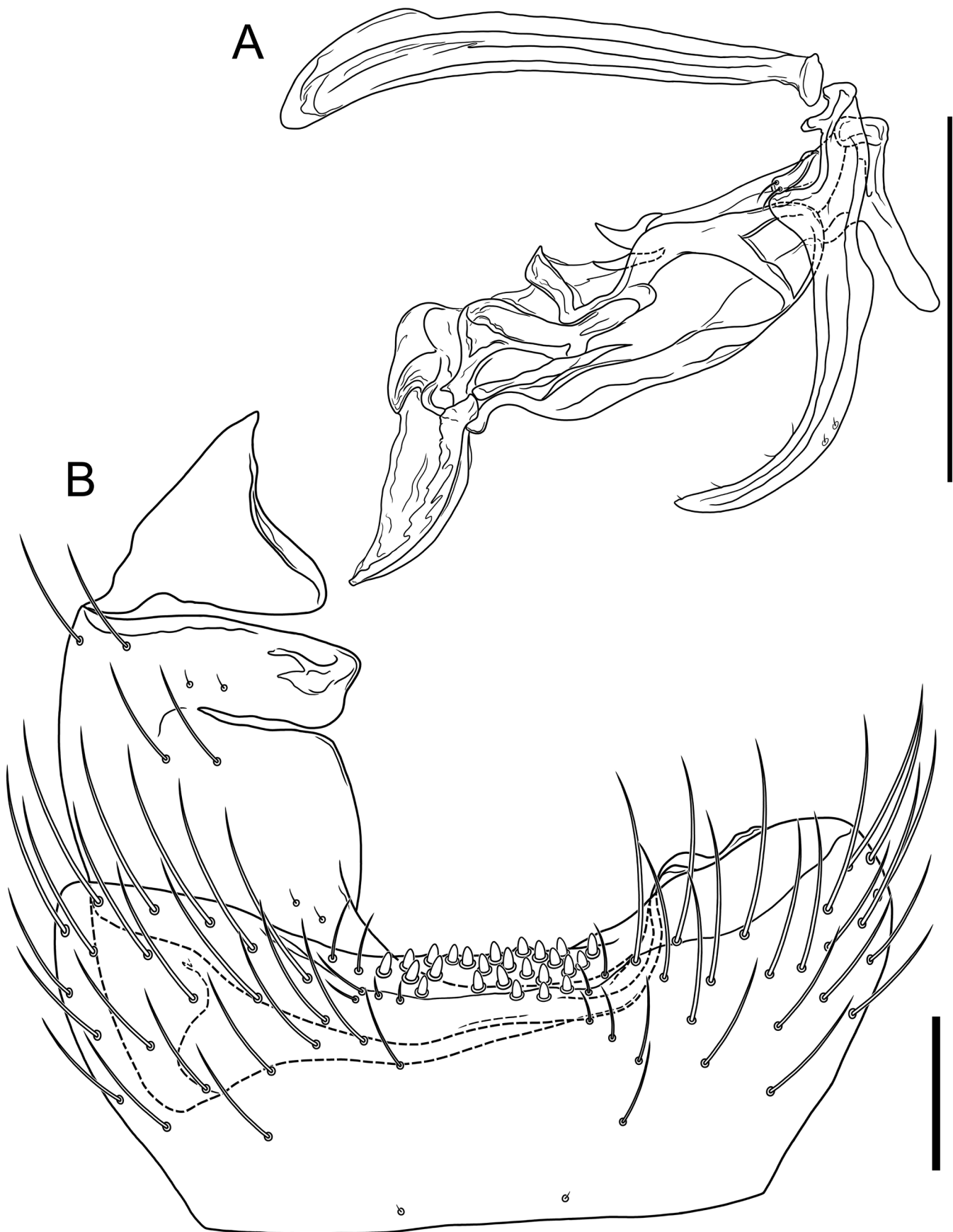


Fig. 2. *Howickia orientalis* (Papp, 1995): A, Male aedeagus and associated structures, lateral; B, Male S5, S6+7, and S8, ventral. Scale bars = 0.10 mm.

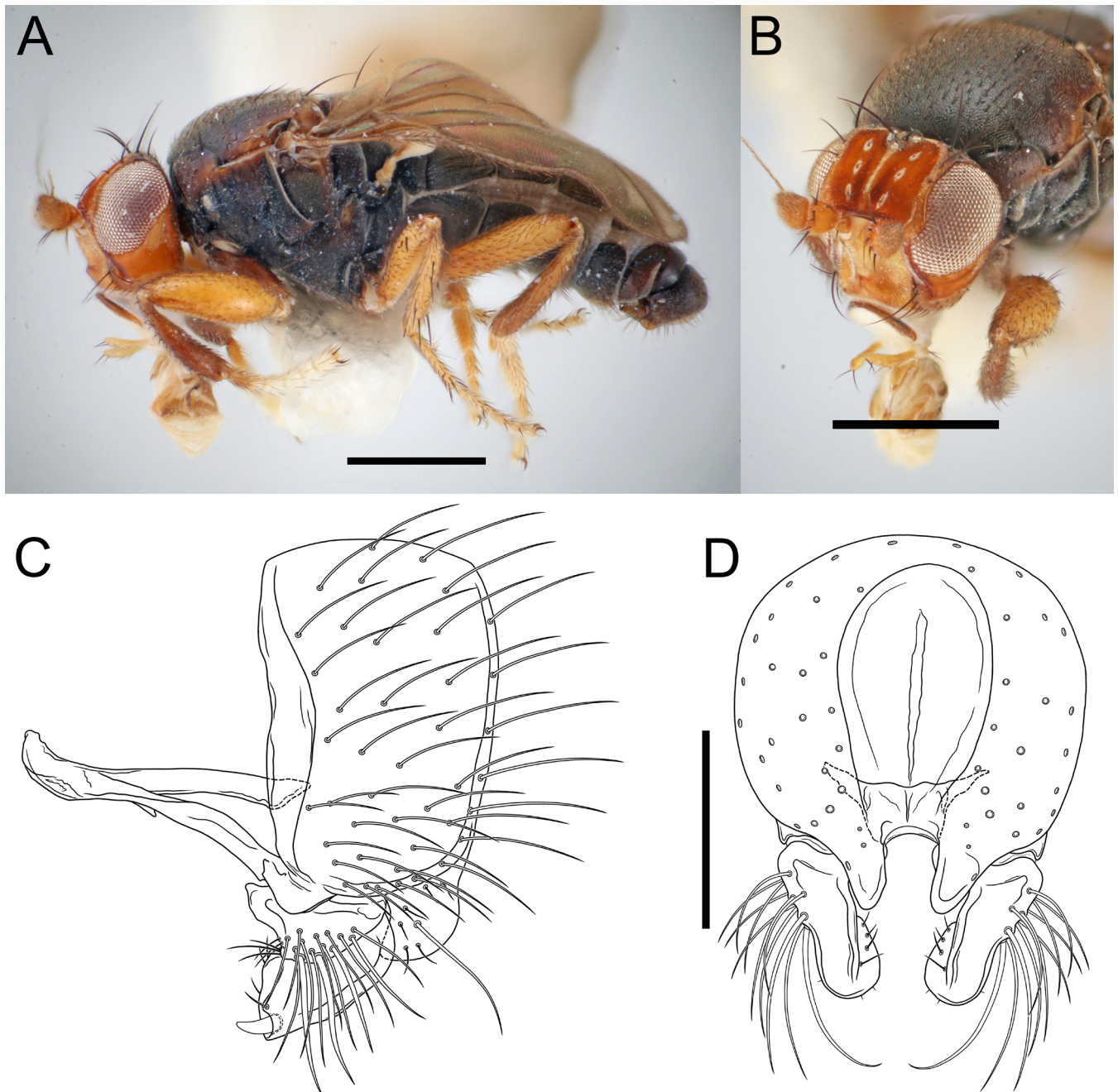


Fig. 3. *Howickia sumatrana*, new species: A, Male habitus, lateral; B, Male head, anterolateral; C, Male terminalia, lateral; D, Male terminalia, posterior. Scale bars (photographs) = 1.0 mm, scale bars (illustrations) = 0.10 mm.

Phylogeny and relationships. The Oriental and Papua New Guinea species of *Howickia* fit into three easily diagnosed species groups: the *H. orientalis* species group (*H. burckhardtii*, *H. orientalis* (Papp, 1995), *H. sumatrana*, new species, and *H. topali* (Papp, 1995)), the *H. cruspica* species group (*H. cruspica* Kuwahara & Marshall, 2022, *H. hirsuta*, new species, *Howickia kukali*, new species, and *H. trulliformis*, new species), and the monotypic *H. vittigera* species group.

Species in the *H. cruspica* species group share strongly patterned wings, indistinct yellow-gold microtomentum on the frons, at least four pairs of dorsocentral bristles (including at least one presutural pair), long-setose femora (setae much denser in males), hind tibiae with large, curved apicoventral

spurs, a very narrow, almost linear alula, black abdominal tergites contrasting with a reddish S6+7, and a simple male fifth sternite. Two Australian species, *Howickia kurandensis* (Richards, 1973) and its sister species *H. xanthocephala* Kuwahara & Marshall, 2022 share most of these characters, suggesting a close relationship to the *H. cruspica* species group.

Species in the *H. orientalis* species group share evenly infusate wings, very distinct golden microtomentum on the frons, two (both postsutural) dorsocentral bristles, enlarged male cerci, reduced ventral hypandrial lobe, a long-setose basal lobe on the surstylus, elongate epiphallus, and elongate distiphallus with long sclerites running its entire length. None of the *Howickia* species from Australia or New Zealand

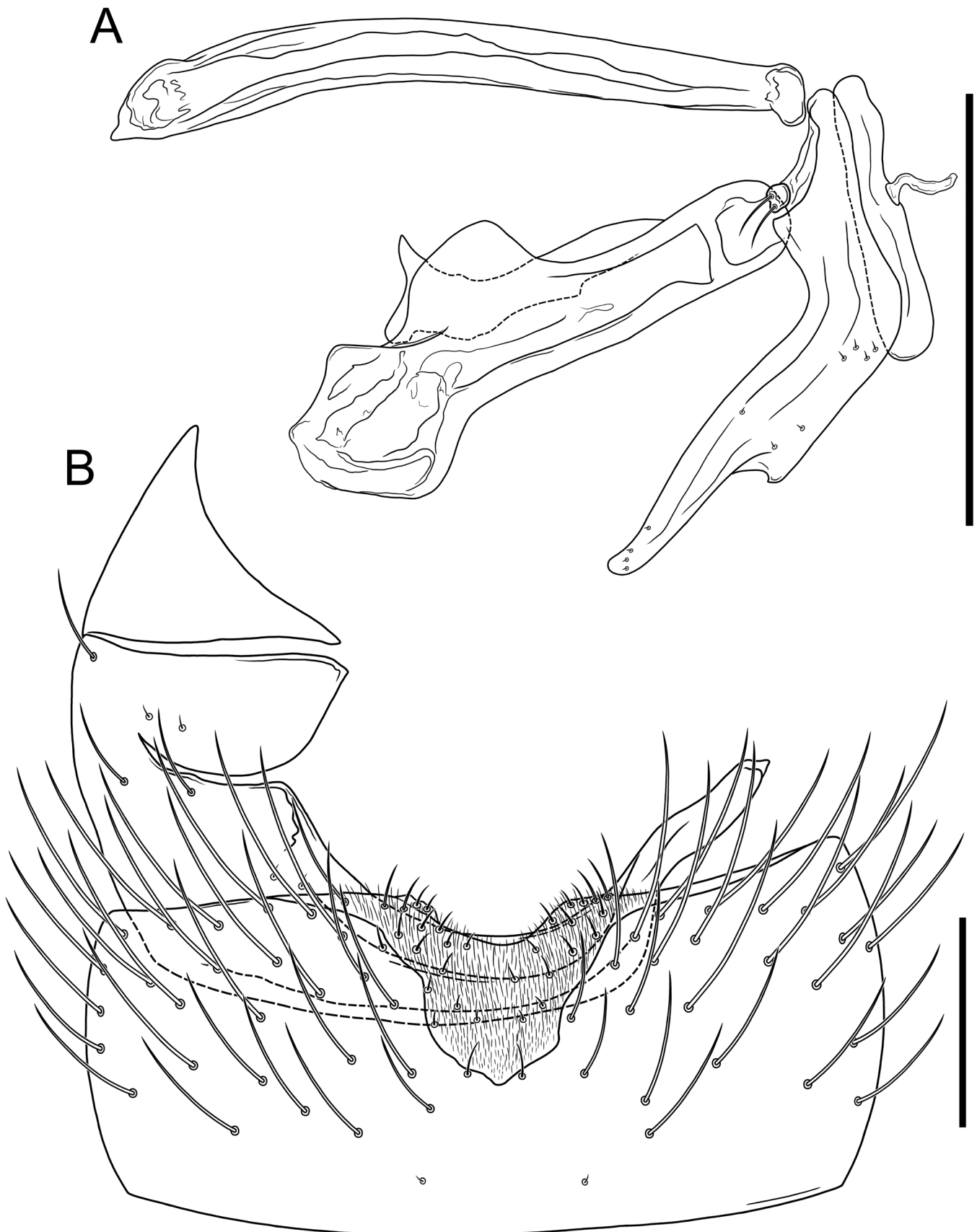


Fig. 4. *Howickia sumatrana*, new species: A, Male aedeagus and associated structures, lateral; B, Male S5, S6+7, and S8, ventral. Scale bars = 0.10 mm.

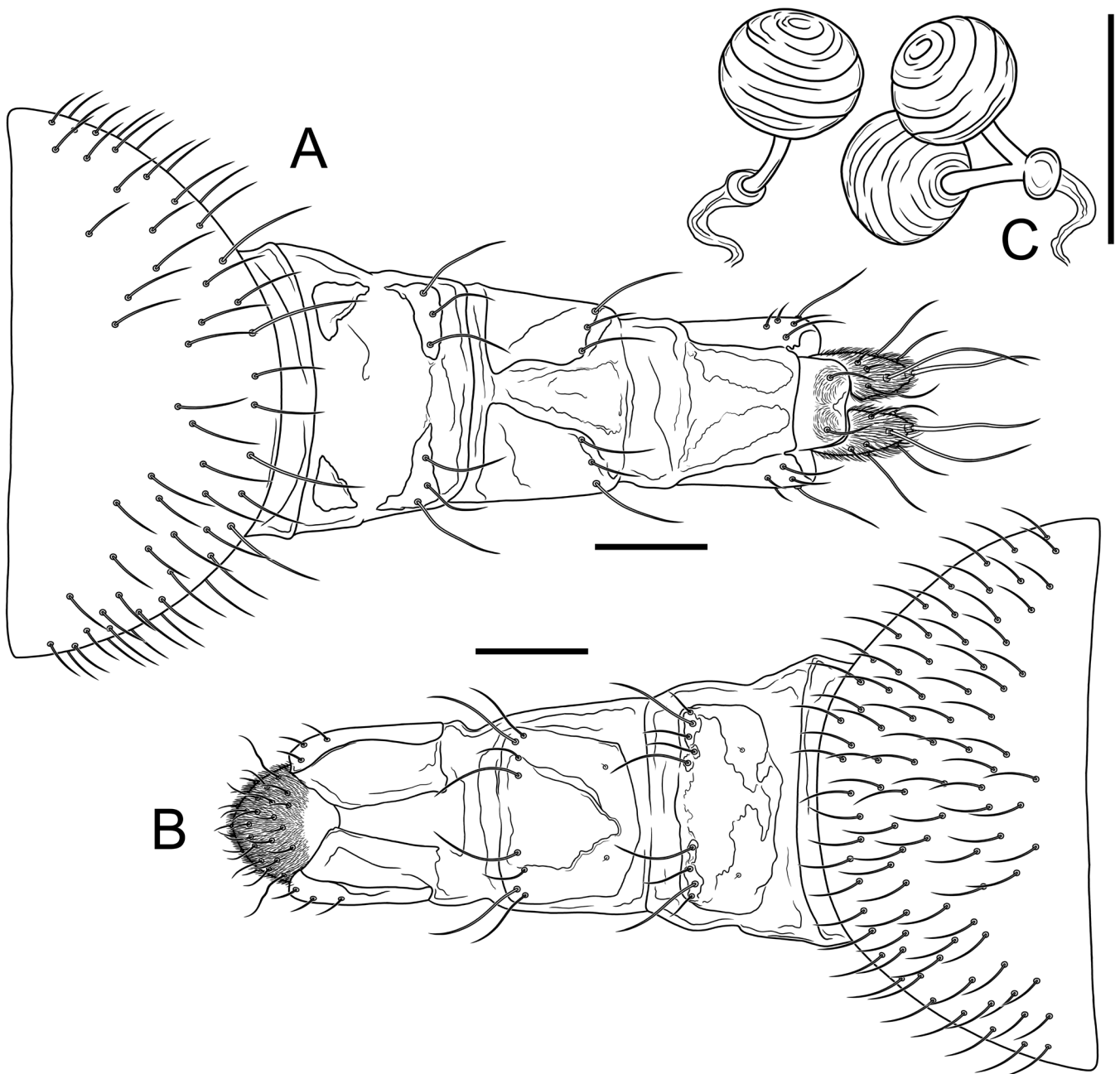


Fig. 5. *Howickia sumatrana*, new species, female terminalia: A, dorsal; B, ventral; C, Spermathecae. Scale bars = 0.10 mm.

show strong affinities to any of the four species in the *H. orientalis* species group.

Howickia vittigera differs markedly from species in either the Asian *H. orientalis* species group or the Papua New Guinean *H. cruspica* species group, having a proportionally large and bulbous head, flattened frons, relatively long section of M_1 between r-m and dm-m, and smaller and pointed anterior surstylar lobe. However, there are some similarities between *H. vittigera* and the strongly brachypterous *H. sabina* (Richards, 1973) from Victoria, Australia. Both species have similar microtomentose patterns on the slightly flattened frons, a dark moustache-like mark on the face, and a similar phallic complex. However, no characters of the male S5 and surstylus are interpreted as synapomorphic for these two species.

Distribution. *Howickia* is found throughout the Oriental (India, Indonesia, Malaysia, Nepal, Pakistan, Thailand) and Australasian/Oceanian (Australia, New Zealand, Papua New Guinea) Regions, and the southeastern portions of the Palearctic Region (China (Sichuan)).

Biology. The Papua New Guinean specimens of *Howickia* were almost all collected using dung traps, while most Indonesian specimens were collected in Malaise traps with pans. Previous records of *Howickia* from Australia and New Zealand indicate an association with decaying vegetation (see Marshall et al., 2014 and Kuwahara & Marshall, 2022). All Oriental and Papua New Guinea specimens with habitat data were collected in forested areas. The genus seems to be infrequently collected outside of Australia and New Zealand, as suggested by the relatively few (23) Oriental *Howickia*

specimens in the University of Guelph Insect collection, and by the absence of any *Howickia* species among the 66 sphaerocerid taxa on the Biodiversity of Singapore website (available at <https://singapore.biodiversity.online/>).

Key to extra-Australian/New Zealand species of *Howickia*

1. Wing membrane patterned, infusate with several pale spots forming zig-zag vertical bars (Fig. 17 C–H).....2
 - Wing membrane evenly lightly infusate, without distinct pale patterning (Fig. 17A–B).....6
 2. Frons distinctly flattened with distinct, golden interfrontal microtomentum; lunule strongly projecting forwards (Fig. 15B); gena and face yellow, face with a dark, moustache-like medial mark (Fig. 15B). Proximal half of mid tibia with one anterodorsal and two posterodorsal setae.....*H. vittigera* (Richards, 1973) [PNG]
 - Frons slightly convex, not distinctly flattened, with indistinct, pale interfrontal microtomentum; lunule rounded, not strongly projecting; gena and face orange, without any distinct dark markings (as in Figs. 6B, 10B). Proximal half of mid tibia with three anterodorsal and two posterodorsal setae.....3
 3. All femora and tibiae dark brown (Fig. 8A); male mid femur, mid tibia, and mid basitarsus with dense, long, fine ventral setae. Ventral extension of S6 with stout, tooth-like posterior knobs (Fig. 9B); surstylus trilobed (Fig. 8C).....*H. hirsuta*, new species [PNG]
 - Femora dark brown to reddish brown, fore and mid tibiae yellowish to reddish brown, basal half to two-thirds of hind tibia yellowish, apical half to third brown (Figs. 6A, 10A, 13A); male mid femur and mid tibia with long to short but not dense setae, mid basitarsus with a stout subbasal ventral seta. Ventral extension of S6 simple (Figs. 7B, 11B, 14B); surstylus bilobed (Figs. 6C, 10C, 13C).....4
 4. Middle interfrontal bristles long (longer than upper and lower pairs) with the tips crossing. Wing slightly to strongly shortened, reaching the tip of T2 to the tip of T5 (Figs. 6A, 17C–D). Posteromedial emargination of male S5 deep, about 0.3 × medial length (Fig. 7B); anterior lobe of surstylus covered in small, rounded scale-like setae (Fig. 6C).....*H. cruspica* Kuwahara & Marshall, 2022 [AUS, PNG]
 - All interfrontal bristles subequal in length. Wing slightly shortened at most, reaching at least to the tip of T5 (Figs. 10A, 13A). Posteromedial emargination of male S5 shallow, comprising < 0.2 × medial length (Figs. 11B, 14B); anterior lobe of surstylus bare (Fig. 13C) or with small, tooth-like setae (Fig. 10C).....5
 5. Greatest eye height 1.8–1.9 × shortest genal height (Fig. 10A). Male S5 without a setulose, membranous posteromedial flap (Fig. 11B). Anterior lobe of surstylus large, about as large as posterior lobe (Fig. 10C), posterior lobe stout with a triangular posteroapical lobe (Fig. 10D). Postgonite recurved and apically bent (Fig. 11A).....*H. kukali*, new species [PNG]
 - Greatest eye height 2.0–2.1 × shortest genal height (Fig. 13A). Male S5 with a setulose, membranous posteromedial flap (Fig. 14B). Anterior lobe of surstylus small, much smaller than posterior lobe, posterior lobe elongate and evenly rounded, without an apical lobe (Fig. 13C). Postgonite sinuate (Fig. 14A).....*H. trulliformis*, new species [PNG]
- Note: Females of *H. kukali*, new species, and *H. trulliformis*, new species, are very similar externally and these species are difficult to separate without recourse to male terminalia characters.
6. Fore femur, mid and hind legs yellow, fore tibia dark brown (Fig. 3A); ventral surface of male mid tibia with long, fine hairs in place of usual stout setae. Male S5 with deep posteromedial emargination (reaching about midpoint of S5)

- (Fig. 4B); postgonite with ventral fin-like lobe in medial third (Fig. 4A).....*H. sumatrana*, new species [IDN, MYS]
- Femora and tibiae concolourous, brown (though tibiae may be slightly paler or reddish) (as in Fig. 1A); ventral surface of male mid tibia with usual row of stout setae. Male S5 with shallower posteromedial emargination (only about one-third the length of S5 at most) (as in Fig. 2B); postgonite smooth ventrally, without any ventral lobes (as in Fig. 2A).....7
7. CS2 0.5–0.6 × CS3. Anterior orbital much shorter (0.2–0.3 ×) than posterior orbital. Posteromedial emargination of male S5 with fine setulae (cf. Papp, 1995: Fig. 2); apical lobe of surstylus elongate, anteriorly curved with fine ventral setae only (cf. Papp, 1995: Figs. 1, 4–5); postgonite sharply bent at about its basal third (cf. Papp, 1995: Figs. 3, 6).....*H. burckhardti* (Papp, 1995) [THA]
- CS2 subequal to CS3. Anterior orbital slightly shorter (0.8–0.9 ×) than posterior orbital. Posteromedial emargination of male S5 with stout, blunt setulae (cf. Papp, 1995: Figs. 19, 25); apical lobe of surstylus broad, relatively short with a stout, peg-like apical seta (cf. Papp, 1995: Figs. 21, 27); postgonite evenly curved in its apical half (cf. Papp, 1995: Figs. 23, 28).....8
8. Interfrontal bristles in four pairs. Basal lobe of surstylus with long setae restricted to posterior two-thirds (i.e., anterior third is bare) (Fig. 1C). Ventral surface of ventral hypandrial lobe smooth (Fig. 1C).....*H. orientalis* (Papp, 1995) [CHN, IND, NPL, PAK]
- Interfrontal bristles in five pairs. Basal lobe of surstylus with long setae along entire length (cf. Papp, 1995: Fig. 27). Ventral surface of ventral hypandrial lobe with tooth-like serrations (cf. Papp, 1995: Fig. 29).....*H. topali* (Papp, 1995) [IND]

Species descriptions. Species descriptions are grouped by species groups (*H. orientalis* species group, *H. cruspica* species group, *H. vittigera* species group). Each section begins with a description for the species group, highlighting differences from the generic description, followed by species descriptions in alphabetical order. Descriptions of the female abdomen are only given in the species group descriptions as they are uniform for each group.

Species descriptions part one, the *Howickia orientalis* species group

Body: Frontal vitta, ocellar triangle, orbital plates, and bases of interfrontal bristles with golden-silver microtomentum (microtomentose spots around interfrontal bristles sometimes confluent to form stripes but usually separated); antennae yellow-orange. Interfrontal bristles in 3–4 fine pairs. Two pairs of dorsocentral bristles (anterior pair short, < 0.5 × length of posterior bristle). Legs yellow to dark brown, tibiae darker, basal 1–2 fore tarsomeres brown, others white, mid and hind tarsomeres yellow. Dorsal surface of mid tibia with five (three anterodorsal, two posterodorsal) proximal bristles and four (two anterodorsal, one dorsal, one posterodorsal) distal bristles. Hind tibia with stout apicoventral spur. Wing evenly infusate. M₁ extending beyond dm-m as a brown, straight pseudovein; M₄ extending slightly beyond dm-m as a tubular vein; dm-m straight, posterior corner of discal cell slightly obtuse; CuA+CuP a long, slightly sinuate, brownish crease. Halter white to pale yellow.

Male abdomen: T2–5 and S2–4 dark brown to black, well-sclerotised, and evenly long-setose in posterior half. Male

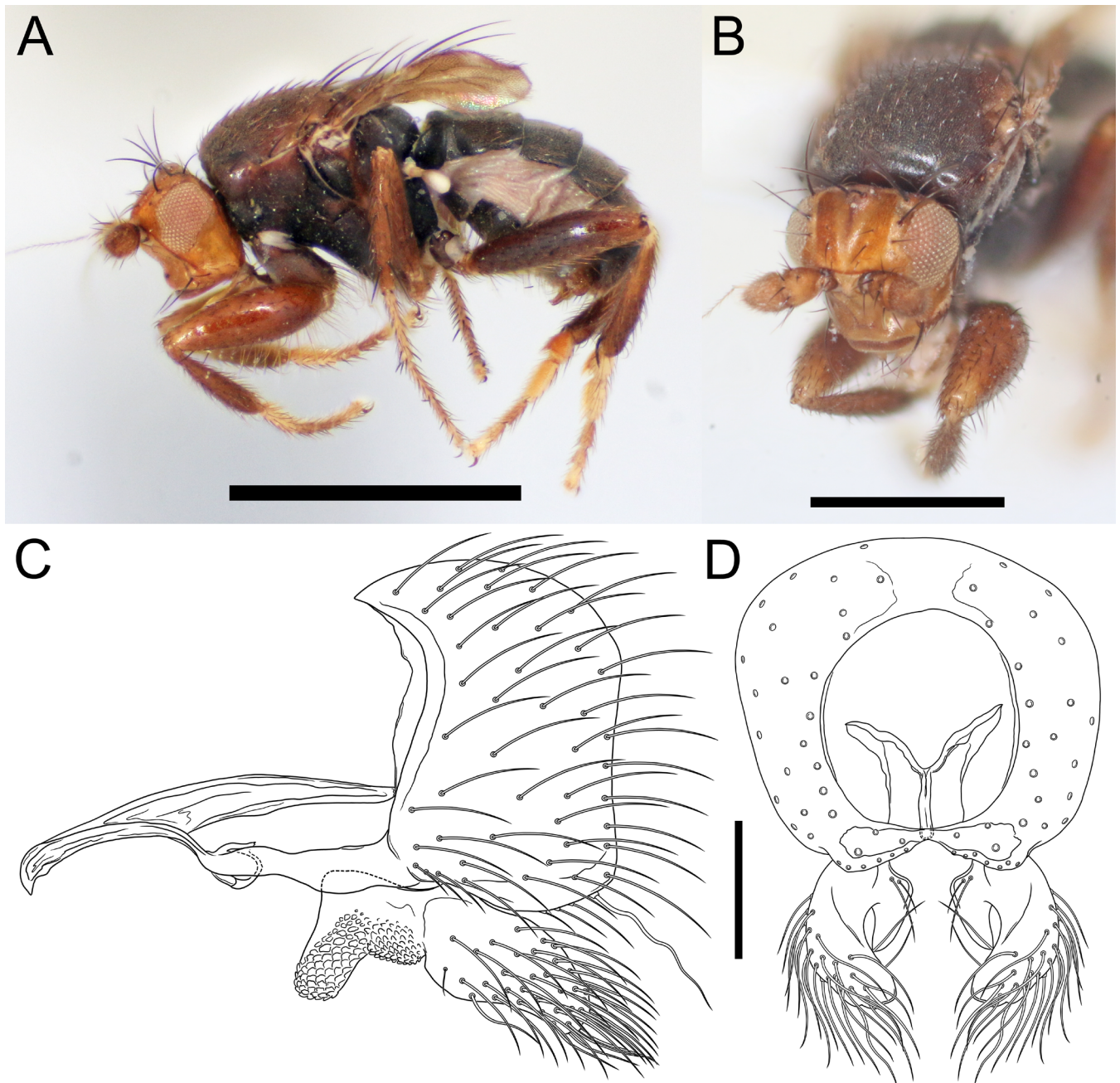


Fig. 6. *Howickia cruspica* Kuwahara & Marshall, 2022: A, Male habitus (moderately brachypterous form), lateral; B, Male head, anterolateral; C, Male terminalia, lateral; D, Male terminalia, posterior. Scale bars (photographs) = 1.0 mm, scale bars (illustrations) = 0.10 mm.

epandrium with enlarged/ventrally produced cerci bearing a distinctly long lateral seta. Anteromedial apodeme of hypandrium large and broad, ventral lobe reduced. Surstylus bilobed, one lobe rounded with very long posteroventrally-directed setae and the other relatively bare and apically tapered. Basiphallus V-shaped in posterior view, with a long, tubular, ventrally-projecting epiphallus. Distiphallus very large, tubular and composed of several sclerites: a long lower sclerite (running almost entire length of distiphallus), paired scoop-shaped upper basolateral sclerites, a tented upper-medial lobe usually flanked by paired upper-lateral lobes at about midlength, smaller paired scoop-shaped apicolateral sclerites, V-shaped outwardly-flared apicomедial sclerite, and scoop-shaped lower-apicolateral sclerites.

Female abdomen (Fig. 5): T2–5 and S2–5 dark brown to black, well-sclerotised, and uniformly long-setose in posterior two-thirds. T6–7 and S6–7 strongly reduced; T6–7 split into paired lateral plates, S6–7 roughly bell-shaped. T8 split into three pieces: a pair of posteriorly-setulose lateral sclerites and a bare dorsomedial sclerite with slightly diverging sclerotised stripes. Vaginal sclerite with two sclerotised strips forming a shield-like plate. Epiproct reduced but shield-like, with a pair of dorsal setae. Cercus microtrichose with several long dorsal, apical, and preapical setae. S8 entirely membranous. Hypoproct shield-like, with many posteromedial setulae. Spermathecae (2+1) spherical and lightly transversely grooved, without apical invagination; stem short and sclerotised, connecting to the long, membranous spermathecal ducts.

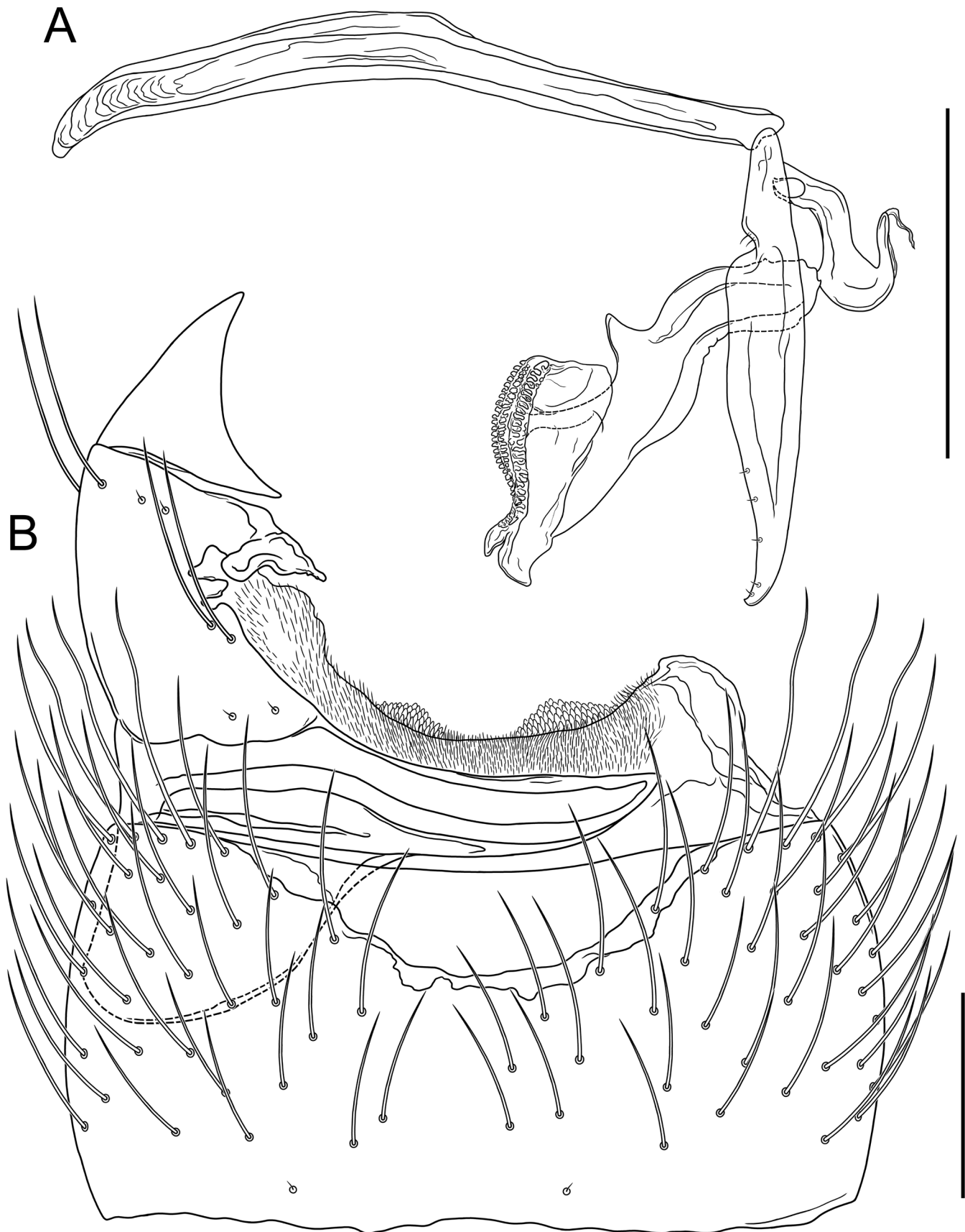


Fig. 7. *Howickia cruspica* Kuwahara & Marshall, 2022: A, Male aedeagus and associated structures, lateral; B, Male S5, S6+7, and S8, ventral. Scale bars = 0.10 mm.

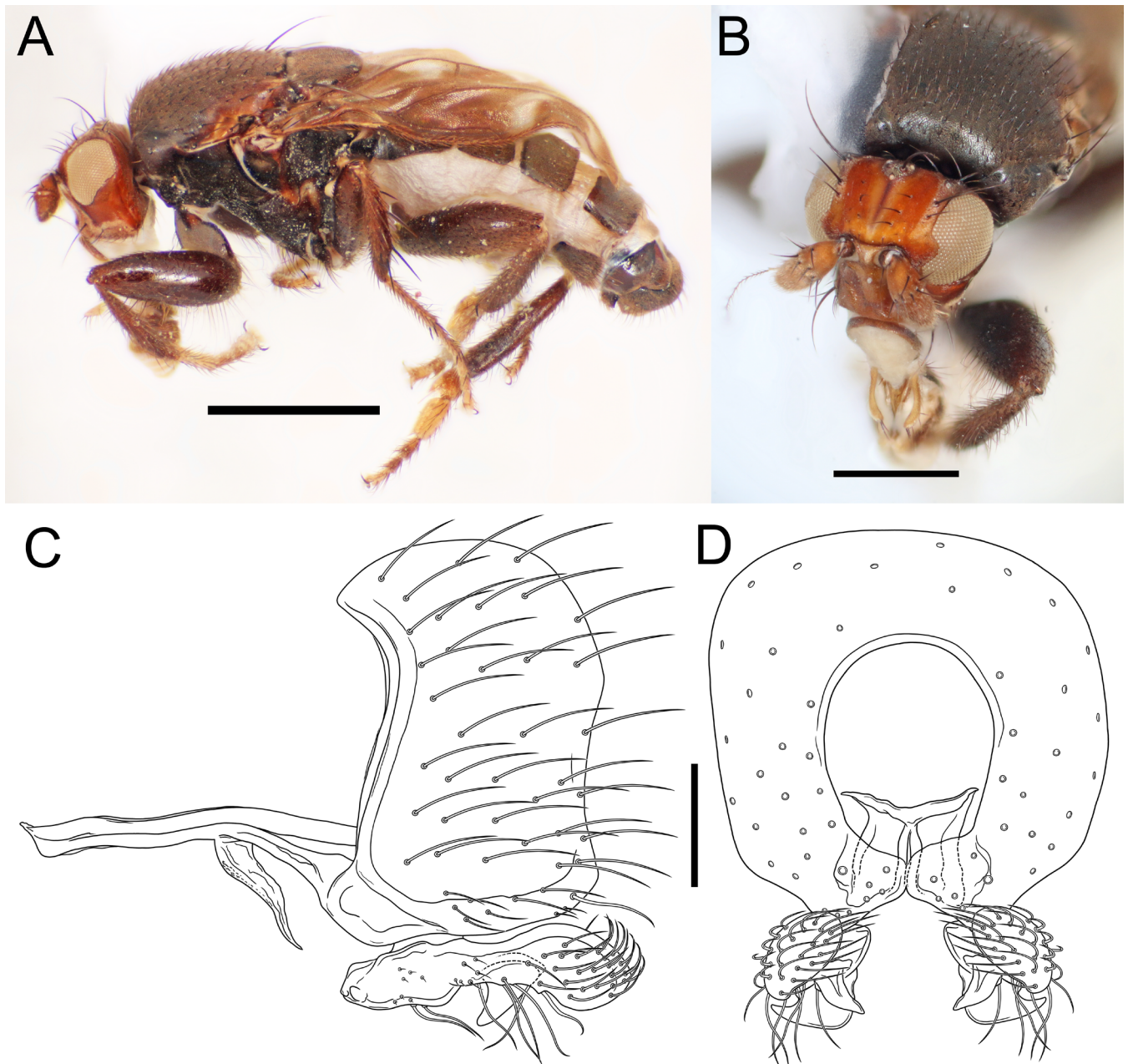


Fig. 8. *Howickia hirsuta*, new species: A, Male habitus, lateral; B, Male head, anterolateral; C, Male terminalia, lateral; D, Male terminalia, posterior. Scale bars (photographs) = 1.0 mm, scale bars (illustrations) = 0.10 mm.

Howickia burckhardtii (Papp, 1995)

Biroina burckhardtii Papp, 1995: 541. – Roháček et al., 2001: 125.
Howickia burckhardtii (Papp, 1995), Marshall et al., 2014: 2.

Type material. Holotype (not examined): male (MHNG), **THAILAND:** Chiang Mai, Doi Suthep, 1,400 m, coll. D. Burckhardt & I. Löbl, 5 November 1985.

Diagnosis. Body length: male 2.8 mm. Head reddish-brown, frons light brown; face and gena paler light reddish-brown. Interfrontal bristles in four relatively short pairs; anterior orbital bristle $0.2\text{--}0.3 \times$ posterior bristle. Thorax dark greyish-brown. Legs brown, femora reddish with darker apices, tibiae darker, basal two fore tarsomeres brown, other fore tarsomeres white. CS2 $0.5\text{--}0.6 \times$ CS3. R_{2+3} short, strongly

curving to costa in basal half, apical third separated from costa by $\sim 1.0 \times$ costal width.

Male abdomen: S5 broad, rectangular with a slight posteromedial emargination bearing short and slightly thickened setulae, right side of emargination slightly produced posteriorly. Anterior lobe of surstylus relatively small, triangular, and bare, posterior lobe larger, projecting anteroventrally, basally with many long, posteroventrally-directed setae, apically with several long ventral setae. Postgonite elongate, tapered, relatively straight except for sharp bend at about one-third length. Basiphallus stout. Distiphallus with lower supporting sclerites with a slight bend about midlength, paired upper-lateral lobes mushroom-shaped (i.e., expanded apically), apex with scattered upper setulae.

Female abdomen: Female unknown.

Distribution. This species is known only from the type locality in northern Thailand.

Comments. The above diagnosis is based entirely on Papp (1995), which indicates that *H. burckhardti* is externally similar to *H. sumatrana*, new species. Both species have a short R_{2+3} , however several characters of *H. burckhardti*, including the uniform femora-tibiae colouration, four pairs of interfrontal bristles, reduced anterior orbital bristle, and stout ventral setae on the male mid tibia, distinguish it from *H. sumatrana*, new species.

***Howickia orientalis* (Papp, 1995)**

(Figs. 1, 2, 17A)

Biroina orientalis Papp, 1995: 545. – Roháček et al., 2001: 126.
Howickia orientalis (Papp, 1995), Marshall et al., 2014: 2.

Type material. Holotype (not examined): male (MHNG), **INDIA:** Uttarakhand, Kumaon, Chaubattia, coll. I. Löbl, 12–13 May 1979.

Paratypes (not examined): **INDIA: Uttarakhand:** 4 males, 3 females (HNHM, MHNG), same data as holotype; 5 males, 4 females (HNHM, MHNG), Ramgarh, 2,000 m, coll. O. Löbl, 9 October 1979; 1 female (MHNG), Gharwal, Dhanolti, coll. I. Löbl; 1 male, 1 female (HNHM), Nainital, Sleepy Hollow, 2,080 m, sifted and singled from under stones, coll. L. Papp, 4 December 1989. **PAKISTAN: Khyber Pakhtunkhwa:** 1 male (MHNG), Swat, Miandam, coll. C. Besuchet & I. Löbl, 10 May 1983; 1 male (MHNG), same data as preceding, 17 May 1983. **NEPAL: Bagmati:** 1 male, 2 females (MHNG), Gul Bhanjyang, 2,600 m, coll. I. Löbl & A. Smetana, 6 April 1981; 1 male, 2 females (MHNG), Malemchi, 2,800 m, coll. I. Löbl & A. Smetana, 14 April 1981; 1 female (MHNG), Tarke, Ghyang, 2,750 m, coll. I. Löbl, 19 April 1981; **Koshi:** 1 female (MHNG), Induwa Kola, 2,100 m, coll. I. Löbl & A. Smetana, 17 April 1981.

Material examined. 1 male (DEBU), **CHINA: Sichuan:** Pingwu, Old Creek Reserve, 32°30'38"N 104°43'10"E, 1,700 m, coll. S.A. Marshall, 16 May 2016.

Redescription. Body (Fig. 1A, B): Length: 1.6–2.6 mm. Head dark brown, anterior half of frons reddish; antenna yellow-orange; lunule and dorsomedial portion of face yellowish. Frontal width 1.7–1.8 × frontal height. Interfrontal bristles in four long pairs; anterior orbital bristle 0.8 × posterior. Greatest eye diameter 2.2 × shortest genal height. Thorax dark brown to black. Legs dark brown, femora reddish, fore basitarsus brown, other fore tarsomeres white. Wing (Fig. 17A) with CS2 subequal to CS3. R_{2+3} long, basal curve very broad. Crossveins r-m and dm-m separated by 1.5 × length of dm-m.

Male abdomen (Figs. 1C, D, 2): S5 broad, slightly trapezoidal, posterolaterally with long setae, posteromedially with a broad, shallow emargination bearing many small, blunt, tooth-like setulae. Epandrium broadened anteroventrally, thus appearing somewhat wedge-shaped in lateral view.

Ventral lobe of hypandrium lacking ventral serrations; lateral arms very wide basally. Basal lobe of surstylus very large and bulging with very long setae confined to posterior two-thirds (i.e., anterior third bare) and many small setulae on inner surface, apical lobe smaller, blade-like, triangular with (ventral) apex curved anteriorly and bearing a pair of thickened, peg-like, anteriorly-directed apical setae. Postgonite elongate, relatively parallel-sided, and evenly curved forwards in its apical half. Basiphallus relatively stout. Distiphallus with lower supporting sclerites sinuate with a slight bend preapically, paired upper-lateral lobes fan-shaped and shifted apically, upper-medial lobe triangular and upcurved, apicomedial sclerites “heart”-shaped, scoop-like apicolateral sclerites large.

Distribution. *Howickia orientalis* is known from northern India, northern Pakistan, eastern Nepal, and now southwestern China (new record).

Comments. While the holotype specimen of *H. orientalis* (Papp, 1995) was not examined in this study, Papp’s (1995) illustrations and description are detailed enough for a confident identification of the Chinese specimen examined. The genitalia of *H. orientalis* and *H. topali* (Papp, 1995) are almost identical, suggesting that the latter may be a synonym of the former (see comments below under *H. topali*).

***Howickia sumatrana*, new species**

(Figs. 3–5, 17B)

Type material. Holotype: male (ROME), **INDONESIA:** Sumatra, Aceh, Gunung Leuser National Park, Ketambe Research Station, 3°41'N 97°39'E, 350 m, primary rainforest, UV/MY light, coll. W.K. Gall, 2–6 September 1989.

Paratypes: **INDONESIA: Aceh:** 2 males (DEBU, ROME), Sumatra, Gunung Leuser National Park, Gurah Recreational Area, 3°41'N 97°39'E, 350 m, primary rainforest, screen sweep, coll. B. Hubley, 6 September 1989; 9 males, 4 females (DEBU, ROME), Sumatra, Mount Leuser National Park, Ketambe Research Station, 350 m, lowland rainforest, mature forest (T4), light gap, Malaise trap with pans, coll. D.C. Darling, 9–21 September 1989; 1 female (DEBU), Sumatra, Mount Leuser National Park, Ketambe Research Station, 350 m, screen sweep along Alas River, coll. B. Hubley, 4 September 1989. **MALAYSIA: Sabah:** 1 male, 1 female (DEBU), Borneo, Sabah, Mount Kinabalu National Park, above Poring Hot Springs, 500–530 m, coll. A. Smetana, 9 May 1987; 1 male, 1 female (CNCI), Borneo, Mount Kinabalu National Park, Poring Hot Springs, 500 m, coll. A. Smetana, 19 August 1988.

Description. Body (Fig. 3A, B): Length: males 1.8–2.5 mm, females 2.0–2.5 mm. Head yellow-orange to orange-brown, frons with a pair of dark triangular stripes between the frontal vitta and interfrontal plates, ocellar triangle and base of occipital bristles dark brown; antenna yellow-orange; face paler yellow. Frontal width 1.5–1.8 × frontal height. Interfrontal bristles in three relatively short pairs; anterior orbital bristle 0.7–0.8 × posterior bristle. Greatest

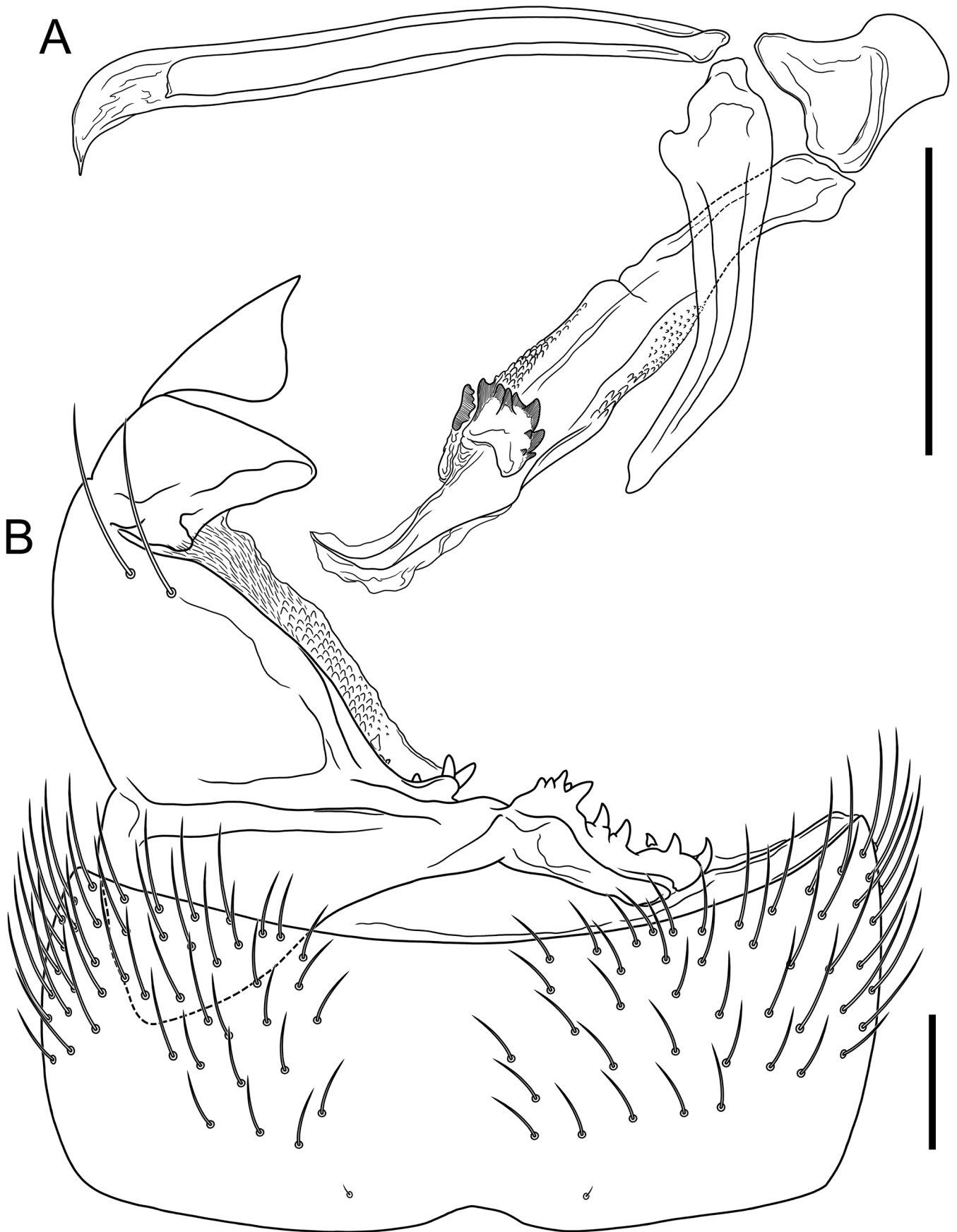


Fig. 9. *Howickia hirsuta*, new species: A, Male aedeagus and associated structures, lateral; B, Male S5, S6+7, and S8, ventral. Scale bars = 0.10 mm.

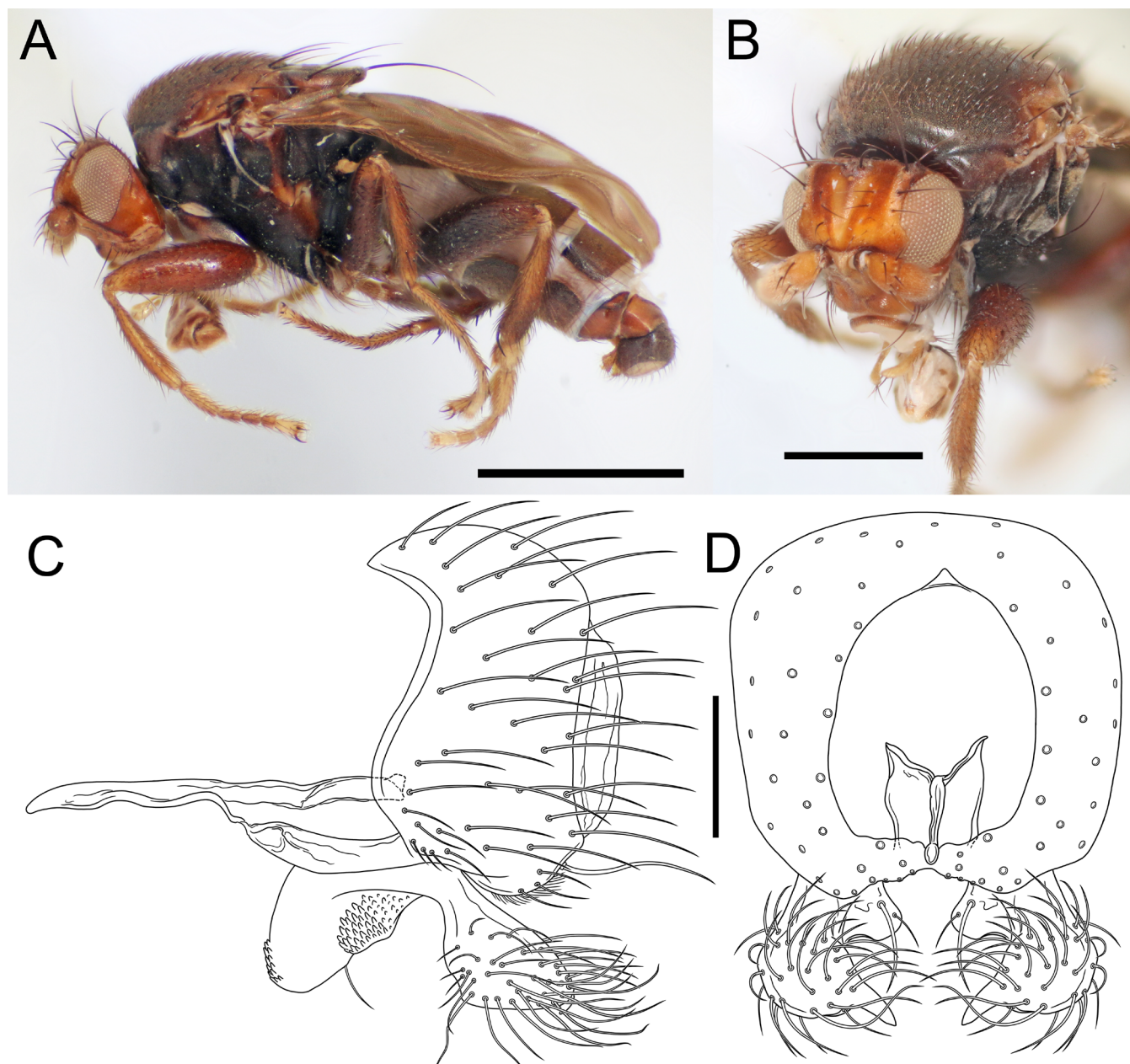


Fig. 10. *Howickia kukali*, new species: A, Male habitus, lateral; B, Male head, anterolateral; C, Male terminalia, lateral; D, Male terminalia, posterior. Scale bars (photographs) = 1.0 mm, scale bars (illustrations) = 0.10 mm.

eye diameter $2.0\text{--}2.2 \times$ shortest genal height. Thorax dark brown to black. Legs yellow, fore tibia brown, basal half of fore basitarsus brown, apical half and other tarsomeres white. Ventral surface of male mid tibia with long fine setae instead of usual stout setae. Wing (Fig. 17B) with CS2 $0.5\text{--}0.6 \times$ CS3. R_{2+3} short, basal curve broad. Crossveins r-m and dm-m separated by $2.0 \times$ length of dm-m.

Male abdomen (Figs. 3C, D, 4): S6+7 and S8 slightly reddish-brown. S5 broad, rectangular, posterolaterally with long setae, posteromedially with a deep (reaching about midlength of S5), triangular or semicircular emargination bearing several thin setulae. Basal lobe of surstylus bulging with several of the ventral setae distinctly thickened, apical lobe large, scoop-shaped with a stout, tooth-like, anteriorly-directed apical seta. Postgonite elongate and sinuate with a strong curve at about one-third length and a triangular

ventral fin-like lobe in about the middle third. Basiphallus weakly developed, indistinct. Distiphallus with most basal sclerites fused into a tube, lower supporting sclerites with a slight bend preapically, paired upper-lateral lobes asymmetrically rectangular (basal edge longer than apical edge), upper-medial lobe strongly tapered, apex with paired lateral membranous flaps.

Female abdomen (Fig. 5): As in the species group description above.

Etymology. This name refers to the Indonesian island of Sumatra, where most of the type specimens were collected.

Type locality. Indonesia, Sumatra, Aceh, Mount Leuser National Park.

Distribution. This species is known from northwestern Indonesia and northwestern Malaysia.

Comments. The Malaysian males have a more triangular posteromedial emargination on S5 and the apical lobe of the surstylus is straighter and projects ventrally more than those of the Indonesian males, but we interpret these differences as intraspecific variation. Within the *H. orientalis* species group, *H. sumatrana*, new species, is externally most similar to *H. burckhardti*, which also has a short R_{2+3} . However, several characters, such as the distinctly coloured fore leg, three pairs of interfrontal bristles, large anterior orbital bristle, and fine ventral setae on the male mid tibia separate this species from *H. burckhardti*.

Howickia topali (Papp, 1995)

Biroina topali Papp, 1995: 549. – Roháček et al., 2001: 126.
Howickia topali (Papp, 1995), Marshall et al., 2014: 2.

Type material. Holotype (not examined): male (HNHM), **INDIA:** Odisha, Daitari, 600–700 m, from forest litter, coll. G. Topál, 23 November 1967.

Diagnosis. Body length: male 3.0 mm. Head reddish-orange, frons brownish-yellow, ocellar triangle, vertex, and posterior halves of orbital plates dark brown; antenna reddish-yellow; gena reddish, face ochreous. Interfrontal bristles in five relatively long pairs. Thorax dark brown. Legs brown, basal two fore tarsomeres brown, other fore tarsomeres white. R_{2+3} strongly sinuate, apical three-quarters running close to costa.

Male abdomen: S5 broad, rectangular, posterolaterally with long setae, posteromedially with a broad emargination bearing many small, blunt, tooth-like setulae. Epandrium broadened anteroventrally, thus appearing somewhat wedge-shaped in lateral view. Ventral lobe of hypandrium with small tooth-like serrations. Basal lobe of surstylus large and bulging with several of the ventral setae distinctly thickened, apical lobe small, scoop-shaped with a small, stout, peg-like, anteriorly-directed apical seta. Postgonite elongate, relatively parallel-sided, and evenly curved forwards in its apical half. Basiphallus stout. Distiphallus with lower supporting sclerites sinuate with a slight bend preapically, paired upper-lateral lobes fan-shaped and shifted apically, upper-medial lobe strongly tapered and upcurved, apicomедial sclerites 'heart'-shaped, scoop-like apical sclerites large.

Female abdomen: Female unknown.

Distribution. *Howickia topali* is known only from the type locality in eastern India.

Comments. The above diagnosis is based entirely on Papp (1995). The male genitalia of the unique type of *H. topali* and the type series of *H. orientalis* are almost identical, although Papp (1995) noted that in the one specimen of *H. topali*, the basal surstylar lobe has a bare anterior third, the ventral hypandrial lobe has ventral serrations, the body size is 3.0 mm (vs 2.6 mm in *H. orientalis*), there are five pairs

of interfrontal bristles (though the specimen from China recorded here has four on one side and five on the other), and the second fore tarsomere is brown (as opposed to white in *H. orientalis*). These differences could represent intraspecific variation. However, since we have seen neither the type nor topotypic material of *H. topali*, we are tentatively retaining *H. topali* and *H. orientalis* as distinct species.

Species descriptions part two, the *Howickia cruspica* species group

Body: Frontal vitta, interfrontal plates, orbital plates, and ocellar triangle with pale but relatively indistinct microtomentum. Interfrontal bristles in 3–4 pairs. 4–6 pairs of dorsocentral bristles (1–2 presutural and 3–4 postsutural, anterior 3–5 dorsocentrals short, about twice as long as surrounding acrostichals). Scutellum semicircular, medial length $\sim 0.6 \times$ basal width. Legs brown, tibiae usually paler, tarsi yellow. Male femora and tibiae with long, dense setae, female legs with long but less dense setae. Male fore and hind femora distinctly swollen, female femora slender. Dorsal surface of mid tibia with five (three anterodorsal, two posterodorsal) proximal bristles and four (two anterodorsal, one dorsal, one posterodorsal) distal bristles. Hind tibia with a curved apicoventral spur. Wing patterned, infusate with a pale hyaline spot in cell dm, three pale spots forming a zigzagged vertical line at the end of R_{2+3} , and three pale spots forming a vertical row below R_{4+5} halfway between the vertical line and the wing margin. CS2 $0.6\text{--}0.7 \times$ CS3. R_{2+3} strongly sinuate, basal curve broader than strong apical curve. M_1 extending beyond dm-m as a brown, sinuate pseudovein; crossveins separated by less than the length of dm-m; M_4 extending beyond dm-m about halfway to wing margin as a tubular vein; posterior corner of discal cell $< 90^\circ$; dm-m slightly but distinctly bent; CuA+CuP a long, sinuate, colourless crease.

Male abdomen: Male S6+7 and S8 usually orange-red or otherwise more reddish than S5 and the epandrium. Epandrium with cerci well developed, partially fused to form a strongly deflexed and therefore mostly horizontal subanal plate largely hidden in posterior view, always with a long sinuate (outer) lateral seta and several smaller setae. Surstylus elongate, bi- or trilobed: anterior lobe relatively bare, shorter than posterior lobe, ventromedial lobe (when present) triangular, posterior lobe larger and long-setose externally, apex curved inwards.

Female abdomen (Fig. 12): Postabdomen $2.4\text{--}2.5 \times$ length of T5. T6 and T7 strongly reduced, split into thin, strap-like posterior sclerites each with 3–4 setae, anterior part of tergites sometimes present; T8 split into a pair of broad lateral plates, posterior half setose; epiproct reduced, split into a long pair of shiny plates, posteriorly with a pair of dorsal setae. Cercus elongate, tapered inwards apically with long, sinuate apical and dorsal preapical setae and several shorter dorsal and lateral setae. S6 and S7 strongly reduced, split into thin, strap-like posterior sclerites each with 8–10 setae, anterior part of sternites usually reduced but anterior sensory setulae present; S8 reduced, subcordate with several posterior

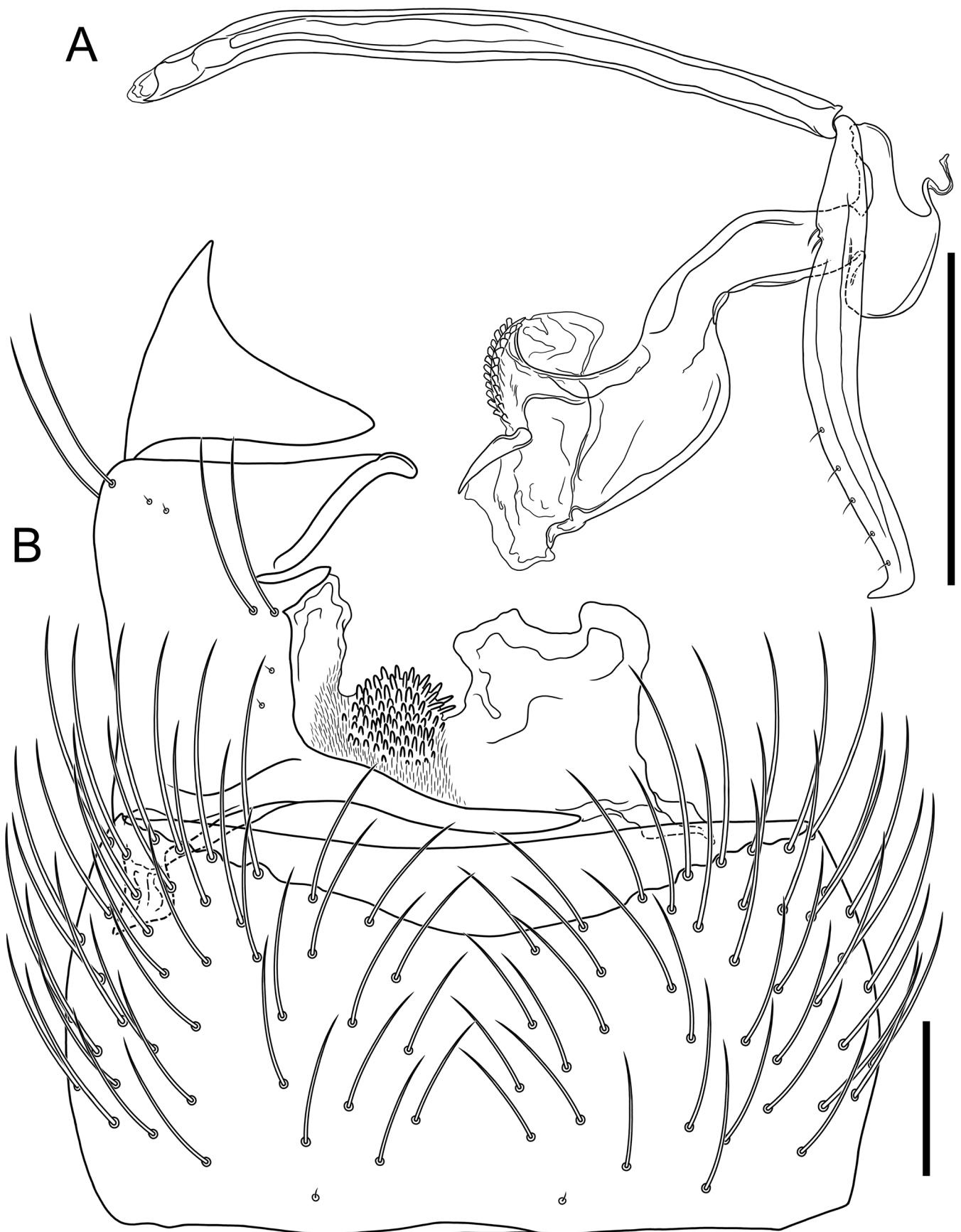


Fig. 11. *Howickia kukali*, new species: A, Male aedeagus and associated structures, lateral; B, Male S5, S6+7, and S8, ventral. Scale bars = 0.10 mm.

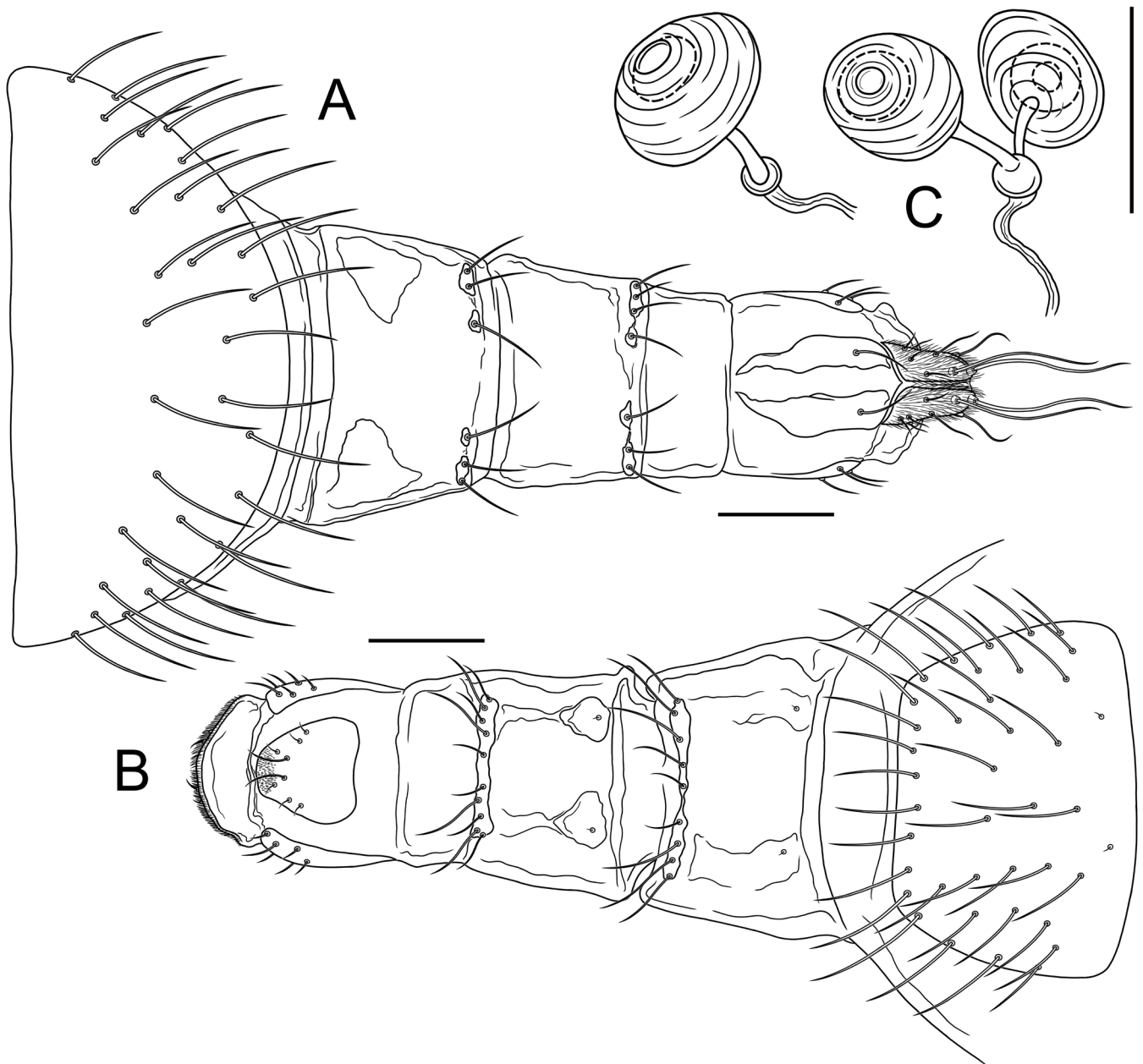


Fig. 12. *Howickia kukali*, new species, female terminalia: A, dorsal; B, ventral; C, Spermathecae. Scale bars = 0.10 mm.

setulae; hypoproct extremely reduced, broad, setulose with four short posteromedial setae. Spermathecae stout, slightly bean-shaped (curved towards one side) with a deep, cup-like apical invagination, stem short and slightly curved.

***Howickia cruspica* Kuwahara & Marshall, 2022**
(Figs. 6, 7, 17C–D)

Howickia cruspica Kuwahara & Marshall, 2022: 95.

Type material. Holotype: **AUSTRALIA:** female (ANIC), Victoria, Warburton, Cement Creek, 200 m, coll. S. Peck, 28 April–7 May 1978.

Material examined. **PAPUA NEW GUINEA:** 45 males, 59 females (DEBU), Oro, Kokoda Trail, Eora Creek, Templeton's Crossing, 23 km S of Kokoda, 1,900 m, dung, coll. O. Kukal, 6–8 August 1976; 1 female (DEBU), Oro,

Kokoda Trail, Eora Creek, 17 km S of Kokoda, dung, coll. O. Kukal, 3–6 August 1976.

Redescription. **Body** (Fig. 6A, B): Length: males 1.8–2.7 mm, females 1.8–2.8 mm. Head orange, frons orange-brown between frontal vitta and orbital plates; antenna yellow-orange; face and gena darker orange. Frontal width $1.8\text{--}1.9 \times$ frontal height. Interfrontal bristles in 3–4 long pairs, the middle pair longest. Greatest eye height $1.7\text{--}1.8 \times$ shortest genal height. Four pairs of dorsocentral bristles (one presutural and three postsutural, anterior three dorsocentrals short, about twice as long as surrounding acrostichals). Legs dark brown, fore femur brown to reddish-brown, fore and mid tibia, basal half to two-thirds of hind tibia, and apex of femora yellowish. Mid basitarsus with a large subbasal ventral seta in both sexes. Wing slightly (Fig. 17C) to strongly (Fig. 17D) shortened, reaching the middle of T2 to the middle of T5.

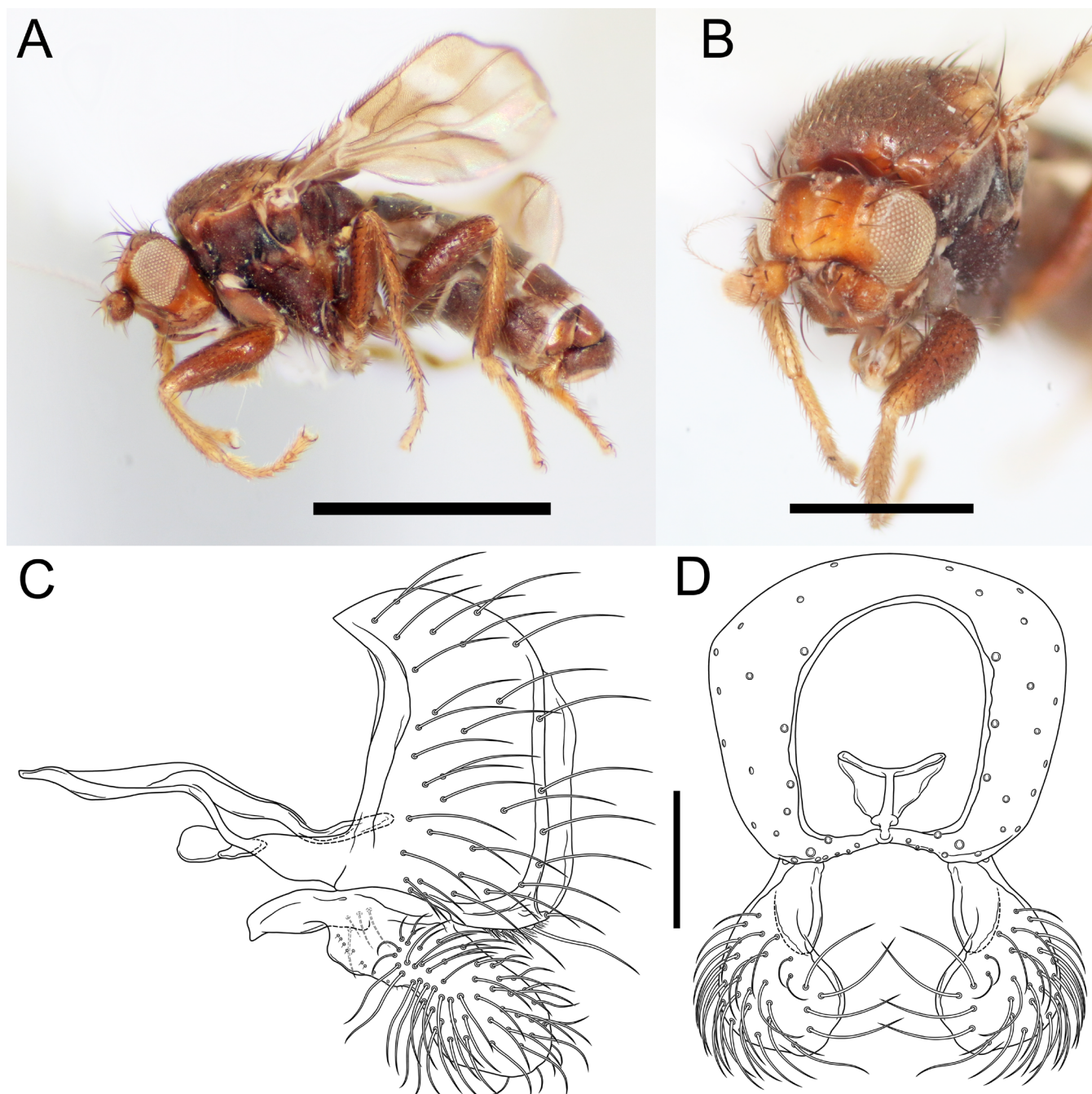


Fig. 13. *Howickia trulliformis*, new species: A, Male habitus, lateral; B, Male head, anterolateral; C, Male terminalia, lateral; D, Male terminalia, posterior. Scale bars (photographs) = 1.0 mm, scale bars (illustrations) = 0.10 mm.

Male abdomen (Fig. 6C, D, 7): S6+7 and S8 reddish-orange. S5 width $2.3\text{--}2.4 \times$ length, broadly desclerotised posteromedially; S6 with a spinulose patch in the membrane posterior to the ventral expansion. Ventral lobe of hypandrium strongly reduced and knob-like. Anterior lobe of surstylus projecting anteroventrally and rounded, covered in faint, broad scales, posterior lobe subtriangular, apically rounded. Postgonite relatively straight, apex slightly curved forwards. Basiphallus with a recurved, whip-like epiphallus. Distiphallus tubular but flattened, largely sclerotised with a triangular upper projection about midlength and the apex split into a pair of curved, apically nodose triangular flaps supported by T-shaped sclerites.

Type locality. Australia, Victoria, Warburton, Cement Creek.

Distribution. This species is known from southeast Australia (Victoria) and southeastern New Guinea.

Comments. While the type locality and the locality of the Papua New Guinean specimens are separated by over 3,000 kilometres (including the entire latitudinal length of Australia), the female terminalia of the specimens collected in Papua New Guinea are apparently identical to the visible terminalia of the mounted type specimen of *H. cruspica* (which has not been dissected). Other external characters, such as the frontal and leg colouration, mid tibial chaetotaxy, and shortened wings, provide further evidence that these

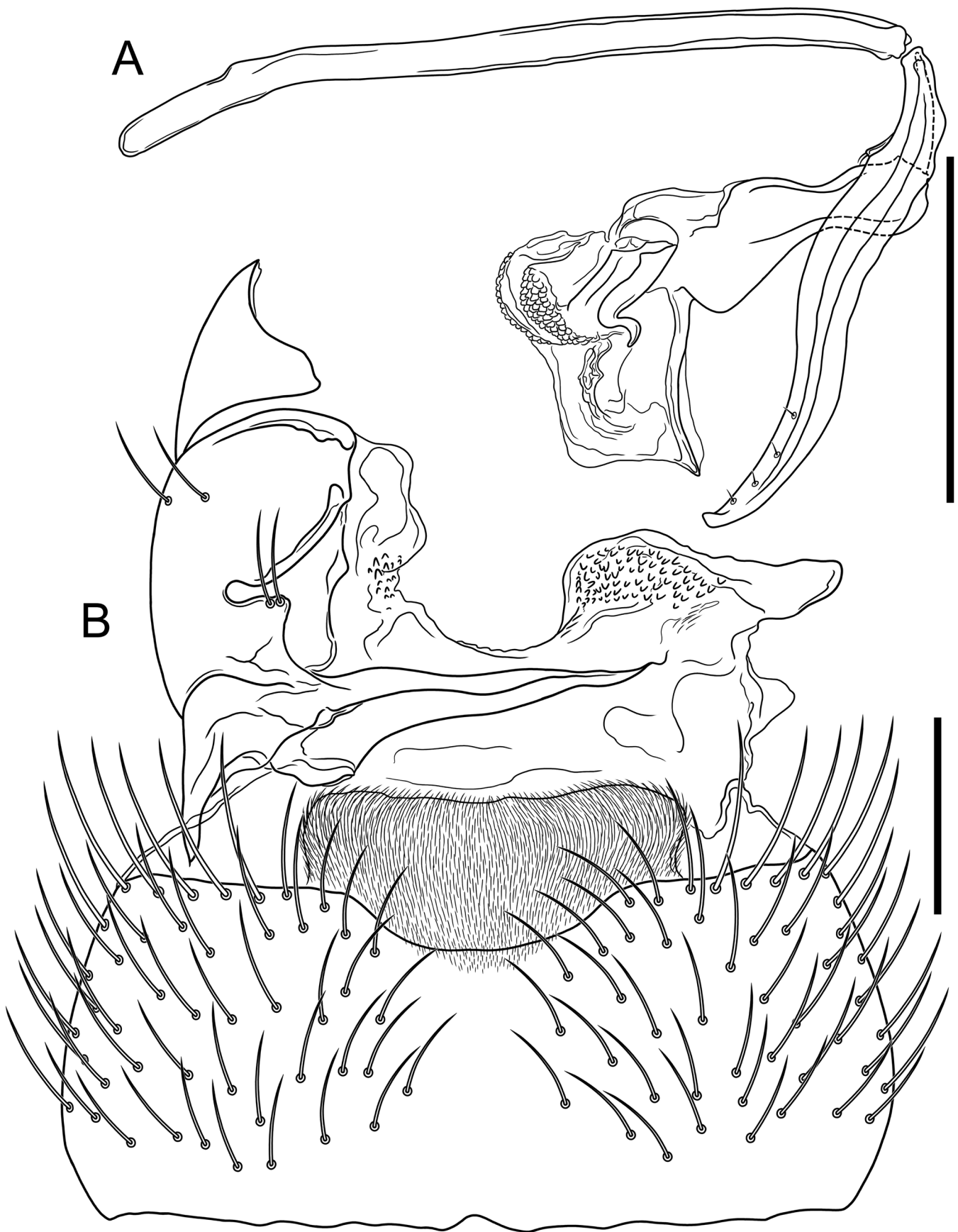


Fig. 14. *Howickia trulliformis*, new species: A, Male aedeagus and associated structures, lateral; B, Male S5, S6+7, and S8, ventral. Scale bars = 0.10 mm.

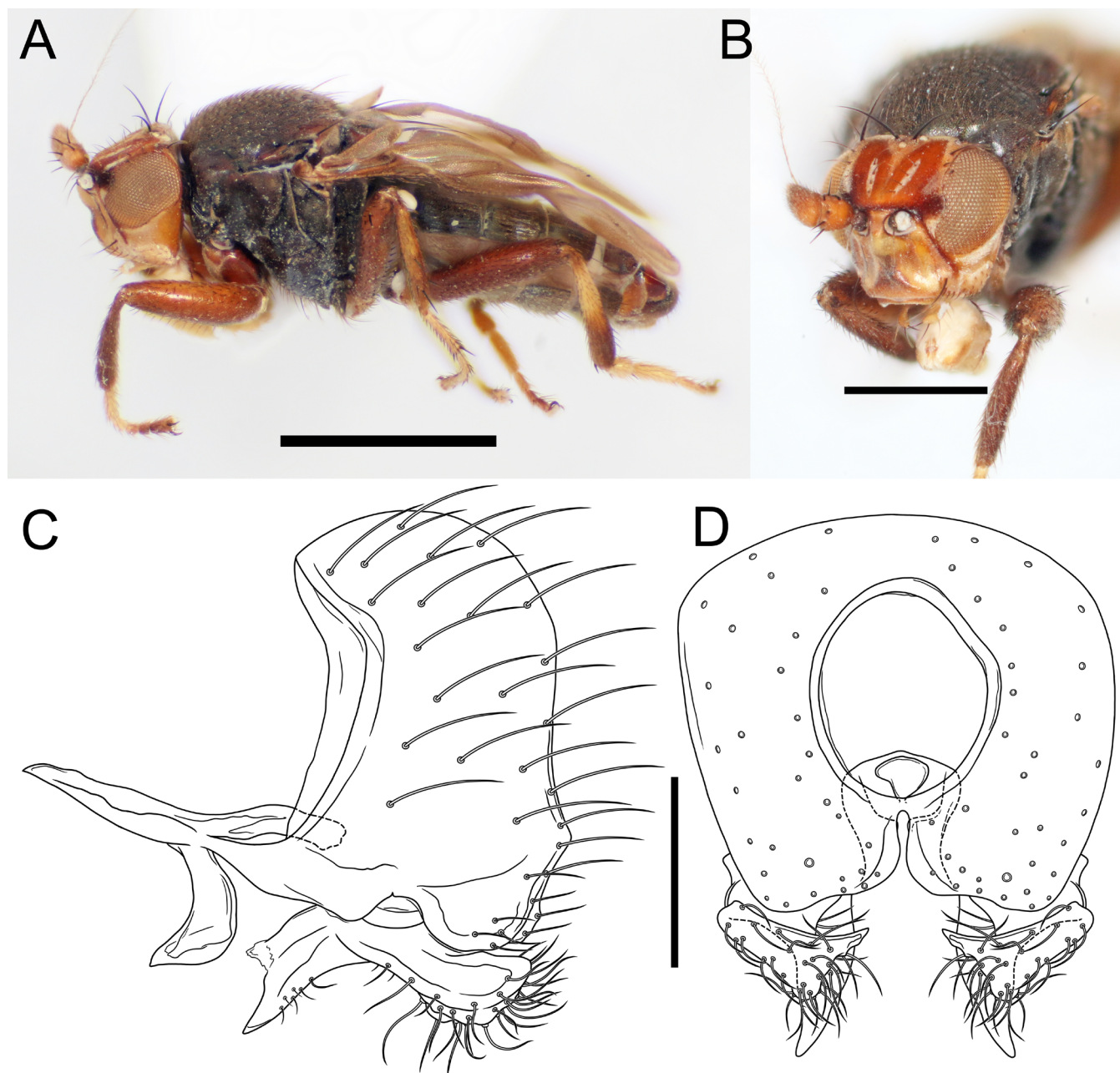


Fig. 15. *Howickia vittigera* (Richards, 1973): A, Male habitus, lateral; B, Male head, anterolateral; C, Male terminalia, lateral; D, Male terminalia, posterior. Scale bars (photographs) = 1.0 mm, scale bars (illustrations) = 0.10 mm.

Papua New Guinean specimens are conspecific with the Victorian *H. cruspica*.

***Howickia hirsuta*, new species**
(Figs. 8, 9, 17E)

Type material. Holotype: male (DEBU debu00412097), **PAPUA NEW GUINEA:** Western Highlands, Mount Hagen, 1,830 m, oak forest, dung, coll. S. Peck, 5–8 July 1974.

Paratypes: **PAPUA NEW GUINEA:** 1 male, 4 females (DEBU), same data as holotype.

Description. Body (Fig. 8A, B): Length: males 3.4–3.5 mm, females 2.0–3.5. Head orange-brown; antenna and face orange; ocellar triangle and centre of frontal vitta dark

brown; gena darker orange. Frontal width $1.8\text{--}1.9 \times$ frontal height. Interfrontal bristles in 3–4 long, strong, subequal pairs. Greatest eye height $1.8\text{--}1.9 \times$ shortest genal height. Six pairs of dorsocentral bristles (two presutural and four postsutural, anterior five dorsocentrals short, about twice as long as surrounding acrostichals). Legs brown to dark brown, tibia usually yellowish. Mid basitarsus with long, fine ventral setae in male and a large subbasal ventral seta in female. Wing (Fig. 17E) fully developed, reaching beyond apex of abdomen.

Male abdomen (Figs. 8C, D, 9): T2–5 and S2–4 black, broad, heavily sclerotised, and uniformly long-setose in posterior half. S5 width $2.5\text{--}2.6 \times$ length, broadly emarginate posteromedially; lateral extension of S6 with dark, tooth-like posterior knobs. Ventral lobe of hypandrium long and largely

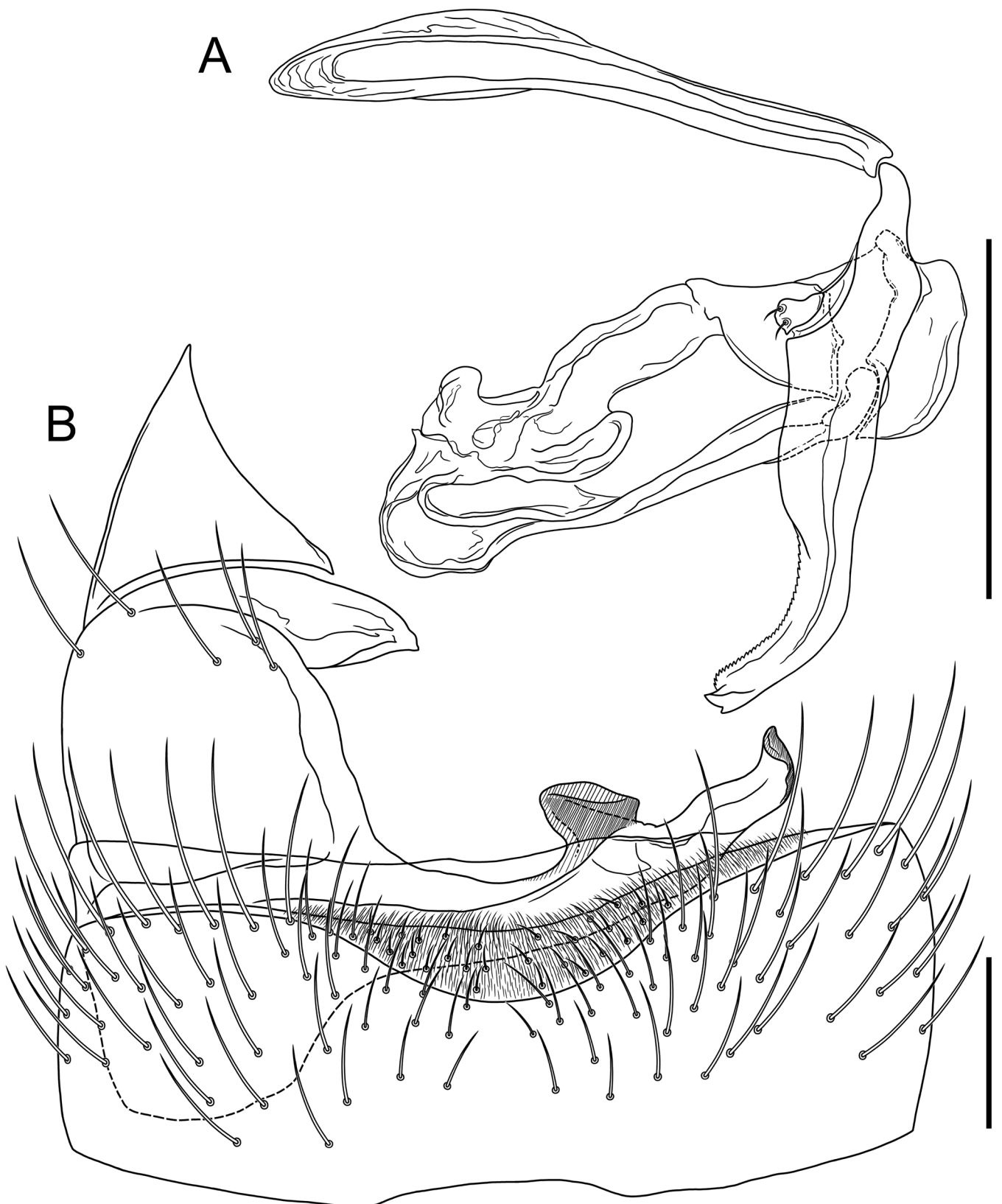


Fig. 16. *Howickia vittigera* (Richards, 1973): A, Male aedeagus and associated structures, lateral; B, Male S5, S6+7, and S8, ventral. Scale bars = 0.10 mm.

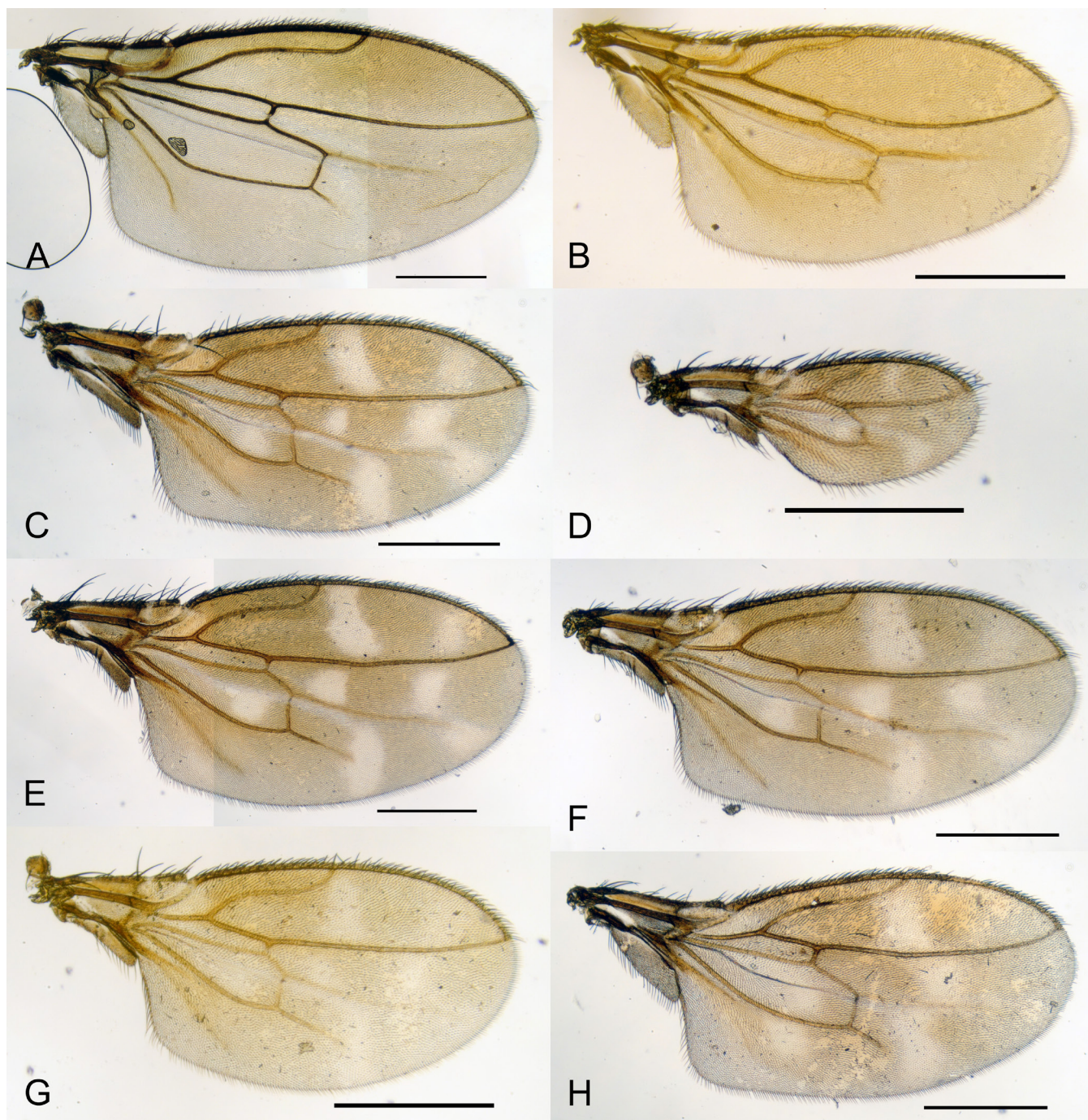


Fig. 17. *Howickia* sp. left wings: A, *Howickia orientalis* (Papp, 1995); B, *Howickia sumatrana*, new species; C, *Howickia cruspica* Kuwahara & Marshall, 2024, slightly shortened wing; D, *Howickia cruspica* Kuwahara & Marshall, 2024, strongly shortened wing; E, *Howickia hirsuta*, new species; F, *Howickia kukali*, new species; G, *Howickia trulliformis*, new species; H, *Howickia vittigera* (Richards, 1973). Scale bars = 0.5 mm.

membranous. Surstylus trilobed: anterior lobe of surstylus subrectangular with a large, triangular, outer-lateral lobe and long ventral setae, ventromedial lobe thick, dark, slightly curved, and triangular with several long, sinuate lateral setae, posterior lobe spoon-shaped, slightly cupped with long outer setae. Postgonites bent forwards about midlength, apex with a tooth-like anterior lobe. Basiphallus with a broad though reduced, blade-like epiphallus. Distiphallus tubular but flattened, basal half largely sclerotised, apical half with a long, flat lower sclerite and a pair of curved, flattened upper sclerites with posteriorly pointed tooth-like lobes; upper and lower surfaces with papillate patches.

Etymology. This name is in reference to the densely hairy male legs (Latin ‘hirsutus’: hairy).

Type locality. Papua New Guinea, Western Highlands, Mount Hagen.

Distribution. This species is known only from its type locality in central Papua New Guinea.

Comments. *Howickia hirsuta*, new species, can be separated from all congeners by the entirely dark legs, densely hirsute male fore and mid legs, and relatively large body size.

***Howickia kukali*, new species**

(Figs. 10–12, 17F)

Type material. Holotype: male (DEBU debu00412113), **PAPUA NEW GUINEA:** Oro, Kokoda Trail, Eora Creek, 17 km S of Kokoda, 1400 m, dung, coll. O. Kukal, 3–6 August 1976.

Paratypes: **PAPUA NEW GUINEA:** 44 males, 52 females (DEBU), same data as holotype.

Description. Body (Fig. 10A, B): Length: males 1.8–3.0 mm, females 1.9–3.2 mm. Head orange, frons on either side of interfrontal plates darker; antenna and face yellow-orange; ocellar triangle dark brown; gena orange. Frontal width $1.7\text{--}1.8 \times$ frontal height. Interfrontal bristles in 3–4 long, fine, subequal pairs. Greatest eye height $1.8\text{--}1.9 \times$ shortest genal height. Four pairs of dorsocentral bristles (one presutural and three postsutural, anterior three dorsocentrals short, about twice as long as surrounding acrostichals). Legs dark brown, fore femur and mid tibia reddish-brown, fore tibia and basal half to two-thirds of hind tibia yellow. Mid basitarsus with a large subbasal ventral seta in both sexes. Wing (Fig. 17F) fully developed, reaching beyond apex of abdomen.

Male abdomen (Figs. 10C, D, 11): S6+7 and S8 reddish-orange. S5 width $2.1\text{--}2.2 \times$ length, broadly emarginate posteromedially; S6 with a spinulose patch in the membrane posterior to the ventral expansion. Ventral lobe of hypandrium strongly reduced and largely membranous. Anterior lobe of surstylus rounded and subtriangular, laterally-flattened, with tooth-like anterior and posterolateral patches, posterior lobe subtriangular with a long, tooth-like apical lobe (visible in Fig. 10D). Postgonites curved backwards, apex with a tooth-like anterior lobe. Basiphallus with a tiny whip-like epiphallus. Distiphallus tubular but flattened, largely sclerotised with a hammer-shaped, apically nodose upper sclerite, a scoop-shaped lower posterior sclerite, and a beak-like apical sclerite, all supporting a pair of triangular, apicolateral membranous flaps.

Etymology. This name is in honour of Olga Kukal, the collector of this species and most of the Papua New Guinean species described in this paper. Olga generously shared her Papua New Guinea trap residues with S.A.M. when they were both students in Ottawa; we are pleased to dedicate this species to her but saddened that it is a posthumous dedication.

Type locality. Papua New Guinea, Oro, Kokoda Trail, Eora Creek.

Distribution. This species is known only from its type locality in southeastern Papua New Guinea.

Comments. *Howickia kukali*, new species, is externally very similar to *H. trulliformis*, new species, with the only reliable non-genitalic difference being the slightly smaller eye (greatest eye height $1.8\text{--}1.9 \times$ shortest genal height). The shape of the surstylus (anterior lobe large, about as

large as posterior lobe; posterior lobe stout with a triangular posteroapical lobe) and the postgonite (recurved and apically bent) are the most reliable characters to separate *H. kukali*, new species, from *H. trulliformis*, new species.

***Howickia trulliformis*, new species**

(Figs. 13, 14, 17G)

Type material. Holotype: male (DEBU debu00412138), **PAPUA NEW GUINEA:** Oro, Kokoda Trail, Ofi Creek, 8 km SW of Naoro, 650 m, lowland forest, dung, coll. O. Kukal, 15–18 August 1976.

Paratypes: **PAPUA NEW GUINEA:** 11 males, 5 females (DEBU), same data as holotype; 20 males, 9 females (DEBU), Oro, Kokoda Trail, Karai River, Manari, 700 m, dung trap, coll. O. Kukal, 12–14 July 1976.

Description. Body (Fig. 13A, B): Length: males 1.4–2.9 mm, females 1.5–2.8 mm. Head orange, frons darkest towards the back of the head; antenna yellow-orange; face and gena darker orange. Frontal width $1.8\text{--}1.9 \times$ frontal height. Interfrontal bristles in 3–4 long, fine pairs. Greatest eye height $2.0\text{--}2.1 \times$ shortest genal height. Four pairs of dorsocentral bristles (one presutural and three postsutural, anterior three dorsocentrals short, about twice as long as surrounding acrostichals). Legs dark brown, mid tibia reddish-brown, fore tibia and basal half to two-thirds of hind tibia yellow. Mid basitarsus with a large subbasal ventral seta in both sexes. Wing (Fig. 17G) fully developed, reaching beyond apex of abdomen.

Male abdomen (Figs. 13C, D, 14): S6+7 and S8 reddish-orange. S5 width $2.3\text{--}2.4 \times$ length, slightly emarginate posteromedially with a densely setulose membranous flap. Ventral lobe of hypandrium slightly reduced and laterally flattened. Anterior lobe of surstylus bare and slightly pointed apically, posterior lobe slightly bent ventrally about midlength, broadest apically. Postgonite sinuate. Basiphallus strongly reduced to a pair of trough-like triangular plates. Basal half of distiphallus tubular, constricted about midlength and broadened apically, apical half largely membranous with a pair of flattened, slightly diverging T-shaped lateral sclerites and a horseshoe-like apical sclerite supporting a pair of papillate membranous flaps.

Etymology. This name is in reference to the scoop-shaped posterior lobe of the surstylus (Latin ‘trulla’: scoop, small ladle & Latin ‘-formis’: having the form of).

Type locality. Papua New Guinea, Oro, Kokoda Trail, Ofi Creek.

Distribution. This species is known only from southeastern New Guinea.

Comments. *Howickia trulliformis*, new species, is externally very similar to *H. kukali*, new species, with the only reliable non-genitalic difference being the slightly larger eye (greatest eye height $2.0\text{--}2.1 \times$ shortest genal height). The shape of the surstylus (anterior lobe small, much smaller than posterior

lobe; posterior lobe elongate and evenly rounded, without an apical lobe) and postgonite (sinuate) are the most reliable characters to separate *H. trulliformis*, new species, from *H. kukali*, new species.

Species descriptions part three, the *Howickia vittigera* species group

Howickia vittigera is treated as the sole member of a separate species group because its position in the genus is uncertain. The patterned wing and distinct ventral hypandrial lobe suggest a relationship with the *H. cruspica* species group, but the relatively vertically-situated and shield-like cercus, apically curved postgonite, and fairly straight distiphallus with several very long sclerites are more similar to those of the *H. orientalis* species group. Other apomorphic characters, such as the rectangular prosternum, oddly reduced mid tibial chaetotaxy, and broadly flattened frons are unlike any other species of *Howickia*.

Howickia vittigera (Richards, 1973) (Figs. 15, 16, 17H)

Leptocera (*Popondetta*) *vittigera* Richards, 1973: 357.

Popondetta vittigera (Richards, 1973), Marshall, 1989: 606; Roháček et al., 2001: 206.

Howickia vittigera (Richards, 1973), Kuwahara & Marshall, 2022: 18.

Type material. Holotype: male (AMSA), **PAPUA NEW GUINEA**: Popondetta subdistrict, near Sasambata, coll. D.K. McAlpine, 30 October 1963.

Material examined. **PAPUA NEW GUINEA**: 2 males (DEBU), Oro, Kokoda Trail, Ofi Creek, 8 km SW of Naoro, 650 m, lowland, coll. O. Kukal, 15–18 August 1976; 1 male (DEBU), Oro, Kokoda Trail, Karai River, Manari, 300 m, coll. O. Kukal, 12–14 July 1976.

Redescription. Body (Fig. 15A, B): Length: males 2.2–2.6 mm. Head orange; frontal vitta, interfrontal plates, orbital plates and area around the ocellar triangle with strips of golden-yellow microtomentum, lower lateral corners of frons dark brown; antenna and ocellar triangle darker orange; gena and face yellow, lower part of face with a pair of brown, moustache-like spots. Frontal width 1.5–1.6 × frontal height. Interfrontal bristles in 4–5 small, fine, subequal pairs; orbital bristles long but fine, anterior bristle 0.8–0.9 × posterior. Greatest eye height 2.0–2.1 × shortest genal height. Thorax black, scutum and scutellum dark reddish laterally; scutum coarsely punctate. Prosternum rectangular. Two pairs of postsutural dorsocentral bristles (both pairs small, anterior pair slightly but distinctly larger than acrostichals). Scutellum semicircular, medial length 0.4–0.5 × basal width. Legs brown, fore tibia dark brown, mid tibia and basal half of hind tibia yellow, all tarsomeres except apical two fore tarsomeres yellow. Fore tibia slightly swollen with a dense inner anterior brush of pale setulae. Dorsal surface of mid tibia with a small posterodorsal bristle basally, a pair of short bristles at about midlength, and a longer pair of bristles at

about four-fifths. Mid basitarsus with an enlarged subbasal ventral seta. Apicoventral spur on hind tibia stout and short. Wing (Fig. 17H) fully developed, reaching beyond apex of abdomen. CS2 subequal to CS3. R₂₊₃ sinuate, basal curve stronger than apical curve. M₁ extending beyond dm-m as a colourless, sinuate crease; M₄ extending beyond dm-m about halfway to wing margin as a tubular vein; CuA+CuP a long, sinuate, colourless crease.

Male abdomen (Figs. 15C, D, 16): Left side of S6+7 and S8 yellow-orange. S5 width 2.9–3.0 × length, posteromedially emarginate with a setulose membrane in the emargination. Ventral extension of S6+7 with a dark, knob-like posterior lobe. Cerci enlarged and rectangular, almost shield-like, ventrally-projecting but only narrowly connected dorsally, with several small setae. Ventral lobe of hypandrium broad, curved, and subtriangular. Anterior lobe of surstylus elongate, dark, and tapered, posterior lobe posteroventrally setose, apex triangular. Postgonite curved forward, apical half with a serrated anterior edge, apex with two tooth-like lobes. Distiphallus composed of several sclerites: basally with a dark, laterally curved, Y-shaped upper sclerite and a long, thin lower sclerite; apically with paired, recurving, lateral sclerites supporting a membranous apex.

Distribution. This species is only known from southeastern Papua New Guinea.

Comments. *Howickia vittigera* is a distinctive species of *Howickia*, easily distinguished from all congeners by the flattened frons, strongly projecting lunule, and dark brown moustache-shaped facial marking. Thus far, this species is only known from male specimens and appears to be relatively rare in collections.

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