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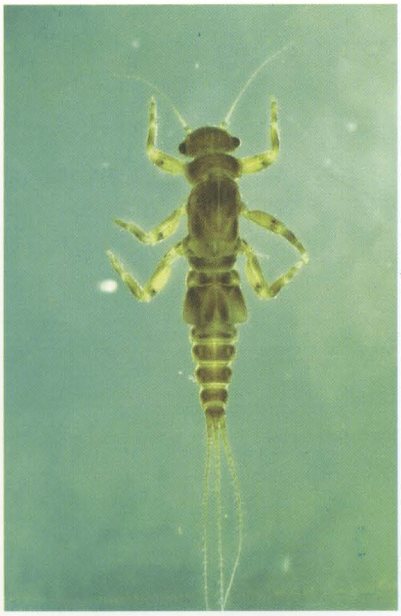

Phillip J. Suter

Identification Guide No. 23

COOPERATIVE RESEARCH CENTRE FOR FRESHWATER ECOLOGY

The Murray-Darling Freshwater Research Centre

With compliments
Phil

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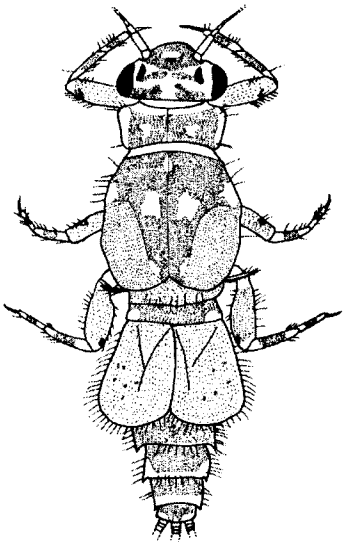

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Front Cover: Left Caenid Genus C, nymph
Right: *Wundacaenis dostini*, nymph.
Photographs by John H. Hawking

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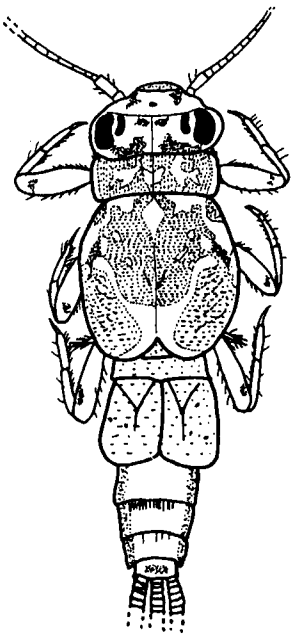


Illustrations. Page 1. *Tasmanocoenis* sp J.
Page 2. *Tasmanocoenis* sp D.

INTRODUCTION

The Caenidae is the third largest family of mayflies in Australia with only the Leptophlebiidae and Baetidae having more described and undescribed genera and species. They are small mayflies, usually less than 6mm long and the nymphs are sprawling "grub-like" insects, brown in colour with a distinctive operculate gill on the second abdominal segment. Family characteristics are given by Dean and Suter (1996).

Only two genera are described from Australia (*Tasmanocoenis* Lestage with 6 species, and *Wundacaenis* Suter with 3 species). In 1996 Dean and Suter provided a key to genera of the Caenidae which recognised 5 genera in this family. Since then more material has been examined from throughout Australia and a number of direct associations of nymphs with adults has enabled a greater understanding about the relationships between the different groups assigned to the genera by Dean and Suter (1996). It is now clear that the material assigned to Genus B by Dean and Suter (1996) represents a single species that on adult characters belongs in the genus *Tasmanocoenis*. Similarly, Genus D and Genus C (Dean and Suter 1996) are here combined on the basis of both adult and nymphal characters determined from direct association of these two life stages. Consequently the present work recognises only three genera of Caenid mayfly in Australia, *Tasmanocoenis* Lestage, *Wundacaenis* Suter and Caenid Genus C.

In the present study 25 species are recorded with 24 of these included in the following key. Only *Tasmanocoenis jillongi* Harker is not included. This species remains unknown and although Harker (1957) includes both nymphal and adult descriptions based on material from Kuringae Chase (*sic.*) (Harker 1957) (presumably Ku -Ring-Gai Chase National Park) it remains unclear whether these stages were directly associated or merely collected from the one locality. The adult description is certainly of a species that should be assigned to *Tasmanocoenis*. However, the nymphal characters (ie. long third segment of the maxillary palp and a rectangular second gill) suggest the nymph belongs in Genus C. Harker (1957) notes that the body is covered in hairs, a characteristic not found in Genus C. The types were deposited in the British Museum of Natural History, but they are not recorded in the collection.

In addition to the problem with *T. jillongi* Harker, there is also difficulty in distinguishing between *T. tillyardi* (Lestage) and *T. queenslandica* (Soldan). The only apparent differences between the two species are morphometric characters. These are used in the key, but only one specimen of *T. queenslandica*, from the type series, has been examined and so the morphometric differences do not allow for a range of variation. Certainly the characters do overlap the range determined for *T. tillyardi*. It is highly likely that the two species are the same and *T. queenslandica* is a junior synonym of *T. tillyardi*. Further work on specimens from Queensland is required to establish the status of *T. queenslandica*.

The following key enables the identification of late instar caenid species. It is possible in many cases to be able to identify earlier instars, but difficulties may occur. In addition there may be some taxa currently not recognised which will key out to one of the species in this key, although not possessing characteristics of the species. In an attempt to overcome these problems a character matrix is provided at the end of the traditional dichotomous key (Appendix 1) to assist in identification of the different species recognised at this time.

MATERIAL EXAMINED

Much of the material examined during this study were from the collection of the Museum of Victoria; collections made by the State programs of the Monitoring River Health Initiative (MRHI); the Murray-Darling Basin Commission's biological monitoring program and the Office of the Alligator Rivers Region biological monitoring program (see Suter 1992). A large number of sites from Victoria, South Australia, Tasmania and Queensland have been examined but New South Wales, Western Australia and Northern Territory are restricted to a few regional localities only. Clearly examination of all the material collected during the MRHI program would extend the known distributions, and may also reveal further species. As noted by Dean (1999) there is a large quantity of preserved material held throughout collections in Australia which should be examined in greater detail than merely identification to family only. This material indeed warrants further study.

Terminology used throughout the key is after Provonsha (1990) and Malzacher (1984 and 1986).

CHECKLIST AND DISTRIBUTION OF AUSTRALIAN CAENID SPECIES

Tasmanocoenis Lestage, 1930	All states and territories, Christmas Is.
T. tonnoiri Lestage, 1930	Tas, Vic, Southern NSW.
T. tillyardi (Lestage, 1938)	Tas, Vic, NSW, SA, Southwest WA, Christmas Is.
T. arcuata Alba-Tercedor and Suter, 1990	SA, NSW, NT. Northwest WA, Qld.
T. queenslandica (Soldan, 1978)	Qld. (Type locality-near Rockhampton)
T. rieki (Soldan, 1978)	NSW (Type locality-Nerolyn Reservoir).
T. jillongi Harker, 1957	NSW (Type locality-Kuringae Chase).
Tasmanocoenis sp B	Tas, Vic, NSW, Qld.
Tasmanocoenis sp D	NT, Qld.
Tasmanocoenis sp E	NT, Qld.
Tasmanocoenis sp G	NT, Qld.
Tasmanocoenis sp H	NT, Qld.

Tasmanocoenis sp J	NT, Qld.
Tasmanocoenis sp L	NT, Qld.
Tasmanocoenis sp M	NT, Qld.
Tasmanocoenis sp N	Qld.
Tasmanocoenis sp P	Qld.
Tasmanocoenis sp Q	Qld.
Wundacaenis Suter, 1993	Northwest WA, NT, Qld, NSW, Vic.
W. dostini Suter, 1993	Northwest WA, NT, Qld, NSW.
W. angulata Suter, 1993	Qld.
W. flabellum Suter, 1993	NSW.
Caenid Genus C	Qld, NSW, Vic.
Caenid Genus C sp A	Qld, NSW, Vic.
Caenid Genus C sp B	Qld.
Caenid Genus C sp C	Qld, Vic. probably NSW
Caenid Genus C sp D	Vic.
Caenid Genus C sp E	Qld.

Key to Species of Mature Nymphs of Australian Caenidae

1. Mesothorax with distinct lateral lobes (Fig. 1, arrowed); 9th sternite produced posteriorly, with a truncated triangular projection, concave apically (Fig. 3) .....**Wundacaenis** 2

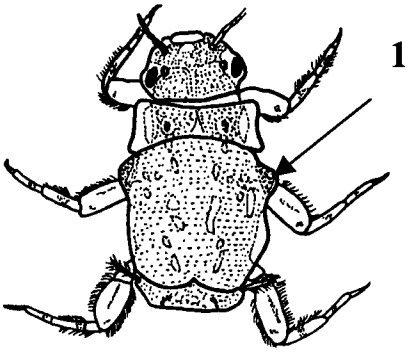
> ***Wundacaenis* Diagnosis**: Mesonotum with distinct rounded or angular lobes on anterolateral margins; head without distinct lobes beneath antennae; tuft of setae near anterior margin of eye absent; seta absent on abdominal segment 1; sternite of abdominal segment IX triangular with posterior margin truncated; postero-lateral spines on abdomen well developed; gill cover with mesal ridge extending almost to posterior margin; body, legs and gill cover with complex anastomosed microtrichia; tibiae and tarsi banded; fore femora lacking a well developed transverse row of setae; tarsal claws with <6 basal teeth, hind tarsal claw may have a comb of bristles. (3 spp described).

\- Mesothorax without lateral lobes (Fig. 2); 9th sternite not produced posteriorly, usually convex (Fig. 4) 4

2.(1) Mesonotum with an angular projection on the anterior margin (Fig. 5); coxae of mid and hind legs with angular projections (Fig. 7, arrowed) ..... ***Wundacaenis angulata*** Suter

Mesonotum with rounded lobes on anterior margins (Fig. 6); coxae of mid legs lacking angular projections 3

Figure 1. Head and thorax of ***Wundacaenis dostini.***
Figure 2. Head and thorax of ***Tasmanocoenis arcuata.***
Figure 3. Ventral view of 9th sternite of ***Wundacaenis dostini.***
Figure 4. Ventral view of 9th sternite of ***Tasmanocoenis arcuata.***
Figure 5. Angular projection on the mesonotum of ***Wundacaenis angulata.***
Figure 6. Rounded projection on mesonotum of ***Wundacaenis dostini.***
Figure 7. Mid and hind legs of ***Wundacaenis angulata*** showing coxal projections.



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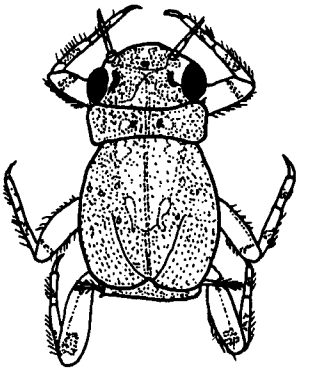

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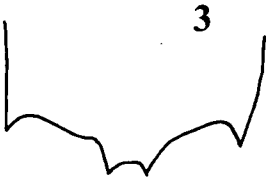

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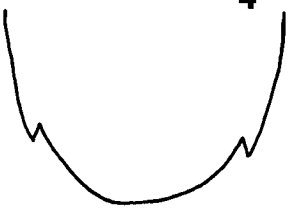

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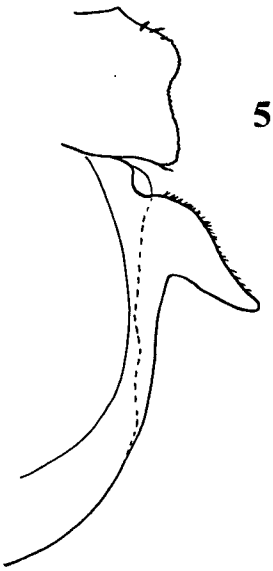

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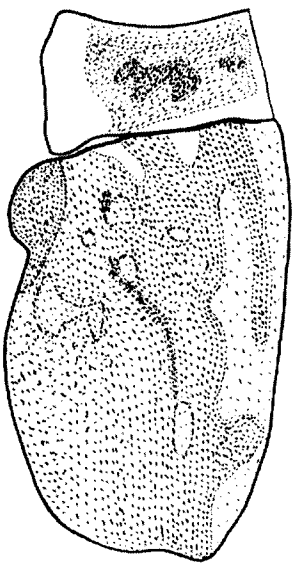

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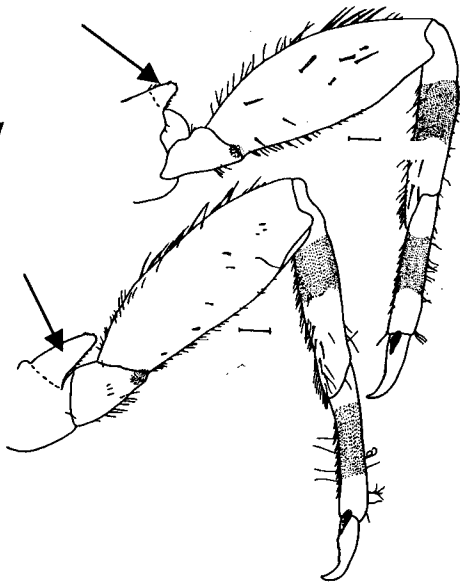

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3.(2) Mesonotal lobes small (Fig. 8); fore femora with longitudinal row of setae (Fig. 10); coxae of all legs lacking projections; hind tarsal claw with only one type of proximal teeth; body, gill covers, mid and hind femora with round complex microtrichia (Fig 13); mesal fork of triangular ridge of gill cover lined with short spines (Fig. 13)..... ***Wundacaenis dostini*** Suter

Mesonotal lobes large (Fig. 9); fore femora with transverse row of setae (Fig. 11); coxae of hind legs with a projection (Fig. 12); hind tarsal claws with 2 types of teeth; body, gill covers, mid and hind femora with fan-like, complex microtrichia; mesal fork of triangular ridge of gill cover lined with stalked microtrichia (Fig. 14) ..... ***Wundacaenis flabellum*** Suter

Figure 8. Rounded projection on mesonotum of ***Wundacaenis dostini***.
Figure 9. Rounded projection on mesonotum of ***Wundacaenis flabellum***.
Figure 10. Fore leg of ***Wundacaenis dostini*** showing longitudinal row of setae on the femur.
Figure 11. Fore leg of ***Wundacaenis flabellum*** showing transverse row of setae on the femur.
Figure 12. Hind leg of ***Wundacaenis flabellum*** showing coxal projection.
Figure 13. Gill cover, enlarged mesal ridge and microtrichia of ***Wundacaenis dostini***.
Figure 14. Gill cover, enlarged mesal ridge and stalked microtrichia of ***Wundacaenis flabellum.***

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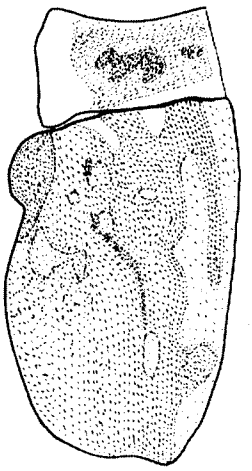

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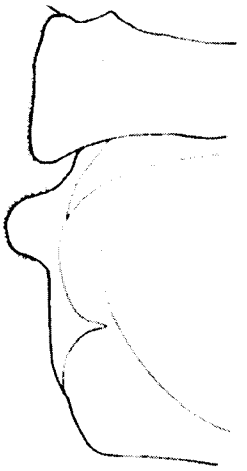

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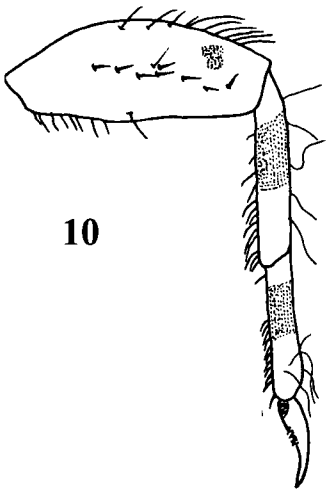

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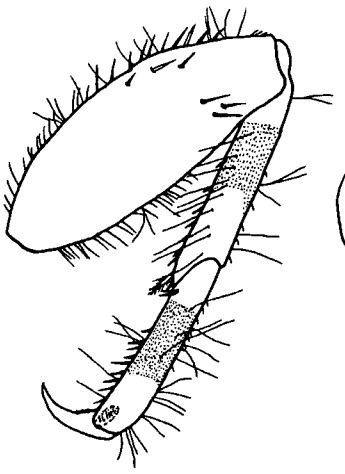

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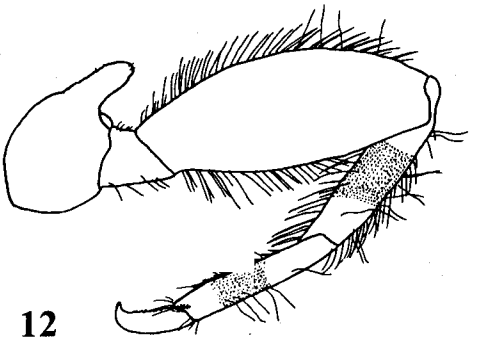

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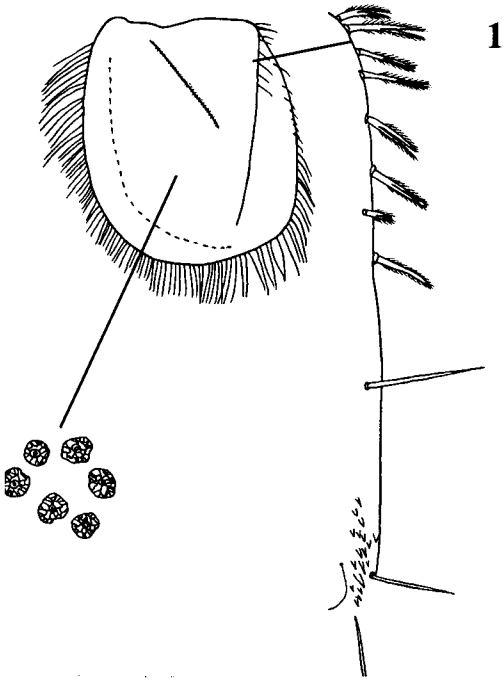

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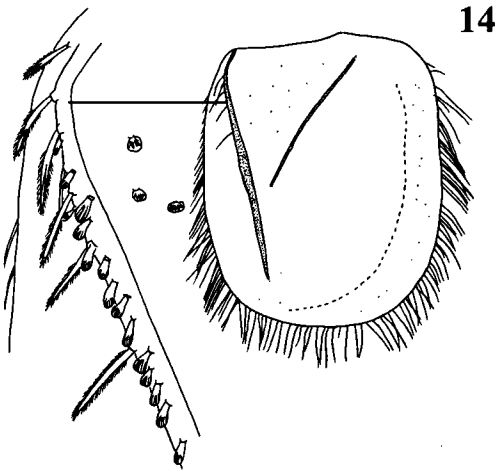


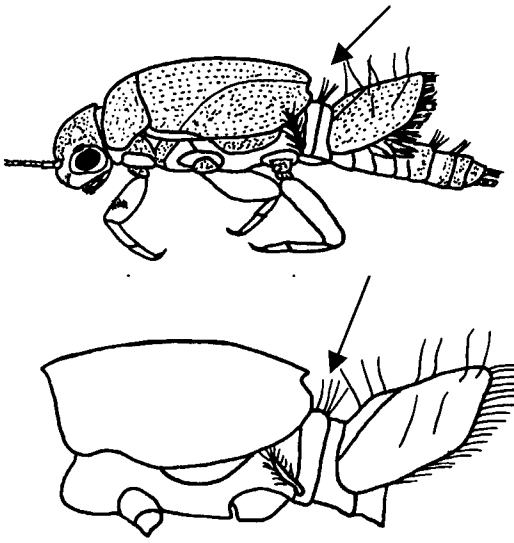
4.(1) First abdominal tergite with setae (Fig. 15, arrowed); gill covers usually with long setae (visible in specimens >1mm long) .....***Tasmanocoenis*** in part 5

First abdominal tergite without setae (Fig 16); gill covers without long setae 6

5.(4) Gill covers with long setae, abdominal sternite IX convex or slightly truncated (Fig. 17) 18

Gill covers without long setae, abdominal sternite IX concave (Fig. 18); fronto-clypeus with numerous, obvious setae ..... ***Tasmanocoenis*** **sp B**

Figure 15. Lateral view of ***Tasmanocoenis*** **sp L** and an enlarged view of first abdominal tergite and gill cover.
Figure 16. Lateral view of ***Tasmanocoenis arcuata*** and an enlarged view of first abdominal tergite and gill cover.
Figure 17. Posterior margin of ninth abdominal sternite of ***Tasmanocoenis tillyardi***.
Figure 18. Posterior margin of ninth abdominal sternite of ***Tasmanocoenis*** **sp B** .



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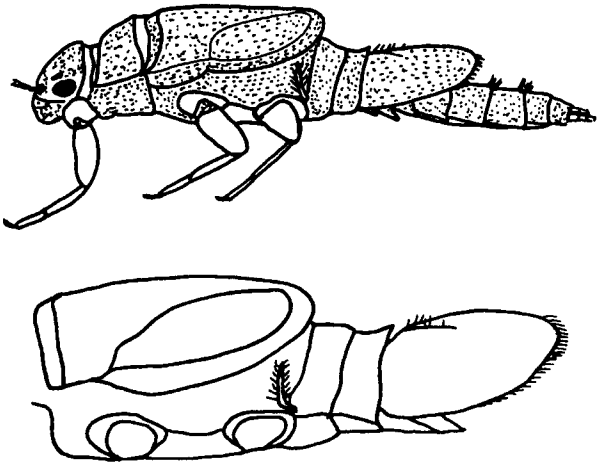

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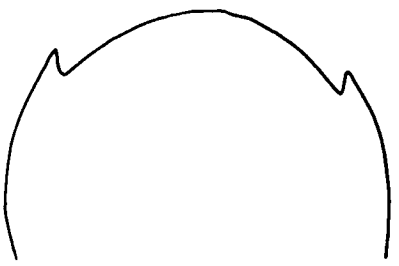

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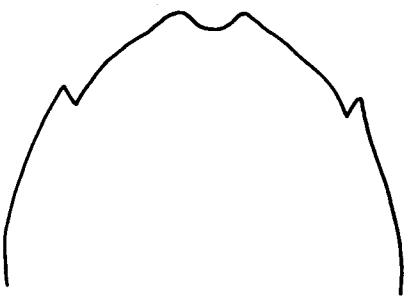

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6.(5) Mesal ridge on gill cover strongly developed, raised and extends nearly to posterior margin of gill cover (Fig. 19); body, gill covers lacking setae but covered with multifid microtrichia so nymph appears "fuzzy", or body covered with small tubercles giving a smooth appearance .....**Caenid Genus C** 7

Genus C Diagnosis: Mesonotum without distinct rounded or angular lobes on anterolateral margins; head with distinct lobes beneath antennae; setae absent on abdominal segment I; sternite of abdominal segment IX with convex posterior margin; postero-lateral spines on abdomen small; gill cover with strongly developed mesal ridge extending almost to posterior margin of cover; body, legs and gill cover with complex multifid microtrichia or tubercles; tibiae and tarsi not banded; fore femora with or without a transverse row of setae. (5spp recognised, 3 in press)

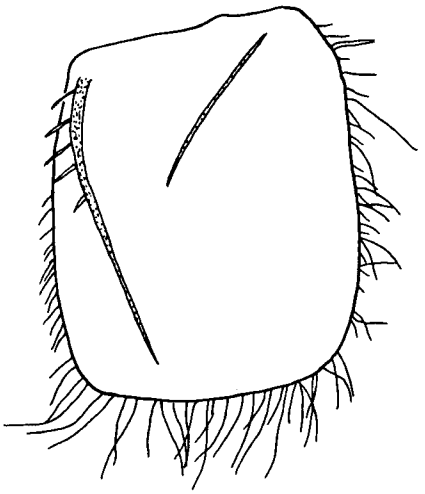
Mesal ridge of gill cover weakly developed, not raised, extending to mid gill cover; body (Fig. 20), gill covers lacking microtrichia or tubercles and are generally hairy .....***Tasmanocoenis***..... 11

Tasmanocoenis Diagnosis: Mesonotum without distinct rounded or angular lobes on antero-lateral margins; head without distinct lobes beneath antennae; tuft of setae near anterior margin of eye usually present; setae present or absent on abdominal segment I; sternite of abdominal segment IX rounded, with convex posterior margin which may have a slight indentation, ventral lobe absent; postero-lateral spines on abdomen well developed; gill cover with mesal ridge weakly developed, extending into posterior half of cover; body, legs and gill cover with setae, lacking complex microtrichia; tibiae and tarsi may be banded; fore femora with a well developed transverse row of setae; tarsal claws with basal teeth present or absent, hind tarsal claw usually with teeth plus a comb of bristles. (6 spp described).

7.(6) Body smooth, femora of fore leg with transverse row of setae (Fig. 21); tarsal claws long with <6 indistinct basal teeth (Fig. 23); setae present on posterior margin of abdominal tergites VII and VIII (Fig. 25) 8

Body and legs "fuzzy"; femora of forelegs lack a transverse row of setae (Fig. 22); tarsal claws usually with >6 distinct basal teeth (Fig. 24); setae absent on posterior margin of abdominal tergites VII and VIII (Fig. 26) 9

Figure 19. Gill cover of **Caenid Genus C sp D.**
Figure 20. Gill cover of ***Tasmanocoenis tillyardi.***
Figure 21. Foreleg of **Caenid Genus C sp C.**
Figure 22. Foreleg of **Caenid Genus C sp A.**
Figure 23. Tarsal claw of foreleg of **Caenid Genus C sp C.**
Figure 24. Tarsal claw of foreleg of **Caenid Genus C sp A.**
Figure 25. Abdomen of **Caenid Genus C sp C.**
Figure 26. Abdomen of **Caenid Genus C sp A.**



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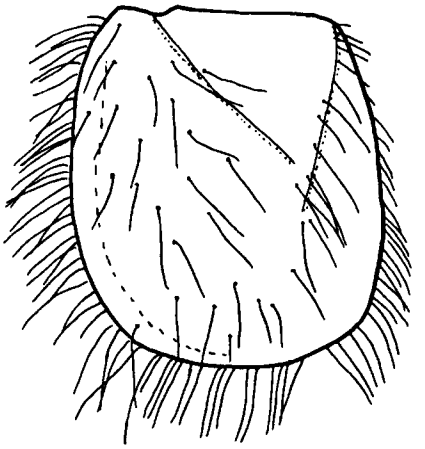

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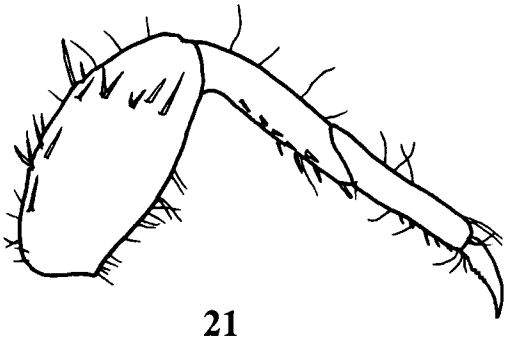

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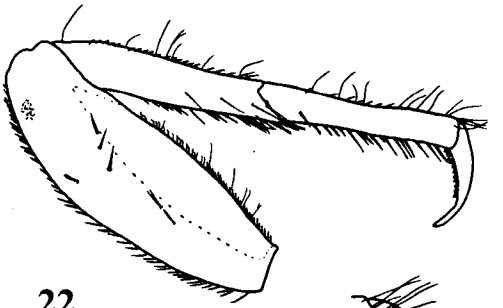

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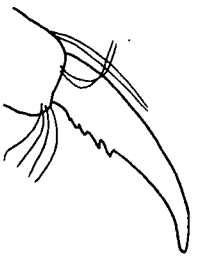

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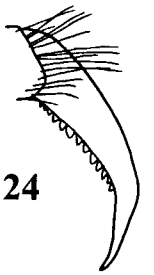

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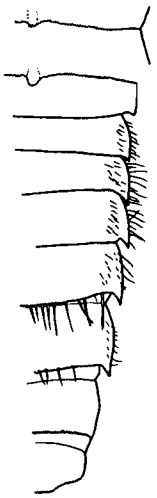

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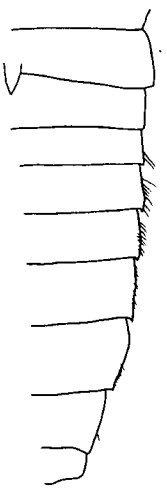

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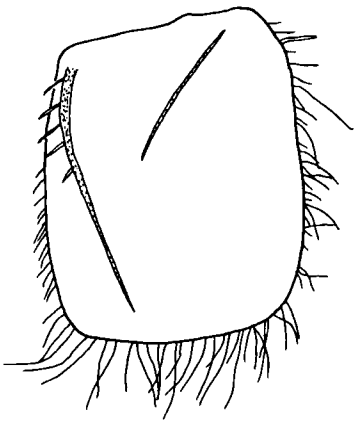
8.(7) Legs and margins of gill covers with numerous long hairs and setae (Fig. 27), gill cover and femora covered with short spines, body covered in tubercles; fore femur with transverse row of long setae and margins lined with numerous long setae (Fig. 29); postero-lateral spines on abdominal segments 4 - 9 (Fig. 31)
.....**Caenid Genus C sp D**

Legs and margins of gill covers with few long setae (Fig. 28); gill cover and femora covered with smooth tubercles; body lightly tuberculate; fore femora with transverse row of short setae and margins lined with few setae (Fig. 30); postero-lateral spines on abdominal segments 4 - 8 (Fig 32)
..... **Caenid Genus C sp C**

Figure 27. Second gill of **Caenid Genus C sp D**.
Figure 28. Second gill of **Caenid Genus C sp C**.
Figure 29. Foreleg of **Caenid Genus C sp D**.
Figure 30. Foreleg of **Caenid Genus C sp C**.
Figure 31. Abdomen of **Caenid Genus C sp D**.
Figure 32. Abdomen of **Caenid Genus C sp C**.



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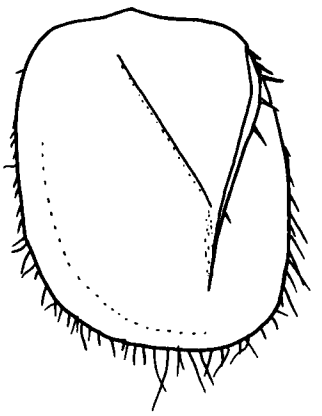

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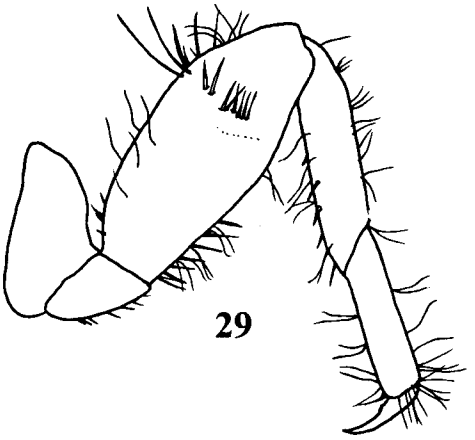

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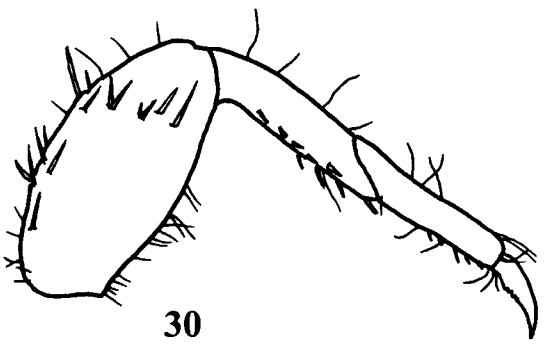

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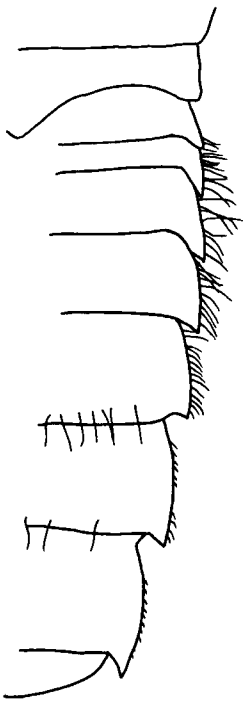

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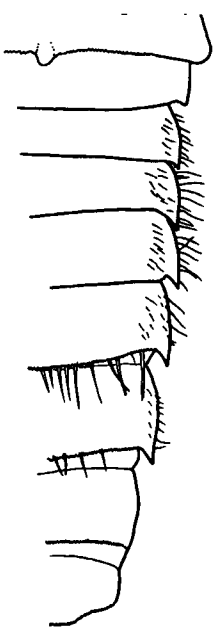

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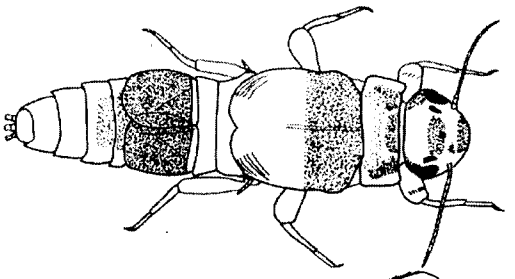
9.(7) Body bi-coloured light and dark, anterior portion of mesothorax and gill covers black, pronotum and abdominal segments I - II and VIII - IX light brown (young specimens may be uniformly light brown) (Fig. 33); fore femur robust and broad, length 2-2.2x width (Fig. 34); coxae of legs with small, flat lateral projection (Fig. 36); postero-lateral spines small, on abdominal segments 2 - 7 ....**Caenid Genus C sp E**

Body uniformly coloured; fore femur "normal", narrow, length >3x width (Fig. 35); coxae of legs lacking lateral projections (Fig. 37); postero-lateral spines on abdominal segments 4 - 8 or 4 - 9 10

10.(9) Medial spine on abdominal tergite II long but less than 3/4 of segment length (Fig. 39, arrowed); first gill short, apical segment <4 x basal segment length (Fig. 38) ....**Caenid Genus C sp A**

Medial spine on abdominal tergite II very long greater than segment length (Fig. 40, arrowed); first gill long, apical segment >6 x basal segment length (Fig 39) .....**Caenid Genus C sp B**

Figure 33. Whole nymph of **Caenid Genus C sp E**.
Figure 34. Fore leg of **Caenid Genus C sp E**.
Figure 35. Fore leg of **Caenid Genus C sp A**.
Figure 36. Hind leg of **Caenid Genus C sp E** showing coxal projection.
Figure 37. Hind leg of **Caenid Genus C sp A**.
Figure 38. Lateral view of abdomen showing medial projection on tergite II and first gill of **Caenid Genus C sp A**.
Figure 39. Lateral view of abdomen showing medial projection on tergite II and first gill of **Caenid Genus C sp B**.



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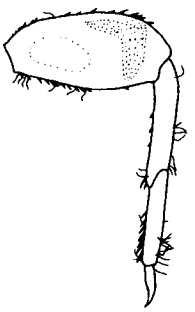

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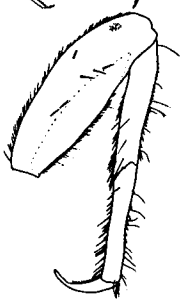

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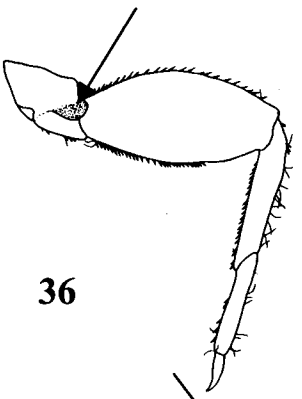

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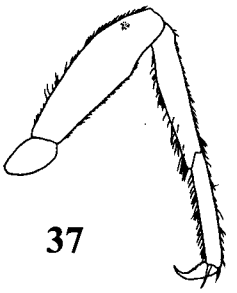

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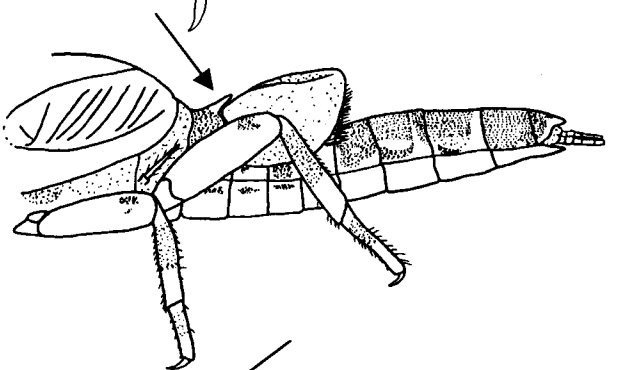

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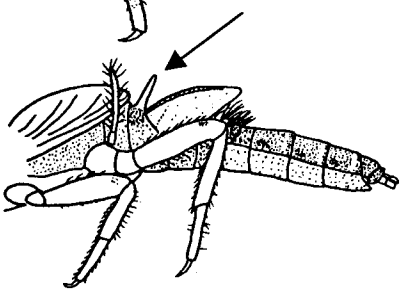


39

11.(6) Sternite of abdominal segment IX with concave posterior margin (Fig 40) .....
.....***Tasmanocoenis* sp B**

Sternite of abdominal segment IX with convex posterior margin (Fig. 41) 12

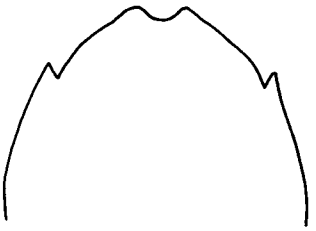
12.(11) Abdominal tergites VII and VIII with setae on posterior margin (Fig. 42) 13

Abdominal tergite VII with setae but tergite VIII lacking setae on posterior margin (Fig. 43) ..... ***Tasmanocoenis* sp P**

13.(12) Body evenly brown without clear mottling (Fig.44); antennal scape, pedicel and some segments of flagellum dark brown (Fig. 46) 14

Thorax clearly mottled (ie with light patches) (Fig. 45); antennal scape, pedicel and flagellum usually light, occasionally dark (Fig. 47) 15

Figure 40. Posterior margin of ninth abdominal sternite of ***Tasmanocoenis* sp B.**
Figure 41. Posterior margin of ninth abdominal sternite of. ***Tasmanocoenis tillyardi.***
Figure 42. Abdomen of ***Tasmanocoenis* sp H.**
Figure 43. Abdomen of ***Tasmanocoenis* sp P.**
Figure 44. Whole animal of ***Tasmanocoenis* sp H.**
Figure 45. Whole animal of ***Tasmanocoenis* sp E.**
Figure 46. Antennal scape, pedicel and base of flagellum of ***Tasmanocoenis* sp H.**
Figure 47. Antennal scape, pedicel and base of flagellum of ***Tasmanocoenis arcuata.***



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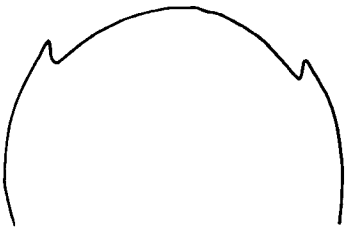

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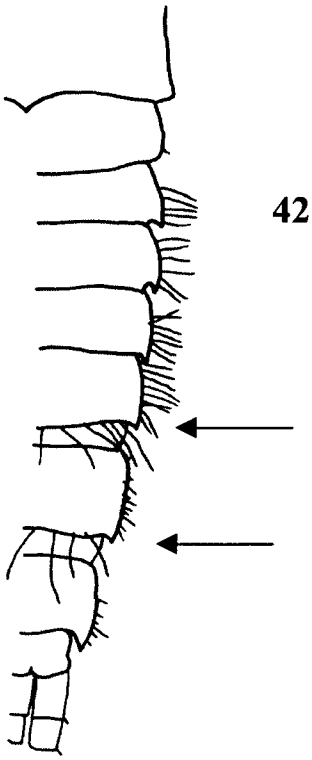

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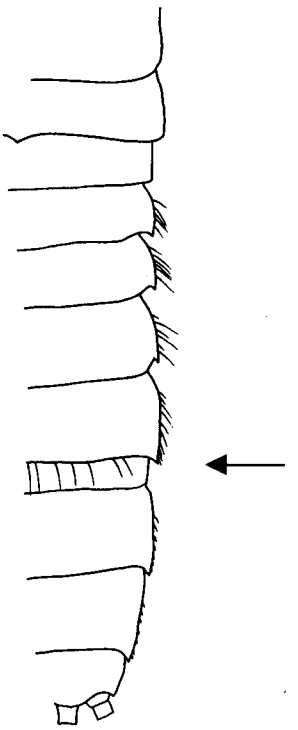

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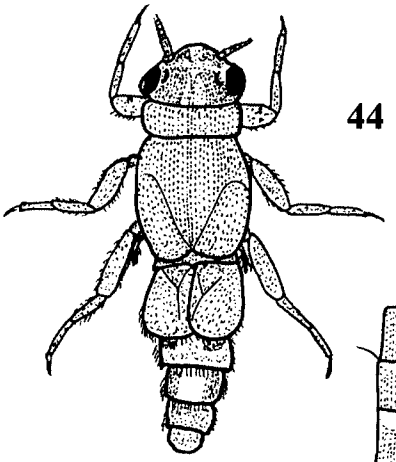

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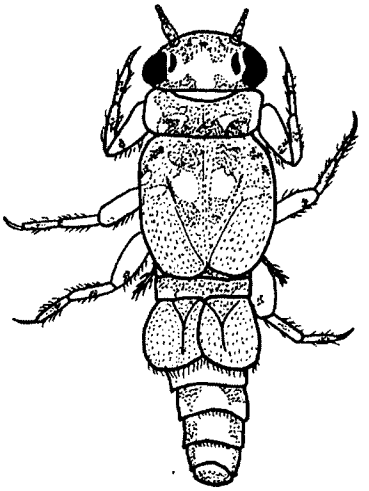

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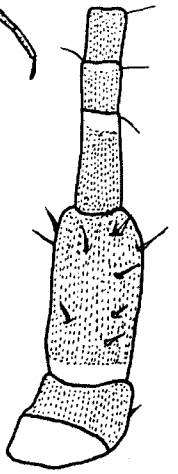

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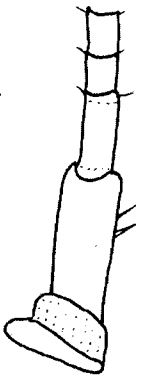

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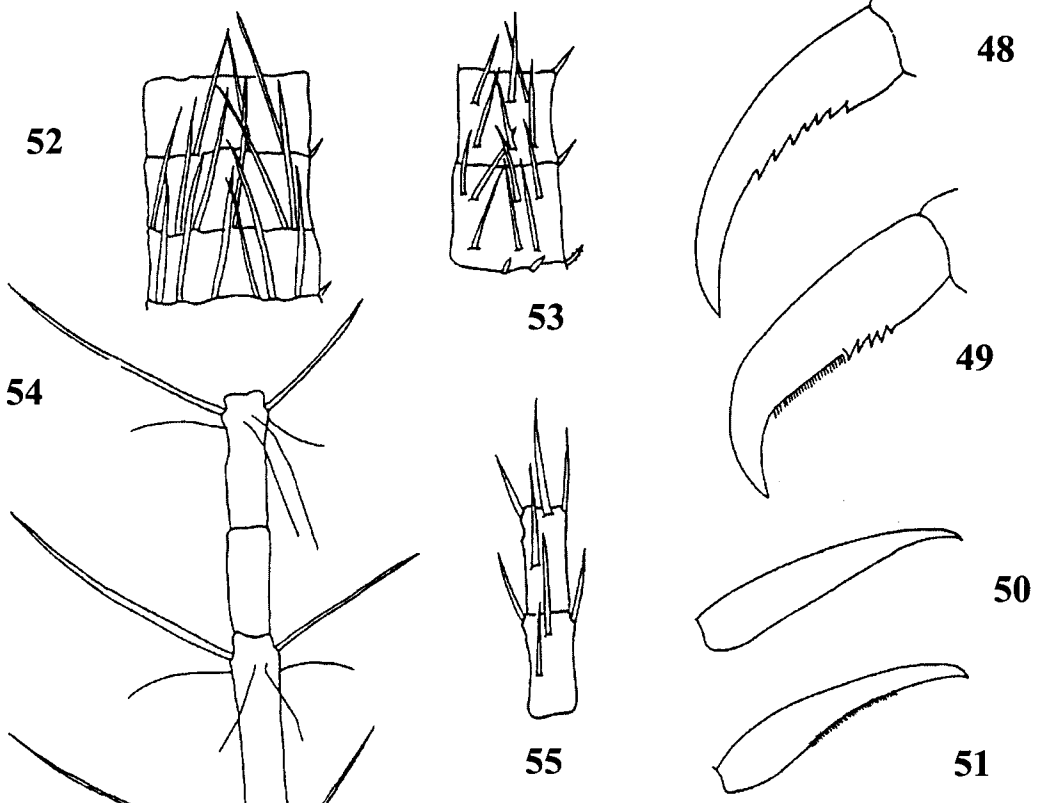
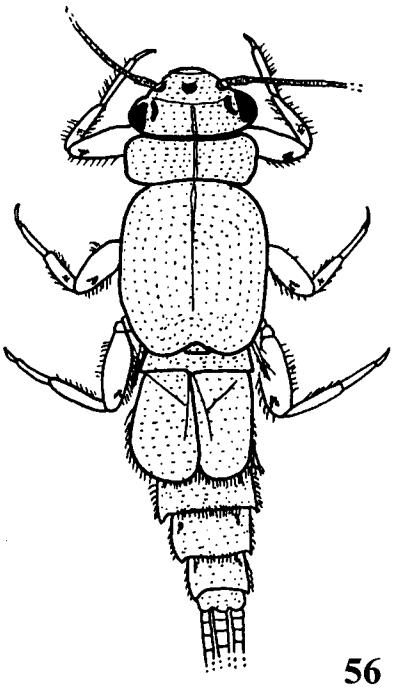
14.(13) Legs banded; antennal scape, pedicel and basal segment of flagellum tinged dark brown, rest of flagellum light; fore and mid tarsal claws short, curved with teeth (Fig. 48), hind tarsal claws with teeth and bristles (Fig. 49); basal segments of caudal filaments with long setae 1.5-2x segment length (Fig. 52); apical segments with long setae 2x segment length (Fig. 54); whole body (Fig. 56) .... ***Tasmanocoenis* sp G**

Legs not banded, uniformly brown; antennal scape, pedicel and flagellum all tinged dark brown; fore and mid tarsal claws long and smooth lacking peg-like teeth (Fig. 50), hind tarsal claws with bristles only (Fig. 51); basal segment of caudal filaments with short setae lx segment length (Fig. 53); apical segments of caudal filaments with long setae 1-1.5x segment length (Fig 55); whole body (Fig. 57) ..... ***Tasmanocoenis* sp H**

Figure 48. Tarsal claw of fore leg of ***Tasmanocoenis* sp G.**
Figure 49. Tarsal claw of hind leg of ***Tasmanocoenis* sp G.**
Figure 50. Tarsal claw of fore leg of ***Tasmanocoenis* sp H.**
Figure 51. Tarsal claw of hind leg of ***Tasmanocoenis* sp H.**
Figure 52. Basal segments of caudal filaments of ***Tasmanocoenis* sp G.**
Figure 53. Basal segments of caudal filaments of ***Tasmanocoenis* sp H.**
Figure 54. Apical segments of caudal filaments of ***Tasmanocoenis* sp G.**
Figure 55. Apical segments of caudal filaments of ***Tasmanocoenis* sp H.**
Figure 56. ***Tasmanocoenis* sp G**, whole animal.
Figure 57. ***Tasmanocoenis* sp H**, whole animal.





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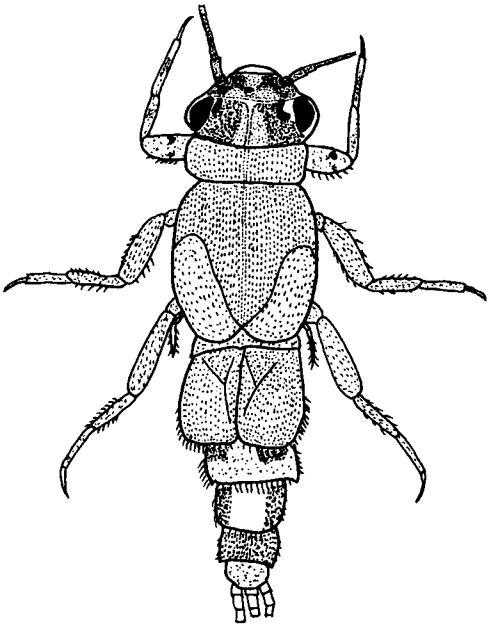

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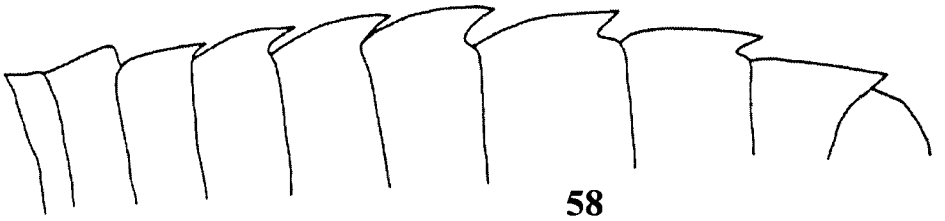
15.(13) Large species, body length >3mm; abdomen with moderately large backward pointing spines on postero- lateral margins 3-9 (Fig. 58) mesonotum with 4-5 light spots, abdomen with a median light stripe (Fig. 60) .....
.....*Tasmanocoenis arcuata* Alba-Tercedor and Suter

Small species <3mm body length; lateral spines on abdomen small (Fig. 59)
..... 16

16.(15) Femur of foreleg with a transverse row of setae (Fig. 61); first abdominal gill with apical segment short, much shorter than hind femur length (Fig. 63) 17

Femur of foreleg lacking transverse row of setae (Fig. 62); first abdominal gill with very long apical segment, equal to hind femur length (Fig. 64); legs long and slender, body with few long fine hairs .....*Tasmanocoenis* **sp Q**

Figure 58. Postero-lateral spines of abdominal segments of ***Tasmanocoenis arcuata.***
Figure 59. Postero-lateral spines of abdominal segments of ***Tasmanocoenis*** **sp E.**
Figure 60. ***Tasmanocoenis arcuata,*** whole animal.
Figure 61. Foreleg of ***Tasmanocoenis*** **sp E.**
Figure 62. Foreleg of ***Tasmanocoenis*** **sp Q.**
Figure 63. Lateral view of thorax and abdomen of ***Tasmanocoenis*** **sp E.**
Figure 64. Lateral view of thorax and abdomen of ***Tasmanocoenis*** **sp Q.**



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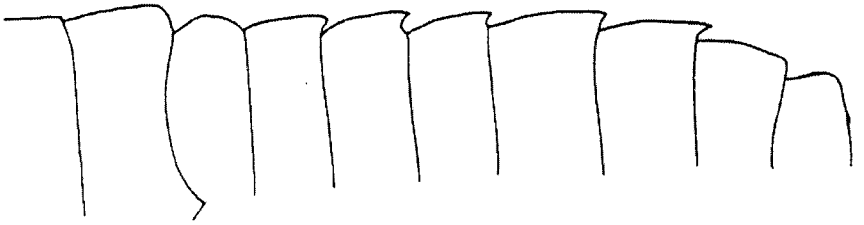

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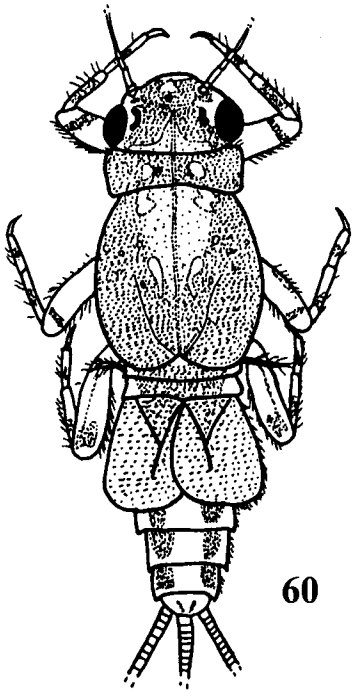

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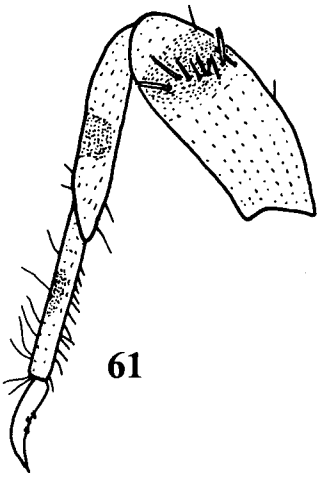

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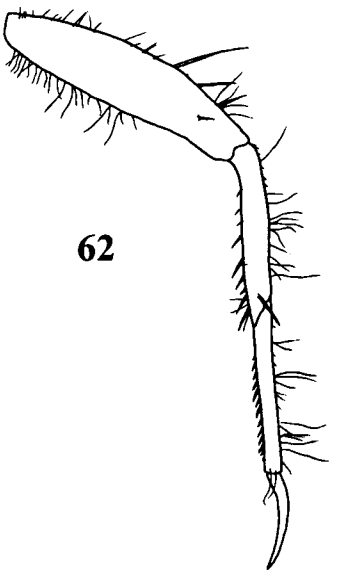

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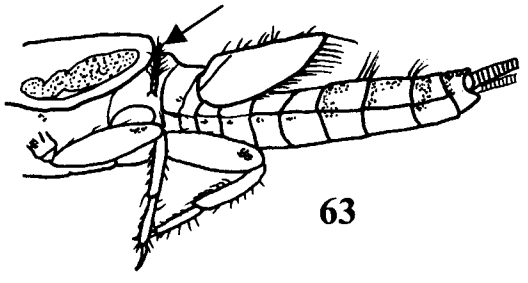

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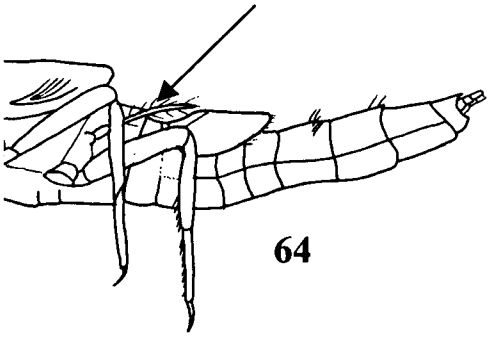

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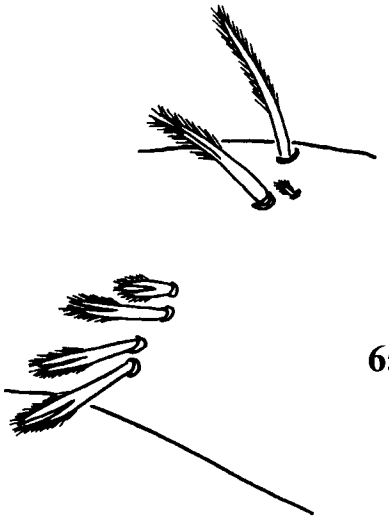
17.(16) Femur of foreleg with a transverse row of bifid setae, (Fig. 65); margin of gill covers with bifid bristles (Fig. 67); basal segments of caudal filaments with short apical tubercles, <0.2x segment length (Fig. 69); apical segments with 1 long fine hair per segment (Fig. 71); postero-lateral spines very small on abdominal segments 4-7 ..... ***Tasmanocoenis* sp D**

Femur of foreleg with transverse row of broad, blunt setae (Fig. 66); margins of gill cover lacking divided bristles (Fig. 68); basal segments of caudal filaments with short setae 0.5x length of segment (Fig. 70); apical segments with few setae all <0.5x segment length (Fig. 72); postero-lateral spines very small on abdominal segments 4-8 ..... ***Tasmanocoenis* sp E**

Figure 65. Bifid setae on femur of the foreleg of ***Tasmanocoenis* sp D.**
Figure 66 Broad setae on femur of the foreleg of ***Tasmanocoenis* sp E.**
Figure 67. Second gill (Gill Cover) and enlargements of marginal setae of ***Tasmanocoenis* sp D.**
Figure 68. Second gill (Gill Cover) and enlargements of marginal setae of ***Tasmanocoenis* sp E.**
Figure 69. Basal segments of caudal filaments of ***Tasmanocoenis* sp D.**
Figure 70. Basal segments of caudal filaments of ***Tasmanocoenis* sp E.**
Figure 71. Apical segments of caudal filaments of ***Tasmanocoenis* sp D.**
Figure 72. Apical segments of caudal filaments of ***Tasmanocoenis* sp E.**



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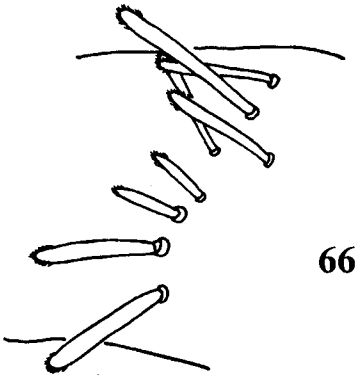

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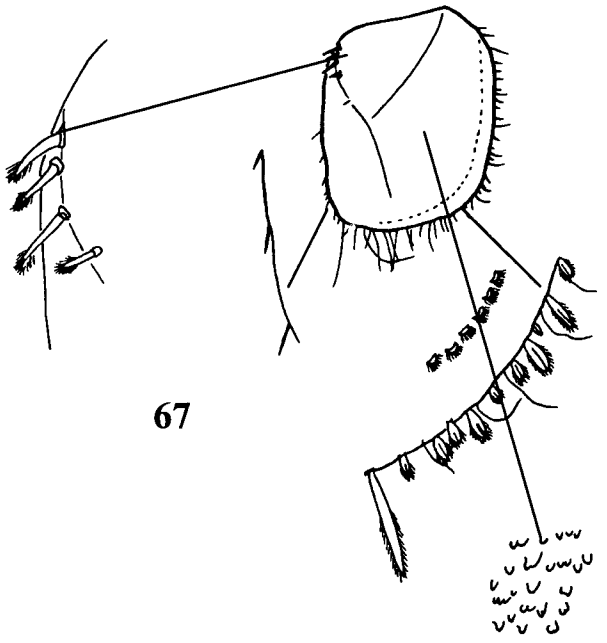

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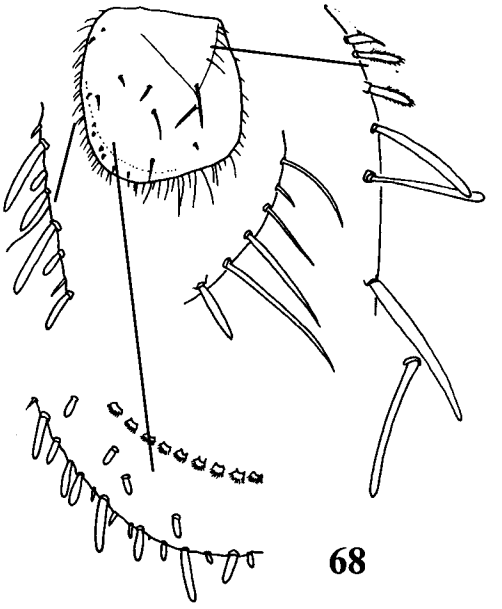

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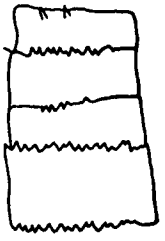

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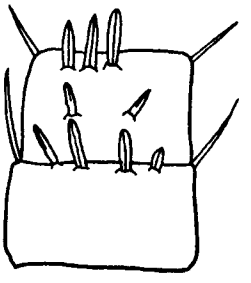

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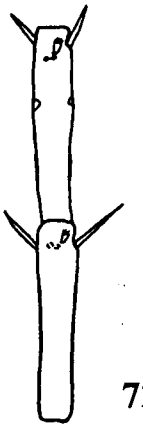

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18.(5) Very hairy nymph with numerous very long setae present on pronotum and mesothorax (Fig.73) ..... ***Tasmanocoenis* sp M**

Setae on pronotum and mesothorax short (Fig. 74) or if long, sparse; body glabrous 19

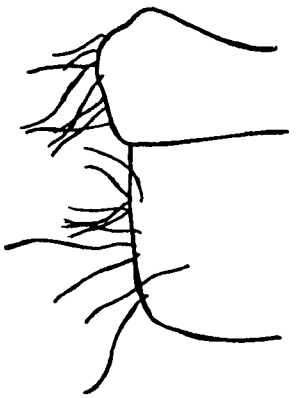
19.(18) No mottling on thorax; legs uniformly dark brown (Fig. 75); postero-lateral spines very small on abdominal segments 4 -7 ..... ***Tasmanocoenis* sp L**

Distinct mottling on thorax (Fig. 76); legs banded, with at least one band per segment on the tibiae and tarsi (Fig. 77) or without banding, but legs light; postero-lateral spines on abdominal segments 3 - 9 or 5 - 9, 4 - 8 or absent 20

20(19) Legs not banded 21

Tibiae and tarsi banded 22

Figure 73. Pronotum and mesothorax of ***Tasmanocoenis* sp M.**
Figure 74. Pronotum and mesothorax of ***Tasmanocoenis* sp J.**
Figure 75. Foreleg of ***Tasmanocoenis* sp L.**
Figure 76. Whole body of ***Tasmanocoenis* sp J.**
Figure 77. Foreleg of ***Tasmanocoenis* sp J.**



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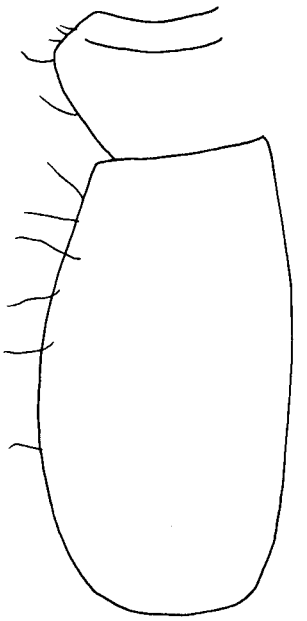

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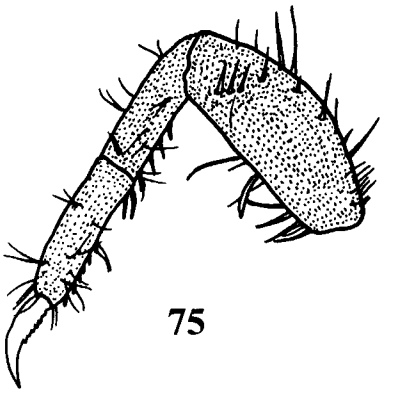

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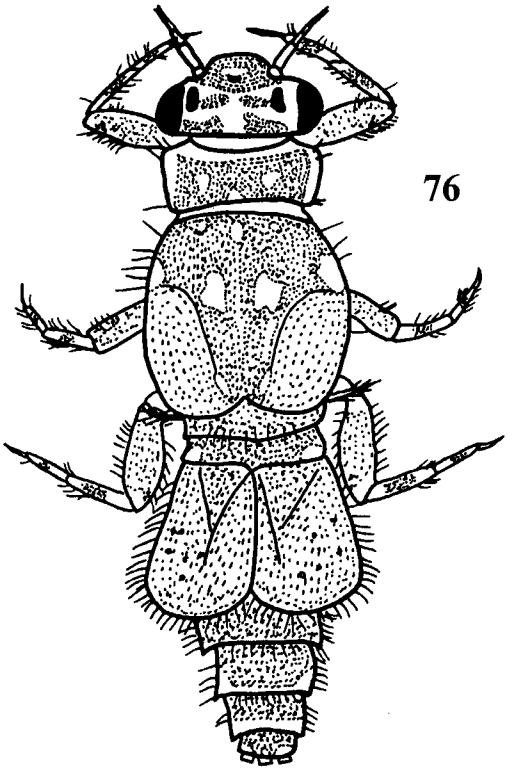

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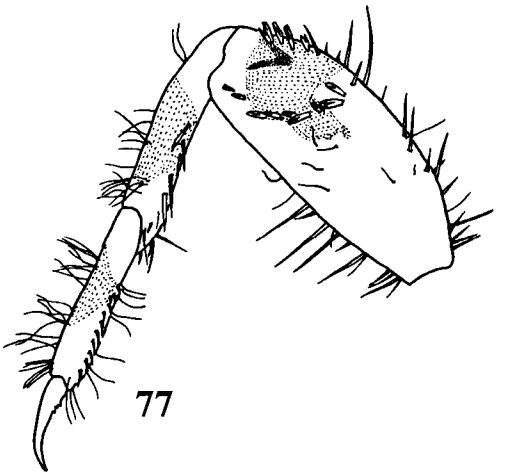

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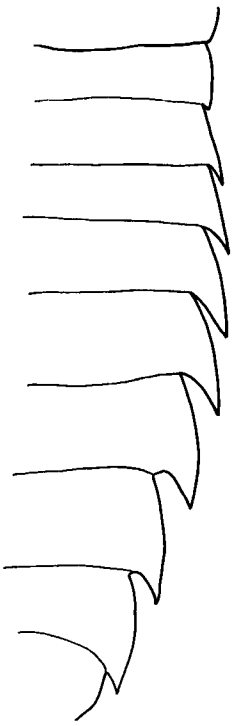
21(20) Distinct postero-lateral spines on abdominal segments 3-9 (Figs. 78 and 79) 23

Postero-lateral spines absent or very small on abdominal segments 4-8 (Fig. 80); distinct marking on thorax (Fig. 81) .....***Tasmanocoenis sp*** **N**

22 (19) Femora, tibiae and tarsi banded (Fig 82); long hairs on legs; postero-lateral spines on abdominal segments 5-9 ..... ***Tasmanocoenis*** **sp J**

Femora not banded, tibiae and tarsi banded; femora with an apical dark spot .....***Tasmanocoenis rieki*** (Soldan)

Figure 78. Postero-lateral spines on the abdomen of ***Tasmanocoenis tillyardi.***
Figure 79. Postero-lateral spines on the abdomen of ***Tasmanocoenis tonnoiri.***
Figure 80. Postero-lateral spines on the abdomen of ***Tasmanocoenis*** **sp N.**
Figure 81. Whole body of ***Tasmanocoenis*** **sp N.**
Figure 82. Foreleg of ***Tasmanocoenis*** **sp J.**



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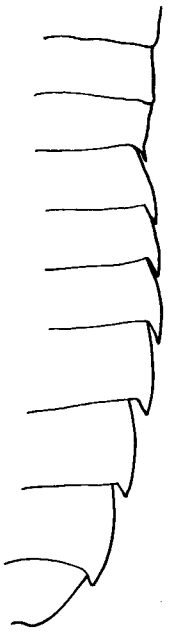
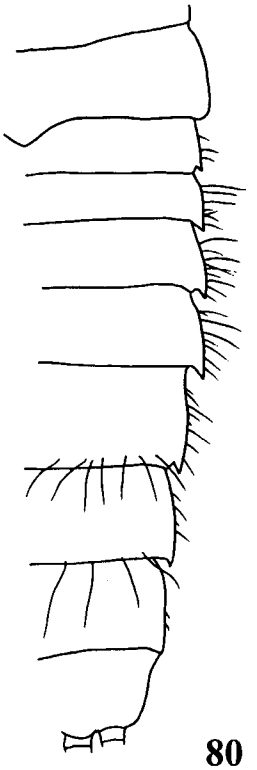


79



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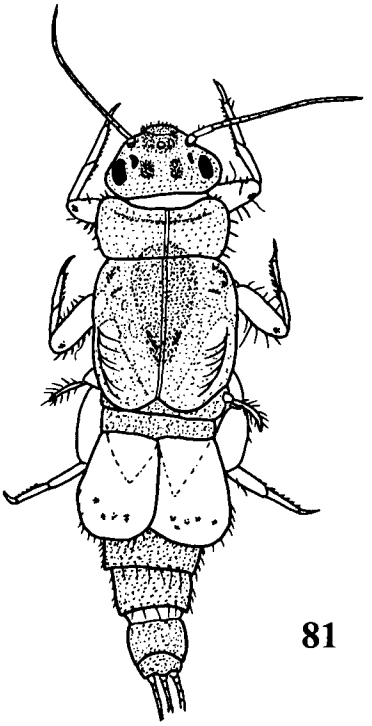

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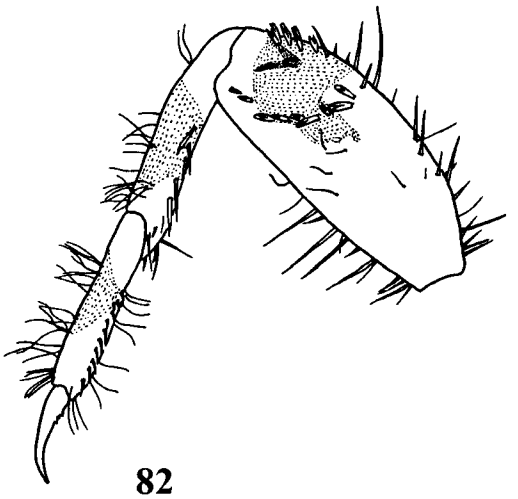


82

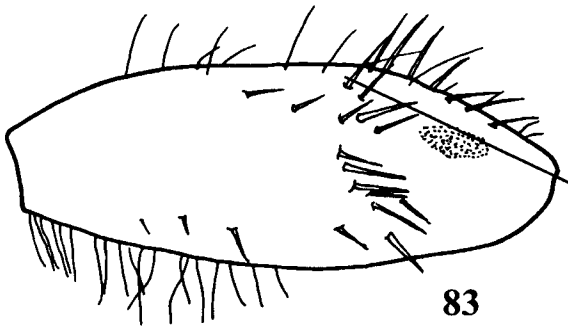
23 (21) Femora with a dark distal marking (Fig. 83); transverse row of fore femur with >10 long bifid setae, 1/3 width of femur (Fig. 85); postero-lateral spines on abdomen large (Fig. 78); apical third of caudal filaments with lateral setae long 2-3x segment length (Fig. 87) 24

Femora without dark distal marking (Fig. 84); transverse row of fore femur with 7-8 short bifid setae, 1/5 width of femur (Fig. 86); postero-lateral spines on abdomen moderately large (Fig. 79); apical third of caudal filaments with lateral setae equal to segment length (Fig. 88) .....
..... ***Tasmanocoenis tonnoiri*** Lestage

24 (23) Femur of foreleg length/width ratio = 2.8 (Fig. 83); apical segment of maxillary palp longer than basal segment (Fig. 90) .....
.....***Tasmanocoenis tillyardi*** (Lestage)

Femur of foreleg broad, length/width ratio = 2.3 (Fig. 89); apical segment of maxillary palp shorter than basal segment (Fig. 91) .....
.....***Tasmanocoenis queenslandica*** (Soldan)

Figure 83. Fore femur of ***Tasmanocoenis tillyardi***.
Figure 84. Fore femure of ***Tasmanocoenis tonnoiri***.
Figure 85. Transverse row of setae on fore femur of ***Tasmanocoenis tillyardi***.
Figure 86. Transverse row of setae on fore femur of ***Tasmanocoenis tonnoiri***.
Figure 87. Apical segments of caudal filaments of ***Tasmanocoenis tillyardi***.
Figure 88. Apical segments of caudal filaments of ***Tasmanocoenis tonnoiri***.
Figure 89. Fore femur of ***Tasmanocoenis queenslandica***.
Figure 90. Maxilla of ***Tasmanocoenis tillyardi***.
Figure 91. Maxilla of ***Tasmanocoenis queenslandica***.



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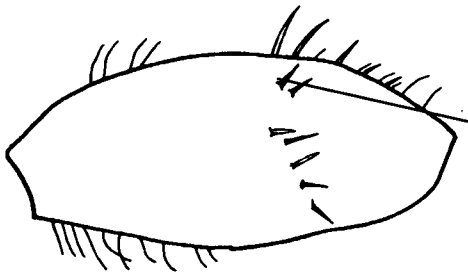

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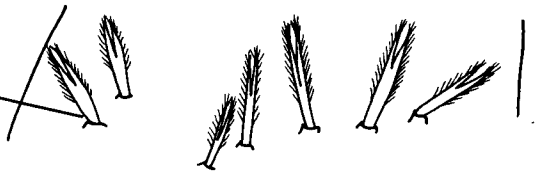

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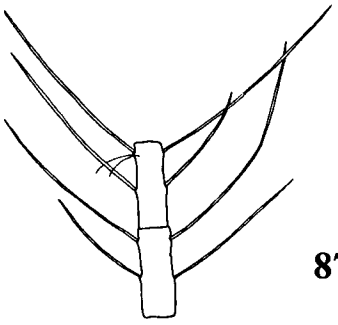
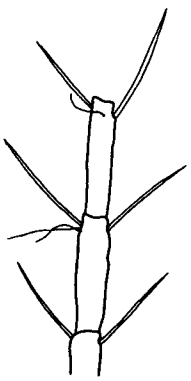


87



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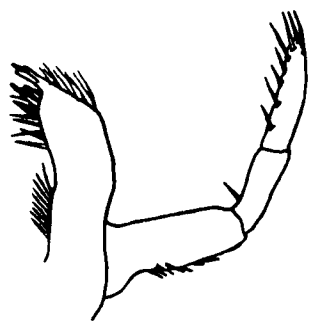

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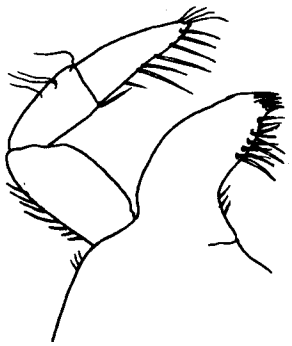

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Appendix 1. Character matrix for Australian Caenid mayflies

	Wundacaenis dostini	*Wundacaenis angulata*	*Wundacaenis flabellum*	*Genus C sp A*	*Genus C sp B*	*Genus C sp C*	*Genus C sp D*	*Genus C sp E*	*Tasmanocoenis arcuata*	*Tasmanocoenis tillyardi*	*Tasmanocoenis tonnoiri*	*Tasmanocoenis queenslandica*	*Tasmanocoenis rieki*	*Tasmanocoenis sp B*	*Tasmanocoenis sp D*	*Tasmanocoenis sp E*	*Tasmanocoenis sp G*	*Tasmanocoenis sp H*	*Tasmanocoenis sp J*	*Tasmanocoenis sp L*	*Tasmanocoenis sp M*	*Tasmanocoenis sp N*	*Tasmanocoenis sp P*	*Tasmanocoenis sp Q*
GENERIC CHARACTERISTICS																								
Head with lobes beneath antennae	1	1	1	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tuft of Setae anterior to eye	0	0	0	0	0	0	1	0	1	1	1			1	0	1	1	0	1	0	1	1	0	0
Pronotum expanded laterally	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Mesonotum with lobes	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Body with complex microtrichia	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Body with tubercles	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Legs with tubercles	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sternite 9 triangular, apically truncated	1	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SPECIES CHARACTERISTICS																								
Thorax mottled	1	0	0	0	0	0	0	0	1	0	0	0	0		1	1	0	0	1	0	0	1	0	0
Body banded	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Small, Body Length <3mm	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	0	1	0	0	0	0	1	1
Legs uniform dark brown	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0	1	0	0
Legs banded	1	1	1	1	0	0	0	0	1	0	0	0	1	0	1	1	1	0	1	0	0	0	1	0
Femora banded	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1	1	0	0	1	0	0	0	0	0
Tibiae banded	1	1	1	1	0	0	0	0	1	0	0	0	1	0	1	1	1	0	1	0	0	0	1	0
Tarsi banded	1	1	1	1	0	0	0	0	1	0	0	0	1	0	1	1	1	0	1	0	0	0	1	0
Femora with apical spot	1	1	0	1	1	0	0	0	1	1	0	1	1	0	0	1	1	0	1	0	0	0	1	0
Femora with transverse row of setae	0	0	1	0	1	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	0
Legs with complex microtrichia	1	1	1	1	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Legs with rounded tubercles	0	0	0	0	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Legs with spine-tubercles	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Appendix 1. Character Matrix for Australian Caenid Mayflies

	Wundacaenis dostini	*Wundacaenis angulata*	*Wundacaenis flabellum*	*Genus C sp A*	*Genus C sp B*	*Genus C sp C*	*Genus C sp D*	*Genus C sp E*	*Tasmanocoenis arcuata*	*Tasmanocoenis tillyardi*	*Tasmanocoenis tonnoiri*	*Tasmanocoenis queenslandica*	*Tasmanocoenis rieki*	*Tasmanocoenis sp B*	*Tasmanocoenis sp D*	*Tasmanocoenis sp E*	*Tasmanocoenis sp G*	*Tasmanocoenis sp H*	*Tasmanocoenis sp J*	*Tasmanocoenis sp L*	*Tasmanocoenis sp M*	*Tasmanocoenis sp N*	*Tasmanocoenis sp P*	*Tasmanocoenis sp Q*	
MORPHOMETRIC CHARACTERISTICS																									
First Gill: Apical length/Basal length	3.3	6	3.6	3.8	7	5.7	3	5	4.6	3.5	3.7	3.5		3.4	4.1	3.9	3.4	5	3.1	4.1	5.2	2.4	5	5	
Femur Length/width : Foreleg	2.5	2.8	2.1	3.2	2.7	2	2.4	2.1	2.6	2.8	2.4	2.3		2.5	2.1	2.5	2.7	2.9	2.6	2.1	2.5	2.3	3	3.8	
Femur Length/width : Mid leg	2.3	2.8	1.7	3	2.6	2.1	2.5	2.1	2.6	2.9	2.5			2.6	2.4	2.9	2.7	2.8	2.5	2.5	2.5	2.2	3.4	4.1	
Femur Length/width : Hind leg	2.4	3.3	2	3.3	3.3	2.5	2.9	2.3	2.8	3	2.6			2.7	3	3	2.8	3.2	2.8	2.3	3	2.6	3.4		
Foreleg Ratios: Tibia:Femur Length	0.6	0.7	0.7	0.8	0.7	0.6	0.7	0.7	0.7	0.7	0.7	0.7		0.7	0.7	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.7	0.6	
Foreleg Ratios: Tarsus:Femur Length	0.6	0.6	0.6	0.7	0.7	0.6	0.6	0.6	0.6	0.7	0.6	0.6		0.6	0.8	0.7	0.6	0.7	0.6	0.7	0.7	0.6	0.6	0.7	
Mid Leg Ratios: Tibia:Femur Length	0.6	0.7	0.7	0.8	0.8	0.7	0.6	0.6	0.6	0.7	0.7			0.6	0.6	0.7	0.7	0.7	0.7	0.6	0.6	0.6	0.7	0.6	
Mid Leg Ratios: Tarsus:Femur Length	0.6	0.6	0.6	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.5			0.5	0.7	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.7	
Hind LegRatios: Tibia:Femur Length	0.6	0.6	0.7	0.9	0.7	0.7	0.7	0.7	0.7	0.8	0.8			0.7	0.7	0.8	0.7	0.8	0.6	0.7	0.7	0.7	0.8		
Hind Leg Ratios: Tarsus:Femur Length	0.5	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	0.6	0.5			0.6	0.7	0.7	0.6	0.6	0.5	0.7	0.7	0.6	0.6		
Labrum length/width	0.5	0.4	0.5	0.5	0.6	0.6	0.5	0.5	0.3	0.4	0.5	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.5	0.6	0.5	0.5	0.5		
Maxillary Palpi Ratios: Basal:Mid Length	0.7	0.9	1	0.7	0.8	0.7	0.7	1.1	0.7	0.7	0.7	0.8	0.7	0.7	0.7	0.7	0.7	0.4	0.8	0.7	0.7	0.7	0.7		
Maxillary Palpi Ratios: Basal:Apical Length	1.2	1.3	1.2	1.1	1.3	1.1	1	0.7	0.9	1.1	1	0.9	0.8	0.9	1.2	0.9	1.1	0.6	1.2	1	0.9	1	1		
Labial Papi Ratios: Basal:Mid Length	0.9	1.2	1.3	0.9	1	0.9	1.1	1	1.2	0.8	0.8	0.9	1.3	1	1	0.9	0.9	0.9	0.9	1	0.6	0.4	0.5		
Labial Papi Ratios: Basal:Apical Length	0.6	0.6	0.5	0.9	0.8	0.5	0.4	0.4	0.5	0.5	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.6	0.5	0.4	0.4	0.9	1		
Labial Palpi: Basal Segment Length/Width	1.5	1.7	1.3	1.5	1.3	1.4	1	1.7	1.4	1.5	1.6	1.6	1.2	1.6	1.6	1.6	1.5	1.5	1.4	1.4	1.5	1.5	2.1		

Appendix 1. Character Matrix for Australian Caenid Mayflies

	Wundacaenis dostini	*Wundacaenis angulata*	*Wundacaenis flabellum*	*Genus C sp A*	*Genus C sp B*	*Genus C sp C*	*Genus C sp D*	*Genus C sp E*	*Tasmanocoenis arcuata*	*Tasmanocoenis tillyardi*	*Tasmanocoenis tonnoiri*	*Tasmanocoenis queenslandica*	*Tasmanocoenis rieki*	*Tasmanocoenis sp B*	*Tasmanocoenis sp D*	*Tasmanocoenis sp E*	*Tasmanocoenis sp G*	*Tasmanocoenis sp H*	*Tasmanocoenis sp J*	*Tasmanocoenis sp L*	*Tasmanocoenis sp M*	*Tasmanocoenis sp N*	*Tasmanocoenis sp P*	*Tasmanocoenis sp Q*
Coxae of fore leg with lateral projection	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coxae of mid leg with lateral projection	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coxae of hind leg with lateral projection	0	1	1	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Hind tarsal claw with bristle comb	0	0	1	0	1	0	1	1	1	1	1	1	1	0	1	1	1	1	1	1	0	1	1	0
No. Teeth on tarsal claws	3 - 8	7 - 10	6 - 10	9 - 16	2 - 4	7 - 10	3 - 6	2 - 4	3 - 6	4 - 5	6 - 9	3 - 5		5 - 9	3-6	8 - 12	6 - 8	0	3 - 6	3 - 6	0	3 - 5	0	0
Gill cover Ridge extends to post. Margin	1	1	1	1	1	1	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Gill cover with complex microtrichia	1	1	1	1	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Gill cover with smooth tubercles	0	0	0	0	1	0	1	1	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Gill cover with spine-tubercles	0	0	0	1	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Tergite II with long projection (>basal width)	1	1	1	1	1	1	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0
Abdominal tergite I with setae	0	0	0	0	0	0	0	0	0	1	1			1	0	0	0	0	1	1	1	1	0	0
Abdominal tergite VII with setae	1	1	1	0	0	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Abdominal tergite VIII with setae	1	1	1	0	0	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	0	1
Abdominal tergite IX with setae	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0
Posterolateral spines on Abdominal Segments	4 - 9	4 - 9	4 - 9	4 - 8	4 - 7	4 - 8	4 - 9	2 - 7	4 - 9	3 - 9	4 - 9	3 - 9		3 - 9	4-8	4 - 8	4 - 9	4 - 9	5 - 9	5 - 8	3 - 9	3 - 9	4 - 9	0
Sternite 9 Concave	0	0	0	0	0	0	0	0	0	0	1	0	0	1	0	0	0	0	1	0	0	0	0	0
Sternite 9 Convex	0	0	0	1	1	1	1	1	1	1	1	1	1	0	1	1	1	1	1	1	1	1	1	1

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