



Tyligma gen. nov., a new Australian genus of planthopper and a key to the Australian genera of Cixiini (Hemiptera: Cixiidae)

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Abstract

A new genus, *Tyligma* gen. nov., is created within Cixiini to accommodate the new species *Tyligma dandavalex* sp. nov. *Tyligma* is characterised by a swollen postclypeus and is closely related to the Australian genera *Chidaea* Emeljanov, 2000, and *Leades* Jacobi, 1928, but differs in the shape of the ventral ridge of the aedeagus in males and several other characters presented here. Occurring in the Australian Capital Territory, New South Wales, Queensland, and Victoria, the genus is restricted to eastern Australia. The species emerges in spring, feeding on native shrubs and small trees of Asteraceae and Myrtaceae and on the invasive West Palaearctic ash species *Fraxinus angustifolia*. In addition, we provide an updated key to the genera of Australian Cixiini.

Key words

antenna, Auchenorrhyncha, Cicadina, distribution, endemic planthopper, Fulgoroidea, identification, morphology, new species, wax plate.

INTRODUCTION

The planthopper tribe Cixiini is distributed worldwide and comprises 48 genera and more than 500 species (Bourgoin 2020). Ten genera, *Aka* White, 1879 (9 Australian species), *Calamister* Kirkaldy, 1906 (2 species), *Chidaea* Emeljanov, 2000 (15 species), *Koroana* Myers, 1924 (*Koroana* sp.), *Latissima* Löcker, 2020b (1 species), *Leades* Jacobi, 1928 (6 species), *Leptolamia* Metcalf, 1907 (15 species), *Monomalpha* Emeljanov, 2000 (2 species), *Yamirrina* Löcker, 2020a (2 species) and *Yanganaka* Löcker, 2015 (1 species), are currently known from Australia. The presence of *Koroana* in Australia, however, is doubtful (Fletcher 2009 and updates). Smithers (1998) lists ‘*Koroama*’ sp. [misspelling of the New Zealand genus *Koroana* Myers, 1924] as the only cixiid present on Norfolk Island, based on a record by Holloway (1977). Whilst the authors have not seen the material mentioned in Holloway (1977), they have examined numerous specimens from Norfolk Island that represent a Cixiini genus, similar to the genera present in New Zealand. Whether this genus is congeneric with any of the New Zealand genera requires further examination.

Large gaps in our knowledge of the Australian Cixiidae fauna, i.e. in the tribe Cixiini, still exist. Recent revisions on Australian Cixiidae (e.g. Löcker *et al.* 2006a, 2006b, 2010; Löcker 2014, 2020a, 2020b; Löcker & Holzinger 2019) have

tried to address this and have more than doubled the number of genera known from Australia and more than tripled the number of species. Whilst examining material from numerous Australian and overseas collections, we discovered specimens representing a new, monotypic genus of the tribe Cixiini. Here we present the description of the new taxon and a revised key to the Australian genera of this tribe.

MATERIALS AND METHODS

Preparation of male genitalia as described in Löcker *et al.* (2006a).

Insects were examined and measured using an Olympus SZH10 stereo microscope with an eyepiece graticule. Photographs were taken with a digital SLR camera (Canon EOS 5D Mark III; Canon Utility Software) through Olympus BX50 and Olympus SZX16 dissecting microscopes and later stacked using Helicon Focus. Photographs (without stacking) were used as a base for line illustrations. SEM images were made using a Generation 5 Phenom Pure Desktop Scanning Electron Microscope. All specimens listed in the type material section are dried (glued on cardboard or pinned) unless otherwise noted as being stored in 70% ethanol.

The morphological terms applied here follow Löcker *et al.* (2006b); terminology of the carinae and compartments on the head follows Löcker (2014); terminology of tegminal veins follows Bourgoin *et al.* (2015) as illustrated by Löcker and

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Holzinger (2019, fig. 28H). The term ‘placodea’, as used in the current paper, refers to the term ‘plaque organs’ in Liang (2001), Romani *et al.* (2009) and Hamilton (2011).

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 (= posterior) emargination and apical (= anterior) carina in midline
- Width of vertex: at level of basal (= posterior) emargination
- Length of frons: apical (= dorsal) transverse carina to frontoclypeal suture, in midline
- Width of frons: maximum width
- Width of forewing: at apex of clavus
- Length of forewing: base to posterior margin of forewing

Abbreviations

ACT	Australian Capital Territory
AMS	Australian Museum, Sydney, Australia
ANIC	Australian National Insect Collection, CSIRO, Canberra, Australia
ASCU	Biosecurity Collections, NSW Department of Primary Industries, Orange, Australia
ASULOB	Arizona State University Lois B. O’Brien Collection, Tempe, United States of America
BMNH	The Natural History Museum, London, United Kingdom
NSW	New South Wales
QDPI	Queensland Department of Primary Industries, Brisbane, Australia
Qld	Queensland
QM	Queensland Museum, Brisbane, Australia
SAMA	South Australian Museum, Adelaide, Australia
UQIC	University of Queensland Insect Collection, Brisbane, Australia (now part of the QM collection)
Vic	Victoria

TAXONOMY

Key to the genera of Australian Cixiini

- 1 Median carina of frons forked (Fig. 1a).....2
 - Median carina of frons unforked (Figs 3a,7c,d).....3
- 2(1) First hind tarsomere with 8 apical teeth and 4 setae; angle formed by hind margin of pronotum rectangular or moderately obtuse (Fig. 1b); lateral carinae of pronotum c-shaped, lateral parts directed towards head (Fig. 1b); vertex in midline at least twice as long as pronotum (Fig. 1b).....*Yanganaka*
 - First hind tarsomere with 5–7 apical teeth and no setae; angle formed by hind margin of pronotum broadly obtuse

- (Fig. 1c); lateral carinae of pronotum s-shaped, second bend turning towards mesonotum (Fig. 1c); vertex in midline about as long as pronotum (Fig. 1c).....*Aka*
- 3(1) Second hind tarsomere without platellae, but with three or fewer very fine setae (Fig. 1d).....4
 - Second hind tarsomere with four or more platellae (Fig. 1e).7
- 4(3) Apical transverse carina of vertex deeply u-shaped (Fig. 1f).....5
 - Apical transverse carina of vertex v-shaped (Fig. 1g), shallowly u-shaped or almost straight (Fig. 1h).....6
- 5(4) Widest part of frons distinctly ventrad of centre of frontoclypeal suture (Fig. 8b); fork of CuA1 and CuA2 in basal half of forewing; RP trifold (Fig. 2c). ...*Latissima*
 - Widest part of frons distinctly dorsad of centre of frontoclypeal suture (Fig. 3a); fork of CuA1 and CuA2 in apical half of forewing; RP unforked or bifid (Fig. 10).....*Monomalpha*
- 6(4) Basal compartment of vertex about as long as wide (Fig. 1g).....*Yamirrina*
 - Basal compartment of vertex not more than half as long as wide (Fig. 1h).....*Leptolamia*
- 7(3) Second hind tarsomere with two fewer platellae than apical teeth (Fig. 1e, 5e); forewing with CuA2 reaching the margin of forewing in its entire thickness (Fig. 2a).....8
 - Second hind tarsomere with four fewer platellae than apical teeth (Fig. 3b); forewing with CuA2 either ending well before it reaches the margin of the forewing or reaching the margin but with slightly reduced thickness (Fig. 2b).....*Calamister*
- 8(7) Male anal tube with ventral lobe in lateral view narrow near base, widening towards apex (Figs 3c, 9d). Male anal style about as long as remainder of 11th segment (Fig. 3c) or slightly longer. Forewing with crossvein r-m₁ usually distad or at same level as fork MP1+2 and MP3+4 (Fig. 2c). Radius anterior (RA) forked (Fig. 2c) or unforked (Fig. 2d).....9
 - Male anal tube with ventral lobe in lateral view tapering (widest near base) (Löcker 2020a: Figs 10e, 11e). Male anal style distinctly longer than remainder of 11th segment (remainder of 11th segment about 2/3–3/4 as long as anal style) (Löcker 2020a: Figs 10e, 11e). Forewing with crossvein r-m₁ usually distinctly basad of fork MP1+2 and MP3+4 (Fig. 2d). RA always unforked (Fig. 2d).....*Leades*
- 9(8) Postclypeus swollen (Fig. 8d–f); frons distinctly shorter than postclypeus (Fig. 8b,c).....*Tyligma* gen. nov.
 - Postclypeus not swollen; frons usually distinctly longer than postclypeus (rarely same length or slightly shorter than postclypeus) (Fig. 3a).....*Chidaea*

Genus *Tyligma* gen. nov.

<http://zoobank.org/urn:lsid:zoobank.org:act:2E124BB9-9B28-4DDA-A0AF-92F5B62560A7>

Type species: *Tyligma dandavalex* sp. nov., by monotypy.

Diagnosis

Tyligma can be distinguished from all other genera of Australian Cixiidae by a combination of the following characters: apex of head with two transverse carinae (apical transverse carina and subapical carina) (Fig. 8a,d,e); median carina of frons unforked (Fig. 8b,c); frons distinctly shorter than postclypeus (Fig. 8b,c); frons without a median ocellus; postclypeus distinctly swollen and prominent (Fig. 8d–f); second hind tarsomere with two fewer platellae than apical teeth (Fig. 1e); male anal tube with ventral lobe in lateral view narrow near base, widening towards apex (Fig. 9d) [for female specimens use the following character: crossvein

$r-m_1$ slightly distad of fork $MP1+2$ and $MP3+4$ (Fig. 2c) or at same level].

Description

Head.

Vertex slightly wider at base than at apical carina or about same width throughout; lateral carinae moderately elevated; angle formed by caudal border of vertex broadly obtuse; apical and subapical carina slightly u- or v-shaped or almost straight (Fig. 8a,d,e). In dorsal view head including eyes slightly narrower than pronotum (Fig. 8a). Frons invisible in dorsal view.

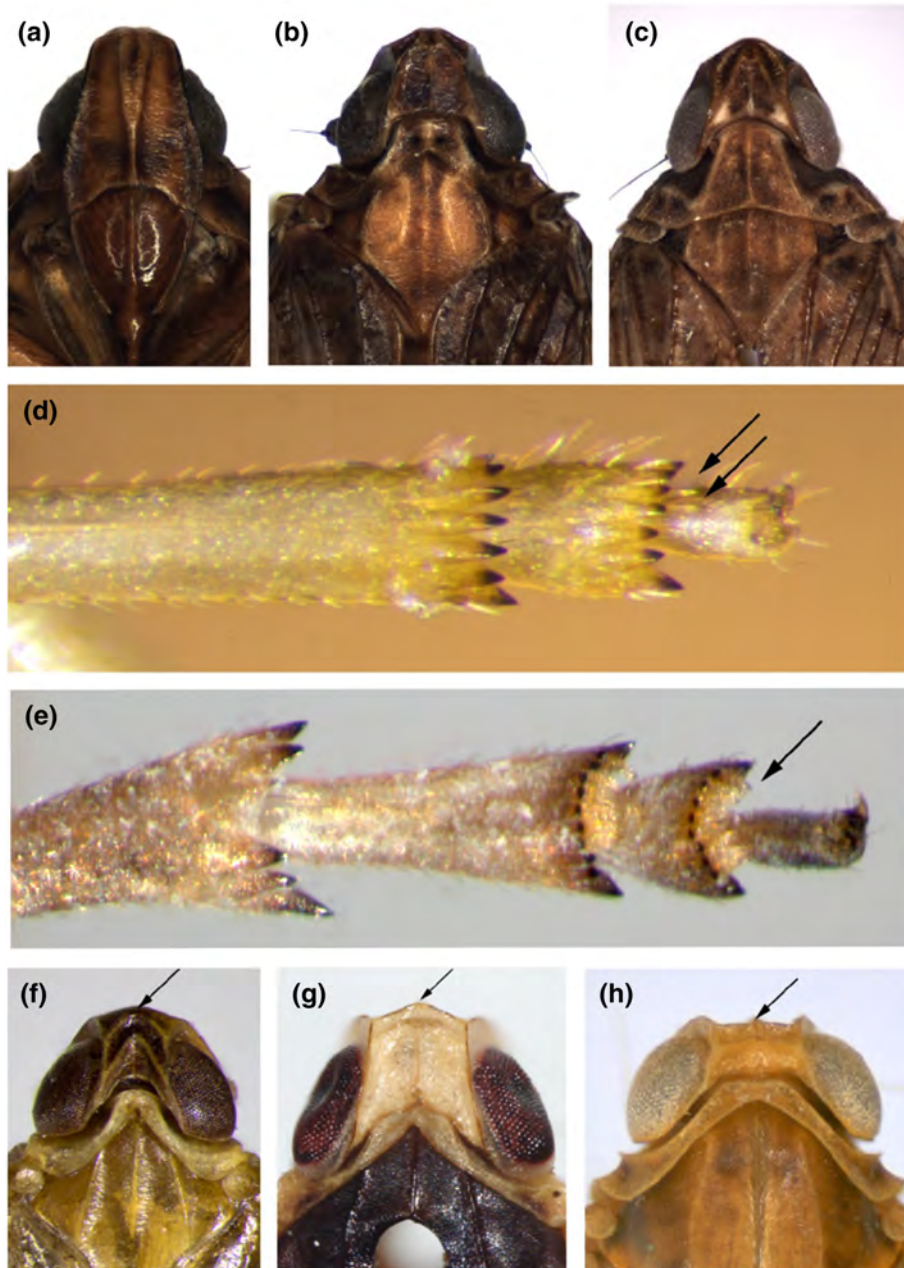


Fig. 1. (a–c) Head and thorax: (a, b) *Yanganaka*; (c) *Aka*. (d, e) Hind leg: (d) *Yamirrina* (arrow pointing to setae); (e) *Tyligma* gen. nov. (arrow pointing to row of platellae). (f–h) Head: (f) *Monomalpha*; (g) *Yamirrina*; (h) *Leptolamia*.

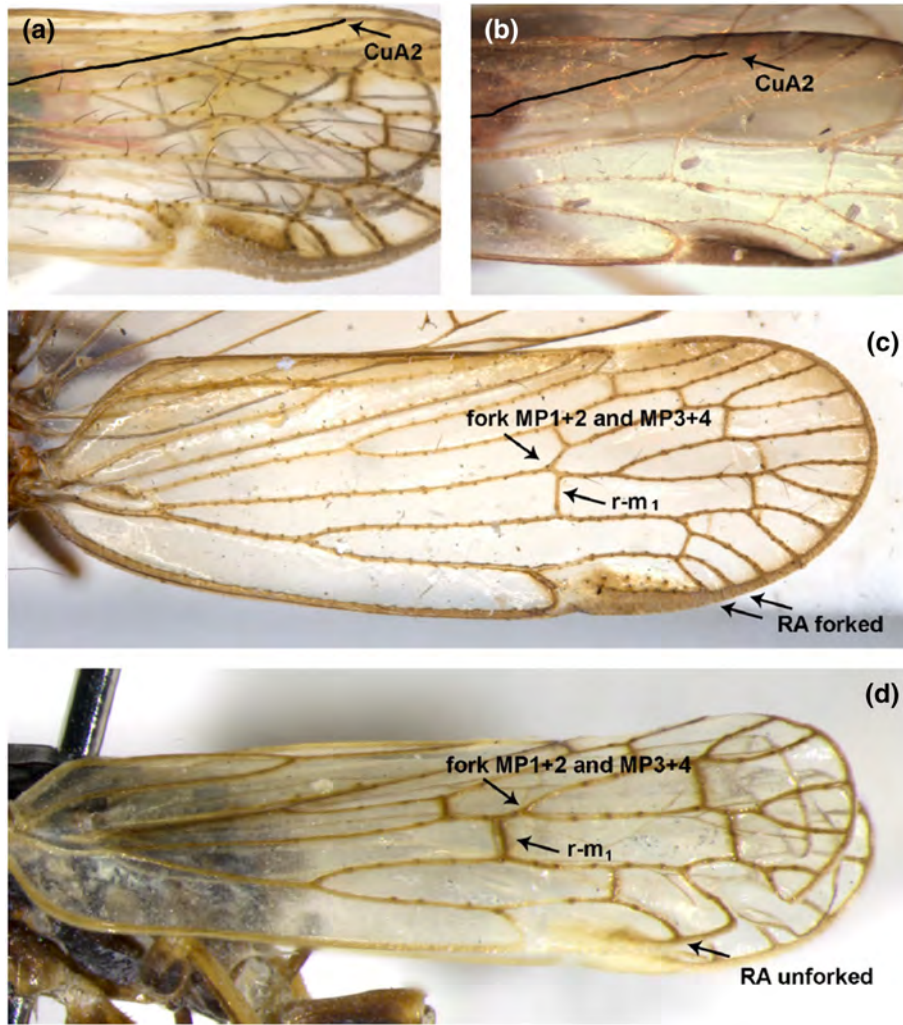


Fig. 2. Forewing: (a) *Tyligma* gen. nov.; (b) *Calamister*; (c) *Chidaea*; (d) *Leades*.

Maximum width of frons not more than 2x apical width. Median carina of frons complete (Fig. 8b,c). Lateral carinae of frons foliaceous, slightly extending laterally, concealing base of antennae. Median ocellus of frons absent. Frontoclypeal suture semicircular, extremely bent upwards, median part reaching at least upper margin of antennal scape (Fig. 8b,c). Postclypeus with evanescent or absent median carina and slightly developed lateral carinae. Anteclypeus with median carina evanescent or absent; lateral carinae absent. Apical and subapical rostrum segments more or less equal in length. Pedicel of antennae cylindrical-ovoid, covered by numerous sensilla trichodea and placodea, former mainly on dorsal and latter mainly on ventral half (Fig. 5a,b).

Thorax.

Pronotum with median carina very short, evanescent or absent; pronotum shortest in middle or about same length in middle and laterally; submedian keels running parallel to eyes. Mesonotum with 3 evanescent or weakly developed longitudinal carinae. Forewings (Fig. 10) moderately tectiform; surpassing tip of abdomen; widest at same level or distad of apex of clavus; concavity at costal border absent; veins except marginal ones

granulate (with tubercles); tubercles on costal margin in single row; tubercles in pterostigma arranged in 1 or 2 rows; no tubercles in cells at apex of wing, only along veins; pterostigma subtriangular; basal cell subtransverse apically; ScP+R+M forming a minute common stem distad of basal cell; ScP+R fused for a long distance; crossvein $r-m_1$ slightly distad of fork MP1+2 and MP3+4 or at same level; icu distad of apex of clavus; CuA apically unforked; nodus of y-vein more or less central within clavus or slightly basad of centre of clavus; vein delimiting subapical cell C4 distinctly distad of vein delimiting C5; subapical cell C5 distinctly longer than C4. Hindwings with R, M and Cu bifurcate (Fig. 7c). Hind legs (Figs 1e, 5c–e): tibiae with 2–3 (rarely 4) minute to barely visible lateral spines, with 6 apical teeth, grouped in two groups with a large (rarely medium sized) gap in between; outermost spine of tibiae largest, followed by 2 smaller spines with their tips well separated; the 3 innermost spines of tibiae almost as long as outermost spine, with their tips in close proximity to each other.

Male genitalia.

Pygofer with a medium sized, triangular ventromedian process (Fig. 9e). Anal tube as in Figures 3c and 9c,d with male anal style

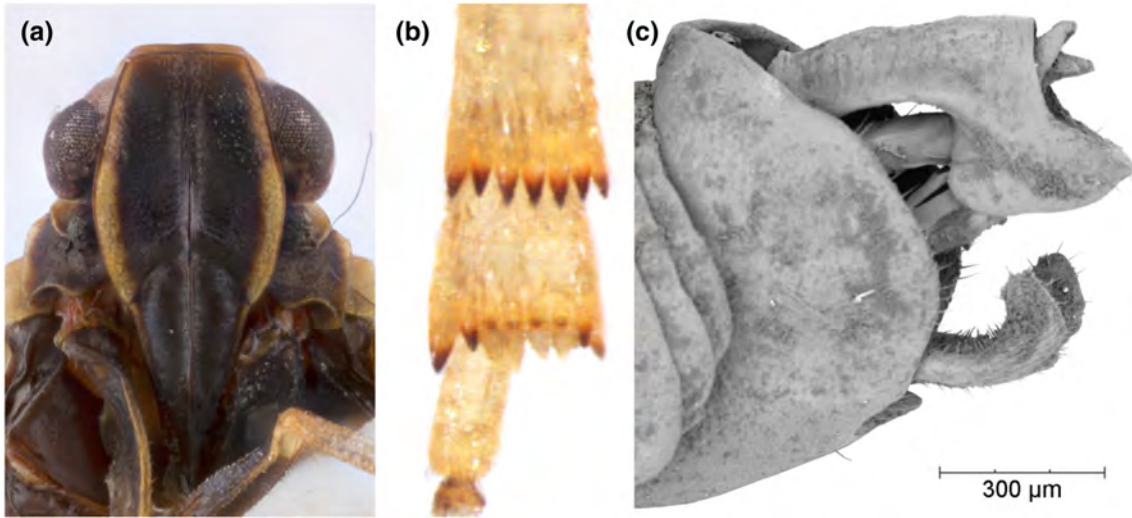


Fig. 3. (a) *Chidaea*: face; (b) *Calamister*: hind tarsi; (c) *Tyligma* gen. nov. male genital segment in lateral view (SEM image).

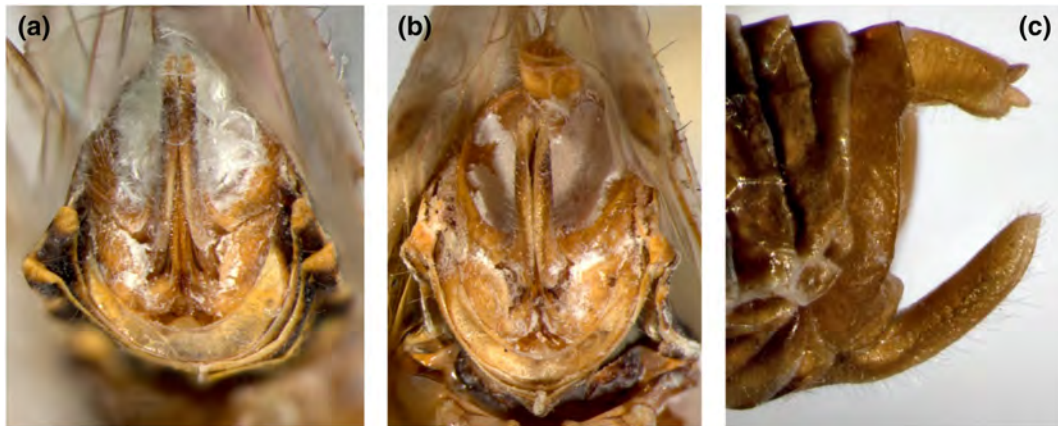


Fig. 4. *Tyligma dandavalex* sp. nov., female genitalia: (a, b) caudoventral; (c) lateral.

about as long as remainder of 11th segment (Fig. 3c) or slightly longer (Fig. 9c,d). Phallosome without a bifurcate ventral process but with a serrated margin at the cranial end of the ventral ridge. Flagellum (endosoma) unarmed.

Female genitalia.

Ovipositor, wax plate and anal tube as in Figures 4 and 6: Ovipositor sabre-shaped (curved upwards), protruding about as far as the anal tube. Segment IX bearing a large, undivided, circular (sometimes slightly ovoid) wax plate (Figs 4a,b,6a). Whole plate covered with one type of more or less hexagonal ‘sieve-plate’ wax pores with a diameter of little less than 3 µm and sparsely dispersed hairs. Anal tube about as long as wide or slightly longer than wide. Anal style about same length as remainder of 11th segment or slightly longer.

Remarks

The structure of the wax plate in *T. dandavalex* is consistent with that found in other Cixiini with wax plate (Holzinger *et al.* 2002).

Etymology

The Greek term ‘tyligma’ means ‘swelling’. Named after the swollen postclypeus.

Distribution

Endemic to Australia (ACT, NSW, Qld and Vic), see Figure 11.

***Tyligma dandavalex* sp. nov.**

(Figs 1e, 2a, 3c, 4–10)
<http://zoobank.org/urn:lsid:zoobank.org:act:B59819A4-3D46-4464-A399-6D788BDF84F3>.

Material examined

Holotype

♂, AUSTRALIA, NSW: Orange, Moulder St, ex *Fraxinus angustifolia*, 22.xi.2017 (B. Loecker) (ASCT00180163 ASCU).

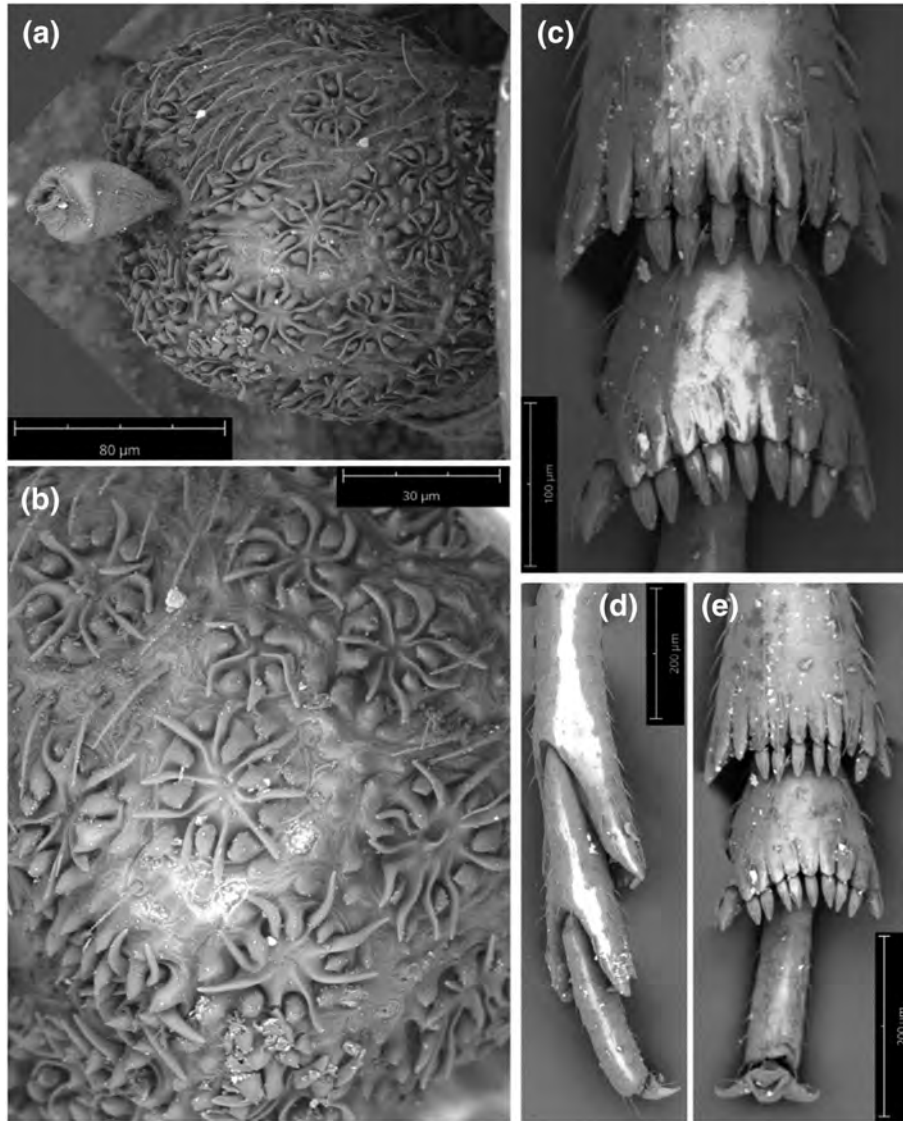


Fig. 5. *Tyligma dandavalex* sp. nov., SEM images: (a, b) male antenna; (c–e) hind tarsi with platellae.

Paratypes

ACT: 5 ♂, 2 ♀, Black Mt., Canberra, 16.xi.1989 (C.W. & L.B. O'Brien) (4 ♂, 1 ♀ ASULOB; 1 ♂ ASCT00180161, 1 ♀ ASCT00180014 ASCU); 1 ♀, Black Mt., 16.ix.1931 (A.L. Tonnoir) (ANIC); 2 ♂, 1 ♀, same data except for, by sweeping veg[etation], 26.xi.1959 (G.F. Gross) (SAMA); 1 ♀, Mt. Ainslie, 5.xii.1983 (M. Stevens) (ASCT00180008 ASCU). **NSW:** 1 ♂, 1 ♀, same data as holotype (♂ ASCT00180868, ♀ ASCT00183216 ASCU); 2 ♂, 3 ♀, same data as holotype except for plant association unknown (♂ ASCTHE031060, ASCT00180871; ♀ ASCTHE036226-ASCTHE036228 ASCU); 1 ♀, Kite St, inside house, 31.x.2019 (D. McKenzie) (ASCT00180024 ASCU); 2 ♂, Crown lease 17 km NE of Ulan; 2.x.2005 (H. & B. Loecker) (ASCTHE030117, ASCTHE030118 ASCU); 5 ♂, 5 ♀, Ophir, ex *Cassinia* sp., 25.x.1998 (McNeil & Gillespie) (♂ ASCTHE028679, ASCT00186934-ASCT00186937, ♀ ASCT00186928-ASCT00186932 ASCU); 1 ♂, Deua River N.P., 7.x.1988 (G.

Cassis) (AMS); 1 ♂, 3 ♀, Woodenbong, 9.xi.1955 (I. Yeo) (QM, formerly UQIC, UQIC reg #54176); 3 ♂, [Tamworth], Oxley Park, 31°05'S, 150°57'E, 520m, ex *Cassinia quinquefaria*, 3.xi.1991 (J.R. Hosking) (ASCT00191495-ASCT00191497 ASCU); 4 ♂, 3 ♀, same data except for 17.xi.1991 (♂ ASCT00191491-ASCT00191494, ♀ ASCT00191499-ASCT00191501 ASCU); 1 ♂, 1 ♀, same data except for 29.x.1992 (R.H. Holtkamp) (♂ ASCT00191498, ♀ ASCT00191502 ASCU); 7 ♂, 3 ♀, Smiths Lake, N of Bungwahl, 33 km S of Forster, 32°23'S, 152°30'E, ex *Ozothamnus diosmifolius*, [95-7], 21.x.1995 (Schuh & Cassis) (2 ♂ ASCTHE026027, ASCTHE026026, 2 ♀ ASCTHE026032, ASCTHE026025 ASCU); 5 ♂, 1 ♀ AMS; 1 ♂, 1 ♀, Cabramatta, Georges River Valley, 24.ix.1960 (M. Nikitin) (BMNH), 2 ♂, same data except for 1.x.1960 (BMNH); 1 ♂, same data except for 2.x.1960 (BMNH); 1 ♂, same data except for 22.x.1961 (BMNH); 1 ♂, same data except for 3.xi.1962 (BMNH); 1 ♂, same data except for 20.iv.1962 (BMNH); 1 ♀, same data except for 1.ii.1954 (BMNH), 1 ♀,

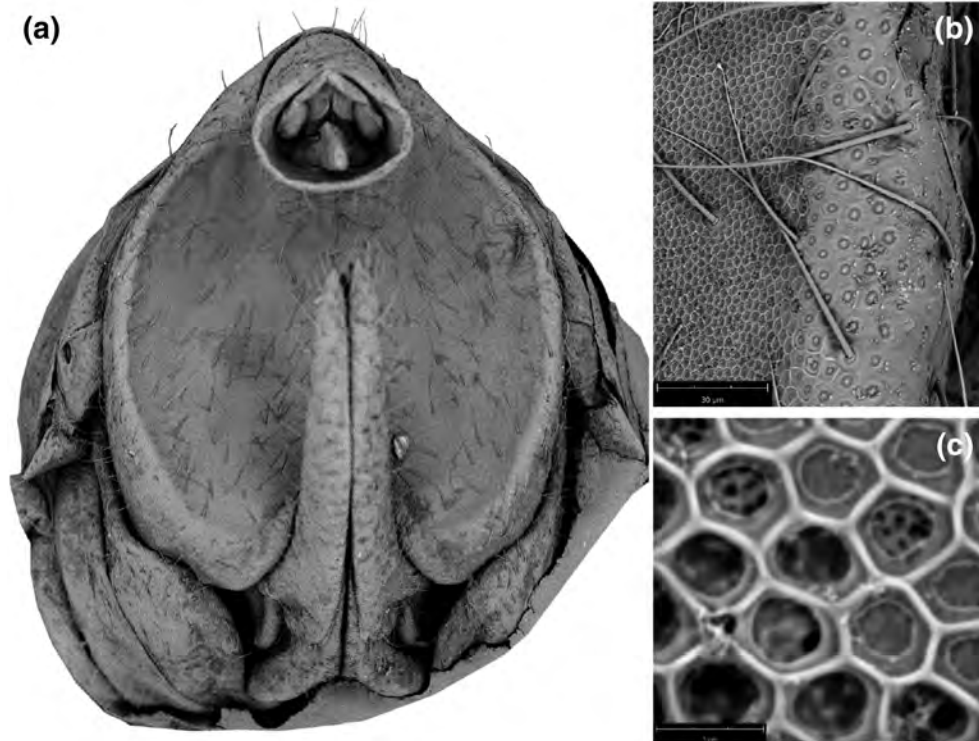


Fig. 6. *Tyligma dandavalex* sp. nov., female SEM images: (a) female genitalia in caudal view; (B) wax plate and its lateral margin; (c) wax pores in higher magnification.

same data except for 29.x.1960 (BMNH); 3 ♂, same data except for 14.x.1961 [one specimen collected by sweeping] (BMNH); 1 ♀, Pinnacles [near Orange], sweeping vegetation, 12.xi.2000 (B. C. McNeil & P.S. Gillespie) (ASCT00180164 ASCU); 2 ♀, Pisgah Ridge, Blue Mountains Nat. Pk, 150°35'E, 33°50'S, 210 m, 18.x.1987 (G. Brown, P. Gillespie & J. MacDonald) (ASCTHE016831, ASCTHE016833 ASCU); 1 ♀, Pilliga Scrub, Rocky Glen area, on *Leptospermum* flowers, 4.-5.xi.1994 (A. Sundholm & R. de Keyzer) (ANIC); 2 ♀, Dorrigo (W. Heron) (SAMA); 1 ♀, Sydney, East Kurrajong, Putty Road, Morilla Rd turnoff, on *Leptospermum* flowers, 7.xii.1994 (A. Sundholm) (ANIC); 1 ♀, Mittagong, 9.xi.[19]00, 86D, [(W.W. Froggatt)] (ASCTHE017026 ASCU); 1 ♀, Orange, Pinnacle Road, 14.xii.2004 (B. Loecker) (ASCT00179989 ASCU); 1 ♀, Lorien Ref., 3 km N Lansdowne nr Taree; rainforest margin; malaise trap, 26.x.-8.xi.1987 (G. Williams) (AMS). **Qld:** 5 ♂, 1 ♀, Imbil S.F., S[outh] Q[ueensland], ex *Heliochrysum diosmifolium*, 5.xi.1957 (T.E. Woodward) (QM, formerly UQIC, UQIC reg ♂ #54111, #54113-54116; ♀ UQIC reg #54112); 2 ♂, 6 ♀, 8.2 km E of Mungallala, 26°27'50"S, 147°37'29"E, 560 m, [98-07], 31.x.1998 (Schuh, Cassis & Silveira) (1 ♂, 4 ♀ AMS; 1 ♂ ASCTHE026043, 2 ♀ ASCTHE026044, ASCTHE026045 ASCU); 2 ♂, [Lamington] National Pk., 25.x.1923 (H. Hacker) (QM); 1 ♀, Fletcher, 11.xi.1934 (E. Sutton) (QDPI); 1 ♀, Ipswich, 28.ix.1964 (J.C. Cardale) (QM, formerly UQIC reg #55195). **vic:** 1 ♂, 3 km SW Castlemaine, S37.07845, E144.18565, MT13, malaise trap, 1.xii.2013 (R. Forbes) (ASCT00180088 ASCU); 1 ♂, 10 km W Nagambie, 36.77910S, 145.05637E, 8C2, ex *Cassinia arcuata*, chemical knockdown, 17.xii.2013 (H. Olfans) (ASCT00183217 ASCU);

1 ♂, 2 ♀, same data (ASCU, stored in ethanol); 1 ♂, same data except for 36.77910S, 145.05635E (R. Forbes) (ASCU, stored in ethanol); 1 ♀, NW of Castlemaine, 36.97427S, 144.12065E, ex *C. arcuata*, chemical knockdown, 2C3, 19.xii.2013 (R. Forbes) (ASCU, stored in ethanol).

Description

Body Size.

Length: ♂ 4.3–5.4 mm; ♀ 5.2–6.9 mm.

Colour (Figs 7-8).

Vertex with light brown carinae, disc of vertex black, mid or dark brown. Frons mid brown or black with light or mid brown carinae. Clypeus black, mid or dark brown with paler carinae. Pronotum light brown, with disc sometimes slightly darker. Mesonotum mid or dark brown, paler in median part between lateral carinae. Forewings light brown, tubercles and veins concolorous with cells or slightly darker (i.e. crossveins and near apex of forewing). Body black or light, mid or dark brown. Legs light brown, mid to dark brown or blackish near base.

Head.

Vertex 2.0–2.7 x wider than long; median carina of vertex complete, evanescent or absent in basal compartment of vertex; evanescent or absent in apical compartment. Frons 1.5–1.9 x wider (maximum width) than long; position of maximum width distinctly ventrad of centre of frontoclypeal suture; lateral carinae of frons in facial view convex (rectilinear apically) or slightly sinuate. Rostrum surpassing hind coxae and attaining hind femora.

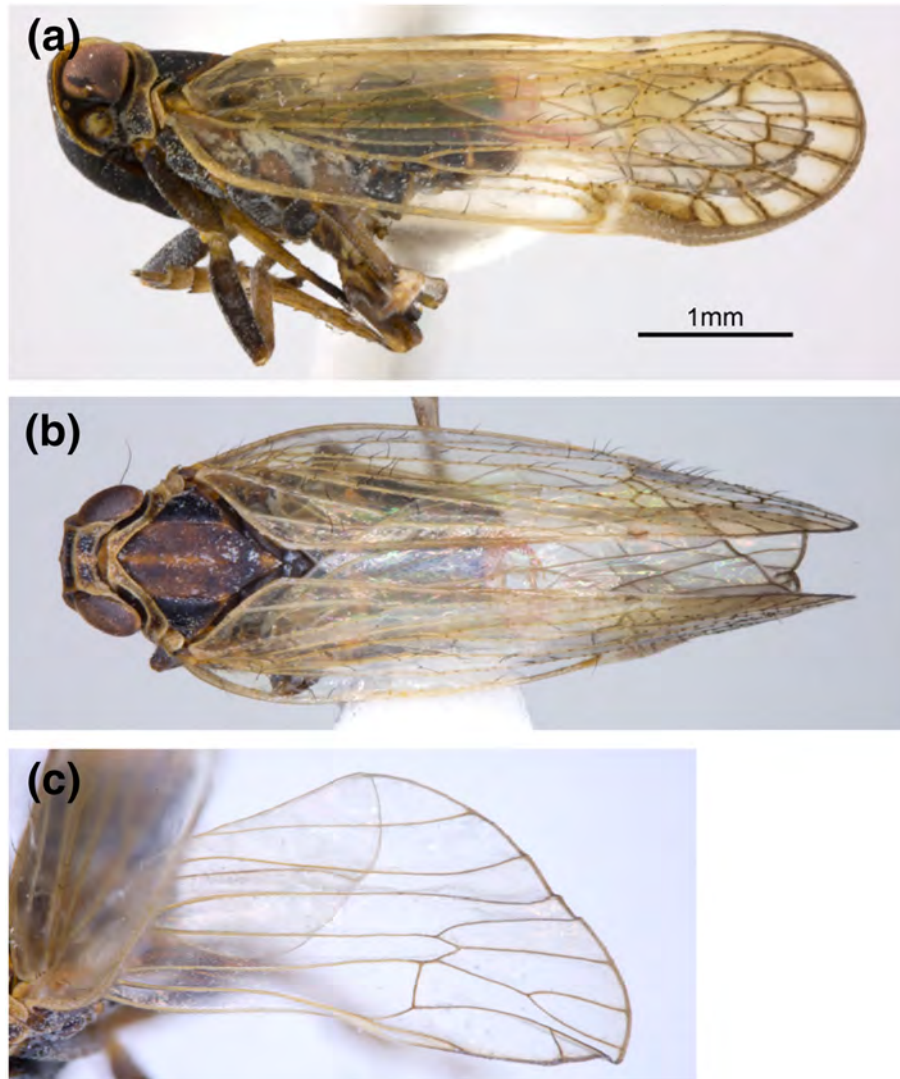


Fig. 7. *Tyligma dandavalex* sp. nov.: (a, b) habitus (σ^7 holotype); (c) hindwing (σ^7 Oxley Park, NSW, ASCT00191497), not to scale.

Thorax.

Hind margin of pronotum obtusely angled or rectangular. Mesonotum with weak to evanescent median and lateral carinae. Forewing 3.1–3.6 x longer than wide; costal margin with 11–13 tubercles; fork of ScP+RA and RP basad, distad or at same level as fork CuA1 and CuA2; tubercles of forewing dark or pale, concolorous with veins (often tubercles slightly darker than veins in apical third of forewing); RA apically unforked or bifid; RP bifid; additional subapical cell between branches of RP absent (rarely present); MP1+2 as well as MP3+4 bifid. Hind leg: 1st tarsomere with 10–11 (rarely 9) apical teeth and 5–7 platellae; 2nd tarsomere with 9–10 (rarely 8) apical teeth and 7–8 (rarely 6) platellae.

Male terminalia.

Anal tube as in Figures 3c, 9c,d, with ventral lobe in lateral view narrow near base, widening towards apex (Fig. 9d). Pygofer and genital styles as in Figures 3c, 9e,f: genital styles in apical portion emarginate. Aedeagus (Fig. 9a,b): Phallosome in ventral view symmetrical, with two very long spines (A) and (B); both

spines almost straight in basal half then strongly curving outwards with tips parallel to aedeagus shaft or slightly turned inwards. Phallosome ventrally with large ridge ending in serrated margin. Aedeagal spines surpassing ventral ridge. Phallosome in ventral view dumbbell-shaped, very narrow in middle section.

Etymology

Derived from the names of the first author's friends Danuta, David and Alexander McKenzie.

Ecology

Based on the currently known distribution (Fig. 11) *Tyligma* seems to be restricted to the temperate climate zone, apart from a few records from the southernmost parts of the subtropical region. This pattern matches that of *Chidaea*; however, some species of *Chidaea* (*Chidaea crassa* Löcker & Holzinger, 2019, and *Chidaea orangensis* Löcker & Holzinger, 2019) are recorded from northern parts of the subtropical region. Adults of *Tyligma* have been collected mainly from mid September until mid December.

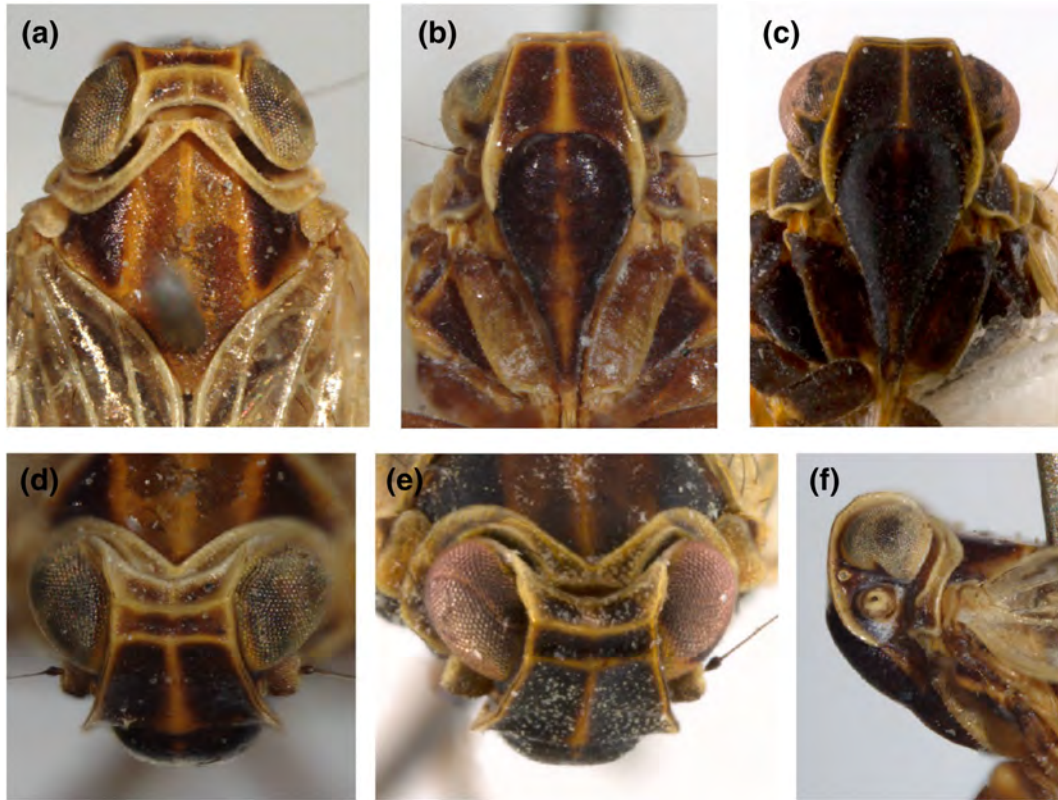


Fig. 8. *Tyligma dandavalex* sp. nov., head and thorax: (a, b, d and f) ♂ Imbil, Qld, ASCTHE031068; (c) ♂ NE of Ulan NSW, ASCTHE030118; (e) ♂ holotype.

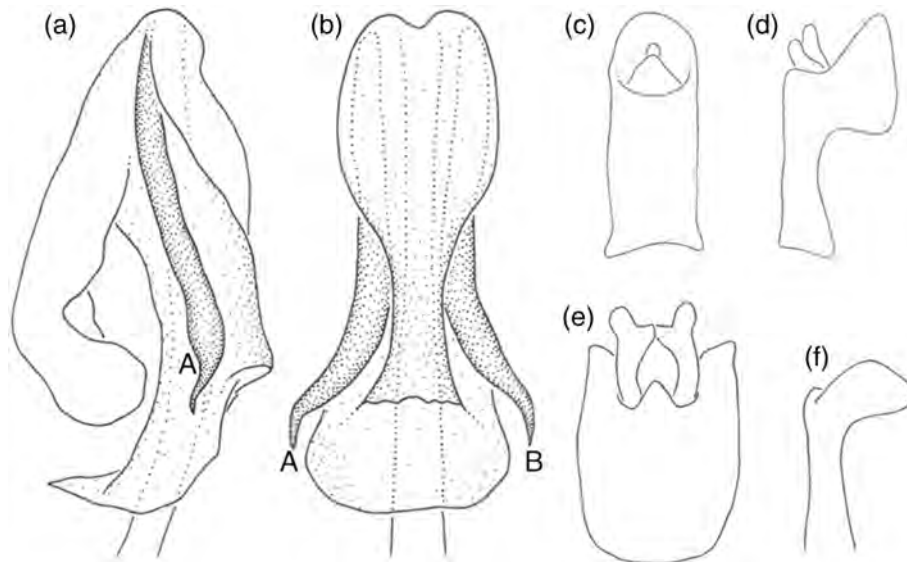


Fig. 9. *Tyligma dandavalex* sp. nov.: (a) aedeagus left lateral; (b) aedeagus ventral; (c, d) anal tube; (e) pygofer and genital styles; (f) genital style. All specimens ♂ Orange, NSW, ASCT00180868; except for (c, d) ♂ NE of Ulan ASCTHE030118. (A, B) spines on the phallosome.

Host plant relationships in Cixiini are poorly studied; for example, for several genera (*Calamister* and *Yanganaka*), no plant association records exist to date, and for others, only few records exist. With the exception of *F. angustifolia*, an introduced ash species in the Oleaceae, *Tyligma* is associated with native shrubs and small trees in the families Asteraceae and Myrtaceae

(see Table 1). *Cassinia* is a popular host for Cixiini species with *T. dandavalex*, *Monomalpha fletcheri* Emeljanov, 2000, *Chidaea crassa*, *C. orangensis* and *Leades clypealis* (Muir, 1931) recorded from this plant genus.

Currently, *T. dandavalex* appears to be oligophagous; however, whether *Tyligma* actually feeds on all the species listed in

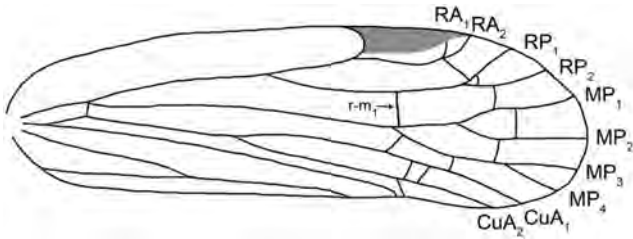


Fig. 10. *Tyligma dandavalex* sp. nov.: forewing (σ^7 Ophir, NSW, ASCT00186934).



Fig. 11. Distribution records of *Tyligma dandavalex* sp. nov.

Table 1 Associated plant records of *Tyligma dandavalex* sp. nov.

Plant family	Recorded species
Asteraceae	<i>Cassinia arcuata</i>
	<i>Cassinia quinquefaria</i>
	<i>Cassinia</i> sp.
	<i>Ozothamnus diosmifolius</i> (syn. <i>Heliochrysum diosmifolium</i>)
Myrtaceae	<i>Leptospermum</i> sp.
Oleaceae	<i>Fraxinus angustifolia</i>

the associated plant records table (Table 1) needs to be investigated. Future sampling (i.e. sweepnetting, beating, tree fogging) is likely to uncover more plant associations.

DISCUSSION

Tyligma greatly resembles two other Australian Cixiini genera, *Chidaea* and *Leades*, in certain features, for example, *Tyligma* and some species of *Chidaea* share the undivided wax plate on segment IX in females (e.g. *Chidaea etelis* Löcker & Holzinger, 2019, and *Chidaea armidalensis* Löcker &

Holzinger, 2019), the presence of platellae on both hind tarsomeres, the wide vertex, the length of the anal segment compared to the remainder of the 11th segment (same length or anal style slightly longer) and the presence of two aedeagal spines (one on each side) emerging from the apex of the phallosome (in *Tyligma* almost symmetrically arranged in ventral view, Fig. 9b). However, in *Tyligma*, the bifurcate ventrocranial process on the phallosome, which is present in all species of *Chidaea* (see Löcker & Holzinger, 2019), is replaced by a serrated margin at the cranial end of the ventral ridge (Fig. 9b). Further, a distinctly swollen and prominent postclypeus is only present in *Tyligma* and to some extent in *Leades ginginensis* Löcker 2020a. *Leades* and *Chidaea* differ in the ratio of frons to postclypeus length.

Leades and *Tyligma* share the presence of platellae on the 2nd hind tarsomere and the general shape of the face but differ in the shape of the anal tube and in the length of anal style vs. remainder of the 11th segment. Females can be separated by the position of the r-m₁ crossvein in combination with the shape of the postclypeus. In *Tyligma*, crossvein r-m₁ is slightly distad of fork MP1+2 and MP3+4 or at the same level (Fig. 10). In *Leades*, crossvein r-m₁ is distinctly basad of fork MP1+2 and MP3+4, with the exception of *Leades rufinus*, in which it can also be slightly distant or at same level. The latter species, however, does not possess a swollen clypeus, as found in *Tyligma*.

Other important diagnostic features of *Tyligma* are the following: apex of head with two straight or almost straight, transverse carinae (apical transverse carina and subapical carina); frons without median ocellus, with one median carina, neither forked nor vanishing; vertex at least about twice as wide as long, anterior margin more or less parallel to caudal margin, straight, slightly rounded or shallowly angulate; pronotum narrow; forewing without concavity at costal border; radius anterior often forked apically; anal tube with a distinct ventral lobe at its end, that in lateral view is narrow at the base and widening towards the apex (Fig. 9d) and females bearing a large wax plate at segment IX (Figs 4, 6a).

A comprehensive phylogenetic analysis of the tribe Cixiini (and in fact the entire family Cixiidae) is needed to investigate how these three seemingly closely related genera are positioned within the rest of the Cixiini, to test the monophyly of Cixiini and to establish a clear concept of the tribe.

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