

Key to the Genera of Male Adult Mayflies of Australia



PJ Suter and J. Webb

TRIN Taxonomy Research and Information Network

La trobe University
Department of Environmental Management and Ecology
Albury-Wodonga

Presented at the Second TRIN Taxonomy Workshop

9-10 February 2010.

Acknowledgements: John Dean for pictures and comments.

Key to the Genera of Male Adult Mayflies of Australia

- 1a Hind wings large, length greater than 1/3 forewing length (Fig. 1) .. 2
- 1b Hind wings small, length less than 1/3 forewing length or absent (Fig. 2) 5

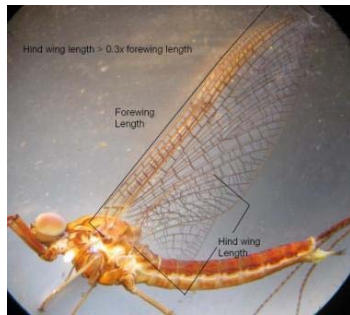


Fig 1. *Coloburiscoides* wings

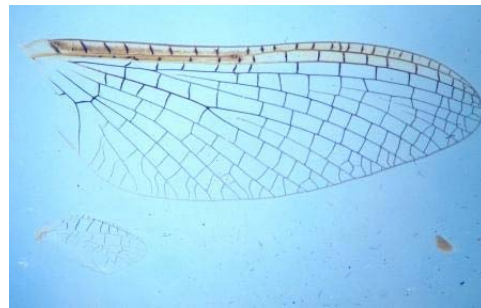


Fig 2 *Jappa* wings

- 2a (1) Tarsal claws of all legs similar, sharp (Fig. 3); three well developed tail filaments in males and females; forceps four segmentedNesameletidae..... *Ameletoides*
- 2b Tarsal claws of mid and hind legs dissimilar, one sharp and hooked, one blunt, pad-like (Fig 4) or pad like only (Fig 10); terminal filament reduced, vestigial or absent; forceps three or four segmented 3



Fig 3. Tarsal claws similar



Fig 4. Tarsal claws dissimilar

- 3a (2)** Forceps four segmented (Fig. 5); only two caudal filaments (Fig 7)
Ameletopsidae..... *Mirawara*
- 3b** Forceps three or four segmented (Fig. 6); three caudal filaments but
 terminal filament reduced/vestigial (Fig 8) 4



Fig 5. Forceps of *Mirawara*

Fig 6. Forceps of *Tasmanophlebia*



Fig 7. *Mirawara* caudal filaments

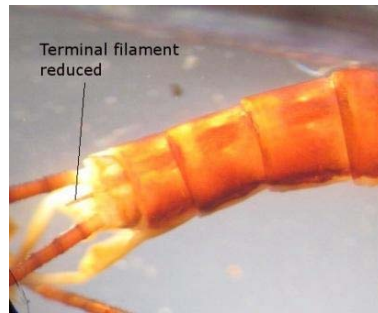


Fig 8. *Coloburiscoides* caudal filaments

- 4a (3)** Fore tarsus with dissimilar claws, one hooked, one blunt (Fig. 9)
Oniscigastridae..... *Tasmanophlebia*
- 4b** Fore tarsal of males with pad-like “claws”, no hooked claw (Fig 10)
Coloburiscidae..... *Coloburiscoides*



Fig 9. Tarsal claws of *Tasmanophlebia*



Fig 10. Tarsal claws of *Coloburiscoides*

5a (1) Forewings with few cross veins; CuP of forewing not strongly curved (Fig 11); hind wing present or absent, if present then with few veins and cross veins (Fig 13) 6

5b Forewings with complete venation and numerous cross veins; CuP of forewing strongly curved (Fig. 12); hind wing present usually with complete venation (Fig. 14) 15

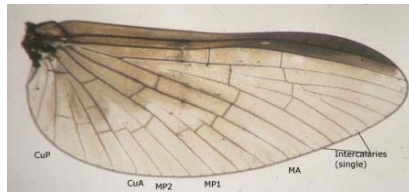


Fig 11. Forewing of *Centropilum*

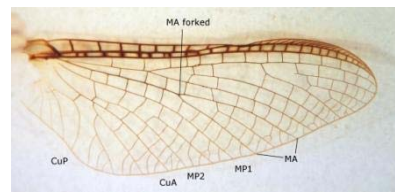


Fig 12. Forewing of *Atalophlebia*



Fig 13. Hindwing of *Offadens*

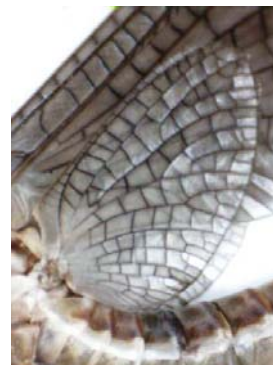


Fig 14. Hindwing of *Coloburiscoides*

6a (5) Forewings with marginal intercalaries between main veins (Fig. 15); pterostigma with cross veins present; hind wings present or absent;Baetidae..... 10

6b Forewings lacking marginal intercalaries between main veins (Fig. 16); pterostigma lacking cross veins..... 7

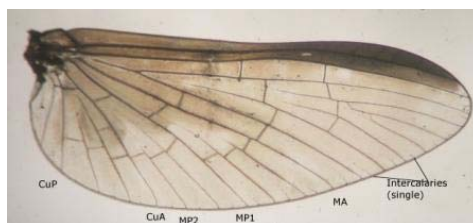


Fig 15 Forewing of *Centropilum*

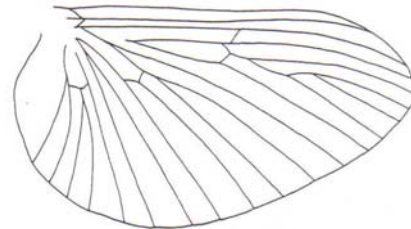


Fig 16. Wing of *Tasmanocoenis*

- 7a (6) Hind wing absent; forewing with MA forked (Fig. 17) Caenidae .. 8
- 7b Hind wing present; hind wing with MA not forked (Fig. 18)
Prosopistomatidae..... *Prosopistoma*

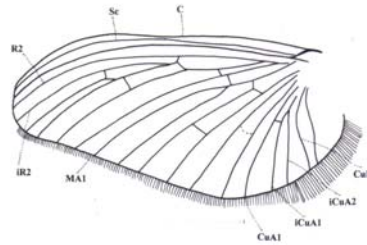
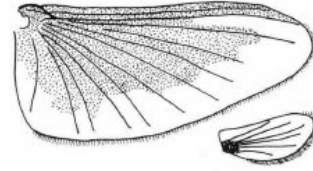


Fig 17. Forewing of *Irpacaenis* with forked MA.



Six longitudinal veins in hindwing

Fig 18. Wings of *Prosopistoma*
 Modified after Campbell and Hubbard (1998)

- 8a (7) Claspers weakly sclerotised, broad and straight, with terminal hook (Fig. 19); styliiger plate and associated sclerites weakly sclerotised; abdominal segments lacking lateral projections *Irpacaenis*
- 8b Claspers strongly sclerotised, narrow, curved to straight, lacking terminal hook (Fig. 20); abdominal segments with or without lateral projections; 9

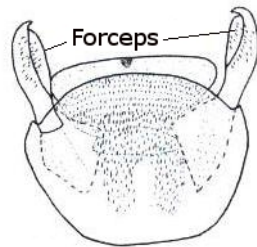


Fig 19. Genitalia of *Irpacaenis*

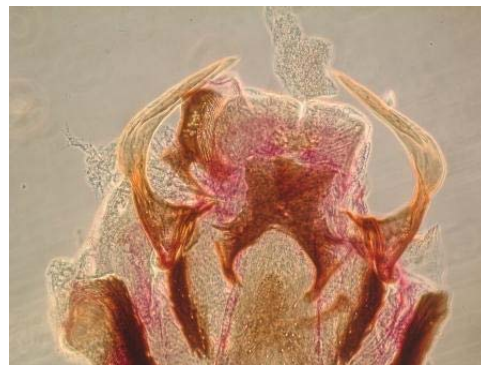


Fig 20. Genitalia of *Tasmanocoenis*

- 9a (8) Abdominal segments lacking lateral projections (Fig. 21)
*Tasmanocoenis*
- 9b Abdominal segments with lateral projections (Fig. 22)
*Wundacaenis*

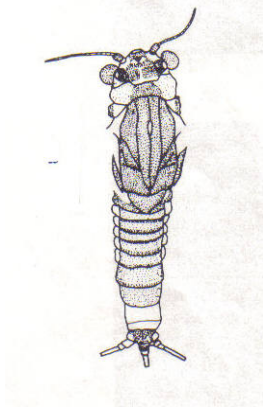


Fig 21. Dorsal view of imago of *Tasmanocoenis*. Modified after Suter (1986).



Fig 22. Dorsal view of imago of *Wundacaenis*. Modified after Suter (1999)

- 10a (6) Hind wing present..... 11
- 10b Hind wing absent..... 12

- 11a (10) Forewings with single intercalaries between main veins (Fig. 23)
*Centroptilum/Offadens*

- 11b Forewings with paired intercalaries between main veins (Fig. 24)
*Offadens/Centroptilum*

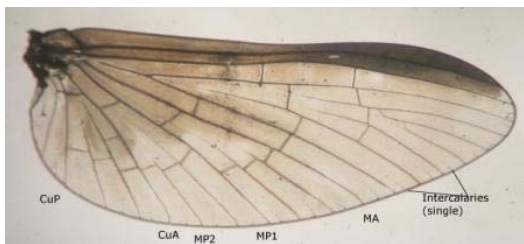


Fig 23. *Centroptilum* forewing with single Intercalaries

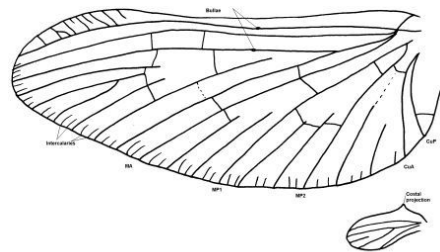


Fig 24. Forewing of *Offadens* with paired intercalaries. Modified after Suter (1986)

- 12a** (10) Forewings with paired intercalaries between main veins (Fig. 24) .. 13
12b Forewings with single intercalaries between main veins (Fig. 25)
*Cloeon*

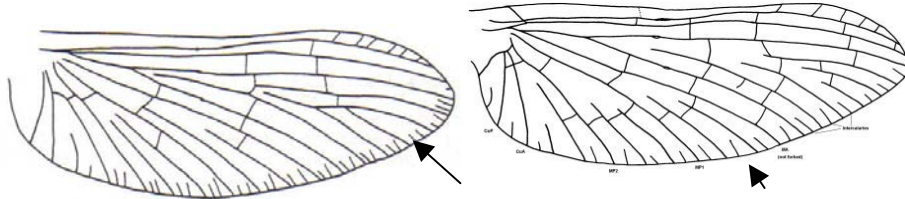
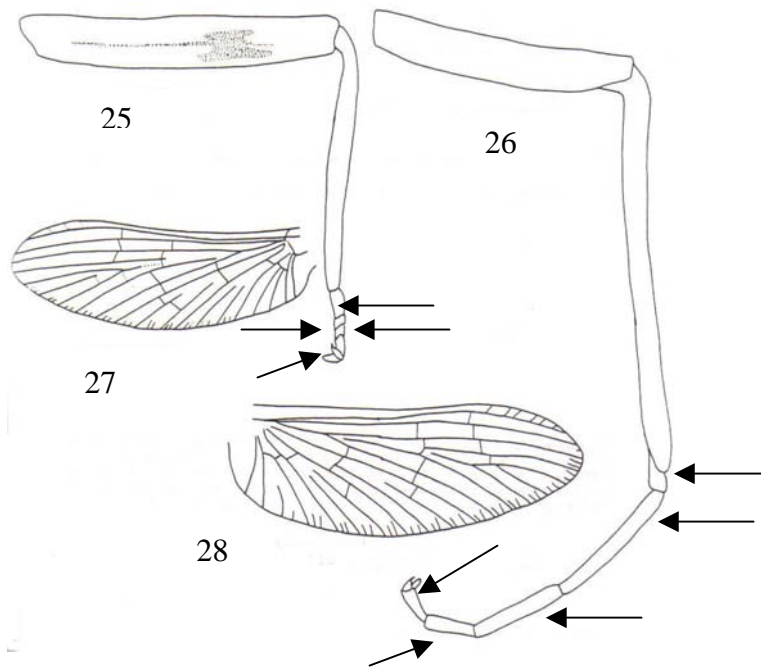


Fig 24. *Pseudocloeon* forewing with paired intercalaries. Modified after Suter (1992)

Fig 25. *Cloeon* forewing with single intercalaries. Modified after Suter (2000).

- 13a** (12) Forelegs with four tarsal segments (Fig. 25); femora of forelegs longer than tibiae; forewing as in Fig. 27 *Platybaetis*
13b Forelegs with five tarsal segments (Fig. 26); femora of foreleg shorter than tibiae; forewing as in Fig. 28 15



Figures 25-28. *Platybaetis* foreleg (25) and forewing (27); *Pseudocloeon* foreleg (26) and forewing (28) with tarsal segments arrowed. Modified after Suter (1992).

- 14a** (13) Turbinate eyes cylindrical and uniform in width, projecting well above head (Fig. 29) *Bungona*
- 14b** Turbinate eyes narrow at base and broad apically (Fig. 30)
..... *Pseudocloeon*

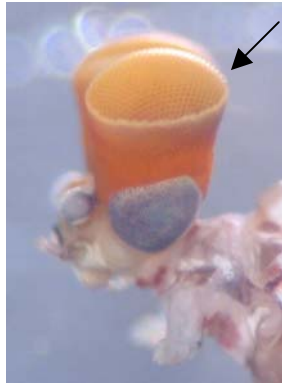


Fig 29. Head and eyes of *Bungona*

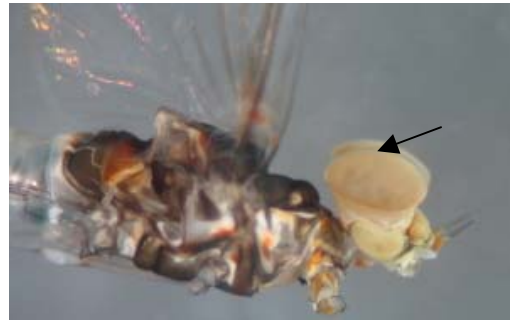


Fig 30 Head and eyes of *Pseudocloeon*.

- 15a** (5) Mesothorax with a pair of long fine filaments (Fig. 31);
intercalaries of forewing free and single *Austremerellidae* ..
..... *Austremerella*
- 15b** Intercalaries of forewing not free, attached to main veins (Fig. 32)
..... *Leptophlebiidae*..... 16

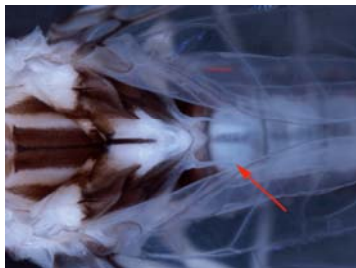


Fig 31 Mesothorax of *Austremerella*
Highlighting filaments

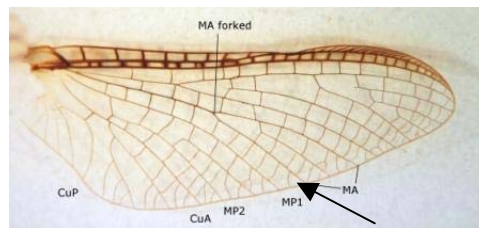


Fig 32. Forewing of *Atalophlebia*
intercalaries not free, attached to main veins

- 16a** (15) Fore tarsal claws similar, slender and hooked (Fig. 33) 17
- 16b** Fore tarsal claws dissimilar, one slender and hooked, one blunt, pad-like (Fig. 34) 27



Fig 33. Tarsal claws similar



Fig 34. Tarsal claws dissimilar

17a (16) Forewing with spots (Fig 35)*Marmenuera*

17b Forewing hyaline lacking spots (Fig 36)18

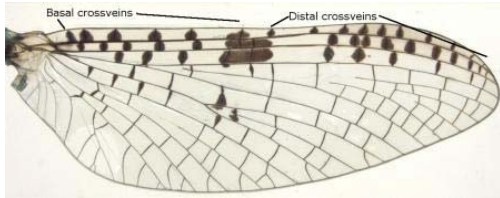


Fig 35. Forewing of *Marmenuera*.

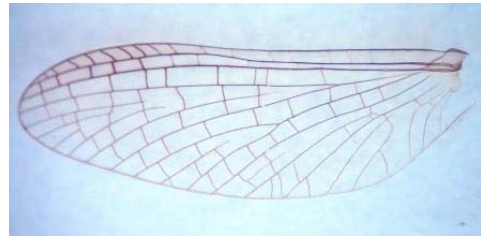


Fig 36. Forewing of *Nousia*.

18a (17) Hind wing small (0.1-0.15x forewing length) (Fig. 37), with large costal projection, MP of hind wing lacking intercalary (Fig. 39); penes fused in basal half, with apical sclerotised curved spines

.....*Nyungara*

18b Hind wing larger (>0.15x forewing length) (Fig. 38), lacking costal projection, MP of hind wing with or without intercalary (Fig. 40); penes separate or fused, with or without sclerotised structures

..... 19

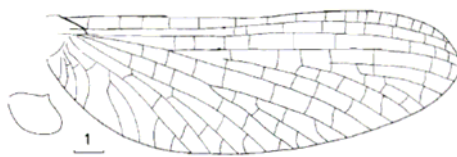


Fig 37. Fore and hind wing of *Nyungara* modified after Dean (1987)

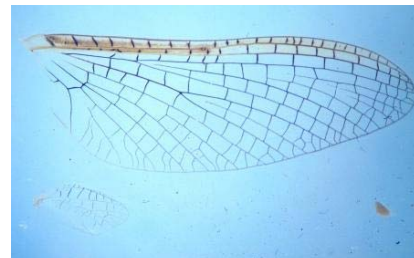


Fig 38. Fore and hind wing of *Jappa*

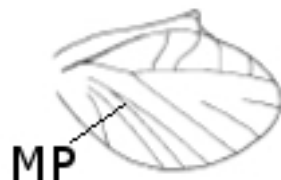


Fig 39 Hind wing of *Nyungara* MP without intercalary - modified after Dean (1987)

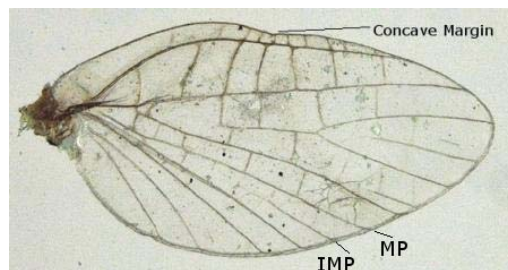


Fig 40. Hind wing of *Loamaggalanga*

19a (18) Forewing appear to lack costal crossveins basal to bullae (they may be present but very faint), ICu1 and ICu2 parallel at wing margins (Fig. 41); costal margin of hindwing convex, with 2-4 costal crossveins, and 3-4 subcostal crossveins; penes fused in basal third (Fig. 43)
 *Thraulophlebia* and *Koornonga*

19b Forewing with obvious costal cross veins basal to bullae, ICu1 and ICu2 divergent to almost parallel at wing margin (Fig. 42); costal margin of hind wing concave or convex, with >four costal and subcostal crossveins; penes separate or fused over more than half length (Fig. 44 and 45) 20

No basal cross veins

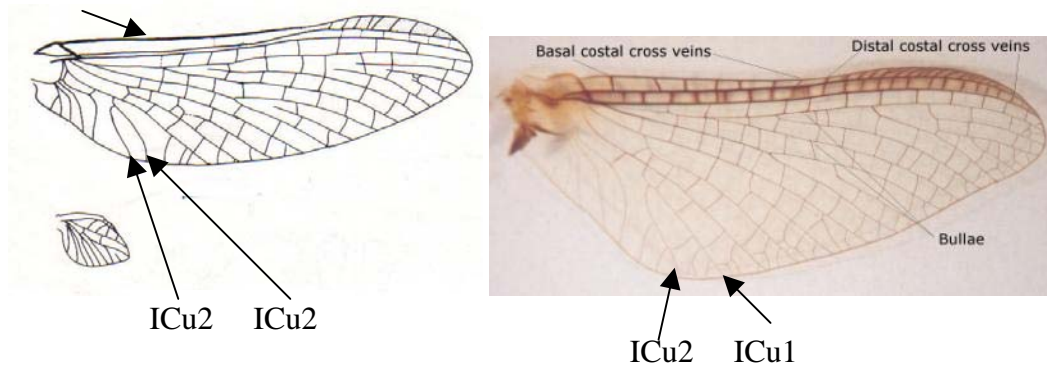


Fig 41. Fore and hind wing of *Koornonga*. Fig 42. Forewing of *Atalophlebia*.
 Modified after Suter (1986).

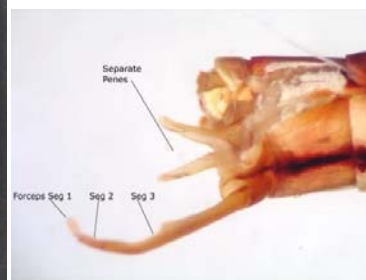


Fig 43. Genitalia of *Koornonga*
 Penes fused basal third.
 Modified after Suter (1986).

Fig 44. Genitalia of *Atalophlebia*
 Penes fused over whole length

Fig 45. Genitalia of *Jappa*.
 Separate penes.

- 20a** (19) Costal margin of hind wing concave near mid length (Fig. 46) 21
- 20b** Costal margin of hind wing convex with raised costal projection in basal half (Fig. 47) 24

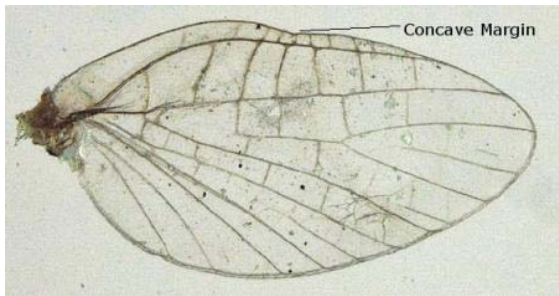


Fig 46. *Loamaggalangta* hindwing.

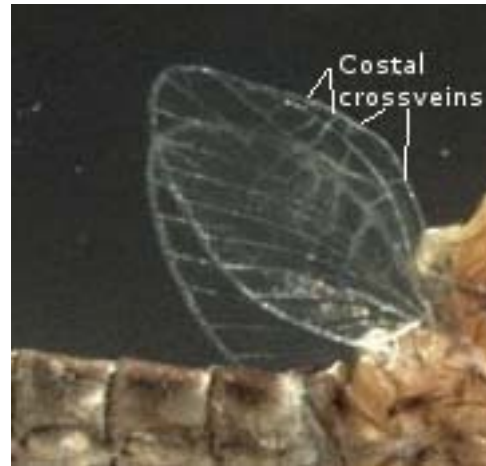


Fig 47. *Manggabora* hindwing.

- 21a** (20) Pterostigma of forewing translucent not pigmented, ICu1 and ICu2 parallel or converging at wing margin, ICu1 attached to CuA-CuP cross vein (Fig. 48); penes slender, fused along whole length with minute spines over apical surface *Loamaggalangta*
- 21b** Pterostigma of forewing translucent or pigmented, ICu1 and ICu2 divergent at wing margin, ICu1 attached by crossvein to CuA (Fig. 49); penes robust, fused or separate 22

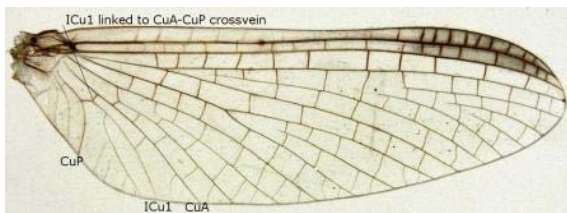


Fig 48. *Loamaggalangta* forewing

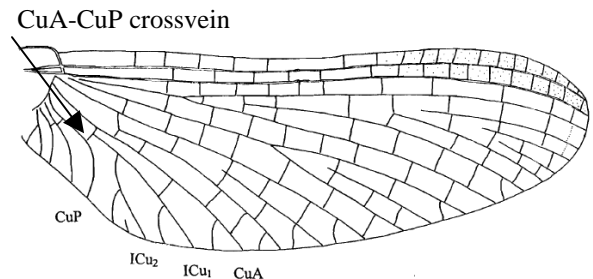


Fig 49. Forewing of *Kaninga* modified after Dean (2000)

- 22a (21)** Pterostigma of forewing tinged with brown, ICu1 not linked to CuP by cross vein (Fig. 50); penes separate over whole length, with sclerotised processes *Garinjuga*
- 22b** Pterostigma of forewing translucent, tinged with white, ICu1 linked to CuA and CuP by crossveins (Fig. 51); penes fused over at least half length, lacking sclerotised processes 23

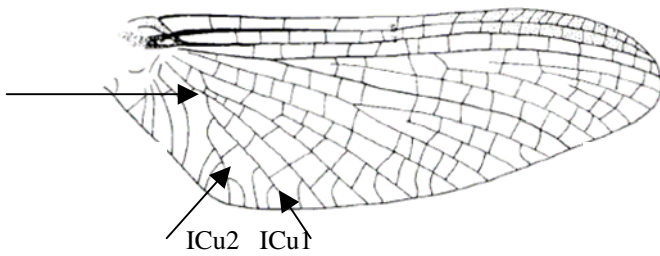


Fig 50. Forewing of *Garinjuga* with divergent ICu1 and ICu2, ICu1 not attached to CuA-CuP crossvein indicated.

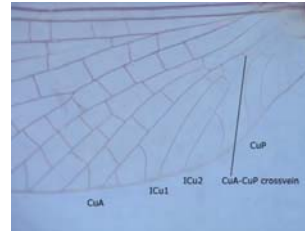


Fig 51. ICu1 and ICu2 parallel, ICu1 attached to CuA-CuP crossvein

- 23a (22)** Pterostigma of forewing with >20 complex (anastomosed) crossveins (Fig. 52); penes with angular apical lobes and minute spines over apical half*Bibulmena*

- 23b** Pterostigma of forewing with <15 simple crossveins (Fig. 53); penes with fleshy lobes, lacking minute spines and not angular at apex *Kaninga*

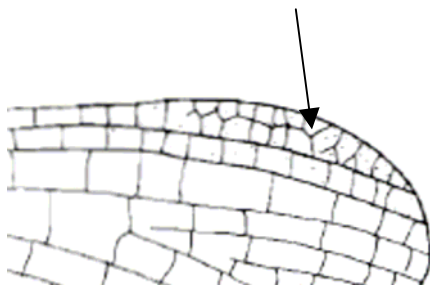


Fig 52. Anastomosed crossveins in pterostigma of *Bibulmena* indicated (modified after Dean 1987).

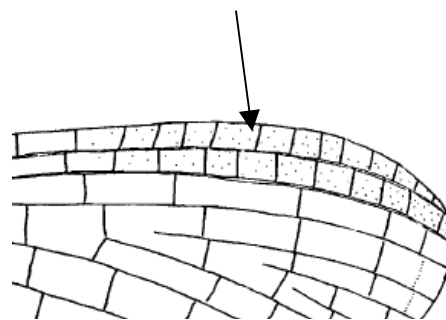


Fig. 53. Simple crossveins in pterostigma of *Kaninga* (modified after Dean 2000).

- 24a** (20) Penes with obvious apical sclerotised spines (Fig. 54); tarsal claws with only one opposing flange *Atalomicria*
- 24b** Penes lacking obvious apical spines (Fig. 55); tarsal claws each with opposing flange 25



Fig 54. *Atalomicria* genitalia lateral view. with spines

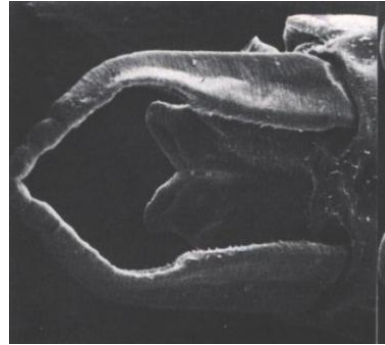


Fig 55. Penes of *Atalophlebia* ventral view. lacking spines

- 25a** (24) Pterostigma of forewing with complex (anastomosed) or simple crossveins, costal and subcostal crossveins pigmented, usually >17 costal crossveins distal of bullae (Fig. 56) *Atalophlebia*
- 25b** Pterostigma of forewing with simple crossveins, costal and subcostal crossveins not pigmented, usually <15 costal crossveins distal of bullae (Fig. 57) 26

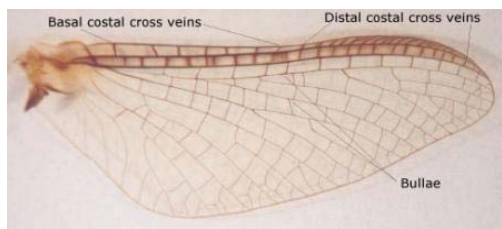


Fig 56. Forewing of *Atalophlebia*

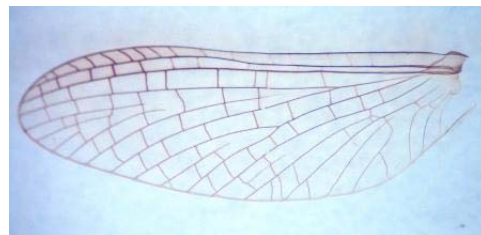


Fig 57. Forewing of *Nousia*.

26a (25) Hind wing with > six costal and subcostal crossveins, MP forked with intercalary (Fig. 58); forewing with ICu1 linked to CuA, ICu1 and ICu2 divergent at wing margin (Fig. 58); penes fused over whole length (Fig. 59)..... *Kalbaybaria*

26b Hind wing with < four costal and subcostal crossveins, MP forked without intercalary (Fig. 60); forewing with ICu1 linked to CuA by crossvein, ICu1 and ICu2 parallel at wing margin (Fig 61); penes fused 0.6x length, but may appear fused over whole length

..... *Nousia*

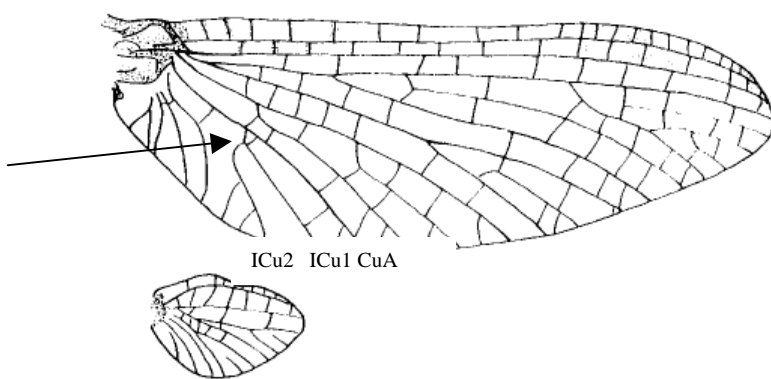


Fig 58. Fore and hind wing of *Kalbaybaria* with forked MP indicated and ICu1 linked to CuA indicated modified after Campbell (1993).

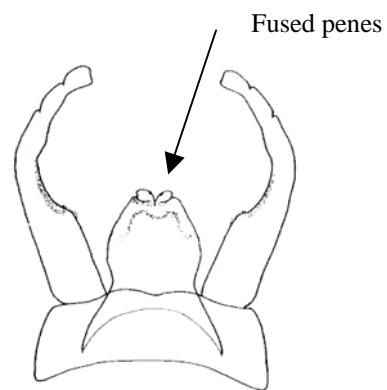
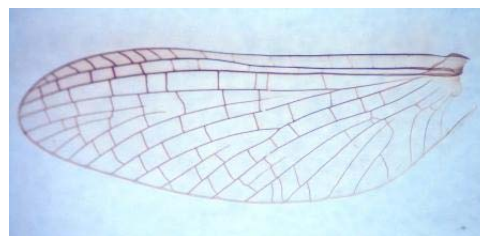
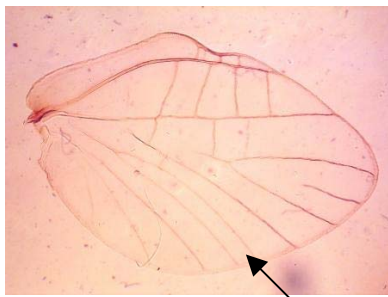


Fig 59. Genitalia of *Kalbaybaria* with fused penes modified after Campbell (1993).



MP

CuA ICu1 ICu2

Fig 60. Hindwing of *Nousia*

Fig 61. Forewing of *Nousia*.

- 27a (16)** Hind wing with large costal projection, venation reduced with only one costal and subcostal crossvein (Fig. 62) *Thraulus*
- 27b** Hind wing lacking large costal projection and with > four costal and > five subcostal crossveins (Fig. 63) 28

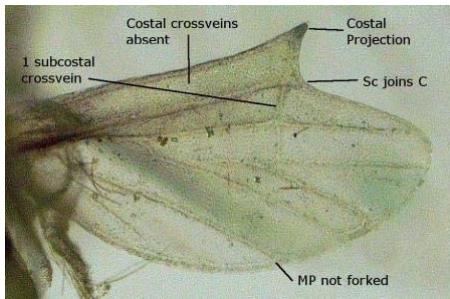


Fig 62. Hindwing of *Thraulus*.



Fig 63. Hindwing of *Jappa*.

- 28a (27)** Penes fused over part of length, greater than half length (Fig. 64) 29
- 28b** Penes separate over greater than half length (Fig. 65) 31



Fig 64. Genitalia of *Manggabora* ventral view.



Fig 65. Genitalia of *Jappa* ventral view.

- 29a (28)** Costal space of forewing basal to bullae lacking crossveins, if present very weakly developed and difficult to see, distally with <10 crossveins (Fig. 66); MP of hind wing lacking an intercalary (Fig. 68).....30
- 29b** Costal space of forewing basal to bullae with six to eight crossveins, distally with > 10 crossveins (Fig. 67); MP of hind wing with an intercalary (Fig. 69); penes lacking a ventral projection
.....*Austrophlebioides*

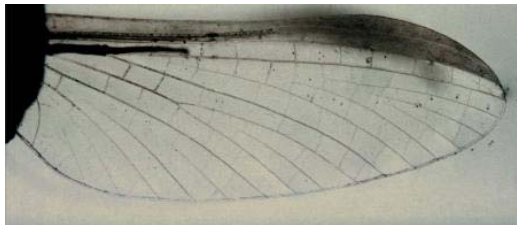


Fig 66. Forewing of *Manggabora* lacking basal costal crossveins.

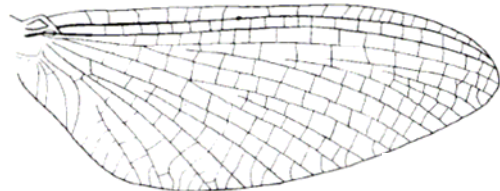


Fig 67. Forewing of *Austrophlebioides* with basal costal crossveins (modified after Campbell and Suter (1986).

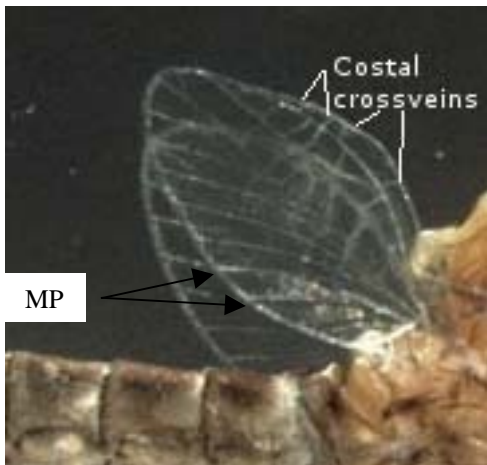


Fig 68. Hindwings of *Manggabora* with MP lacking intercalary indicated.

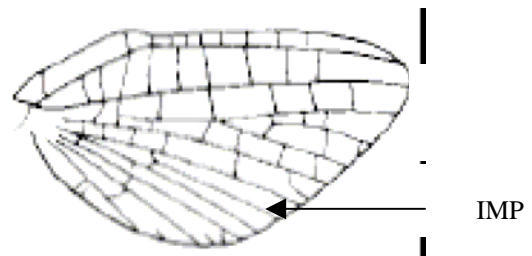


Fig 69. Hindwing of *Austrophlebioides* with an intercalary in MP. Modified after Campbell and Suter (1988).

- 30a** (29) Penes with sharp apical spines and lacking ventral projection; styliger plate deeply cleft *Riekophlebia*
- 30b** Penes with ventral projection (Fig. 70); styliger plate not deeply cleft *Manggabora*



Fig 70. Lateral view of penes of *Manggabora*.

- 31a** (28) Penes with spines at base or apex (Fig. 71) *Tillyardophlebia*
- 31b** Penes lacking spines (Fig. 72) 32

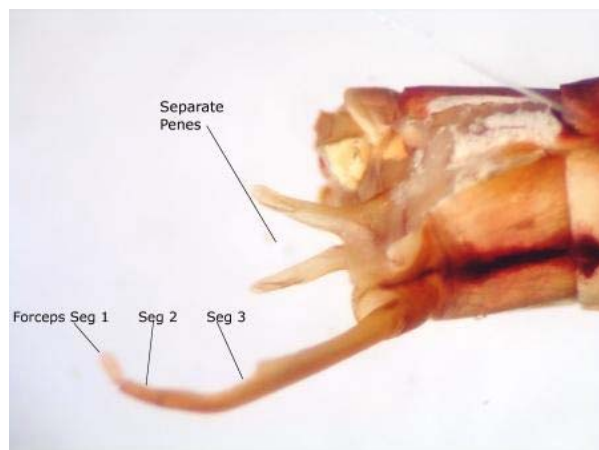
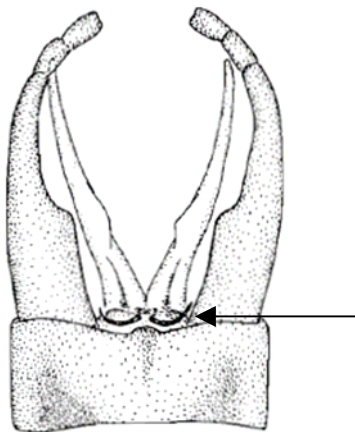


Fig 71. Ventral view of genitalia of *Tillyardophlebia* with spines indicated modified after Dean (1997).

Fig 72. Ventral view of genitalia of *Jappa*.

- 32a (31)** Costal space of forewing basal to bullae lacking crossveins, if present very weakly developed and difficult to see (Fig. 73); apex of penes hooked *Neboissophlebia*
- 32b** Costal space of forewing basal to bullae with six to eight crossveins (Fig. 74); penes simple or with a small ventral knob only 33

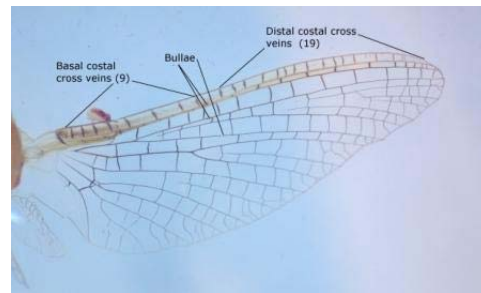
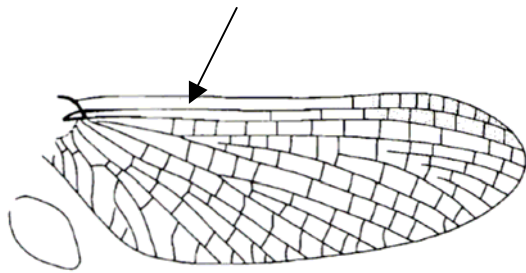


Fig 73. Forewing of *Neboissophlebia* modified after Dean (1988) showing absence of basal costal crossveins.

Fig 74. Forewing of *Jappa*.

- 33a (32)** MP of hind wing forked with intercalary present (Fig. 75); penes with ventral medial knob *Kirrara*
- 33b** MP of hind wing if forked lacking an intercalary (Fig. 76); penes simple lacking ventral projections 34

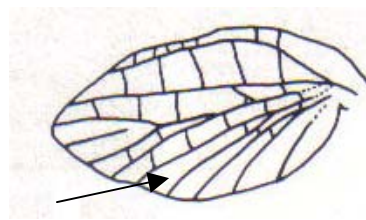
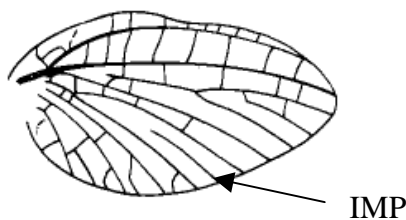


Fig 75. Hind wing of *Kirrara* with Intercalary indicated Modified after Campbell and Peters (1986).

Fig 76. Hindwing of *Ulmerophlebia* lack of intercalary (IMP) indicated Modified after Suter (1986).

- 34a** (33) Sc of hind wing joins costal margin at 0.75 wing length (Fig. 77);
penes short and separate (Fig. 78) *Ulmerophlebia*
- 34b** Sc of hind wing joins costal margin at >0.8 wing length (Fig. 79);
penes long and separate (Fig. 80) *Jappa*

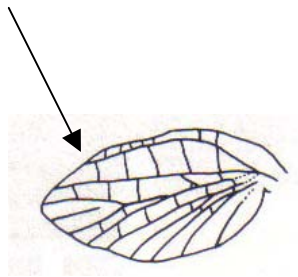


Fig 77. Hind wing of *Ulmerophlebia* with Sc joining costal margin shown. (Modified after Suter 1986).

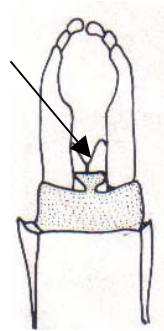


Fig 78. Genitalia of *Ulmerophlebia*. (Modified after Suter 1986)

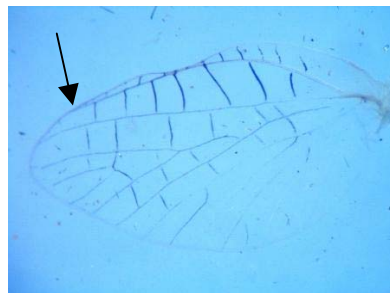


Fig 79. Hind wing of *Jappa* with Sc joining costal margin shown



Fig 82. Genitalia of *Jappa*

References

- Campbell IC (1993) A new genus and species of leptophlebiid mayfly (Ephemeroptera: Leptophlebiidae: Atalophlebiinae) from tropical Australia. *Aquatic Insects* **15**, 159-167.
- Campbell IC, Hubbard MD (1998) A New Species of *Prosopistoma* (Ephemeroptera, Prosopistomatidae) from Australia. *Aquatic Insects* **20**, 141-148.
- Campbell IC, Peters WL (1993) A revision of the Australian Ephemeroptera Genus *Atalomicria* Harker (Leptophlebiidae: Atalophlebiinae). *Aquatic Insects* **15**, 89-107.
- Campbell IC, Suter PJ (1988) Three new genera, a new subgenus and a new species of Leptophlebiidae (Ephemeroptera) from Australia. *Journal of the Australian Entomological Society* **27**, 259-273.
- Christidis F (2009) *Riekophlebia crocina*, a new genus and species of Atalophlebiinae (Ephemeroptera: Leptophlebiidae) from the wet tropics bioregion of north-eastern Australia. *Zootaxa* **2063**, 64-68.
- Dean JC (1988) Description of a new genus of Leptophlebiid mayfly from Australia (Ephemeroptera: Leptophlebiidae: Atalophlebiinae). *Proceedings of the Royal Society of Victoria* **100**, 39-45.
- Dean JC (1997) Descriptions of New Leptophlebiidae (Insecta: Ephemeroptera from Australia. I. *Tillyardophlebia* gen. nov. *Memoirs of the Museum of Victoria* **56**, 83-89.
- Dean JC (2000) Description of new Leptophlebiidae (Insecta: Ephemeroptera) from Australia. II. Kaninga, a new monotypic genus from south-western Australia. *Records of the Western Australian Museum* **20**, 87-94.
- Dean JC, Forteach GNR, Osborn AW (1999) *Loamaggalangta pedderensis* gen. & sp. nov.: A new mayfly from Tasmania (Ephemeroptera: Leptophlebiidae: Atalophlebiinae). *Australian Journal of Entomology* **38**, 72-76.
- Dean JC, Forteach GNR, Osborn AW (2008) *Marmenuera*, a new genus of leptophlebiid mayfly (Insecta: Ephemeroptera). *Memoirs of the Museum of Victoria* **65**, 43-50.
- Dean JC, Suter PJ (2004) Descriptions of new species and a new genus of leptophlebiid mayflies (Insecta: Ephemeroptera) from the Northern Territory, Australia. *Memoirs of the Museum of Victoria* **61**, 111-118.
- Finlay KJ (2000) Description and distribution of a new species of *Nousia* Navas (Ephemeroptera: Leptophlebiidae: Atalophlebiinae) from south-eastern Australia. *Australian Journal of Entomology* **39**, 111-117.

- Harker JE (1950) Australian Ephemeroptera. Part 1. Taxonomy of New South Wales species and evaluation of taxonomic features. *Proceedings of the Linnean Society of New South Wales* **75**, 1-34.
- Harker JE (1954) The Ephemeroptera of Australia. *Transactions of the Entomological Society of London* **105**, 241-268.
- Harker JE (1957) Some new Australian Ephemeroptera. *Proceedings of the Royal Entomological Society of London Series B* **26**, 63-78.
- Lugo-Ortiz CR, McCafferty WP, Waltz RD (1999) Definition and reorganization of the genus *Pseudocloeon* (Ephemeroptera: Baetidae) with new species descriptions and combinations. *Transactions of the American Entomological Society* **125**, 1-37.
- Lugo-Ortiz CR, McCafferty WP (1998) *Offadens*, a New Genus of Small Minnow Mayflies (Ephemeroptera, Baetidae) from Australia. *Proceedings of the Entomological Society of Washington* **100**, 306-309.
- Lugo-Ortiz CR, McCafferty WP (1999) *Edmundsiops instigatus*: A new genus and species of small minnow mayflies (Ephemeroptera : Baetidae) from Australia. *Entomological News* **110**, 65-69.
- Riek EF (1955) Revision of the Australian Mayflies (Ephemeroptera) I. Subfamily Siphonuridae. *Australian Journal of Zoology* **3**, 266-280.
- Riek EF (1963) An Australian mayfly of the family Ephemerellidae (Ephemeroptera). *Journal of the Entomological Society of Queensland* **2**, 48-50.
- Suter PJ (1984) A re-description of the genus *Tasmanocoenis* Lestage (Ephemeropter: Caenidae) from Australia. *Transactions of the Royal Society of South Australia* **108**, 105-111.
- Suter PJ (1986) The Ephemeroptera (Mayflies) of South Australia. *Records of the South Australian Museum* **19**, 339-397.
- Suter PJ (1992) 'Taxonomic key to the Ephemeroptera (Mayflies) of the Alligator Rivers Region, Northern Territory. Open File Record 96.' (Supervising Scientist for the Alligator Rivers Region: Sydney)
- Suter PJ (1993) *Wundacaenis*, a new genus of Caenidae (Insecta: Ephemeroptera) from Australia. *Invertebrate Taxonomy* **7**, 787-803.
- Suter PJ (1999) *Irpacaenis*, a new genus of Caenidae (Ephemeroptera) from Australia. *Australian Journal of Entomology* **38**, 159-167.
- Suter PJ (2000) *Edmundsiops hickmani* sp. nov., *Offadens frater* (Tillyard) nov. comb. and description of the nymph of *Cloeon tasmaniae* Tillyard (Ephemeroptera: Baetidae) from Tasmania. *Papers and Proceedings of the Royal Society of Tasmania* **134**, 63-74.

Suter PJ (2001) *Platybaetis gagadjuensis*, a new species from Northern Australia (Ephemeroptera: Baetidae). In 'Trends in Research in Ephemeroptera and Plecoptera'. (Ed. E Dominguez) pp. 359-364. (Kluwer Academic/Plenum Publishers: New York)

Suter PJ, Pearson MJ (2001) Redescription of *Bungona* Harker with new synonyms in the Australian Baetidae (Insecta: Ephemeroptera). *Memoirs of Museum Victoria* **58**, 247-254.

Suter PJ, Mynott JH (2013) The first record and description of a male imago of *Austremerella picta* Riek (Ephemeroptera: Ephemerellidae). *Australian Entomologist* **40**, 237-242.

Tillyard RJ (1933) The mayflies of the Mount Kosciusko region. I. (Plectoptera.) Introduction and Family Siphonuridae. *Proceedings of the Linnean Society of New South Wales* **58**, 1-32.

Tillyard RJ (1934) The Trout-Food Insects of Tasmania Part I.-A Study of the genotype of the mayfly genus *Atalophlebia* and its life history. *Papers and Proceedings of the Royal Society of Tasmania* **1933**, 1-16.

Tillyard RJ (1936) The Trout-Food Insects of Tasmania Part II.-A Monograph of the Mayflies of Tasmania. *Paper and Proceedings of the Royal Society of Tasmania* **1935**, 23-60.

Ulmer G (1916) Results of Dr E. Mjöberg's Swedish Scientific Expedition to Australia 6. Ephemeroptera. *Arkiv für Zoologi* **10**, 2-18.

Ulmer G (1919) Neue Ephemeroptera. *Arch. Naturgesch.* **85**, 1-80.