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A revision of the Australian cicada genus *Punia* Moulds, 2012 (Cicadidae: Cicadettinae: Cicadettini) with the description of four new species

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Abstract

Punia minima (Goding & Froggatt, 1904) from the Northern Territory is redescribed and the female described for the first time. Four new species found across the monsoonal north of Australia are documented: *P. hyas* **sp.n.**, *P. limpida* **sp.n.**, *P. kolos* **sp.n.** and *P. queenslandica* **sp.n.** A key to all five species is provided and their phylogenetic relationships discussed.

Key words: Cicadoidea, monsoonal cicadas, key to *Punia* species

Introduction

Goding and Froggatt (1904) described what is one of Australia's smallest cicadas, *Punia minima*. The species remained in obscurity, appearing only as listings in the checklists of Metcalf (1963), Burns (1957) and Duffels and van der Laan (1985) until Moulds (1990) provided brief notes on its distribution and habitat. The genus *Punia* was established to accommodate this single species (Moulds 2012) and details of wing venation and other morphology, including distinguishing characters, can be found there. Five species are here recognised in the genus, four of them new. Together they are distributed across monsoonal northern Australia from the Kimberley region of Western Australia, through the Northern Territory to northern Queensland. The distribution for *P. minima* given by Moulds (1990) includes the distributions of all five species, but otherwise the text refers to *P. minima*.

In a cladistic analysis (Moulds 2005) *Punia minima* was found to be closely allied to *Neopunia graminis* (Goding & Froggatt, 1904) and *Nanopsalta basalis* (Goding & Froggatt, 1904), together forming a late branching clade within a larger clade of Australian Cicadettini (including *Pauropsalta* Goding & Froggatt and related genera), an association later confirmed in molecular studies by Owen *et al.* (2015) and Marshall *et al*. (2016). A later study by Owen *et al.* (2017), on the aridification of Australia and its affect on cicadas of the genus *Pauropsalta* and its allies, found that the ancestor of *Punia* species distributed in Northern Territory/Western Australian likely diverged from the ancestors of *Nanopsalta* around 22–18 million years ago due to marine transgression in the Gulf of Carpentaria.

The following abbreviations are used: AE collection of Tony Ewart; AM Australian Museum, Sydney; ANIC Australian National Insect Collection, Canberra; BMNH Natural History Museum, London; DE collection of David Emery; JO collection of John Olive; LP collection of Lindsay Popple; MSM author's collection; NTM Northern Territory Museum of Arts and Science, Darwin; QDAF Queensland Department of Agriculture and Fisheries, Brisbane; QM Queensland Museum, Brisbane; SAM South Australian Museum, Adelaide; WAM Western Australian Museum, Perth.

Terminology for morphological features follows that of Moulds (2005, 2012).

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Key to species of *Punia*

Some teneral individuals (not fully coloured) may not key correctly and the male genitalia should be examined by dissection to confirm identification.

1. Body green or tending so . . . . . *limpida* **sp.n.** (green form)
- Body predominantly light yellowish brown, never with green 2
2. Forewing venation (excluding costa) entirely brown or blackish 3
- Forewing venation on basal half (ignoring costa) partly or entirely very pale; brown or blackish on distal remainder 4
3. Male forewing less than 11 mm long (usually 10.8 mm or less), female less than 11.5 mm long (usually 11.2 or less); forewing vein CuA_1 divided by crossvein about equally; found only in Queensland . . . . . *queenslandica* **sp.n.**
- Male forewing more than 11 mm long (usually 11.2 or more), female 12.3 mm or more long (usually 12.6 or more); forewing vein CuA_1 divided by crossvein so that proximal portion clearly shortest; found only in Western Australia and Northern Territory . . . . . *hyas* **sp.n.**
4. Forewing with basal stem of vein M brown or blackish, vein CuA very pale or colourless . . . . . *minima* (G. & F.)
- Forewing veins M and CuA both very pale 5
5. Postclypeus almost entirely brown or mainly so except for a narrow pale border following ventral margin . . . . . *kolos* **sp.n.**
- Postclypeus with brown pigmentation covering no more than half its surface, and always with a broad pale lateral border, never a narrow even border extending around entire length of ventral margin . . . . . *limpida* **sp.n.** (brown form)

Punia minima (Goding & Froggatt, 1904)

(Figs 10–12, 28)

Pauropsalta minima Goding & Froggatt, 1904: 628.
Melampsalta minima: Burns, 1957: 658.
Cicadetta minima: Moulds, 1990: 162–163, pl. 16, figs 3, 3a
Punia minima Moulds, 2012: 195. (Fig. 180 labelled as this species in Moulds, 2012 is not this species but *P. kolos*.)
Punia minima_KWW02 Owen *et al*., 2015: 261, 267–270.
Punia noninfuscata_LVQ03 Owen *et al*., 2015: 263, 267-270
Punia "sp. brown" Owen *et al*. 2017: 572, 580.
Punia "non-infuscated" Owen *et al*. 2017: 572, 580.

Types. Three syntypes, all in SAM (examined): one male, in very poor condition, bearing five labels: (1) 'TYPE' red circular label; (2) 'N.T. 1875 Tepper' handwritten; (3) '18.22 Goding 12.7.04' handwritten; (4) 'Melampsalta minima Godg. Type' handwritten; (5) 'SAMA Database No. 20-014639' printed and recently added; and two further males in very poor condition (together on the same pin) bearing five labels: (1) 'TYPE' red square label; (2) 'N.T. 1875 Tepper'; (3) '22(2) Goding 12.1.03' handwritten; (4) 'Pauropsalta minima G & F' printed and recently added; (5) 'SAMA Database No. 20-014640' printed and recently added.

Lectotype designation. Goding and Froggatt (1904) state that they had three examples at the time of description and there is no reason to doubt that the three specimens labelled as types in SAM are the three in question. They are conspecific, and the specimen pinned singly is here designated as lectotype and the two mounted together on the same pin are designated paralectotypes. Only two of the three specimens retain their genitalia (the lectotype and the lower specimen of the two on the same pin) and examination of these confirm the identity of the species. The lectotype has only the right forewing and left hindwing still attached to the body and the left forewing and abdomen separated and mounted on a card. The upper specimen of the two on the same pin lacks most of its abdomen and much of the distal half of all wings, but its pigmented forewing vein M and unpigmented vein CuA imply it is conspecific with the specimens retaining their genitalia. The lower specimen comprises a body with wing stumps only. The data labels of the three specimens suggest they were collected together.

Although the original description gives the type locality as 'Northern Territory, S.A.' the species does not occur in South Australia; Goding and Froggatt's reference to South Australia stems from the fact that the Northern Territory was at that time under the administration of South Australia.

Material examined. *Types* as above and the following: WESTERN AUSTRALIA: 2 males (1 genitalia prep. PU31) (Simon Lab. vouchers 10.AU.WA.LVQ.03, 10.AU.WA.LVQ.04), 1 female, nr Broome, 13 km up Cape Leveque road, 17°46.210S 122°16.868E, 18 Jan. 2010, Hill, Marshall, Moulds (**MSM**). NORTHERN TERRITORY: 3 males, same data as holotype (**AE**). 3 males, same data as holotype (**AM**). 4 males, Smith Point, Coburg

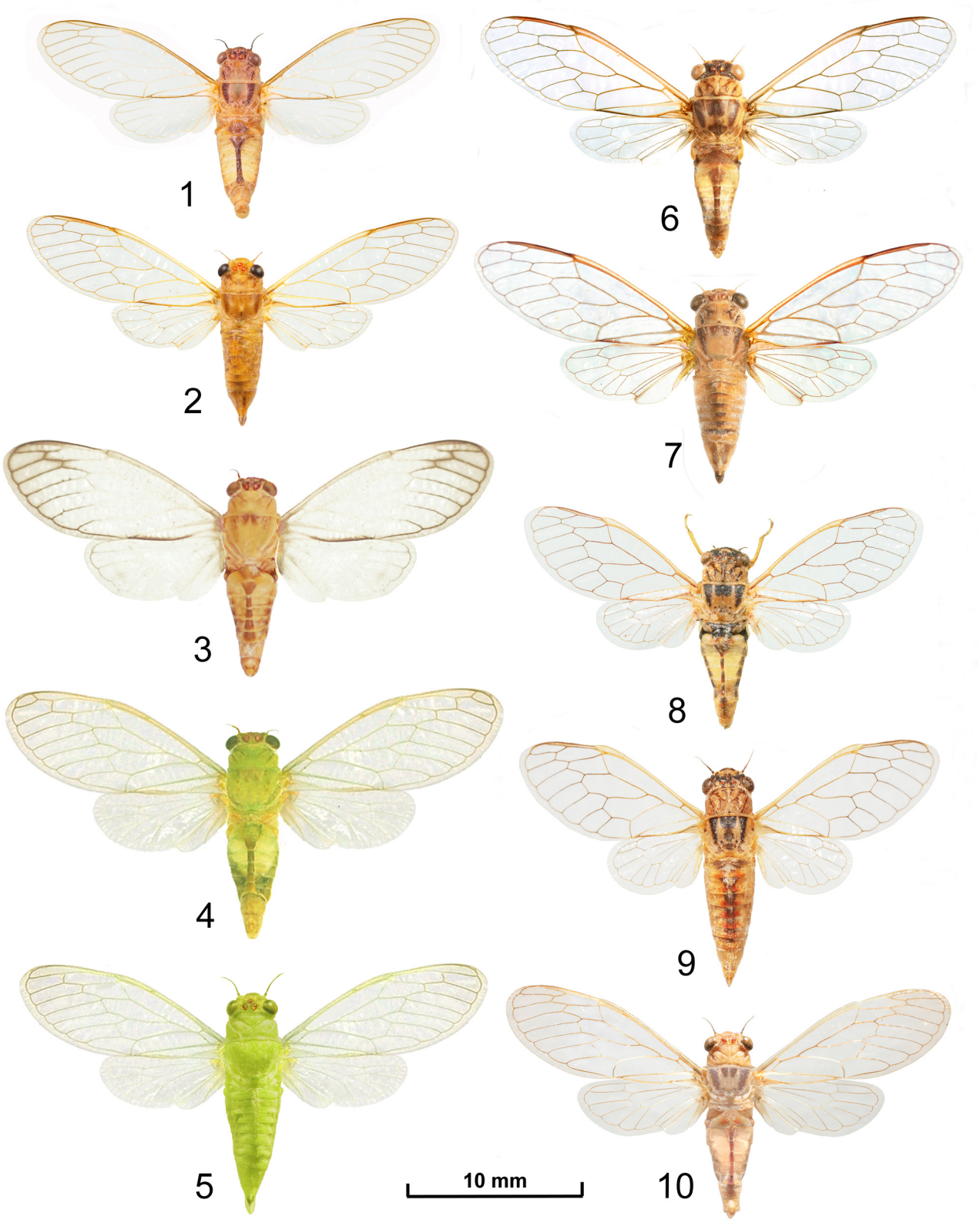
Pen., 11°07'S 132°08'E, 19–25.i., 3–21.ii.1977, R.C. Lewis (**ANIC**). 2 males, same data as holotype; 1 male, Savannah Way, ~57 km WSW of Borroloola nr Tawallah Stn, 16°16.976'S 135°49.093'E, 90m, 13.xi.2011, K. Hill, D. Marshall (**DE**). 3 males, same data as holotype (**LP**). 17 males (4 genitalia preps PAU20, PAU21, PAU24, PU17), same data as holotype; 1 male (genitalia prep. PU16) U.D.P. Falls, Waterfall Ck, ENE of Pine Creek, 1.i.1987, M.S. & B.J. Moulds; 2 males, Cullen R. x-ing, S of Pine Creek, 3.i.1992, M.S. & B.J. Moulds; 1 male, 80 km S of Larrimah, 24.i.1977, M.S. & B.J. Moulds; 1 male, NTR.KWW, 30 km W of Katherine, 125m, 14°40.8'S 132°05.1'E, 24.i.2004, Cooley, Hill, Marshall, Moulds; 6 males (1 genitalia prep. PU43) (1 Simon Lab. voucher 11.AU.NT.KWW.07), 3 females (1 Simon Lab. voucher 11.AU.NT.KWW.06), Victoria Hwy (Hwy 1), 30 km W of Katherine, 125m, 14°40.776'S 132°05.142'E, 30.xi.2011, K. Hill, D. Marshall; 10 males (2 genitalia preps PU32, PU38) (one Simon Lab. voucher 11.AU.NT.MIK.01), ~4 km W of South Alligator R., Kakadu NP, Yurmikmik, on rd to Gunlom area, 82m, 13°31.124'S 132°27.166'E, 1.xii.2011, K. Hill, D. Marshall; 2 males (1 genitalia prep. PU42) (1 Simon Lab. voucher 11.AU.NT.CHE.03), Cheon Ck xing on Roper Hwy, ~39 km W of Roper Bar, 57m, 14°45.363'S 134°13.207'E, 14.xi.2011, K. Hill, D. Marshall; 15 males (one genitalia prep. PU41), (1 Simon Lab. voucher 11.AU.NT.TAW.01), Savannah Way, ~57 km WSW of Borroloola nr Tawallah Stn, 16°16.976'S 135°49.093'E, 90m, 13.xi.2011, K. Hill, D. Marshall (**MSM**). 1 male, Lake Bennett area, c. 25 km SE of Manton Dam, 29-30.xii.1979, M.B. Marlipatil; 1 male Mataranka, 29–31.xii.1994, G.R. Brown; 1 male, Katherine, Springvale H/S, 1-3.i.1995, G.R. Brown; 5 males, Katherine Experimental Farm, 12 ml. N of Katherine, 24.i.1973, T. Angeles & N. Forrester (**NTM**).

Distribution and habitat (Fig. 28). Near Broome in Western Australia, and in the Northern Territory from Smith Point on Coburg Peninsula and Lake Bennett (some 60 km south of Darwin), south-east in a broad band through the central Top End to near Tawallah Stn (57 km WSW of Borroloola). The large gap between the single known locality in Western Australia (near Broome), and those from the Northern Territory suggests the species is far more widespread than known records suggest. There are records from mid November to early March. Adults can be found in dead or browning grass.

Redescription of male (Figs 10–12). *Head* light yellowish brown sometimes with small darker brown patches beside ocelli or near supra-antennal plates; lora light yellowish brown or sometimes darker brown. Anteclypeus light yellowish brown or sometimes dark brown. Postclypeus with a broad central brown area (not always clearly defined) extended to dorsal surface but not encompassing most anterior part of midline. Rostrum light yellowish brown basally becoming dark brown to blackish distally; reaching apices of mid coxae. Antennae dark brown to black except sometimes for light yellowish brown scape. *Thorax* with pronotum light yellowish brown except usually for dark brown paramedian and lateral fissures. Mesonotum light yellowish brown; submedian sigilla ill-defined but lateral sigilla clearly defined dark brown to blackish unless teneral; scutal depressions indistinctly marked brown or blackish. *Wings* hyaline; forewing venation brown or blackish except for very pale or colourless C+Sc, CuA and sometimes CuP+1A; forewing veins near apex very weakly infuscated (those forming sides of apical cells and the ambient vein); forewing basal membrane whitish to very pale grey; hindwing usually with median vein and associated crossveins brown, others tending whitish; hindwing plaga following veins 2A and 3A whitish. *Legs* light yellowish brown, sometimes darker brown on distal tarsi. Meracantha light yellowish brown. *Opercula* light yellowish to whitish. *Timbals* with three long ribs spanning timbal membrane and fused dorsally. *Abdomen* light yellowish brown with tergites 3–6 predominantly translucent pale yellow laterally; dorsal midline pinkish red to dark brown to black variable between individuals, widest on tergites 2 and 3, tapering distally on tergite 3, narrower on tergites 4–7; tergites 6–8 also blackish sublaterally often extending to cover much of segments 7 and 8; tergites 2–7 narrowly edged pale yellow to pale light yellowish brown along posterior margin, tergite 8 less distinctly so. Sternites pale yellow to almost white except for sternites VI–VIII sometimes with dark brown or blackish suffusion.

Genitalia (Figs 11–12). Pygofer dorsal beak not strongly developed, broad and tending confluent with pygofer margin; basal lobe large, in lateral view tending triangular and a small but well formed secondary basal lobe adjacent to its outer base; upper pygofer lobe broad, flat, with a well developed accessory tooth curving inwards and no longer than the length of the lobe. Uncus well developed and clearly projecting beyond anal tube, broad and gradually tapering to a broadly rounded apex. Claspers broad basally, claw-like, triangular in dorsal view, diverging, distally gently curved downwards to a bluntly pointed apex, concave below. Aedeagus with endotheca gently curved, sclerotized to apex, apically tapering ventrally to become sharply pointed; pseudoparameres slender, rounded in cross-section, usually lying partly above endotheca but sometimes entirely lateral, far longer than endotheca (at least a third as long again), gradually tapering throughout their length to a blunt point.

Female. Similar to male but mostly with very little or no red abdominal markings, and without translucent sides to abdomen. Abdominal segment 9 similar in colour to other abdominal segments but usually slightly paler, without markings; ovipositor sheath light brown to nearly black, clearly extending beyond apex of abdomen.



FIGURES 1–10. *Punia* species, adults in dorsal view. (1) *kolos* **sp.n.**, male; (2) *kolos* **sp.n.**, female; (3) *limpida* **sp.n.**, male, brown form; (4) *limpida* **sp.n.** male, green form; (5) *limpida* **sp.n.** female; (6) *hyas* **sp.n.**, male; (7) *hyas* **sp.n.**, female; (8) *queenslandica* **sp.n.**, male; (9) *queenslandica* **sp.n.**, female; (10) *minima* (Goding & Froggatt, 1904), male.

Measurements. Range and mean (in mm) for 10 males and 4 females (including largest and smallest of available specimens). *Length of body*: male 9.9–11.8 (11.1); female 9.9–11.2 (10.7). *Length of forewing*: male 10.3–12.7 (12.0); female 12.4–13.1 (12.9). *Width of head* (including eyes): male 2.7-3.2 (2.9); female 2.9–3.3 (3.1). *Width of pronotum* (across lateral angles): male 2.8–3.6 (3.2); female 3.0–3.4 (3.2).

Distinguishing features. Distinguished from all other *Punia* species by having the stem of forewing vein M brown or blackish while vein CuA is very pale. Males often have a pinkish red dorsal midline to the abdomen, otherwise found only in some specimens of *P*. *hyas*. The male genitalia have a long uncus that protrudes well beyond the anal tube and the aedeagus is distinctive with its pseudoparameres that extend far beyond the apex of the endotheca, at least a third as long again.

***Punia kolos* sp. n.**
(Figs 1–2, 19–25)

Types. *Holotype* male, South Alligator R. x-ing, SSW of Cooinda, 26.xii.1986, M.S. & B.J. Moulds (**NTM**). *Paratypes* as follows: NORTHERN TERRITORY: 1 male, South Alligator R. x-ing, SSW of Cooinda, 26.xii.1986, M.S. & B.J. Moulds (**AE**). 1 male, 1 female, Katherine, 27.xi.1967, W.J.M. Vestjens (**ANIC**). 1 male, South Alligator R. x-ing, SSW of Cooinda, 26.xii.1986, M.S. & B.J. Moulds (**DE**). 8 males (3 genitalia preps C62, PU7, PU29), 1 female, South Alligator R. x-ing, SSW of Cooinda, 26.xii.1986, M.S. & B.J. Moulds (**MSM**). 1 male, South Alligator R. x-ing, SSW of Cooinda, 26.xii.1986, M.S. & B.J. Moulds (**LP**). 1 male, South Alligator R. x-ing, SSW of Cooinda, 26.xii.1986, M.S. & B.J. Moulds (**SAM**).

Distribution and habitat (Fig. 25). Top End of the Northern Territory where it is known only from Katherine and the South Alligator River crossing north-west of Pine Creek township. The distribution given by Moulds (1990) includes other *Punia* species. Adults have been taken from late November to mid January, the only exception being one of the type series, which is labelled as having been taken on 12th July, a record that requires confirmation. Adults inhabit grass, tending brown rather than green.

Male (Figs 1, 19–24). *Head* light yellowish brown with dark brown or blackish patch surrounding or almost surrounding ocelli and a dark brown band extending to supra-antennal plates; lora light yellowish brown. Postclypeus with a broad central brown or blackish area ventrally that extends to dorsal surface. Anteclypeus with a narrow black midline. Rostrum reaching apices of mid coxae; light yellowish brown basally, otherwise black or nearly so. Antennae dark brown to black except for light yellowish brown scape. *Thorax* with pronotum light yellowish brown extensively suffused brown except for light yellowish brown pronotal collar. Mesonotum light yellowish brown; submedian and lateral sigilla dark brown to black, the lateral sigilla always darkest; scutal depressions marked brown or black. *Wings* (Figs 23–24) hyaline, the venation very pale and almost colourless except for blackish veins near apex that are very weakly infuscated (those forming sides of apical cells and the ambient vein); forewing basal membrane whitish to very pale grey; hindwing plaga following veins 2A and 3A whitish. *Legs* light yellowish brown, sometimes in places slightly darker brown. Meracantha light yellowish brown. *Opercula* whitish. *Timbals* with three long ribs spanning timbal membrane and fused dorsally. *Abdomen* light yellowish brown with tergites 3–6 predominantly translucent pale yellow laterally; dorsal midline dark brown to black, wide on tergites 1 and 2, tapering distally on tergite 3, narrowest on tergites 4–6, a littler wider on 7; tergites 6–8 also blackish sublaterally often extending to cover the greater part of segments 7 and 8; tergites 2–7 narrowly edged pale yellow to pale light yellowish brown along posterior margin, tergite 8 less distinctly so; sternites pale yellow to almost white except for sternites VI–VIII sometimes with dark brown or blackish suffusion.

Genitalia (Figs 19–22). Pygofer dorsal beak absent or ill-defined and confluent with pygofer margin; basal lobe large, in lateral view tending triangular; upper pygofer lobe broad, flat, with a well developed accessory tooth curving inwards and no longer than the length of the lobe. Uncus very short, broad, gradually tapering to a broadly rounded apex that projects only a little beyond anal tube. Claspers much reduced, their short apices tending rod-like and close to the apex of uncus. Aedeagus with endotheca gently curved, sclerotized to apex; pseudoparameres lateral of endotheca, a little longer than endotheca, flat, becoming a little wider before gently curving downwards to a pointed apex.

Female (Fig. 2). Similar to male but with less intense dark markings and without translucent sides to abdomen. Abdomen lacking a black dorsal midline but sometimes with a reddish dorsal hue; abdominal segment 9 pale yel-

lowish brown with or without an indistinct black or brown band either side of midline slightly turned outwards distally and not reaching distal margin, sometimes also with indistinct black or brown suffusion along anterior margin; ovipositor sheath yellowish brown to black, clearly extending a little beyond apex of abdomen.

Measurements. Range and mean (in mm) for 10 males and 2 females (includes largest and smallest males). *Length of body*: male 3.7–10.6 (9.9); female (including ovipositor) 10.1–10.3 (10.2). *Length of forewing*: male 9.6–11.1 (10.8); female 11.8–12.2 (12.0). *Width of head* (including eyes): male 2.2–2.7 (2.5); female 2.6–2.8 (2.7). *Width of pronotum* (across lateral angles): male 2.3–2.9 (2.7); female 2.5–2.8 (2.7).

Etymology. From the Greek *kolos,* meaning curtailed, shortened, and pertaining to the much reduced male uncus and claspers in this species.

Distinguishing features. Distinguished from all other species of *Punia* in having, in combination, forewing veins M and CuA both very pale and the postclypeus almost entirely brown or mainly so except for a narrow pale border following ventral margin. The male genitalia are distinctive and differ from all other *Punia* species in having the claspers much reduced and contracted towards the uncus with their pointed apices barely discernible (distinct in other *Punia* species) and very close to the uncus. Care should be taken not to confuse *P. kolos* with small brown specimens of *P. limpida* that differ from *P. kolos* in having the brown pigmentation on the postclypeus covering no more than half its surface, and always with a broad pale lateral border, never a narrow even border extending around entire length of ventral margin.

Punia hyas **sp. n.**
(Figs 6–7, 13–14, 26)

Punia "nr hentyi" / hentyi MTE09 Owen *et al*., 2015: 261, 267–270.
Punia hentyi Owen *et al*. 2017: 572, 580. *Nomen nudum.*
Punia "sp. grey" Owen *et al*. 2017: 572, 580.

Types. *Holotype* male, 21 km W of Pentecost R. x-ing, Gibb R. road, Western Australia, 30.xii.1991, M.S. Moulds & B.J. Moulds (**WAM**). *Paratypes* as follows: WESTERN AUSTRALIA: 4 males, 1 female, same data as holotype (**AE**). 4 males, 1 female, same data as holotype (**AM**). 4 males, 1 female, same data as holotype; 8 males, 1 female, Ord River, 15°43'42"S 128°42'20"E, 14.xii.2019, S. Ong; 3 males, NAASRA creek, 15°45'54"S 128°17'13"E, 24.xii.2019, S. Ong (**DE**). 4 males, same data as holotype (**JO**). 4 males, 1 female, same data as holotype; 2 males, Ord River, 15°43'42"S 128°42'20"E, 14.xii.2019, S. Ong (**LP**). 4 males, Durack R. x-ing, Gibb R. Road, E. Kimberley, 29.xii.1991, M.S. & B.J. Moulds; 89 males (1 genitalia prep. CI103), 7 females, same data as holotype; 1 female, Zebedee Springs, El Questro Stn, E. Kimberley, 28.xii.1991, M.S. & B.J. Moulds; 7 males, 1 female, King R. x-ing, Gibb R. Road, 30.xii.1991, M.S. & B.J. Moulds; 56 males, 2 females, Kununurra, 6.i.1986, M.S & B.J. Moulds; 7 males, 2 females, Kununurra, 10.i.1986, 10.i.1986, 19.i.1987, 28.ii.1987, E.A. Henty; 3 males (1 Simon Lab. voucher 11.AU.WA.BAR.08), Barnett River xing on Gibb River Road, 433m, 16°42.589S 125°56.143E, 20.xi.2011, K. Hill, D. Marshall; 6 males (1 Simon Lab. voucher 11.AU.WA.ELL.01), 1 female, ~196 km W of Great Northern Hwy on Gibb River Rd, W of Ellenbrae Stn rd, 411m, 15°56.765S 126°50.061E, 19.xi.2011, K. Hill, D. Marshall; 8 males (1 Simon Lab. voucher 11.AU.WA.PCC.01), 2 females, ~57 km E of Great Northern Hwy on Parry Ck Rd, SE of Wyndham, 15°59.194S 128°40.138E, 32m, 28.xi.2011, K. Hill, D. Marshall (**MSM**). 4 males, 1 female, same data as holotype; 6 males (1 Simon Lab. voucher 11.AU.WA.ELL.01), 1 female, ~196 km W of Great Northern Hwy on Gibb River Rd, W of Ellenbrae Stn rd, 411m, 15°56.765S 126°50.061E, 19.xi.2011, K. Hill, D. Marshall (**WAM**). NORTHERN TERRITORY: 23 males, 2 females, Tindal, 14°31'S 132°22'E, 1–20.xii.1967, W. Vestjens; 1 male, 3 km SSW of Katherine, 14°30'S 132°15'E, 12.xi.1979, T. Weir (**ANIC**). 4 males, 1 female, 37 km E of Borroloola, 21.xii.1991, M.S. & B.J. Moulds (**NTM**). 1 male, Maud Ck, Katherine, 3.xii.1978, R.I. Storey; 1 male, Larrimah, 4.xii.1978, R.I. Storey (**QDAF**). 3 males, Gurrandalng camping area, Keep River Nat. Park, 15°52S 129°03E, 3.i.1993, G. & A. Daniels; 5 males, Keep River x-ing, Victoria Hwy, 7.i.1986, M.S. & B.J. Moulds; 1 male, Berry Springs, 29.x.1993, G.A. Husbana; 1 male (genitalia prep. PU15), 3 females, Springvale Stn, 12 km W of Katherine, 8.xii.1982, A. Walford-Huggins; 1 male (genitalia prep. PU13), Maud Ck, Katherine, 3.xii.1978, R.I. Storey; 2 males (genitalia preps PU11, PU14), Mainoru, ENE of Katherine, 14.xii.1982, A. Walford-Huggins; 5 males (1 genitalia prep. PU9), 2 females, Waterhouse River, Mataranka Hsd, 9.i.1986, 23,24.xii.1986, M.S. & B.J. Moulds; 1 male (genitalia prep. PU12), Larrimah, 4.xii.1978, R.I. Storey; 39 males (2 genitalic preps PU25,

PU26), 5 females, 37 km E of Borroloola, 21.xii.1991, M.S. & B.J. Moulds; 14 males (1 genitalia prep. PU46) (1 Simon Lab. voucher 11.AU.NT.KWW.01), Victoria Hwy (Hwy 1), 30 km W of Katherine, 125m, 14°40.776'S 132°05.142'E, 30.xi.2011, K. Hill, D. Marshall; 34 males (1 Simon Lab. voucher 11.AU.NT.KRX.01), 2 females, 58 km SW of Katherine on Victoria Hwy, 127m, 14°49.762S 131°55.001E, 15.xi.2011, K. Hill, D. Marshall; 15 males, (1 Simon Lab. voucher 11.AU.NT.GPB.02), 3 females (1 Simon Lab. voucher 11.AU.NT.GPB.03), Bullita campground, Gregory NP, 46 km S of Vic. Hwy, 103m, 16°06.802S 130°25.406E, 16.xi.2011, K. Hill, D. Marshall; 8 males (1 Simon Lab voucher 06.AU.NT.MTE.09), 2 females, 76 km E of Mataranka, 14°54.888S 133°42.780E, 77m, 3.ii.2006, Hill, Marshall, Moulds (**MSM**). 14 males, Victoria Hwy (Hwy 1), 30 km W of Katherine, 125m, 14°40.776'S 132°05.142'E, 30.xi.2011, K. Hill, D. Marshall; 34 males, 1 female, AU.NT.KRX, 58 km SW of Katherine on Victoria Hwy, 127m, 14°49.762S 131°55.001E, 15.xi.2011, K. Hill, D. Marshall; 15 males, (1 Simon Lab. voucher 11.AU.NT.GPB.02), 2 females, Bullita campground, Gregory NP, 46 km S of Vic. Hwy, 103m, 16°06.802S 130°25.406E, 16.xi.2011, K. Hill, D. Marshall; 9 males, 1 female, AU.NT.MTE, 76 km E of Mataranka, 14°54.888S 133°42.780E, 77m, 3.ii.2006, Hill, Marshall, Moulds (**NTM**). 19 males, 1 female, Groote Eylandt, N.B. Tindale (**SAM**).

Distribution and habitat (Fig. 26). The far north-east of Western Australia including the east Kimberley, and the Top End of Northern Territory south to Larrimah and west to Groote Eylandt and near Borroloola, but as yet unknown from Arnhem Land. There are records from late October to late February but most are for December. Adults inhabit eucalypts in open woodland.

Male (Figs 6, 13–14). *Head* with vertex black except for small light brown patch on midline adjacent to posterior margin and light brown supra-antennal plates (latter tinged red on some specimens); lora dark brown to black. Postclypeus with a broad central brown or black area ventrally that sometimes extends to dorsal surface; the most anterior part of postclypeus light brown. Anteclypeus smoky light brown to dark brown. Rostrum reaching apices of mid coxae; light brown or brown basally, becoming black towards apex. Antennae light brown to black. *Thorax* with pronotum light brown, the pronotal collar and anterior margin always palest; paramedian and lateral fissures black and sometimes with irregular black markings between fissures, usually a black fascia either side of a pale dorsal midline not reaching to pronotal collar, a black spot on midline adjacent to pronotal collar, and a blackish patch on lateral angles of pronotal collar. Mesonotum light brown; submedian and lateral sigilla usually distinct, both dark brown or black; scutal depressions marked brown or black; the area between anterior arms of cruciform elevation usually partly brown or black and sometimes extending to encompass scutal depressions. *Wings* hyaline, forewing venation brown to black except often for pale yellowish costa; forewing basal membrane very pale greyish to pale orange. Hindwing venation brown to black; plaga following veins 2A and 3A white and indistinct. *Legs* light to dark brown, coxae, trochanters and femora sometimes with a dark longitudinal stripe; meracantha pale yellow tending whitish. *Opercula* pale yellow tending whitish with base brown to nearly black. *Timbals* with three long ribs spanning timbal membrane and fused dorsally. *Abdomen* light brown with tergites 3–6 predominantly translucent pale yellow laterally; dorsal midline dark brown to black variable between individuals often with variable patches of pinkish red or reddish orange; dorsal markings widest on tergites 1–3, tapering distally on tergite 3, narrowest on tergites 4–7; tergites 2–8 also blackish sublaterally including auditory capsule and often extending to cover the greater part of tergites 6–8; tergites 3–7 narrowly edged pale yellow to pale light yellowish brown along posterior margin, tergite 8 less distinctly so. Sternites pale yellow to almost white except for sternites V–VIII usually with dark brown or blackish suffusion.

Genitalia (Figs 13–14). Pygofer dorsal beak variable, usually well formed but sometimes ill-defined; basal lobe large, in lateral view tending triangular, often a little elongated and gently upturned distally; upper pygofer lobe short but broad, flat, with a short accessory tooth variable in shape from sharply pointed to very blunt, about as long as the pygofer lobe. Uncus very short but broad, gradually tapering to a broadly rounded apex that barely projects beyond anal tube. Claspers small, broad basally, claw-like, tending triangular in dorsal view, diverging, distally gently curved downwards to a bluntly pointed apex, concave below. Aedeagus with endotheca strongly curved in an arc, its sclerotisation gradually reduced towards the apex, the apex a little sloping backwards towards the ventral surface; pseudoparameres about as long as or a little shorter than endotheca, more or less parallel, lying above endotheca, slender and not obviously flattened except a little before a downturned pointed apex.

Female (Fig. 7). Similar to male but with much reduced dark markings and without translucent sides to abdomen. In some individuals prothorax with black or brown along median and lateral fissures and sometimes mesonotum with black or brown submedian and lateral sigilla; abdomen pale yellowish brown sometimes with irregular

black or brown dorsal midline, and sometimes with a pinkish dorsal hue; abdominal segment 9 pale yellowish brown with an indistinct black or brown band either side of midline slightly turned outwards distally and not reaching distal margin, sometimes also with indistinct black or brown suffusion along anterior margin; ovipositor sheath yellowish brown to black, slightly protruding beyond apex of abdomen.

Measurements. Range and mean (in mm) for 10 males and 10 females (includes largest and smallest of available specimens). *Length of body*: male 9.3–11.3 (10.5); female (including ovipositor) 10.5–12.2 (11.1). *Length of forewing*: male 10.4–12.4 (11.7); female 12.6–14.3 (13.3). *Width of head* (including eyes): male 2.7–3.1 (2.9); female 2.9–3.3 (3.1). *Width of pronotum* (across lateral angles): male 2.9–3.3 (3.1); female 3.1–3.6 (3.3).

Etymology. From the Latin *Hyas*, one of the seven stars in the constellation Taurus, whose rising with the sun presaged rainy weather, and referring to the monsoonal climate that this species inhabits.

Distinguishing features. Differs from all *Punia* species except *P. queenslandica* in having the entire forewing venation (excluding costa) brown or blackish. Differs from *P. queenslandica* in being slightly larger, the male forewing being more than 11 mm long (usually 11.2 or more), female 12.3 mm or more long (usually 12.6 or more) whereas that of *P. queenslandica* probably never reaches those lengths. Forewing shape is also different, most notable in being narrower and with a less swollen costa at the node (compare Figs 6 and 7 with 8 and 9). The male genitalia of *P. hyas* have the endotheca strongly curved in an arc, its sclerotisation gradually reduced ventrally toward the apex leaving only a narrow distal ridge of sclerotization that is pointed apically, and the pseudoparameres lie above the endotheca. The distributions of the two species are widely separated, *P. hyas* being found in Western Australia and the Northern Territory whereas *P. queenslandica* is found only in Queensland.

Punia limpida **sp. n.**
(Figs 3–5, 15–16, 27)

Punia "punia green" / punia_green_TSE01 Owen *et al*., 2015: 263, 267–270.
*Punia*_sp_STC07 Owen *et al*., 2015: 263, 267–270;
"tiny green": Marshall *et al*., 2016: fig. 2.
Punia "green" Owen *et al*. 2017: 572, 580.
Punia "tennant Creek" Owen *et al*. 2017: 572, 580.

Types. *Holotype* male, Dunham River x-ing, 100 km S of Wyndham, Western Australia, 7.ii.1977, M.S. & B.J. Moulds (**WAM**). *Paratypes* as follows: WESTERN AUSTRALIA: 2 males, Kimberley Research Stn, via Wyndham, ii.1986, E.C.B. Langfield (**ANIC**). 81 males (1 genitalia prep. CI 105), 6 females, same data as holotype; 2 males (one genitalia prep. PU36) (Simon Lab. voucher 10.AU.WA.NCH.06), nr Nicholson R., 145 km E of Halls Creek, 18°08.41'S 128°42.003'E, 23.i.2010, Hill, Marshall, Moulds; 1 male (genitalia prep. PU40), AU.WA.GNE, 100 km SE Fitzroy Crossing, Great Northern Hwy, 18°44.829'S 126°08.442'E, 309m, 21.i.2010, Hill, Marshall, Moulds (**MSM**). 4 males, same data as holotype (**WAM**). NORTHERN TERRITORY: 4 males, 110 km E of Kununurra, Victoria Hwy, 26.xii.1991, M.S. & B.J. Moulds (**AE**). 4 males, 110 km E of Kununurra, Victoria Hwy, 26.xii.1991, M.S. & B.J. Moulds (**AM**). 4 males, 110 km E of Kununurra, Victoria Hwy, 26.xii.1991, M.S. & B.J. Moulds (**ANIC**). 4 males, 110 km E of Kununurra, Victoria Hwy, 26.xii.1991, M.S. & B.J. Moulds; 6 males, 2 females, off Packsaddle Rd, Kununurra, 15°48'18"S 128°41'06"E, 5.ii.2020, S. Ong; 1male, same location 27.i.2020, S. Ong (**DE**). 4 males, 110 km E of Kununurra, Victoria Hwy, 26.xii.1991, M.S. & B.J. Moulds (**JO**). 4 males, 110 km E of Kununurra, Victoria Hwy, 26.xii.1991, M.S. & B.J. Moulds; 3 males, 1 female, off Packsaddle Rd, Kununurra, 15°48'18"S 128°41'06"E, 1.ii.2020, S. Ong (**LP**). 4 males, Victoria Hwy, Dingo Ck, nr W.A. border, 1.i.1992, M.S. & B.J. Moulds; 1 male (genitalia prep. PAU19), Keep R. x-ing, Victoria Hwy, 7.i.1986, M.S. & B.J. Moulds; 175 males (3 genitalic preps CI104, PU3, PU4), 1 female, 110 km E of Kununurra, Victoria Hwy, 26.xii.1991, M.S. & B.J. Moulds; 5 males, 2 females, 16 km W of West Baines R. x-ing, Victoria Hwy, 8.i.1986, M.S. & B.J. Moulds; 1 female, West Baines R., Victoria Hwy, 8.i.1986, M.S. & B.J. Moulds; 3 males, 2 females, 27 km W of Timber Creek, Victoria Hwy, 8.i.1986, M.S. & B.J. Moulds; 10 males, Victoria R., 18 km W of Timber Creek township, 25.xii.1991. M.S. & B.J. Moulds; 49 males (1 genitalia prep. CI106), 40 km E of Timber Creek, Victoria Hwy, 8.i.1986, M.S. & B.J. Moulds; 7 males (1 genitalia prep. PU34) (1 Simon Lab. voucher 08.AU.NT.SKU.07), 5 females, ~40 km E of Timber Creek, 15°44.047'S 130°45.144'E, 48m, 22.ii.2008, K. Hill. D. Marshall, M. Moulds, C. Owen, M. Humphrey; 1 male, Victoria Hwy, 10 km E Victoria R. Inn at river x-ing, 2.i.1992, M.S. & B.J. Moulds; 6 males (1

genitalia prep. PU33), 1 female, NTR.TSE, 9 km E of Top Springs, 180m, 16°35.5'S 131°51.7'E, 25.i.2004, Cooley, Hill, Marshall, Moulds; 2 males, AU.NT.ILL, 7.8 km ESE of Top Springs, 16°35.392'S 131°50.958'E, 18.ii.2008, K. Hill, D. Marshall, M. Moulds, C. Owen, M. Humphrey; 6 males, 2 females, NTR.TSE, 9 km E of Top Springs, 179m, 16°35.487'S 131°51.728'E, 17.ii.2008, K. Hill, D. Marshall, M. Moulds, C. Owen, M. Humphrey; 4 males, NTR.PIT, 57 km E of Top Springs, 278m, 16 44.2'S 132 14.6'E, 25.i.2004, Cooley, Hill, Marshall, Moulds; 45 males, AU.NT.HTP, 74 km SW of Top Springs, 16°59.831'S 131°24.372'E, 179m, 17.ii.2008, K. Hill, D. Marshall, M. Moulds, C. Owen, M. Humphrey; 6 males (genitalia prep. PU35), 3 females, NTR.KAL, 15 km N of Daly Waters, 214m, 16°11.2'S 133°25.6'E, 20.i.2004, Cooley, Hill, Marshall, Moulds; 39 males, 6 females, Mataranka Hstd, Waterhouse River, 25.i.1977, 9.i.1986, 4.xii.1986, M.S. & B.J. Moulds; 37 males, 1 female, Roper R. x-ing, 2 km W of Mataranka Hstd, 14:56S 133:04E, 11.i.1992, M.S. & B.J. Moulds; 141 males (3 genitalia preps CI107, PU1, PU2), 1 female, 80 km S of Larrimah, 24.i.1977, M.S. & B.J. Moulds; 1 female, AU.NT.TMQ, Tanami Road, 25 km SE of Rabbit Flat, 349m, 20°22.970'S 130°09.078'E, 26.i.2010, Hill, Marshall, Moulds; 36 males (2 genitalia preps PAU22, PAU23), October Ck, Carpentaria Hwy, 180 km E of Daly Waters, 11.i.1986, M.S. & B.J. Moulds; 3 males, 1 female, AU.NT.TCW, 59 km W of Timber Creek, 15°46.131'S 130°01.512'S, 34m, 22.ii.2008, K. Hill, D. Marshall, M. Moulds, C. Owen, M. Humphrey; 1 male (Simon Lab. voucher 06.AU.NT.STC.07), 2 females (1 Simon Lab. voucher 06.AU.NT.STC.03), 60 km S of Tennant Creek, 20°10.932'S 134°13.125'E, 388m, 31.i.2006, Hill, Marshall, Moulds; 1 male, AU.NT.TTN, ~30 km N of Ti Tree, 21°54.421'S 133°33.928'E, 502m, 3.ii.2010, Hill, Marshall, Moulds (**MSM**). 6 males (1 genitalia prep. PU34) (1 Simon Lab. voucher 08.AU.NT.SKU.07), 4 females, ~40 km E of Timber Creek, 15°44.047'S 130°45.144'E, 48m, 22.ii.2008, K. Hill. D. Marshall, M. Moulds, C. Owen, M. Humphrey; 6 males (1 Simon Lab voucher NTR.TSE.01), 1 female, 9 km E of Top Springs, 179m, 16°35.487'S 131°51.728'E, 17.ii.2008, K. Hill, D. Marshall, M. Moulds, C. Owen, M. Humphrey; 45 males, AU.NT.HTP, 74 km SW of Top Springs, 16°59.831'S 131°24.372'E, 179m, 17.ii.2008, K. Hill, D. Marshall, M. Moulds, C. Owen, M. Humphrey (**NTM**). 4 males, 110 km E of Kununurra, Victoria Hwy, 26.xii.1991, M.S. & B.J. Moulds (**QM**). QUEENSLAND: 2 females, Cloncurry, 12.iii.1993, S. Lamond; 6 males (one genitalia prep PU44), 1 female, Mt Garnet, 26.ii.1993, S. Lamond; 1 male (genitalia prep. PU8), Chillagoe, 20.i.1988, M.S. & B.J. Moulds; 4 males (1 genitalia prep. PAU18), 24 km N of Einasleigh, 31.xii.1989, M.S. & B.J. Moulds (**MSM**).

Distribution and habitat (Fig. 27). Eastern and southern margins of the Kimberley region of Western Australia south to Halls Creek, through much of the northern Territory but excluding the Top End north of Mataranka and the far south beyond Ti Tree, and across northern Queensland from Cloncurry to Forty Mile Scrub, Chillagoe and near Einasleigh. There are records from December to March but most specimens have been taken in December and January. Adults inhabit grass.

Male (Figs 3–4, 15–16). In two colour forms, either light yellowish brown or green. BROWN FORM. *Head* with vertex pale yellowish brown, often extensively mottled brown, sometimes almost entirely so but excluding supra-antennal plates; lora pale yellowish brown to pale brown. Postclypeus pale yellowish brown with a broad, brown to blackish midline from or near frontoclypeal suture to about postclypial centre. Anteclypeus pale yellowish brown to pale brown, sometimes with black midline and apex of variable extent. Rostrum brown becoming black towards apex; reaching apices of mid coxae. *Thorax* with pronotum, mesonotum and metanotum pale yellowish brown; mesonotum sometimes with submedian and lateral sigilla sometimes partially and weakly pigmented pale brown. *Wings* hyaline; forewing venation whitish on basal half or more, distally (including ambient vein) brown to blackish with RA_1, RA_2, RP and crossveins r and r-m weakly infuscated brown sometimes extending to apical cells 1–3; basal membrane white. Hindwing venation whitish; plaga white. *Legs* pale yellowish brown to light brown; pretarsal claws pale brown on basal half, dark brown to blackish on distal half. Meracantha whitish. *Opercula* whitish. *Timbals* with three long ribs spanning timbal membrane and fused dorsally; pale brown tending translucent. *Abdomen* pale yellowish brown to light brown; tergites 3–6 laterally translucent and very pale brown; a broad, dull dark brown to blackish band dorsally along tergites 2–7, sometimes also with a capping of orange red replacing brown on distal half or less; tergites 3–7 often narrowly edged pale yellow along posterior margin; tergites 4–7 partly dull black laterally, extensively so on 7 but gradually reducing to sublateral region on 4; tergite 8 usually partly dull black, sometimes extensively so. Sternites I-VI translucent light brown, sometimes with a little dull black laterally; sternite VII and VIII pale brown. GREEN FORM. *Head* pale green; vertex pale green or pale green extensively mottled brown between lateral ocelli and supra-antennal plates but excluding the latter; lora pale green or pale brown. Postclypeus pale green to yellowish brown with a broad, brown band on midline from or near frontoclypeal suture to about postclypial centre. Anteclypeus pale green to pale brown. Rostrum pale brown becoming

dark towards apex; reaching apices of mid coxae. *Thorax* with pronotum, mesonotum and metanotum pale green; mesonotum sometimes with submedian and lateral sigilla sometimes partially and weakly pigmented pale brown. *Wings* hyaline; forewing venation pale green on basal half or more, distally (including ambient vein) brown, and RA_1, RA_2, RP and crossveins r and r-m weakly infuscated brown sometimes extending to apical cells 1–3; basal membrane white. Hindwing venation very pale green; plaga white. *Legs* with coxae pale green; femora and tibiae pale green to pale brown; tarsi light brown; pretarsal claws very pale brown on basal half, dark brown on distal half. Meracantha pale yellow tending white. *Opercula* pale green tending whitish. *Timbals* with three long ribs spanning timbal membrane that are fused dorsally; whitish tending translucent. *Abdomen* predominantly pale green; tergites 3–6 laterally translucent and very pale green to almost colourless; a broad dull blackish band dorsally along tergites 2–6; tergites 4–7 partly dull black laterally, extensively so on 7, less so on 6, and reduced to sublateral region on 4 and 5; tergite 8 usually partly dull black, sometimes extensively so. Sternites I–VI translucent pale green, sometimes with a little dull black laterally; sternite VII partly or completely pale brown; sternite VIII pale brown.

Genitalia (Figs 15–16). Pygofer dorsal beak well developed; basal lobe large, in lateral view tending triangular; upper pygofer lobe broad, flat, much reduced and dominated by a very large accessory tooth. Uncus well developed and clearly projecting beyond anal tube, broad and often sharply down-turned across apical region. Claspers broad basally, claw-like, triangular in dorsal view, diverging, distally gently curved downwards to a bluntly pointed apex, concave below. Aedeagus with endotheca gently curved, sclerotized to apex, apically tapering ventrally to become sharply pointed; pseudoparameres slender, lateral of endotheca, about as long or a little longer than endotheca, flat, becoming a little broader before a down-turned and pointed apex, sometimes slightly diverging distally.

Female (Fig. 5). Similar to male but usually smaller and a little darker green (doubtfully in a brown form), with very few markings and without translucent sides to abdomen. In some individuals head bearing black or brown markings; sometimes prothorax with black or brown along median and lateral fissures; sometimes mesothorax with black or brown submedian and lateral sigilla. Abdominal segment 9 light yellowish brown without markings; ovipositor sheath translucent pale yellowish brown with black ovipositor, clearly extending a little beyond apex of abdomen.

Measurements. Range and mean (in mm) for 10 males and 10 females (includes largest and smallest of available specimens). *Length of body*: male 10.4–13.2 (12.0); female (including ovipositor) 11.2–13.5 (12.2). *Length of forewing*: male 12.2–14.0 (13.1); female 12.2–13.7 (12.7). *Width of head* (including eyes): male 2.7–3.1 (3.0); female 2.9–3.3 (3.0). *Width of pronotum* (across lateral angles): male 2.9–3.6 (3.4); female 3.3–3.9 (3.5).

Etymology. From the Latin *limpidus* meaning clear, transparent, pure, and referring to the translucent abdominal tergites of the males.

Distinguishing features. This is the only *Punia* species so far known to occur in a green form. Brown individuals differ from all other *Punia* species except *P. kolos* in having forewing veins M and CuA both very pale. Small brown specimens of *P. limpida* are very similar to those of *P. kolos* but can be separated by the extent of the brown marking on the postclypeus that covers no more than half its surface, and always with a broad pale lateral border, never a narrow even border extending around entire length of ventral margin. In addition, the uncus of *P. limpida* is long and projects far beyond the anal tube (only *P. minima* has a similar uncus), whereas that of *P. kolos* barely projects beyond the anal tube.

Punia queenslandica **sp. n.**

(Figs 8–9, 17–18, 29)

Types. *Holotype male*, Morehead R. x-ing, 110 km NW of Laura, 10.i.1988, Queensland, M.S. & B.J. Moulds (**QM**). *Paratypes* as follows: QUEENSLAND: 1 male, 35 km S of Townsville, 8359/015546, 7.ii.1998, A. Ewart (**AE**). 2 males, 1 female, same data as holotype (**AM**). 4 males, N. Queensland, (Kelsall Coll.), 1910-168 (**BMNH**). 2 males, 1 female, same data as holotype; 4 males, 3 females, Balgal Beach, Acheron Drive, 12–15.i.2010, K. Green (**DE**). 2 males, 1 female, same data as holotype; 1 male, 1 female, Balgal Beach, Acheron Drive, 12–15.i.2010, K. Green (**LP**). 15 males, 4 females, Iron Range, 2, 4, 5, 6.i.1964, M.S. Moulds; 1 male, King Park, Iron Range, 12°46’02’’S’ 143°17’13’’E, 2.i.1996, G. & A. Daniels; 1 male, Coen, 9.i.1964, M.S. Moulds; 1 male, Bathurst Bay, near Cape Melville, 10–15.i.1988, M. Walford-Huggins; 4 males, 1 female, Noble Is., S of Cape Melville, 10–15.i.1988, M. Walford-Huggins; 1 male, 1 female, Carrol Ck, 14 km S of Musgrave Hsd, 10.i.1989, M.S. & B.J. Moulds; 66 males

(3 genitalia preps PU6, PU27, PU28), 14 females, Morehead R. x-ing, 110 km NW of Laura, 10.i.1988, 9.i.1990, M.S. & B.J. Moulds; 1 female, 2 km S of McIvor Riv., 9.i.1982, G. & A. Daniels; 7 males (1 genitalia prep. CI108), 3 females, Southedge Tobacco Res. Stn, 12 km NW of Mareeba, 1, 5–7, 15.i.1989, H. & A. Howden; 3 males, 10 km E of Mareeba, 28.xii.1988, 1.i.1989, H. & A. Howden; 4 males, 1 female, Clohesy River crossing, Mareeba road, 1.iii.1973, A. & M. Walford-Huggins; 1 male, Cardwell, 27.xi.1984, A. & M. Walford-Huggins (**MSM**). 1 male, 1 female, same data as holotype (**QM**).

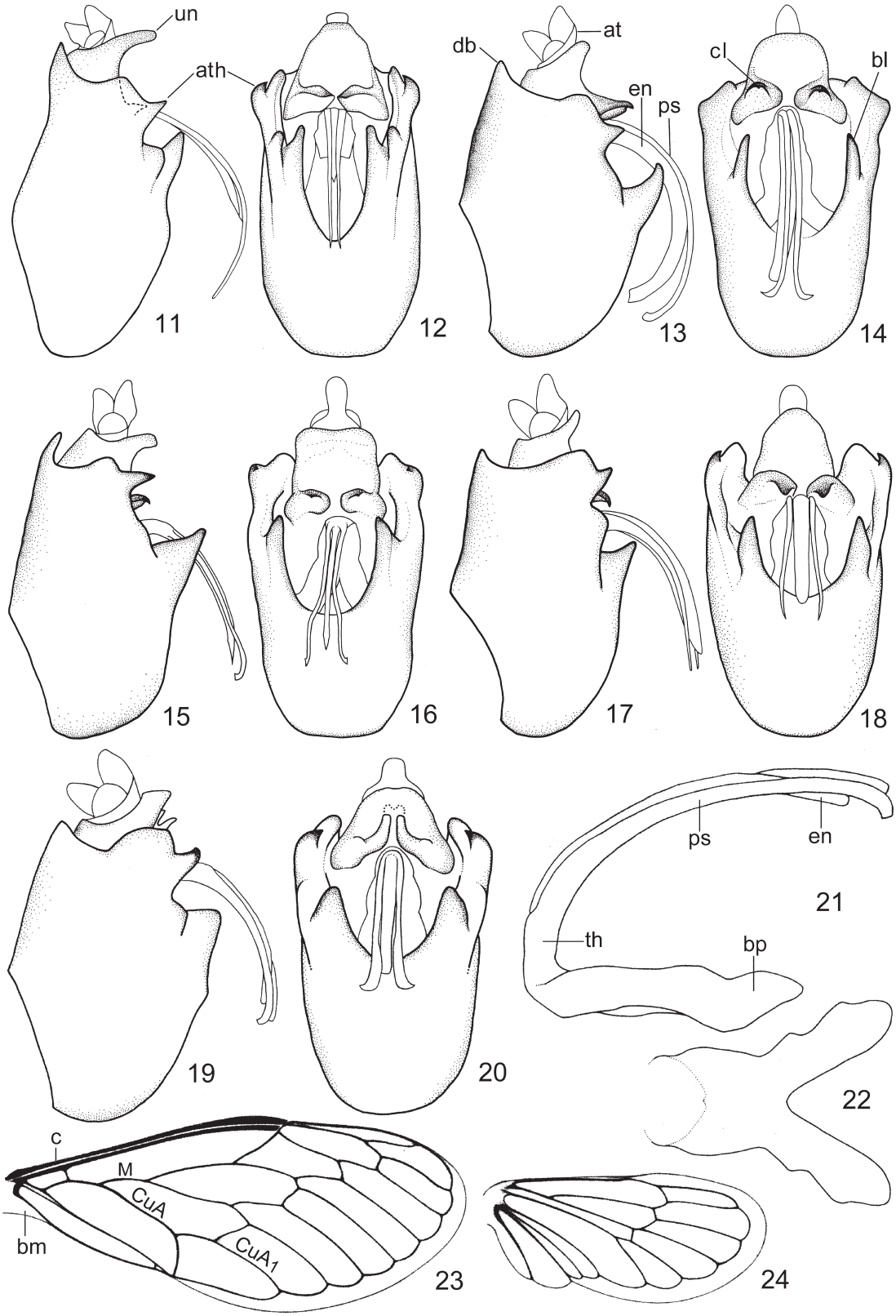
Distribution and habitat (Fig. 29). North-eastern Queensland from Iron Range to Mt. Storth (35 km south of Townsville), including localities such as Coen, Bathurst Bay, Noble Island near Cape Melville, Morehead River crossing south of Musgrave homestead and the Mareeba district. There are records from late November to early March but most records are from January and February during the early wet season. Adults inhabit grass that is often browning rather than green.

Male (Figs 8, 17–18). *Head* usually with vertex black except for a small, light yellowish brown patch on midline adjacent to posterior margin and light yellowish brown supra-antennal plates but sometimes with the black reduced towards ocelli; lora black or nearly so. Postclypeus with a broad central brown or black area ventrally that sometimes extends to dorsal surface; most anterior region of postclypeus always light yellowish brown. Anteclypeus usually light yellowish brown but sometimes black or nearly so. Rostrum yellowish brown basally to varying degrees becoming black distally, reaching apices of hind coxae. Antennae brown to black, often with light yellowish brown scape. *Thorax* with pronotum light yellowish brown, the paramedian and lateral fissures black and sometimes with irregular black markings between fissures, usually a black fascia either side of a pale dorsal midline not reaching to pronotal collar, a black spot on midline adjacent to pronotal collar, and a blackish patch on lateral angles of pronotal collar. Mesonotum light yellowish brown, the submedian and lateral sigilla black, the scutal depressions black, the area between anterior arms of cruciform elevation usually partly brown or black and sometimes extending to encompass scutal depressions. *Wings* hyaline; forewing venation brown to black except for pale yellow costa; apical cells on average about as long as ulnar cells with vein CuA divided by crossvein about equally; basal membrane very pale orange. Hindwing venation brown to black except for very pale costal margin and veins 2A and 3A; plaga following veins 2A and 3A whitish and indistinct. *Legs* light yellowish brown, sometimes with a black longitudinal fascia on coxae; meracantha pale yellow tending whitish. *Opercula* very pale yellow tending whitish. *Timbals* with three long ribs spanning timbal membrane and fused dorsally. *Abdomen* light yellowish brown with tergites 3–6 predominantly translucent pale yellow laterally; dorsal midline dark brown to black variable between individuals often with variable patches of pinkish red, widest on tergites 1–3, tapering distally on tergite 3, narrowest on tergites 4–7; tergites 2–7 also blackish sublaterally including auditory capsule and often extending to cover the greater part of segments 6 and 7; tergites 2–7 narrowly edged pale yellow along posterior margin. Sternites pale yellow to almost white except for sternites VI–VIII usually with dark brown or blackish suffusion.

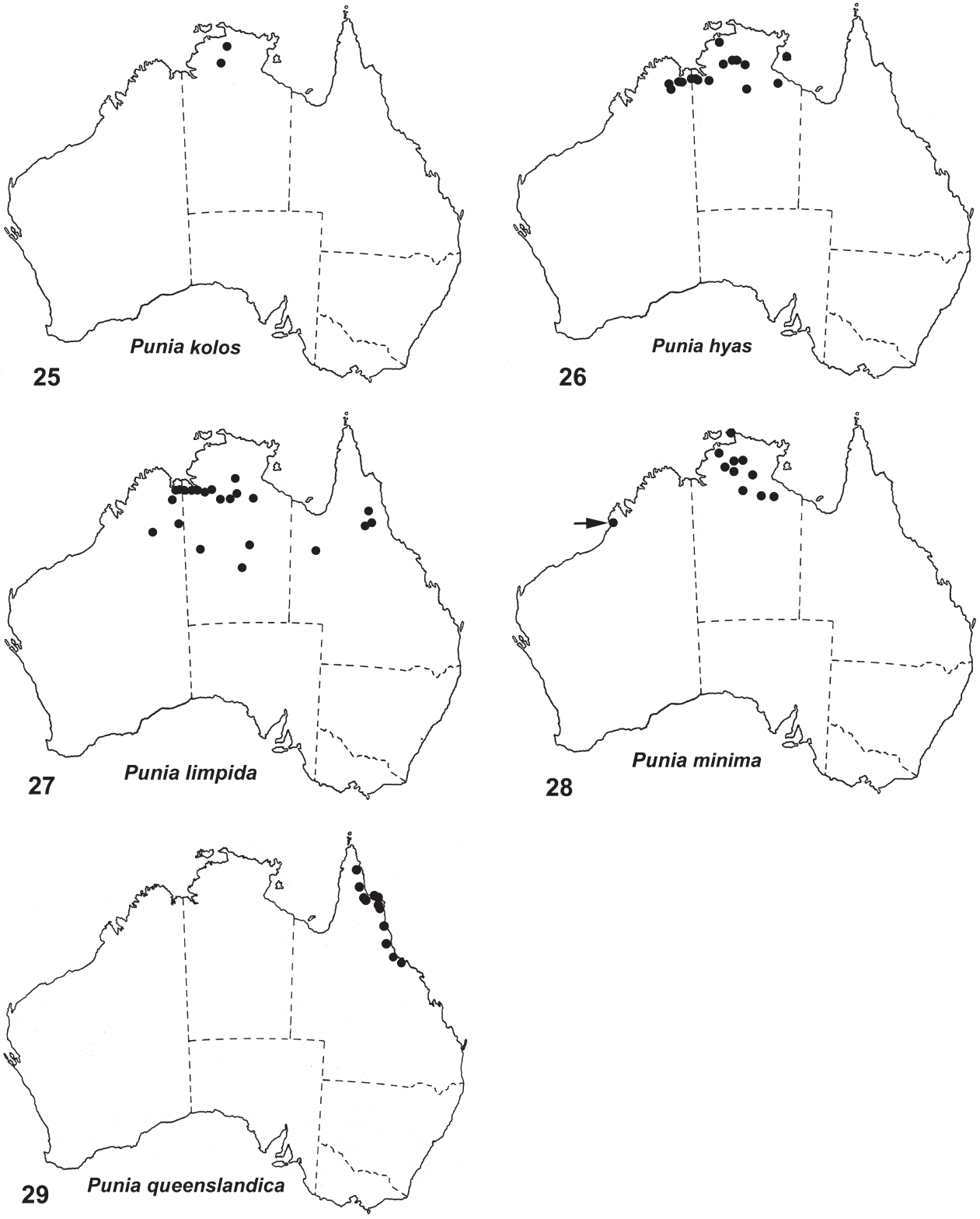
Genitalia (Figs 17–18). Pygofer dorsal beak not strongly developed, broad and tending confluent with pygofer margin; basal lobe large, in lateral view tending triangular; upper pygofer lobe broad, flat, with a very short accessory tooth much shorter than length of upper pygofer lobe. Uncus very short but broad, gradually tapering to a broadly rounded apex that barely projects beyond anal tube. Claspers broad basally, claw-like, triangular in dorsal view, diverging, distally gently curved downwards to a bluntly pointed apex, concave below. Aedeagus with endotheca gently curved, sclerotized to apex, apically tapering ventrally to become sharply pointed; pseudoparameres a little longer than endotheca, lateral of endotheca, flat on basal half or so becoming rounded distally and gradually tapering to a point, slightly diverging from endotheca from about mid length before weakly curving inwards before apex.

Female (Fig. 9). Similar to male but with much reduced dark markings and without translucent sides to abdomen. Prothorax only with very narrow black or brown markings along median and lateral fissures and mesonotum with incomplete black or brown submedian and lateral sigilla. Abdomen pale brown with irregular black or brown and usually some pinkish red dorsal marking usually terminating at tergite 6, but sublateral black markings absent or very small; abdominal segment 9 pale yellowish brown and without dark markings; ovipositor sheath yellowish brown to black, clearly extending a little beyond apex of abdomen.

Measurements. Range and mean (in mm) for 10 males and 10 females (includes largest and smallest of available specimens). *Length of body*: male 9.0–10.0 (9.5); female (including ovipositor) 8.5–10.2 (9.6). *Length of forewing*: male 9.5–10.8 (10.2); female 10.0–11.2 (10.6). *Width of head* (including eyes): male 2.5–2.8 (2.6); female 2.6–2.9 (2.7). *Width of pronotum* (across lateral angles): male 2.6–2.9 (2.8); female 2.7–3.0 (2.9).



FIGURES 11–24. *Punia* species, 11–22 male genitalia, 23–24 male wings. (11) *minima* (Goding & Froggatt, 1904), lateral; (12) *minima* (Goding & Froggatt, 1904), ventral; (13) *hyas* **sp.n.**, lateral; (14) *hyas* **sp.n.**, ventral; (15) *limpida* **sp.n.**, lateral; (16) *limpida* **sp.n.**, ventral; (17) *queenslandica* **sp.n.**, lateral; (18) *queenslandica* **sp.n.**, ventral; (19) *kolos* **sp.n.**, lateral; (20) *kolos* **sp.n.**, ventral; (21) *kolos* **sp.n.**, aedeagus, lateral; (22) *kolos* **sp.n.**, basal plate, dorsal; (23) *kolos* **sp.n.**, forewing; (24) *kolos* **sp.n.**, hindwing. **at** anal tube; **ath** accessory tooth of upper pygofer lobe; **bl** basal lobe of pygofer; **bp** basal plate; **c** costa; **cl** clasper; **CuA** cubitus anterior vein; **db** dorsal beak; **en** endotheca; **M** median vein; **ps** pseudoparamere; **th** theca; **un** uncus.



FIGURES 25–29. Distribution of *Punia* species.

Etymology. Named for its distribution, the only species of *Punia* that is found only in Queensland.

Distinguishing features. Differs from all *Punia* species except *P. hyas* in having the entire forewing venation (excluding costa) brown or blackish. Differs from *P. hyas* in being slightly smaller, the male forewing being less than 11 mm long (usually 10.8 mm or less), the female less than 11.5 mm long (usually 11.2 or less) whereas that of male *P. hyas* is more than 11 mm and the female more than 12.3 mm. Forewing shape is also different, most notable

in being broader and with a more swollen costa at the node (compare Figs 6 and 7 with 8 and 9). The distributions of the two species are widely separated, *P. queenslandica* being found only in Queensland whereas *P. hyas* is found only in Western Australia and the Northern Territory. The male genitalia have the endotheca gently curved, sclerotized evenly to its apex, and the pseudoparameres lie laterally against the endotheca.

Phylogenetic relationships

Moulds (2005), in a morphological cladistic study of the higher classification of cicadas with an emphasis in the Australian fauna, found that *Punia* (represented by *P. minima*) was a late branching lineage (together with *Neopunia* and *Nanopsalta*) within a large clade containing *Pauropsalta* and allied genera. Owen *et al.* (2015, 2017) in their molecular studies of *Pauropsalta* and allied genera found strong support for these relationships, and Marshall *et al*. (2016), in a molecular study of the Cicadettini, found similar relationships for these genera. The synapomorphy supporting the close relationship of these three genera in the Moulds study was the flat upper pygofer lobe with its spine-like accessory tooth.

The molecular studies by Owen *et al.* (2015, 2017) are the only ones to include more than two species of *Punia*, and then only three species, *P. minima* (represented by two and three specimens respectively) being sister to *P. hyas* **sp.n.** (represented by one and two specimens respectively) and those two species together sister to *P. limpida* **sp.n.** (represented by two specimens). These relationships are not strongly supported at nodes despite the molecular analyses being exceptionally rigorous, and the lack of strong support may reflect rapid speciation in the genus. This lack of clarity is reflected in the morphology and finding relationships within *Punia* based on morphology is difficult. Body structures provide no clear evidence and wing venation is similar in all species except *P. queenslandica* that deviates in its broader forewing and generally shorter apical cells. The male genitalia seem the most promising indicators of relationships in this group. Among the five *Punia* species the upper pygofer lobe is interesting in that its size relates directly to the size of its accessory tooth, the larger the tooth the smaller the lobe such that the species with the largest tooth, *P. limpida*, has very little in the way of a lobe. Indeed, there is a tendency for those species with the smallest tooth to have the largest lobe; however, the development of the lobe is a little variable. Nevertheless, the distinctly larger tooth of *P. limpida* supports the results of molecular studies, which indicate that it is sister to *P. minima* and *P. hyas*. Further, this tooth is large in *Nanopsalta* (the sister to *Punia* + *Neopunia*) suggesting that a large tooth is the plesiomorphic state.

Beyond the development of the upper pygofer lobe accessory tooth, other attributes of the male genitalia were found to be either autapomorphies or imply conflicting relationships and no unambiguous synapomorphies could be found to support the nodes in the molecular analyses. For example, *P. minima* and *P. hyas* (sisters in the molecular analyses) differ noticeably from each other in the development of their pseudoparameres, those of *P. minima* tending filiform while those of *P. hyas* are flat in cross section. On the other hand *P. hyas* has pseudoparameres similar to those of *P. limpida,* but then *P. limpida* and *P. minima* (not sisters in the molecular results) have in common a well developed dorsal beak, an uncus that is well developed and an endotheca sclerotized to its apex that tapers ventrally so that the apex is pointed. This lack of clarity in morphology may stem from relatively recent speciation in the genus.

Because of the uncertainties in determining relationships based on morphology it is difficult to place the two species lacking molecular analysis. *Punia queenslandica*, may be allied to *P. minima*, both species having filiform pseudoparameres, in addition to a theca with an under cut apex and a well developed uncus. Likewise, *P. kolos* may be allied to *P. hyas*, both having flat pseudoparameres that are apically pointed, although there is little else in common and the uncus and claspers are very different.

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