Revision of the genus *Innobindus* Jacobi (Hemiptera: Fulgoromorpha: Cixiidae) with the description of six new species and comments on other Australian Brixiini genera

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**Abstract**

Australian planthoppers of the genus *Innobindus* Jacobi are revised. A lectotype for *Innobindus multimaculatus* Jacobi is designated and six new species of *Innobindus* are described: *I. alternans*, *I. collessi*, *I. licinus*, *I. marginatus*, *I. robinae* and *I. unicornis*. Maps of the known distribution for the species of *Innobindus* are presented and discussed. The Australian Brixiini fauna, which appears to be restricted in distribution to Queensland and New South Wales, comprises a further two genera: *Solonaima* Kirkaldy and *Undarana* Hoch & Howarth. The majority of Brixiini, including *Innobindus*, is non-cavernicolous; however, eight species within the genera *Solonaima* and *Undarana* have adapted to life in lava tubes and limestone caves. A key to genera and a checklist of the Australian species are presented.

**Key words**

Auchenorrhyncha, Australia, *Solonaima*, sp.n., *Undarana*.

**INTRODUCTION**

The Brixiini (Hemiptera: Fulgoromorpha: Cixiidae) comprises eight genera from the Ethiopian, Oriental and Australian Regions (Emeljanov 2002), and three of these genera, *Innobindus* Jacobi, *Solonaima* Kirkaldy and *Undarana* Hoch & Howarth, are represented in Australia. Despite the majority of cixiids living above ground, six species of *Solonaima* and two species of *Undarana* are cavernicolous, living in limestone caves and lava tubes of northern Queensland (Hoch 1988, 2002; Hoch & Asche 1988; Hoch & Howarth 1989a,b,c; Erbe & Hoch 2004; Soulier-Perkins 2005). These species display varying degrees of cave adaptation such as a more planate body form, pilose antennae and clypeus, specialised hind tibial spination, a wax fringe on the wings, loss of pigment and reduction of eyes and wings (Hoch 2002; Hoch & Asche 1988; Hoch & Howarth 1989c). Nymphs and adults of cavernicolous species feed on tree roots that extend into the caves (Hoch & Asche 1988).

In our review of the Australian fauna, six undescribed species of the genus *Innobindus* Jacobi have been discovered and these are described below including a redescription of *Innobindus multimaculatus* Jacobi. Information provided on data labels of the specimens examined (e.g. light trap, flight interception, pyrethrum knockdown, malaise trap, pitfall trap, collected in rainforest) suggests that the species of this genus are non-cavernicolous. The habitat of nymphs remains unknown.

**MATERIALS AND METHODS**

**Preparation of male genitalia**

Male specimens were softened and dissected following the protocol described by Löcker *et al.* (2006).

**Measurements**

The morphological terms applied here are as used by Löcker *et al.* (2006) and illustrated in Figure 1c, except for the nomenclature applied in this paper to the venation of the tegmen, which follows Anufriev and Emeljanov (1988), and differs slightly from that applied in Löcker *et al.* (2006).

The following measurements were taken in this study:

- Body length: tip of head to posterior margin of forewing
- Width of vertex: width level with tip of basal emargination
- Length of vertex: subapical transverse carina to tip of basal emargination
- Length of frons: apical transverse carina to frontoclypeal suture, in median line
• 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

Abbreviations:
ANZSES: Australian and New Zealand Scientific Exploration Society Inc.
AMS: Australian Museum, Sydney
ANIC: Australian National Insect Collection, CSIRO, Canberra
NHRS: Naturhistoriska Riksmuseet, Stockholm
NSW: New South Wales
NZAC: New Zealand Arthropod Collection, Auckland
Qld: Queensland
QM: Queensland Museum, Brisbane
SAMA: South Australian Museum, Adelaide
UQIC: University of Queensland Insect Collection, Brisbane.

RESULTS

Key to Australian genera of Brixiini

1 Pedicel of antennae at least 3× longer than its diameter (Fig. 6a) ........................................... Solonaima Kirkaldy
   – Pedicel of antennae not longer than twice its diameter (Figs 1d, 6b) ................................. 2

2(1) Vertex about 6× wider than long, bent ventrad (Fig. 6c) ................................. Undarana Hoch & Howarth
   – Vertex less than 3× wider than long, facing dorsad (Fig. 5b) ................................. Innobindus Jacobi

A checklist of the known species of Brixiini is presented in Table 1.

Genus Innobindus Jacobi

Table 1  Species list of Australian Brixiini

<table>
<thead>
<tr>
<th>Genus</th>
<th>Species</th>
<th>Synonymy</th>
<th>References</th>
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<tr>
<td>Innobindus</td>
<td>Jacobi, 1928: 31</td>
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<td>licinus group</td>
<td><em>Innobindus licinus</em> Löcker sp.n.</td>
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<td><em>Innobindus marginatus</em> Löcker sp.n.</td>
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<td><em>Innobindus robiniae</em> Löcker sp.n.</td>
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<td>multimaculatus group</td>
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<td><em>Innobindus multimaculatus</em> Jacobi, 1928: 31</td>
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<td><em>Innobindus collinsi</em> Löcker sp.n.</td>
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<td><em>Innobindus unicorns</em> Löcker sp.n.</td>
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<td>Solonaima</td>
<td>Kirkaldy, 1906: 396</td>
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<td><em>Talaola</em> Daybora, 1907: 294, synonymised by Muir, 1925: 104</td>
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<td><em>Solonaima bifissa</em> Hoch &amp; Howarth, 1989b: 395</td>
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<td><em>Solonaima bifurcata</em> Hoch, 1988: 126</td>
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<td><em>Solonaima cedrivulata</em> Hoch, 1988: 131</td>
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<td><em>Solonaima halos</em> Hoch &amp; Howarth, 1989b: 393</td>
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<td><em>Solonaima minutula</em> Hoch, 1988: 132</td>
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<td><em>Solonaima monteithi</em> Erbe &amp; Hoch, 2004: 4</td>
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<td><em>Solonaima nielseni</em> Erbe &amp; Hoch, 2004: 2</td>
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<td><em>Solonaima ornata</em> Hoch, 1988: 132</td>
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<td><em>Solonaima pallescens</em> Distant, 1907: 295</td>
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<td><em>Solonaima pholotor</em> Hoch &amp; Howarth, 1989b: 388</td>
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<td><em>Solonaima riocampa</em> Hoch, 1988: 129</td>
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<td><em>Solonaima stonei</em> Hoch &amp; Howarth, 1989b: 391</td>
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<td><em>Solonaima sullivani</em> Hoch &amp; Howarth, 1989b: 388</td>
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<td><em>Undarana tamborina</em> Hoch &amp; Howarth, 1989a: 182</td>
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<td><em>Undarana gloriosa</em> Hoch &amp; Howarth, 1989a: 184</td>
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<td><em>Undarana towomba</em> Hoch &amp; Howarth, 1989a: 186</td>
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<td><em>Undarana daybora</em> Hoch &amp; Howarth, 1989a: 190</td>
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<td><em>Undarana rosella</em> Hoch &amp; Howarth, 1989a: 192</td>
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<td><em>Undarana collina</em> Hoch &amp; Howarth, 1989a: 192</td>
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Type species are in bold. Cavernicolous species are marked with an asterisk.

Type species *I. multimaculatus* Jacobi, 1928, by monotypy.

**Colour.** Body brown; forewing hyaline, colourless, sometimes with scattered brown marks and darker crossveins, legs light brown.

**Morphology.** Body length: ♀ 5.0–7.4 mm, ♂ 5.7–7.4 mm.

**Head.** Vertex with u- or v-shaped basal emargination; lateral carinae strongly elevated; median carina absent or present; apical and subapical carinae well developed, slightly curved, forming a rectangle (Fig. 4e–g). Maximum width of frons more than 2x apical width, evenly widening from apex to maximum width which is distinctly dorsal of centre of frontocelypeal suture; lateral carinae extending laterally, concealing base of antennae; median carina incomplete; frontocelypeal suture slightly semicircular bent upwards, median part not reaching level with lower margin of antenial scape; median ocellus present. Median and lateral carinae of postcelypeus well developed; median carina of antcelypeus well developed; lateral carinae absent. Rostrum surpassing hind coxae.

**Thorax.** Pronotum with hind margin rectangular to slightly obtusely angled; median carina present. Mesonotum with 3 well-developed carinae. Forewing in resting position steeply tectiform, apices of wings touching; concavity at costal border; tubercles along veins; Sc+R+M forming a common stem; fork of Sc+RA+RP basad of fork of CuA1+CuA2; position of r-m at same level as or slightly basad of fork of MA+MP; icu distinctly distad of apex of clavus; RP apically trifid; additional subapical cell between branches of RP present; MA apically trifid; MP apically bifid; additional subapical cell between branches of MA present; fork of Pu+PuA distad of centre of clavus (rarely central within clavus); 10 (rarely 11) apical cells. Hind leg: tibia with 6 apical teeth forming uninterrupted row of spines or small gap present, dividing spines in two groups of three teeth; 1st tarsomere with 7 (rarely 8) apical teeth; 2nd tarsomere with 8 (rarely 7) apical teeth; tarsomeres usually without plateellae; 2nd tarsomere with 0–3 fine setae underneath row of apical teeth.

**Distribution.** Queensland, NSW.

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**Key to Australian species of *Innobindus* Jacobi**

Note: This key is mainly based on male specimens, which means females can only be identified to the level of species group.

1   Lateral carinae of frons strongly elevated; median carina of frons incomplete, covering less than 3/4 of frons (Figs 3c, 4b, 5c); lateral carinae of frons continuous with those of clypeus (Figs 3c, 4b, 5c)................. ................................. multimaculatus group......2

2(1) Phallotheca right lateral with medium-sized spine (Fig. 10a); ventral with pair of very small spines as in Figure 10a..........................I. alternans Löcker, sp.n.

3(2) Phallotheca left lateral with very long spine (Fig. 12a).................I. multimaculatus Jacobi

4(3) Phallotheca left lateral with medium-sized spine (Figs 11a, 13a)........

5(1) Phallotheca ventral with very long spine (b') with its tip curved caudad (Fig. 7a) .......I. licinus Löcker, sp.n.

6(5) Phallotheca ventral with medium-sized spine (b') with its tip curved dorsad or cephalad (Figs 8a, 9a, b)............................I. robiniae Löcker, sp.n.

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Phallotheca ventral with short spine (b') with its tip curved cephalad (Fig. 8a) ............................................
......................................................................................I. marginatus Löcker, sp.n.

licinus group

These 3 species share the following attributes and are therefore grouped together as the licinus group: vertex with or without median carina; lateral carinae of frons slightly elevated; median carina of frons incomplete, covering more than 4/5 of frons; lateral carinae of frons and clypeus not continuous; genital styles and ventromedian process as in Figures 7d, 8d and 9d; phallotheca with 3–4 spines and a pair of very small, ventral spines arranged as in Figures 7a, 8a and 9a,b; flagellum unarmed.

Innobindus licinus Löcker, sp.n.
Innobindus marginatus Löcker, sp.n.
Innobindus robinae Löcker, sp.n.

Innobindus licinus Löcker, sp.n. (Figs 1a–d, 7, 14a)

Types. Holotype, ♀. Australia, NSW: 5 miles NW of Coffs Harbour, 800 ft, 1.xi.1965 (M.S. Upton) (ANIC), Paratypes, NSW: 6 ♂, 1 ♀, same data as holotype (ANIC).

Etymology. The Latin term ‘licinus’ means ‘bent or turned upward’. Named after the upwardly curved spine (b) on the phallotheca.

Colour. Vertex mid- to dark brown with 2 light brown stripes; face light brown, disc of frons darker; pronotum light brown, mesonotum darker; forewing hyaline, colourless with scattered brown marks, veins light brown with darker sections,
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crossveins and pterostigma mid-brown, tubercles concolorous with veins; legs light brown; abdominal sternites mid-brown.

**Morphology.** Body length: ♂ 5.1–5.8 mm, ♀ 6.1 mm.

*Head:* Vertex 0.6–0.7× as long as wide. Frons 2.0–2.2× longer than wide.

*Thorax:* Forewing 3.0–3.2× longer than wide; MP apically bifid; costa with 16–23 tubercles; 10 apical cells. Hind leg: tibia with 1–5 very small lateral spines; tibia with 6 apical teeth forming uninterrupted row of spines; 1st tarsomere with 7 apical teeth; 2nd tarsomere with 8 apical teeth and 2–3 very fine setae underneath row of apical teeth, without platellae.

*Male genitalia:* Anal tube as in Figure 7b,c; genital styles and ventromedian process as in Figure 7d,e. Aedeagus (Fig. 7a): Phallotheca ventral with pair of very small spines (a’) and very long, strongly curved spine (b’) with its tip curved caudal (upwards); left lateral with sinuate spine (c’); dorsal with slightly curved spine (d’). Flagellum unarmed.

**Innobindus marginatus** Löcker, sp.n. (Figs 1e,2a–c,8,14b)

**Types.** *Holotype,* ♂. *Australia,* Qld: National Park [Lamington NP], xii.1921 (H. Hacker) (QM QMT.133350), *Paratypes,* Qld: 1 ♂, same data as holotype (QM).

**Etymology.** Named after the distinctly coloured border of the wing.

**Colour.** Body light brown, forewing hyaline, colourless with brown marks (mainly along the apex of wing as in Fig. 1e), veins and tubercles light brown, pterostigma mid-brown; legs light brown.

**Morphology.** Body length: ♂ 5.3 mm.

*Head:* Vertex 0.7× as long as wide. Frons 2.1× longer than wide.

*Thorax:* Forewing 3.0× longer than wide; MP apically bifid; costa with 16–19 tubercles; 10 apical cells. Hind leg:
tibia with 2–3 very small lateral spines; tibia with 6 apical teeth forming uninterrupted row of spines; 1st tarsomere with 7 apical teeth; 2nd tarsomere with 8–9 apical teeth and 6–7 platellae, without fine setae.

Male genitalia: Anal tube as in Figure 8b,c; genital styles and ventromedian process as in Figure 8d,e. Aedeagus (Fig. 8a): Phallotheca ventral with pair of very small spines (a’) and short, slender spine (b’) with its tip curved cephalad; left lateral with medium-sized, sclerotised spine (c’); dorsal with medium-sized, less sclerotised spine (d’); left lateral with minute spine (e’). Flagellum unarmed.

Remarks. The chaetotaxy of *I. marginatus* differs from other species within this genus in the presence of 6–7 platellae instead of 1–3 fine setae on the 2nd hind tarsomere.

**Innobi**nda**s** **ro**bi**nae** Löcker, sp.n.  
**(Figs 2d–g,9,14c)**

Types. Holotype, ♂, Australia, NSW: Lawson (Lea) (SAMA I21763).

Other material examined. NSW: 1 ♂, Starrs Ck., Lansdowne S.F., NE Taree, rainforest, 6.–8.1.1988 (G. Williams) (AMS).

Etymology. Named in honour of Robin Thompson, a friend of the authors.

Colour. Body light brown, forewing hyaline, colourless with scattered brown marks, veins light brown with darker sections, tubercles concolorous with veins, pterostigma light or mid-brown; legs and abdominal sternites light brown.
Fig. 5. *Innobindus unicornis*: (a) habitus; (b–d) head.

Fig. 6. *Solonaima* sp.: (a) head. *Undarana* sp.: (b, c) head.

Fig. 7. *Innobindus licinus*: (a) aedeagus; (b, c) anal tube; (d, e) genital styles.

Fig. 8. *Innobindus marginatus*: (a) aedeagus; (b, c) anal tube; (d, e) genital styles.
**Morphology.** Body length: ♂ 5.0–6.2 mm.

*Head:* Vertex 0.7× as long as wide. Frons 1.8–2.1× longer than wide.

*Thorax:* Forewing 2.9–3.3× longer than wide; MP apically bifid or trifid; costa with 17–25 tubercles; 10–11 apical cells. Hind leg: tibia with 2–5 very small lateral spines; tibia with 6 apical teeth forming uninterrupted row of spines or small gap present, dividing spines in 2 groups of 3 teeth; 1st tarsomere with 7 or 8 apical teeth; 2nd tarsomere with 7 or 8 apical teeth and 2–3 very fine setae underneath row of apical teeth, without plattellae.

*Male genitalia:* Anal tube as in Figure 9c,d; genital styles and ventromedian process as in Figure 9e,f. Aedeagus (Fig. 9a,b): Phallotheca ventral with pair of very small spines (a′) and medium-sized, strongly curved spine (b′) with its tip curved dorsad; left lateral with sinuate spine (c′); dorsal with slightly curved spine (d′); right lateral with slightly curved spine (e′). Flagellum unarmed.

*Remarks.* The specimen from Starrs Ck, NSW is excluded from the type series because it lacks spine (e′) and is therefore not typical of the species.
multimaculatus group

These 4 species, including the type species, share the following attributes and are therefore grouped together as the multimaculatus group: vertex lacking median carina; lateral carinae of frons strongly elevated; median carina of frons incomplete, covering less than 3/4 of frons; lateral carinae of frons continuous with lateral carinae of clypeus; phallotheca lateral with medium-sized or very long, curved spine, ventral with a fringed ridge or a pair of very small spines; flagellum armed or unarmed. *Innobindus alternans* Lörker, sp.n. *Innobindus collessi* Lörker, sp.n. *Innobindus multimaculatus* Jacobi, 1928 *Innobindus unicornis* Lörker, sp.n.

**Innobindus alternans** Lörker, sp.n. *(Figs 10,13a–d,14d)*

**Types.** Holotype, ♂, Australia, Qld: Lamington NP, 28.i.–3.ii.1963 (G. Monteith) (QM QMT.133351, originally UQIC).

Paratypes. Qld: 2 ♂, 1 ♀, same data as holotype (UQIC); 8 ♂, 3 ♀, National Park [Lamington NP], xii.1923 (H. Hacker) (QM).

**Other material examined.** Qld: 1 ♂, National Park [Lamington NP], xii.1923 (H. Hacker) (QM).

**Etymology.** In contrast to similar species of *Innobindus* the types of this species have the curved spine inserting on the right rather than the left side of the phallotheca.

**Colour.** Body light, mid- or dark brown, mesonotum and disc of frons and vertex slightly darker; forewing hyaline, colourless, with scattered brown marks, veins light or mid-brown with a few paler sections, tubercles concolorous with veins, pterostigma mid-brown; legs light brown; abdominal sternites mid-brown.

**Morphology.** Body length: ♂ 6.2–7.4 mm, ♀ 6.8–7.4 mm.

*Head:* Vertex 0.5–0.7× as long as wide. Frons 2.0–2.3× longer than wide.

*Thorax:* Forewing 2.5–2.8× longer than wide; fork of PCu+A1 distad of centre of clavus; costa with 31–35 tubercles. Hind leg: tibia with 1–3 very small lateral spines.
Male genitalia: Anal tube as in Figure 10b,c; genital styles and ventromedian process as in Figure 10d,e. Aedeagus (Fig. 10a): Phallotheca right lateral with medium-sized, curved spine; right and left lateral near base with minute spine; ventral with pair of very small spines. Flagellum unarmed.

Remarks. The specimen excluded from the type series has the medium-sized, curved spine of the phallotheca left lateral instead of right lateral. Whether this is an aberration is uncertain. If not, the significance is unclear at this stage.

Innobindus collessi Löcker, sp.n.
(Figs 3e,4a–c,11,14e)

Types. Holotype, ♂. Australia, Qld: Mt Edith Forest Road, 1.5 m off Danbullura Road, N.Qld, 6.v.1967 (D.H. Colless) (ANIC). Paratypes, Qld: 1 ♀, same data as holotype (ANIC); 1 ♂, Mt Graham, 8 km N Abergowrie, NE.Qld, pitfall trap, RF, 600–700 m, flight intercept, 26.xii.1986–15.i.1987 (S. Hamlet) (QM); 1 ♂, Karnak-Devil’s Thumb, 8–12 km NW Mossman, N.Qld, 1080 m, flight intercept, 26.xii.1989–15.i.1990 (ANZSES Expedition) (QM); 1 ♂, Mt Williams, NE.Qld, 16.555S 145.40E, 1000 m, pyrethrum, trees and logs, 2.xii.1993 (Monteith & Janetzki) (QM).

Etymology. Named in honour of Dr Don H. Colless, eminent Australian dipterist, who collected the holotype.

Colour. Body light to mid-brown; forewing hyaline, colourless, with scattered brown marks, veins light brown with mid-brown sections, crossveins mid-brown, tubercles concolorous with veins, pterostigma mid-brown; legs light brown; abdominal sternites mid-brown.

Morphology. Body length: ♂ 5.3–6.1, ♀ 6.4 mm. Head: Vertex 0.4–0.6× as long as wide. Frons 1.8–2.0× longer than wide.

Thorax: Forewing 2.7–3.0× longer than wide; fork of Pcu+A1 distad of centre of clavus or central within clavus; costa with 26–33 tubercles. Hind leg: tibia with 2–3 very small lateral spines.

Male genitalia: Anal tube as in Figure 11b,c; genital styles and ventromedian process as in Figure 11d,e. Aedeagus (Fig. 11a): Phallotheca left lateral with medium-sized, curved spine; ventral with small, fringed ridge. Flagellum unarmed.

Innobindus multimaculatus Jacobi
(Figs 4d–g,12,14f)

Innobindus multimaculatus Jacobi, 1928: 31 (fig. 18a–d)

Types. Lectotype, here designated, ♂ (examined), Australia, Qld: Malanda (Mjöberg) (NHRS). Paralactotypes, Qld: 2 ♀, same data as lectotype (1 ♀ MTD examined, 1 ♀ NHRS not examined). The 2 specimens examined match the features and type locality given in the original description. The male specimen is labelled ‘Typus’ and the female ‘co-Typus’. Because the original description does not mention the designation of a holotype these specimens are regarded as syntypes. A lectotype is designated to provide a diagnostic reference for the species to ensure there is no confusion with several other Australian species described below.

Other material examined. Australia, Qld: 3 ♂, 2 ♀, Windsor T-land via Mt Carbine, N.Qld, rainforest, at light, 28.xii.1976 (R.I. Storey) (QDPI); 1 ♂, 1 ♀, 26 km up Tinaroo Ck Rd via Mareeba, N.Qld, 29.ix.–11.xi.1983 (Storey & Brown) (QDPI); 1 ♂, 26 km up Tinaroo Ck Rd via Mareeba, intercept trap, 28.i.–16.ii.1983 (Storey & Brown) (QDPI); 1 ♀, Mt Lewis, 11.3 km along Mt Lewis Rd, 16.35.31S 145.16.15E, ex light, 30.iv.1998 (G. Cassis) (AMS); 1 ♂, NE.Qld, Mt Demi, 7 km SW Mossman, 1100 m, pyrethrum knockdown in rainforest, 29.x.1983 (D.K. Yeates & G.I. Thompson) (QM); 1 ♂, 1 ♀, Mossman Bluff Track, 5–10 km W Mossman, N.Qld, 1300 m, flight intercept, 1–17.i.1989 (Monteith, Thompson & ANZSES) (QM); 1 ♂, Mossman Bluff Track, 9 km W Mossman, N.Qld, 860 m, pyrethrum, 20.xii.1989 (Monteith & Thompson) (QM); 2 ♂, 3 km N Cape Tribulation, NE.Qld, 500 m, 20.xi.–7.x.1982 (Monteith, Yeates & Thompson) (QM); 1 ♂, same data, 23.x.–7.x.1982, rainforest pitfall trap (QM); 1 ♂, 4 ♀, Bellenden Ken Range, Cable Tower 5, NE.Qld, 500 m, malaise, x.–xii.1982 (S. Montague) (QM).

Colour. Body light brown, mesonotum, disc of frons and vertex slightly darker; forewing hyaline, colourless, with scattered brown marks, pterostigma and veins light brown, crossveins darker, tubercles concolorous with veins; legs light brown; abdominal sternites light to mid-brown.

Morphology. Body length: ♂ 5.8–6.4 mm, ♀ 5.7–6.9 mm. Head: Vertex 0.5–0.8× as long as wide. Frons 1.7–2.1× longer than wide.

Thorax: Forewing 2.8–3.1× longer than wide; fork of Pcu+A1 distad of centre of clavus or central within clavus; costa with 24–33 tubercles. Hind leg: tibia with 0–4 very small lateral spines.

Male genitalia: Anal tube as in Figure 12b,c; genital styles and ventromedian process as in Figure 12d,e. Aedeagus (Fig. 12a): Phallotheca left lateral with very long, curved spine; ventral with large, evenly curved, fringed, sheet-like ridge. Flagellum unarmed.

Innobindus unicornis Löcker, sp.n.
(Figs 5a–d,13,14g)

Types. Holotype, ♂. Australia, Qld: Mt Finnigan summit, NE.Qld, 15.495S 145.17E, 1100 m, rainforest, mv lamp, 20–21.xi.1998 (C.J. Burwell) (QM QMT.133349). Paratypes, Qld: 1 ♂, 1 ♀, same data as holotype (QM). Etymology. The name is derived from the presence of a single spine on the flagellum.

Colour. Body light brown; forewing hyaline, colourless, apex of wing smoky brown, veins light to mid-brown, crossveins darker, tubercles concolorous with veins, pterostigma dark brown; legs light brown; abdominal sternites mid-brown.

Morphology. Body length: ♂ 6.8–6.9 mm, ♀ 7.2–7.4 mm. Head: Vertex 0.5× as long as wide. Frons 1.9–2.0× longer than wide.


Male genitalia: Anal tube as in Figure 13b,c; genital styles and ventromedian process as in Figure 13d,e. Aedeagus
(Fig. 13a): Phallotheca left lateral with medium-sized, sinuate spine; ventral with medium-sized, fringed ridge. Flagellum left lateral near base with small spine.

**DISCUSSION**

The Australian Brixini are reported only from Queensland and NSW. Maps of the known distribution for the species of *Innobindus* are shown in Figure 14. The *licinus* group occurs in eastern NSW and south-east Queensland, whereas the *multimaculatus* group is restricted to north-east Queensland, with the exception of *I. alternans*, which occurs isolated from the other species of *Innobindus* in Lamington NP near the border between Queensland and NSW. Its distribution overlapps that of the *licinus* group. Moreover, the presence of a ventral pair of spines on the phallotheca of *I. alternans* is a feature shared with the *licinus* group. Nevertheless, features such as the strongly elevated lateral carinae of frons, the continuous lateral carinae of frons and clypeus, the length of the median carina of frons (covering less than three-fourths of frons) and the colour pattern of the wing support its placement within the *multimaculatus* group. *Innobindus alternans*, however, differs in the absence of the fringed ventral ridge that characterises all other species of the *multimaculatus* group. Although *I. alternans* possesses a single spine on the phallotheca, which is a feature of *multimaculatus* group, the spine inserts right lateral instead of left lateral as in the remaining species of the group. However, one of 12 specimens collected at Lamington National Park had the spine inserted on the left side of the phallotheca. The pair of ventral spines observed in the *licinus* group and *I. alternans* may represent a plesiomorphy, because it is also found in some species of other tribes such as Gelascocephalini and Cixiini. Therefore, *I. alternans* may be basal to the remaining species in the *multimaculatus* group. However, a phylogenetic analysis is needed to test this hypothesis.

Within Cixiidae two different branching patterns of the Media in the tegmen exist: a trifid Media anterior, present in *S. halos*, and a bifid or trifid Media posterior. Emeljanov (2002) notes in the tegmen exist: a trifid Media anterior, present in *S. halos*, and a bifid or trifid Media posterior. Emeljanov (2002) states that the anterior and posterior are either bifid or trifid Media posterior with the exception of *I. alternans*, which occurs isolated from the other species of *Innobindus* in Lamington NP near the border between Queensland and NSW. Its distribution overlaps that of the *licinus* group. Moreover, the presence of a ventral pair of spines on the phallotheca of *I. alternans* is a feature shared with the *licinus* group. Nevertheless, features such as the strongly elevated lateral carinae of frons, the continuous lateral carinae of frons and clypeus, the length of the median carina of frons (covering less than three-fourths of frons) and the colour pattern of the wing support its placement within the *multimaculatus* group. *Innobindus alternans*, however, differs in the absence of the fringed ventral ridge that characterises all other species of the *multimaculatus* group. Although *I. alternans* possesses a single spine on the phallotheca, which is a feature of *multimaculatus* group, the spine inserts right lateral instead of left lateral as in the remaining species of the group. However, one of 12 specimens collected at Lamington National Park had the spine inserted on the left side of the phallotheca. The pair of ventral spines observed in the *licinus* group and *I. alternans* may represent a plesiomorphy, because it is also found in some species of other tribes such as Gelascocephalini and Cixiini. Therefore, *I. alternans* may be basal to the remaining species in the *multimaculatus* group. However, a phylogenetic analysis is needed to test this hypothesis.

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