



## ***Riekophlebia crocina*, a new genus and species of Atalophlebiinae (Ephemeroptera: Leptophlebiidae) from the Wet Tropics bioregion of north-eastern Australia**

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### **Abstract**

*Riekophlebia crocina*, a new genus and species, is described from Australia based on nymphs and adults. *Riekophlebia* belongs to a lineage that also includes the Australian genera *Austrophlebioides*, *Kirrara*, *Manggabora* and *Tillyardophlebia*.

**Key words:** mayflies, taxonomy, Leptophlebiidae, Australia

### **Introduction**

There have been few taxonomic studies on the Leptophlebiidae of the Wet Tropics bioregion of north-eastern Australia. The first species to be described from the region were those by Ulmer (1916). Later, two species of the genus *Jappa* were described by Skedros and Polhemus (1986), the genus *Kalbaybaria* was established by Campbell (1993), and two northern species of *Atalomicria* were included in a revision of that genus by Campbell and Peters (1993). More recently, Christidis (2003) recorded 27 species in 13 genera from the Wet Tropics bioregion, many of which are undescribed. Formal description of these undescribed taxa commenced with the description of three species of the genus *Austrophlebioides* by Christidis and Dean (2005). In this paper I describe a new genus from the Wet Tropics bioregion of north-eastern Australia and record its phylogenetic relationship to other Gondwanan genera.

### **Methods**

Nymphs were collected from streams by carefully removing individuals from the surface of stones with forceps. Individuals for rearing were placed in aerated containers, all other specimens were preserved in 70% ethanol. Nymphs were reared individually in chambers similar to those recommended by Edmunds *et al.* (1976). Imago wings were dissected and mounted on slides. Male genitalia were mounted in Euparal. The mouthparts, forelegs, and some abdominal gills of nymphs were also mounted in Euparal. All measurements are in millimetres. Type specimens and other material examined are lodged in the Queensland Museum (QM), Brisbane, Australia.

## ***Riekophlebia* gen. n**

**Type species.** *Riekophlebia crocina* sp. n

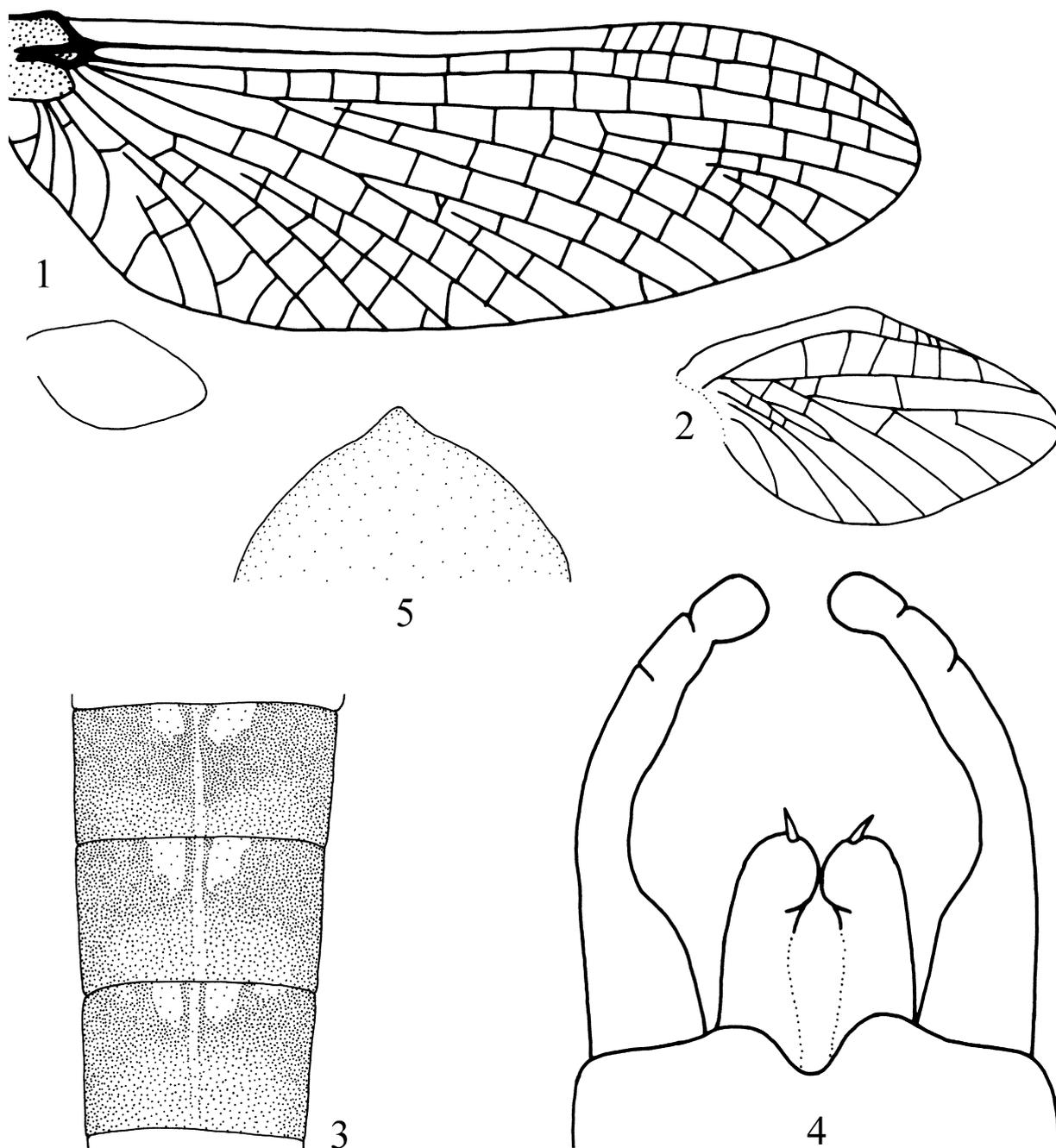
**Diagnosis. Imago.** Wings hyaline (Fig. 1). Forewing length-width ratio 3.0–3.2; MA forked at just over half distance from base of vein to margin of wing, fork symmetrical; MP<sub>2</sub> attached to MP<sub>1</sub> at about 0.24 length of MP<sub>1</sub>; ICu<sub>1</sub> not attached at base to CuA-CuP cross vein. Hind wing 0.18–0.20 times length of forewing; costal margin convex; vein Sc about 0.8 length of hind wing (Fig. 2). Tarsal claws dissimilar, one with an apical hook, the other pad-like. Male genitalia with claspers 3 segmented, segment 1 of claspers narrowing at about 0.4 of length; penes fused along most of their length, each lobe with a large ventral spine near apex; styliger plate with deep cleft (Fig. 4). Female ninth sternum entire, pointed apically (Fig. 5).

**Nymph.** Head prognathus. Antennae about two times length of head. Mouthparts as in Figures 6–11. Labrum broader than clypeus; length 1.18–1.20 times maximum length of clypeus; labrum broadest beyond midlength; anterior margin with median U-shaped notch; dorsal surface with two setal fringes (Fig. 6). Clypeus with lateral margins slightly divergent apically. Outer margin of mandible with small median setal tuft and series of fine setae between tuft and outer incisor (Fig. 7); incisors slender; prostheca well developed. Maxilla broad apically, with 25–27 subapical pectinate setae (Fig. 8). Ligula of hypopharynx with well developed lateral processes, anterior margin cleft (Fig. 9). Labium with glossae on about the same plane as paraglossae. Lateral margins of submentum with a few basal setae (Fig. 10). Labial palp with segments 1 and 2 subequal in length, segment 3 about half length of segment 2. Tarsal claws with ventral teeth, increasing in size apically. Abdomen with posterolateral spines present on segments 2–9; lateral margins of abdominal segments bare, without setae. Gills present on segments 1–7; each gill lanceolate, lateral tracheae moderately developed (Fig. 13). Caudal filaments 1.5 to 2 times length of body; each segment with apical whorl of spines and short setae.

**Remarks.** *Riekophlebia* can be distinguished from all other leptophlebiid genera by the following combination of characters. Imago: (1) penes fused along most of their length, each lobe with large ventral spine near apex; (2) segment 1 of claspers narrowing at about 0.4 of length; (3) styliger plate with deep cleft; (4) tarsal claws dissimilar; (5) female ninth sternum entire and pointed apically. Nymph: (1) anterior margin of labrum with median U-shaped notch; (2) labrum length 1.18–1.20 times maximum length of clypeus (3) labrum broadest beyond midlength; (4) maxillae broad apically, with 25–27 subapical pectinate setae; (5) lateral margins of submentum with a few basal setae; (6) abdomen with posterolateral spines present on segments 2–9; (7) lateral margins of abdominal segments without setal fringe; (8) gills with lateral tracheae. *Riekophlebia* is a member of the *Meridialaris* lineage as defined by Pescador and Peters (1980) and Christidis (2005), based on the possession of the following synapomorphic character states: adult tarsal claws dissimilar; ninth abdominal sternum of female entire; labrum of nymph with U-shaped notch on anterior margin; labrum broader than clypeus; maxilla broad apically; lateral margins of submentum with few basal setae. Other Australian members of the *Meridialaris* lineage include the genera *Austrophlebioides*, *Kirrara*, *Tillyardophlebia* and *Manggabora*.

*Riekophlebia* most closely resembles *Tillyardophlebia* and *Manggabora*, but can be distinguished from these genera as follows. *Riekophlebia* is separated from *Manggabora* in the imago by the deep cleft on the posterior margin of the styliger plate, and absence of a large ventral projection on the penes; and in the nymph by the presence of posterolateral spines on abdominal segments 2–9, a maxilla with 25–27 subapical pectinate setae, and presence of setae on the outer margin of mandible between the median setal tuft and the outer incisor. *Riekophlebia* is distinguished from *Tillyardophlebia* by the form of the male genitalia including penes that are fused along most of their length, presence of large ventral spine near apex of each penes lobe, absence of a pair of large curved ventral spines near base of penes, and a styliger plate with a deep cleft. The nymph of *Riekophlebia* is distinguished from *T. dostinei* by the presence of lateral tracheae on the gills; and from *T. alpina* and *T. rufosa* by the form of the labrum which in *Riekophlebia* is broadest beyond midlength and has angular lateral margins whereas in *T. alpina* and *T. rufosa* is broadest at about midlength and has rounded lateral margins.

**Etymology.** This genus is named for Edgar Riek, in recognition of his contribution to mayfly research in Australia. Gender, feminine.

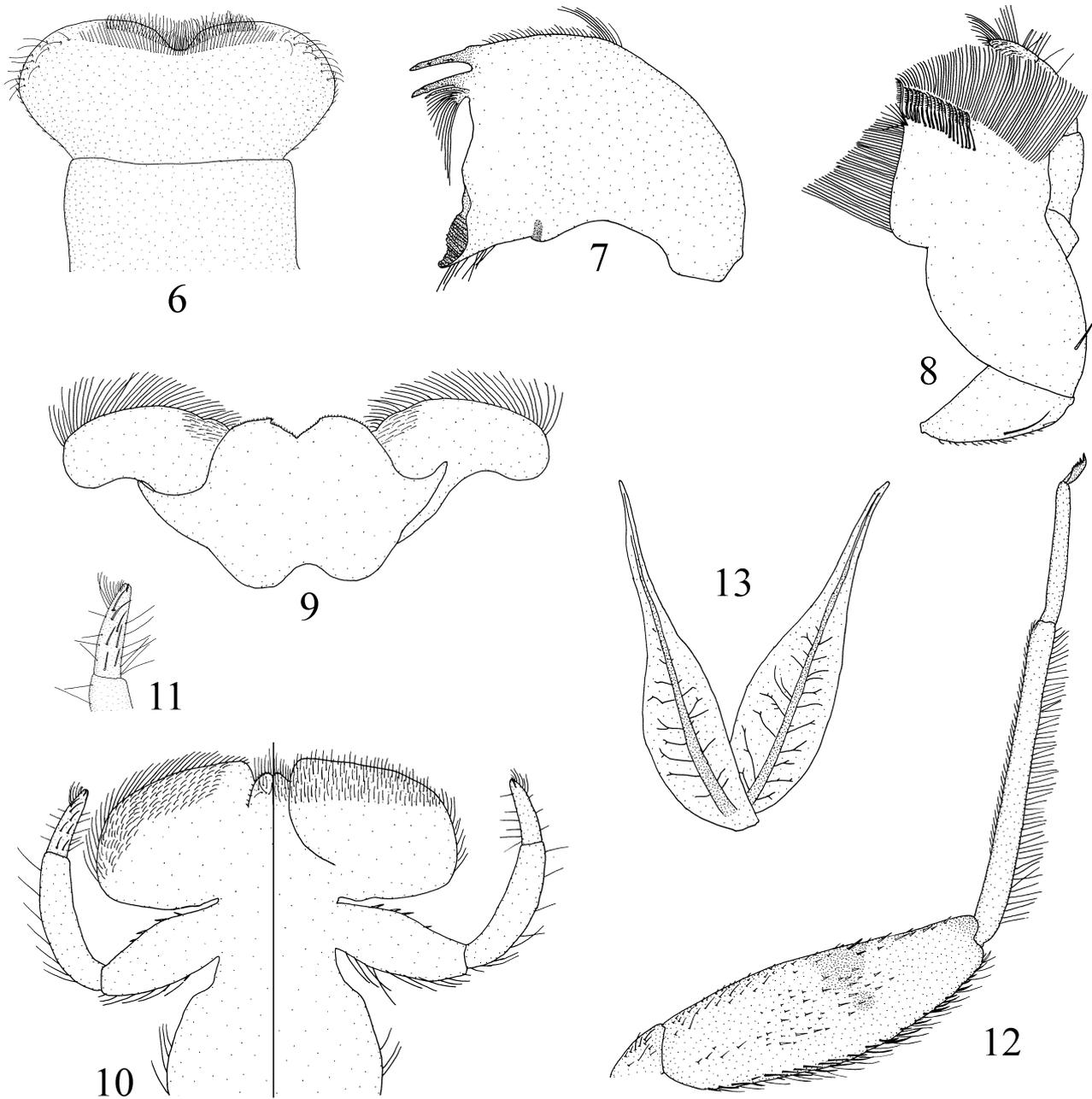


**FIGURES 1–5.** *Riekophlebia crocina*. Male imago: (1) wings; (2) hind wing; (3) abdominal terga 3–5; (4) penes and claspers, ventral view. Female imago: (5) ninth abdominal sternum.

***Riekophlebia crocina* sp. n**

**Type material. Queensland.** Holotype: male imago reared from nymph, Cloudy Ck, Paluma Range National Park (19°00'S, 145°26.4'E), collected 10 January 1999, F. Christidis (QM). Paratypes: all collected from type locality by F. Christidis; 1 reared male imago and 1 reared female imago, 29 March 1998; 1 reared female imago, 10 January 1999; 13 nymphs, 17 November 1996; 4 nymphs, 21 July 1999; 3 nymphs, 19 April 2008; (QM).

**Other material examined. Queensland.** Camp Ck, Paluma Range National Park: 1 reared male imago, 1 reared female imago and 4 nymphs, 24 October 1996, F. Christidis (QM). Birthday Ck, Paluma Range National Park: 1 reared male imago, 19 May 1999; 1 nymph, 24 October 1996; 1 nymph, 12 April 1998; F. Christidis (QM).



**FIGURES 6–13.** *Riekophlebia crocina*. Nymph: (6) labrum and clypeus; (7) right mandible; (8) maxilla, ventral view; (9) hypopharynx; (10) labium, dorsal view left of midline and ventral view right of midline; (11) segment 3 of labial palp, dorsal view; (12) foreleg; (13) abdominal gill.

**Male imago.** Length: body 6.0–6.2 mm, forewings 6.2–6.4 mm. Head brown. Eyes in contact dorsally; upper portion of eye orange-brown, lower portion black. Antennae reddish brown. Thorax dark brown. Wings hyaline (Figs. 1, 2), costal and subcostal cells in apical third of forewing whitish, longitudinal veins and cross veins pale brown; forewing with 9–11 costal cross veins; hind wing with 5–6 costal cross veins and 5–6 subcostal cross veins; MP of hind wing with discoidal cell; hind wing width 0.60–0.62 of length. Foreleg with

femur dark brown, remainder of leg yellowish-brown. Middle and hind legs brownish yellow. Abdomen dark red with areas of black (Fig. 3); terga 2–8 with paired pale submedian maculae. Genitalia reddish; styliger plate deeply cleft; claspers 3 segmented, segment 1 narrowing at about 0.4 of length, segment 3 slightly shorter than segment 2, segment 2 about 0.18 length of segment 1 (Fig. 4). Penes fused along most of their length, each lobe with large ventral spine near apex (Fig. 4).

**Female imago.** Length: body 6.0–7.0 mm, forewings 6.5–7.2 mm. Similar to male except as follows: eyes black, separated on meson of head by a distance of 2 times the maximum width of an eye; fore wing with 16–18 costal cross veins; sternum of ninth abdominal segment entire, pointed apically (Fig. 5).

**Nymph.** Body length: male 6.2–7.4 mm, female 7.2–8.2 mm. Mouthparts as in Figures 6–11. Labrum width 1.32–1.38 times maximum width of clypeus, labrum length 1.18–1.20 times maximum length of clypeus. Thorax brown. Forelegs yellow, femora of foreleg with limited dark brown pigmentation (Fig. 12). Abdomen yellow with dark brown to black markings. Gill lamellae pale yellow, tracheae black, lateral tracheae moderately developed (Fig. 13).

**Etymology.** *Crocina*, Latin for yellow, saffron colored, in reference to the yellow pigmentation of the nymph, particularly when alive.

**Remarks.** This species was included as *Tillyardophlebia* sp. AV7 in the key of Dean (1999) and as ‘WT species 1’ in the phylogenetic analyses of Christidis (2001, 2005). The nymphs of this species occur on stones in pool habitats of rainforest streams.

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