

New species of *Mayawa* Fletcher and description of a related new Australian leafhopper genus (Hemiptera: Cicadellidae: Deltocephalinae: Paralimnini)

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Abstract

Five new species of the endemic Australian leafhopper genus *Mayawa* Fletcher, 2000 (*M. affiniifacialis* sp. nov., *M. bimaculata* sp. nov., *M. brevicephala* sp. nov., *M. kathyae* sp. nov. and *M. vestigia* sp. nov.) are described and illustrated and a revised key to species is provided. One of the new species tested positive for a previously unknown strain of phytoplasma belonging to the 16SrV group. The related paralimnine genus *Austroauridius* gen. nov. based on *A. iwaii* sp. nov. from Queensland is also described and illustrated and a key to known genera of Australian Paralimnini is provided.

Key words: Auchenorrhyncha, morphology, key, grassland, phytoplasma, vector

Introduction

The deltocephaline leafhopper fauna of Australia is diverse but remains poorly documented. The catalogue of Day and Fletcher (1994) listed only 132 species. More recent papers have increased this number substantially and added five new genera (Fletcher 2000, 2006, Fletcher & Moir 2008, Knight & Fletcher 2007, Fletcher & Dai 2018). One of these, the paralimnine genus *Mayawa* was erected by Fletcher (2000) to include *Limotettix capitatus* Kirkaldy, 1907 and five new species endemic to Australia. Study of recently collected samples for use in an ongoing project on the phylogeny and microbial associations of deltocephaline leafhoppers revealed the presence of five additional new species of *Mayawa*, one of which tested positive for a previously unknown strain of phytoplasmas (Trivellone et al., in review, Wei et al., in review). These new species are described and illustrated below and a revised key to species of the genus is provided. An additional new species representing a new genus apparently related to *Mayawa* is also described and illustrated. Keys to Australian genera of Paralimnini and species of *Mayawa* are provided.

Materials and methods

Specimens examined are deposited in the Museum and Art Gallery of the Northern Territory, Darwin (MNT), Queensland Museum, Brisbane (QM), South Australia Museum, Adelaide (SAM), Western Australian Museum, Perth (WAM) and the Illinois Natural History Survey, Champaign (INHS). Morphological terminology follows Dietrich (2005). Scale bars for habitus photos are 1 mm.

Taxonomy

Family Cicadellidae Latreille 1825

Subfamily Deltocephalinae Dallas 1870

Tribe Paralimnini Distant, 1908

Key to Australian genera of Paralimnini

1. Forewing macropterous, extended well beyond apex of abdomen in both sexes, cells not outlined with brown pigment (Figs 1A–B, 2A–B) 2
- Forewing submacropterous, at most extended only slightly beyond apex of abdomen, cells outlined with brown pigment highlighting relatively pale veins 3
2. Aedeagus with shaft very short, arising from dorsal part of atrium (Figs 1G–H), overall coloration bright yellowish orange without distinct markings, body length less than 3.5 mm *Austroauridius* gen. nov.
- Aedeagus with shaft elongate, arising from ventral part of atrium (Figs 2G–H), overall coloration stramineous to olive green, often with dark markings on head, body length 3.5 mm or longer *Mayawa* Fletcher, 2000
3. Aedeagus with pair of elongate processes arising from ventral part of atrium (Fletcher 2004: Figs 30–31) *Micrelloides* Evans, 1973
- Aedeagus without basal processes 4
4. Style apophysis beyond preapical lobe usually short and thick with rounded apex (Naveed & Zhang 2018: Fig. 2B) *Soractellus* Evans, 1966
- Style apophysis beyond preapical lobe elongate and pointed *Soracte* Kirkaldy, 1907

Austroauridius gen. nov.

(Figure 1)

Type species: *A. iwaii* sp. nov., by monotypy.

Diagnosis. This genus may be distinguished from all other Paralimnini by the following combination of traits: head in dorsal view angulately produced and wider than pronotum; forewing outer anteapical cell very small; male pygofer without teeth or processes, with scattered macrosetae; anal tube well sclerotized; subgenital plate lateral margin convex, macrosetae uniseriate; connective loop-shaped without stem; style apex enlarged with prominent teeth; aedeagus small, without processes.

Description. Medium-sized, slender, moderately depressed paralimnines with macropterous forewings. Coloration nearly uniformly bright yellow-orange with pair of very indistinct longitudinal orange bands extended across crown and pronotum. Head in dorsal view (Fig. 1A) with anterior margin angulately produced, longer medially than next to eye, wider than pronotum; crown width between eyes less than median length and eye width, texture glabrous except shagreen near anterior margin; face (Fig. 1C) with frontoclypeus relatively narrow, lateral frontal sutures extended laterad of ocelli, ocelli small, separated from adjacent eye by one ocellar diameter; antenna longer than width of head; mesal margin of eye notched adjacent to antennal base; lorum small, narrower than anteclypeus, well separated from ventral margin of face; anteclypeus weakly convex, slightly tapered from base to apex. Forewing (Figs 1A–B) with three closed anteapical cells; outer anteapical cell very small, petiolate, not extended to costal margin (rarely absent); clavus with crossvein extended from PCu to claval suture. Front femur with AM1 seta on ventral margin; IC row with several fine setae; AV with few very short, widely spaced setae in basal half; tibia rows AD and PD with 1 and 4 macrosetae, respectively. Hind femur macrosetal formula 2+2+1, tibia rows PD, AD and AV with 9, 9, and 8 long macrosetae, respectively; PD with one short seta between respective macrosetae; AD with 1–4 very short setae between respective macrosetae; tarsomere I pecten with 4 platellae, mesal seta platelliform.

Male pygofer (Fig. 1E) without basal apodemes; basolateral cleft obsolete; basal tergite well sclerotized; lobe moderately elongate, bluntly angulate distally, with numerous macrosetae, without teeth or processes. Segment X elongate and slender, unsclerotized, without processes. Valve (Fig. 1F) parabolically produced posteriorly. Subgenital plate (Fig. 1H) longer than basal width, lateral margin abruptly tapered beyond midlength to pointed apex, macrosetae sparse, uniseriate; few long, fine setae present basolaterally and at apex. Connective (Fig. 1H) loop-shaped, more than twice as long as wide. Style (Fig. 1H) with median anterior lobe relatively short, preapical lobe indistinct, apophysis enlarged denticulate, apex with prominent teeth. Aedeagus simple (Figs 1G–H), small, with atrium somewhat enlarged, shaft very short, tubular, arising from dorsal part of atrium, apex bifid, gonopore apical.

Female pygofer profusely macrosetose; ovipositor extended slightly beyond pygofer; gonopods (Fig. 1J) densely microtrichiose but without setae; first valvula (Figs 1K–L) moderately broad, evenly tapered distally, dorsal sculpture squamiform, merging with ventral sculpture near apex; second valvulae (Figs 1M–N) moderately broad, evenly tapered distally, dorsal margin finely and irregularly serrate in distal two thirds.

Etymology. The genus name, a masculine noun, refers to the superficial similarity of the type species to species of the North American paralimnine genus *Auridius*.

Notes. This genus will run to *Mendraus* Ribaut in Emeljanov's (1999) key to Asian Paralimnini. It differs from this genus in having the forewing fully developed, the outer anteapical cell small and well separated from the costal margin, male segment X slender and unsclerotized, the pygofer elongate, and the aedeagus with the shaft very short and arising from the dorsal part of the atrium. The new genus is similar to another endemic Australian paralimnine genus, *Mayawa*, in external appearance, especially the elongate forewing with reduced outer anteapical cell and lack of dark pigment outlining the veins; as well as in the structure of the genital capsule, connective and style. *Mayawa* differs in its larger size and elongate aedeagus with two pairs of distal processes.

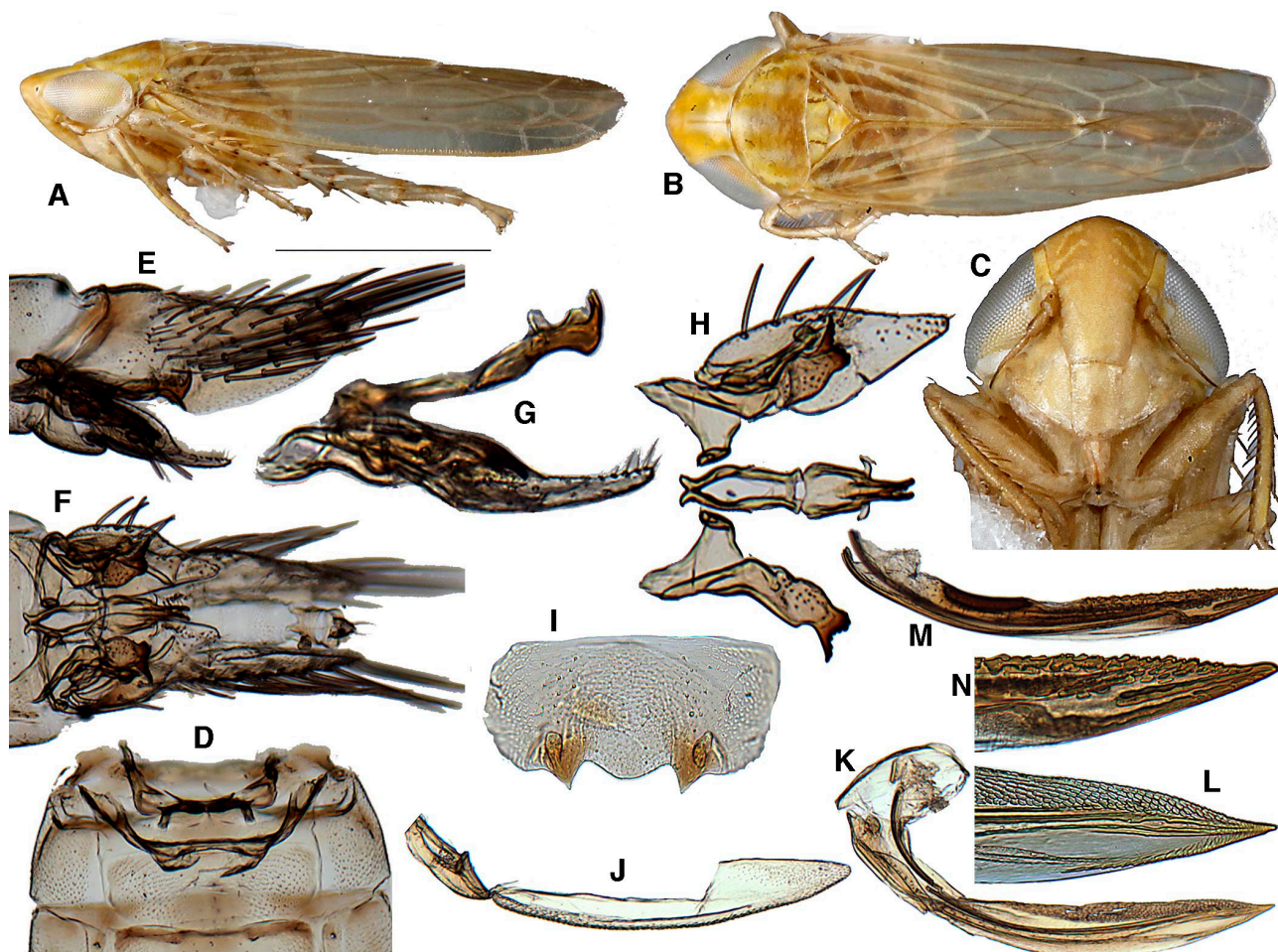


FIGURE 1. *Austroauridius iwaii* sp. nov. A–H, male holotype. A–B, lateral and dorsal habitus; C, head and anterior part of thorax, anteroventral view; D, base of abdomen, ventral view; E–F, genital capsule, lateral and ventral view; G–H, genitalia and subgenital plate, lateral and ventral view. I–N, paratype female: I, abdominal sternite VII; J, gonoplags; K, first valvula; L, detail of same; M, second valvulae; N, detail of same. Scale bar = 1 mm.

Austroauridius iwaii sp. nov.

(Figure 1)

Description. Length of male 2.6 mm, female 3.0. Male 2S apodemes well-developed but short, paddlelike, extended halfway to posterior margin of sternite III, space between apodemes narrowly rectangular (Fig. 1D). Subgenital plate (Fig. 1H) half as long as pygofer, with 4–5 macrosetae. Style apophysis inflated medially, constricted preapically in ventral view, apex with posteromedial angle broad, lateral angle narrow and projected posterolaterad to sharp point (Fig. 1H).

Female sternite VII posterior margin with pair of sharp, darkly sclerotized teeth flanking slightly shorter median parabolic lobe, lateral margins rounded (Fig. 1I).

Etymology. The species is named for I'wai, mythical hero of the Koko Ya'o indigenous people of Queensland.

Material examined. Holotype male, AUSTRALIA: QLD, Crow's Nest N.P. 27.2540°S 152.1071°E, 454m, 22 Feb 2015, C.H.Dietrich, AU15-08-3, vacuum rocky area (QM). Paratypes, 2 males, 1 female, same data as holotype (INHS).

Notes. The type series was collected by vacuuming grasses and other herbaceous vegetation in an open riparian woodland.

Mayawa Fletcher, 2000

Notes. Fletcher (2000) provided a description of the genus based on the six species originally included. The crown texture was described as “shagreen” but only the anterior part of the crown has this texture, the posterior two thirds of the crown between the eyes is glabrous with very fine longitudinal striations laterally. The following additional traits appear to be characteristic of the genus and are included here to supplement the original description. Coronal suture extended nearly full length of crown. Eye emarginate adjacent to antenna. Anteclypeus only slightly tapered distally. Maxillary sensillum closely adjacent to lateral margin of lorum near middle. Front femur with AM1 seta large and situated near ventral margin, IC row extended to basal half of femur, AV row with basal setae very short and inconspicuous; tibia rows PD and AD with 4 and 1 macrosetae, respectively. Hind femur macrosetal formula 2+2+1; tibial row PD with macrosetae alternating short and long; tarsomere I pecten with 4 platellae, inner seta platelliform.

In the structure of the male genitalia, *Mayawa* closely resembles the widespread Holarctic genus *Sorhoanus* Ribaut but species of the latter have the forewing less elongate with the outer anteapical cell usually much larger, the crown more strongly produced and angulate anteriorly, and the ventroapical pygofer process greatly reduced or absent.

Key to species of *Mayawa*

1. Crown of head with pair of large submedial black spots (Fig. 3B) 2
- Crown of head without large spots, with broken transverse line or multiple pairs of small spots (Fig. 2B), or without distinct markings (Fig. 4B) 3
2. Spots on crown extended onto face (Fig. 3B) *bimaculata* sp. nov.
- Spots on crown not extended onto face, face usually with separate pair of black spots below crown margin *capitata* (Kirkaldy)
3. Head without distinct brown markings on crown (Fig. 4B) 4
- Head with small brown spots or lines near anterior margin of crown (Fig. 2B) 6
4. Male style apophysis slender and evenly curved laterad (Fig. 5G) *kathyae* sp. nov.
- Male style apophysis broad, posteromedial margin abruptly bent laterad (Fig. 4G) 5
5. Crown between eyes approximately as long as wide; aedeagal shaft curved dorsad in lateral view *flava* Fletcher
- Crown between eyes much shorter than wide (Fig. 4B); aedeagal shaft arcuate in lateral view (Fig. 4H) *brevicephala* sp. nov.
6. Male style apophysis slender and evenly curved, posteromedial margin not distinctly angulate (Fig. 6F) 7
- Male style apophysis usually broad, posteromedial margin distinctly angulate (Fig. 4G) 9
7. Aedeagal shaft in posterior view distinctly tapered distad of preapical processes, distal processes less than one fifth as long as gonopore (Fig. 6H) *vestigia* sp. nov.
- Aedeagal shaft in posterior view parallel-sided distad of preapical processes, distal processes at least one third as long as gonopore (Fig. 2G) 8
8. Subgenital plate more than twice as long as maximum width; aedeagus with gonopore extended basad beyond distal process more than length of process (Fig. 2H); style apophysis more than 6x longer than basal width (Fig. 2F) *affinifacialis* sp. nov.
- Subgenital plate distinctly less than twice as long as maximum width; aedeagus with gonopore extended only slightly basad of distal process; style apophysis approximately 4x longer than basal width *facialis* Fletcher
9. Male style apophysis with lateral projection oriented basolaterad *fusca* Fletcher
- Male style apophysis with lateral projection oriented distolaterad or laterad (Fig. 4G) 10
10. Male subgenital plate with posteromedial notch *neoflava* Fletcher
- Male subgenital plate truncate apically, without posteromedial notch *carolae* Fletcher

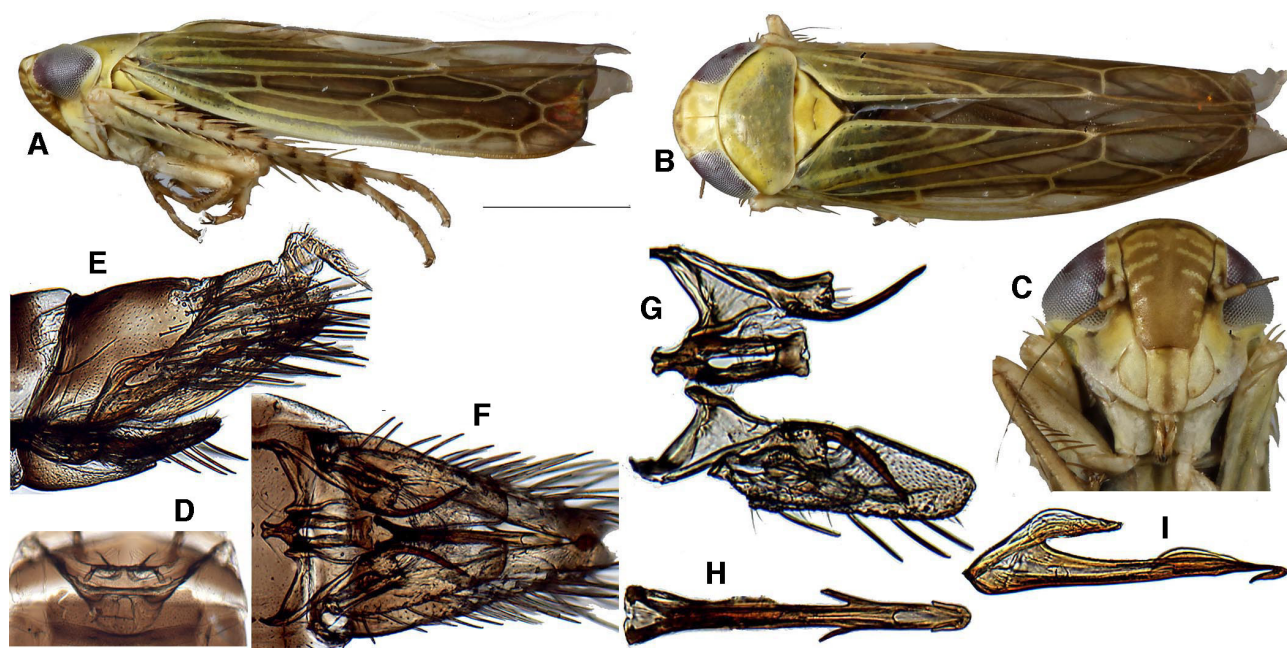


FIGURE 2. *Mayawa affinfacialis* sp. nov., male holotype. A-B, lateral and dorsal habitus; C, head and anterior part of thorax, anterior view; D, base of abdomen, ventral view; E-F, genital capsule, lateral and ventral view; G, styles, connective and subgenital plate, ventral view; H, aedeagus, ventral view; I, aedeagus, lateral view.

***Mayawa affinfacialis* sp. nov.**

(Figure 2)

Diagnosis. This species closely resembles *M. facialis* Fletcher but differs in having the face relatively pale, without dark brown pigmentation, the male style apophysis thinner and more elongate, and the gonopore of the aedeagus arising farther from the apex.

Description. Length of male 3.8 mm. Ground color dull stramineous, marked with brown. Crown (Fig. 2B) uniformly stramineous except indistinct anterior submarginal broken transverse light brown band; face (Fig. 2C) mostly brown, frontoclypeus with thin dorsal transverse dark brown band, remainder brown with pale transverse arcs, without pale median patch; anteclypeus with median longitudinal light brown line; pronotum stramineous anteriorly, olive green posteromedially; exposed part of mesonotum and scutellum stramineous; thoracic sternites olive green; forewing membrane olive green, veins, stramineous.

Crown distinctly shorter than width between eyes, anterior and posterior margins parallel, evenly rounded in dorsal view. Forewing with second apical cell petiolate.

Male 2S apodemes (Fig. 2D) well-developed, parallel to each other, slightly tapered to truncate apices, extended to posterior margin of sternite III, space between apodemes narrowly rectangular; 1S apodeme with trapezoidal dorsomedial extension. Pygofer lobe (Fig. 2E) narrowly rounded distally. Subgenital plate (Fig. 2G) with lateral margin nearly straight, with 4-6 macrosetae; apex obliquely truncate. Style (Fig. 2G) preapical lobe right-angled with four long, fine setae; apophysis very slender and elongate in ventral view, broader in lateral view with 6 short preapical teeth, apex tapered to point. Aedeagus with shaft forming acute angle with dorsal apodeme in lateral view (Fig. 2I); shaft strongly tapered from base to midlength in lateral view, distal part of uniform width and slightly sinuate, preapical processes bowed anterad, distal processes extended basad below shaft apex but not distinctly divergent from shaft in ventral view; shaft in ventral view (Fig. 2H) parallel-sided through most of length, widened near base, preapical processes slender and extended basolaterad, distal processes shorter and extended ventrolaterad but only reaching distal end of gonopore. Gonopore elongate, approximately three times longer than maximum width, base situated approximately midway between preapical and apical processes.

Etymology. The species name alludes to the similarity of this species to *M. facialis* Fletcher.

Material examined. Holotype male, AUSTRALIA: Queensland ~31km S of Beenleigh on road from Beaudes-

ert. N of Canungra 27°56.057'S 153°04.710'E 50m 04 Jan 2009 K. Hill, D. Marshall, M. Moulds, C. Owen (QM). Paratypes: 3 males, AUSTRALIA: Western Australia, SW side of Lennard River on Gibb River Road, 17°23.525'S 124°45.304'E 78m 20 Jan 2010, Kathy Hill, David Marshall, Max Moulds (QM, INHS).

Notes. DNA extracted from the abdomen of the holotype of this species tested positive (via PCR) for a previously unknown strain of phytoplasma that will be characterized separately (Trivellone et al., in review; Wei et al., in review).

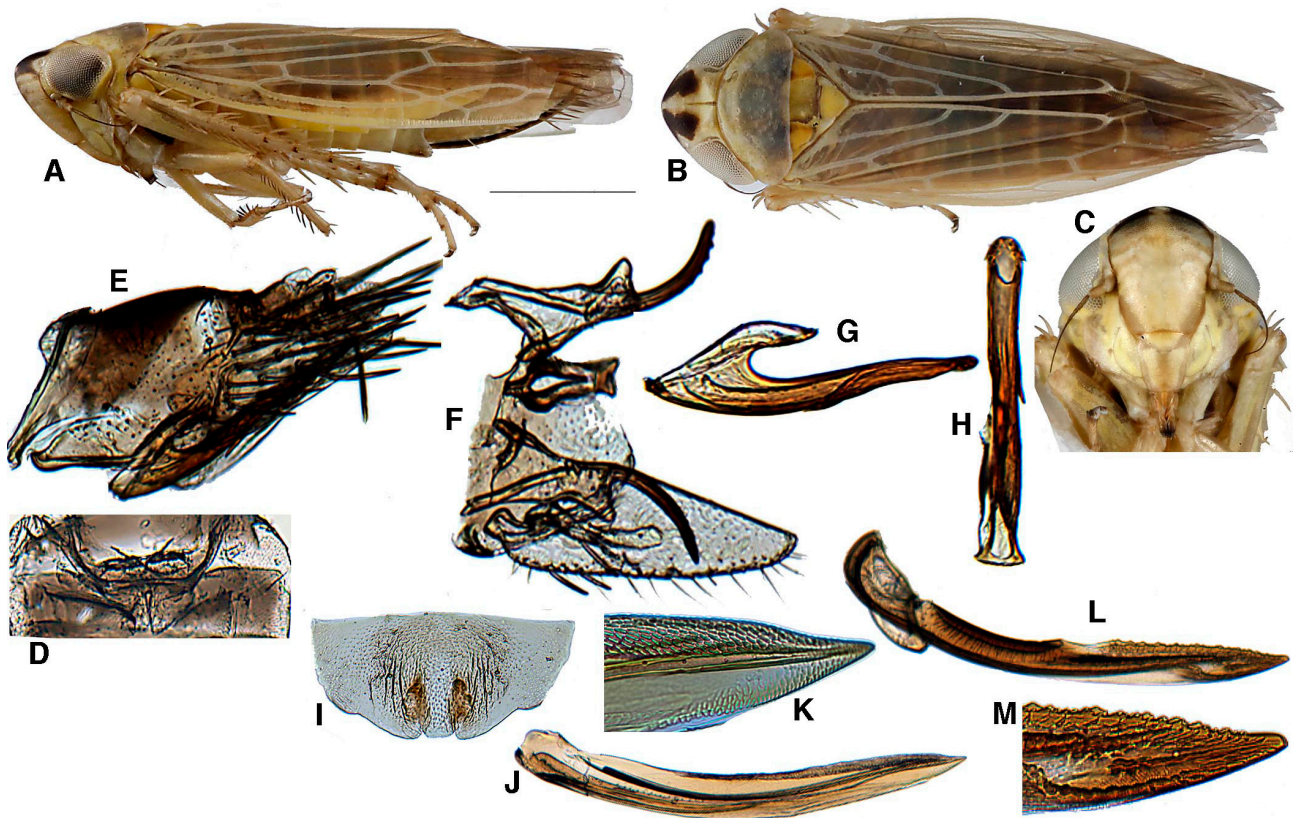


FIGURE 3. *Mayawa bimaculata* sp. nov., male holotype. A-B, lateral and dorsal habitus; C, head and anterior part of thorax, anterior view; D, base of abdomen, ventral view; E, genital capsule, lateral view; F, styles, connective, valve and subgenital plate, ventral view; G, aedeagus, posteroventral view; H, aedeagus, lateral view. I–M, female paratype: I, abdominal sternite VII; J, first valvula; K, detail of same; L, second valvulae; M, detail of same.

***Mayawa bimaculata* sp. nov.**

(Figure 3)

Diagnosis. This species differs from all other known *Mayawa* species in having a pair of large maculae on the crown and the paired processes on the aedeagus greatly reduced and inconspicuous.

Description. Length of male 2.9 mm, female 3.8 mm. Overall color stramineous, head with pair of black maculae extended from between ocelli onto anterior half of crown, face (Fig. 3C) unmarked except muscle scars on frontoclypeus slightly darker than adjacent parts; pronotum light grey posteromedially; mesonotal triangles bright orange; forewing membrane light brown contrasting with pale stramineous wing veins; abdominal tergites brown, ovipositor black. Crown (Fig. 3B) produced anteriorly at obtuse angle, slightly longer medially than next to eyes. Forewing with second apical cell petiolate basally. Male pygofer lobe (Fig. 3E) narrowly rounded distally, margin unmodified. Subgenital plate (Fig. 3F) approximately twice as long as wide, lateral margin weakly convex, with 5–6 macrosetae, apex obliquely rounded. Style preapical lobe acutely produced, apophysis narrow, elongate, evenly curved laterad, nearly parallel-sided, with five blunt, evenly spaced preapical teeth, apex bluntly rounded (Fig. 3F). Aedeagus with dorsal apodeme approximately parallel to shaft in lateral view (Fig. 3H), shaft evenly tapered from base to apex, slightly sinuate in lateral view; in ventral view (Fig. 3G) shaft parallel-sided with pair of very short,

inconspicuous retrorse lateral spines near midlength and pair of small lateral teeth near apex, apex rounded; gonopore relatively short, ovoid, situated near apex. Female sternite VII posterior margin trilobed medially with medial lobe shorter and narrower than lateral lobes (Fig. 3I). First valvula dorsal sculpture squamiform, merging with ventral sculpture near apex (Figs 3J–K). Second valvulae with median dorsal tooth moderately prominent, distal teeth irregular (Figs 3L–M).

Etymology. The species name is a Latinized adjective referring to the pair of maculae on the crown.

Material examined. Holotype male, AUSTRALIA: Northern Territory; Buchanan Hwy (Hwy 80); Gravelpit; 57.2km E of Top Springs; 25 Jan 2004; Hill, Cooley, Marshall, Moulds; light trap; 04.NTR.PIT (MNT). Paratypes: three females, same data as holotype (MNT, INHS).

***Mayawa brevicephala* sp. nov.**

(Figure 4)

Diagnosis. This species is readily distinguishable from others in the genus by the short crown with evenly rounded anterior margin and by the elongate, arched aedeagus.

Description. Length of male 3.5 mm. Color pale stramineous, frontoclypeus, basolateral triangles of mesonotum and median area of mesonotum and scutellum pale ochraceous. Crown in dorsal view (Fig. 4B) with anterior margin evenly rounded, subparallel to posterior margin, median length less than width between eyes. Forewing with second apical cell petiolate (Fig. 4A).

Male 2S apodemes (Fig. 4D) short and rounded. Pygofer lobe (Fig. 4E) with small but distinct sclerotized rounded tooth posteroventrally. Subgenital plate (Fig. 4G) moderately long with 4–5 macrosetae, apex oblique. Style preapical lobe rounded, apophysis footlike apically with short toe and rounded heel (Fig. 4G). Aedeagal shaft elongate, slender, evenly arched in lateral view (Fig. 4H) with preapical processes short and well separated from apex, apical processes relatively long, acuminate and extended ventrobasad relative to shaft apex. Gonopore preapical on posterior surface adjacent to tips of distal processes (Fig. 4G).

Etymology. The species name is a Latinized adjective referring to the relatively short head.

Material examined. Holotype male, AUSTRALIA: South Australia; 39.6km S of Maria, off Stuart Hwy; 27.57973° S 133.8410° E, 304 m, 31 Jan 2004; K. Hill et al.; Coll at light. (SAM).

Notes. The holotype of this species represents the first record of the genus from South Australia.

***Mayawa kathyae* sp. nov.**

(Figure 5)

Diagnosis. This species differs from other species in the genus in lacking dark markings on the head and in having the aedeagus with a preapical flange giving rise to a pair of elongate retrorse processes.

Description. Length of male 3.2 mm, female 4.3 mm. Overall coloration pale stramineous; median part of crown, anterior part of pronotum and scutellum bright yellow; basolateral triangles of mesonotum orange.

Crown (Fig. 5B) produced anteriorly at obtuse angle, slightly longer medially than next to eye. Forewing with second apical cell petiolate.

Male 2S apodemes (Fig. 5D) very short, triangular, well separated at base. Pygofer lobe (Fig. 5E) narrowly rounded apically, margin unmodified. Subgenital plate (Fig. 5G) approximately twice as long as wide, lateral margin convex, with 5–6 macrosetae, apex narrowly rounded. Style preapical lobe acutely produced, apophysis slender, evenly curved laterad with five evenly spaced posteromedial teeth, apex narrowed to blunt tip (Fig. 5G). Aedeagus in lateral view (Fig. 5H) with dorsal apodeme relatively short and narrow, approximately parallel to shaft; shaft tapered in basal half, nearly parallel sided and distinctly sinuate in distal half with apex rounded; in ventral view (Fig. 5G) gradually and slightly tapered with lateral preapical flange giving rise to pair of long retrorse spines, apex rounded with pair of triangular preapical lateral teeth; gonopore elongate, extended from between base of lateral preapical processes to near apex.

Female sternite VII posterior margin trilobed medially with median lobe longer and broader than lateral lobes (Fig. 5I).

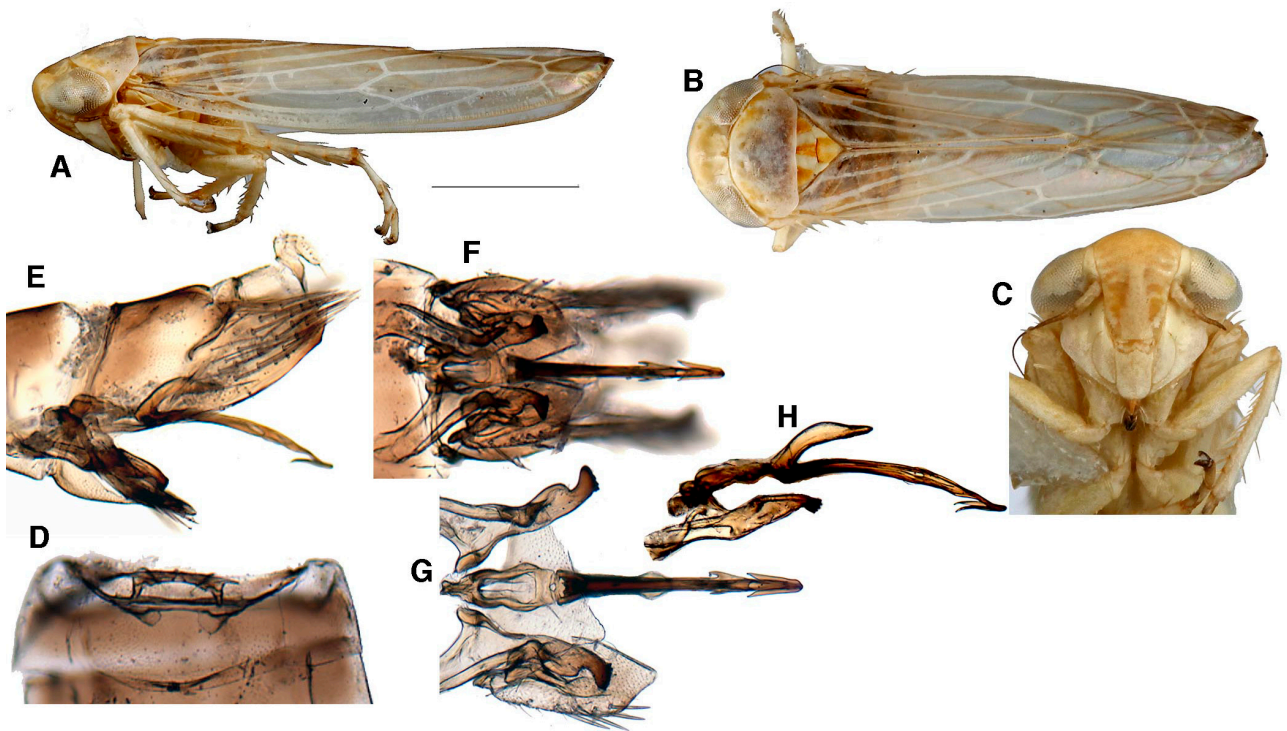


FIGURE 4. *Mayawa brevicephala* sp. nov., male holotype. A–B, lateral and dorsal habitus; C, head and anterior part of thorax, anterior view; D, base of abdomen, ventral view; E–F, genital capsule, lateral and ventral view; G, genitalia, valve and subgenital plate, ventral view; H, genitalia, lateral view.

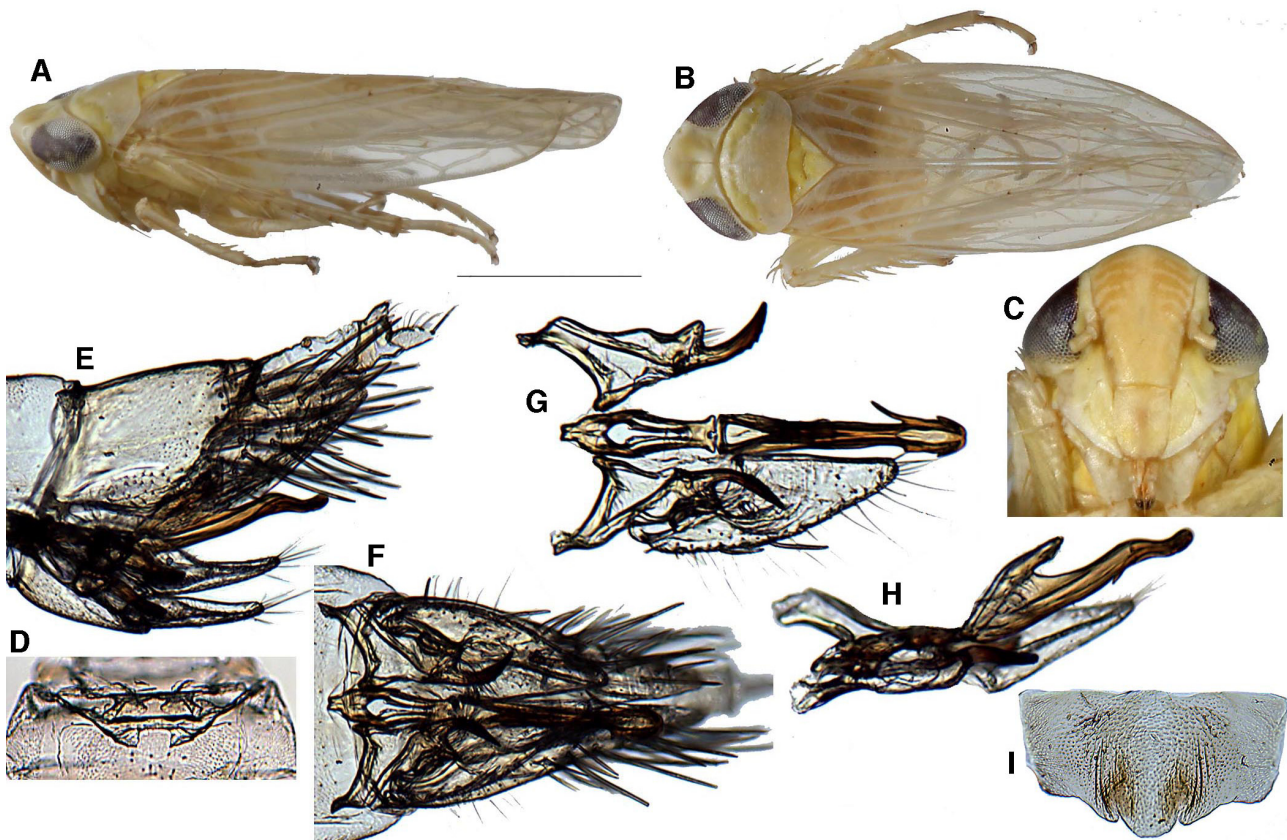


FIGURE 5. *Mayawa kathyae* sp. nov., male holotype. A–B, lateral and dorsal habitus; C, head and anterior part of thorax, anterior view; D, base of abdomen, ventral view; E–F, genital capsule, lateral and ventral view; G, genitalia and subgenital plate, ventral view; H, genitalia and subgenital plate, lateral view. I, abdominal sternite VII of female.

Etymology. The species is named in honor of Kathy Hill, cicada expert and collector of the type series of this and many other new and interesting Australian leafhoppers.

Material examined. Holotype male, AUSTRALIA: Northern Territory 76km E of Mataranka on Roper Bar Hwy. 14°54.888'S 133° 42.78'E 77m, 03 Feb 2006 K. Hill, D. Marshall, M. Moulds, coll at light at night (MNT). Other material. 2 females, AUSTRALIA: Queensland 37.6 km west of Alpha (E. of Beta). approx 15km E of Jericho, 23°37.439'S 146°16.228'E 372 m, 3 Jan 2004, K. Hill, D. Marshall, J. Cooley, M. Moulds, at lights (QM, INHS).

Notes. The two female specimens from Queensland closely resemble the male holotype from Northern Territory except for being much larger. These females are not treated as paratypes because of the considerable distance between collecting localities.

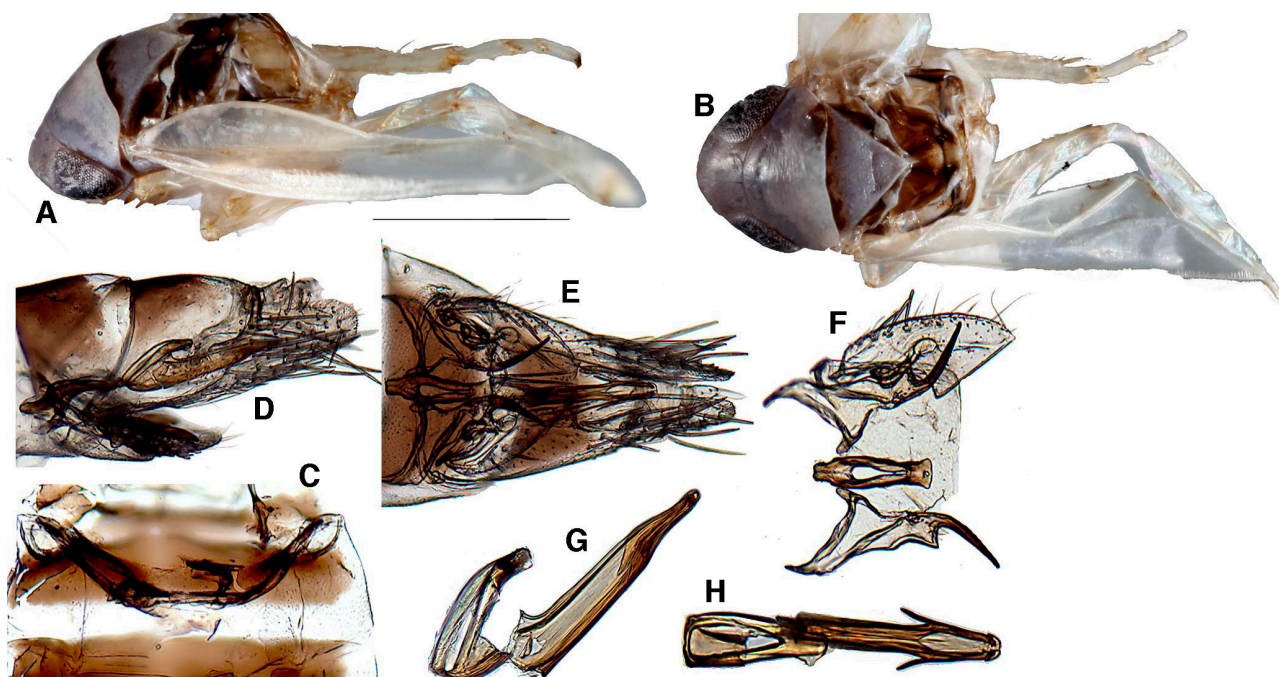


FIGURE 6. *Mayawa vestigia* sp. nov., male holotype. A–B, lateral and dorsal habitus; C, base of abdomen, ventral view; D–E, genital capsule, lateral and ventral view; F, styles, connective, valve and subgenital plate, ventral view; G, aedeagus, lateral view (shaft broken); H, aedeagus, ventral view.

***Mayawa vestigia* sp. nov.**
(Figure 6)

Diagnosis. This species differs from other species of the genus in having the apex of the aedeagal shaft distinctly tapered beyond the preapical processes in posterior view and the preapical processes relatively long.

Description. Length of male 3.5 mm. Natural coloration of only available specimen unknown due to DNA extraction from whole body, crown with two pairs of small spots on anterior margin, dorsum otherwise without distinct spots or larger maculae. Crown (Fig. 6B) slightly longer medially than next to eye, shorter than basal width between eyes.

Male pygofer lobe (Fig. 6D) narrowly rounded apically, margin unmodified. Subgenital plate (Fig. 6F) slightly longer than maximum width, lateral margin evenly convex, apex forming slightly acute angle. Style preapical lobe acutely produced, apophysis slender and elongate without preapical angle, with seven rounded preapical teeth (Fig. 6F). Aedeagus in lateral view (Fig. 6G) with dorsal apodeme relatively short and narrow, forming narrowly acute angle with dorsal margin of shaft; shaft relatively broad and very slightly tapered over most of length, more abruptly tapered at level of preapical processes and slightly sinuate distally; shaft in posterior view (Fig. 6H) parallel-sided basally, broadened at level of preapical processes, then tapered toward apex, preapical processes relatively long and strongly divergent from shaft, distal processes very short; gonopore very large, extended slightly basad of bases of preapical processes.

Etymology. The species name refers to the vestigial distal processes of the aedeagus.

Material examined. Holotype male, AUSTRALIA: Northern Territory 76km E of Mataranka on Roper Bar Hwy. 14°54.888'S 133° 42.78'E 77m, 03 Feb 2006 K. Hill, D. Marshall, M. Moulds, coll at light at night (MNT).

Notes. A whole-body DNA extraction procedure was performed on the holotype specimen of this species before it was recognized as a new species. The procedure removed most of the pigment from the exoskeleton such that the natural coloration and wing venation cannot be described. The aedeagus was also broken during the extraction procedure but the parts of the male terminalia are intact and undistorted. DNA sequences from this species are being incorporated into a large-scale phylogenetic analysis of Deltocephalinae (Y. Cao et al., unpublished).

Discussion

Although leafhoppers of the grass-specialist tribe Paralimnini are highly diverse and occur worldwide, the paralimnine fauna of Australia appears to be relatively depauperate. The fauna appears to be largely endemic, although *Soractellus* is more widespread, having also been recorded from Asia and Africa (Naveed & Zhang 2018). Nevertheless, discovery of the new genus and several new species described above suggests that additional collecting in Australia, especially vacuum sampling in grasslands, is likely to reveal the presence of additional paralimnines and other grass-feeding leafhoppers.

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References

- Day, M.F. & Fletcher, M.J. (1994) An annotated catalogue of the Australian Cicadelloidea (Hemiptera: Auchenorrhyncha). *Invertebrate Taxonomy*, 8, 1117–1288.
<https://doi.org/10.1071/IT9941117>
- Dietrich, C.H. (2005) Keys to the families of Cicadomorpha and subfamilies and tribes of Cicadellidae (Hemiptera: Auchenorrhyncha). *Florida Entomologist*, 88, 502–517.
[https://doi.org/10.1653/0015-4040\(2005\)88\[502:KTTFOC\]2.0.CO;2](https://doi.org/10.1653/0015-4040(2005)88[502:KTTFOC]2.0.CO;2)
- Emeljanov, A.F. (1999) A key to genera of the subfamily Deltocephalinae s.l. (Homoptera: Cicadellidae) from Kazakhstan, Middle Asia and Mongolia with description of new genera and subgenera. *Entomological Review*, 79, 547–562.
- Evans, J.W. (1966) The leafhoppers and froghoppers of Australia and New Zealand (Homoptera: Cicadelloidea and Cercopoidae). *Memoirs of the Australian Museum*, 12, 1–347.
<https://doi.org/10.3853/j.0067-1967.12.1966.425>
- Evans, J.W. (1973) Some new genera and species of Cicadelloidea from Australia and New Guinea (Homoptera). *Pacific Insects*, 15 (2), 185–197.
- Fletcher, M.J. (2006) A new genus, *Warlucephala*, for the reception of *Deltocephalus arunda* Jacobi, 1909, and two new species (Hemiptera: Cicadellidae: Deltocephalinae). *Records of the Australian Museum*, 58 (2), 125–128.
<https://doi.org/10.3853/j.0067-1975.58.2006.1449>
- Fletcher, M.J. (2000) A new genus, *Mayawa*, for the reception of *Limotettix capitatus* Kirkaldy (Hemiptera: Cicadellidae: Deltocephalinae) and descriptions of five new species of *Mayawa*. *Australian Journal of Entomology*, 39 (3), 103–110.
<https://doi.org/10.1046/j.1440-6055.2000.00158.x>
- Fletcher, M.J. & Dai, W. (2018) A new genus *Austrimonus* for *Eutettix melaleuca* Kirkaldy (Hemiptera: Cicadellidae: Deltocephalinae: Opsiini) and nine new species. *Zootaxa*, 4387 (2), 310–330.
<https://doi.org/10.11646/zootaxa.4387.2.4>
- Fletcher, M.J. & Moir, M.L. (2008) *Gunawardeneia*, a new genus of squat leafhoppers from Western Australia, with description of two new species (Hemiptera: Cicadellidae: Deltocephalinae). *Records of the Western Australian Museum*, 24 (4), 429–436.
[https://doi.org/10.18195/issn.0312-3162.24\(4\).2008.429-436](https://doi.org/10.18195/issn.0312-3162.24(4).2008.429-436)
- Knight, W.J. & Fletcher, M.J. (2007) A new deltocephaline leafhopper genus, *Melanetettix*, from Melanesia (Hemiptera: Cic-

- adellidae: Deltocephalinae). *Systematics and Biodiversity*, 5 (2), 199–222.
<https://doi.org/10.1017/S1477200006002027>
- Kirkaldy, G.W. (1907) Leafhoppers supplement (Hemiptera). *Report of Work of the Experiment Station of the Hawaiian Sugar Planters' Association. Division of Entomology Bulletin*, 3, 1–186.
- Naveed, H. & Zhang, Y. (2018) Revision of the leafhopper genus *Soractellus* Evans (Cicadellidae: Deltocephalinae) with description of a new species from Pakistan. *Zootaxa*, 4429 (3), 595–599.
<https://doi.org/10.11646/zootaxa.4429.3.12>
- Trivellone, V., Wei, W., Filippin, L. & Dietrich, C.H. (2021) Screening potential insect vectors in a museum biorepository reveals undiscovered diversity of plant pathogens in natural areas. *Ecology and Evolution*. [in review]
- Wei, W., Trivellone, V., Dietrich, C.H., Zhou, Y., Bottner-Parker, K.D. & Ivanauskas, A. (2021) Identification of phytoplasmas representing multiple new ge-2 netic lineages from phloem-feeding leafhoppers highlights the 3 diversity of phytoplasmas and their potential vectors. *Pathogens*. [in review]