



## Two new species of *Pliocaloca* Neboiss (Trichoptera: Calocidae) from eastern Australia, with descriptions of the immature stages of one species

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### Abstract

The adult males of *Pliocaloca kleithria* sp.nov. and *Pliocaloca fidesria* sp.nov. are described. The major diagnostic feature distinguishing these two species is the shape of the slender process arising from the inferior appendage. In *P. fidesria* this process is abruptly curved outwards at about 1/3rd its length, while in *P. kleithria* it is gently curved along its length. The presence of a sclerotised knob on the underside of the fore wing, arising from vein  $Cu_1$ , suggests that these two species are more closely allied with *P. dasodes* than with other species of *Pliocaloca*, in which this knob is lacking or arises from a different vein.

The immature stages of *P. kleithria* are described, providing the first association and detailed description of the immature stages of a *Pliocaloca* species. Larvae are distinguished from other genera of Calocidae by having a covering of small spinules on the dorsum of the head and pronotum.

**Key words:** caddisfly, larva, pupa, taxonomy, Australia

### Introduction

The genus *Pliocaloca* Neboiss was first described by Neboiss in 1984. Until now, the genus has comprised 3 species known only from north Queensland; *P. mucronata* Neboiss, *P. fastigiata* Neboiss, and *P. dasodes* Neboiss. A larva from northern New South Wales and southern Queensland has been identified and associated with an unknown species of *Pliocaloca* by Jackson (1998), who assigned the voucher collection name AV1. While it is likely that this larva corresponds to either of the two new species described here, unfortunately the current location of the specimens originally used to associate AV1 with *Pliocaloca* is unknown. This paper provides the first detailed descriptions of the immature stages of a new *Pliocaloca* species.

### Materials and methods

Adult specimens from the Museum of Victoria, Melbourne, were examined. Pupae and larvae were collected by John Dean and Ros St Clair. Specimens are deposited in the Museum of Victoria, Melbourne (MV) and the Australian Museum, Sydney (AM).

Adult genitalia of the specimens illustrated were cleared in KOH. Larval sclerites were extracted from pupal cases and used to associate paratype male pupae with larvae. Keys used to identify specimens were those of Jackson (1998) and Neboiss (1986, 1992). Terminology of wing venation follows Holzenthal *et.al.* (2007). The extreme modification of wing venation of these species makes identification of individual veins difficult. Labels on the illustrations of the wings indicate my interpretation of the main veins. Terminology of larval characters follows that of Jackson (1998), and terminology of adult characters follows those of Holzenthal *et.al.* (2007), CSIRO (1991), and Neboiss (1992).

Material was examined using a Leica MZ12.5 microscope. Photographs were taken using a Leica DFC320 camera mounted on a Leica MZ16 microscope. Auto-montage Essentials version 5.00(e) was used to create photographs with a wide depth of field. Photographs were edited using Adobe Photoshop Elements V6 and Corel Draw V4. Line drawings of the wing venation were obtained from tracings of the colour photos.

## Family CALOCIDAE

### Genus *Pliocaloca* Neboiss, 1984

Type species. *Pliocaloca mucronata* Neboiss, by original designation, from north-eastern Queensland.

Neboiss (1984) stated that *Pliocaloca* is distinguished from other calocid genera by the presence of a small discoidal cell in the posterior wings of males and females. There are no clear diagnostic features that separate larval Calocidae from Helicophidae (Jackson 1998). To date, it appears, the best indication that a larva belongs to Calocidae is the absence of sclerite/s on the lateral abdominal humps. The larvae of *Pliocaloca* do not bear these sclerites. It is interesting to note that the dorsum of the head and pronotum is covered in sclerotised spinules. Within Calocidae, this feature is unique to *Pliocaloca*.

### Revised generic description

Adult : Head: Dorsum of males with triangular membranous receptacle; anterior warts fused or abutting and raised; postocular warts long, narrow. Antennae about as long as, or slightly shorter than, anterior wing length; scape of males with a digitiform process. Maxillary palpi five segmented in both sexes. Wings: venation differing slightly between sexes, venation of males reduced. Forewing with discoidal cell; *sc-r* crossvein between Sc and R<sub>1</sub>. Hind wing with small discoidal cell; vein R<sub>1</sub> parallel to Sc until just beyond midpoint of wing, then fusing for short distance before separating to approach wing margin. Legs: Spurs 2:2:4.

### Key to males of *Pliocaloca* from Australia

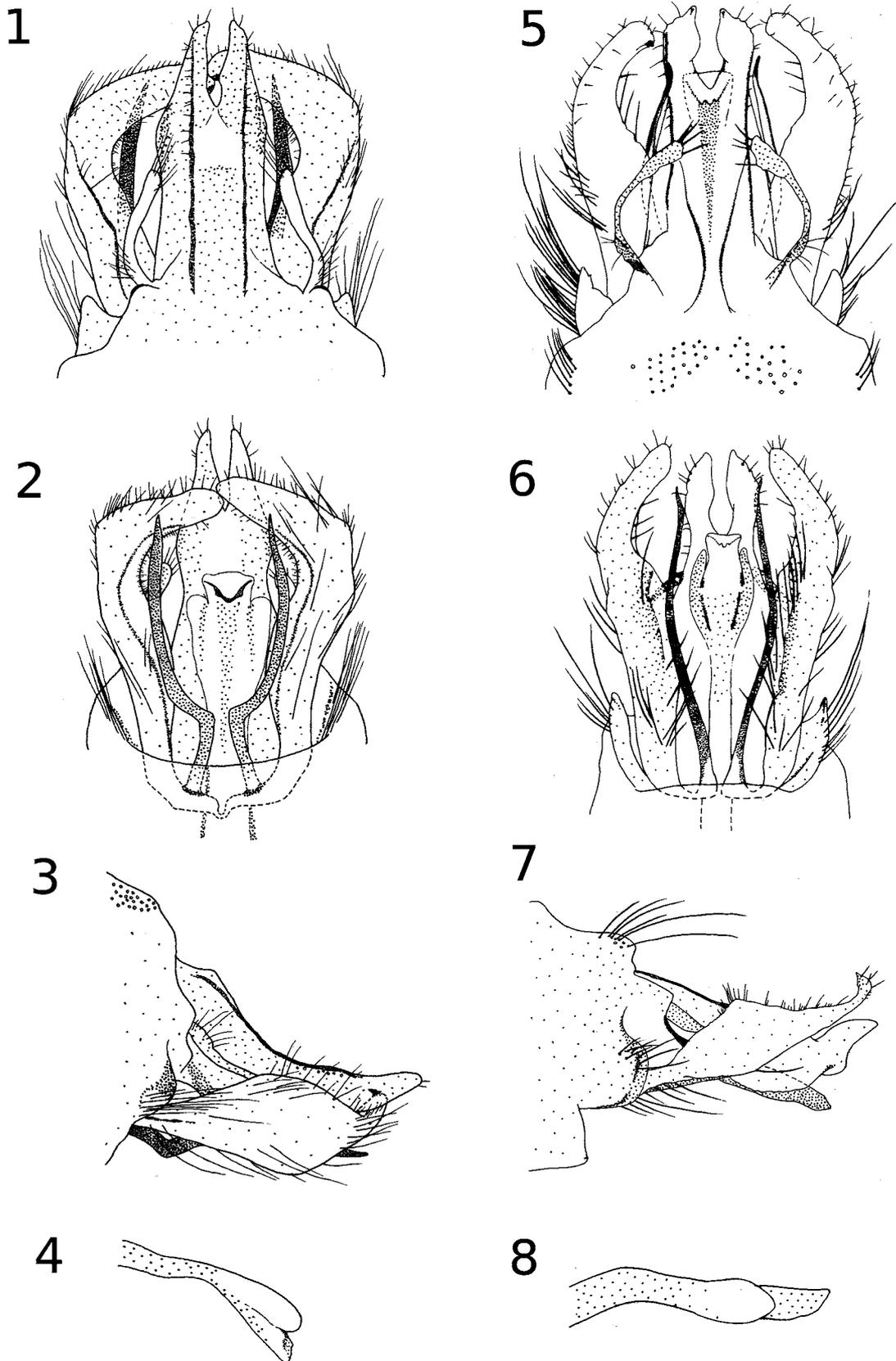
- 1 Inferior appendage with a long, slender, process arising medially from the base (Figs 2, 6) ..... 2
- Inferior appendage without a long, slender, process arising medially from the base (Figs 14, 17 in Neboiss 1984)...4
- 2 Preanal appendage long, extending to about half the length of segment X (Figs 1, 5) ..... 3
- Preanal appendage short (Fig 19 in Neboiss 1984) ..... *P. dasodes*
- 3 Slender process arising medially from inferior appendage abruptly curved outward at about 1/3rd length (Fig. 2).....
- ..... *P. fidesria* sp. nov.
- Slender process arising medially from inferior appendage without abrupt curve, gently angled outwards (Fig. 6).....
- ..... *P. kleithria* sp. nov.
- 4 Segment X incised deeply, beyond half the length of the segment (Fig. 16 in Neboiss 1984). Inferior appendages with apico-mesal angles produced and pointed (Fig. 17 in Neboiss 1984) ..... *P. mucronata*
- Segment X incised to about half the length of the segment (Fig. 13 in Neboiss 1984). Inferior appendages with apico-mesal angles produced and rounded (Fig. 14 in Neboiss 1984) ..... *P. fastigiata*

### *Pliocaloca fidesria*, sp. nov.

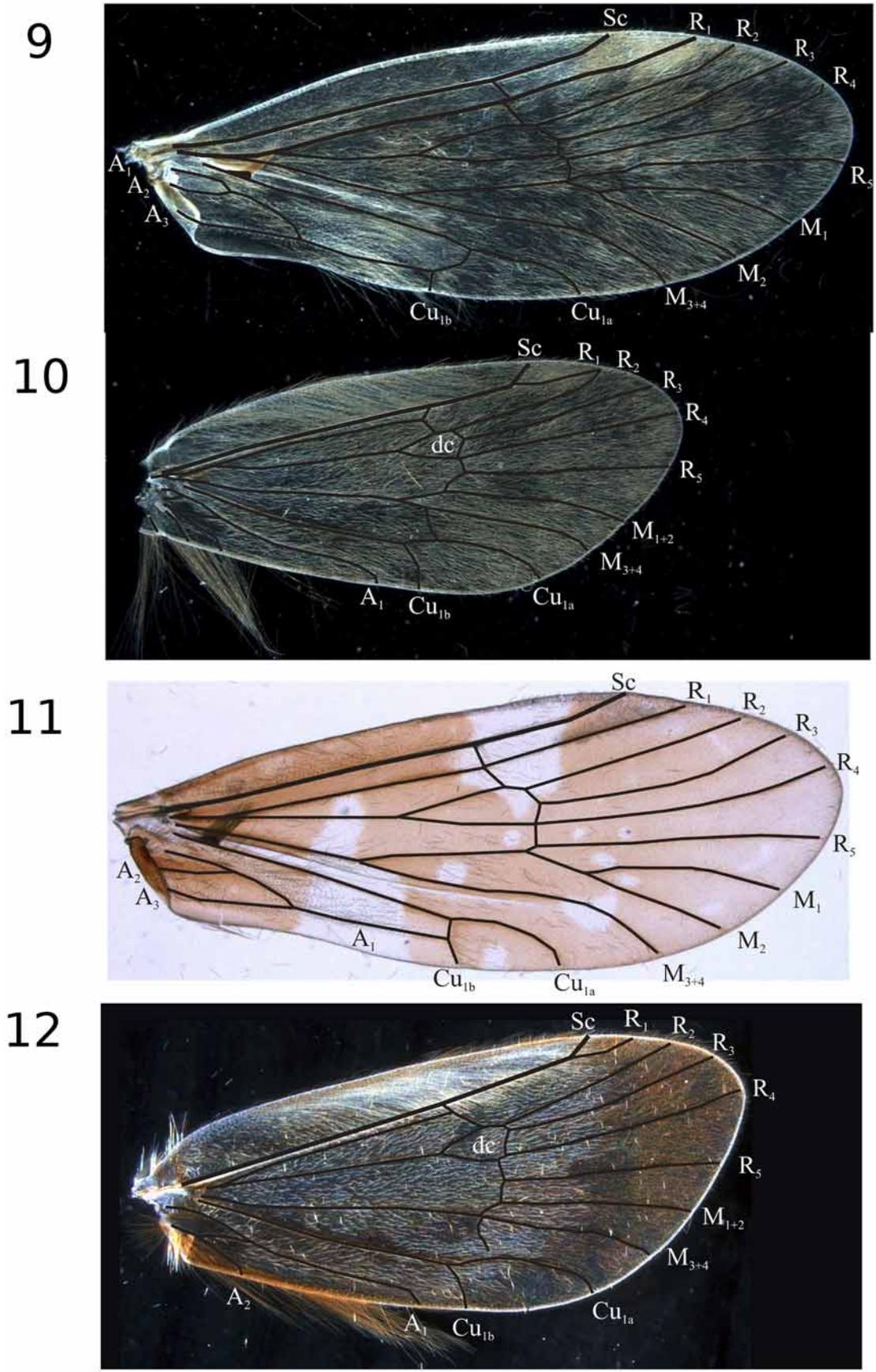
Figs 1–4, 9–10

**Diagnosis.** The similarity between features of *Pliocaloca fidesria* and *P. kleithria* suggests that these two species are more closely allied to each other than to any of the previously described species. Of those species that have been described, the number of characteristics shared with *P. fidesria* is greatest in *P. dasodes* (Neboiss 1984). In both of these species the forewings (Fig. 9) lack a thyridial cell and possess a setose,

sclerotised knob on the underside of vein Cu<sub>1</sub>. Morphology of the genitalia is similar in both species and a slender process rises medially from the base of the inferior appendage (Fig. 2).



**FIGURES 1–8.** Male genitalia of *Pliocaloca* spp., dorsal (Figs 1, 5), ventral (Figs 2, 6), and left lateral views (Figs 3, 7) and phallus in left lateral view (Figs 4, 8). 1–4. *Pliocaloca fidesria*, sp. nov.; 5–8. *Pliocaloca kleithria*, sp. nov.



**FIGURES 9–12.** Male right fore wings (Figs 9, 11) and hind wings (Figs 10, 12) of *Pliocaloca* spp. 9–10. *Pliocaloca fidesria*, sp. nov.; 11–12 *Pliocaloca kleithria*, sp. nov.

The following characters separate *Pliocaloca fidesria* from *P. dasodes*: the preanal appendages (Fig. 1) and the slender processes of the inferior appendages (Fig. 2) are much longer, segment X (Fig. 1) is not as tapered and has a much wider apical incision, and the sclerotised knob on vein  $Cu_1$  of the forewing (Fig. 9) is located more basally.

The shapes of the genital features distinguish *Pliocaloca fidesria* from *P. kleithria*. The slender process arising from the inferior appendage (Fig. 2) is abruptly curved outwards at about 1/3rd the length of the segment in *P. fidesria*, while in *P. kleithria* it is gently curved outwards (Fig. 6). In *P. fidesria*, segment X (Fig. 1) bears a pair of strong parallel ridges dorsally and the lateral margins of the posterior 1/3rd are relatively straight and tapered inwards. In *P. kleithria* the dorsal ridges diverge apically (Fig. 5). The apices of the segment are somewhat rounded, with the lateral margins curved outwards.

**Description.** Male. Length of fore wing 6.8–7.4 mm. Wings brown. Fore wing (Fig. 9): thyridial cell absent; vein  $A_1$  joins  $Cu_{1b}$  at arculus but basal of where  $Cu_{1b}$  separates from  $Cu_{1a}$ ; base of  $Cu_1$  with oval sclerotised knob bearing tuft of dark, long, setae on underside of wing; membrane between veins  $A_1$  and  $Cu_1$  with long setae. Hind wing (Fig. 10): fork 1 sessile;  $R_2$  joining with  $R_1$  at wing margin. Genitalia (Figs 1–3): Segment X long and narrow, deeply incised in apical 1/3rd, 2 strong parallel ridges on dorsum extending along most of length of segment; preanal appendages slender, rounded apically, curved medially, extending to approximately half length of segment X; inferior appendages in dorsal view broad, strongly angled inwards at mid-length with apices almost in contact at midline, each with darkly sclerotised ridge extending from base to 1/2 length on dorsal surface, in lateral view broad at mid-length, apices projecting dorsad and terminating in dark point, in ventral view with darkly sclerotised ridge extending almost full length of segment, slender process attached medially at base; slender processes extending almost to apices of inferior appendages, abruptly curved outward at about 1/3rd length, apical 2/3rds gently curved inwards, terminating parallel, tapered to points. Phallus (Fig. 4): with a pair of lobes within distal 1/2, laterally compressed, apically rounded, projecting from the dorsolateral margin.

Female and immature stages unknown.

**Holotype male:** Queensland, Bunya Mountains National Park, 15 Oct 1973, A. Neboiss, (MV TRI–26408).

**Paratypes:** 4 males, collected with holotype, (MV TRI–26406, TRI–26407, TRI–26409, TRI–26410 (specimen figured)); 1 male, Queensland, Bunya Mountains National Park, 12 Dec year unknown, A. Neboiss (MV TRI–26287).

**Etymology.** From the Latin *fides*, meaning “stringed instrument such as a lyre,” pertaining to the shape formed by the pair of slender processes that extend from the inferior appendages.

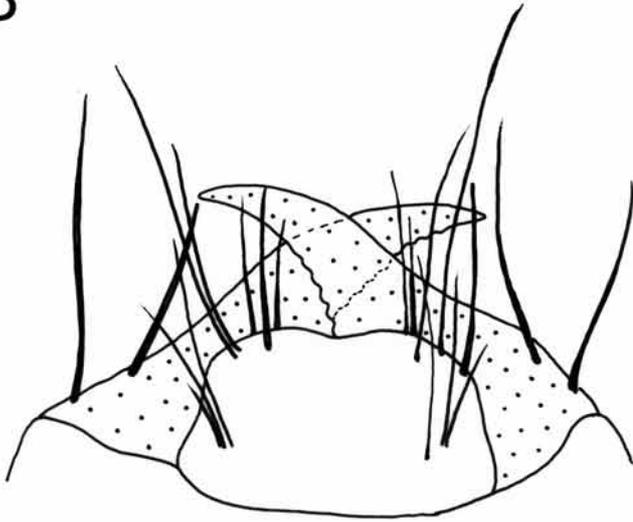
### ***Pliocaloca kleithria* sp.nov.**

Figs 5–8, 11–23

**Diagnosis.** As stated above, *P. kleithria* and *P. fidesria* possess many similar characteristics, suggesting a close alliance between the two. Of the previously described species, *P. dasodes* (Neboiss 1984) appears to be most similar to *P. kleithria*. In both species the forewings (Fig. 11) lack a thyridial cell and possess a setose, sclerotised knob on the underside of vein  $Cu_1$ . Morphology of the genitalia is similar in both species and a slender process rises, medially, from the base of the inferior appendage (Fig. 6).

The following characters separate *Pliocaloca kleithria* from *P. dasodes*: the preanal appendages (Fig. 5) and the slender processes of the inferior appendages (Fig. 6) are much longer, segment X (Fig 5) is not as tapered and has a much wider apical incision, and the sclerotised knob on vein  $Cu_1$  of the forewing (Fig. 11) is located more basally. The shape of the apices of segment X also differs between these species. In *P. dasodes*, the lateral margins of this segment gently taper along its length (Neboiss 1984). The segment is deeply and narrowly incised apically. In *P. kleithria*, the lateral margins are curved inwards at about 2/3rds their length (Fig. 5). The medial incision of the segment is wider but not as deep as in *P. dasodes* and the apices are somewhat rounded.

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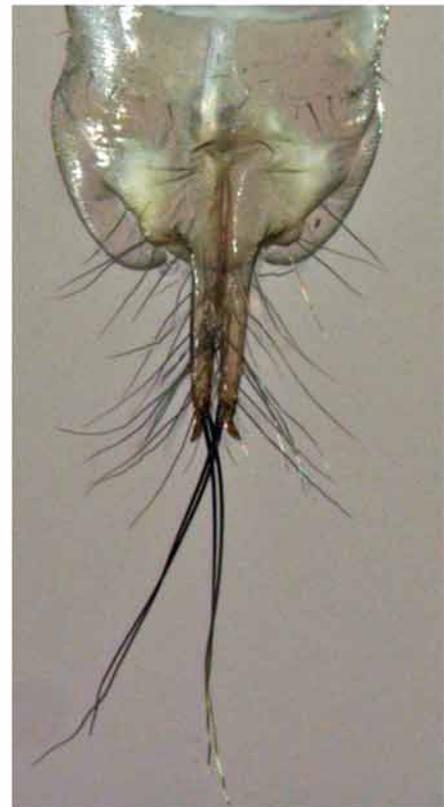
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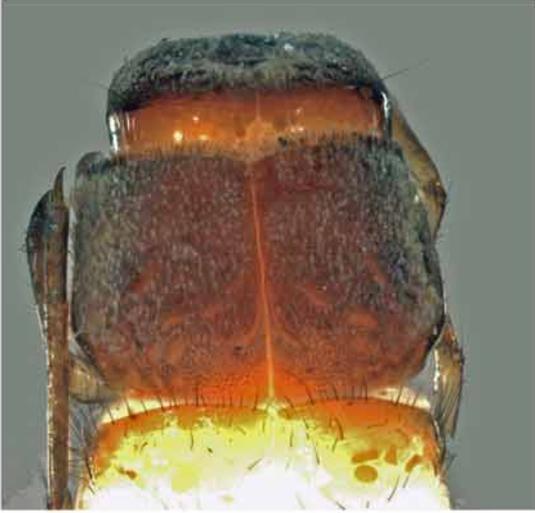


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**FIGURES 13–16.** Pupa of *Pliocaloca kleithria*, sp. nov. 13. labrum and mandibles, dorsal; 14. hookplates; 15. terminal segment, right lateral; 16. terminal segment, dorsal.

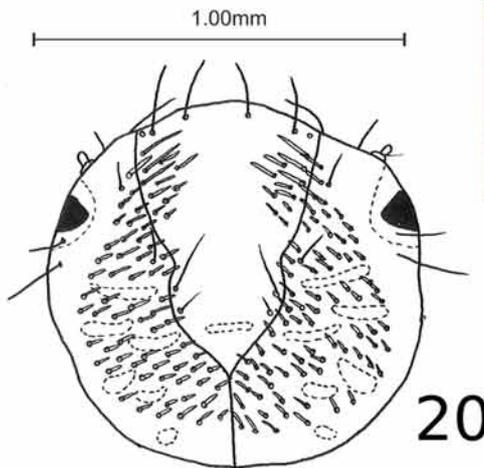
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**FIGURES 17–23.** Larva of *Pliocaloca kleithria*, sp. nov. 17. pronotum, dorsal; 18. head and pronotum, right lateral; 19. larva in case, right lateral; 20. head, dorsal, illustrating robust setae; 21. spinules on dorsum of head; 22. meso- and metanotum; 23. right abdominal proleg, right lateral.

The shapes of the genital features distinguish *Pliocaloca kleithria* from *P. fidesria*. The slender process arising from the inferior appendage (Fig. 6) is gently curved outwards in *P. kleithria*, while in *P. fidesria* it is abruptly curved outwards at about 1/3rd the length of the segment (Fig 2). In *P. kleithria*, segment X (Fig 5) bears a pair of strong dorsal ridges that diverge apically. The apices of the segment are somewhat rounded, with the lateral margins curved outwards. In *P. fidesria*, the dorsal ridges of segment X (Fig. 1) are parallel to each other and the lateral margins of the posterior 1/3rd are relatively straight and tapered inwards.

**Description.** Male. Length of fore wing 5.7–6.7 mm. Wings brown. Fore wing with distinct white patches, 1 large patch adjacent to costal margin basal of pterostigma, 1 large patch on anal region, scattered smaller patches. Forewing (Fig. 11): thyridial cell absent; vein  $A_1$  joins  $Cu_{1b}$  at arculus just behind position where  $Cu_{1b}$  separates from  $Cu_{1a}$ ; base of  $Cu_1$  with oval sclerotised knob bearing tuft of dark, long, setae on underside of wing; membrane between veins  $A_1$  and  $Cu_1$  with long setae. Hind wing (Fig. 12): crossvein *m-cu* not quite joining with  $Cu_{1a}$ . Genitalia (Figs 5–7): Segment X long and narrow, strongly incised apically, 2 strong dorsal ridges extending along most of length of segment and diverging apically; preanal appendages slender, rounded apically, strongly curved medially, enlarged sub-apically, extending to approximately half length of segment X; inferior appendages relatively narrow, curved inwards, apices pointed and projecting dorsad, each with slender process arising medially from base; slender process extending almost to apex of inferior appendage, gently curved, tapered to point. Phallus (Fig. 8): with a pair of rounded lobes within distal 1/2, projecting from the lateral margin.

Female unknown.

**Pupa.** Head: antennae as long as body; labrum (Fig. 13) with anterior margin straight or slightly concave, 3 dark setae towards each posterolateral corner, each anterolateral corner with 3 dark sub-apical setae and 2 transparent apical setae; mandibles (Fig. 13) with small serrations along inner margins, each with 2 setae on basal 1/4th of outer margin. Middle legs: each tibia with dorsal fringe of setae. Abdomen (Fig. 14): lateral fringes present; anterior hookplates on tergites 3–6, posterior hookplates on segment 5 only; all hookplates with 2 hooks; terminal processes (Figs 15, 16) narrow, apically acute and upturned, each with 2 long black setae subapically, rows of finer setae on ventral and dorsolateral surfaces.

**Larva.** Length: 8 mm. Head (Figs 20, 21): brown, dorsum covered by spinules, slight depression in posterior region of frontoclypeus; strong band of pale secondary setae mostly outside frontoclypeus, those inside frontoclypeus longer and directed mesad; frontoclypeus with 2 pairs of primary setae on anterior margin; antennae small, situated about halfway between anterior margin of head capsule and eye; carina not present. Pronotum (Figs 17, 18): dorsum covered by spinules; each sclerite with anterior margin curved forward between suture line and lateral margin; lateral carina present, almost reaching posterior margin, not extending onto dorsum of segment; anterior margin with dense row of short blunt setae; foretrochantin not fused to propleuron, apically acute. Mesonotum (Fig. 22): lightly sclerotised, pigmentation predominantly in anterior half. Metanotum (Fig. 22): with single, round, medial sclerite; setal area 1 with about 6 setae, setal area 2 with 1 seta, setal area 3 with about 8 setae. Abdomen (Fig. 23): segment I lateral humps without sclerites; abdominal gills absent; tergite 9 with 5 pairs of hairlike setae; anal lateral sclerites with many setae, 2 setae darker, thicker, and slightly longer than rest; abdominal prolegs each with 1 accessory tooth. Legs (Fig. 19): hind legs almost twice as long as forelegs. Case (Fig. 19): curved cylinder of sand grains, posterior aperture round.

**Holotype male:** New South Wales, Wilson River Res nr. Bellangry, 5 Dec 1988, G. Theischinger, (MV TRI–26295).

**Paratype** (specimen figured): 1 male, New South Wales, Terania Creek N of Lismore 28°25' S, 153°18' E, 21 Jan 1986, G. Theischinger, (MV TRI–26285).

Other material examined: New South Wales. Tributary of Wilson River, 70 meters along Falls Walk Track 13°12' S, 152°29' E, 4 Dec 2007, A. Glaister, J. Dean, and R. St Clair 1 male pupa, 3 female pupae, 5 larvae, (AM); 4 male pupae, 2 female pupae, 3 larvae (MV).

**Etymology.** From the Greek *kleithria*, meaning “keyhole,” pertaining to the keyhole shape formed by the apical incision in segment X.

Remarks. Jackson (1998, figs 1.12–1.17) has previously illustrated the larvae of what she called *Pliocaloca* sp. AV1, with a distribution in southern Queensland and northern New South Wales. She makes reference to a pupal specimen associating this larva with an undescribed adult of *Pliocaloca*. Unfortunately, the specimens Jackson used to associate this larva are missing from the Australian voucher collection. The larva of *P. kleithria* is similar to the illustrations given by Jackson (1998). However, it is not known if the larva Jackson illustrated represents *P. kleithria* or *P. fidesria*, or if the larvae of these species can be distinguished based on morphology.

## Acknowledgements

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