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Key to genera of larvae of Australian Chironomidae (Diptera)

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Abstract

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A key is presented to aquatic chironomid larvae of Australia. Characters used to separate each genus are generally visible under a dissecting microscope which removes the need to routinely mount larvae to enable identification. Over ninety taxa are keyed, including some undescribed but distinctive taxa recognized by chironomid workers in Australia. This key will supplement other publications and enable identification beyond subfamily during biomonitoring and ecological sampling.

Key Words Chironomidae, Australia, larvae, key, genus, identification guide

Introduction

This key had its genesis when I was a student at the University of Adelaide in the late 1980s. One of my supervisors, Phil Suter, provided me with a key to identify, mostly to the level of genus, chironomid larvae from the Adelaide region, developed from the keys of Jon Martin, which were published in the Australian Society for Limnology newsletter (Martin 1974, 1975). Most characters could be observed without the need to mount larvae on microslides. References from the northern hemisphere were also consulted and so some names were inappropriate, even if the taxa were distinctive. The first version of what became Peter Cranston's AWT Taxonomic Workshop key (Cranston, 1996) was produced around this time, so I was able to use this to check identifications by mounting larvae. The next chapter of development happened when I was employed at the Australian Water Quality Centre (AWQC) in Adelaide to work for the Monitoring River Health Initiative, which developed the Ausrivas methods. The Ausrivas program sampled many parts of South Australia (SA) where macroinvertebrate collecting had not been carried out before, so many new taxa were collected that did not fit Phil Suter's key. In SA we identified taxa past family level with available keys, so I was able to take a month or so to compare the new specimens and match others to drawings in Peter Cranston's key. This resulted in a more robust key with names as correct as they could be at the time. New staff were taught to use the key and we realised it was possible to routinely identify most chironomids to genus without the need for mounting. As the Ausrivas project drew to a close, the biomonitoring group at AWQC took on consulting work that meant we were identifying specimens from other parts of Australia. As the most familiar with Chironomidae, I was given the task of identifying them. I used the SA key as a starting point and soon realised that the common taxa were all included and that others could easily be added in new couplets. So it became apparent that a key using whole larval characteristics may be possible for the whole of Australia. The final chapter has happened since I became a consultant and was awarded an ABRS grant to develop a Lucid key for the whole of Australia, of which this dichotomous key is a by-product.

The aim of this key is to supplement the keys of Cranston (1996, 2000) which rely on the mounting of larvae and pupae to identify genera of the Chironomidae of Australia. I cannot better the pupal key of Cranston. The translucent nature of pupal skins means that the key can be successfully used to identify whole pupae or exuviae without the need for permanent mounting. However, Cranston's larval key generally uses internal characters that require clearing and mounting of larvae to view characters and use the key. The aim of this key is to allow identification to genus without the need for routine mounting of larvae.

This key aims to provide shortcuts to allow identification to genus by using characters visible on the whole animal (using a good quality microscope) and therefore reduce the need for mounting of larvae for routine identification to genus. The lofty aim at the start of the project was to allow the identification of all recognized genera or equivalent taxa in Australia without the need for mounting. It has not been possible to achieve this in all cases, notably in the Tanypodinae, and there are some couplets where there is still the need for a temporary mount in glycerol to separate taxa.

I have used the code names for undescribed taxa from Cranston (1996) where they are easily recognised and I had specimens available to photograph. Some of these have been formally described since publication of that key and I have used the formal names where they exist, while listing the codename as well. There are also a couple of voucher codes used by Don Edward for taxa he has recognised in Western Australia.

One further aim of this key is to get ecologists and groups carrying out biomonitoring programs to look past sub-family level when identifying Chironomidae (hopefully nobody is still in the Dark Ages and leaves identifications at family level!). There are nearly 100 genera listed in this key, which can provide an enormous amount of ecological information when identified. In my experience, apart from high quality sites with natural vegetation, when diversity at genus level is considered, the family Chironomidae are usually more diverse than most orders, including the Ephemeroptera, Plecoptera and Trichoptera combined.

Some operating requirements. I have used an Olympus SZX-12 with a 7 to 90 zoom and a 1x objective lens when viewing larvae and all characters can be recognized below the maximum magnification. Photographs were taken by the author using an Automontage camera system on a Zeiss microscope at the University of Adelaide, apart from those taken using the Automontage at DEC in Perth. Some photographs were taken by Ros St Clair of the Victorian EPA and Peter Cranston of the University of California, Davis using their own Automontage systems.
An assumed knowledge of chironomid larval morphology is not included a guide as this can be obtained from the webpage for the Electronic Guide to the Chironomidae of Australia (http://entomology.ucdavis.edu/chiropage/index.html).

This key sometimes uses characters that are secondary and not diagnostic for a genus so I would urge the user to confirm identification by mounting representative larvae from a group of specimens until confident with the use of the key and recognition of the characters used. When collecting and viewing larvae please be aware of mature larvae that are about to pupate (recognised by the swollen thorax, e.g. Figures 23, 63 and 65). These specimens can be invaluable as an aid to identification because they exhibit both larval and pupal characters, such as thoracic respiratory horns and abdominal setal patterns, and can allow the recognition of a genus that is more distinctive in the pupal stage e.g. Botryocladius. A pupa that still has a larval skin attached can be used in a similar manner to recognise taxa.
Collection and observation of mature larvae and pupae with attached larval skins is also a valuable method for linking life stages of taxa with few collected specimens.

Key to genera of larvae of Australian Chironomidae

1 Eye spot single and round or kidney-shaped (Figure 1) or if eyespot appears double then procercus prominent (Figure 2) 2

Eye spot single and complex or more than one eye spot (Figure 3) or if eyespot appears single then procercus absent (Figure 4) 28

Figure 1.

Figure 2.

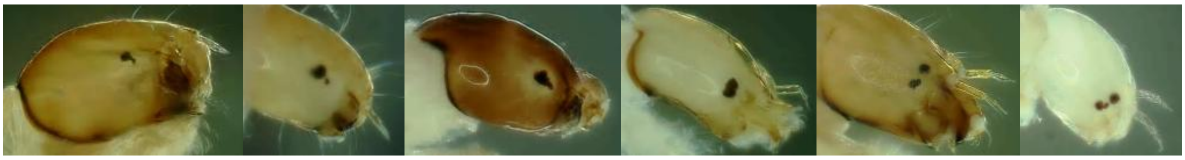

Figure 3.

Figure 4. *Gymnometriocnemus* (Don Edward V45)

2(1) Head usually long, or if short, eye kidney-shaped (Figure 5), avoid capture by moving backwards when alive .... (Tanypodinae) 3

Head short (Figure 6).. 19

Figure 5.

Figure 6.

3(2) Lateral fringe present (Figure 7), dorsomentum distinct and toothed (Figure 8) 4

Lateral fringe absent (but some body setae may be present), dorsomentum indistinct, not toothed 11

Figure 7. *Clinotanypus*

Figure 8. *Apsectrotanypus*

4(3) Head with large gape (Figure 9), sharply wedge-shaped in lateral view .... *Coelopynia*

Head without large gape (Figure 8) 5

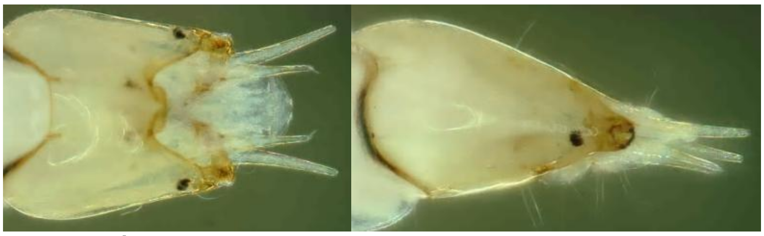

Figure 9. *Coelopynia*

5(4) Head conical shape (Figure 10), eyes on ventral surface of head, large larvae up to 15 mm, distribution Murray drainage and north .... *Clinotanypus*

Head not conical, eyes on lateral edge of head 6

Figure 10. *Clinotanypus*

6(5) Teeth on dorsomentum arranged in a line (Figure 11) 7

Teeth on dorsomentum arranged in two lines ascending either side of prementum (Figures 8, 12) 8


Figure 11. *Fittkauimyia*


Figure 12. *Procladius*

7(6) Head almost rectangular when viewed dorsally or ventrally (Figure 11).. *Fittkauimyia*

Head tapering towards front when viewed dorsally or ventrally (Figure 13).. *Tanypus*

Figure 13. *Tanypus* Photo and text on right by Peter Cranston

8(6) Head and body usually pale, ligula teeth black, in contrast to the head colour (Figure 14) 9

Head usually brown or golden coloured, ligula the same colour as head.. 10


Figure 14. *Procladius*

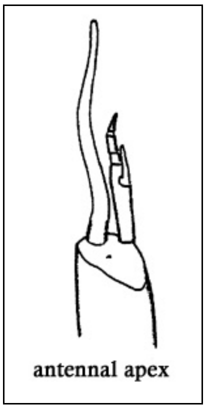

Figure 15. *Djalmabatista* (from Cranston 1996)

9(8) Antenna with long blade that extends beyond end of antennal segments (Figure 15)........................ *Djalmabatista*

Antenna with blade no longer than antennal segments .... *Procladius*

10(8) Dorsomentum with 7 teeth on each side, head width to length ratio about 0.7, only reported from south-western WA and south-eastern SA, may be restricted to swamps and lakes ....*Alotanypus*

Dorsomentum with 5 teeth on each side (Figure 8), head width to length ratio about 0.9, common in flowing waters in south-eastern and south-western Australia ....*Apsectrotanypus*

Mounting may be required to separate larvae. *Alotanypus* has a distinctive ligula with curved inner teeth.

11(3) Two dark simple claws on posterior prolegs (Figure 16), large larvae up to 11mm ....*Ablabesmyia*

Claws on posterior prolegs all the same colour, if dark claws present pectinate or bifid (temporary mount) 12

Figure 16. *Ablabesmyia*

12(11) Anal tubules as long as posterior prolegs (Figure 17), mature specimens no longer than 3 mm, flowing clean water habitat .... *Nilotanypus*

Mature larvae larger than 3 mm... 13

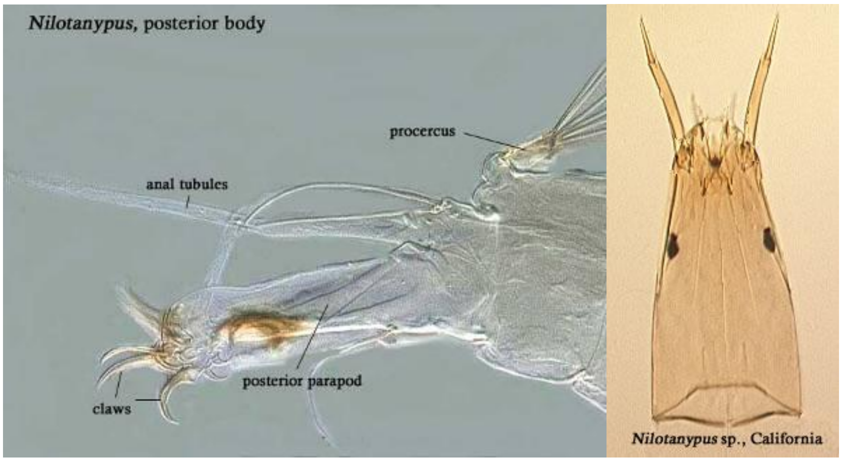

Figure 17. *Nilotanypus* Photos and text by Peter Cranston

13(12) Setae on all body segments (Figure 18)..*Thienemannimyia*

Setae, if present, only on ventral surface of segments (Figure 19) 14

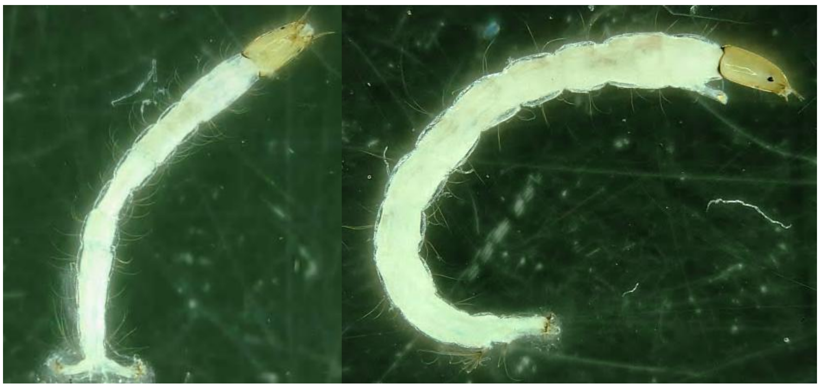

Figure 18. *Thienemannimyia*

14(13) Ventral setae on thorax and abdomen (Figure 19, 20) 15

No ventral setae on thorax and abdomen 17

Figure 19. *Monopelopia*

Figure 20. *Australopelopia*

15(14) Head darker at rear than at front, dorsal apotome suture line obvious (Figures 20, 21)......................................*Australopelopia*

Head all the same colour, dorsal apotome line not obvious 16

Figure 21. *Australopelopia*

Figure 22. ?*Telmatopelopia*

16(15) Head rounded on dorsal side in lateral view (Figure 19) .... *Monopelopia*

Head more rectangular in shape with blunt end at front of head (Figure 22)..?*Telmatopelopia*

Mounting may be required to separate genera. *Monopelopia* has a brown second antennal segment and the star charts are very different.

17(14) Head rectangular in lateral and ventral view (Figure 23)... *Zavrelimyia*

Head not rectangular in lateral view 18

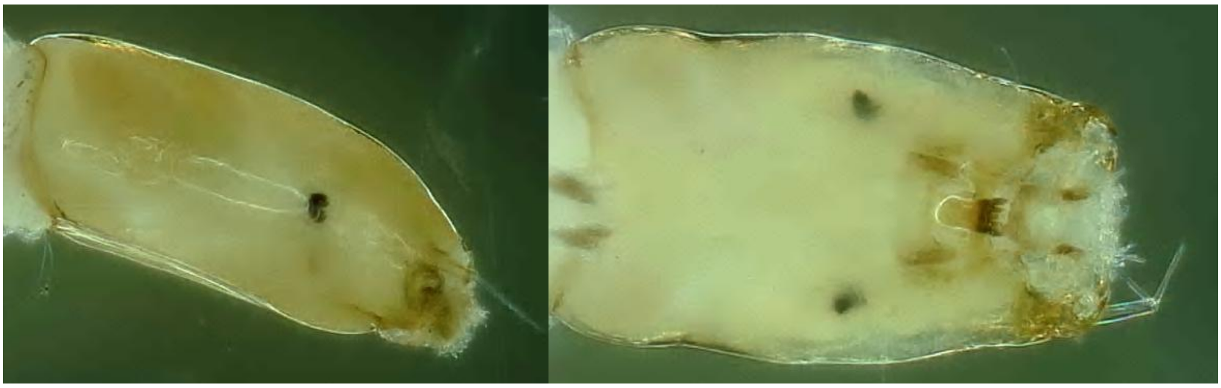

Figure 23. *Zavrelimyia*

18(17) When viewed ventrally, head widest at about mid-point (Figure 24) .... *Paramerina*

When viewed ventrally head widest at base, head pale (Figure 25).. *Larsia*


Figure 24. *Paramerina*

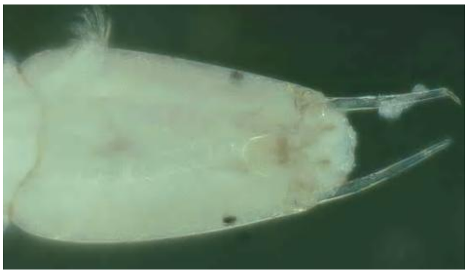
Figure 25. *Larsia*

There will be specimens of Tanypodinae that do not fit any couplet in this key. I illustrate one in Figure 26, Pentaneurini Genus C. This specimen shows the value of examining larvae about to pupate, as the structure of the distinctive pupal thoracic horn is evident on the larval thorax and allows identification purely based on this character.
Among the taxa for which I did not have specimens are Pentaneurini Genus A, Pentaneurini Genus B, Pentaneurini Genus D, Pentaneurini Genus E, Pentaneurini ST1 and ?Hayesomyia. All but ?Hayesomyia are illustrated as larvae in Cranston 1996 and can be keyed by mounting using that reference. Other taxa also probably occur in Australia that are not recorded in Cranston or any other current publication.


Figure 26. Pentaneurini Genus C

19(2) Habitat marine rockpools, procercus absent but setae present, antennae very short (Figure 27) .... Telmatogetoninae (only genus *Telmatogeton)*

Freshwater habitat 20

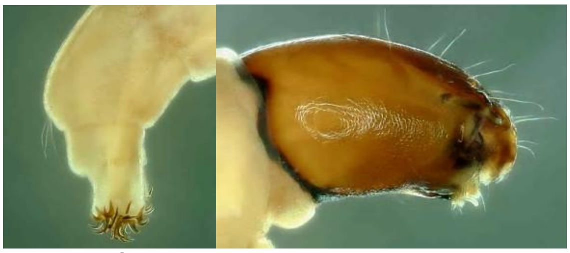
Figure 27. *Telmatogeton*

20(19) Larvae very small (1.5 to 2 mm), head very short, procercus very long, body covered with setae so that silt often adheres to it (Figure 28).. (Aphroteniinae) 21

Body smooth, mature larvae larger than 1.5 to 2 mm 23


Figure 28. *Aphroteniella*

21(20) Head greater than 15% of body length, body smooth (these characters are based on non-Australian species, Australian larvae not known) .... *Paraphrotenia*

Head about 10% of body length, body covered with papillae and feathered setae 22

22(21) Body with feathered setae that are easy to see when viewed laterally, some appearing darker than body colour (Figure 29) .... *Aphrotenia*

Body setae not feathered (Figure 28) .... *Aphroteniella*

Figure 29. *Aphrotenia*

23(20) Dark collar at back of head, procercus and antennae small (Figure 30) .... Diamesinae (only genus *Paraheptagyia*)

Procercus usually bulbous and long, antennae often long and prominent .... (Podonominae) 24

Figure 30. *Paraheptagyia*

24(23) Antennae attached towards centre of head and greater than half head length, sutures obvious on head, anal prolegs very long with dark hooks, procercus bulbous with very short setae, anal tubules longer than procercus .... *Podonomopsis*

Antennae much less than half head length 25

Figure 31. *Podonomopsis*

25(24) Only found in seeps on granite outcrops (Figure 32) .... *Austrochlus* (was *Archaeochlus*)

Found in riverine habitats 26

Figure 32. *Austrochlus*

Figure 33. *Podochlus*

26(25) Spines on last abdominal segment (Figure 33) ....*Podochlus*

No spines on last abdominal segment 27

27(26) Short, dark procercus, about same length as anal tubules, body setae present, dense fine setae on posterior proleg (Figure 34) ....*Podonomus*?

Procercus much longer than anal tubules, no body setae, pale head, (Figure 35) ....*Parochlus*

The first part of couplet 27 is based on a single specimen and I am not certain that the genus assignment is correct. I will be very glad of more specimens that resemble the figure 34.

Figure 34. *Podonomus*?

Figure 35. *Parochlus*

28(1) One eye-spot shaped like a comma (Figure 36), single eyespot (Figure 4) or two eye spots of different sizes (Figure 37) .... (Orthocladiinae) 29

Two or three eye-spots that are similar sizes, usually arranged in a vertical line, in some cases eyes spots may be joined (Figure 38), ventromental plates obvious (Figure 39), larvae pink to red coloured in life .... (Chironominae) 56


Figure 36. *Botryocladius*


Figure 37. *Cricotopus*


Figure 38. *Cladopelma*, *Microtendipes* and *Cryptochironomus*


Figure 39. ventromental plates of *Kiefferulus* and *Paraborniella*

29(28) Marine habitat (no figures available) .... *Clunio*

In inland water habitats 30

30(29) No procercus present (but setae at site sometimes), anal prolegs reduced or absent 31

Procercus present with tuft of setae and anal prolegs long 34

31(30) Mentum with two central teeth extended forward (Figure 40) 32

Mentum without two central teeth extended forward (Figure 41) 33


Figure 40.


Figure 41.

32(31) Hooks below mentum (Figure 42), sclerotized ring dorsally on anal segment, antennae short ....Genus wood miner (Don Edward V43)

No hooks below mentum, no sclerotised ring on anal segment, antennae long (Figure 43) .... Don Edward V15

Figure 42. Genus wood miner Don Edward V43

Figure 43. Don Edward V15

33(31) This singlet is a catch all for a group of genera that I am unable to separate reliably at the moment in a dichotomous key. Characteristics that may be useful are the degree of reduction of the prolegs and associated hooks and the length and shape of antennal segments and antennal blade. Genera included are *Gymnometriocnemus, Bryophaenocladius, Camptocladius, Pseudosmittia, Semiocladius, Smittia* and *Allotrissocladius* and possibly others. There are coded species recognised in WA, some of which probably belong to the above genera. Ecology of taxa varies. Many are semi-terrestrial and occur on the wet edges of water bodies. I have collected *Gymnometriocnemus* and *Bryophaenocladius* from true aquatic situations and some of the WA species have been collected from temporary water bodies. *Semiocladius* is reported from estuarine sections of the Clyde River in NSW by Cranston and Dimitriadis, 2005. I have identified *Pseudosmittia* in Great Artesian Basin springs. Some larvae are illustrated below to help identify the form of the larvae and it is hoped that separation will be possible in a later version of this key.

Figure 44. *Bryophaenocladius*

Figure 45. *Gymnometriocnemus* (Don Edward V44), see also Figure 4

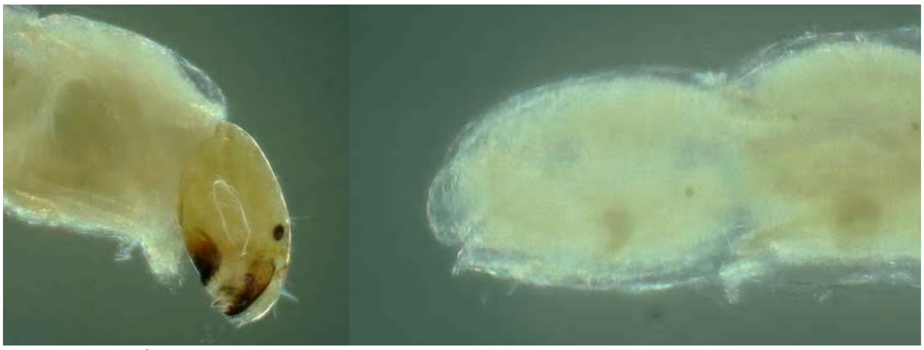

Figure 46. *Pseudosmittia*

34(31) Two separate eye-spots (Figure 37, 47) 35

One eye-spot 36

35(34) Body covered in setae (Figure 47) ....Genus Australia
I have only one specimen of this taxon to photograph (species B in Cranston, 1996). Other specimens I have seen (species A and D) had the body setae but I do not recall if they all had a double eyespot.

Body not covered in setae ....*Cricotopus* (in part)

Figure 47. Genus Australia

36(34) Antennae greater than half head length (Figure 48, 49) 37

Antennae less than half head length.. 40

37(36) Antennae greater than 2X head length (Figure 48), if antennae missing can use length of head capsule, and lack of dark patch at rear (Figure 49) ....*Corynoneura*

Antennae no longer than head.. 38

Figure 48. *Corynonuera*

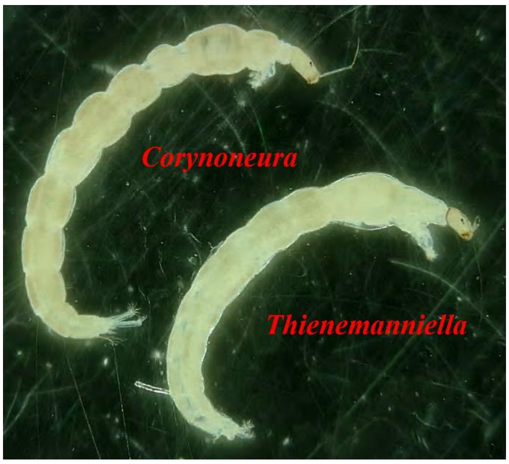

Figure 49.

38(37) Antennae with second segment dark (Figure 50)..*Thienemanniella*

No antennal segment dark 39

Figure 50. *Thienemanniella*

39(38) Antennae as long as head, second antennal segment not completely sclerotised (Figure 51)..................................*Stictocladius*

All antennal segments sclerotised, procercus attached to rounded extension of final abdominal segment (Figure 52) SO4

Figure 51. *Stictocladius*

Figure 52. SO4

40(36) Lateral fringe of two pairs of setae per segment (Figure 53, 54) 41

No lateral fringe but dorsal and ventral setae may be present... 42

41(40) Lateral setae as long as body segments (Figure 53).. *Paralimnophyes*

Lateral setae half as long as body segments ....*Limnophyes*

The character of the setae length is from Cranston, 1996. I am not certain it will work in all cases as I have seen *Paralimnophyes* with short setae. There are two body types of this genus present, one with dark head and purple body colouration and the other paler. The first type lives in fresher, small streams in general and the latter is quite tolerant of elevated salinity and can be the dominant orthoclad in saline streams (also collected in GAB springs).

I have found *Limnophyes* to be quite rarely collected and most specimens for this couplet will be *Paralimnophyes*. If in doubt, mount larvae. *Paralimnophyes* has four inner teeth on the mandible and *Limnophyes* only three.

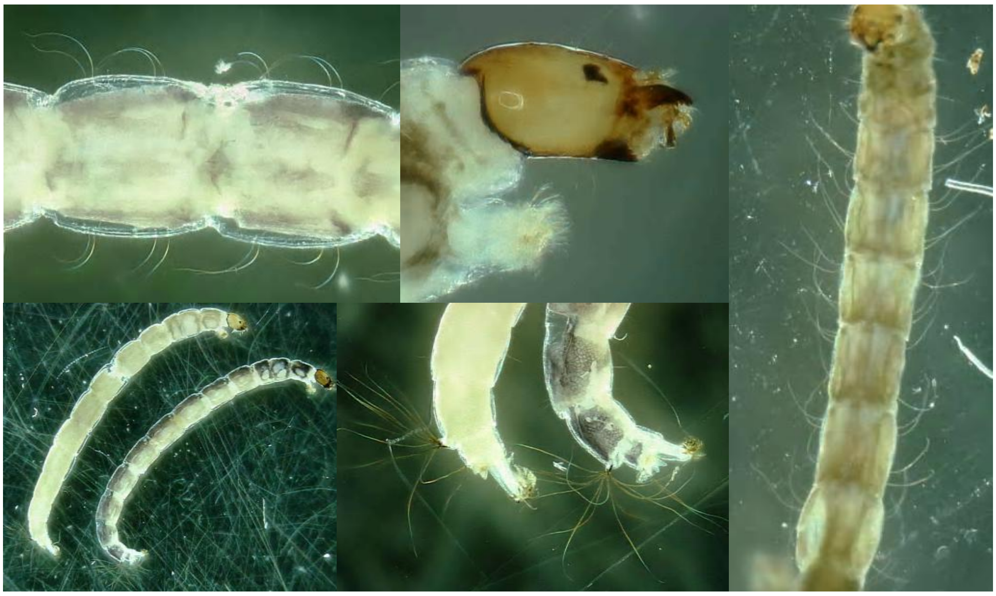

Figure 53. *Paralimnophyes*

Figure 54. *Limnophyes*

42(40) Dorsal and ventral setae present (Figure 55, 56).. 43

No long setae on body 44

43(42) Anal tubules long, head long, ventromental plates large (Figure 55, temporary mount to see this clearly) .... *Rheocricotopus*

Anal tubules not long, short head (Figure 56, see Cranston, 2009).. *Anzacladius* (was SO3)

Figure 55. *Rheocricotopus*

Figure 56. *Anzacladius*

44(42) Head dark, pale area around eyespots, strong pre-apical seta on procercus (Figure 57) .... *Eukiefferiella*

Head pale, if head dark, no strong seta on procercus 45

Figure 57. *Eukiefferiella*

45(44) Spots at base of mentum, usually long green body (Figure 58) .... *Parametriocnemus*

No spots at base of mentum 46

Figure 58. *Parametriocnemus*

46(45) Anal tubules much longer than prolegs, pale head, ventromental plates obvious (Figure 59) 47

Anal tubules shorter than anal prolegs 48

Figure 59. *Nanocladius*

47(46) Ventromental plates much wider than mentum (Figure 59) .... *Nanocladius*

Ventromental plates not as wide as mentum .... "*Psectrocladius*"

This genus is keyed here based on the features in Cranston, 1996. The name applied in that publication is not correct and the taxon still awaits formal description. I have not seen any larvae to confirm characters.

48(46) Ectoparasitic on Ephemeroptera (Figure 60), small head on swollen body .... *Symbiocladius*

Free living larvae 49

Figure 60. *Symbiocladius* pupa on a leptophlebiid mayfly

49(48) Depression on top of head, large lauterborn organs obvious on antennae (Figure 61)........................ *Echinocladius* (was MO3)

No depression on top of head.. 50

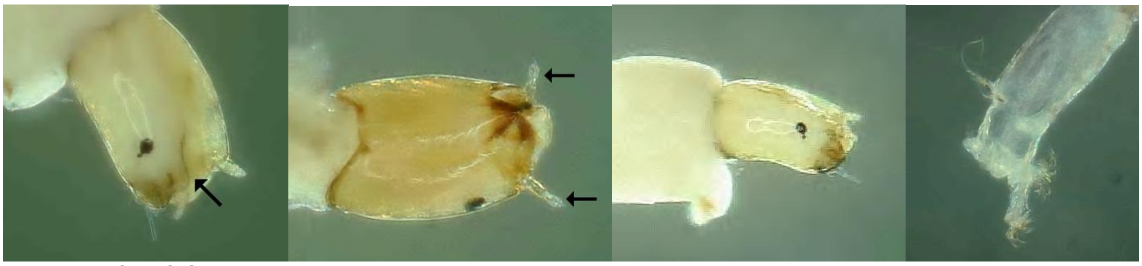

Figure 61. *Echinocladius*

50(49) Pale stripe laterally across top of head (Figure 62) ....*Pirara*

No pale lateral stripe on top of head 51

Figure 62. *Pirara*

51(50) Anterior prolegs fused, sutures on head obvious, back of head dark with notch, long anal pro-legs, procercus attached to end of abdominal segment, anal tubules long, body with bluish colouration (Figure 63).. *Cardiocladius*

Not as above, procercus attached to top of anal segment.. 52

Figure 63. *Cardiocladius*

52(51) Long body, usually with thoracic marbling (Figure 64), first two antennal segments of equal length (for most common species), median tooth of mentum single.. *Parakiefferiella*

Not as above, if body has thoracic marbling then median mentum tooth bifid.. 53

Figure 64. *Parakiefferiella* Photo left by Ros St Clair, photo right by Peter Cranston

53(52) Thorax marbled (Figures 36, 65), median teeth of mentum usually bifid, setae under lateral edges of mentum can be seen by mounting, thoracic horn distinctive if pre-pupa collected.. *Botryocladius*

Thorax not marbled 54

Figure 65. *Botryocladius*

54(53) Long body (about 20x head), raised ridge at front of head, anal tubules pointed, anal prolegs short, anal proleg claws and procercus brown (Figure 66) ....*Austrobrillia*

Shorter body (about 10x head length), no ridge on head, procercus not coloured, mentum triangular.................................... 55

Figure 66. *Austrobrillia*

55(54) Lateral setae at segment joints tufted (Figure 67)..*Cricotopus*

Lateral setae at segment joints single (Figure 68)..*Paratrichocladius*

This character may be distinguished more clearly by a temporary mount in glycerol

Figure 67. *Cricotopus*

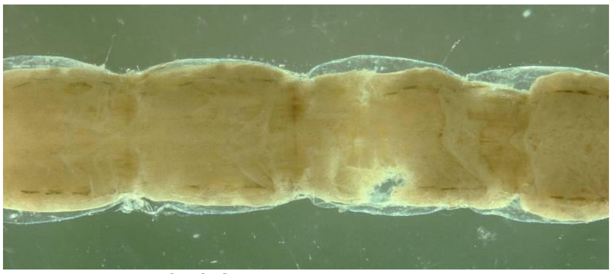

Figure 68. *Paratrichocladius*

There are several other Orthocladiinae genera in Cranston (1996) that I do not know as whole larvae (MO1, MO2, MO5, SO1, SO2, SO5 etc. These can be identified after mounting by using the key in that publication.

56(28) Anal segment with raised lobes and procercus long, blade obvious on antenna, eyespots sometimes joined or lower spot can be slightly smaller, head often retracted into thorax (Figure 69) .... Pseudochironomini *Riethia*

Not with above combination of characters 57

A second genus of Pseudochironomini, *Megacentron*, has been recorded in Australia but I have not seen any larvae.

Figure 69. *Riethia*

57(56) Antennal pedestals prominent, lauterborn organs usually obvious or on long stalks, lateral setae at abdominal segment joints (Figure 70), ventromental plates broad ....(Tanytarsini) 58

No lateral setae at joints, lauterborn organs usually small, ventromental plates variable .... (Chironomini) 65

Figure 70. Tanytarsini lateral setae and antennal structure

58(57) Living in habitat consisting of thin water film flowing over vertical rock face (hygropetric zone, see Cranston, 1996 and 1998 for descriptions) .... *Neozavrelia*

Not limited to hygropetric habitat 59

59(58) Inhabiting marine habitats, coastal lakes or seagrass meadows .... *Pontomyia*

Not in marine habitats (but see note below on Tanytarsus barbitarsis in salt lakes) 60

Figure 71. *Tanytarsus barbitarsis*

60(59) Lauterborn organ stalks very long (Figure 72), usually protruding beyond end of antenna (exception *Tanytarsus barbitarsis* that lives in saline habitats, Figure 71, 73), antennae often much longer than head, median teeth of mentum pale .... *Tanytarsus*

Lauterborn organ stalks not protruding beyond end of antenna, antennae less than head length 61

Figure 72. *Tanytarsus*

Figure 73. *Tanytarsus barbitarsis*

61(60) Living in portable case made of sand grains (Figure 74) 62

Not living in portable case (but may live in sessile tube covered in various materials) 63

62(61) Palmate process on antennal pedestal, southern distribution, case curved (Figure 74) .... *Stempellina*

No palmate process, northern distribution, case straight (Figure 75) .... *Stempellinella*

Figure 74. *Stempellina*

Figure 75. *Stempellinella*

63(61) Lauterborn organs held above bent antennae (Figure 76) .... *Cladotanytarsus*

Not as above 64

Figure 76. *Cladotanytarsus*

64(63) Pointed anal tubules (Figure 77), case nondescript, antennal blade obvious, lauterborn organs usually also, lotic or lentic habitats...*Paratanytarsus*

Rounded anal tubules, case with arms for building capture net (Figure 78), antennal blade and lauterborn organs not obvious, rheophilic.. *Rheotanytarsus*

Figure 77. *Paratanytarsus*

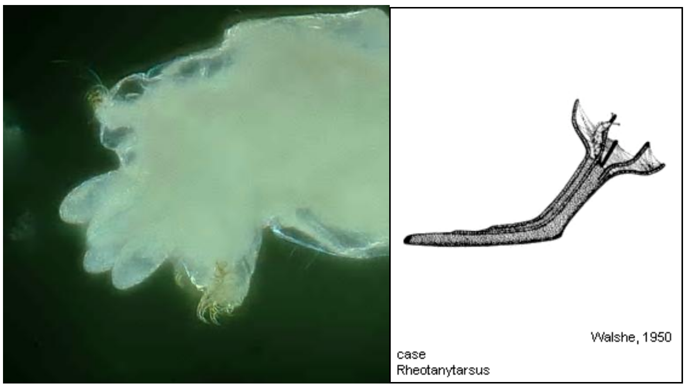

Figure 78. *Rheotanytarsus*

65(57) One or two pairs of ventral tubules present on abdominal segment 8 (Figure 79).. 66

No ventral tubules present 68

66(65) Two pairs of ventral tubules in most cases (occasionally only one, in one species none), lateral tubules present on segment 7 in some species (Figure 79), distal edge of frontal apotome convex between antennal bases (Figure 79).....................*Chironomus*

One pair of ventral tubules, no lateral tubules, distal edge of frontal apotome flat or concave (Figures 80, 81) 67

Figure 79. *Chironomus*

67(66) Ventral tubules long, at least as long as segment 8, anal tubules large, more than half as long as prolegs (Figure 80), distal edge of frontal apotome strongly concave between antennal bases (Figure 80), more than 2 teeth on premandible (Figure 80), in one species feeding fans attached to labrum..*Kiefferulus*

Ventral tubules only half as long as segment 8, anal tubules smaller (Figure 81), distal edge of frontal apotome straight or slightly concave between antennal bases, median mentum tooth large and projecting forward (Figure 81) .... *Dicrotendipes* (in part)

Figure 80. *Kiefferulus* (photo bottom right by Ros St Clair)

68(65) Large tooth in centre of mentum, fan-shaped ventromental plates, some species may have three eye spots................................ .... *Dicrotendipes* (in part)

Central tooth of mentum similar in size to others or bifid or trifid 69

Figure 81. *Dicrotendipes*

69(68) Head bean-shaped (Figure 82) i.e. ventral surface of head concave, small larvae max length 5mm .... *Nilothauma*

Head not bean-shaped 70

Figure 82 .*Nilothauma*

70(69) Eyespots touching (Figures 83, 84, 85, 86).. 71

Eyespots well separated 74

71(70) Larvae in case (Figure 83), antennae longer than head, lateral tubules present if larva taken out of case....................*Zavreliella*

Larva not in case, antennae shorter than head, no lateral tubules.. 72

Figure 83. *Zavreliella*

72(71) Median teeth of mentum paired and taller than first laterals or all teeth of mentum approximately even (Figure 84).................. .... *Polypedilum* (in part)

Median teeth of mentum not as above 73

Figure 84. *Polypedilum*

73(72) Anal tubules rounded (Figure 85), usually living in granite rock pools and other temporary habitats ....*Paraborniella*

Anal tubules pointed (Figure 86), median teeth of mentum paler than the other teeth, not restricted to temporary habitats .... *Microtendipes*

Figure 85. *Paraborniella*

Figure 86. *Microtendipes*

74(70) Three eyespots, antennae at least one third head length, head pale, teeth of mentum all fairly even in size (Figure 87) ....*Parachironomus*

Two eyespots, antennae variable 75

Figure 87. *Parachironomus*

75(74) Head flattened, anal tubules long (Figures 88, 89)..*Harrisius* and *Stenochironomus*
(mount to separate using antennal character of Cranston, 1996: no reliable character to separate whole larvae as yet)

Head not flattened, anal tubules no longer than anal prolegs 76

Figure 88. *Harrisius*

Figure 89. *Stenochironomus*

76(75) Labral brush present (developed to various degrees, Figure 90), lower eyespot often larger than upper, head narrowed when viewed dorsally .... *Xenochironomus*

No labral brush present, eyespots same size 77

Figure 90. *Xenochironomus*

77(76) First lateral teeth tallest on mentum (Figure 91), larval habitat wood-mining .... *Xylochironomus*
This taxon is keyed here based on the description in Cranston (2006), no larvae available. Was "Unknown Genus K1" in Cranston (1996)

First lateral teeth not tallest, not wood-mining 78

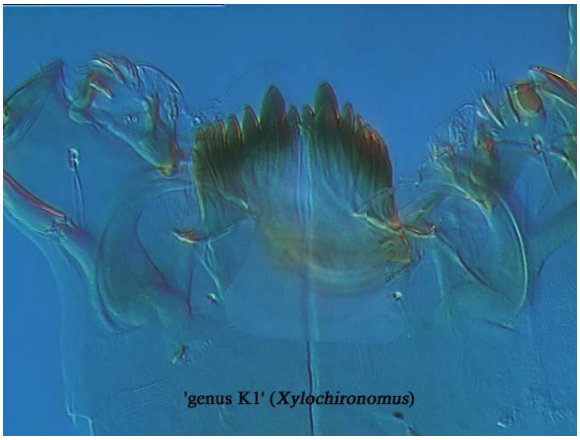

Figure 91. *Xylochironomus* Photo and caption by Peter Cranston

78(77) Paired median teeth on mentum that are taller than first lateral teeth (Figure 84, 92), second laterals same height as median teeth 79

Median teeth not paired or same height as first laterals 80

79(78) Antennae with 5 segments .... *Polypedilum* (in part)

Antennae with 6 segments .... *Imparipecten*
Mounting required to see this difference. *Polypedilum nubifer* and *P. watsoni* key out here. *Imparipecten* larvae illustrated in Figure 92. No larvae available to author.

Figure 92. *Imparipecten* Photos and captions by Peter Cranston

80(79) Eyespots in same vertical plane 81

Eyespots in oblique line i.e. upper eyespot closer to front of head than lower eyespot (Figures 101 to 110) 88

81(80) Anal tubules long and constricted (Figure 93), northern and central Australia distribution .... *Conochironomus*

Anal tubules not constricted 82

Figure 93. *Conochironomus*

82(81) Maxillary palp with brush of setae (Figure 94), ventromental plates wide and narrow and meeting at centre of mentum ....*Axarus*

No brush of setae, ventromental plates not meeting in middle 83

Figure 94. *Axarus*

83(82) Sclerotised plates on ventral surface of thoracic segments (Figure 95) .... "TCC333"
This taxon most likely belongs in *Xenochironomus* but rearing is required to associate other life stages.

No sclerotised plates on ventral thorax 84

Figure 95. "TCC333"

84(83) Teeth on mentum not darkly pigmented, similar colour to rest of head capsule (Figure 96), median teeth paler than other teeth, usually 4 even median teeth, anal setae shorter than last segment 85

Teeth on mentum much darker than head capsule, gula area of ventral head capsule darkened (Figure 98), lateral group of 3 teeth on mentum raised compared to other teeth, anal setae longer than last body segment and anal prolegs combined 86

85(84) Antennae approximately one quarter head length (Figure 96) ....*Paratendipes*

Antennae approximately half head length (Figure 97)...*Skusella*

Figure 96. *Paratendipes*

Figure 97. *Skusella*

86(84) Median tooth of mentum double (Figure 98)..*Cladopelma*

Median tooth trifid or single 87

Figure 98. *Cladopelma* Top left photo and caption by Peter Cranston

87(86) Median tooth of mentum trifid (Figure 99)..*Microchironomus*

Median tooth of mentum single and broad (Figure 100) ....*Paracladopelma* (in part)

Figure 99. *Microchironomus*

Figure 100. *Paracladopelma* M3

88(80) All teeth of mentum evenly sized and coloured (character not illustrated) .... *Stictochironomus*

Teeth of mentum of different sizes or different colours 89

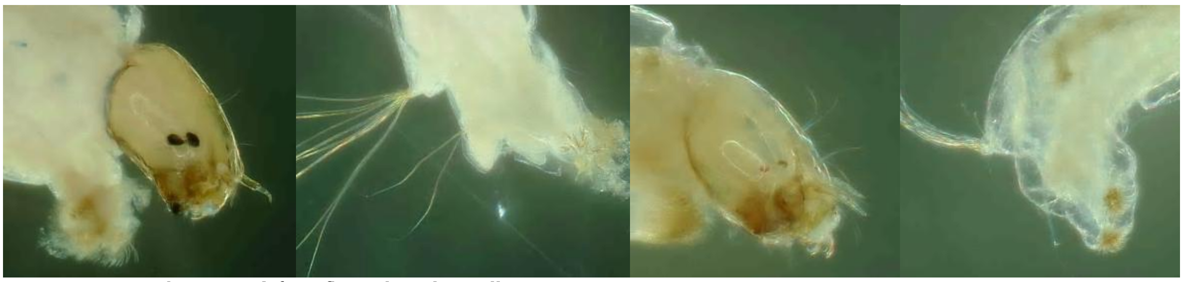

Figure 101. *Stictochironomus* left: *S. fluviatile*, right: *S. illawarra*

89(88) Mentum concave, central tooth clear in contrast to rest of teeth, ventromental plates obvious laterally on head (Figure 102) .... *Cryptochironomus*

Mentum convex or central tooth not clear and contrasting 90

Figure 102. *Cryptochironomus*

90(89) Centre of mentum with cleft (Figure 103) .... *Fissimentum*

Centre of mentum without cleft 91

Figure 103. *Fissmentum* Top left photo and caption by Peter Cranston

91(90) Terminal antennal segment fine and hair like, teeth of mentum pale (Figure 104)....................................... Unknown Genus K2

Terminal antennal segment not fine and hair like.. 92

Figure 104. Unknown Genus K2

92(91) Procercus setae half body length, tropical Australia (Figure 105, see also description in Cranston, 1999)......... *Anuncotendipes*

Procercus setae not half body length 93

Figure 105. *Anuncotendipes* Photos, drawing and captions by Peter Cranston

93(92) Central tooth of mentum broad, as broad as lateral teeth on one side of mentum, antennae less than half head length (Figure 106).. 94

Central tooth of mentum not as broad as combined lateral teeth, antennae half head length or more (Figure 108).................. 95

94(93) Premandible hooked, ventromental plates smooth on front margin and inner edge reaches to edge of broad central tooth, mandible with little sign of inner teeth (mounting required, characters illustrated in Cranston, 1996) .... *Harnischia*

Premandible not as hooked, ventromental plates crenulate on front margin, inner edge of ventromental plates reaches no further than second tooth from edge of mentum, mandible with obvious inner teeth (mounting required, characters illustrated in Cranston, 1996) .... *Paracladopelma* M1

Figure 106. *Harnischia*

Figure 107. *Paracladopelma* M1

95(93) Mandibular palps almost as long as antennae (Figure 108), larvae very long, anal prolegs about ten times as long as basal width .... *Robackia*

Mandibular palps much shorter than antennae, anal prolegs less than ten times as long as basal width 95

Figure 108. *Robackia*

96(95) Anal prolegs about four times as long as basal width, at least twice as long as anal tubules, mentum convex (Figure 109) .... *Paracladopelma* (in part)

Anal prolegs less than four times as long as basal width, not much longer than anal tubules, mentum concave (Figure 110) .... *Demicryptochironomus*

Figure 109. *Paracladopelma*

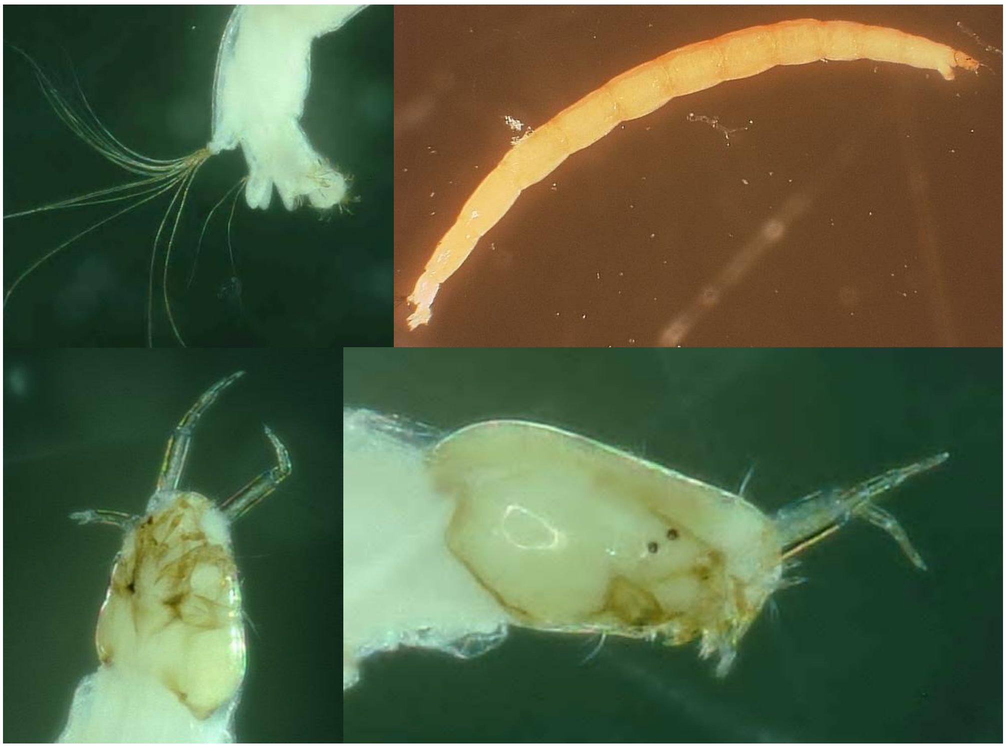

Figure 110 *Demicryptochironomus*

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