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Revision of the Australian species of *Aka* White, 1879 (Fulgoromorpha: Cixiidae) with the description of a new genus

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Abstract

The Australian species of the genus *Aka* White are revised. Seven new species are described: *A. balma* **sp. nov.**, *A. dobsonensis* **sp. nov.**, *A. gwana* **sp. nov.**, *A. issidopsis* **sp. nov.**, *A. kuraka* **sp. nov.**, *A. pirri* **sp. nov.**, *A. sorellensis* **sp. nov.** Adding to those the 5 species solely occurring in New Zealand, we have a total number of 14 species in *Aka*. The types of *A. hardyi* Muir, 1931 and part of the type series including the holotype of *A. tasmani* Muir, 1931 are declared lost. However, based on the original descriptions and the remaining type material, these species have been matched with new material examined and are redescribed in this paper. Neotypes are designated for *A. hardyi* and *A. tasmani*. A new monotypic genus *Yanganaka* **gen. nov.** is described from Australia. Based on characters such as the general shape of the body as well as a forked frontal carina it appears to be closely related to *Aka* and the New Zealand genus *Chathamaka* Larivière, 1999. *Yanganaka ariecornia* **sp. nov.** is described and illustrated. An identification key to differentiate between the two genera occurring in Australia, *Aka* and *Yanganaka*, is provided. Information on how to distinguish *Chathamaka* from the latter two genera, as well as a key to identify all Australian species of *Aka* is presented. Host plant associations are discussed which support the hypothesis that *Aka* is a Gondwanan relict.

Key words: Australia, New Zealand, Gondwana, planthopper, identification, *Nothofagus*, *Atherosperma*, *Chathamaka*, morphology

Introduction

The genus *Aka* was created by White (1879) to accommodate the New Zealand species *Cixius finitimus* (Walker, 1858). Muir (1931) added two species from Tasmania, *A. hardyi* Muir, 1931 and *A. tasmani* Muir, 1931. Four additional species, *A. dunedinensis* Larivière, 1999, *A. duniana* (Myers, 1924), *A. rhodei* Larivière, 1999 and *A. westlandica* Larivière, 1999 have since been described from New Zealand. Material of *Aka* held in Australian and overseas collections has been investigated and revealed the presence of new species. Further, a new Australian genus, sharing several features with *Aka* and the New Zealand genus *Chathamaka* Larivière, 1999 is described in this paper. This paper focuses on the Australian species of *Aka*, since the New Zealand fauna has been revised in detail by Larivière, 1999.

Material and methods

Males were dissected by softening the entire specimen for 1–2 days in a humid chamber: a plastic box containing a paper towel soaked with vinegar to prevent mould. Mounted specimens were pinned on a piece of Styrofoam and put in the humid chamber. After softening, the specimens were demounted and the pygofer carefully removed using forceps and pins. The specimens were then remounted and the pygofer transferred to a beaker containing hot soapy water for few minutes to be softened further before examination. For the short-term, genitalia were stored in cavity slides (square piece of plexiglass, with a hole drilled into it, glued onto a microscopic slide) containing glycerol. For long-term storage, the genitalia were transferred into micro-vials containing glycerol.

Insects were examined and measured using an Olympus SZH10 stereo microscope with an eyepiece graticule. Drawings were made and photographs taken with a Micropublisher 5 RTV digital camera (QImaging) attached to a Leica MZ12.5 dissecting microscope and montaged images produced with AutoMontage Pro (Synchroscope P/L).

The morphological terms applied here follow Löcker *et al.* (2006); terminology of y-vein follows Mead and Kramer (1982). The following is a list of the measurements taken in this study:

Body length: tip of head to posterior margin of forewing
Length of vertex: distance between basal emargination and apical carina in midline
Width of vertex: at level of basal emargination
Length of frons: apical transverse carina to frontoclypeal suture, in midline
Width of frons: at level of frontoclypeal suture
Width of forewing: at level of apex of clavus
Length of forewing: base to posterior margin of forewing
Length of mesonotum: in midline
Length of pronotum: in midline

Abbreviations

ACT	Australian Capital Territory
AMS	Australian Museum, Sydney, Australia
ANIC	Australian National Insect Collection, CSIRO, Canberra, Australia
ASCU	Agricultural Scientific Collections Unit, NSW Department of Primary Industries, Orange, Australia
BMNH	British Museum of Natural History, London, United Kingdom
BPBM	Bernice Pauahi Bishop Museum, Honolulu, United States of America
SAMA	South Australian Museum, Adelaide, Australia
Tas	Tasmania
TAIC	Tasmanian Agricultural Invertebrate Collection, Department of Agriculture, Hobart, Australia
QM	Queensland Museum, Brisbane, Australia
UQIC	University of Queensland Insect Collection, Brisbane Australia (now part of the QM collection)
Vic	Victoria

Results

Key to Australian Cixiini genera with a forked frontal median carina

- 1 First hind tarsomere with 8 apical teeth and 4 setae; angle formed by hind margin of pronotum rectangular or moderately obtuse (Fig. 6D); lateral carinae of pronotum c-shaped, lateral parts directed towards head; vertex in midline at least twice as long as pronotum. *Yanganaka*, **gen. nov.**
- First hind tarsomere with 5–7 apical teeth and no setae; angle formed by hind margin of pronotum broadly obtuse (Figs 2–5B,D, 6B); lateral carinae of pronotum s-shaped, second bend turning towards mesonotum (Figs 2–5B,D, 6B); vertex in midline about as long as pronotum. *Aka* White.

Genus *Aka* White

Aka White, 1879: 216

Type species: *Cixius finitimus* Walker, 1858, by original designation.

Diagnosis. The three genera *Aka*, *Chathamaka* and *Yanganaka* **gen. nov.** share a very small to almost inconspicuous pterostigma, a forked frontal carina and a curved apical and subapical carina of the vertex connected by two ridges. *Aka* can be distinguished from *Chathamaka* and *Yanganaka* by the shape of the lateral carinae of the pronotum. In *Aka* these carinae are s-shaped. The first bend of the “s” is rounded but with its sides forming a rectangular angle, therefore not following the contour of the eye. The second bend forms an obtuse angle (arched)

and gently turns towards the mesonotum (Figs 2–5B,D, 6B). In *Chathamaka* the first bend is more evenly rounded, following the contour of the eye. Then the carina turns abruptly (angularly) towards the mesonotum (Fig. 1). In *Yanganaka* the lateral carinae are c-shaped, with their lateral parts (ends) directed towards the head (Fig. 6D).

Compared to other Australian Cixiidae, the intercubitus (icu) in *Aka* is very long, almost appearing to be a second or third branch of CuA2. Emeljanov (2002) reported a similar elongated icu, directed obliquely longitudinally, from the tribes Brixidiini and Bennini and the subfamily Borystheninae.

The following combination of characters uniquely identifies *Aka* within other Australian Cixiidae: frons with forked median carina; vertex in midline about as long as pronotum.

Morphology. Body length: ♂ 3.8–5.6 mm; ♀ 5.1–5.7 mm.

Head: Vertex 0.8–1.1 x as long as pronotum (1.4–1.5 x longer than pronotum in the 2 specimens of New Zealand species measured); with lateral carinae concave, vertex widest at base, narrowest between subapical and apical carina; lateral carinae slightly elevated; angle formed by caudal border of vertex broadly obtuse; subapical carina M-shaped, connected to apical carina by two short ridges. Frons with forked median carina. Lateral carinae of frons in facial view convex, rectilinear apically or slightly sinuate. Frontoclypeal suture slightly semicircular, bent upwards, median part not reaching lower margin of antennal scape. Postclypeus with well developed median and lateral carinae. Anteclypeus lacking lateral carinae. Rostrum in Australian species very long (situation in New Zealand species of *Aka* unclear, but may be shorter), surpassing hind coxa by far and extending into femur, subapical segment reaching hind trochanter. Head including eyes much narrower than pronotum.



FIGURE 1. *Chathamaka andrei* Larivière, 1999: head and thorax.

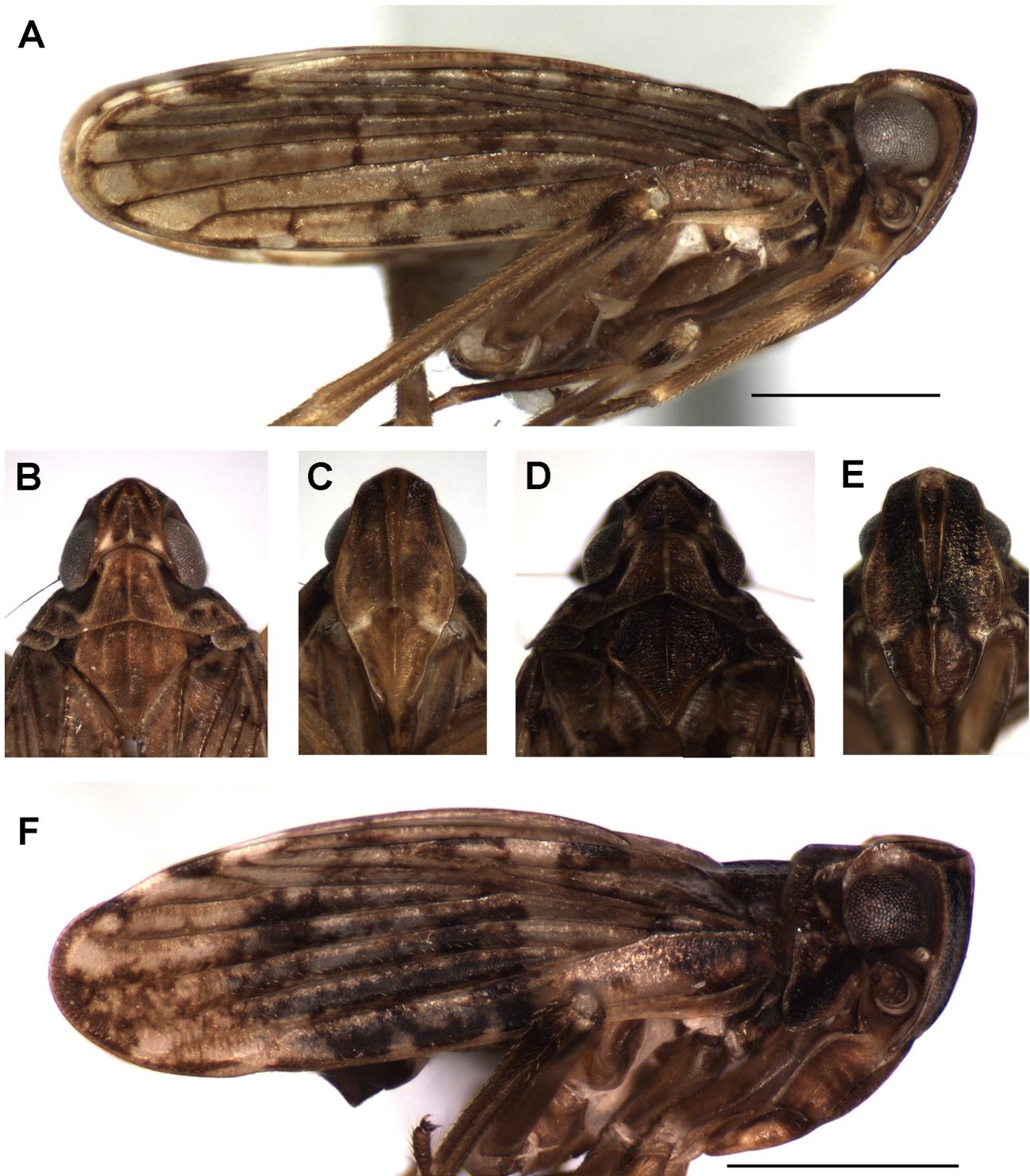


FIGURE 2. *Aka balma*: A habitus; B,C head. *Aka dobsonensis*: D,E head; F habitus. Scale bar 1 mm.

Thorax: Pronotum with median carina well developed; lateral carinae s-shaped, lateral parts directed towards mesonotum (sometimes median and lateral parts of carinae evanescent), lateral carinae not following contour of eyes; angle of hind margin of pronotum widely obtuse. Mesonotum 1.6–3.1 x longer than pronotum (3.2–4.5 x in the two specimens of New Zealand species measured); with moderately or well developed median carina, fading before it reaches hind margin of mesonotum; lateral carinae well developed, reaching hind margin; with or without sublateral carinae, which do not reach hind margin. Forewing short, curved to fit body (with the exception of *A. issidopsis*); surpassing tip of abdomen; concavity at costal border poorly developed or absent; pterostigma very small and indistinct (slightly larger in *A. kuraka*), triangular; forewing widest anterior to apex of clavus; icu

elongated; y-vein with A1 to a varying degree higher elevated than PCu. Hind leg: tibia with 1–4 very small to large lateral spines, with 6 apical spines, grouped in two groups with or without a small gap in between, outermost spine largest, innermost and 3rd innermost spine almost as long as outermost spine; 1st tarsomere with 5–7 apical teeth and no platellae; 2nd tarsomere with 5–8 apical teeth and no platellae but with 1–5 fine setae.

Female genitalia: Ovipositor, wax plate and anal tube as in Fig. 7A–C: Ovipositor sabre-shaped (curved upwards), extending well beyond abdomen, sometimes protruding forewings. Wax plate oval shaped (widest from left to right). Anal tube varying in length (very short to medium length), in ventral view either trapezoid (widening towards apex) or rectangular. Anal style very long (about as long or longer than dorsal length of anal tube).



FIGURE 3. *Aka gwana*: A habitus; B,C head. *Aka hardyi*: D,E head; F,G habitus. Scale bar 1 mm.

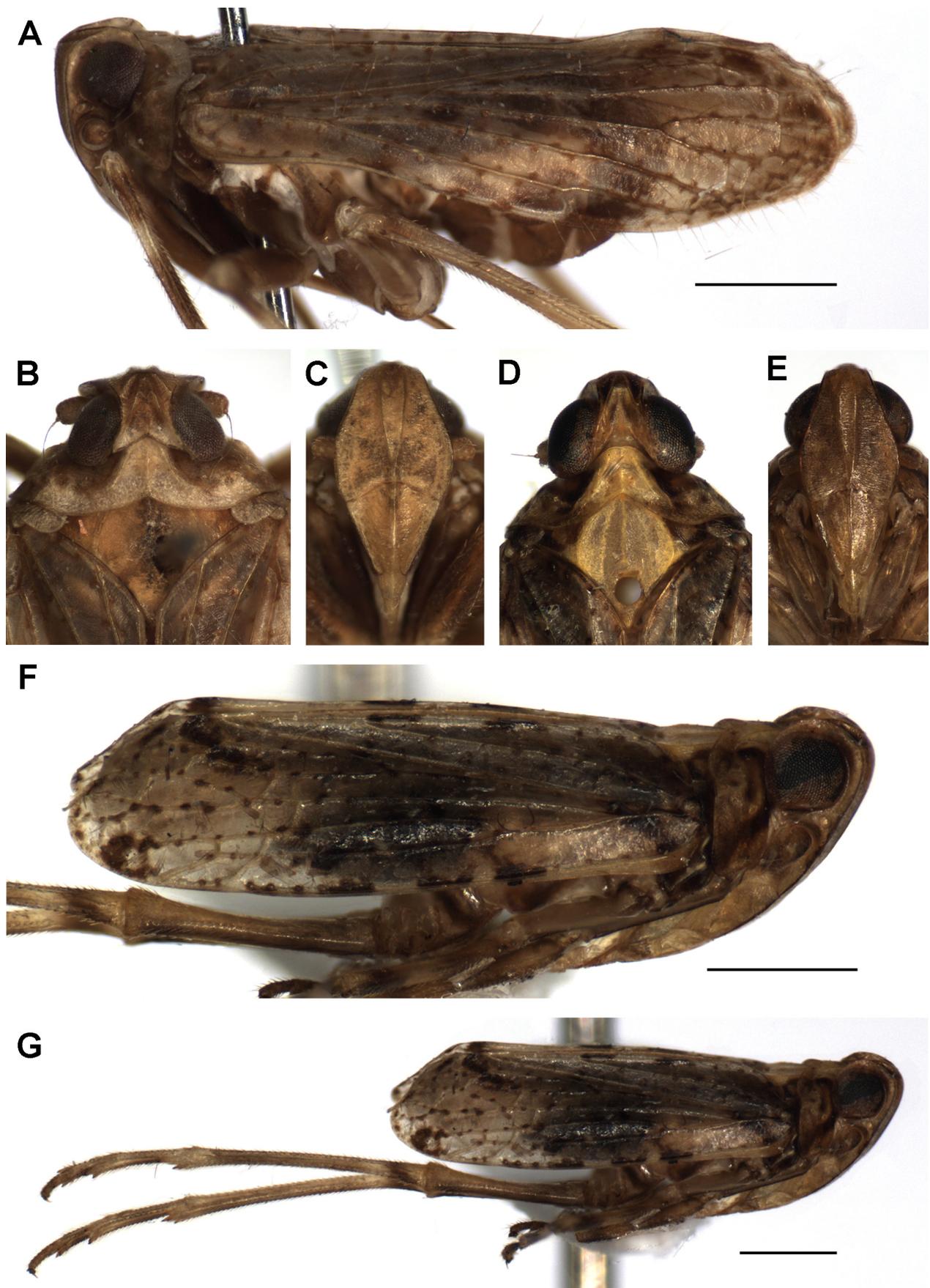


FIGURE 4. *Aka issidopsis*: A habitus; B,C head. *Aka kuraka*: D,E head; F, G habitus. Scale bar 1 mm.

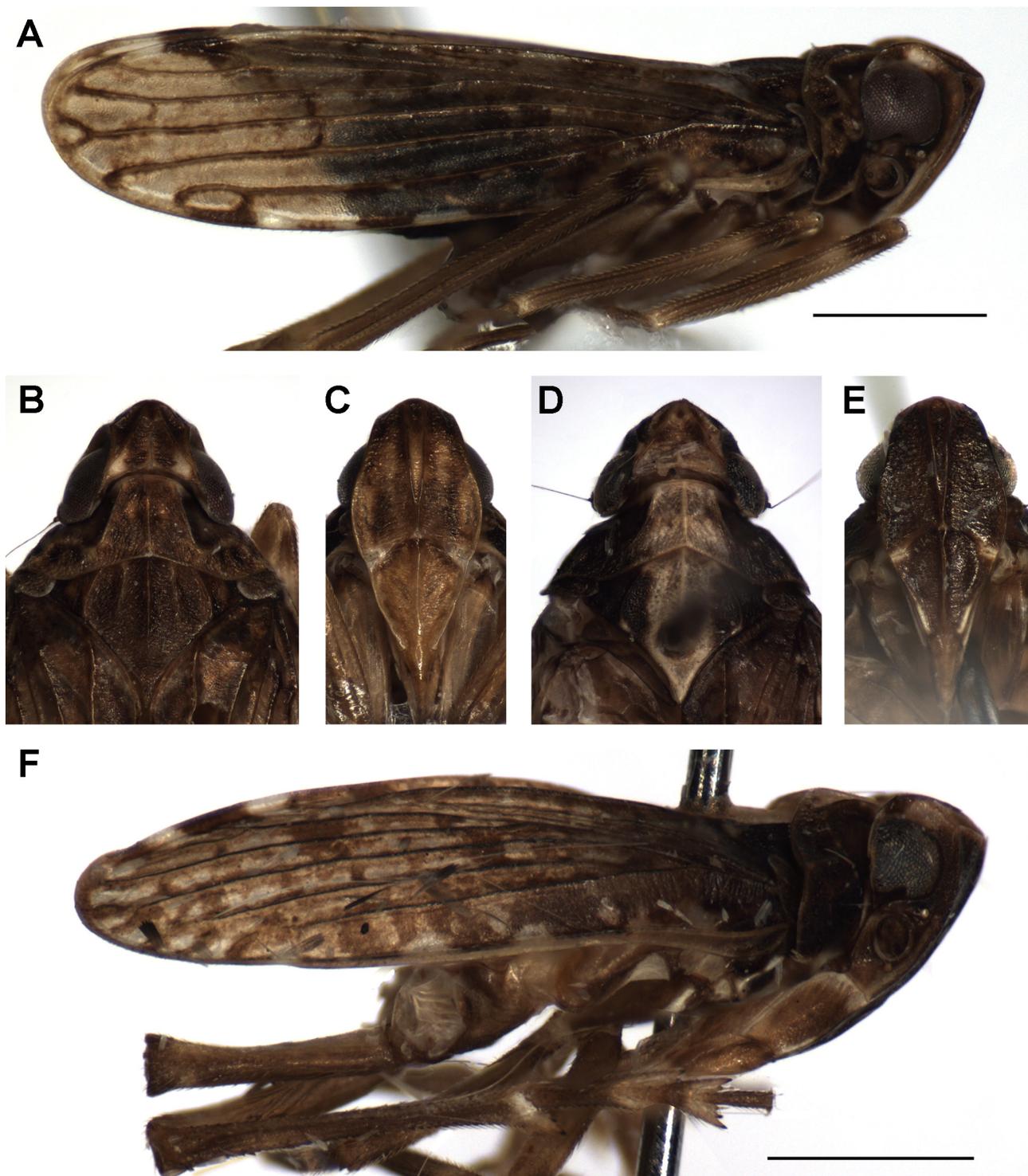


FIGURE 5. *Aka pirri*: A habitus; B,C head. *Aka sorellensis*: D,E head; F habitus. Scale bar 1 mm.

Distribution. Australia, New Zealand.

Remarks. On the tibia of one specimen of *A. dobsonensis* 5 apical spines were observed. The other leg showed the usual configuration of 6 spines. As all other specimens of *Aka* have 6 apical spines this appears to be an aberration.

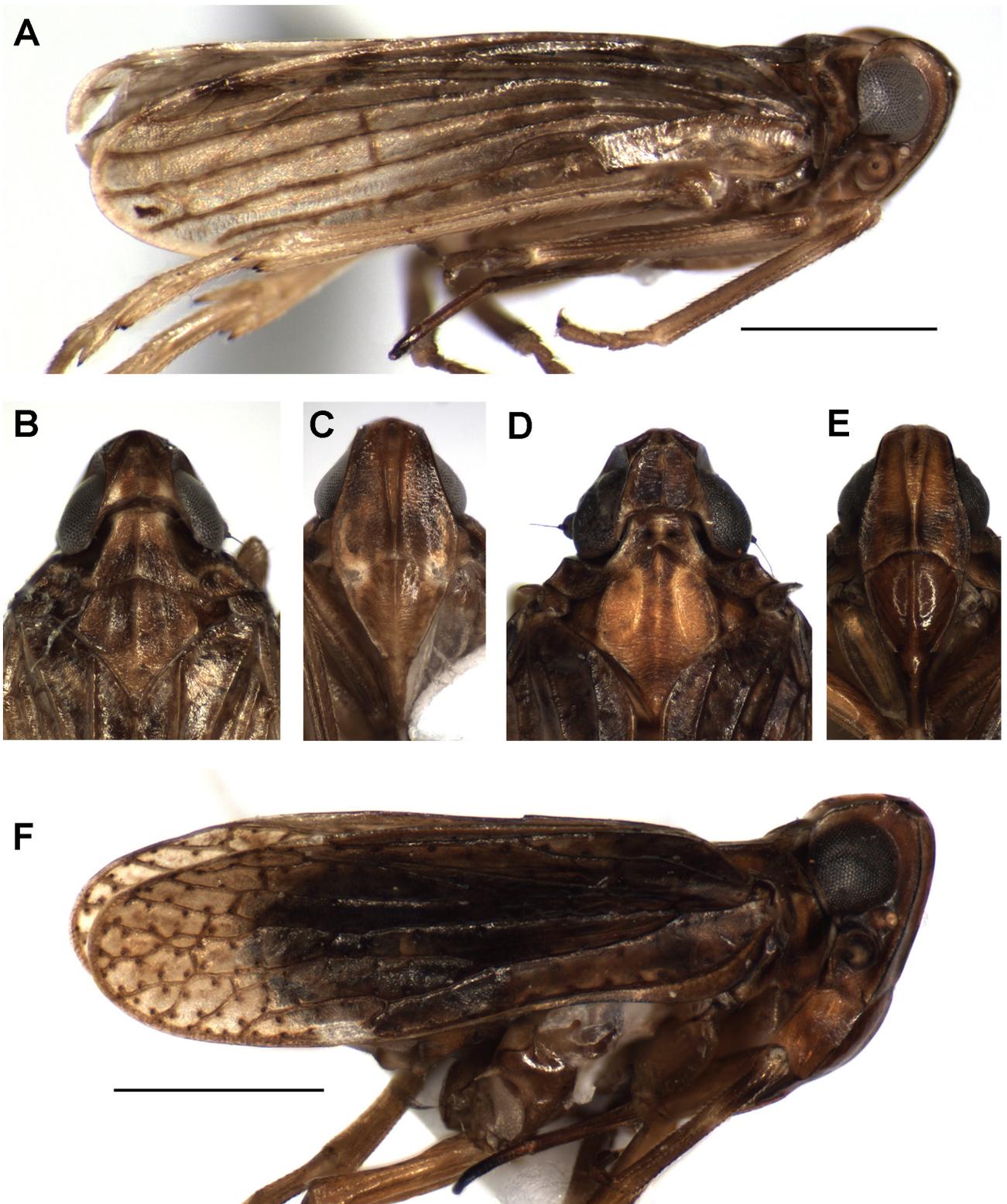


FIGURE 6. *Aka tasmani* (specimen from Thumbs Parallel Gully): A habitus; B,C head. *Yanganaka ariecornia*: D,E head; F habitus. Scale bar 1 mm.

Checklist of species of *Aka* White

- A. balma* **sp. nov.** (Australia)
A. dobsonensis **sp. nov.** (Australia)
A. dunedinensis Larivière, 1999 (New Zealand)
A. duniana (Myers, 1924) (New Zealand)
A. finitima (Walker, 1858) (New Zealand)
A. gwana **sp. nov.** (Australia)
A. hardyi Muir, 1931 (Australia)
A. issidopsis **sp. nov.** (Australia)
A. kuraka **sp. nov.** (Australia)
A. pirri **sp. nov.** (Australia)
A. rhodei Larivière, 1999 (New Zealand)
A. sorellensis **sp. nov.** (Australia)
A. tasmani Muir 1931 (Australia)
A. westlandica Larivière, 1999 (New Zealand)

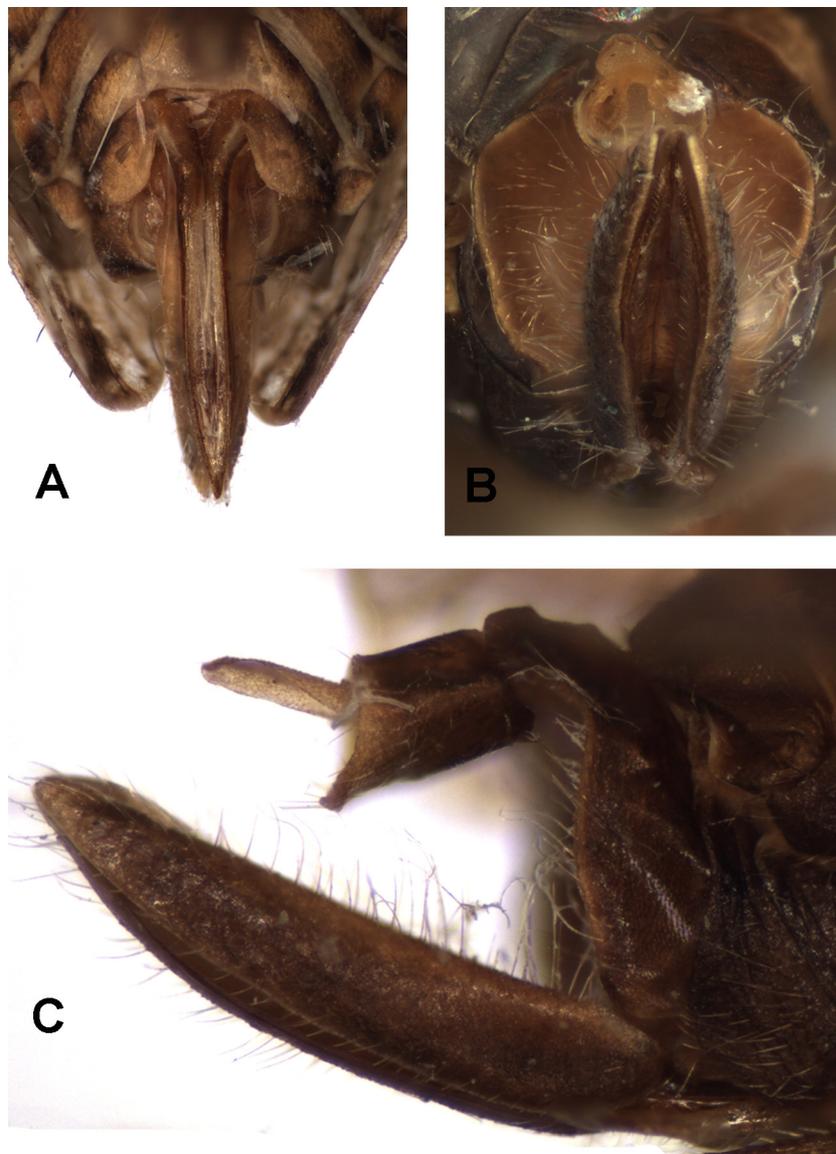


FIGURE 7. Female genitalia: A *Aka gwana* ventral view; B,C *Aka kuraka*: (B) caudal view, (C) right lateral view.

Key to Australian species of *Aka* White

- 1 Tubercles of forewing dark, in distinct contrast to cells (Figs 3A, 4A,F). 2
- Tubercles of forewing concolorous with veins and cells (Figs 2A,F, 3F, 5A,F, 6A). 4
2(1) Forewing with nodus of y-vein central within clavus (Fig. 3A). Hind leg with 7 apical teeth on the 1st tarsomere and 7–8 apical teeth on the 2nd tarsomere. *Aka gwana* sp. nov.
- Forewing with nodus of y-vein distinctly distad of centre of clavus (Figs 4A, F). Hind leg with 6 apical teeth on the 1st and 2nd tarsomere. 3
3(2) Caudal border (basal emargination) of vertex rectangular to acute (Fig. 4D). *Aka kuraka* sp. nov.
- Caudal border (basal emargination) of vertex broadly obtuse (Fig. 4A). *Aka issidopsis* sp. nov.
4(1) Hind leg with 5–6 apical teeth on the 1st tarsomere. 5
- Hind leg with 7 apical teeth on the 1st tarsomere. 6
5(4) Aedeagus with one very long spine and two shorter ones (Fig. 9A). *Aka dobsonensis* sp. nov.
- Aedeagus with 3 spines of more or less equal length (Figs 11A). *Aka hardyi* Muir
6(4) Mesonotum with three carinae. Forewing with RP apically forked. Distance tegula to ScR+M about as long as distance between this fork and ScRA+RP fork. *Aka sorellensis* sp. nov.
- Mesonotum with five carinae. Forewing with RP apically unforked. Distance tegula to ScR+M fork much longer than distance between this fork and ScRA+RP fork. 7
7(6) Aedeagus with one forked spine and two unforked spines (Figs 8A,B). *Aka balma* sp. nov.
- Aedeagus with unforked spines only (Figs 14A,B, 16A,B). 8
8(7) Aedeagus right lateral with a very long spine (about as long as flagellum) with its tip directed downwards towards base of the aedeagus (Fig. 14B). *Aka pirri* sp. nov.
- Aedeagus right lateral with a medium sized spine (about half as long as flagellum) with its tip directed dorsally towards the flagellum (Fig. 16B). *Aka tasmani* Muir

Aka balma sp. nov.

(Figs 2A–C, 8)

Zoobank Registration: <http://zoobank.org/urn:lsid:zoobank.org:act:5A0967D9-98A4-4087-B197-BF3D8924DA17>

Types. *Holotype*, ♂, **AUSTRALIA, Tas:** Big Sassy Creek, pyrethrum knockdown, Sassafras, 12.v.1989 (D. Rounsevelli) (ASCU ASCT00179976). *Paratypes*, **Tas:** 1 ♂, same as holotype except for site 2 (P. Greenslade & D. Rounsevelli) (ASCU); 6 ♂, Big Sassy Creek, u.v.l., 10.iv.1991 (T. Semmens) (TAIC).

Etymology. The term „balma“ means „fork“ in Gooniyandi, an Aboriginal language spoken in Western Australia (Thieberger & McGregor 1994). Named after the forked spine on the phallosoma.

Diagnosis. This species can be distinguished from all other Australian *Aka* by the presence of a bifurcate spine left laterally on the phallosoma.

Colour. Vertex mid brown, carinae paler, with a whitish spot where subapical carinae meet lateral borders of vertex. Face light to mid brown, sometimes with a few darker areas; with a whitish spot at each lateral end of frontoclypeal suture. Pro- and mesonotum brown with slightly paler carinae; lateral parts of pro- and mesonotum usually darker. Forewings light brown to whitish, mottled with darker marks; tubercles and veins concolorous with cells; costa with 3 or more mid to dark brown bands; pterostigma whitish. Abdominal sternites mid to dark brown. Legs light brown with a few darker marks.

Morphology. Body length: ♂ 4.6–4.9 mm.

Head: Vertex 1.2–1.3 x wider than long; median carina of vertex covering ½ to almost full length of basal compartment of vertex. Frons 1.1–1.2 x longer than wide; maximum width no more than 2x apical width; position of maximum width moderately to distinctly dorsad of centre of frontoclypeal suture; median carina forked in basal (near frontoclypeal suture) third to half of frons. Median ocellus absent or present (distinct or indistinct). Anteclypeus lacking median carina. Subapical segment of rostrum 1.6–1.7 x longer than apical segment.

Thorax: Mesonotum with distinct sublateral carinae. Forewing 2.9–3.4 x longer than wide; costal margin with a few indistinct tubercles; tubercles never within cells; tubercles very small, concolorous with veins; tubercles not bearing setae; Sc+R+M near basal cell fused, forming a minute common stem; Sc+R+M fork of ScRA+RP distinctly basad of fork CuA1+CuA2; distance tegula to ScR+M fork longer than distance between this fork and ScRA+RP fork; position of r-m distinctly basad of fork MA+MP; fork MA+MP situated between apical 1/16 and 1/8 of forewing or M unforked; icu distinctly distad of apex of clavus; RP apically unforked; MA unforked, MP unforked or sometimes M not forked into MA and MP; nodus of y-vein distinctly distad of centre of clavus; y-vein

with A1 slightly elevated; 4–5 apical cells. Hind leg: 1st tarsomere with 7 apical teeth; 2nd tarsomere with 7 apical teeth and 4 fine setae.

Male genitalia: Anal tube (Figs 8C,D) in dorsal view rounded, straight or very slightly excavated, starting to form two separate lobes; lobes in lateral view produced into rounded hooks. Pygofer and genital styles as in Figs 8E–G. Aedeagus (Figs 8A,B): Phallosome left laterally with a forked spine (a); right laterally with a very long spine (b), reaching down as far as flagellum and a much shorter spine (c). Flagellum unarmed.

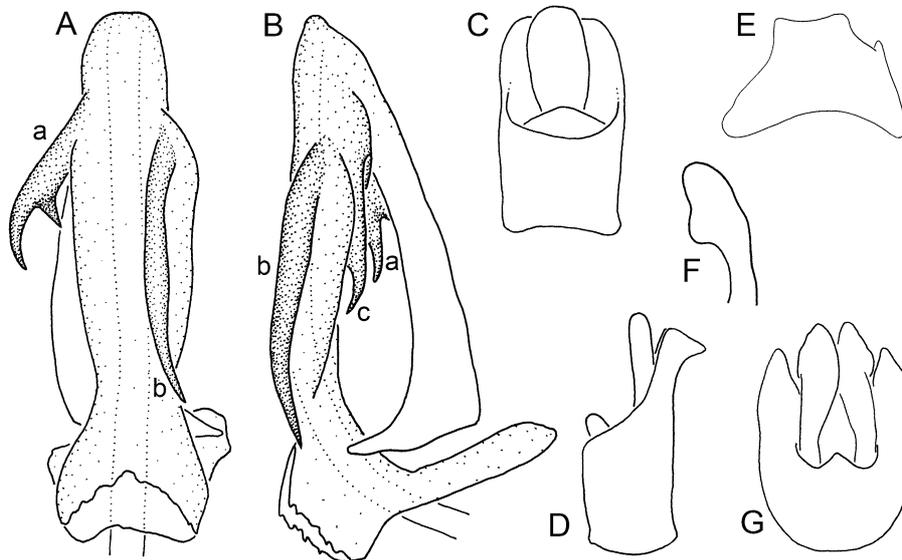


FIGURE 8. *Aka balma*: A aedeagus ventral; B aedeagus right lateral; C–D anal tube; E pygofer; F–G genital styles.

***Aka dobsonensis* sp. nov**

(Figs 2D–F, 9)

Zoobank Registration: <http://zoobank.org/urn:lsid:zoobank.org:act:C5B732FF-807E-4E8A-9AA1-C1ACD42BC335>

Types. *Holotype*, 1 ♂, **AUSTRALIA, Tas:** Lake Dobson, Mt Field N.P., 42° 40.9'S, 146° 35.2'E, 1080m, ex *Nothofagus cunninghamii* beats, 55GDN662743, Id4/Nc/HeAu3, 6.iii.2000 (PJK-W [J. Keble Williams]) (ASCU ASCTHE028621). *Paratypes*, **Tas:** 1 ♂, Lake Fenton, Mt Field N.P., 42° 40.6'S, 146° 37.4'E, 1000m, ex *Nothofagus cunninghamii* beats, 55GDN692748, If12/Nc/HeAu3, 10.iv.2000 (PJK-W [J. Keble Williams]) (ASCU); 1 ♂, [Mount?] Pelion, malaise #1, 15.v.1990 (ANIC).

Etymology. Named after the type locality, Lake Dobson.

Diagnosis. *Aka dobsonensis* and *A. sorellensis* are the only Australian species of *Aka* with a deeply excavated apex of the anal tube. These two species differ in the number of apical teeth on the first tarsomere (*A. dobsonensis* with 6, *A. sorellensis* with 7).

Colour. Vertex brown, carinae paler, with a whitish spot where subapical carinae meet lateral borders of vertex. Frons in most specimens with a rectangular, dark brown, central area; lateral parts and carinae mid brown; a paler spot where forked carinae meet vertex and a whitish spot at each lateral end of frontoclypeal suture; post- and anteclypeus mid brown with slightly paler carinae. Pro- and mesonotum brown with slightly paler carinae; pronotum paler than mesonotum. Forewings light brown to whitish, mottled with mid to dark brown spots; tubercles and veins concolorous with cells; pterostigma whitish. Abdominal sternites mid to dark brown. Legs light brown with a few darker marks.

Morphology. Body length: ♂ 3.9–4.3 mm.

Head: Vertex 1.3–1.4 x wider than long; median carina of vertex covering 1/2–2/3 of basal compartment of vertex. Frons 1.0–1.1 x as long as wide; maximum width no more than 2x apical width; position of maximum width slightly dorsad of centre of frontoclypeal suture; median carina forked in basal (near frontoclypeal suture) fourth of frons. Median ocellus present (distinct or indistinct). Anteclypeus lacking median carina. Subapical segment of rostrum 1.5 x longer than apical segment.

Thorax: Mesonotum without sublateral carinae. Forewing 2.8–3.6 x longer than wide; costal margin with or

without a number of indistinct tubercles; tubercles never within cells; tubercles very small, concolorous with veins; some tubercles bearing setae; Sc+R+M near basal cell fused, forming a minute common stem Sc+R+M or Sc+R fused, M emerging separately from basal cell; fork of ScRA+RP distinctly basad of fork CuA1+CuA2; distance tegula to ScR+M fork longer than distance between this fork and ScRA+RP fork; position of r-m distinctly basad of fork MA+MP; fork MA+MP situated around apical 1/16 of forewing; icu distinctly distad of apex of clavus; RP apically unforked or bifid; MA unforked, MP unforked or sometimes M not forked into MA and MP; nodus of y-vein distinctly distad of centre of clavus; y-vein with A1 moderately to highly elevated; 5–6 apical cells. Hind leg: 1st tarsomere with 6 apical teeth; 2nd tarsomere with 6 (rarely 5 or 7) apical teeth and 2–3 fine setae.

Male genitalia: Anal tube apically deeply excavated, forming two separate apical lobes as in Figs 9C,D. Pygofer and genital styles as in Figs 9E–G. Aedeagus (Figs 9A,B): Phallosome ventrally with a long, slightly curved spine (b) covering about ¾ of length of aedeagus; left and right lateral with a shorter strongly curved spine (a,c) each. Flagellum unarmed.

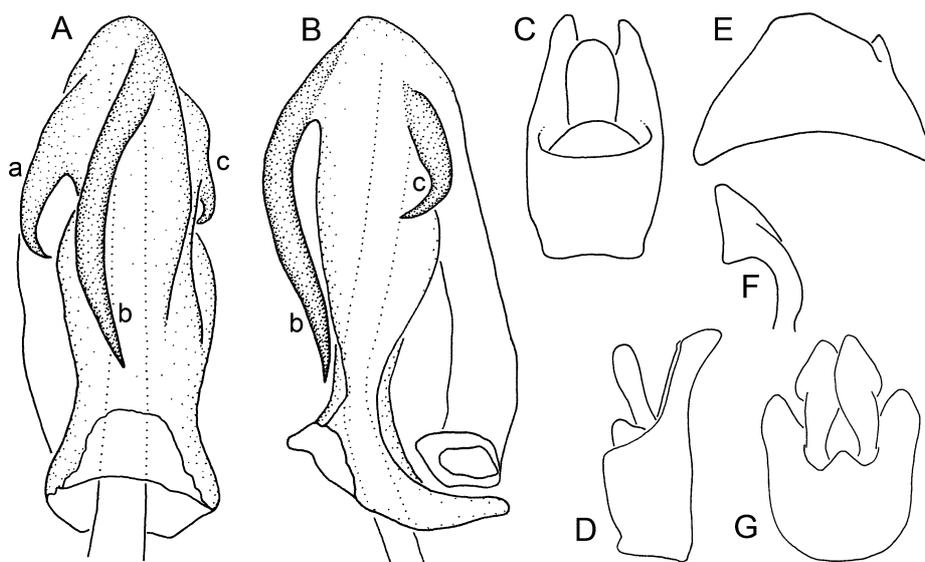


FIGURE 9. *Aka dobsonensis*: A aedeagus ventral; B aedeagus right lateral; C–D anal tube; E pygofer; F–G genital styles.

***Aka gwana* sp. nov.**

(Figs 3A–C, 7A, 10)

Zoobank Registration: <http://zoobank.org/urn:lsid:zoobank.org:act:06E87AA3-58B5-4325-BCA5-A77F6C8B0F99>

Types. *Holotype*, ♂, **AUSTRALIA, Tas:** Mt Michael, 710m, u.v.l., 24.x.1990 (T. Semmens) (TAIC 145562). *Paratypes*, 1 ♂, same data as holotype; 1 ♀, Mt Barrow summit, 1280m, UVL, 25.i.1990 (L. Hill) (TAIC).

Etymology. The term „gwana“ means „goanna“ in Torres Strait Creole, an indigenous language spoken in Queensland (Thieberger & McGregor 1994). Named after the long, forked spine on the apex of flagellum which resembles the forked tongue of a goanna.

Diagnosis. This species can be distinguished from all other Australian *Aka* by the presence of more than two spines on the flagellum.

Colour. Vertex mid brown, carinae paler, with a whitish spot where subapical carinae meet lateral borders of vertex or vertex entirely light brown. Face light to mid brown, darker near vertex; carinae concolorous; frons often with a whitish spot at each lateral end of frontoclypeal suture. Pro- and mesonotum brown with slightly paler carinae; pronotum either paler than mesonotum or both the same colour but lateral parts darker. Forewings light brown to whitish, mottled with darker spots; veins concolorous with cells; tubercles darker, in distinct contrast to cells; pterostigma whitish. Abdominal sternites light brown. Legs light brown with a few darker marks.

Morphology. Body length: ♂ 4.2–4.3 mm; ♀ 5.1–5.6 mm.

Head: Vertex 1.3–1.4 x wider than long; median carina of vertex covering about ¾ of basal compartment of vertex. Frons 1.2–1.3 x longer than wide; maximum width no more than 2x apical width; position of maximum

width distinctly dorsad of centre of frontoclypeal suture; median carina forked in basal (near frontoclypeal suture) third to half of frons. Median ocellus present (indistinct). Anteclypeus with very indistinct median carina. Subapical segment of rostrum 1.3–1.7 x longer than apical segment.

Thorax: Mesonotum with indistinct sublateral carinae. Forewing 2.9–3.3 x longer than wide; costal margin with 8–11 distinct tubercles; tubercles aligned alongside veins, but reaching to some extent into cell area; tubercles large, dark, in distinct contrast to cells; many tubercles bearing very long setae; Sc+R+M near basal cell fused, forming a minute common stem Sc+R+M; fork of ScRA+RP distinctly basad, slightly basad or at same level as fork CuA1+CuA2; distance tegula to ScR+M fork distinctly (about $\frac{1}{2}$ to $\frac{3}{4}$) shorter than distance between this fork and ScRA+RP fork; position of r-m moderately basad of fork MA+MP; fork MA+MP situated around apical $\frac{1}{3}$ of forewing; icu slightly distad of apex of clavus; RP apically bifid; MA bifid; MP unforked; nodus of y-vein more or less in centre of clavus; y-vein with A1 moderately elevated; 7 apical cells. Hind leg: 1st tarsomere with 7 apical teeth; 2nd tarsomere with 7–8 apical teeth and 4–5 fine setae.

Male genitalia: Anal tube (Figs 10C,D) apically slightly indented, forming two rounded lobes. Pygofer as in Fig. 10E. Genital styles apically rounded, laterally produced resembling the beak of a bird as in Figs 10F,G. Aedeagus (Figs 10A,B): Phallosome left laterally with spines (a,b) and right laterally with a curved spine (c). Base of phallosome ventrally with 2 small sclerotised teeth. Flagellum near base with 3 sclerotised spines (d,e,f), apically widening into a large disc which gives rise to a long, bifurcate spine (g).

Remarks. In one of the specimens the CuA1+CuA2 fork is in an unusual position near the apex of the forewing, therefore the ScRA+RP fork is distinctly basad in this specimen.

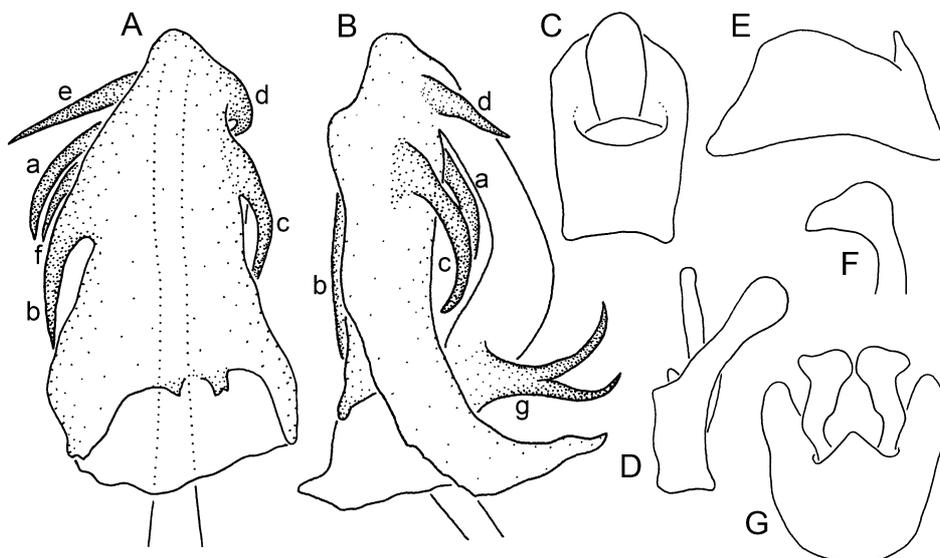


FIGURE 10. *Aka gwana*: A aedeagus ventral; B aedeagus right lateral; C–D anal tube; E pygofer; F–G genital styles.

Aka hardyi Muir, 1931

(Figs 3D–F, 11)

Aka hardyi Muir, 1931: 64.

Types. *Neotype*, here designated, ♂, **AUSTRALIA, Tas:** Mt Wellington, 22.ix.1935 (J.W. Evans) (ASCU ASCTHE016788).

Notes. Muir (1931) based this species on one male from Mount Wellington, 30.ix.1917 collected by G.H. Hardy and deposited in AMS. The male holotype could not be located in AMS. Neither could it be located in other collections known to contain Muir types (BMNH, BPBM). Therefore the type is declared lost. Nine specimens examined in this study matched the description of *A. hardyi* and are therefore used to redescribe this species. From these specimens a male topotypic specimen is hereby designated as a neotype to provide a diagnostic reference for the species.

Other material examined. AUSTRALIA, Tas: 1 ♀, same data as neotype (ASCU); 2 ♂, Lake Fenton, Mt Field N.P., 42° 40.6'S, 146° 37.4'E, 1000m, ex *Nothofagus cunninghamii* beats, 55GDN692748, If12/Nc/HeAu3, 10.iv.2000 (PJK-W [J. Keble Williams]) (ASCU); 1 ♂, same data except for 1010m, If2NcN/He30, 27.iii.2000 (J.Keble Williams); 1 ♂, same data except for If1Ng/He32, 3.iii.2000; 1 ♂, Lake Skinner, Snowy Range, 42° 56.4'S, 146° 40.6'E, 2000m, ex *Nothofagus cunninghamii* beats, 55GDN738456, Is9/Nc/HeAu3, 7.iv.2000 (PJK-W [J. Keble Williams]) (ASCU); 2 ♂, Hobart, 18.ix.1935 (J.W. Evans) (ASCU).

Diagnosis. This species can be distinguished from all other Australian *Aka* by the following combination of characters: male anal tube apically rounded, forming only one lobe; aedeagus with only 3 spines which are more or less equal in length.

Colour. Vertex mid to dark brown, carinae paler, with a whitish spot where subapical carinae meet lateral borders of vertex. Frons with a rectangular, dark brown, central area; lateral parts and carinae mid brown; a paler spot where forked carinae meet vertex and a whitish spot at each lateral end of frontoclypeal suture; post- and anteclypeus brown with slightly paler carinae. Pro- and mesonotum brown with slightly paler carinae; pronotum paler than mesonotum. Forewings light brown to whitish, mottled with mid to dark brown spots; tubercles concolorous with cells; veins in general darker than cells; pterostigma whitish. Abdominal sternites mid brown. Legs light to mid brown sometimes with a few darker marks.

Morphology. Body length: ♂ 3.8–4.9 mm; ♀ 5.4 mm.

Head: Vertex 1.3–1.4 x wider than long; median carina of vertex generally covering about 1/2 of basal compartment of vertex, rarely complete cover. Frons 1.0–1.2 x as long as wide; maximum width no more than 2x apical width; position of maximum width moderately dorsad of centre of frontoclypeal suture; median carina forked in basal (near frontoclypeal suture) fourth of frons. Median ocellus absent or present (distinct or indistinct). Anteclypeus lacking median carina. Subapical segment of rostrum 1.2–1.5 x longer than apical segment.

Thorax: Mesonotum with or without indistinct sublateral carinae. Forewing 2.7–2.9 x longer than wide; costal margin with a number of indistinct tubercles; tubercles never within cells; tubercles very small, concolorous with veins; tubercles not bearing setae; Sc+R+M near basal cell fused, forming a minute common stem Sc+R+M; fork of ScRA+RP distinctly basad of fork CuA1+CuA2; distance tegula to ScR+M fork longer than distance between this fork and ScRA+RP fork; position of r-m distinctly basad of fork MA+MP; fork MA+MP situated between apical 1/16 and 1/4 of forewing; icu distinctly distad of apex of clavus (rarely at same level as apex of clavus); RP apically unforked; MA unforked; MP unforked or bifid; nodus of y-vein distinctly distad of centre of clavus; y-vein with A1 moderately elevated; 4–6 apical cells. Hind leg: 1st tarsomere with 6 apical teeth (rarely 5); 2nd tarsomere with 6 apical teeth and 2–3 fine setae.

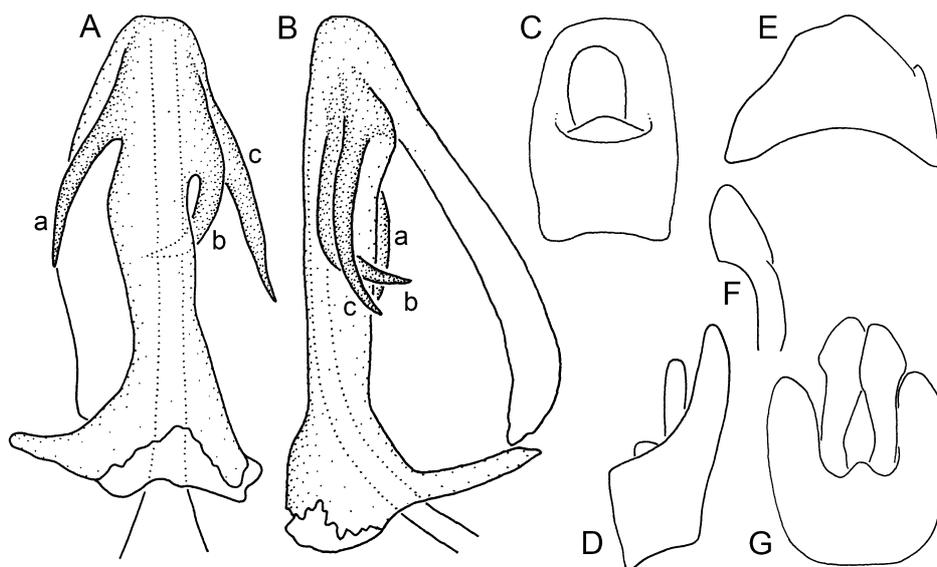


FIGURE 11. *Aka hardyi*: A aedeagus ventral; B aedeagus right lateral; C–D anal tube; E pygofer; F–G genital styles.

Male genitalia: Anal tube apically rounded, forming only one lobe, as in Figs 11C,D. Pygofer and genital styles as in Figs 11E–G. Aedeagus (Figs 11A,B): Phallosome with 3 spines of more or less equal length. Spine (a) slightly

curved, arising left lateral; the other two arising right lateral, close to each other, spine (b) strongly curved, its tip directed left lateral and spine (c) slightly curved. Flagellum unarmed.

***Aka issidopsis* sp. nov**

(Figs 4A–C, 12)

Zoobank Registration: <http://zoobank.org/urn:lsid:zoobank.org:act:73DC0C0F-AC8E-4C44-9E11-BCD695F9831B>

Types. *Holotype*, ♂, AUSTRALIA, ACT: B[1]undells Ck, 35.22S 148.50E, vi 1987 (D.H. Colless) (ANIC 20-007841). *Paratypes*, ACT: 6 ♂, 3 ♀, same data as holotype; 2 ♂, same data except for v.1987; 4 ♂, same data except for vi.1987, malaise trap; 2 ♂, 5 ♀, same data except for v.1987, malaise trap. **Vic:** 1 ♂, Cumberland Ck, via Marysville, 850m, sweeping low vegetation, temperate rainforest, 10.xii.1974 (I. Naumann) (QM); 1 ♂, Mt Buffalo, 21.viii.1935 (O.H. Swezey) (BPBM).

Etymology. This species resembles members of the Fulgoromorpha family Issidae in general body shape.

Diagnosis. This species can easily be distinguished from all other species of *Aka* by the following characters. Forewings at posterior end of thorax not tectiform, but raised up, both forewings almost forming a continuous plane. Therefore in dorsal view forewings very wide, diamond shaped, resembling Issidae. All other species have entirely tectiform wings, which are narrow in dorsal view.

Colour. Vertex yellowish, light brown, carinae paler, with a whitish spot where subapical carinae meet lateral borders of vertex. Frons and postclypeus light brown; anteclypeus paler. Pro- and mesonotum yellowish, light brown, sometimes with slightly paler carinae; pronotum sometimes paler than mesonotum. Forewings light brown with a few darker marks; tubercles darker, in distinct contrast to cells; veins sometimes slightly darker than cells; pterostigma whitish. Abdominal sternites light to mid brown. Legs light brown with a few darker marks.

Morphology. Body length: ♂ 4.8–5.4 mm; ♀ 5.1–5.7 mm.

Head: Vertex 1.0–1.2 x as wide as long; median carina covering 1/3 to full length of basal compartment of vertex. Frons 1.0–1.4 x as long as wide; maximum width no more than 2x apical width; position of maximum width moderately to distinctly dorsad of centre of frontoclypeal suture; median carina forked in basal (near frontoclypeal suture) fourth of frons. Median ocellus absent or present (indistinct). Anteclypeus lacking median carina. Subapical segment of rostrum 1.6–1.7 x longer than apical segment.

Thorax: Basal thirds of forewings not tectiform but raised up to form an almost continuous plane. In dorsal view forewings very wide, their shape resembling Issidae. Mesonotum with or without indistinct sublateral carinae. Forewing 2.5–3.0 x longer than wide; costal margin with 13–19 very distinct tubercles; tubercles aligned alongside veins, but reaching to some extent into cell area; tubercles dark, underlaid by a larger dark circle, therefore appearing large and distinctly in contrast to cells; most tubercles bearing very long setae; Sc+R fused, M emerging separately from basal cell; fork of ScRA+RP distinctly basad of fork CuA1+CuA2; distance tegula to ScR+M fork about as long or slightly shorter than distance between this fork and ScRA+RP fork; position of r-m distinctly basad of fork MA+MP; fork MA+MP situated between apical 1/5 and 1/2 of forewing; icu at same level or slightly distad of apex of clavus; RP apically bifid; MA bifid; MP unforked or bifid; nodus of y-vein distinctly distad of centre of clavus; y-vein with A1 slightly elevated; 6–8 apical cells. Hind leg: 1st tarsomere with 6 apical teeth; 2nd tarsomere with 6 apical teeth and 1–3 fine setae.

Male genitalia: Anal tube apically rounded, forming only one lobe, as in Figs 12C,D. Pygofer and genital styles as in Figs 12E–G. Aedeagus (Figs 12A,B): Phallosome left laterally with an almost straight spine (a), slightly curved at its tip; right laterally with a shorter, slightly s-shaped spine (b) and a long, strongly curved spine (c) with its tip directed caudally. Base of phallosome ventrally with 2 small sclerotised teeth. Flagellum near base laterally extended forming a large sheet, apically with 2 slightly sclerotised spines.

Remarks. One specimen collected in ACT had 7 apical teeth on the first tarsomere. This situation was only present in one leg, the other leg displayed 6 teeth as in all other specimens of this species. Therefore this appears to be an aberration. The specimen from Mt. Buffalo deviates slightly from the colour description given above as it is generally darker in colour.

The length of aedeagal spine (b) varies within the species. It is longest in the specimen from Cumberland Ck and shorter in the specimens from Blundells Ck.

The curved spine (c) inserting right lateral and transversing to left lateral resembles that of the New Zealand

species of *A. finitima*, *A. dunedinensis*, *A. westlandica* and *A. duniana*. However, in these species there are two spines inserting on the left lateral side, whereas *A. issidopsis* has only one spine inserting left lateral.

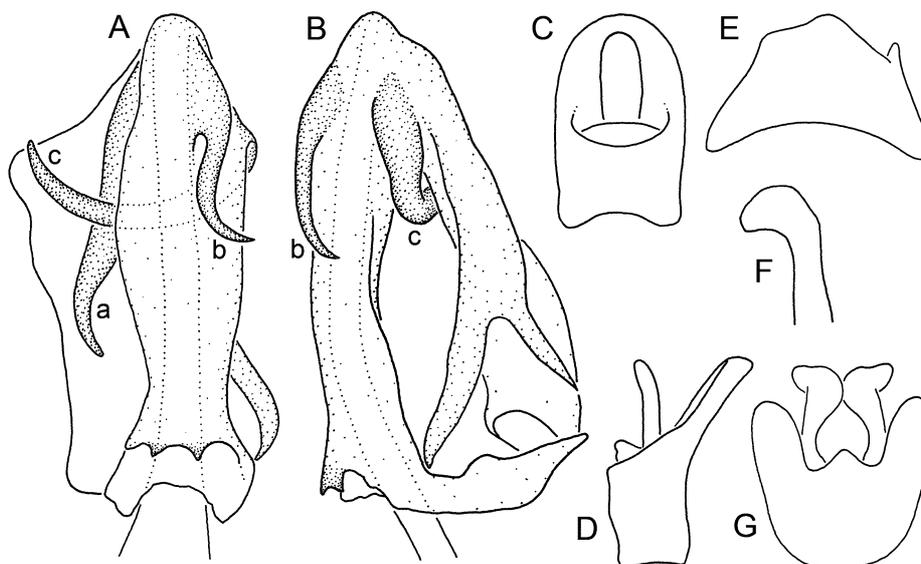


FIGURE 12. *Aka issidopsis*: A aedeagus ventral; B aedeagus right lateral; C–D anal tube; E pygofer; F–G genital styles.

***Aka kuraka* sp. nov.**

(Figs 4D–G, 7B,C, 13)

Zoobank Registration: <http://zoobank.org/urn:lsid:zoobank.org:act:1BD1C04B-C09B-4785-A647-002DDEED8777>

Types. *Holotype*, ♂, **AUSTRALIA, Tas:** Balfour Track F.R., 41.08S, 144.57E, 80m, uvl, *Nothofagus*, 8.xi.1992 (P.B. McQuillan) (TAIC 145563). *Paratypes*, **Tas:** 1 ♂, 2km W Commonwealth Hill, via Rennison Bell, 40.49S, 145.24E, ex ethanol, 9.xii.1981 (I.D. Naumann) (ANIC); 1 ♀, Corinna, UVL, 11.iv.1986 (L. Hill) (TAIC); 1 ♂, Waratah (Lea) (SAMA).

Etymology. The term „kuraka“ means „duck“ in Nyungar, an Aboriginal language spoken in Western Australia (Thieberger & McGregor 1994). Named after the shape of the genital style in lateral view which resembles the head of a duck.

Diagnosis. This species can be distinguished from all other Australian species of *Aka* by the angle formed by the caudal border of the vertex, which is rectangular to acute in *A. kuraka*, as opposed to broadly obtuse.

Colour. Vertex light brown, carinae paler, disc and other concave areas between apical and subapical carinae often dark brown; sometimes with a whitish spot where subapical carinae meet lateral borders of vertex. Face light to mid brown; carinae concolorous with face; frons with a whitish spot at each lateral end of frontoclypeal suture. Pro- and mesonotum brown with slightly paler carinae; lateral parts of pro- and mesonotum darker. Forewings light brown to whitish, with a few mid to dark brown marks; 3 or more darker bands on costa; usually with 2–3 darker marks in clavus; tubercles dark, in distinct contrast to cells; veins concolorous with cells, sometimes slightly darker; pterostigma whitish. Abdominal sternites mid to dark brown. Legs light to mid brown sometimes with a few darker marks.

Morphology. Body length: ♂ 5.3–5.4 mm; ♀ 5.7 mm.

Head: Vertex 0.9–1.0 x as wide as long; median carina of vertex covering about 1/3 of basal compartment of vertex. Frons 1.4 x longer than wide; maximum width more than 2x apical width, steadily broadening; position of maximum width distinctly dorsad of centre of frontoclypeal suture; median carina forked in basal (near frontoclypeal suture) fourth of frons. Median ocellus absent or present (indistinct). Anteclypeus with very indistinct median carina. Subapical segment of rostrum 2.0 x longer than apical segment.

Thorax: Mesonotum with or without indistinct sublateral carinae. Forewing 3.2–3.5 x longer than wide; costal margin with 13–18 distinct tubercles; tubercles aligned alongside veins, but reaching to some extent into cell area;

tubercles dark, underlaid by a larger dark circle, therefore appearing large and distinctly in contrast to cells; tubercles not bearing setae; Sc+R fused, M emerging separately from basal cell; fork of ScRA+RP distinctly basad of fork CuA1+CuA2; distance tegula to ScR+M fork distinctly (about $\frac{1}{2}$ to $\frac{3}{4}$) shorter than distance between this fork and ScRA+RP fork; position of r-m distinctly to moderately basad of fork MA+MP; fork MA+MP situated between apical $\frac{1}{8}$ and $\frac{1}{3}$ of forewing; icu at same level or slightly distad of apex of clavus; RP apically bifid; MA bifid; MP bifid; nodus of y-vein distinctly distad of centre of clavus; y-vein with A1 slightly elevated; 6–9 apical cells. Hind leg: 1st tarsomere with 6 apical teeth; 2nd tarsomere with 6 apical teeth and 3 fine setae.

Male genitalia: Anal tube (Figs 13C,D) apically slightly indented, forming two rounded lobes. Pygofer as in Fig. 13E. Genital styles apically rounded, laterally produced resembling the beak of a duck as in Figs 13F,G. Aedeagus (Figs 13A,B): Phallosome left laterally with a strongly curved spine (a); ventrally with a thick, long spine (b); right laterally with a short, straight spine (c). Base of phallosome ventrally with 2 small sclerotised teeth. Flagellum unarmed, near base laterally extended.

Remarks. *Aka kuraka* and *A. issidopsis* share the same lateral extension near the base of the flagellum, however in *A. issidopsis* the flagellum is widened twice as much as in *A. kuraka*.

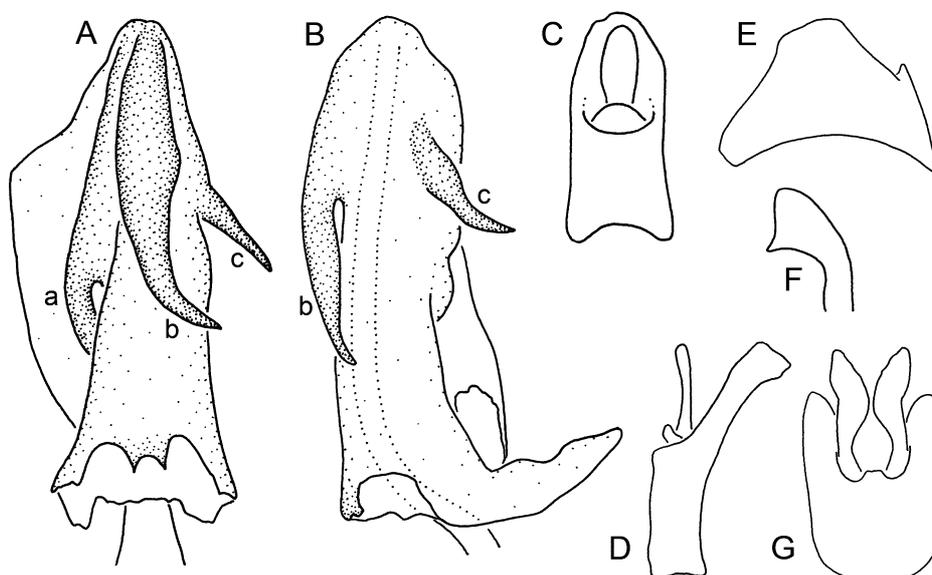


FIGURE 13. *Aka kuraka*: A aedeagus ventral; B aedeagus right lateral; C–D anal tube; E pygofer; F–G genital styles.

***Aka pirri* sp. nov.**

(Figs 5A–C, 14)

Zoobank Registration: <http://zoobank.org/urn:lsid:zoobank.org:act:C49B3E32-8B15-4555-876A-8BB85B7D665A>

Types. *Holotype*, ♂, **AUSTRALIA, Tas:** Thumbs Parallel Gullies, inner closed forest, pyrethrum knockdown, Sassafras, 1 ix.1989 (R.Coy) (ASCU ASCTHE016784). *Paratypes*, **Tas:** 2 ♂, same data as holotype; 1 ♂, Warra LTER site, site 254, 7.xi.1997 (R. Bashford) (ASCU); 1 ♂, same data except for site 663, ex ethanol.

Etymology. The term „pirri“ means „hook“ in Kaurna, an Aboriginal language spoken in the Adelaide Plains (Thieberger & McGregor 1994). Named after the apical lobes of the anal tube which are produced into hooks in lateral view.

Diagnosis. This species can be distinguished from all other Australian *Aka* by the following combination of characters: first tarsomere with 7 and second tarsomere with 7–8 apical teeth; lobes of male anal tube in lateral view produced into hooks; aedeagus right lateral with a very long spine (about as long as flagellum) with its tip directed towards the base of the aedeagus; absence of a bifurcate spine on the aedeagus.

Colour. Vertex light to mid brown, carinae paler, with a whitish spot where subapical carinae meet lateral borders of vertex. Face light brown, rarely with a few darker marks; with a whitish spot at each lateral end of frontoclypeal suture. Pro- and mesonotum brown with slightly paler carinae; pronotum caudad to lateral carinae

paler than mesonotum. Forewings light brown, mottled with darker spots; tubercles concolorous with cells; veins sometimes slightly darker than cells; pterostigma whitish. Abdominal sternites light brown. Legs light brown sometimes with a few darker marks.

Morphology. Body length: ♂ 4.4–5.6 mm.

Head: Vertex 1.1–1.4 x wider than long; median carina of vertex covering 1/2–3/4 of basal compartment of vertex. Frons 1.1–1.3 x longer than wide; maximum width no more than 2x apical width; position of maximum width distinctly dorsad of centre of frontoclypeal suture; median carina forked in basal (near frontoclypeal suture) fourth of frons. Median ocellus absent or present (distinct or indistinct). Anteclypeus lacking median carina. Subapical segment of rostrum 1.5–1.8 x longer than apical segment.

Thorax: Mesonotum with distinct or indistinct sublateral carinae. Forewing 3.2–3.6 x longer than wide; costal margin with a few indistinct tubercles; tubercles never within cells; tubercles very small, concolorous with veins; some tubercles bearing very short setae; Sc+R+M near basal cell fused, forming a minute or small common stem Sc+R+M; fork of ScRA+RP distinctly basad of fork CuA1+CuA2; distance tegula to ScR+M fork longer than distance between this fork and ScRA+RP fork; position of r-m distinctly basad of fork MA+MP; fork MA+MP situated around apical 1/16 of forewing or M unforked; icu slightly or distinctly distad of apex of clavus; RP apically unforked; MA unforked, MP unforked or sometimes M not forked into MA and MP; nodus of y-vein distinctly distad of centre of clavus; y-vein with A1 slightly elevated; 4–5 apical cells. Hind leg: 1st tarsomere with 7 apical teeth; 2nd tarsomere with 7–8 (rarely 6) apical teeth and 3–5 fine setae.

Male genitalia: Anal tube (Figs 14C,D) in dorsal view slightly excavated, starting to form two separate lobes; lobes in lateral view produced into hooks. Pygofer and genital styles as in Figs 14E–G. Aedeagus (Figs 14A,B): Phallosome with 3 almost straight spines, slightly curved at their tips; spine (a) inserting left lateral, spines (b and c) inserting right lateral; spine (b) very long (about as long as flagellum); spine (c) half as long. Flagellum unarmed.

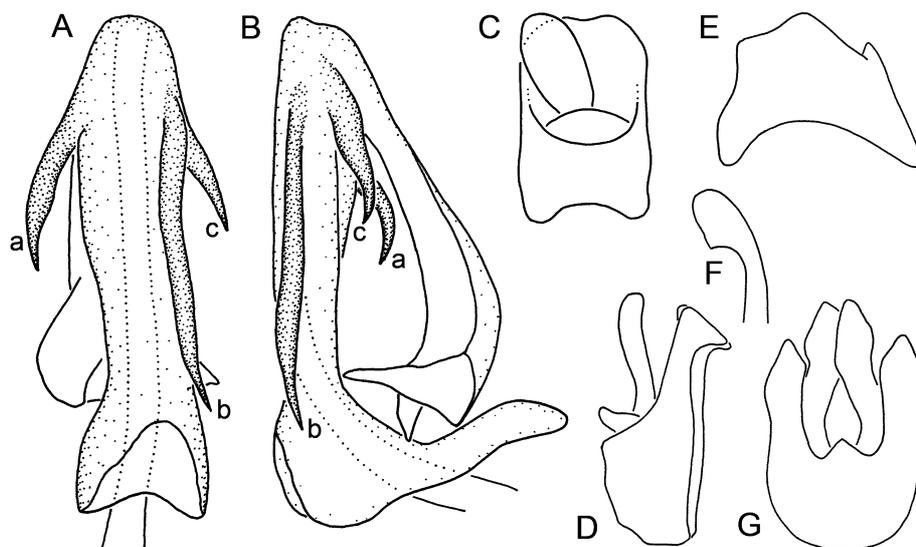


FIGURE 14. *Aka pirri*: A aedeagus ventral; B aedeagus right lateral; C–D anal tube; E pygofer; F–G genital styles.

***Aka sorellensis* sp. nov.**

(Figs 5D–F, 15)

Zoobank Registration: <http://zoobank.org/urn:lsid:zoobank.org:act:2256C517-8BCD-4962-9E45-F97059887F91>

Types. *Holotype*, ♂, **AUSTRALIA, Tas:** Port Sorell, 41.09S, 146.31E, tall wet heath, 4644.602.443, 6.xi.1990 (L. Hill) (TAIC 145564).

Etymology. Named after the type locality, Port Sorell.

Diagnosis. *Aka sorellensis* and *A. dobsonensis* are the only Australian species of *Aka* with a deeply excavated

apex of the anal tube. These two species differ in the number of apical teeth on the first tarsomere (*A. sorellensis* with 7, *A. dobsonensis* with 6).

Colour. Face dark brown; paler near vertex; frons with a whitish spot at each lateral end of frontoclypeal suture; lateral carinae of postclypeus whitish near anteclypeus. Vertex, pro- and mesonotum with a creamy, whitish band that runs across most of the width of vertex and the central part of pro- and mesonotum, lateral parts dark brown. Forewings light brown to whitish, mottled with darker spots; tubercles and veins concolorous with cells; pterostigma whitish. Legs mid brown with a few paler marks.

Morphology. Body length: ♂ 4.3 mm.

Head: Vertex 1.4 x wider than long; median carina of vertex covering about 1/2 of basal compartment of vertex. Frons 1.1 x longer than wide; maximum width no more than 2x apical width; position of maximum width slightly to moderately dorsad of centre of frontoclypeal suture; median carina forked in basal (near frontoclypeal suture) fourth of frons. Median ocellus present (indistinct). Anteclypeus lacking median carina. Subapical segment of rostrum 1.6 x longer than apical segment.

Thorax: Mesonotum without sublateral carinae. Forewing 2.9 x longer than wide; costal margin with a few indistinct tubercles; tubercles never within cells; tubercles very small, concolorous with veins; tubercles not bearing setae; Sc+R+M near basal cell fused, forming a minute common stem Sc+R+M; fork of ScRA+RP distinctly basad of fork CuA1+CuA2; distance tegula to ScR+M fork about as long as distance between this fork and ScRA+RP fork; position of r-m distinctly basad of fork MA+MP; fork MA+MP situated around apical 1/8 of forewing; icu distinctly distad of apex of clavus; RP apically bifid; MA unforked; MP unforked; nodus of y-vein distinctly distad of centre of clavus; y-vein with A1 moderately elevated; 6 apical cells. Hind leg: 1st tarsomere with 7 apical teeth; 2nd tarsomere with 6 apical teeth and 3 fine setae.

Male genitalia: Anal tube apically deeply excavated, forming two separate apical lobes as in Figs 15C,D. Pygofer and genital styles as in Figs 15E–G. Aedeagus (Figs 15A,B): Phallosome left laterally with a short, curved spine (a); ventrally with a long spine (b), crossing over from right to left lateral; right lateral with two short, curved spines (c,d). Flagellum unarmed, steadily widening towards apex.

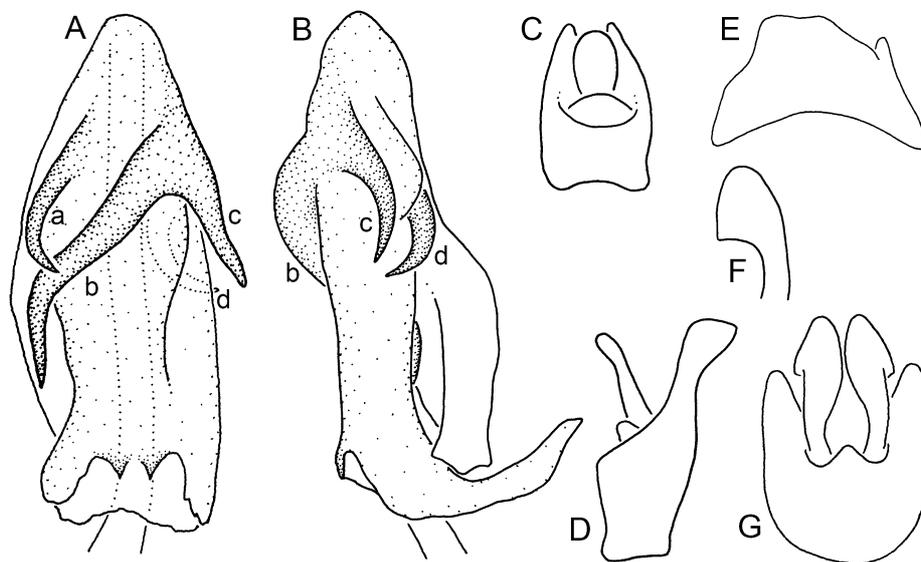


FIGURE 15. *Aka sorellensis*: A aedeagus ventral; B aedeagus right lateral; C–D anal tube; E pygofer; F–G genital styles.

***Aka tasmani* Muir, 1931**
(Figs 6A–C, 16, 18)

Aka tasmani Muir, 1931: 63.

Types. *Neotype*, here designated, ♂, **AUSTRALIA, Tas:** Hobart, 5.vii. 1913/43 (G.H. Hardy) (BMNH K45391). *Paratypes.* **AUSTRALIA, Tas:** 2 ♂, Hobart, 20.vii. 1913/39 (G.H. Hardy) (BMNH K45388) (originally on one mount, now mounted on two separate mounts).

Other material examined. **AUSTRALIA, Tas:** 1 ♂, Thumbs Parallel Gullies, Sassafras, outer 3, 1.ix.1989 (H. Elliott) (ASCU).

Notes: Muir (1931) based this species on 4 females and 2 males from Hobart, Tasmania (G.H. Hardy, May, July, 1913) with „type in Australian Museum, paratype in British Museum“. Three paratypes were found in the BMNH (Fig. 18). Enquiries for the types in the AMS and BPBM were unsuccessful which means part of the type series (3 specimens), including the holotype, is lost. Interestingly all of the paratypes in the BMNH are males, although Muir stated he had only 2 males. Mick Webb (BMNH) was able to match the paratypes with illustrations and the description given in this paper of a specimen from Thumbs Parallel Gully. A neotype has been designated to provide a diagnostic reference for the species.

Muir 1931 lists another female from the same location as the types, which was slightly larger and may also represent this species. This specimen could not be found and must have been lost together with parts of the type series.

Diagnosis. This species can be distinguished from all other Australian *Aka* by the following combination of characters: first tarsomere with 7 and second tarsomere with 6–7 apical teeth; lobes of male anal tube in lateral view produced into hooks; aedeagus right lateral with a medium sized spine (about half as long as flagellum) with its tip directed towards the flagellum; absence of a bifurcate spine on the aedeagus.

Colour. Vertex mid brown, with a whitish spot where subapical carinae meet lateral borders of vertex and near basal emargination. Face mid brown with a whitish spot at each lateral end of frontoclypeal suture; lateral carinae of postclypeus whitish near anteclypeus. Pro- and mesonotum brown with slightly paler carinae. Forewings light brown to whitish, with a few darker marks; costa with several mid brown bands; tubercles concolorous with cells; veins in general slightly darker than cells; pterostigma whitish. Legs light brown with a few darker marks.

Morphology. Body length: ♂ 4.4 mm.

Head: Vertex 1.1 x wider than long; median carina of vertex covering about 3/4 of basal compartment of vertex. Frons 1.1 x longer than wide; maximum width no more than 2x apical width; position of maximum width moderately dorsad of centre of frontoclypeal suture; median carina forked in basal (near frontoclypeal suture) third of frons. Median ocellus present. Anteclypeus lacking median carina. Subapical segment of rostrum 1.5 x longer than apical segment.

Thorax: Mesonotum with distinct sublateral carinae. Forewing 3.3 x longer than wide; costal margin with a several indistinct tubercles; tubercles never within cells; tubercles very small, concolorous with veins; tubercles not bearing setae; Sc+R+M near basal cell fused, forming a minute common stem; Sc+R+M fork of ScRA+RP distinctly basad of fork CuA1+CuA2; distance tegula to ScR+M fork much longer than distance between this fork and ScRA+RP fork; icu distinctly distad of apex of clavus; RP apically unforked; M not forked into MA and MP; nodus of y-vein slightly to moderately distad of centre of clavus; y-vein with A1 slightly elevated; 4 apical cells. Hind leg: 1st tarsomere with 7 apical teeth; 2nd tarsomere with 6–7 apical teeth and 3 fine setae.

Male genitalia: Anal tube (Figs 16C,D, 18E,F) apically slightly excavated, starting to form two separate apical lobes; lobes in lateral view produced into hooks. Pygofer and genital styles as in Figs 16E–G, 18E,F. Aedeagus (Figs 16A,B, 18E,F): Phallosome left laterally with a curved spine (a), right laterally with two spines (b,c). Flagellum unarmed, about the same width throughout.

Remarks. The male genitalia of the specimen from Thumbs Parallel Gullies matches those illustrated by Muir (1931) of *A. tasmani*, apart from a few minor details discussed below. Further it matches the description apart from the following character states. Muir lists, “No spines on the hind tibiae”. The specimen examined showed 3–4 medium sized lateral spines. The colouration deviates slightly from the description, with lighter coloured areas (marks) situated near the frontoclypeal suture, at the posterior end of the vertex and the anterior part of the pronotum. However, the light basal half of the costa, with three or four lighter marks on the apical half of the costal margin as described by Muir, can be observed in the specimen from Thumbs Parallel Gullies.

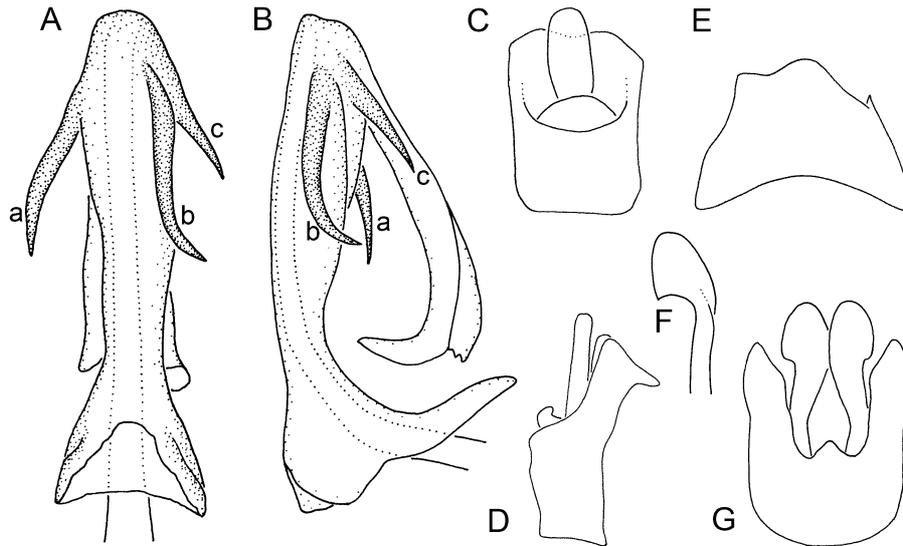


FIGURE 16. *Aka tasmani* (specimen from Thumbs Parallel Gully): A aedeagus ventral; B aedeagus right lateral; C–D anal tube; E pygofer; F–G genital styles.

There is a certain degree of variation in the curvature, length and position of spines on the aedeagus. In two out of three specimens in the type series spines (b) and (c) are more pincer-like (Fig. 18E) than in the third specimen (Fig. 18F) and in the non-type-specimen from Thumbs Parallel Gully (Fig. 16B) (pers. comm. Mick Webb, 2014). Because the pincer-like condition more closely resembles that of Muir’s illustration the neotype has been chosen from those two paratypes. Spine (b) is inserted closer to the ventral side in one of the paratypes (Fig. 18F) than in the neotype (Fig. 18E) and other paratype. The specimen from Thumbs Parallel Gully (Fig. 16B) shows an intermediate state.

The ASCU collection holds a specimen, collected on the 4 April, 1989 in yellow pan traps at Mt Mangana on Bruny Island by J. Diggle and P. Greenslade, that has a configuration of aedeagal spines similar to *A. tasmani* and *A. hardyi*. Further it shares the presence of 7 apical teeth on the first and second tarsomere with the specimen from Thumbs Parallel Gullies. However, it differs from that one, and the original description of *A. tasmani*, in the absence of well developed triangular spines on the anal tube (the lobes are only slightly produced), the forking of M, the evanescent sublateral (medio-lateral) carinae on the mesonotum and the colouration. The specimen from Bruny Island is very pale in colour with clearly contrasting light and dark brown marks. It has very distinct dark tubercles which are not present in the Thumbs Parallel Gullies specimen and which are not mentioned in Muir’s description. Further studies are needed to clarify whether this specimen belongs to *A. tasmani*, *A. hardyi* or represents a new species closely related to those two.

Genus *Yanganaka* gen. nov.

Zoobank Registration: <http://zoobank.org/urn:lsid:zoobank.org:act:A82B0EE7-94B3-4E00-B4E4-7C8312128512>

Type species: *Yanganaka ariecornia* sp. nov. Löcker

Etymology. The term “Yangan” means “hair” in Wik-Mungkan, an Aboriginal language spoken in Queensland (Thieberger & McGregor 1994). Named after the setae on the first tarsomere combined with the genus *Aka* which is closely related to this new genus. Gender: feminine.

Diagnosis. The angle formed by the hind margin of the pronotum (rectangular or moderately obtuse) is similar to that of the New Zealand genus *Chathamaka* Larivière (slightly obtuse) but differs from that found in the genus *Aka* (broadly obtuse). The presence of 4 fine setae on the first tarsomere is unique to *Yanganaka*. This character has not been observed in *Aka* or *Chathamaka*.

Yanganaka can be distinguished from all other Australian Cixiidae by the following combination of characters: presence of a forked frontal carina; absence of a median ocellus; 8 apical teeth on the first tarsomere.

Morphology. Body length: ♂ 4.1–4.2 mm.

Head: Vertex 2.1–2.5 x longer than pronotum; with lateral carinae concave, vertex widest at base, narrowest between subapical and apical carina. Frons with forked median carina; lateral carinae of frons in facial view convex, rectilinear apically or slightly sinuate. Frontoclypeal suture slightly semicircular, bent upwards, median part not reaching lower margin of antennal scape. Postclypeus with well developed median and lateral carinae. Anteclypeus lacking lateral carinae. Rostrum very long, surpassing hind coxa by far, subapical segment reaching hind trochanter. Head including eyes narrower than pronotum.

Thorax: Pronotum with median carina well developed; lateral carinae of pronotum c-shaped, lateral parts directed towards head; lateral carinae not following contour of eyes; angle formed by hind margin of pronotum rectangular or moderately obtuse. Mesonotum 4.9–6.0 x longer than pronotum; with moderately developed median carina, fading before it reaches hind margin of mesonotum; lateral carinae well developed, reaching hind margin. Forewing with concavity at costal border poorly developed (wing straightened) or absent pterostigma very small and indistinct, triangular; forewing widest anterior to apex of clavus; y-vein with A1 slightly higher elevated than PCu (almost the same elevation as PCu). Hind leg: tibia with 2–3 large lateral spines, with 6 apical spines, grouped in two groups with or without a small gap in between, outermost spine largest, innermost and 3rd innermost spine almost as long as outermost spine; 1st tarsomere with 8 apical teeth and no platellae but with 4 fine setae; 2nd tarsomere with 7–8 apical teeth and no platellae but with 4–5 fine setae.

Distribution. Australia (Tasmania).

Yanganaka ariecornia sp. nov

(Figs 6D–F, 17)

Zoobank Registration: <http://zoobank.org/urn:lsid:zoobank.org:act:A0256F01-D5B6-44BA-BADE-A86E9DCD90BD>

Types. *Holotype*, ♂, **AUSTRALIA, Tas:** McPartlan Pass, 5256300N 0438000E, +/- 25m, Grid/Sample: ARE 2, Method: S, 10.viii.1999 (M. Driessen) (AMS K.437130). *Paratypes*, **Tas:** 1 ♂, same data as holotype except for Grid/Sample: ARW6, Method: P, 23.vii.2000.

Etymology. The Latin term „aries“ means „ram“ and „cornus“ means „horn“. Named after a thick spine on the aedeagus which resembles the horn of a ram.

Colour. Vertex mid to dark brown, carinae sometimes paler. Face including carinae mid brown; slightly darker near carinae. Pro- and mesonotum displaying various shades of brown with paler carinae. Forewings light brown to whitish, with a dark brown spot anterior to pterostigma; tubercles and veins dark, in distinct contrast to cells; pterostigma whitish. Abdominal sternites light to mid brown. Legs light brown sometimes with a few darker marks.

Morphology. Body length: ♂ 4.1–4.2 mm.

Head: Vertex 1.1–1.2 x wider than long; median carina of vertex covering full length of basal compartment of vertex; angle formed by caudal border of vertex broadly obtuse. Frons 1.3 x longer than wide; maximum width of frons no more than 2 x apical width; position of maximum width around frontoclypeal suture or slightly dorsad of centre of frontoclypeal suture; median carina forked in basal (near frontoclypeal suture) third to half of frons. Median ocellus absent. Anteclypeus with very indistinct median carina. Head including eyes slightly narrower than pronotum. Subapical segment of rostrum 1.7–1.9 x longer than apical segment.

Thorax: Mesonotum with distinct or indistinct sublateral carinae. Forewing short, curved to fit body, only slightly raised in posterior part of thorax. Forewing 2.8 x longer than wide; costal margin with 12–14 very distinct tubercles; tubercles aligned alongside veins, but reaching to some extent into cell area; tubercles dark, some underlaid by a larger dark circle, therefore appearing large and distinctly in contrast to cells; tubercles not bearing setae; Sc+R+M near basal cell fused, forming a minute common stem Sc+R+M or Sc+R fused, M emerging separately from basal cell; fork of ScRA+RP about same level as fork CuA1+CuA2; distance tegula to ScR+M fork distinctly (about ½ to ¾) shorter than distance between this fork and ScRA+RP fork; position of r-m distinctly basad of fork MA+MP; fork MA+MP situated between apical 1/8 and 1/4 of forewing; icu at same level or slightly distad of apex of clavus; RP apically bifid or trifid; MA unforked, bifid or trifid; MP unforked or bifid; nodus of y-

vein more or less in centre of clavus; y-vein with A1 only very slightly elevated; 7–9 apical cells. Hind leg: 1st tarsomere with 8 apical teeth and no platellae but with 4 fine setae; 2nd tarsomere with 7–8 apical teeth and no platellae but with 4–5 fine setae.

Male genitalia: Anal tube rounded, forming only one lobe as in Figs 17C,D. Pygofer and genital styles as in Figs 17E–G. Aedeagus (Figs 17A,B): Phallosome left laterally with an almost straight spine (a), ventrally with a very thick, curved spine (b) and right laterally with a thick, s-shaped spine (c). Flagellum unarmed, pear-shaped.

Remarks. *Yanganaka ariecornia* slightly resembles *A. issidopsis* in the shape and curvature of the forewing. However, in *Y. ariecornia* the forewing is much less raised than in *A. issidopsis*.

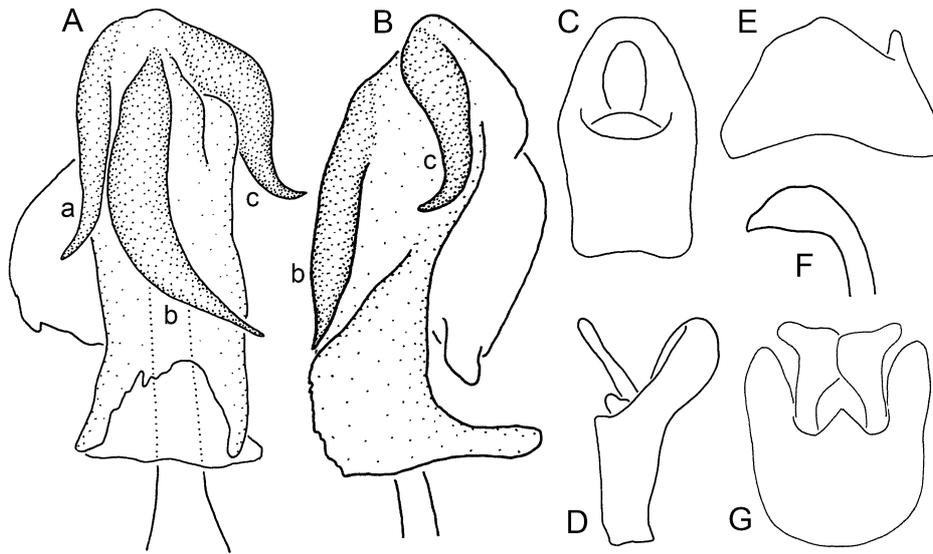


FIGURE 17. *Yanganaka ariecornia*: A aedeagus ventral; B aedeagus right lateral; C–D anal tube; E pygofer; F–G genital styles.

Discussion

The Australian species of *Aka* have a very prominent pronotum (it is remarkably long in midline). Therefore the vertex is about as long as the pronotum (0.8–1.1 x as long) and the mesonotum only 1.6–3.1 x longer than the pronotum. This feature clearly distinguishes these taxa from *Yanganaka* (vertex 2.1–2.5 x as long; mesonotum 4.9–6.0 x as long) and *Chathamaka* (vertex 2.4 x as long; mesonotum 6.9 x as long). Interestingly the two specimens of New Zealand species of *Aka* which were examined in this project showed intermediate values between the Australian species and the genus *Yanganaka*. This feature needs to be studied in more detail across all New Zealand species of *Aka*.

Two different character states are present in Australian species of *Aka* and *Yanganaka* regarding the ventral base of the phallosome:

- a serrated, u-shaped excavation (Figs 8–9A,B, 11A,B, 14A,B, 16–17A,B): *A. balma*, *A. dobsonensis*, *A. hardyi*, *A. pirri*, *A. tasmani*, *Yanganaka ariecornia*
- two small, sclerotised teeth fringed by semicircular excavations with a smooth or serrated border (Figs 10A,B, 12–13A,B, 15A,B): *A. gwana*, *A. issidopsis*, *A. kuraka*, *A. sorellensis*

The two sclerotised teeth appear to be present in *Chathamaka andrei* and *A. finitima* and may be present in other New Zealand species of *Aka*. Further investigations are necessary to clarify which is the apomorphic state.

At least two more new species appear to be present in the material examined from the QM and ANIC collection, but they are represented by female specimens only. Additional material needs to be collected before they can be formally described.



FIGURE 18. *Aka tasmani* Type series. Photos taken by Mick Webb (BMNH): A–C habitus, data labels, A Neotype, B Paratypes, C Neotype and remounted Paratypes; D “tasmani” writing on underside of yellow paratype labels; E–F male genitalia, right lateral view, E Neotype, F Paratype.

In Australia, the only recorded hosts of *Aka* are *Atherosperma moschatum* (for *Aka balma*, *Aka pirri*, *Aka tasmani*) and *Nothofagus cunninghamii* (for *Aka dobsonensis*, *Aka hardyi*, *Aka karaka*). *Atherosperma moschatum* Labill. is the only representative of Atherospermataceae, a family of trees and shrubs known also as southern sassafras, in Tasmania. It often co-occurs with *Nothofagus cunninghamii* (Hook.) Oerst. (Sommerville & Read, 2008) belonging to Nothofagaceae. Both the family Atherospermataceae as well as the genus *Nothofagus* show a

Gondwanan distribution, occurring in cooler rainforests of South America, New Guinea, Australia, New Zealand and New Caledonia.

Larivière (1999) also noted a close association of *Aka* with *Nothofagus* forests. This suggests that *Aka* is of Gondwanan origin and therefore it is possible that *Aka* was once, or still is, more widely distributed and may occur in South America, New Guinea or New Caledonia, areas which have not been studied well in regards to the cixiid fauna.

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