

Six new species of Stenometopiini (Hemiptera: Cicadellidae: Deltocephalinae) with redescription of additional species and new distributional records

YANI DUAN¹, YATING ZHANG¹ & CHRISTOPHER H. DIETRICH^{2,3}

¹School of Plant Protection, Anhui Agricultural University, Hefei, Anhui Province 230036, China

²Illinois Natural History Survey, Prairie Research Institute, University of Illinois, Champaign, IL 61820, USA

³Corresponding author. E-mail: chdietri@illinois.edu

Abstract

Six new species of Stenometopiini are described: *Stirellus paracatalinus* **sp. nov.** from Mexico, *Stirellus lesioensis* **sp. nov.** from Republic of Congo, *Stirellus paraletioensis* **sp. nov.** from South Africa, *Stirellus kitwensis* **sp. nov.** from Zambia, *Stirellus madagascarensis* **sp. nov.** from Madagascar, and *Stirellus petfordensis* **sp. nov.** from Australia. Ten species are redescribed: *Kinonia elongata* Ball, *Stirellus catalinus* (Beamer & Tuthill), *Stirellus labiatus* (Gillette), *Stirellus mexicanus* (Osborn & Ball), *Stirellus picinus* (Berg), *Stirellus laetus* (Melichar), *Stirellus multipunctatus* Duan, Webb & Zhang, *Stirellus neospeciosus* Duan, Webb & Zhang, *Stirellus rubrolineatus* (Distant), and *Stirellus sagittarius* (Naudé). *Kinonia elongata* Ball, *S. catalinus* (Beamer & Tuthill) and *S. labiatus* (Gillette), all described from the Southwestern USA, are recorded from Mexico for the first time. *Stirellus picinus* (Berg) is recorded from the Virgin Islands (Guana Island) for the first time. *Stirellus laetus* (Melichar), *S. multipunctatus* Duan, Webb & Zhang, *S. neospeciosus* Duan, Webb & Zhang, and *S. rubrolineatus* (Distant) are recorded from Thailand for the first time.

Key words: Taxonomy, Auchenorrhyncha, morphology, distribution, identification

Introduction

Leafhoppers of the deltocephaline tribe Stenometopiini feed on grasses and sedges and are often abundant in grassland ecosystems (Zahniser & Dietrich, 2013). This tribe previously included as many as 25 genera (discussed in detail by Duan *et al.*, 2016) but, presently, only three genera are recognized as valid: *Hodoedocus* Jacobi, *Kinonia* Ball and *Stirellus* Osborn & Ball (Duan *et al.*, 2016). A key is provided for their separation. The distinctions between the remaining genera remain somewhat unclear because the male genitalia of all stenometopiine genera are very similar and they intergrade in external morphology, particularly in the shape and proportions of the head and in the degree of development and venation of the forewing. A comprehensive phylogenetic analysis of the group is needed to elucidate the status and relationships of genera and species. At present, *Stirellus* is the largest and most morphologically heterogeneous genus of the tribe with 86 previously described species distributed worldwide. In the present paper, six new species of *Stirellus* are described and illustrated, ten additional species of Stenometopiini are redescribed and some new country records are reported.

Material and methods

The material studied here is deposited in the Illinois Natural History Survey (INHS), California Academy of Sciences, San Francisco (CAS), Queen Sirikit Botanical Garden, Chiang Mai, Thailand (QSBG), and the Australian National Insect Collection (ANIC). Morphological terminology follows Dietrich (2005). Digital photographs were taken with a QImaging Micropublisher 3.3 digital camera mounted on an Olympus BX41 stereo microscope and with a Nikon D1x digital SLR camera configured with lenses by the Microoptics, Digital Lab XLT system. Photographs were edited to remove background and balance color and contrast using Adobe Photoshop CS.

Results

Stenometopiini Baker, 1923

Stenometopiini Baker, 1923: 350 (Type: *Stenometopius* Matsumura, 1914 [= *Hodoedocus* Jacobi]).

Stirellini Emeljanov, 1966: 609 (Type: *Athysanus* (*Stirellus*) Osborn & Ball, 1902). Synonymised by Hamilton, 1983: 21.

Diagnosis. Stenometopiini are small to medium sized leafhoppers, often brightly colored or iridescent green when alive. They can be identified by the following combination of characters: narrow crown, texture of crown completely shagreen to base of head, lateral margins of the pronotum without carinae, male pygofer sloping caudoventrally and often with a distinct lateral tooth, ovipositor protruding far beyond pygofer apex, first valvula dorsal sculpturing granulose to maculose and submarginal, first valvula with distinctly delimited ventroapical sculpturing and second valvula without dorsal teeth. Zahniser & Dietrich (2013) provided a more detailed description.

Distribution. Worldwide.

Key to genera of Stenometopiini (males)

1. Aedeagus relatively broad and hinged at the base of the shaft. *Kinonia* Ball
- Aedeagus base triangular, shaft without basal hinge. 2
2. Face with longitudinal keel at front. Forewing with recurved veins in corium from outer anteapical cell. . . *Hodoedocus* Jacobi
- Face and forewing not as above. *Stirellus* Osborn & Ball

Kinonia Ball, 1933 n. rec.

Kinonia Ball, 1933: 224 (Type: *Kinonia elongata* Ball, 1933, by original designation).

Diagnosis. Head acutely produced in dorsal and lateral view. Ocelli on anterior margin of crown. Frontoclypeus straight in profile, clypeal sulcus prominent. Forewing rounded apically, usually not extended to apex of abdomen, branches of R not strongly reflexed, usually with three anteapical cells, inner anteapical cell open basally, appendix absent. Pygofer side with short tooth on apical half near ventral margin. Valve long, triangular. Style preapical angle distinct. Connective H-shaped. Aedeagus with shaft relatively short and broad in lateral and posterior view, hinged at the base.

Distribution. Mexico; USA.

Remarks. This genus only includes the type species, *Kinonia elongata*. Emeljanov (1962) treated it as a junior synonym of *Stirellus* but Oman *et al.* (1990) retained *Kinonia* as a valid genus. Although it is similar to *Stirellus*, as delimited here, in most respects, it differs in having the aedeagus relatively broad and hinged at the base of the shaft, a trait characteristic of most Chiasmini Distant. Thus, further analysis may show that this genus may be more appropriately placed in the latter tribe. Nevertheless, *Kinonia* agrees with the current definition of Stenometopiini in other respects and phylogenetic analysis of combined morphological and molecular data placed this genus as sister to *Stirellus* with strong branch support (Zahniser & Dietrich, 2013). *Kinonia* was originally described from the southwestern USA. It is here recorded from Mexico for the first time.

Kinonia elongata Ball, 1933 n. rec.

(Figs 1–2)

Kinonia elongata Ball, 1933: 224.

Description. Length. Male: 3.3–3.6mm; female: 4.0–4.9mm.

Coloration. Generally yellow green throughout without obvious markings other than variable brown infuscation on abdomen (Fig. 1A–F). Face mostly ochraceous (Fig. 1G). Forewing translucent (Fig. 1A–F). Femora and tibiae with dark brown marks (Fig. 1F). Abdominal sternites variably infused with dark brown (Fig. 1H).

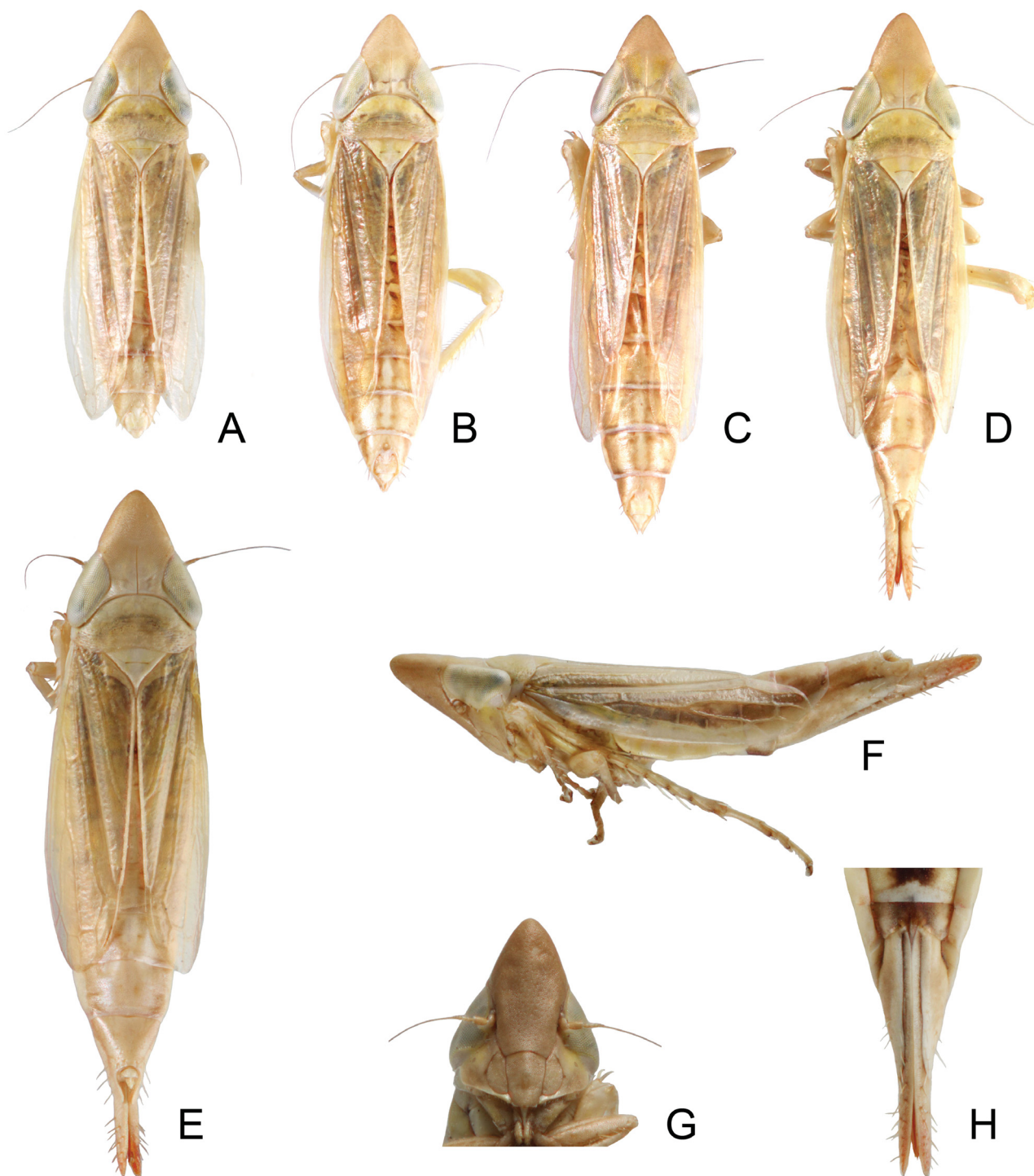


FIGURE 1. *Kinonia elongata* A–E: habitus, dorsal view; F: habitus, lateral view; G: face; H: the end of female abdomen, ventral view. A–C: male; D–H: female.

Morphology. Head slightly wider than pronotum, subconical, anterior margin rounded to face (Fig. 1A–F). Crown longer than 2x width between eyes (Fig. 1A–E). Anteclypeus tapering to apex, slightly tumid medially, extending beyond normal curve of genae (Fig. 1F). Pronotum median length shorter than median length of crown. Mesonotum and scutellum nearly as long as pronotum (Fig. 1A–E). Forewing exposing apex of abdomen (Fig. 1A–F).

Male genitalia. Pygofer side with few macrosetae dorsally, dorsal margin convex, posterior margin nearly truncate (Fig. 2A). Subgenital plate ovoid, strongly convex laterally, apex obliquely truncate with weak median apical

tooth, macrosetae uniseriate (Fig. 2C). Style apophysis digitate, slim, bent laterad adjacent to obtuse preapical lobe, then straight and tapered distally (Fig. 2D). Connective H-shaped, stem nearly as long as weakly divergent anterior arms (Fig. 2E). Aedeagal shaft robust, evenly curved anterodorsad and slightly tapered in lateral view with attenuate posteroapical projection, broadened from base to distal third, then tapered to apex in posterior view; gonopore large, apical (Fig. 2F–H).

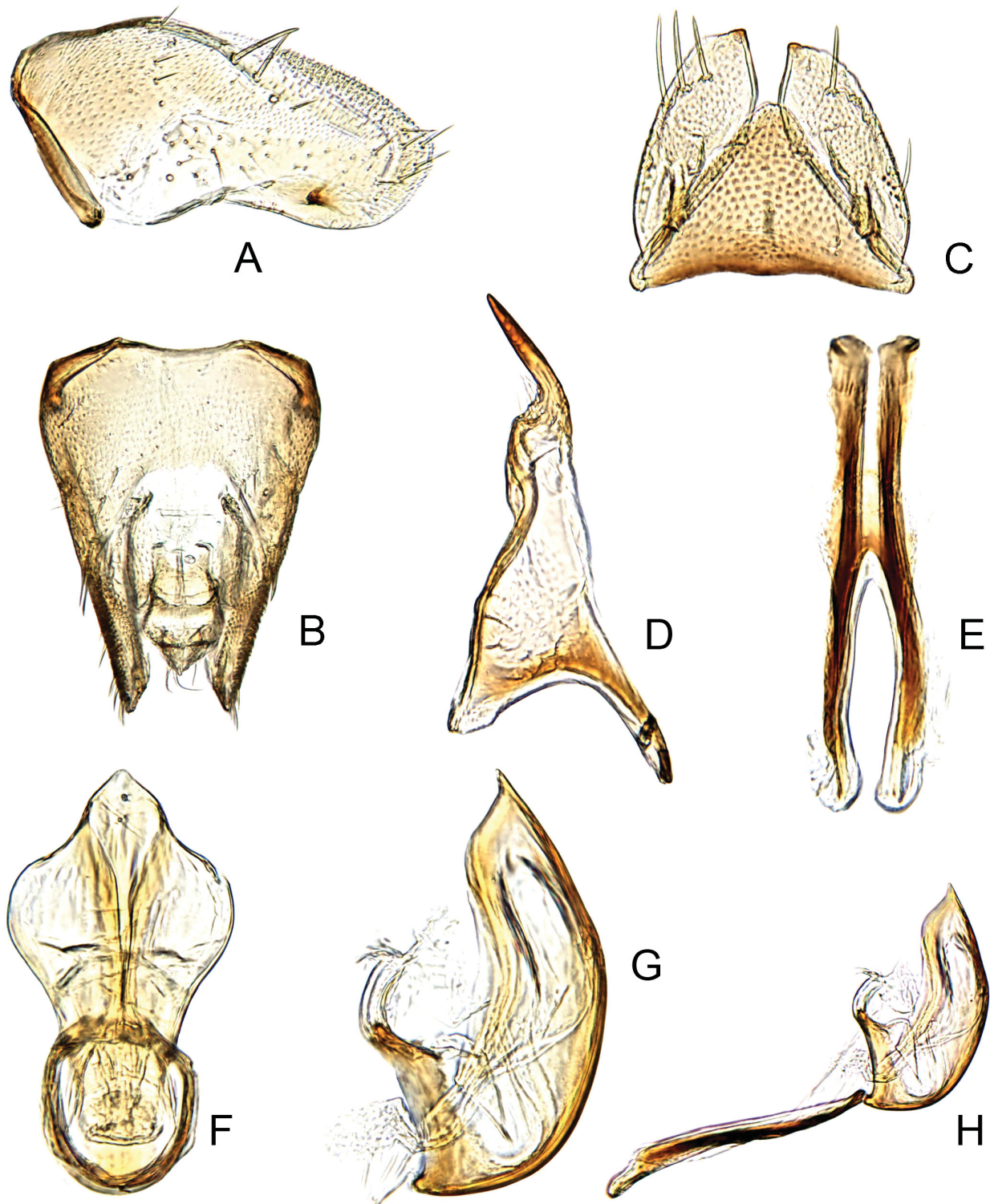


FIGURE 2. *Kinonia elongata* A: male pygofer lobe, lateral view; B: male pygofer and segments X and XI, dorsal view; C: valve and subgenital plates, ventral view; D: style, dorsal view; E: connective, dorsal view; F: aedeagus, dorsal view; G: aedeagus, lateral view; H: connective and aedeagus, lateral view.

Female. Hind margin of seventh sternum broadly concave medially, angulate laterally (Fig. 1H).

Material examined. 2♂♂, Sabino Can[yon] Ar[izona]. 14 vii 1932, coll. R.H. Beamer (INHS); 1♂, 6♀♀, Mexico: Durango. Hacienda El Potrero 4.5mi N. Borbollones, 2280m, 25 x 1995, coll. C.H. Dietrich vacuum 95-055 (INHS); 9♂♂, 19♀♀, Mexico: Chihuahua. Rt. 432 29km NE Parral. 0.5km E Rio Chico. 1800m, 30 x 1995, coll. C.H. Dietrich, sweeping, 95-075 (INHS).

Distribution. Mexico; USA.

Remarks. This species is here recorded from Mexico for the first time.

***Stirellus* Osborn & Ball, 1902**

Athysanus (*Stirellus*) Osborn & Ball, 1902: 250 (Type: *Athysanus bicolor* Van Duzee, 1892).

Stirellus, Kirkaldy, 1907: 58.

Doratulina Melichar, 1903: 198 (Type: *Doratulina jocosa* Melichar, 1903).

Phrynophyes Kirkaldy, 1906: 237 (Type: *Phrynophyes phrynophyes* Kirkaldy, 1906).

Anemochrea Kirkaldy, 1906: 329 (Type: *Anemochrea mitis* Kirkaldy, 1906).

Anemolua Kirkaldy, 1906: 329 (Type: *Anemolua hanuala* Kirkaldy, 1906).

Giffardia Kirkaldy, 1906: 336 (Type: *Giffardia dolichocephala* Kirkaldy, 1906). **syn. nov.**

Arya Distant, 1908: 338 (Type: *Arya rubrolineatus* Distant, 1908).

Trebellius Distant, 1918: 52 (Type: *Trebellius albifrons* Distant, 1918).

Campbellinella Distant, 1918: 69 (Type: *Campbellinella illustrata* Distant, 1918).

Viridomarus Distant, 1918: 69 (Type: *Viridomarus capitatus* Distant, 1918).

Bituitus Distant, 1918: 70 (Type: *Bituitus projectus* Distant, 1918).

Paternus Distant, 1918: 71 (Type: *Paternus pusana* Distant, 1918).

Volusenus Distant, 1918: 72 (Type: *Volusenus lahorensis* Distant, 1918).

Nandidrug Distant, 1918: 74 (Type: *Nandidrug speciosus* Distant, 1918).

Allectus Distant, 1918: 75 (Type: *Allectus notata* Distant, 1918).

Galerius Distant, 1918: 78 (Type: *Galerius indicatrix* Distant, 1918).

Paivanana Distant, 1918: 95 (Type: *Typhlocyba indrus* Distant, 1908).

Gillettiella Osborn, 1930: 689 (Type: *Deltocephalus labiatus* Gillette, 1898).

Bella Singh-Pruthi, 1930: 44 (Type: *Bella apicalis* Singh-Pruthi, 1930).

Penestirellus Beamer & Tuthill, 1934: 21 (Type: *Penestirellus catalinus* Beamer & Tuthill, 1934).

Sunda Singh-Pruthi, 1936: 112 (Type: *Sunda ribeiroi* Singh-Pruthi, 1936).

Pseudaconura Linnavuori, 1952: 182 (Type: *Pseudaconura luxorensis* Linnavuori, 1952).

Malagasiella Evans, 1954: 110 (Type: *Malagasiella minima* Evans, 1954).

Umesaona Ishihara, 1961: 246 (Type: *Umesaona asiatica* Ishihara, 1961).

Doratulina (*Cymbopogonella*) Viraktamath, 1976: 79 (Type: *Doratulina longivertex* Viraktamath, 1976).

Anaconura Emeljanov, 1999: 559 (Type: *Stirellus aristidae* Emeljanov, 1968). **syn. nov.**

Diagnosis. Head variably produced. Ocelli on or slightly below anterior margin. Frontoclypeus straight to moderately convex in profile, clypeal sulcus prominent. Forewing variably developed, usually with three anteapical cells, inner anteapical cell open basally. Pygofer side with dorsal margin usually straight or concave distally, short tooth usually present on apical half near ventral margin. Valve long, triangular. Style preapical angle distinct. Connective Y-shaped or H-shaped. Aedeagus base triangular, shaft without basal hinge, usually elongate and slender, strongly curved anterodorsally.

Distribution. Worldwide.

Remarks. The composition and morphological definition of this genus remain controversial. It is presently defined based on the absence of the distinctive characters used to define other genera of the tribe. Our current concept of *Stirellus* includes 25 other named genus-group taxa, here considered junior synonyms. As noted by Emeljanov (1962), *Stirellus* is a large and heterogeneous assemblage of species distributed worldwide. Although there is considerable interspecific (and sometimes intraspecific) variation in body proportions, wing development and coloration, the male genitalia vary far less obviously among species of *Stirellus* than in other leafhopper genera. The differences among species in body proportions and coloration, partly explain why many such diverse forms were previously considered to represent separate genera. Most of these taxa have been recognized by previous authors as synonyms of either *Stirellus* or *Doratulina* (Linnavuori 1959, Emeljanov 1962, Vilbaste 1965). We follow Emeljanov (1966) and Duan *et al.* (2016) in treating *Doratulina* as a junior synonym of *Stirellus*. Comprehensive phylo-

genetic analyses including molecular data will be needed to elucidate the status of *Stirellus*, the taxa here treated as synonyms, and relationships among the many included species.

***Stirellus catalinus* (Beamer & Tuthill, 1934) n. rec.**

(Figs 3–6)

Penestirellus catalinus Beamer & Tuthill, 1934: 22.

Penestirellus to *Stirellus*; Emeljanov, 1962: 393 [comb. not given].

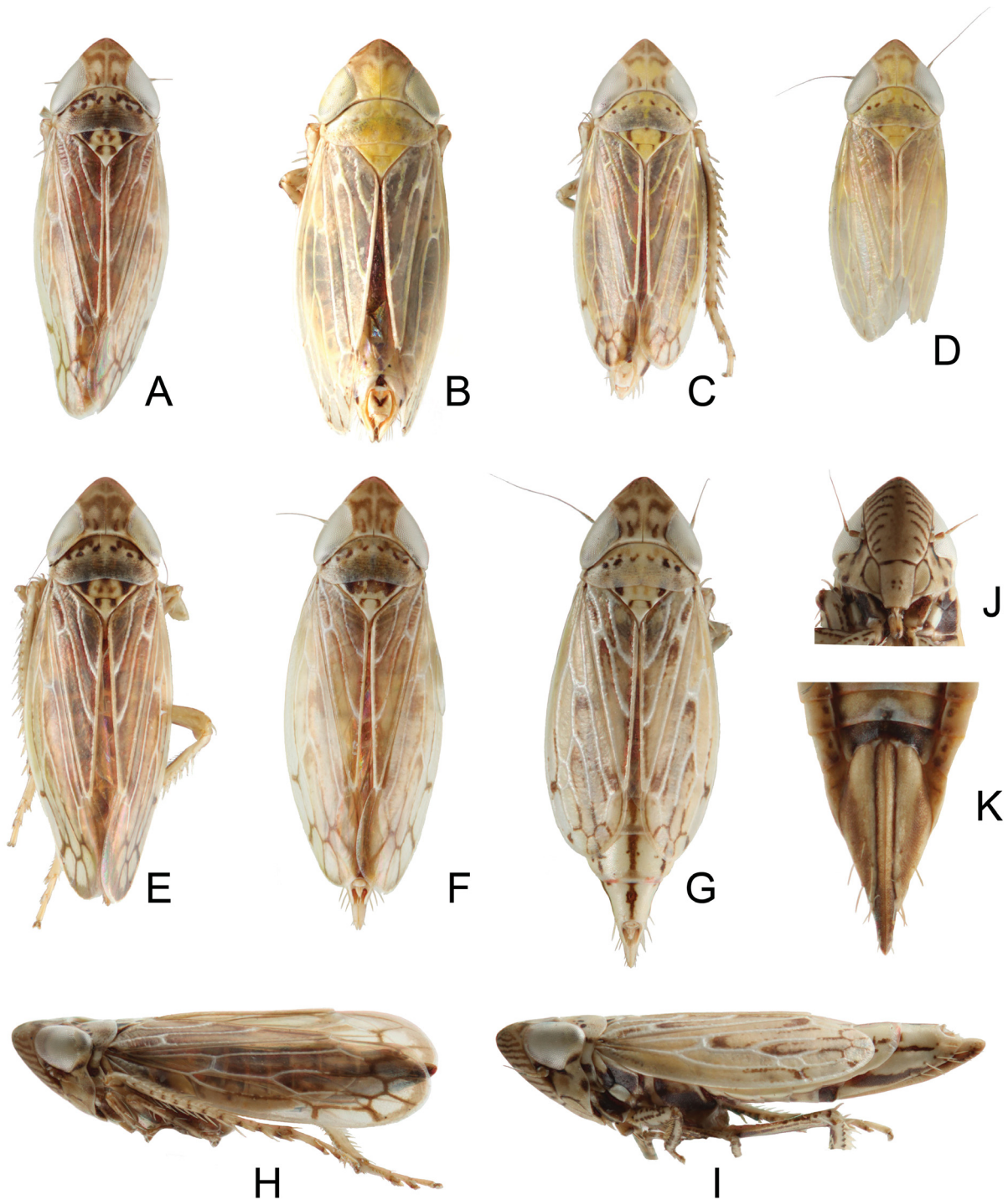


FIGURE 3. *Stirellus catalinus* A–G: habitus, dorsal view; H, I: habitus, lateral view; J: face; K: the end of female abdomen, ventral view. A–D: male; E–K: female.

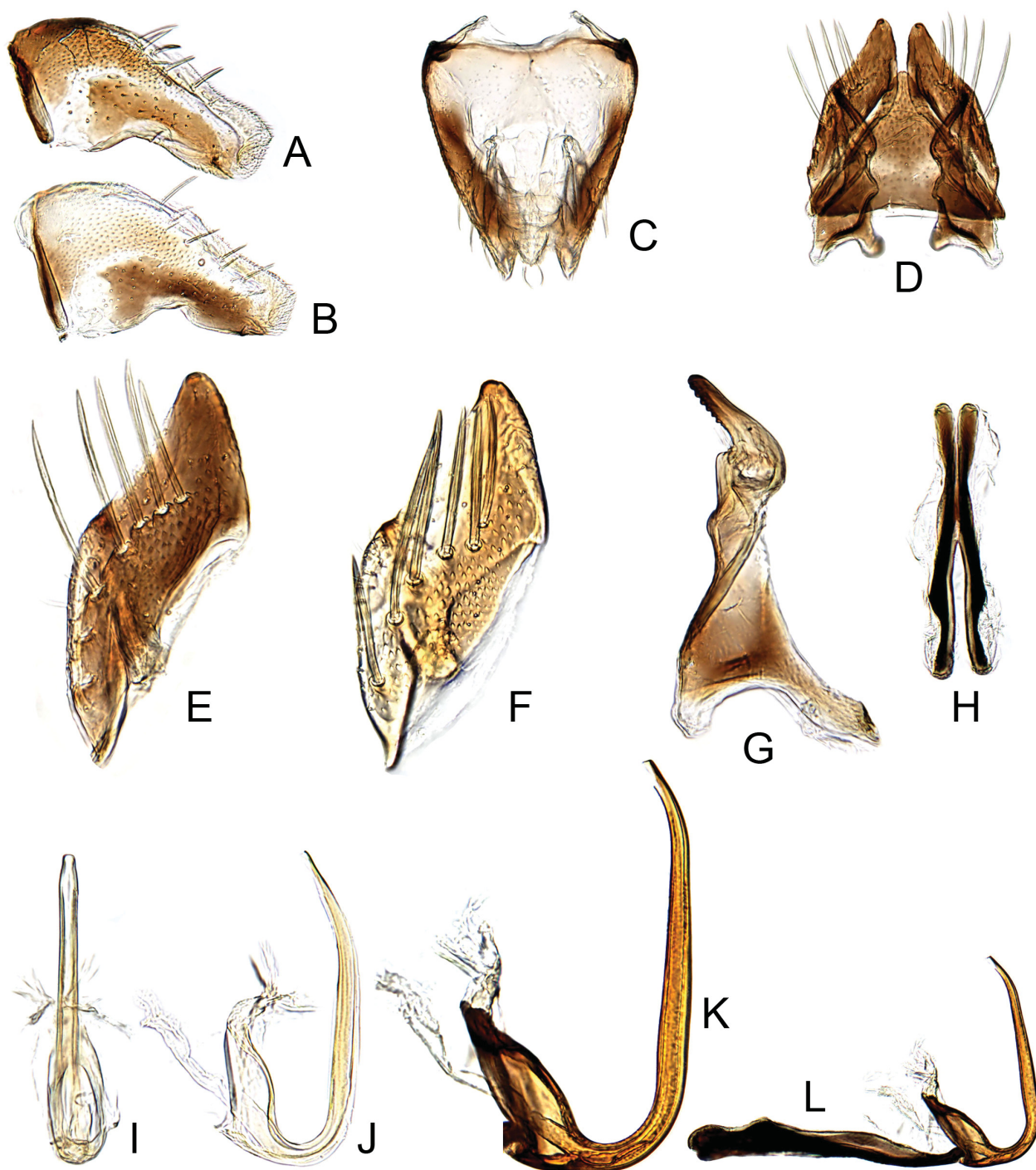


FIGURE 4. *Stirellus catalinus* A, B: male pygofer lobe, lateral view; C: male pygofer and segments X and XI, dorsal view; D: valve, subgenital plates and styles, ventral view; E, F: subgenital plate, ventral view; G: style, dorsal view; H: connective, dorsal view; I: aedeagus, dorsal view; J–K: aedeagus, lateral view; L: connective and aedeagus, lateral view.

Description. Length. Male: 2.9–3.2mm; female: 3.2–3.9mm.

Coloration. Overall color varying from ochraceous to yellow green with or without variable symmetrical fuscous marks (Figs 3A–I; 5A–E). Crown usually with marks consisting of pair of apical spots, pair of preapical arcuate lines and two pairs of basal spots (Figs 3A–G; 5A–D). Frontoclypeus ochraceous with fuscous arcs reaching only part way across (Figs 3J; 5F). Forewing translucent with or without fuscous tint, veins pale (Figs 3A–I; 5A–E). Femora and tibiae with dark brown marks (Figs 3H, I; 5E). Abdominal sternites variably infused with dark brown; female sternite VII usually dark brown in contrast to pale segments more basad (Figs 3K; 5G).

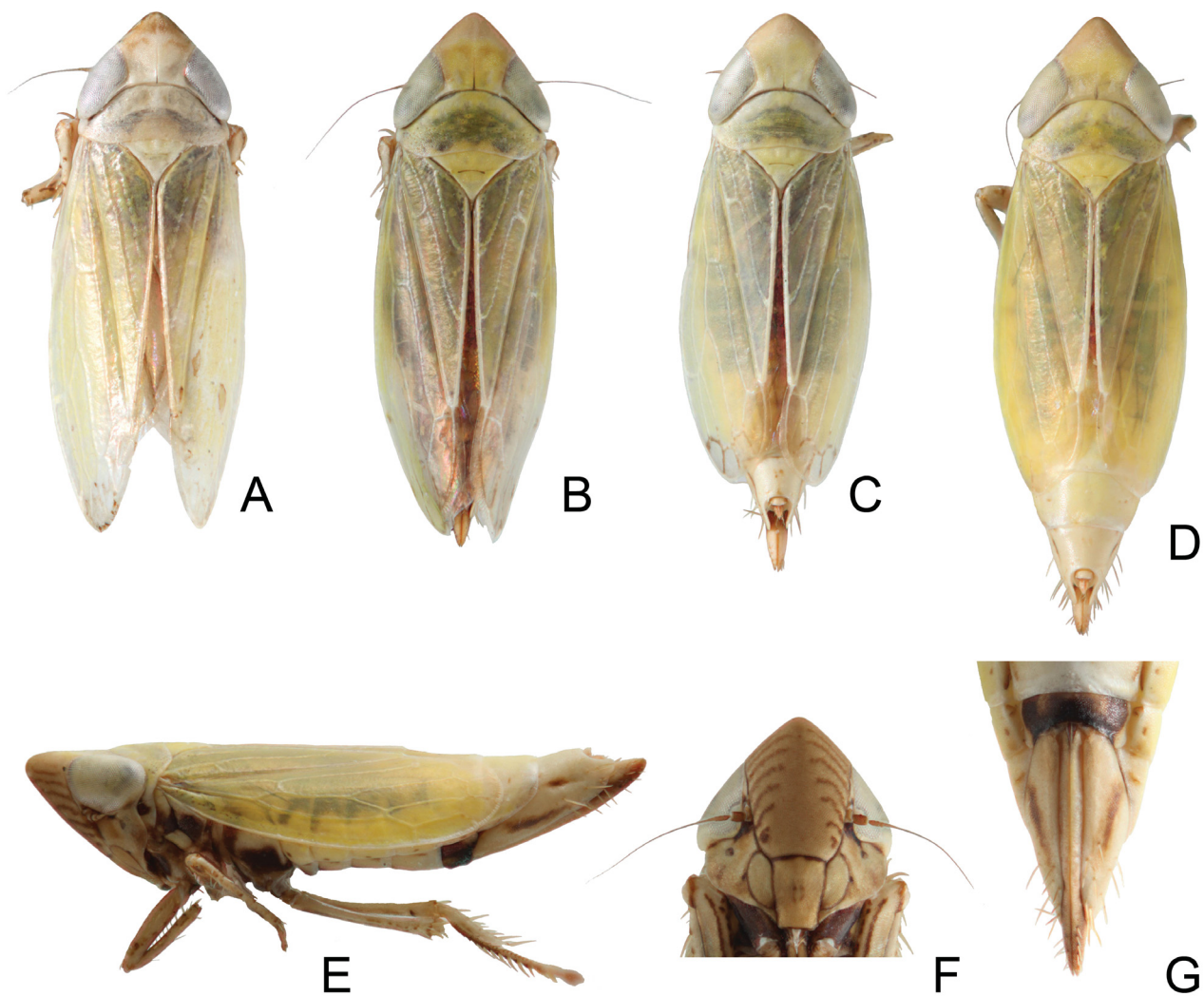


FIGURE 5. *Stirellus catalinus* A–D: habitus, dorsal view; E: habitus, lateral view; F: face; G: the end of female abdomen, ventral view. A: male; B–G: female.

Morphology. Head subequal in width to pronotum, subconical, anterior margin rounded to face, acutely angled in dorsal and lateral view (Figs 3A–I; 5A–E). Crown longer than width between eyes (Figs 3A–G; 5A–D). Anteclypeus tapering to apex, extending beyond normal curve of genae (Figs 3J; 5F). Pronotum median length shorter than median length of crown. Mesonotum and scutellum nearly as long as pronotum (Figs 3A–G; 5A–D). Forewing macropterous to submacropterous, usually exposing apex of abdomen in female and sometimes in male, appendix weakly developed, R branches not reflexed (Figs 3A–I; 5A–E).

Male genitalia. Pygofer side with few macrosetae dorsally, dorsal margin weakly concave, posterior margin nearly truncate (Figs 4A, B; 6A, B). Subgenital plate distinctly concave laterally in distal half, macrosetae uniseriate, well separated from lateral margin (Figs 4D–F; 6D). Style apophysis digitate, relatively robust, laterally curved, outer margin serrate (Figs 4G; 6E). Connective narrowly Y-shaped, stem parallel sided, shorter than arms (Figs 4H; 6F). Aedeagal shaft bent near base but divergent from base throughout length, long, very slightly expanded above bend, nearly straight through most of length, curved slightly anterad at distal fourth, apex blunt (Figs 4I–L; 6G–I).

Female. Hind margin of seventh sternum shallowly concave medially, angulate laterally; nearly uniformly dark brown or black, contrasting with paler adjacent abdominal segments (Figs 3K; 5G).

Material examined. 1♂, Mexico: Durango 10km S El Valle Nacional, 1720m, 29 x 1995, coll. C.H. Dietrich, sweeping, 95-072 (INHS); 5♂♂, 4♀♀, Mexico: Durango 5km SE Mesquital, 1900m, 6 xi 1995, coll. C.H. Dietrich, sweeping, 95-088 (INHS); 1♂, 5♀♀, Mexico: Jalisco Aguacate-Zenzontla rd., 840m, 19° 38' 22" N 104° 03' 01" W,

13 x 2001, coll. C.H. Dietrich, sweeping, 01-006-02 (INHS); 9♂♂, 6♀♀, Mexico: Jalisco 6km ESE Tuxcacuesco, 1200m, 19° 40' 8" N 104° 0' 50" W, 14 x 2001, coll. C.H. Dietrich, vacuum, 01-007-02 (INHS); 1♂, Mexico: Jalisco Rt 80 k♂149 NE Lagos de Moreno, 1875m, 21° 22' N 101° 53' E, 18 x 2001, coll. C.H. Dietrich, sweeping, 01-017-02 (INHS); 1♂, Mexico: Chiapas, Rt 195 k♂31, 10km NE Chiapa de Corzo, 1000m, 16° 49' N 92° 58' E, 4 xi 2001, coll. C.H. Dietrich, vacuum, 01-0541-03 (INHS); 2♂♂, 3♀♀, Mexico: Oaxaca, Rt 190 km #36 Tulenito 95m, 16° 33' 10" N 94° 37' 50" W, 6 xi 2001, coll. C.H. Dietrich, sweeping, 01-054-03 (INHS); 2♀♀, Mexico: Puebla Rt 125 3.5 km SW Tehuacan, 1700m, 18° 24' N 97° 23' E, 8 xi 2001, coll. C.H. Dietrich, vacuum, 01-061-01 (INHS); 3♂♂, Mexico: Coah: Cuahtemoc rd. km 9.9, 2230m, 25.27751° N 100.96519° W, 30 x 2005, coll. C.H. Dietrich, sweeping, MX05-74-1 (INHS).

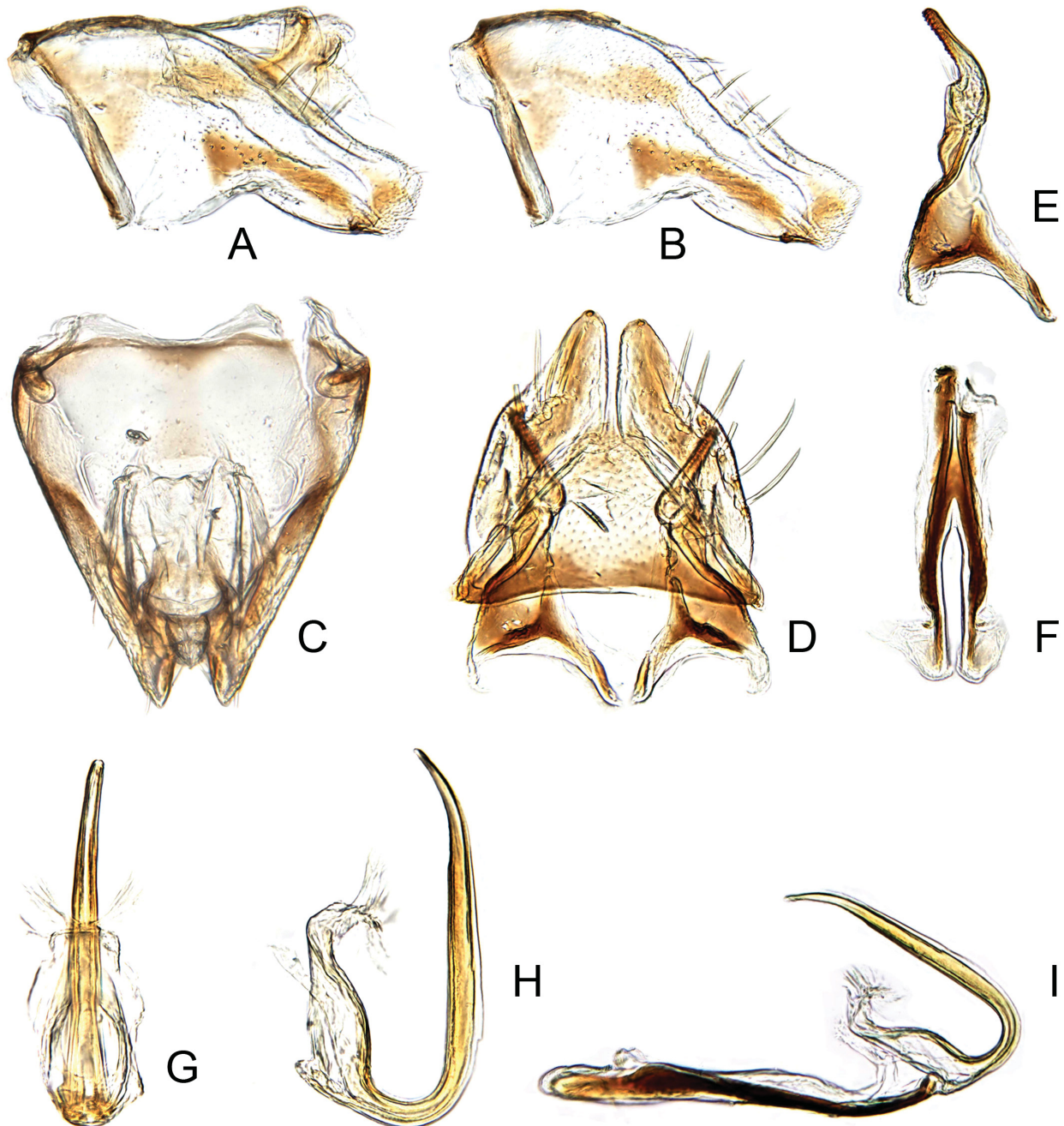


FIGURE 6. *Stirellus catalinus* A, C: male pygofer and segments X and XI, lateral and dorsal view, respectively; B: male pygofer lobe, lateral view; D: valve, subgenital plates and styles, ventral view; E: style, dorsal view; F: connective, dorsal view; G: aedeagus, dorsal view; H: aedeagus, lateral view; I: connective and aedeagus, lateral view.

Distribution. Mexico; USA.

Remarks. This species is here recorded from Mexico for the first time. There are two more or less distinct color forms (cf. Figs 3 and 5), both of which were collected simultaneously in the same habitats at most Mexican localities listed above. Therefore, these apparently do not represent seasonal forms, as seen in the temperate North American species *S. bicolor*.

***Stirellus paracatalinus* sp. nov.**

(Figs 7–8)

Description. Length. Male: 2.4–2.6mm; female: 2.6mm.

Coloration. General color stramineous with dark brown or fuscous marks (Fig. 7A–C). Crown, pronotum, mesonotum and scutellum usually with dark brown symmetrical markings; anterior half of crown mostly dark brown, posterior part with two pairs of oblong spots (Fig. 7A, B). Frontoclypeus sordid yellow with dark brown arcs, median longitudinal stripe and band across ventral part (Fig. 7D). Forewing translucent with fuscous tint, veins white in basal two thirds, brown distally (Fig. 7A–C). Femora and tibiae with dark brown marks (Fig. 7C). Abdominal sternites variably infused with dark brown (Fig. 7E).

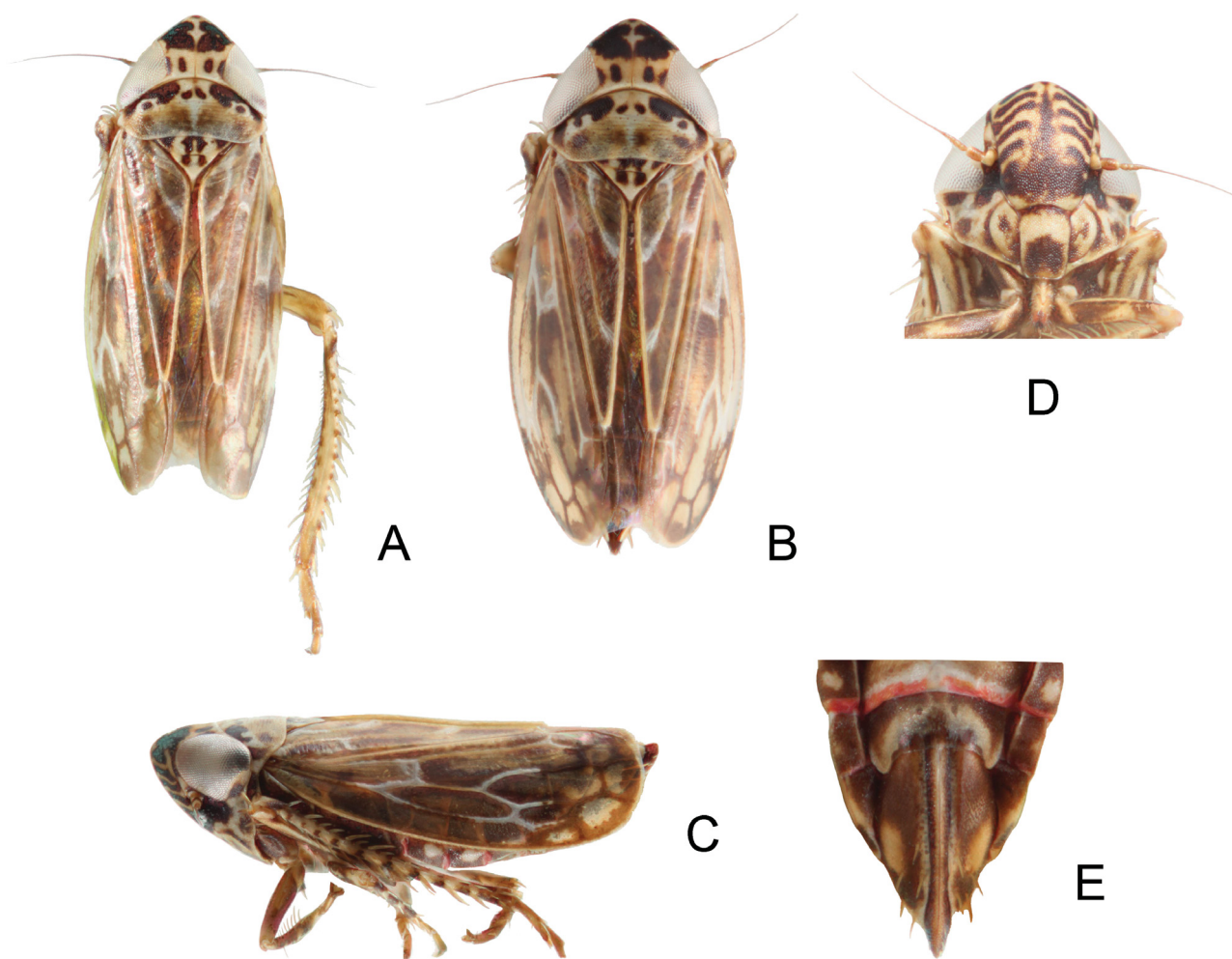


FIGURE 7. *Stirellus paracatalinus* sp. nov. A, B: habitus, dorsal view; C: habitus, lateral view; D: face; E: the end of female abdomen, ventral view. A: paratype, male; B–E: paratype, female.

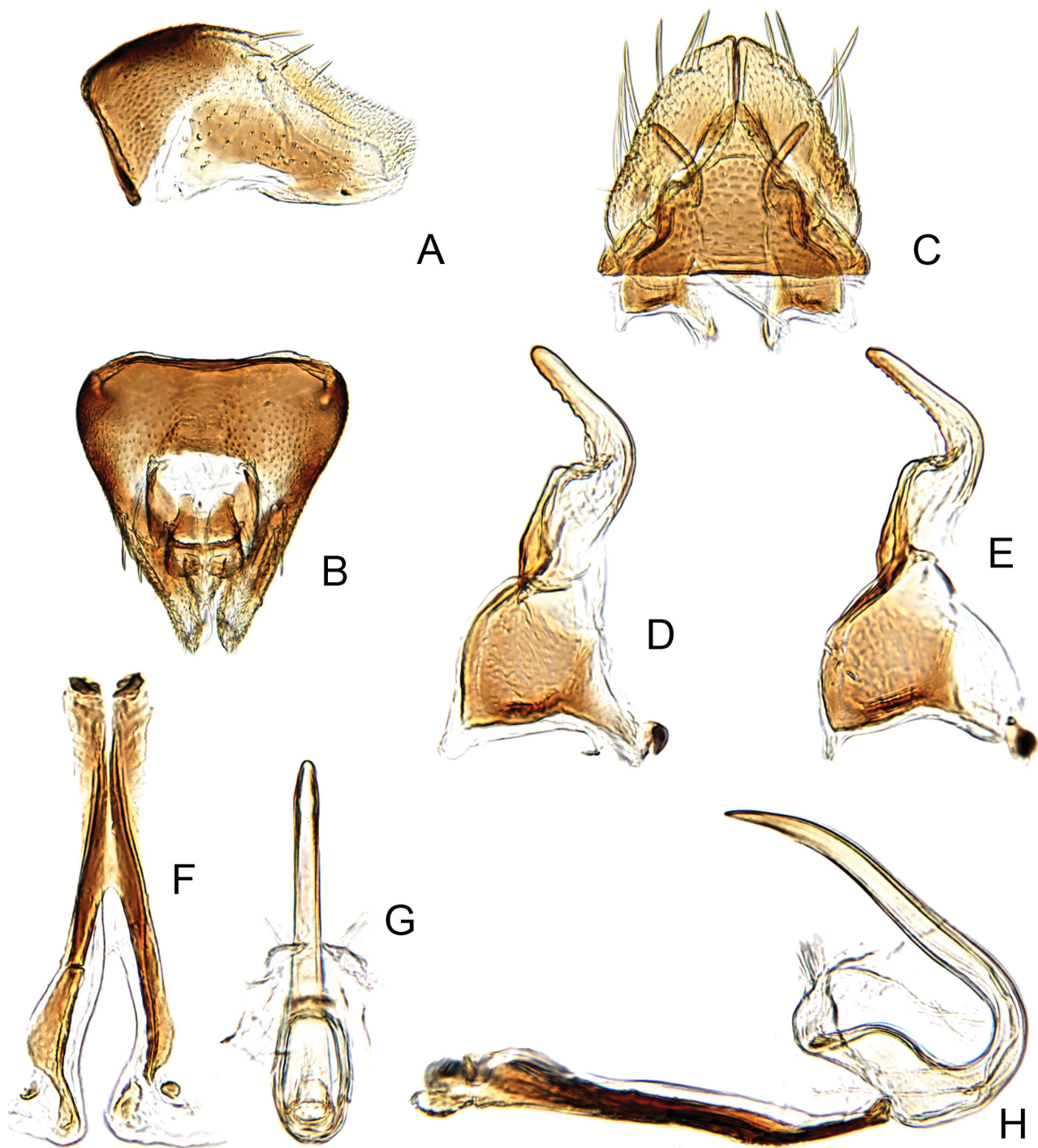


FIGURE 8. *Stirellus paracatalinus* sp. nov. A: male pygofer lobe, lateral view; B: male pygofer and segments X and XI, dorsal view; C: valve, subgenital plates and styles, ventral view; D, E: style, dorsal view; F: connective, dorsal view; G: aedeagus, dorsal view; H: connective and aedeagus, lateral view. A–H: holotype, male.

Morphology. Head subequal in width to pronotum, subconical, anterior margin of crown rounded to face, acutely angled in dorsal and lateral view (Fig. 7A–C). Crown slightly longer than width between eyes (Fig. 7A, B). Anteclypeus slightly tapered, extending slightly beyond normal curve of genae (Fig. 7D). Pronotum median length nearly as long as median length of crown. Mesonotum and scutellum together nearly as long as pronotum (Fig. 7A, B). Forewing macropterous to submacropterous, usually exposing apex of abdomen in female (Fig. 7A–C).

Male genitalia. Pygofer side with few macrosetae dorsally, dorsal margin slightly concave, posterior margin

truncate (Fig. 8A). Subgenital plate with lateral margin nearly straight through most of length, angled mesad distally and terminating in blunt posteromesal angle, macrosetae uniseriate (Fig. 8C). Style apophysis digitate, bent laterad just distad of preapical lobe and slightly tapered to blunt apex, outer margin serrate (Fig. 8D, E). Connective Y-shaped, stem broadened posterad, shorter than arms (Fig. 8F). Aedeagal shaft in lateral view bent near base, moderately long, slightly sinuate, very slightly expanded near middle, parallel to aedeagal base, apex attenuate, in dorsal view slightly tapered to bluntly rounded apex (Fig. 8G, H).

Female. Hind margin of seventh sternum shallowly concave medially, angulate laterally, pigmentation similar to that of other sternites (Fig. 7E).

Material examined. Holotype: ♂, Mexico: Sinaloa Rt. 40 100km E Mazatlan, 2000m, 24 x 1995, coll. C.H. Dietrich, vacuum, 95-044 (INHS). Paratypes: 1♂, 1♀, Mexico: Durango 20 mi SE Msequital, 2450m, 7 xi 1995, coll. C.H. Dietrich, sweeping (INHS).

Etymology. The species epithet is based on the similarity of this species to *S. catalinus*.

Distribution. Mexico.

Remarks. This species is similar to *S. catalinus*, but it can be distinguished by the following combination of characters: crown shorter and broader with apical spots enlarged to cover most of distal half; subgenital plate with lateral margin straight through most of length; connective stem broadened distally.

***Stirellus labiatus* (Gillette, 1898) n. rec.**

(Figs 9–10)

Deltocephalus labiatus Gillette, 1898: 26.

Gillettella labiata, Metcalf, 1967, 6 (10b): 1608.

Giletiella [sic] to *Stirellus*; Emeljanov, 1962: 393 [comb. not given].

Description. Length. Male: 2.5–2.9mm; female: 3.4–4.0mm.

Coloration. Male usually dark brown overall with forewing apex and pregenital abdominal segment contrastingly white and crown marked with paired brown spots of variable size, female usually yellow green with or without indistinct brown markings on crown similar to those of male (Fig. 9A–J). Frontoclypeus variable, darkest males with white band extended across face below eyes (Fig. 9K–M). Forewing translucent, male with white veins, female with veins concolorous with membrane (Fig. 9A–J). Femora and tibiae with dark brown marks (Fig. 9I). Abdominal sternites variably infused with dark brown (Fig. 9N).

Morphology. Head subequal in width to pronotum, subconical, crown with anterior margin rounded to face, acutely angled in dorsal and lateral view (Fig. 9A–J). Crown longer than width between eyes (Fig. 9A–H). Anteclypeus tapering to apex, extending beyond normal curve of genae (Fig. K–M). Pronotum median length shorter than median length of crown. Mesonotum and scutellum together nearly as long as pronotum (Fig. 9A–H). Forewing brachypterous and truncate in both sexes, usually exposing most of abdomen (Fig. 9A–J).

Male genitalia. Pygofer side with few macrosetae dorsally, dorsal margin slightly convex, posterior margin bluntly and unevenly rounded (Fig. 10A). Subgenital plate evenly convex laterally, macrosetae uniseriate on lateral margin (Fig. 10C). Style apophysis digitate, laterally curved, preapical lobe sharply angulate (Fig. 10D). Connective H-shaped, stem slightly shorter than arms and unusually broad (Fig. 10E). Aedeagal shaft in lateral view bent near base, relatively short, slightly curved, slightly divergent from base, apex blunt; in posterior view slightly tapered, apex with shallow median longitudinal cleft in dorsal view (Fig. 10F–H).

Female. Hind margin of seventh sternite with broad median convexity, lateral angles blunt (Fig. 9N).

Material examined. 8♂♂, 3♀♀, Mexico: Jalisco Rt. 80 k♂149 NE Lagos de Moreno, 1875m, 21° 22' N 101° 53' E, 18 x 2001, coll. C.H. Dietrich, sweeping, 01-017-02 (INHS); 4♂♂, 1♀, Mexico: Jalisco Rt 80 k♂122 NE Lagos de Moreno, 2010m, 21° 32' N 101° 43' E, 18 x 2001, coll. C.H. Dietrich, vacuum, 01-018-02 (INHS); 5♂♂, 2♀♀, Mexico: Mexico, Rt. 150D km 64, 33 km E Ixtapaluca, 2920m, 19° 18' N 98° 44' E, 8 xi 2001, coll. C.H. Dietrich, vacuum, 01-061-02 (INHS).

Distribution. Mexico; USA.

Remarks. This species is here recorded from Mexico for the first time.

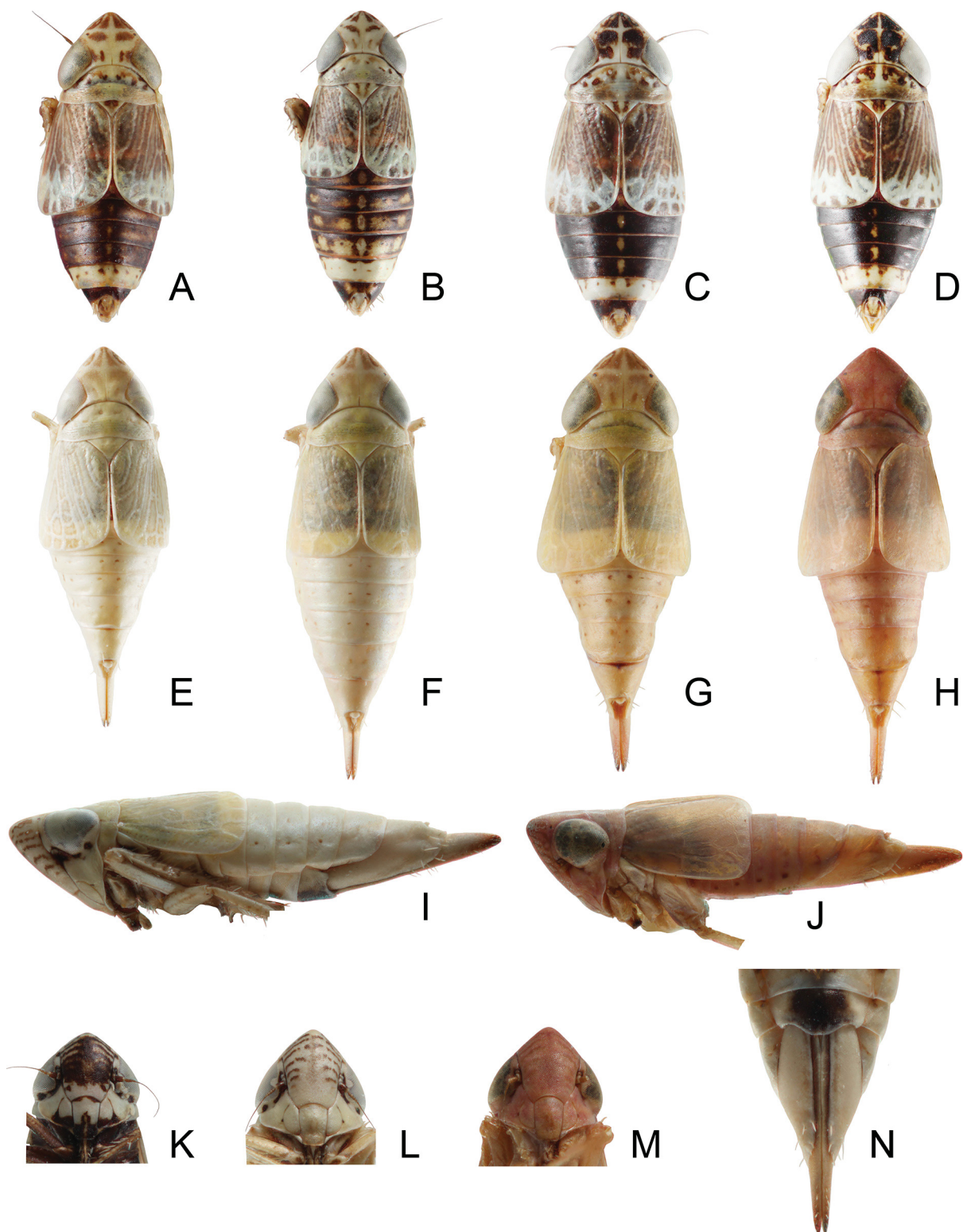


FIGURE 9. *Stirellus labiatus* A–H: habitus, dorsal view; I, J: habitus, lateral view; K–M: face; N: the end of female abdomen, ventral view. A–D, K: male; E–J, L–N: female.

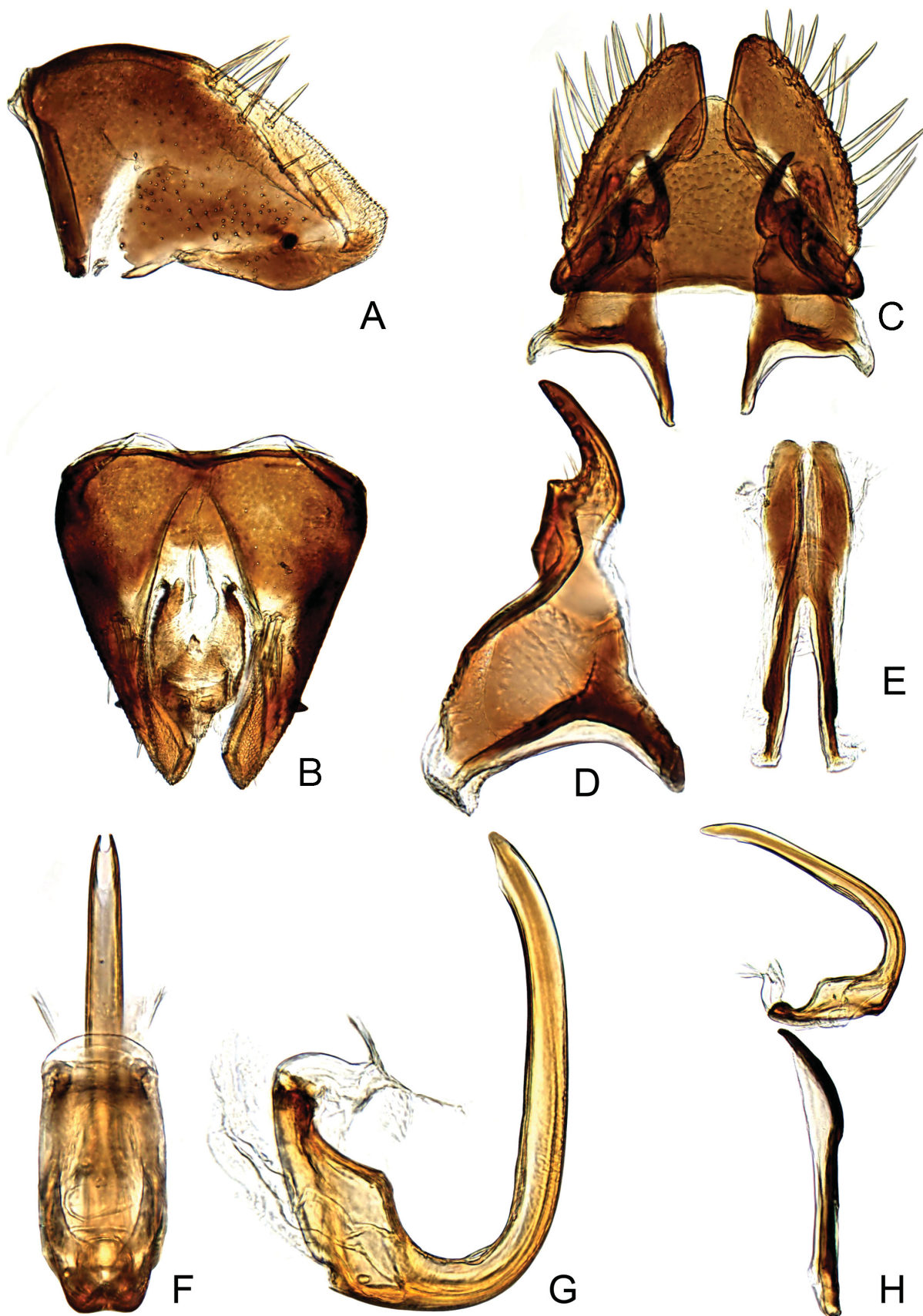


FIGURE 10. *Stirellus labiatus* A: male pygofer lobe, lateral view; B: male pygofer and segments X and XI, dorsal view; C: valve, subgenital plates and styles, ventral view; D: style, dorsal view; E: connective, dorsal view; F: aedeagus, dorsal view; G: aedeagus, lateral view; H: connective and aedeagus, lateral view.

***Stirellus mexicanus* (Osborn & Ball, 1902)**
(Figs 11–12)

Athysanus (*Stirellus*) *mexicanus* Osborn & Ball, 1902: 254.

Euscelis mexicanus, Osborn, 1926: 349.

Stirellus mexicanus, Sleesman, 1929: 126.

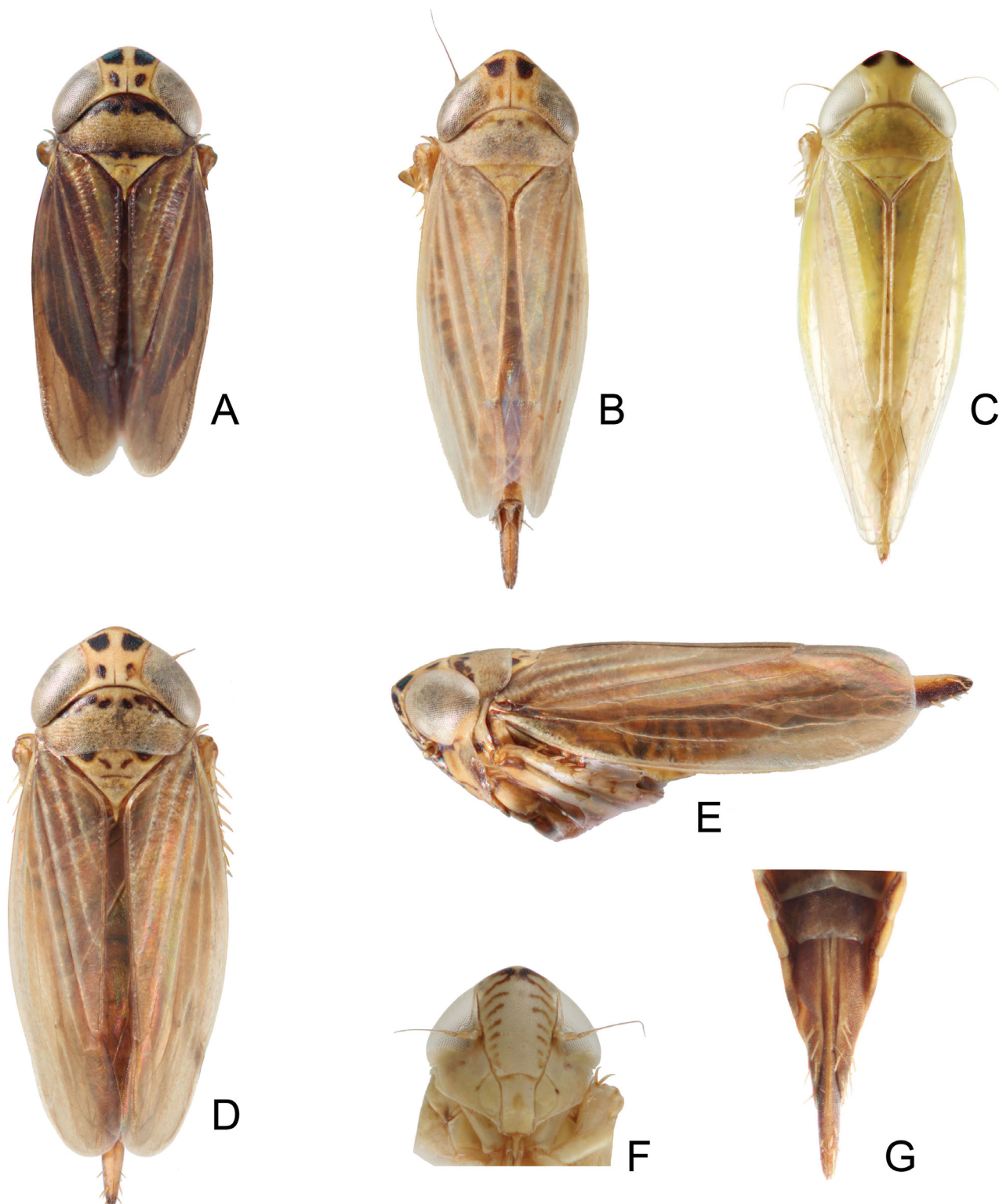


FIGURE 11. *Stirellus mexicanus* A–D: habitus, dorsal view; E: habitus, lateral view; F: face; G: the end of female abdomen, ventral view. A: male; B–G: female.

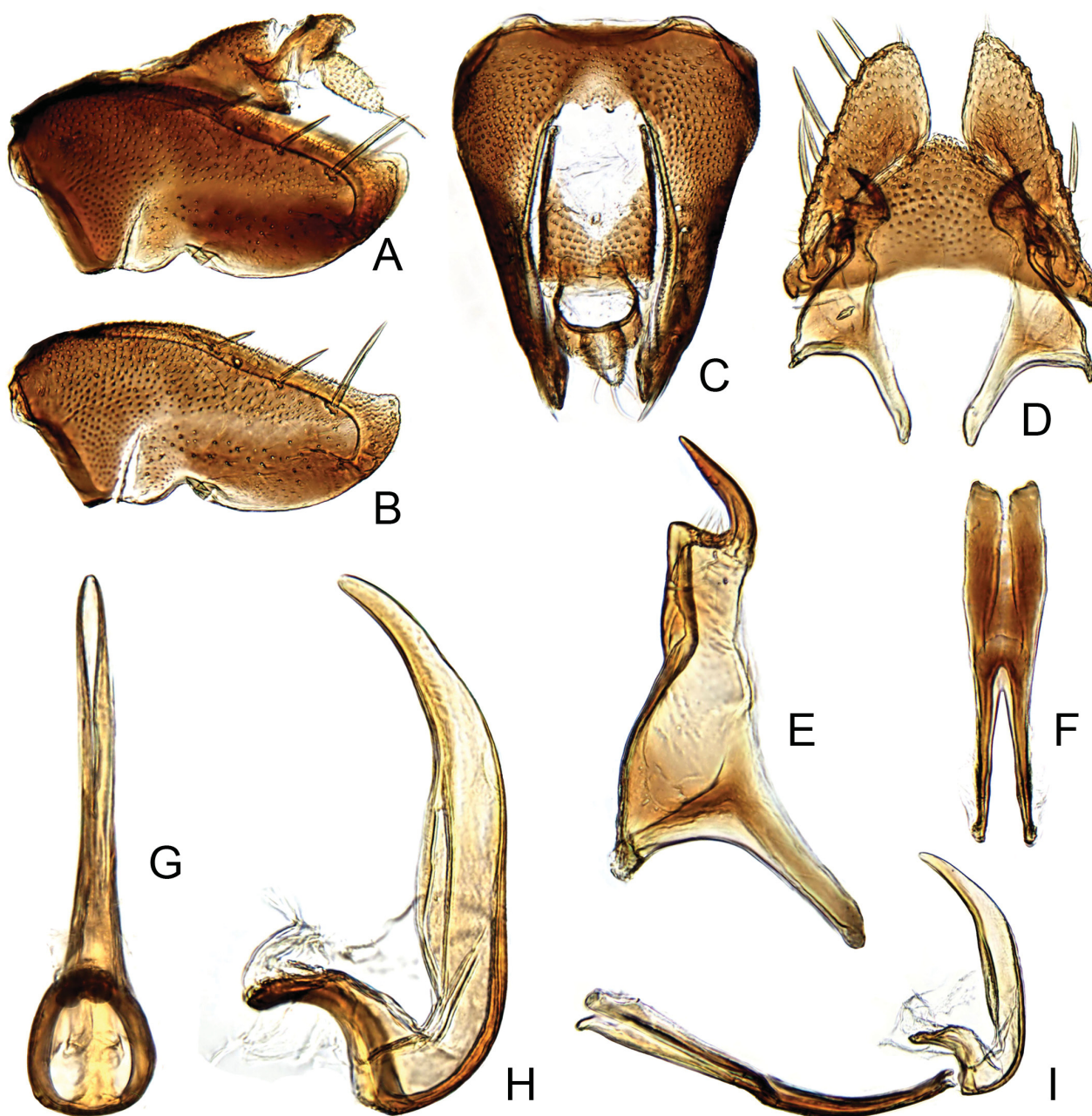


FIGURE 12. *Stirellus mexicanus* A, C: male pygofer and segments X and XI, lateral and dorsal view, respectively; B: male pygofer lobe, lateral view; D: valve, subgenital plates and styles, ventral view; E: style, dorsal view; F: connective, dorsal view; G: aedeagus, dorsal view; H: aedeagus, lateral view; I: connective and aedeagus, lateral view.

Description. Length. Male: 2.6–3.1mm; female: 3.5–4.1mm.

Coloration. Overall color varying from brown to ochraceous to yellow green with dark brown marks (Fig. 11A–E). Crown with pair of dark brown apical spots and usually smaller pair of brown spots posteriorly. Pronotum, mesonotum and scutellum with or without symmetrical dark brown marks (Fig. 11A–D). Frontoclypeus ochraceous with fuscous arcs from lateral frontal suture reaching only part way across (Fig. 11F). Forewing translucent without fuscous tint, veins usually pale (Fig. 11A–E). Femora and tibiae with dark brown marks (Fig. 11E). Abdominal sternites variably infused with dark brown (Fig. 11G).

Morphology. Head wider than pronotum, weakly subconical, crown-face transition slightly angled (Fig. 11A–E). Crown nearly as long as or slightly longer than width between eyes (Fig. 11A–D). Anteclypeus nearly parallel-

sided, extending beyond normal curve of genae (Fig. 11F). Pronotum median length nearly as long as median length of crown. Mesonotum and scutellum together nearly as long as pronotum (Fig. 11A–D). Forewing macropterous, usually exposing apex of abdomen in female (Fig. 11A–E).

Male genitalia. Pygofer side with few macrosetae dorsally, dorsal margin with slight preapical concavity, posterior margin rounded (Fig. 12A, B). Subgenital plate slightly convex laterally, macrosetae uniseriate on lateral margin (Fig. 12D). Style apophysis digitate, slim, laterally curved, preapical lobe relatively broad and acute (Fig. 12E). Connective H-shaped, stem nearly as long as arms and very broad (Fig. 12F). Aedeagal shaft in lateral view sharply bent near base, relatively short and broad, distinctly expanded just dorsad of bend, broadly curved distally, apex blunt; in posterior view very slender and tapered with gonopore unusually elongate (Fig. 12G–I).

Female. Hind margin of seventh sternum nearly straight with very short lateral angles (Fig. 11G).

Material examined. 4♂♂, 4♀♀, 3ml. E Ocozocoantla, Chiapas, Mex, Je 24, 55GL262 RB & JM Selander (INHS); 3♂♂, 1♀, Mexico: Quintana Roo about 33 Km from Majahual along road from Majahual to road 307, 21 xi 2004, coll. M. Olmi (INHS).

Distribution. Cuba; Mexico; USA.

Remarks. It is similar to *Stirellus picinus* but it can be distinguished by the truncate hind margin of female sternite VII, by the upturned apex of the male pygofer lobe and the tapered aedeagal apex (in posterior view) with elongate gonopore.

Stirellus picinus (Berg, 1879) n. rec.

(Figs 13–14)

Athysanus picinus Berg, 1879: 263.

Stirellus picinus, Linnavuori, 1959: 322.

Description. Length. Male: 3.1–3.6mm; female: 4.2–4.6mm.

Coloration. General color usually from dark brown to yellow green with dark brown maculae (Fig. 13A–E). Crown with marks on vertex that are variable, usually with large triangular anterior pair and smaller posterior pair but posterior pair absent in some specimens. Pronotum, mesonotum and scutellum with or without dark brown maculae (Fig. 13A–D). Frontoclypeus ochraceous with fuscous arcs (Fig. 13F). Forewing translucent veins pale yellow and areas between veins variably infused with dark brown (Fig. 13A–E). Femora and tibiae with dark brown marks (Fig. 13E). Abdominal sternites variably infused with dark brown (Fig. 13G).

Morphology. Head wider than pronotum, subconical, anterior margin rounded to face (Fig. 13A–E). Crown nearly as long as or slightly longer than width between eyes (Fig. 13A–D). Anteclypeus slightly tapered, extending beyond normal curve of genae (Fig. 13F). Pronotum median length nearly as long as median length of crown. Mesonotum and scutellum nearly as long as pronotum (Fig. 13A–D). Forewing macropterous, usually exposing apex of abdomen in female (Fig. 13A–E).

Male genitalia. Pygofer side with few macrosetae dorsally, dorsal margin slightly concave distally, posterior margin rounded (Fig. 14A, B). Subgenital plate convex laterally, macrosetae uniseriate laterally (Fig. 14D, E). Style apophysis digitate, short, laterally curved; preapical lobe forming right angle (Fig. 14F–H). Connective Y-shaped, stem broad and nearly as long as arms (Fig. 14I). Aedeagal shaft curved strongly dorsad near base, relatively short and broad in lateral view, slightly curved anterad beyond midlength, apex tapered to blunt tip, apex broadened and bifid in dorsal view (Fig. 14J–L).

Female. Seventh sternum produced and tapered to shallowly bilobed apex (Fig. 13G).

Material examined. 2♂♂, 3♀♀, Argentina: Misiones Rt 211 36 km SE jct Rt 12, 450m, 26° 55' 55" S 54° 43' 52" W, 5 i 2008, coll. C.H. Dietrich, vacuum, AR5-1 (INHS); 1♂, Argentina: Misiones Pto. Iguazú, Viejo Amer. Campgd, 200m, 25° 37' 19" S 54° 32' 52" W, 7 i 2008, coll. C.H. Dietrich, sweeping, AR7-2 (INHS); 1♂, 1♀, Argentina: Corrientes, P.N. Mburucuyà 1.8 km W Campgd, 80m, 28° 1' 11" S 58° 3' 18" W, 8 i 2008, coll. C.H. Dietrich, vacuum, AR9-4 (INHS); 1♂, Brazil: Parana nr. Ponta Grossa, 8 ii 1974, coll. S.G. Turnipseed, 969 (INHS); 1♂, Costa Rica Punt 7km, E Las Juntas, 5 ix 1998, coll. C.W. & L.O'Brien (INHS); 1♀, British Virgin Is. Guana Island, 16 x 1993, coll. C. Parilet & J. Cryan (INHS).

Distribution. Argentina; Bolivia; Brazil; Colombia; Costa Rica; Virgin Islands; Honduras; Panama; Suriname; Venezuela.

Remarks. This species is here recorded from the British Virgin Islands (Guana Island) for the first time. It is similar to *S. mexicanus*, but it can be distinguished by the shape of the hind margin of the female seventh abdominal sternum and the apex of the aedeagal shaft.

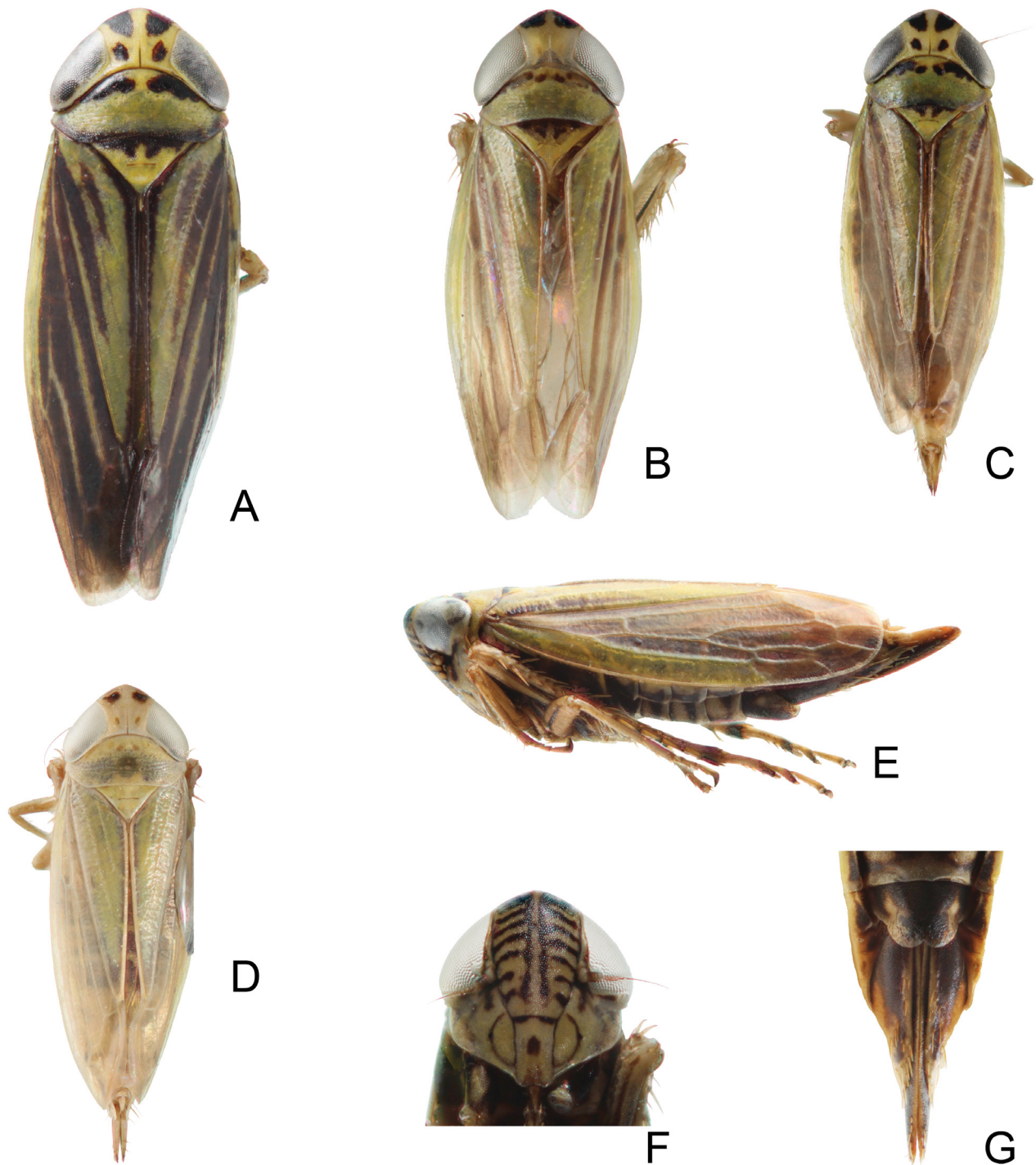


FIGURE 13. *Stirellus picinus* A–D: habitus, dorsal view; E: habitus, lateral view; F: face; G: the end of female abdomen, ventral view. A, B, F: male; C–E, G: female.

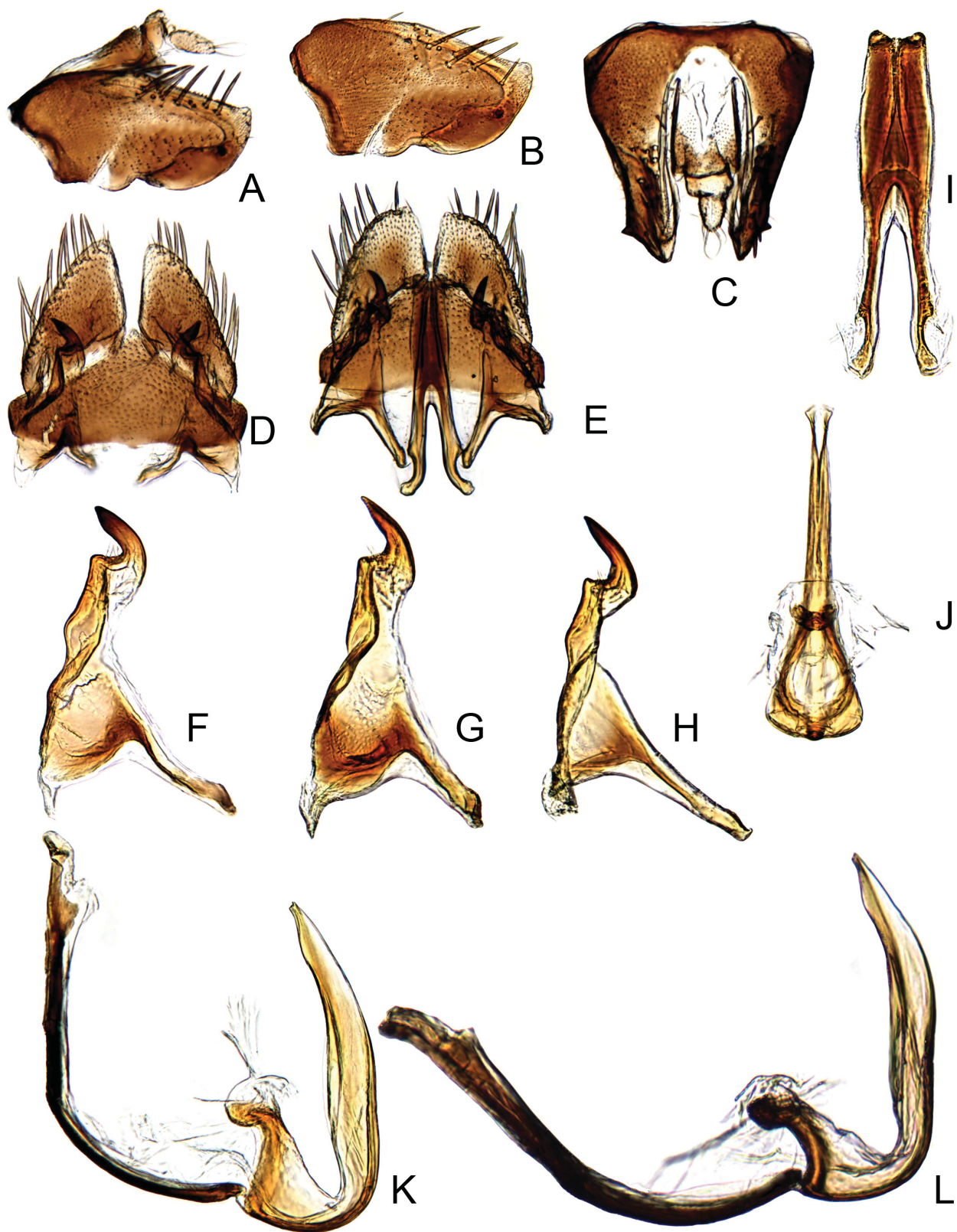


FIGURE 14. *Stirellus picinus* A, C: male pygofer and segments X and XI, lateral and dorsal view, respectively; B: male pygofer lobe, lateral view; D: valve, subgenital plates and styles, ventral view; E: valve, subgenital plates, styles and connective, ventral view; F–H: style, dorsal view; I: connective, dorsal view; J: aedeagus, dorsal view; K, L: connective and aedeagus, lateral view.

***Stirellus laetus* (Melichar, 1903) n. rec.**

(Figs 15–16)

Deltocephalus laetus Melichar, 1903: 202.

Stirellus laetus, Webb & Viraktamath, 2009: 30.

Description. Length. Male: 2.8mm.

Coloration. General color usually stramineous with orange-red and dark brown markings (Fig. 15A, B). Crown with transverse preapical orange band, pronotum with anterior margin orange, mesonotum with basal triangle orange (Fig. 15A). Face with two black round markings on each side just below antennal sockets; frontoclypeus ochraceous with fuscous arcs (Fig. 15C). Forewing translucent without fuscous tint (Fig. 15A, B). Femora and tibiae with dark brown marks. Abdominal segments variably infused with dark brown (Fig. 15B).

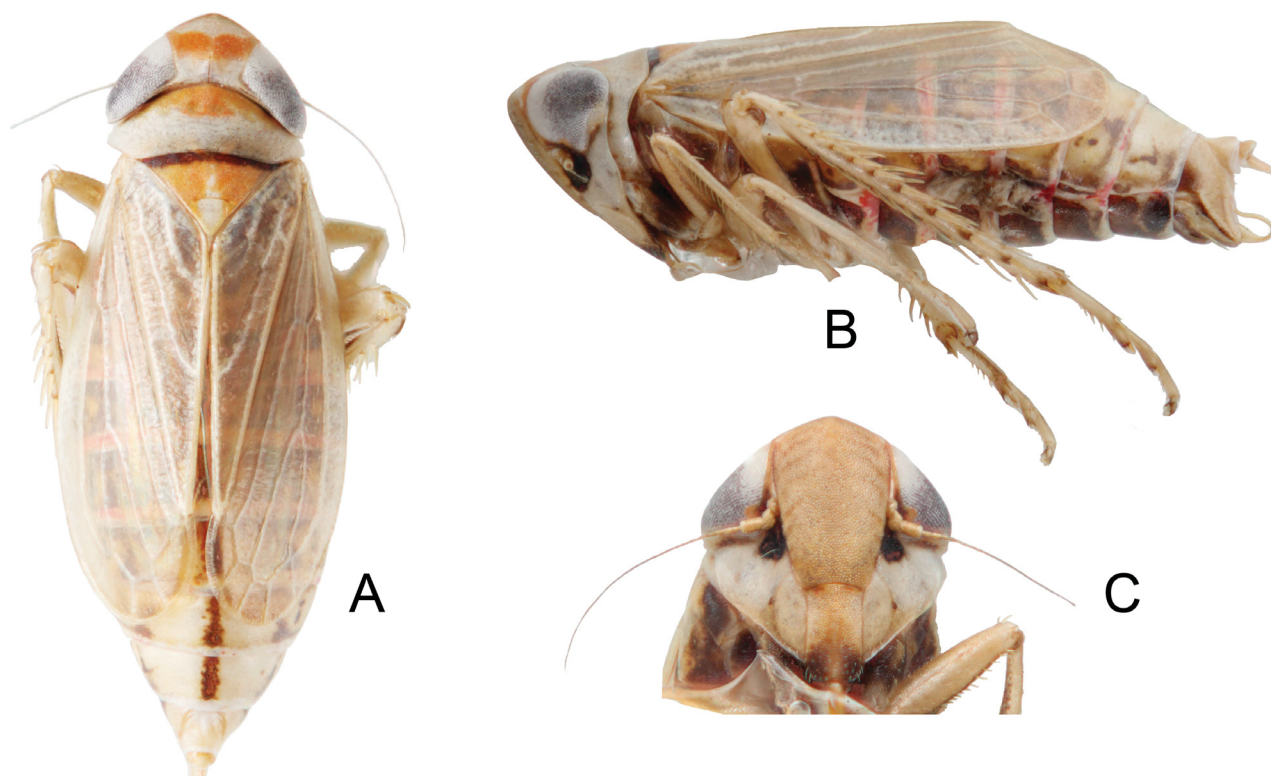


FIGURE 15. *Stirellus laetus* A: habitus, dorsal view; B: habitus, lateral view; C: face.

Morphology. Head nearly as long as pronotum, subconical, anterior margin rounded to face, angled in dorsal and lateral view (Fig. 15A, B). Crown nearly as long as width between eyes (Fig. 15A). Anteclypeus parallel-sided, extending beyond normal curve of genae (Fig. 15C). Pronotum median length nearly as long as median length of crown. Mesonotum and scutellum together longer than pronotum (Fig. 15A). Forewing submacropterous, usually exposing apex of abdomen (Fig. 15A, B).

Male genitalia. Pygofer side with few macrosetae dorsally, steeply declivous posteriorly, apex narrow, posterior margin bluntly rounded (Fig. 16A). Subgenital plate slightly convex laterally, macrosetae uniseriate, well separated from lateral margin, not extended to apex (Fig. 16C). Style apophysis relatively long, digitate, nearly straight, preapical lobe forming right angle (Fig. 16D). Connective H-shaped, stem broad and nearly as long as arms (Fig. 16E). Aedeagal shaft strongly bent dorsad near base, long, sinuate, parallel to aedeagal base in lateral view, apex hooked and blunt; in posterior view abruptly constricted near apex, apex pointed (Fig. 16F, G).

Female. Hind margin of seventh sternum slightly concave.

Material examined. 1♂, Thailand Loei Phu Ruea NP Pah Lo Noy, 17° 33' 502" N 101° 20' 868" E, 1343m, Pan trap, 5–6 ix 2006, Nukoonchai Jaroenchai, leg T817 (INHS).

Distribution. India; Sri Lanka; Thailand.

Remarks. This species is here recorded from Thailand for the first time.

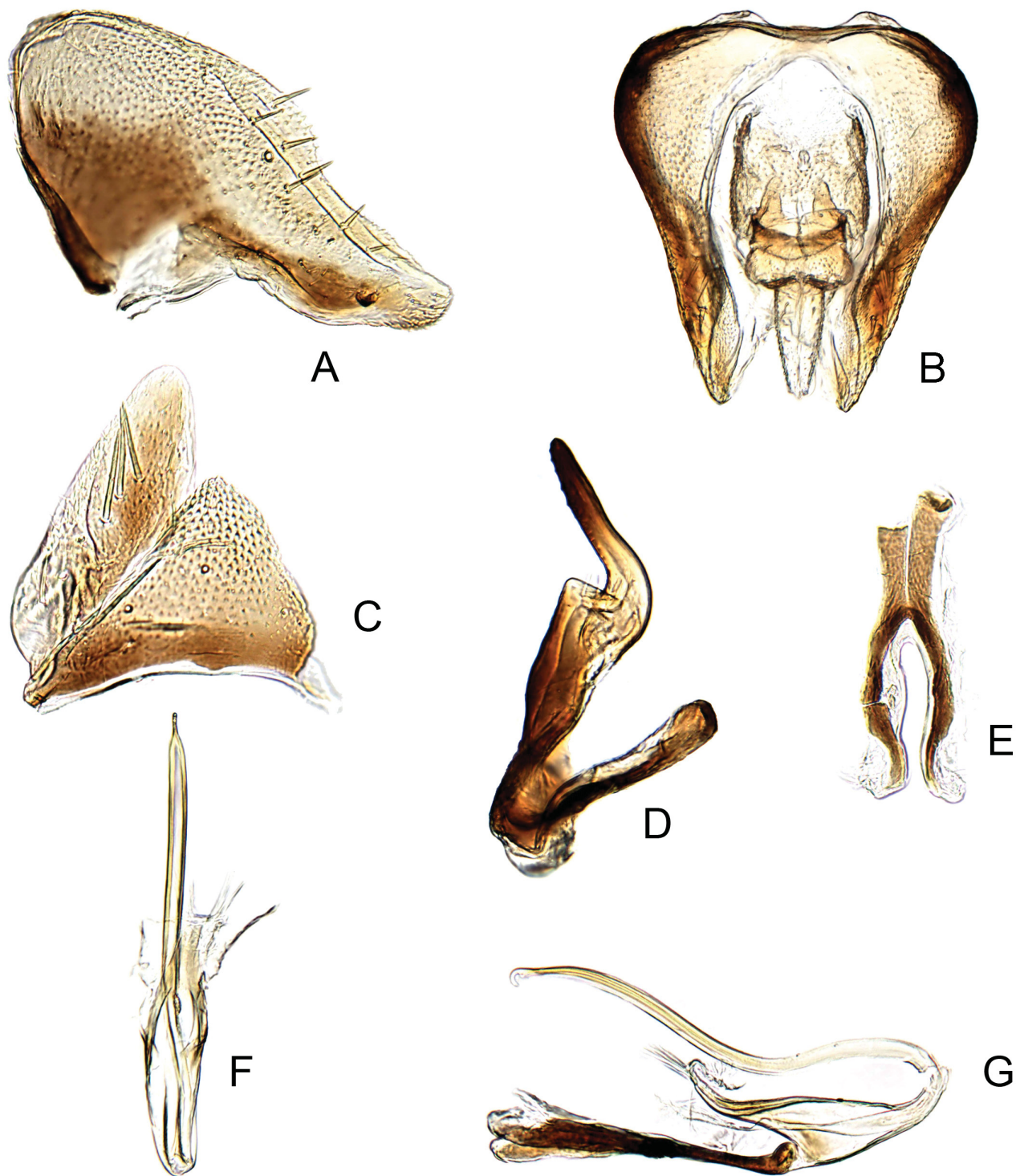


FIGURE 16. *Stirellus laetus* A: male pygofer lobe, lateral view; B: male pygofer and segments X and XI, dorsal view; C: valve and subgenital plate, ventral view; D: style, dorsal view; E: connective, dorsal view; F: aedeagus, dorsal view; G: connective and aedeagus, lateral view.

***Stirellus multipunctatus* Duan, Webb & Zhang, 2016 n. rec.**
(Figs 17–18)

Stirellus multipunctatus Duan, Webb & Zhang, 2016: 120.

Length. Male: 3.4–3.8mm; female: 3.6–4.4mm.

Material examined. 6♂♂, 9♀♀, Thailand Phetchabun Nam Nao NP Forest protection unit Huay Pralard cave, 16° 44' 986" N 101° 27' 874" E, 711m, Malaise trap, 5–12 ii 2007, Noopean Hongyothi, leg T1632 (QSBG, INHS).

Distribution. China; Thailand.

Remarks. This species is here recorded from Thailand for the first time. Duan *et al.* (2016) described this species adequately. We supplement their description with color illustrations. The hind margin of female sternite VII is slightly concave (Fig. 17F).

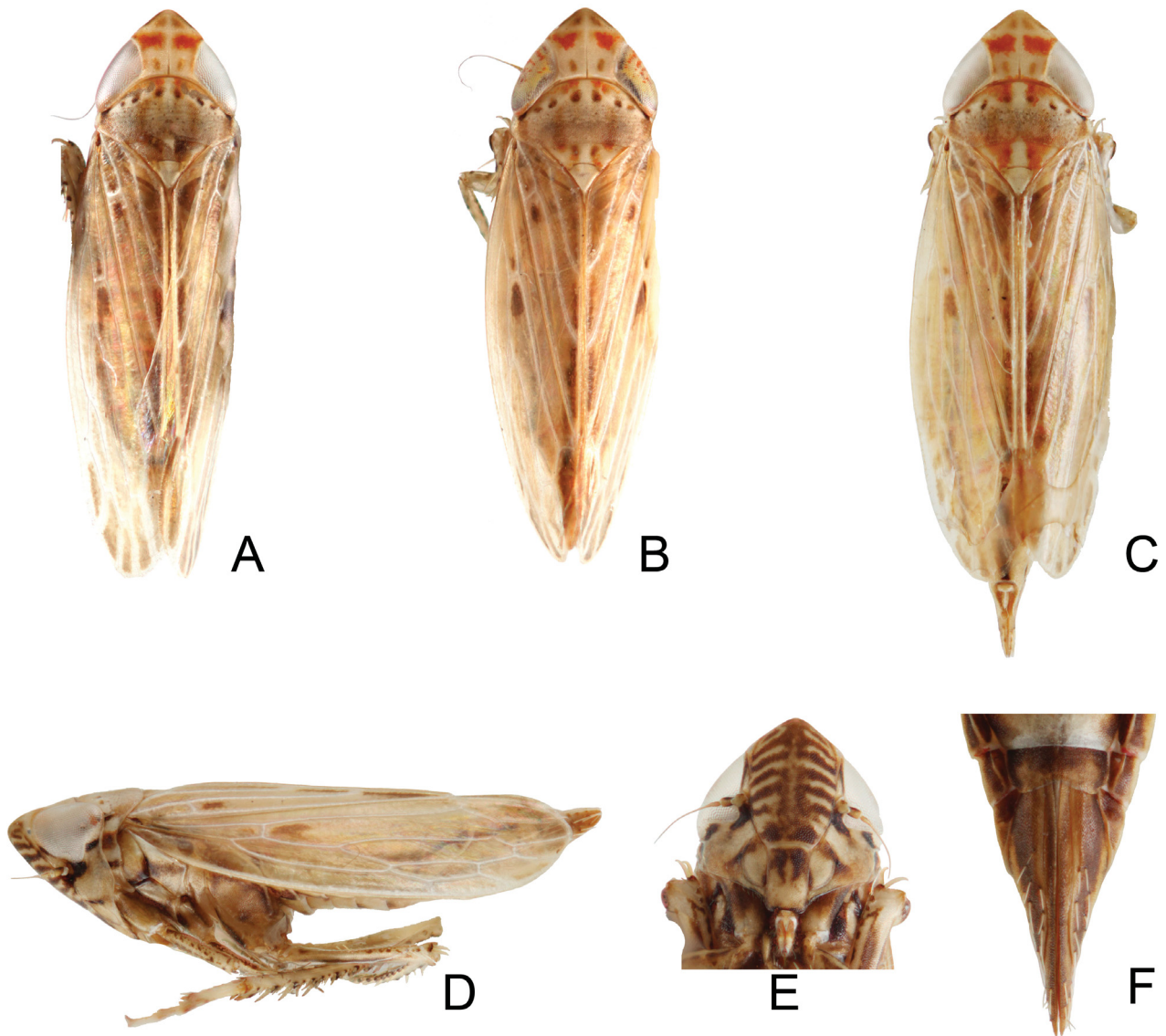


FIGURE 17. *Stirellus multipunctatus* A–C: habitus, dorsal view; D: habitus, lateral view; E: face; F: the end of female abdomen, ventral view. A: male; B–F: female.

Stirellus neospeciosus Duan, Webb & Zhang, 2016 n. rec.
(Fig. 19)

Stirellus neospeciosus Duan, Webb & Zhang, 2016: 121.

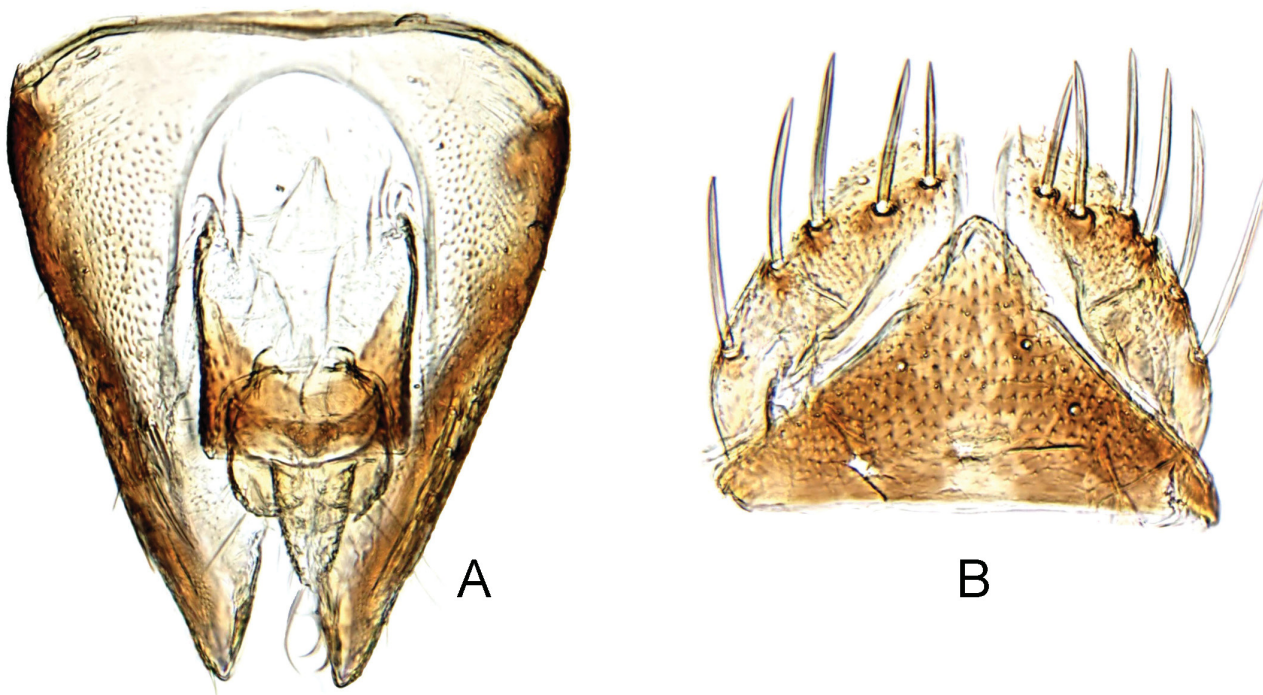


FIGURE 18. *Stirellus multipunctatus* A: male pygofer and segments X and XI, dorsal view; B: valve and subgenital plates, ventral view.

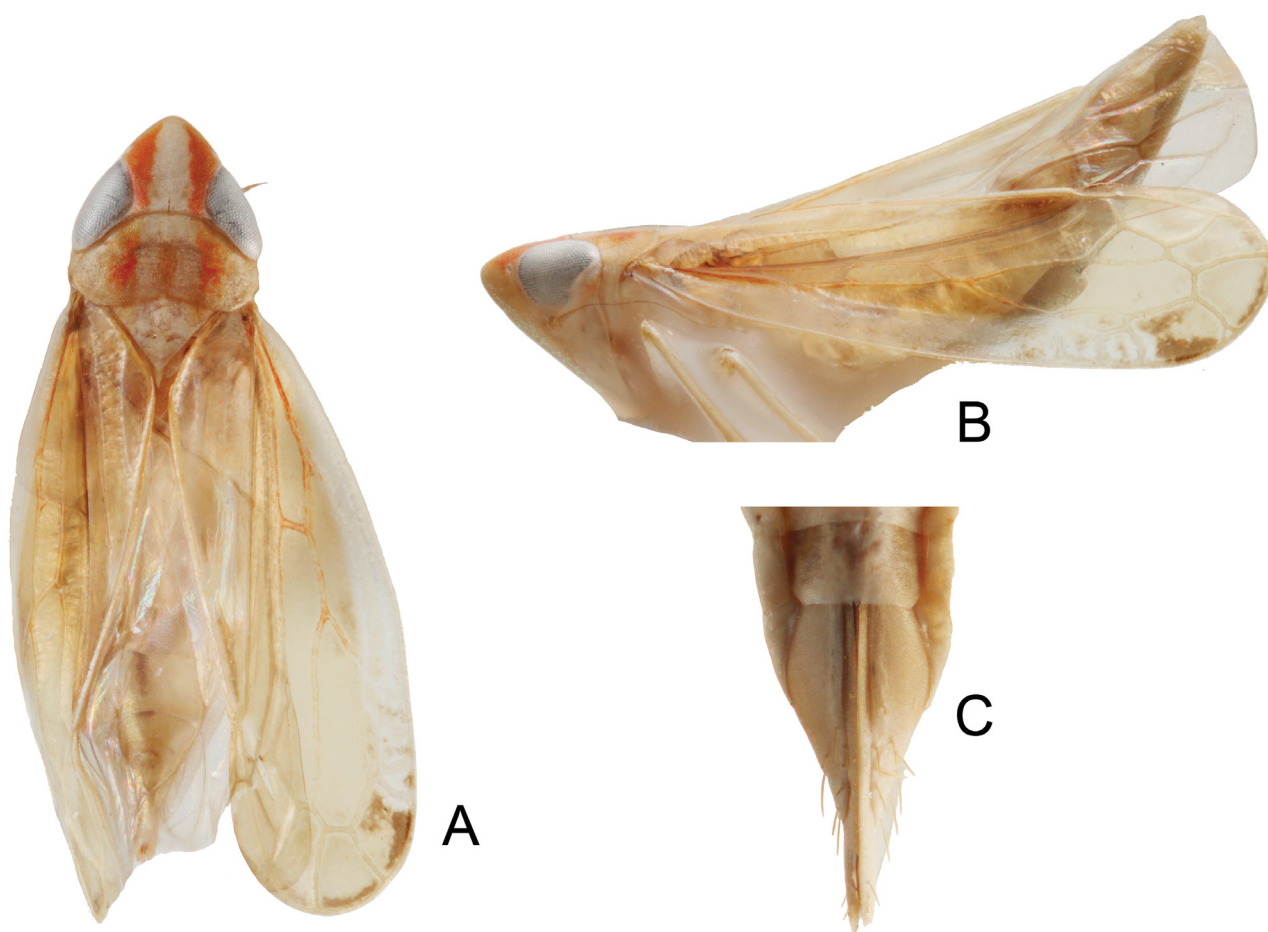


FIGURE 19. *Stirellus neospeciosus* A: habitus, dorsal view; B: habitus, lateral view; C: the end of female abdomen, ventral view.

Length. Male: 3.8–4.0mm; female: 4.1–4.4mm.

Material examined. 1♀, Thailand Nan Doi Phu Kha NP Office 14, 19° 12' 488" N 101° 4' 907" E, 1375m, Malaise, 8–15 xii 2007, Charoen & Nikomi, leg T3278 (INHS).

Distribution. China; Thailand.

Remarks. This species is newly recorded from Thailand. Duan *et al.* (2016) have described this species adequately. We supplement their description by including color illustrations. The hind margin of female sternite VII is slightly concave or straight (Fig. 19C).

***Stirellus rubrolineatus* (Distant, 1908) n. rec.**

(Fig. 20)

Arya rubrolineata Distant, 1908: 338.

Stirellus rubrolineatus, Duan, Webb & Zhang, 2016: 127.

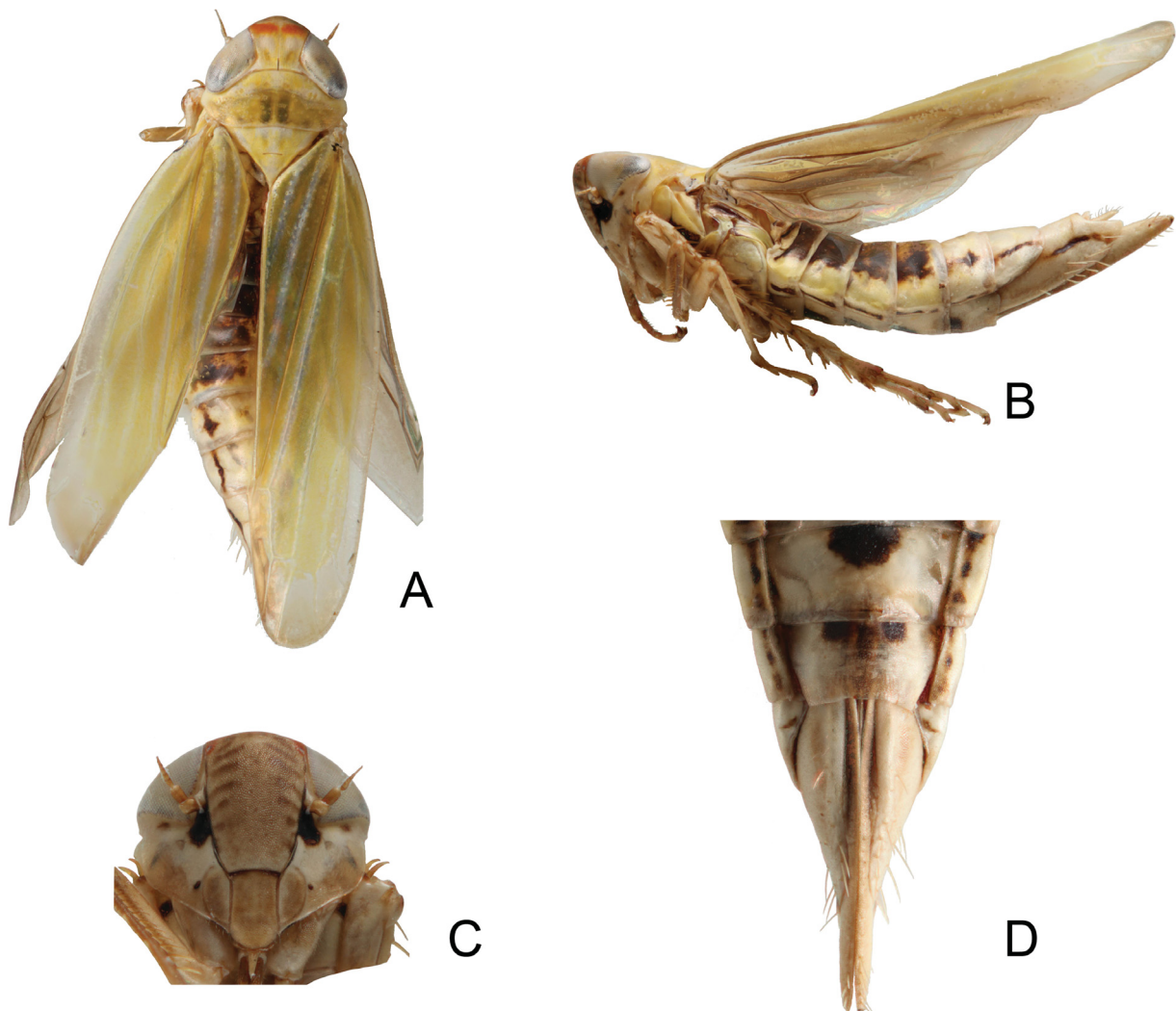


FIGURE 20. *Stirellus rubrolineatus* A: habitus, dorsal view; B: habitus, lateral view; C: face; D: the end of female abdomen.

Length. Male: 4.8–5.1mm; female: 5.9mm.

Material examined. 1♀, Thailand Chaityaphum Pa Hin Ngam NP Savana (Thepana waterfall), 15° 38' 948" N 101° 25' 625" E, 604m, Malaise, 1–7 x 2006, K Sa-nog & B. Adnafai, leg T657 (INHS).

Distribution. China; India; Thailand.

Remarks. This species is newly recorded from Thailand. Duan *et al.* (2016) described this species adequately. We supplement their description by including color illustrations. The hind margin of female sternite VII is slightly concave (Fig. 20D).

***Stirellus sagittarius* (Naudé, 1926)**

(Figs 21–22)

Aconura sagittaria Naudé, 1926: 54.

Stirellus sagittarius, Theron, 1975: 189.

Length. Male: 3.0–3.6mm; female: 4.1–5.1mm.

Material examined. 4♂♂, 4♀♀, South Africa: KZN Prov. Kwa Dlamini-White Mt. Resort, 29° 08' 186" S 29° 36' 408" E, 1532m, 26 xii 2004, #04-66, coll. J.N. Zahniser, sweep (INHS).

Distribution. Namibia; South Africa.

Remarks. Theron (1975) described this species adequately. We supplement his description by including color illustrations.

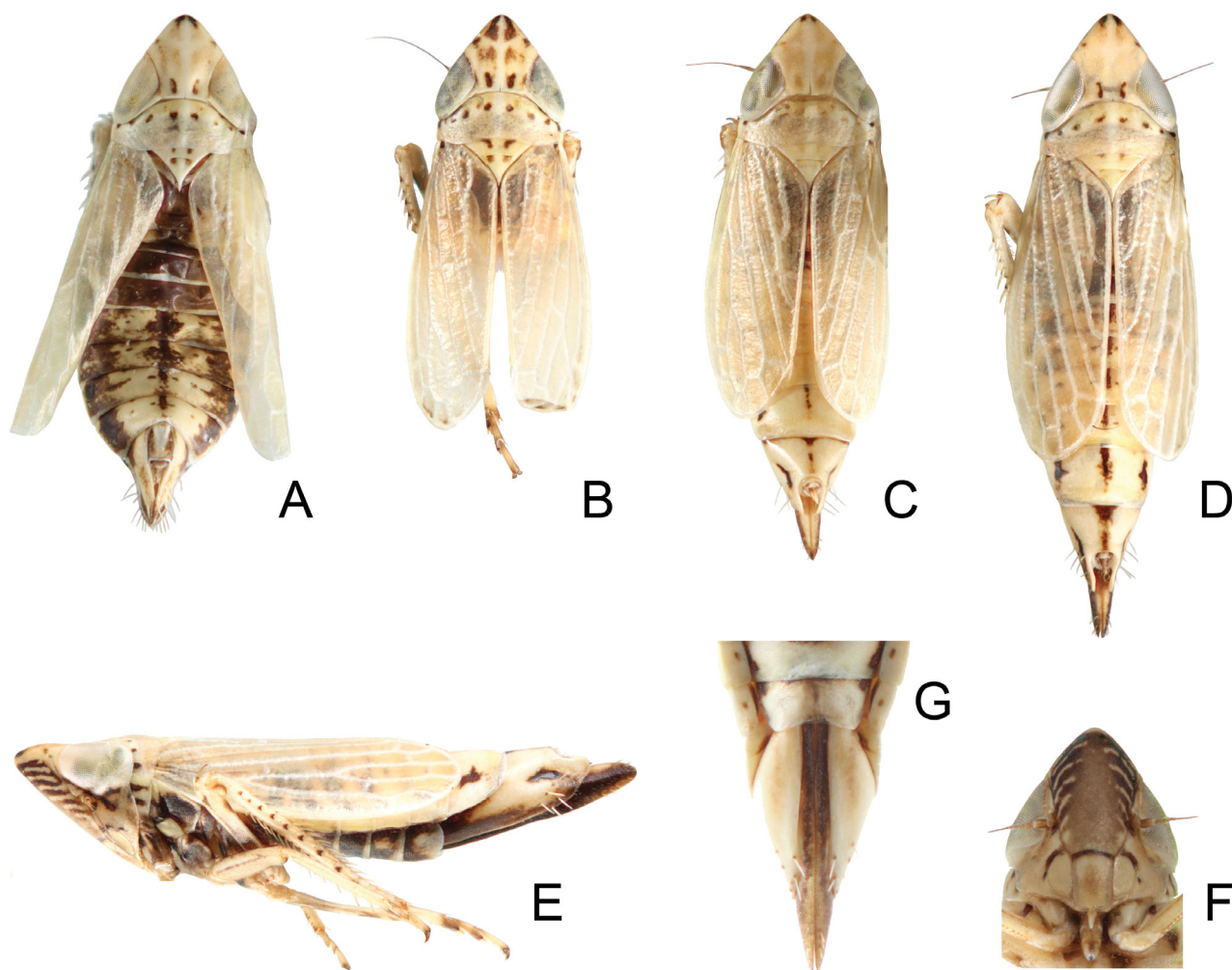


FIGURE 21. *Stirellus sagittarius* A–D: habitus, dorsal view; E: habitus, lateral view; F: face; G: the end of female abdomen, ventral view. A, B: male; C–G: female.

***Stirellus lesioensis* sp. nov.**

(Figs 23–24)

Description. Length. Male: 4.1–4.2mm.

Coloration. General color stramineous with brown or orange-red marks (Fig. 23A–C). Crown with pair of small apical submedial spots, four spots between anterior eye angles and two spots on posterior margin; pronotum, mesonotum and scutellum symmetrically marked with brown or orange-red (Fig. 23A, B). Frontoclypeus brown with

sordid white arcs reaching only part way across (Fig. 23D, E). Forewing translucent with fuscous tint and white veins (Fig. 23A–C). Femora and tibiae with dark brown marks (Fig. 23C). Abdominal sternites variably infused with dark brown.

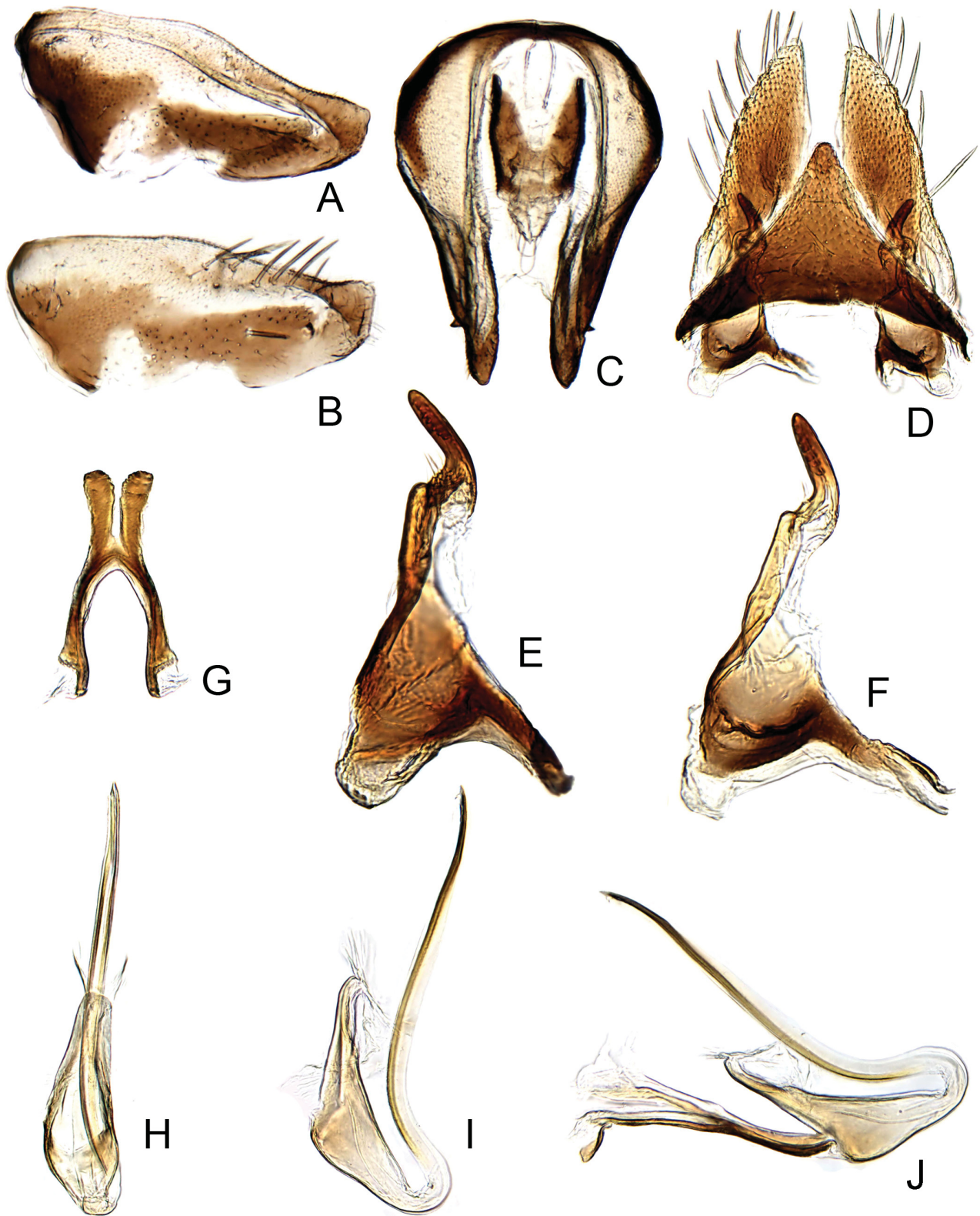


FIGURE 22. *Stirellus sagittarius* A, B: male pygofer lobe, lateral view; C: male pygofer and segments X and XI, dorsal view; D: valve, subgenital plates and styles, ventral view; E, F: style, dorsal view; G: connective, dorsal view; H: aedeagus, dorsal view; I: aedeagus, lateral view; J: connective and aedeagus, lateral view.

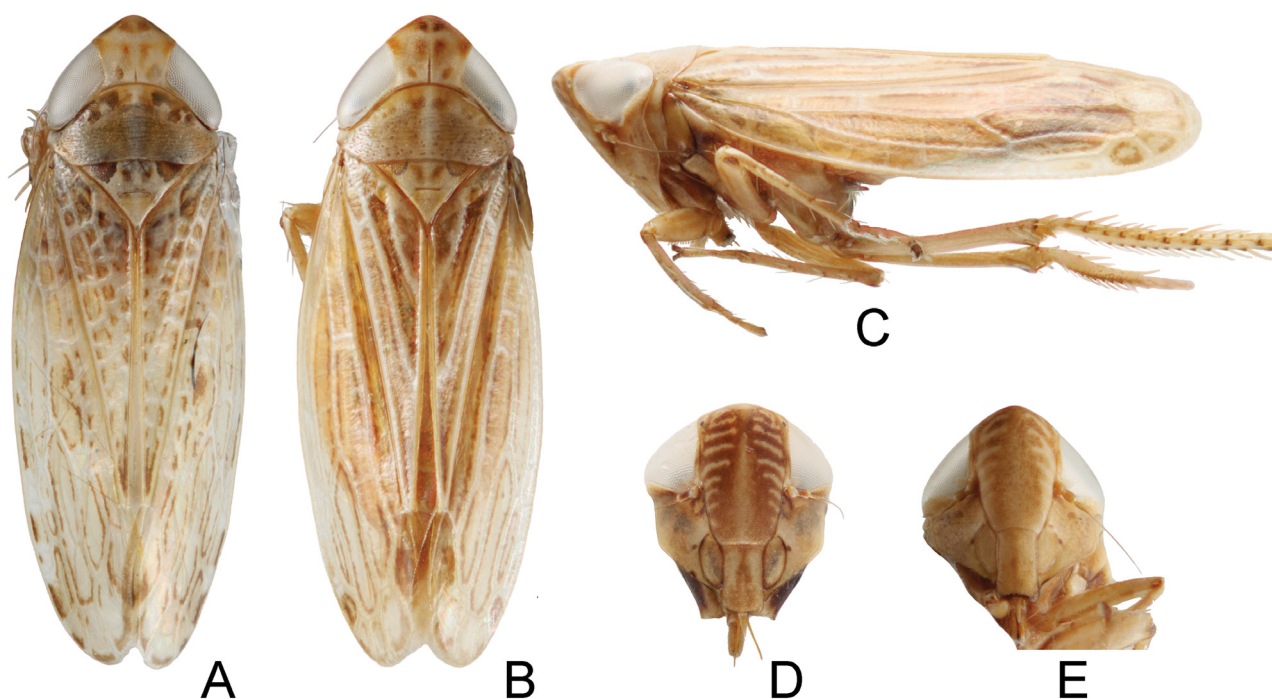


FIGURE 23. *Stirellus lesioensis* sp. nov. A, B: habitus, dorsal view; C: habitus, lateral view; D, E: face. A, D: holotype, male; B, C, E: paratype, male.

Morphology. Head nearly subequal in width to pronotum, subconical, anterior margin rounded to face, angled in dorsal and lateral view (Fig. 23A–C). Crown with anterior margin forming right angle in dorsal view, slightly longer than width between eyes (Fig. 23A, B). Anteclypeus parallel-sided, extending slightly beyond normal curve of genae (Fig. 23D, E). Pronotum median length slightly longer than median length of crown. Mesonotum and scutellum together nearly as long as pronotum (Fig. 23A, B). Forewing macropterous, with few to many supernumerary crossveins (Fig. 23A–C).

Male genitalia. Pygofer side long, with few macrosetae dorsally, dorsal margin slightly concave distally, posterior margin nearly truncate (Fig. 24A). Subgenital plate slightly concave laterally, macrosetae uniseriate laterally (Fig. 24C). Style apophysis digitate, laterally curved, preapical lobe poorly developed, rounded (Fig. 24D). Connective Y-shaped, stem broad and shorter than arms (Fig. 24E). Aedeagal shaft bent dorsad near base, long, very slender, sinuate in lateral view, apex abruptly tapered to point in dorsal view (Fig. 24F–H).

Material examined. Holotype: ♂, REP OF CONGO Dept Pool, Abio Lesio-Louna Pk, 03° 06' 020" S 15° 31' 440" E, 330m, MT, 29 viii 2008, coll. Braet & Sharkey (INHS). Paratype: 1♂, same data as holotype (INHS).

Etymology. The species epithet is based on the type locality.

Distribution. Republic of Congo.

Remarks. This species can be distinguished from other species of *Stirellus* by the distinctive color pattern of the crown (Fig. 23A, B), presence of supernumerary crossveins on the forewing, and the relatively long, apically truncate male pygofer (Fig. 24A, B). The Australian species *S. hamuala* also has supernumerary crossveins on the forewing but its forewing is truncate apically rather than rounded.

Stirellus paralesioensis sp. nov.

(Figs 25–26)

Description. Length. Male: 3.3–3.6mm; female: 4.6mm.

Coloration. General color stramineous with brown marks (Fig. 25A–C). Crown unmarked except pair of small spots on posterior margin, pronotum with transverse row of 4–6 anterior spots, mesonotum with pair of small sub-

medial spots (Fig. 25A, B). Frontoclypeus with sordid white arcs reaching only part way across (Fig. 25D). Forewing translucent with fuscous tint and white veins (Fig. 25A–C). Femora and tibiae with dark brown marks (Fig. 25C). Abdominal segments variably infused with dark brown (Fig. 25E).

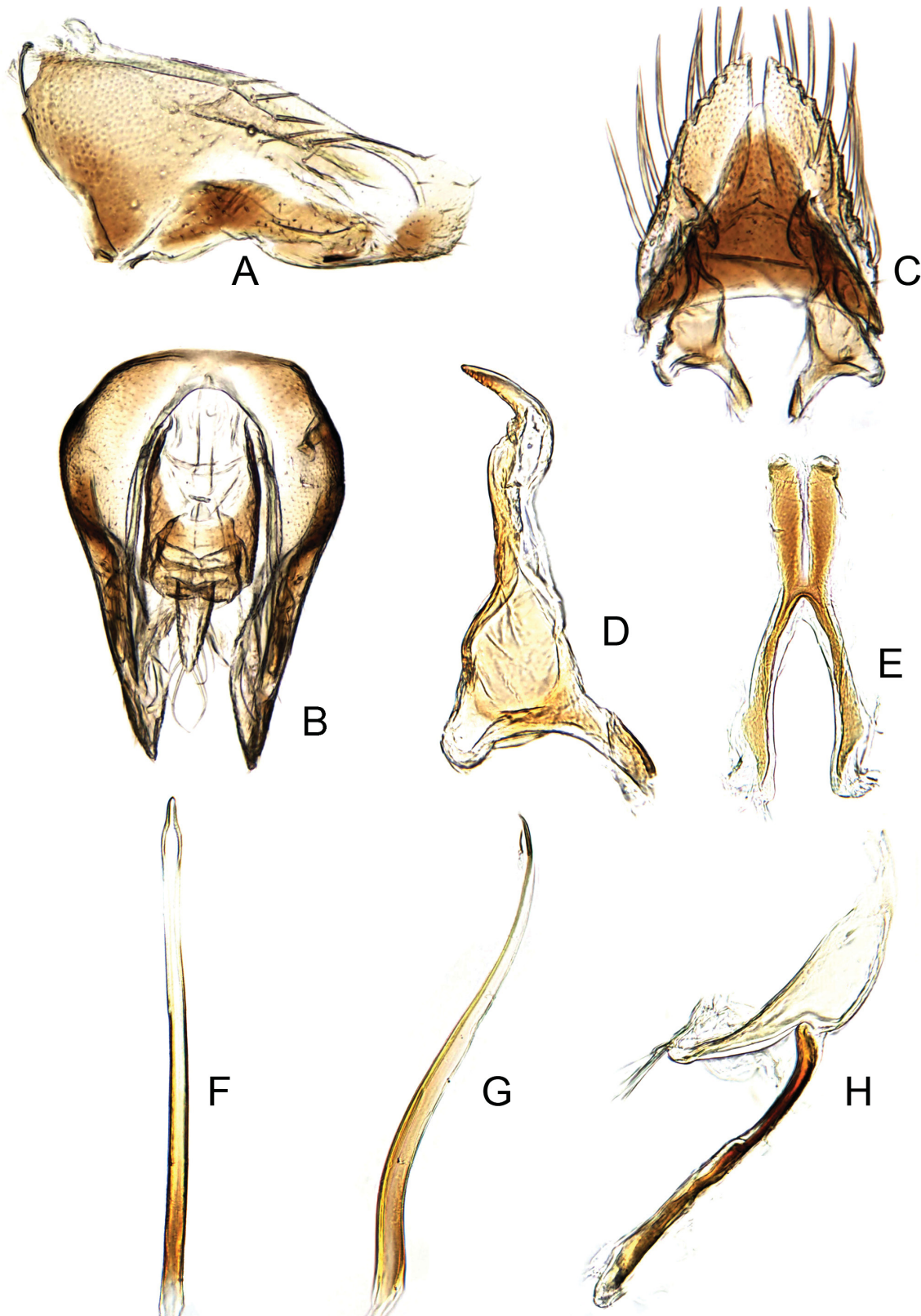


FIGURE 24. *Stirellus lesioensis* sp. nov. A: male pygofer lobe, lateral view; B: male pygofer and segments X and XI, dorsal view; C: valve, subgenital plates and styles, ventral view; D: style, dorsal view; E: connective, dorsal view; F: aedeagal shaft, dorsal view; G: aedeagal shaft, lateral view; H: connective and aedeagal base, lateral view. A–H: holotype, male.

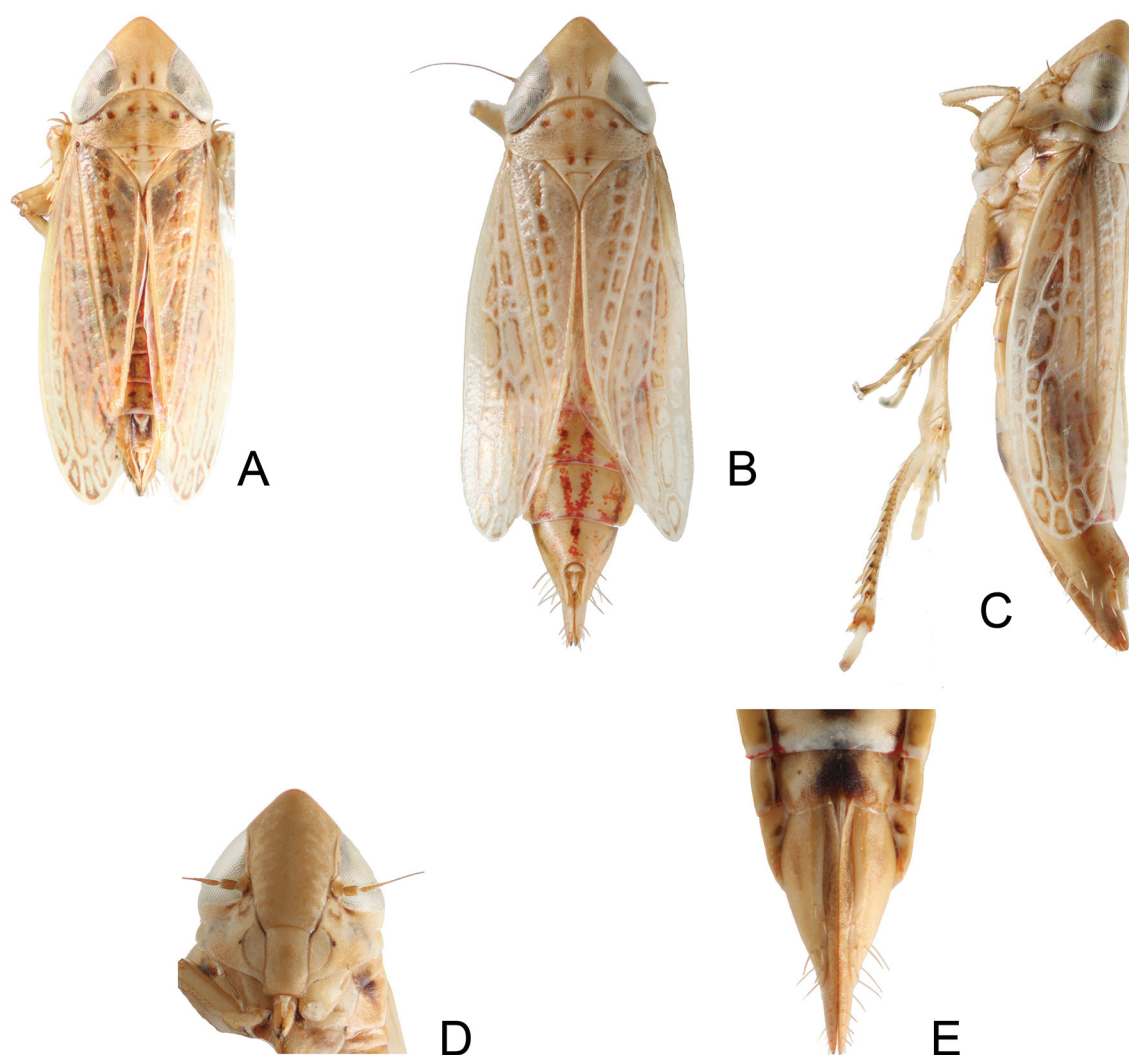


FIGURE 25. *Stirellus paralesioensis* sp. nov. A, B: habitus, dorsal view; C: habitus, lateral view; D: face; E: the end of female abdomen, ventral view. A: paratype, male; B–E: paratype, female.

Morphology. Head slightly narrower than pronotum, subconical, anterior margin rounded to face, acutely angled in dorsal and lateral view (Fig. 25A–C). Crown nearly as long as 2x width between eyes (Fig. 25A, B). Anteclypeus parallel-sided, extending slightly beyond normal curve of genae (Fig. 25D). Pronotum median length shorter than median length of crown. Mesonotum and scutellum together nearly as long as pronotum (Fig. 25A, B). Forewing submacropterous, usually exposing apex of abdomen in female, with many supernumerary crossveins (Fig. 25A–C).

Male genitalia. Pygofer side long, with few macrosetae dorsally, posterior margin nearly truncate (Fig. 26A). Subgenital plate slightly concave laterally, macrosetae uniseriate laterally (Fig. 26C). Style apophysis digitate, laterally curved (Fig. 26D, E). Connective Y-shaped, stem shorter than arms (Fig. 26F). Aedeagal shaft bent at near base, long, slim, curving, parallel to aedeagal base, tip not pointed in dorsal view (Fig. 26G, H).

Female. Hind margin of seventh sternum shallowly concave (Fig. 25E).

Material examined. Holotype: ♂, South Africa: W Cape Prov. Koeël Bay, 34° 14' 560" S 18° 51' 573" E, 64.5m, 18 xii 2004, #04-52, coll. J.N. Zahniser, sweep (INHS). Paratypes: 1♀, South Africa: W Cape Prov. Voëlvleidam, 33° 20' 768" S 19° 03' 389" E, 90.5m, 14 xii 2004, #04-37, coll. J.N. Zahniser, sweep (INHS); 1♂, 1♀, South Africa: W Cape Prov. Hangklip, 33° 22' 686" S 18° 50' 759" E, 1.797m, 19 xii 2004, #04-54, coll. J.N. Zahniser, sweep (INHS).

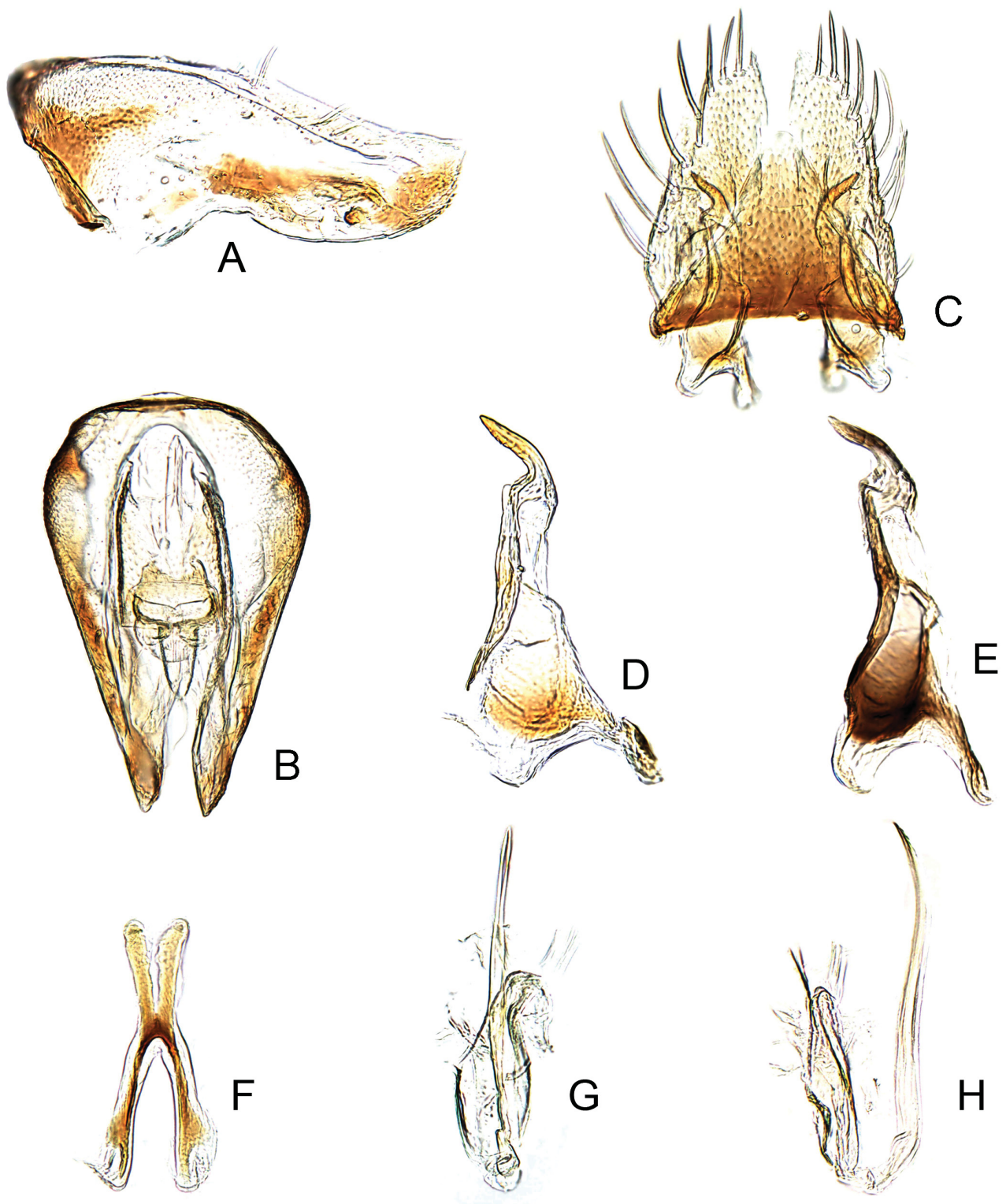


FIGURE 26. *Stirellus paralesioensis* **sp. nov.** A: male pygofer lobe, lateral view; B: male pygofer and segments X and XI, dorsal view; C: valve, subgenital plates and styles, ventral view; D, E: style, dorsal view; F: connective, dorsal view; G: aedeagus, dorsal view; H: aedeagus, lateral view. A–D, F–H: holotype, male; E: paratype, male.

Etymology. The species epithet alludes to the similarity of this species to *S. lesioensis* **sp. nov.**

Distribution. South Africa.

Remarks. This species is similar to *S. lesioensis* **sp. nov.** but it can be distinguished by its much smaller size, reduced markings on the dorsum, and acutely angulate anterior margin of the crown.

***Stirellus kitwensis* sp. nov.**

(Figs 27–28)

Description. Length. Male: 3.4mm; female: 3.6mm.

Coloration. General color stramineous with ochraceous and brown or black markings (Fig. 27A, B, D). Crown with transverse apical and preapical band sometimes joined by black longitudinal stripe along midline, pronotum with white median area partly or completely enclosed by brown or black pigment, mesonotum with basal triangles brown or black and more extensive dark pigment sometimes present (Fig. 27A, D). Face with dorsal, median and ventral transverse black bands variably developed (Fig. 27E). Forewing translucent with symmetrical pattern consisting of large irregular orange areas and numerous small orange spots (Fig. 27A, B, D). Femora and tibiae with dark brown marks (Fig. 27B). Abdominal sternites dark variably infused with white (Fig. 27F).

Morphology. Head slightly narrower than pronotum, subconical, anterior margin rounded to face, acutely angled (Fig. 27A, B, D). Vertex nearly as long as 2x width between eyes (Fig. 27A, D). Anteclypeus nearly parallel-sided, extending slightly beyond normal curve of genae (Fig. 27E). Pronotum median length slightly shorter than median length of crown. Mesonotum and scutellum together slightly shorter than pronotum (Fig. 27A, D). Forewing macropterous, usually exposing apex of abdomen in female, with supernumerary crossveins (Fig. 27A, B, D).

Male genitalia. Pygofer side long, with few macrosetae dorsally, dorsal margin nearly straight posteriorly, posterior margin rounded (Fig. 28A). Subgenital plate slightly convex laterally, macrosetae uniseriate laterally (Fig. 28C). Style apophysis attenuated, laterally curved, preapical lobe rounded (Fig. 28D). **Connective Y-shaped, stem** broadened distally and nearly as long as arms (Fig. 28E). Aedeagal shaft bent strongly dorsad near base, relatively short and sinuate in lateral view with apex attenuated, parallel to aedeagal base, slightly widened preapically then tapered to sharp point in dorsal view, with subapical membranous area (Fig. 28F–H).

Female. Hind margin of seventh sternum shallowly concave (Fig. 27F).

Material examined. Holotype: ♂, Zambia: Copperbelt Prov. ~12km SSE of Kitwe Kumasamba Lodge, 12° 54' 325" S 28° 14' 373" E, 1151m, 31 x–10 xi 2007, sweep, ZA-01, coll. J.N. Zahniser (INHS). Paratype: 1 ♀, Zambia: Northwest Prov. ~28.5 km N Mwinilunga, 11° 30' 16.1" S 24° 22' 44.8" E, Chitunta plain grassland, 1384m, 7 xi 2007, sweep, ZA-03, coll. J.N. Zahniser (INHS).

Etymology. The species epithet is based on the holotype locality.

Distribution. Zambia.

Remarks. This species differs from other species of *Stirellus* in the unique color pattern (Fig. 27A, D); forewing with supernumerary crossveins (Fig. 27A, B, D), evenly rounded male pygofer apex, and aedeagal shaft with a subapical membranous area (Fig. 28F–H).

***Stirellus madagascarensis* sp. nov.**

(Figs 29–30)

Description. Length. Male: 4.7–4.8mm; female: 4.9–5.1mm.

Coloration. General color light brown with darker brown and orange-red marks (Fig. 29A–E). Crown, with pair of orange-red medial spots variably developed (Fig. 29A–F). Frontoclypeus uniformly light brown with dorsal pair of orange-red marks (Fig. 29E, F). Forewing translucent infused with dark brown (Fig. 29A–E). Femora and tibiae usually without dark brown markings (Fig. 29E). Abdominal sternites dark, variably infused with white (Fig. 29G).

Morphology. Head narrower than pronotum, subconical, anterior margin rounded to face, angled (Fig. 29A–E). Vertex nearly as long as 1.5x width between eyes (Fig. 29A–D). Apex of anteclypeus widened, extending slightly beyond normal curve of genae (Fig. 29F). Pronotum median length longer than median length of crown. Mesonotum and scutellum together nearly as long as pronotum (Fig. 29A–D). Forewing macropterous, usually exposing apex of abdomen in female (Fig. 29A–D).

Male genitalia. Pygofer side without macrosetae, long, dorsal margin deeply concave, posterior margin rounded (Fig. 30A). Subgenital plate subquadrate, macrosetae arranged in irregular band and well separated from lateral margin (Fig. 30C, D). Style preapical angle indistinct, apophysis robust, digitate, laterally curved (Fig. 30E). **Connective H-shaped, stem** broadened distally and nearly as long as arms (Fig. 30F). Aedeagal shaft broadly curved

dorsad in lateral view divergent from aedeagal base, slightly sinuate, apex attenuate, dorsal view slender with apex abruptly tapered to acute point, with subapical membranous area (Fig. 30G, H).

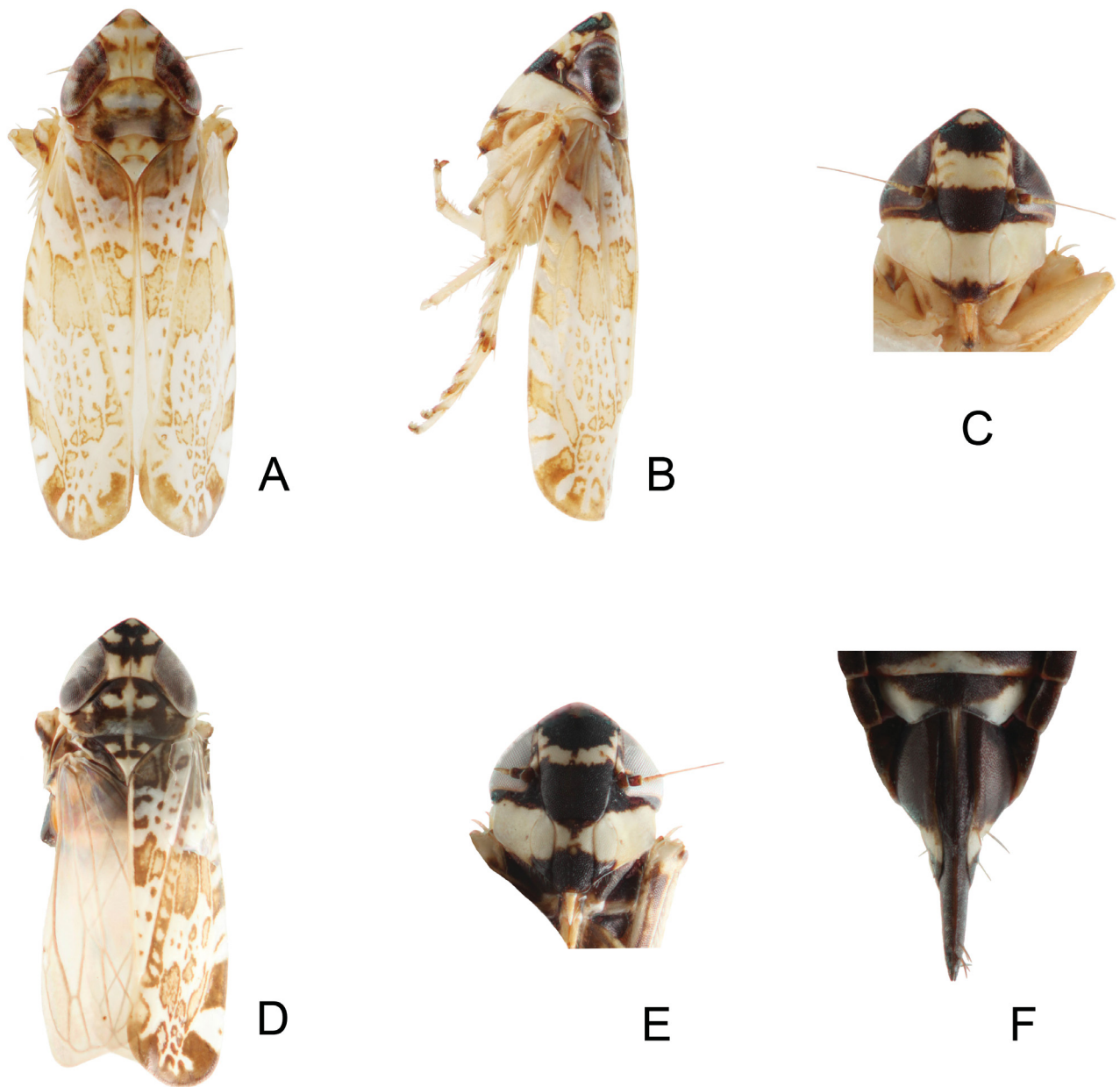


FIGURE 27. *Stirellus kitwensis* sp. nov. A, D: habitus, dorsal view; B: habitus, lateral view; C, E: face; F: the end of female abdomen, ventral view. A–C: holotype, male; D–F: paratype, female.

Female. Hind margin of seventh sternum shallowly concave (Fig. 29G).

Material examined. Holotype: ♂, Madagascar: Province Fianarantsoa, Parc National Ranomafana Belle Vue at Talatakely, elev 1020m, 14–23 iv 2002, 21° 15' 99" S 47° 25' 21" E, collector R. Harin'Hala California Acad of Sciences malaise, secondary tropical forest, MA-02-09C-25 (CAS). Paratypes: 3♂♂, 3♀♀, the same with holotype; 1♂, 2♀♀, Madagascar: Province d'Antananarivo, 3km 41°NE Andranomay, 11.5km 147° SS, elev 1300m, 5–13 xii 2000, 18° 28' 24" S 47° 57' 36" E, BLF2375, collector Fisher, Griswold *et al.* Calif. Acad. Sci. Collection (CAS); 1♂, 1♀, Madagascar: Province d'Antsiranana: parc National Montagne d'Ambre, 12.2km 211° SSW Joffreville, elev 1300m, 2–7 ii 2001, 12° 35' 47" S 49° 9' 34" E, BLF2853, collector Fisher, Griswold *et al.* (CAS, INHS); 2♂♂, 1♀, Madagascar: Province Fianarantsoa, Parc National Ranomafana Vohiparara at broken bridge, elev 1110m, 22

xi–8 xii 2001, 21° 13' 57" S 47° 22' 19" E, collector R. Harin' Hala California Acad of Sciences malaise trap in high altitude rainforest, MA-02-09A-05(INHS); 3♂♂, 8♀♀, Madagascar: Province Fianarantsoa, Parc National Ranomafana radio tower at forest edge, elev 1130m, 21 xii 2001–4 vi 2002, 21° 15' 05" S 47° 24' 43" E, collector R. Harin' Hala California Acad. of Sciences malaise mixed tropical forest (CAS, INHS).

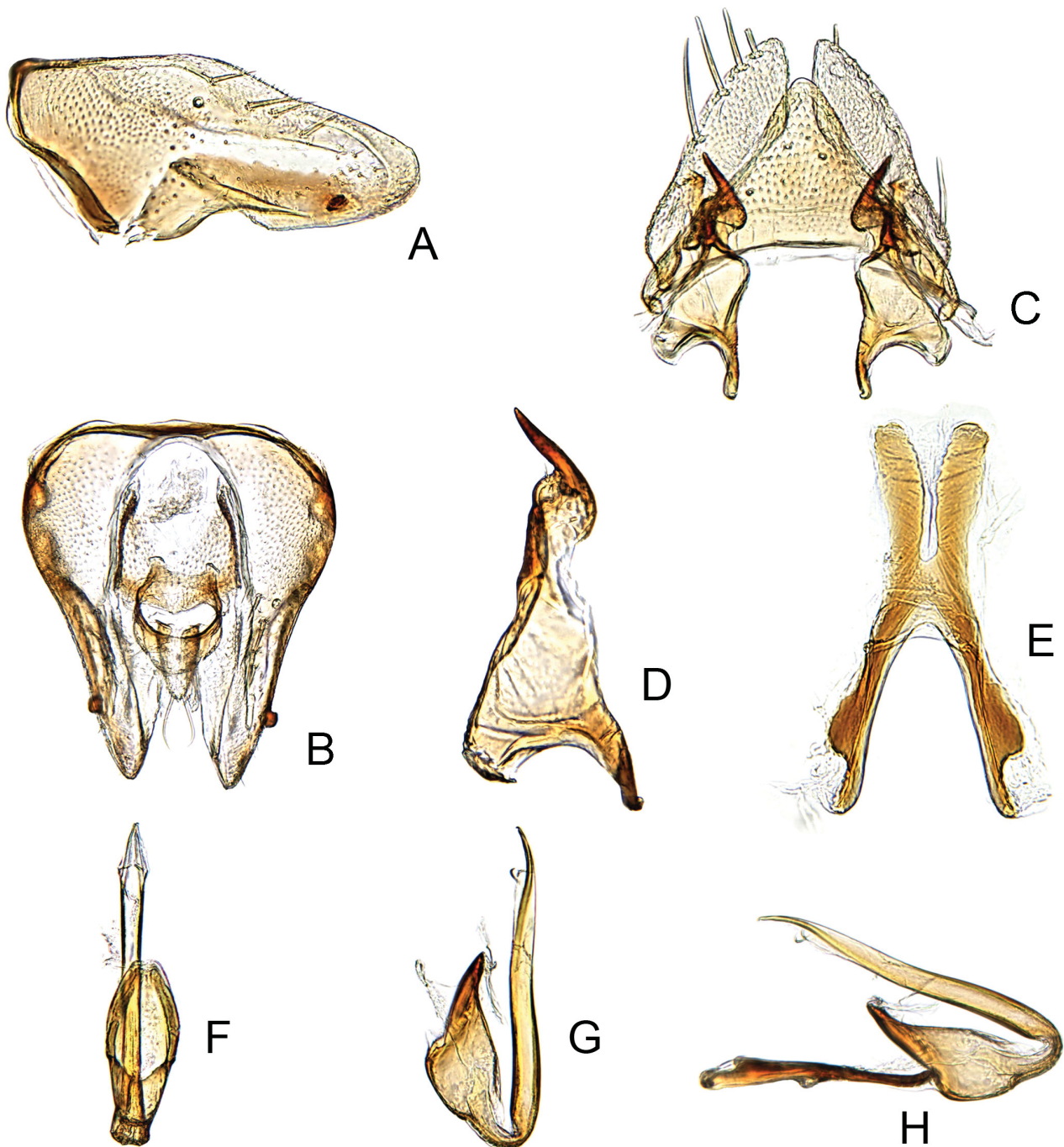


FIGURE 28. *Stirellus kitwensis* **sp. nov.** A: male pygofer lobe, lateral view; B: male pygofer and segments X and XI, dorsal view; C: valve, subgenital plates and styles, ventral view; D: style, dorsal view; E: connective, dorsal view; F: aedeagus, dorsal view; G: aedeagus, lateral view; H: connective and aedeagus, lateral view. A–H: holotype, male.

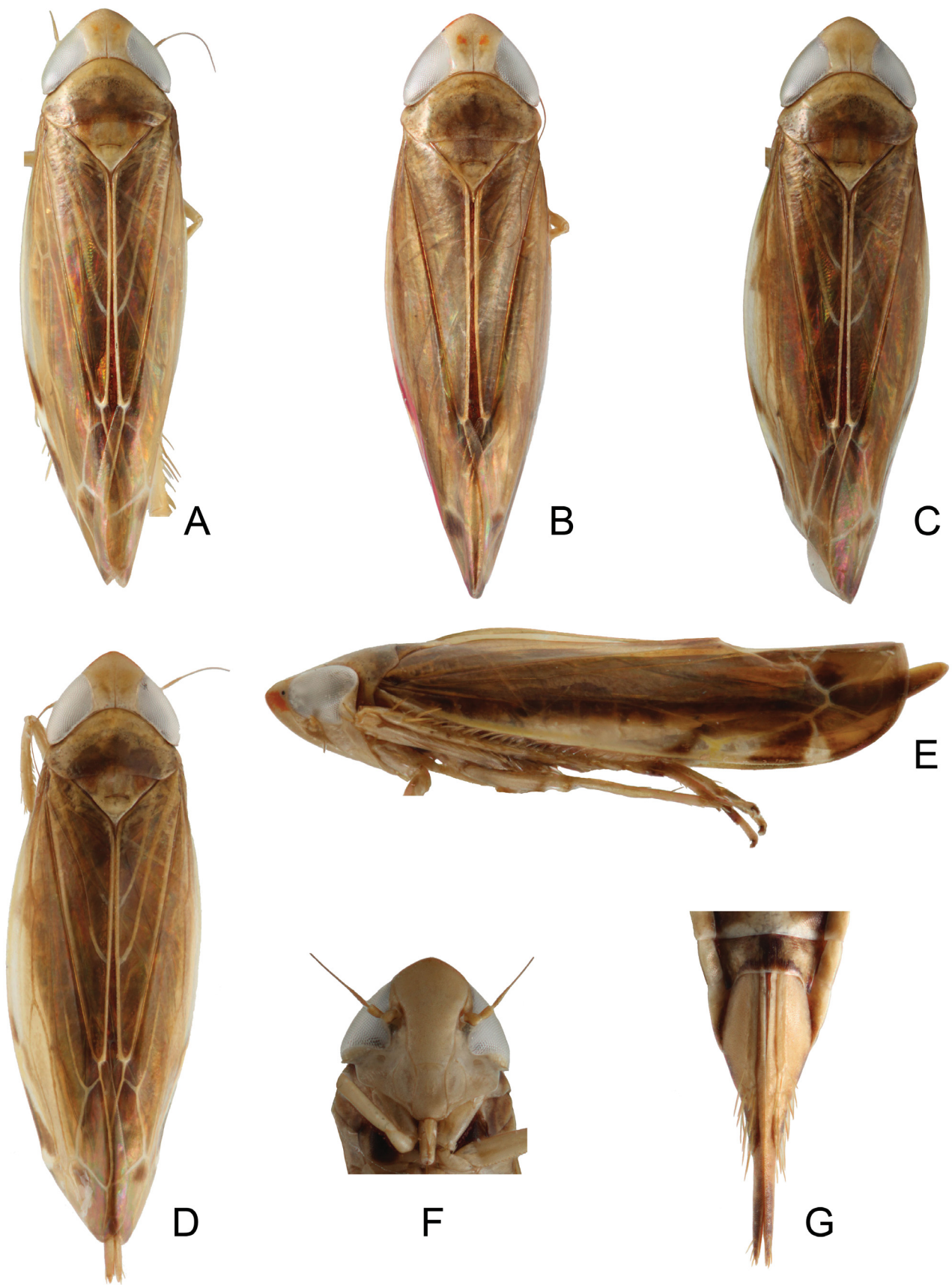


FIGURE 29. *Stirellus madagascarensis* sp. nov. A–D: habitus, dorsal view; E: habitus, lateral view; F: face; G: the end of female abdomen, ventral view. A–C, F: paratype, male; D, E, G: paratype, female.

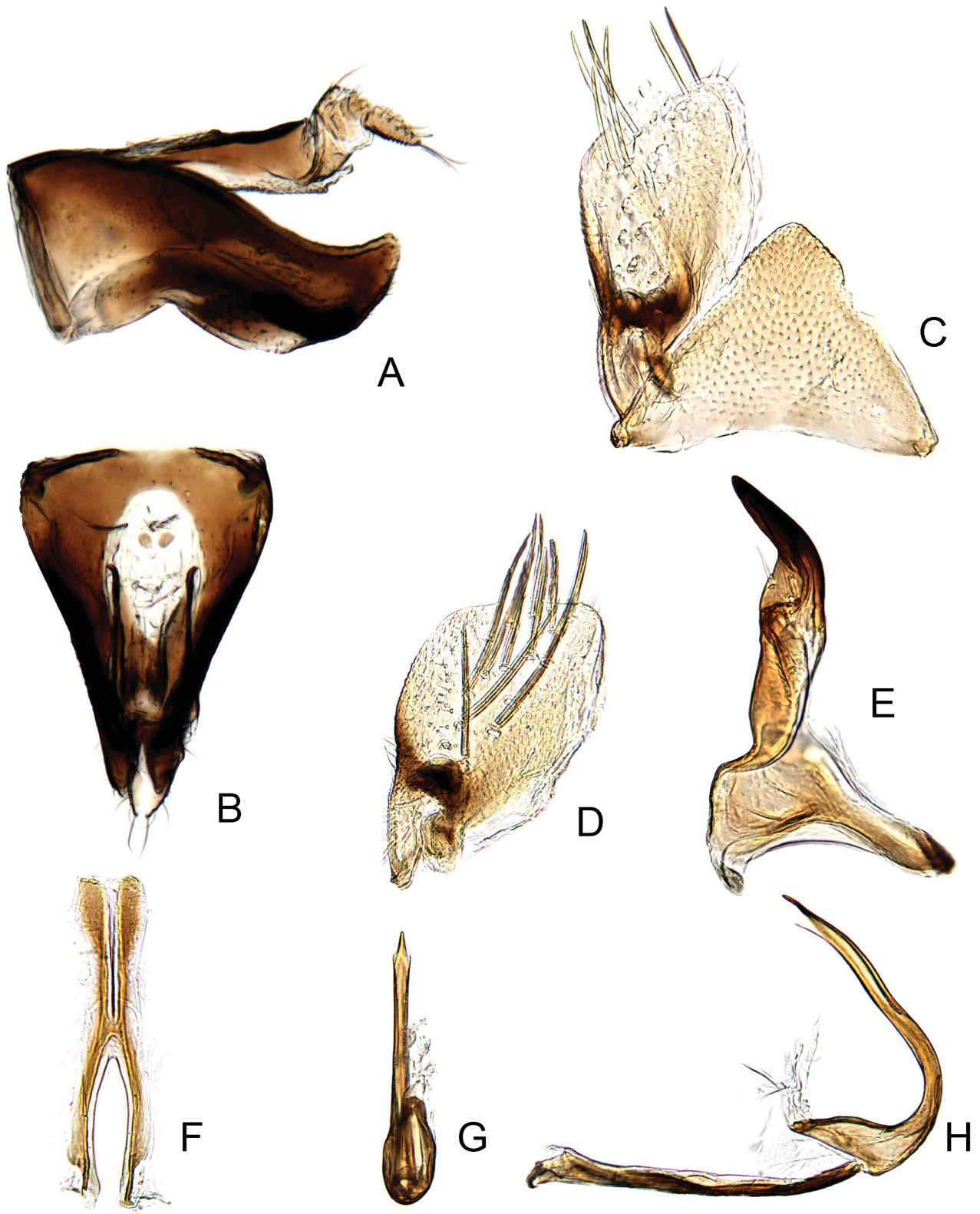


FIGURE 30. *Stirellus madagascarensis* **sp. nov.** A, B: male pygofer and segments X and XI, lateral and dorsal view, respectively; C: valve and subgenital plate, ventral view; D: subgenital plate, ventral view; E: style, dorsal view; F: connective, dorsal view; G: aedeagus, dorsal view; H: connective and aedeagus, lateral view. A–H: holotype, male.

Etymology. The species epithet is based on the type locality.

Distribution. Madagascar.

Remarks. This species can be distinguished from other species of *Stirellus* by the following combination of characters: general color brown without extensive markings (Fig. 29A–E); subgenital plate distinctly convex laterally, macrosetae not uniseriate (Fig. 30C–D); aedeagal shaft with subapical membranous area (Fig. 30G, H). Only one other species of Stenometopiini has been recorded from Madagascar so far: *Stirellus minimus* (Evans). It differs from *S. madagascarensis* **sp. nov.** in its less elongated body, less reflexed costal crossveins, rounded subgenital plate, and strongly acute angle between the aedeagal atrium and shaft. *Malagasiella* was treated as a junior synonym of *Doratulina* by Zahniser & Nielson (2012). The latter genus was considered a junior synonym of *Stirellus* by Duan *et al.* (2016).

***Stirellus petfordensis* sp. nov.**

(Figs 31–32)

Description. Length. Male: 4.4mm.

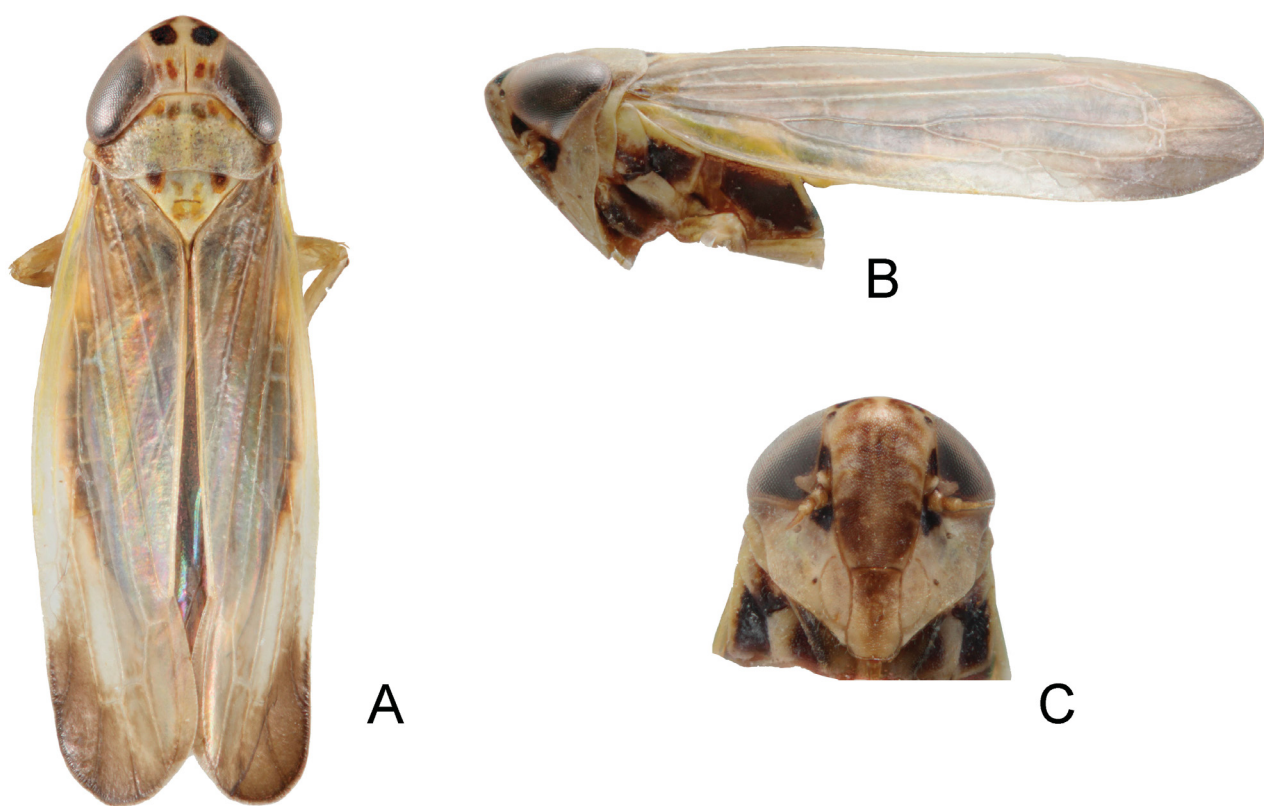


FIGURE 31. *Stirellus petfordensis* **sp. nov.** A: habitus, dorsal view; B: habitus, lateral view; C: face. A–C: holotype, male.

Coloration. General color stramineous with dark brown, brown and orange-red marks (Fig. 31A, B). Crown with large apical pair of dark brown spots and smaller pair of median orange-red marks. Pronotum with irregular anterior row of brown spots, mesonotum with basal triangles brown (Fig. 31A). Frontoclypeus brown with sordid white marks, dark brown spot below each eye, gena unmarked (Fig. 31C). Forewing translucent, apex brown (Fig. 31A, B). Femora and tibiae with dark brown marks.

Morphology. Head narrower than pronotum, weakly subconical, anterior margin rounded to face, angled (Fig. 31A–B). Crown ~ 1.3x width between eyes (Fig. 31A). Apex of anteclypeus widened, extending slightly beyond normal curve of genae (Fig. 31C). Pronotum median length nearly as long as median length of crown. Mesonotum and scutellum together longer than pronotum (Fig. 31A). Forewing macropterous (Fig. 31A, B).

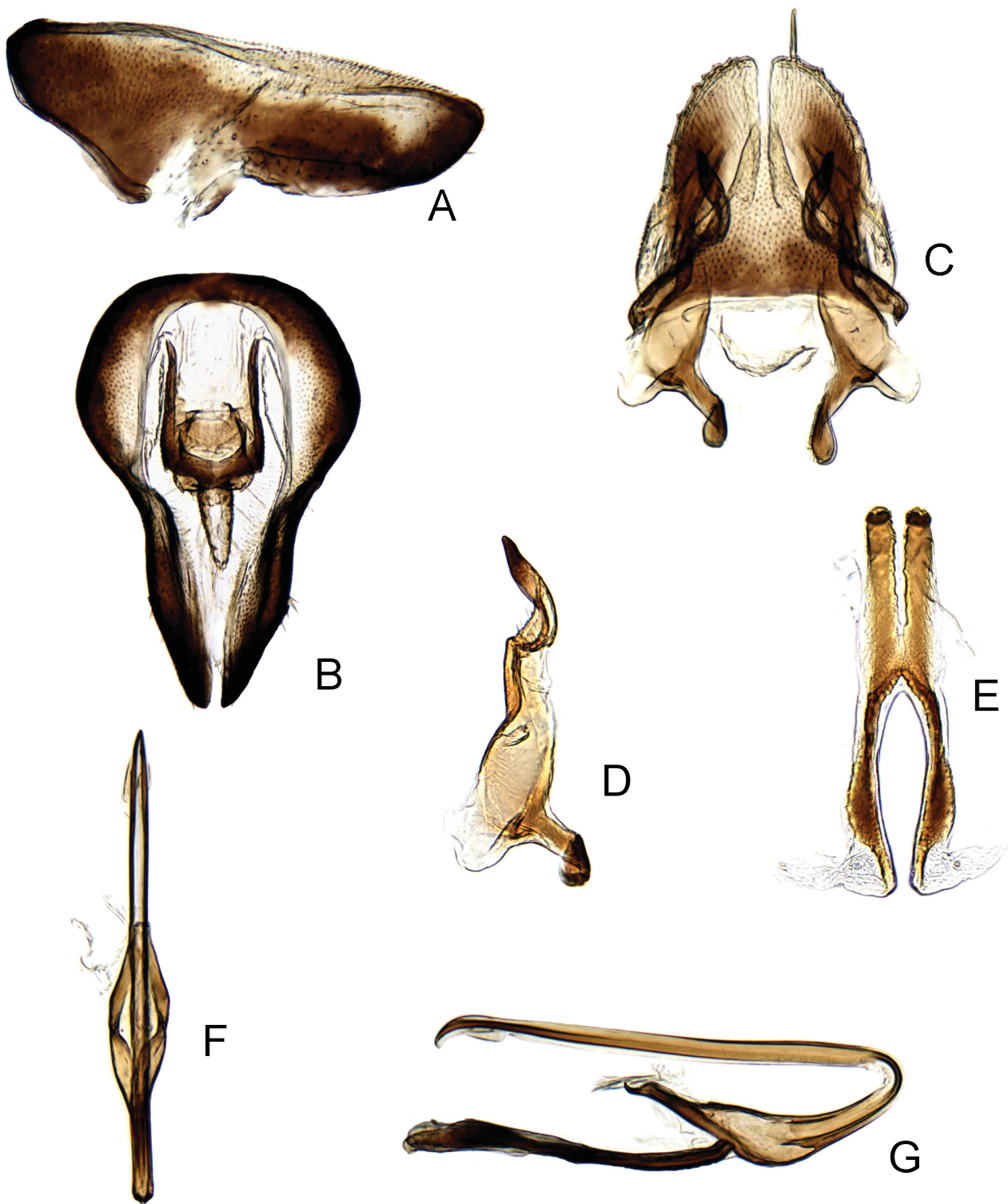


FIGURE 32. *Stirellus petfordensis* sp. nov. A: male pygofer lobe, lateral view; B: male pygofer and segments X and XI, dorsal view; C: valve, subgenital plate and styles, ventral view; D: style, dorsal view; E: connective, dorsal view; F: aedeagus, dorsal view; G: connective and aedeagus, lateral view. A–G: holotype, male.

Male genitalia. Pygofer side without macrosetae, dorsal margin slightly convex, posterior margin rounded (Fig. 32A). Subgenital plate convex laterally, macrosetae uniseriate laterally (Fig. 32C). Style preapical angle indistinct, apophysis robust, digitate, slightly sinuate (Fig. 32D). Connective H-shaped, stem slightly shorter than arms (Fig. 32E). Aedeagal shaft bent strongly dorsad near base, nearly straight through most of length in lateral view, parallel

to aedeagal base, apex hooked anterad and attenuate, apex gradually tapered to point in dorsal view, with subapical membranous area (Fig. 32F, G).

Material examined. Holotype: ♂, Australia, Q[ueensland], 7 km. W. Petford, 24 ii 1997, L.B. O'Brien (ANIC).

Etymology. The species epithet is based on the type locality.

Distribution. Australia.

Remarks. This species is similar to *Stirellus indrus* (Distant), but it can be distinguished by the following combination of characters: marks on vertex, the proportions of the vertex and pygofer side without macrosetae.

Stirellus sobrinus (Melichar, 1912)

(Fig. 33)

Arya sobrina Melichar, 1912: 118.

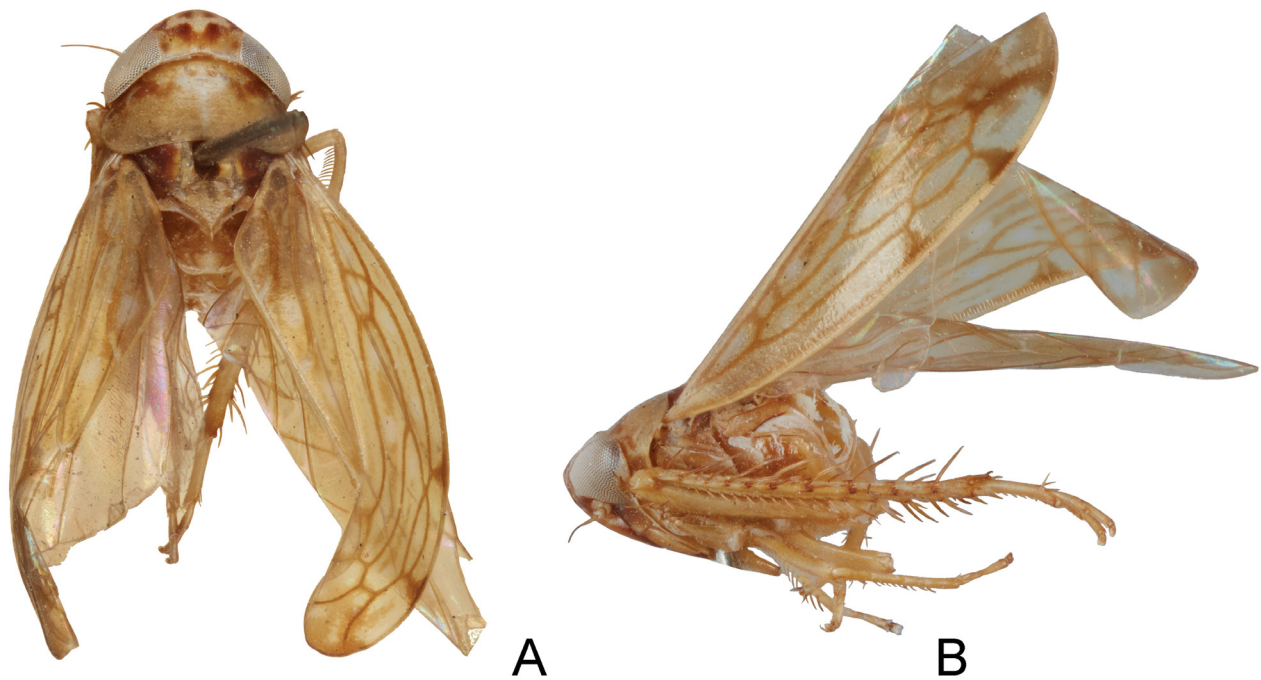


FIGURE 33. *Stirellus sobrinus*. A: habitus, dorsal view; B: habitus, lateral view. A, B: Holotype.

Material examined. Male holotype (photos), "Französisches Kongo, Mong[o]umba am Ubangi, Di. H. Schubotz leg., 1. XI. 1910.; Inner-Afrika-Exped. D. Hrzt. Adolf-Friedrich zu Mecklenburg 1910-1911" (Zoological Museum, Universität Hamburg).

Distribution. Central African Republic.

Remarks. This species was described and illustrated by Melichar (1912) but has not been treated since. We provide habitus photos of the holotype to help clarify its identity and for comparison to the new African species described above. The abdomen of the holotype was previously cleared and glued to a card but the genital capsule appears to be missing.

The following additional new combination is proposed as a result of the new generic synonymy proposed above:

Stirellus dolichocephalus (Kirkaldy, 1906), comb. nov. (from *Giffardia*)

Discussion

Although species of *Stirellus* are unusual among deltocephaline leafhoppers in exhibiting relatively little interspe-

cific variation in the male genitalia, most species are quite dissimilar in external morphology including body proportions, head shape and degree of development of the wings. Considerable intraspecific variation also occurs among males and females of the same species and some species have different seasonal color forms. These characteristics pose a challenge to morphology-based species taxonomy of the genus.

The species described here are all distinguishable from their congeners by both external morphology including body proportions and color pattern, and by details of the male genitalia. Unfortunately, many previously published descriptions for species of *Stirellus* did not provide enough detail and we have provided supplemental information to facilitate identification several such species. Future taxonomic work on the genus would benefit from more detailed descriptions and illustrations such as those provided here.

Stirellus is in need of a comprehensive worldwide revision based on a species-level phylogenetic analysis. Unfortunately, the paucity of discrete morphological characters will make any analysis based on morphology alone difficult. Thus, an analysis including DNA sequence data will likely be necessary not only to elucidate species-level relationships but also to clarify species boundaries and examine the phylogenetic status of the genus and its many included synonyms. As presently defined, *Stirellus* is one of very few recognized genera of Cicadellidae that are distributed worldwide, although individual species of the genus are mostly restricted to a single region. Thus, phylogenetic study of the genus could help elucidate recent biogeographic patterns of faunal interchange among grasslands.

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