

A KEY TO THE VICTORIAN GENERA OF FREE-LIVING AND RETREAT-MAKING CADDIS-FLY LARVAE (INSECTA: TRICHOPTERA)

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Summary

A key is provided to Victorian genera of free-living and retreat-making Trichoptera larvae of the families Philopotamidae, Polycentropodidae, Hydrobiosidae, Ecnomidae and Hydropsychidae. Twenty-eight genera are included, although some remain unidentified while the status of several others is uncertain. In addition larvae of four genera of Hydrobiosidae cannot be separated, and have been lumped in the key as the *Taschorema* complex.

Introduction

With the great upsurge in environmental and ecological studies over the last few years, there has been an increase in the demand for taxonomic information. For Australian freshwater environments, however, taxonomic information has in general been found completely inadequate. Although the immature stages of caddis-flies represent an important component of many inland water communities, there are very few descriptions of Australian larvae in the literature except at the family level (Riek, 1970; Williams, 1980).

We have been investigating the taxonomy of free-living and retreat-making Trichoptera larvae of the families Hydrobiosidae, Philopotamidae, Polycentropodidae, Ecnomidae and Hydropsychidae. Taxonomic knowledge of the adults of Victorian species in these families unfortunately is incomplete, and this has presented some problems. There are numerous undescribed species and probably several undescribed genera, and in addition in many cases it is not known whether genera described from elsewhere in Australia also occur in Victoria. As a consequence many larval types cannot be allocated to a genus, either because we have not bred them out or because the associated adult cannot readily be accommodated in any described genus. However, since it could be some time before all Victorian genera can be identified, we believe that a preliminary guide is justified, and that the inclusion of unidentified material will enhance the value of the keys. Although the families Hydroptilidae and Glossosomatidae are not considered in this paper, for the sake of com-

pleteness they are included in the key to families.

The keys have been developed for the Victorian fauna, and should be used elsewhere with caution. Erroneous identifications could result in regions where non-Victorian genera occur. It is also possible that species from elsewhere in Australia may exhibit characters which fall outside the range found to define a genus in Victoria, so that when the fauna of the whole of Australia is considered new generic criteria will be required. The keys are primarily for later instar larvae, and difficulties could be encountered in keying out early instars. Terminology generally follows that of Wiggins (1977).

KEY TO THE FAMILIES OF FREE-LIVING AND RETREAT-MAKING TRICHOPTERA LARVAE OF VICTORIA

- 1. Larvae campodeiform; abdominal prolegs usually long, not fused at base, anal claws terminal; tubercles absent from abdominal segment one; mostly free-living or retreat-makers2
 SUPERFAMILIES RHYACOPHILOIDEA and HYDROPSYCHOIDEA
- Larvae eruciform; abdominal prolegs short, fused to form an apparent tenth abdominal segment, anal claws lateral; tubercles present on abdominal segment one; construct portable cases
 SUPERFAMILY LIMNephiloidea (Not considered further)

2. Dorsal sclerotisation on first thoracic segment only (Fig. 33)3
 — Dorsal sclerotisation on all three thoracic segments, although incomplete on mesonotum and metanotum in some families (Figs. 27, 28, 41, 51, 52)5
3. Labrum membranous, anterior margin considerably broader than posterior margin (Fig. 23).....
PHILOPOTAMIDAE
 — Labrum sclerotised, anterior margin not greatly broader than posterior margin (Figs. 18, 34).....4
4. Protrochantin distinct and well developed, prothoracic leg simple (Figs. 31, 32)
POLYCENTROPODIDAE
 — Protrochantin reduced, not at all obvious; prothoracic leg modified, either chelate or with femur broadened and with a field of stout spines (Figs. 2, 8, 12, 20) ...HYDROBIOSIDAE
5. Abdomen of final instar swollen, distinctly wider than head and thorax; final instar living in portable purse-like case (Fig. 51)
HYDROPTILIDAE
 — Abdomen not swollen, only slightly wider than head and thorax; not living in purse-like case6
6. Mesonotum and metanotum each bearing a pair of small sclerites (Fig. 52); living in dome-shaped portable stone caseGLOSSOSOMATIDAE
 — Mesonotum and metanotum with sclerotisation complete or almost complete (Figs. 27, 28, 39, 41)7
7. Abdominal gills present (Figs. 39, 41)
HYDROPSYCHIDAE
 — Abdominal gills absent ...ECNOMIDAE

Hydrobiosidae

The Hydrobiosidae of Australia were revised by Neboiss (1962), who recorded twenty-four species from Victoria contained in nine genera. Since then three additional species have been recorded from the state, *Austrochorema nama*, *Ulmerochochorema onychion* and *Tanjilana*

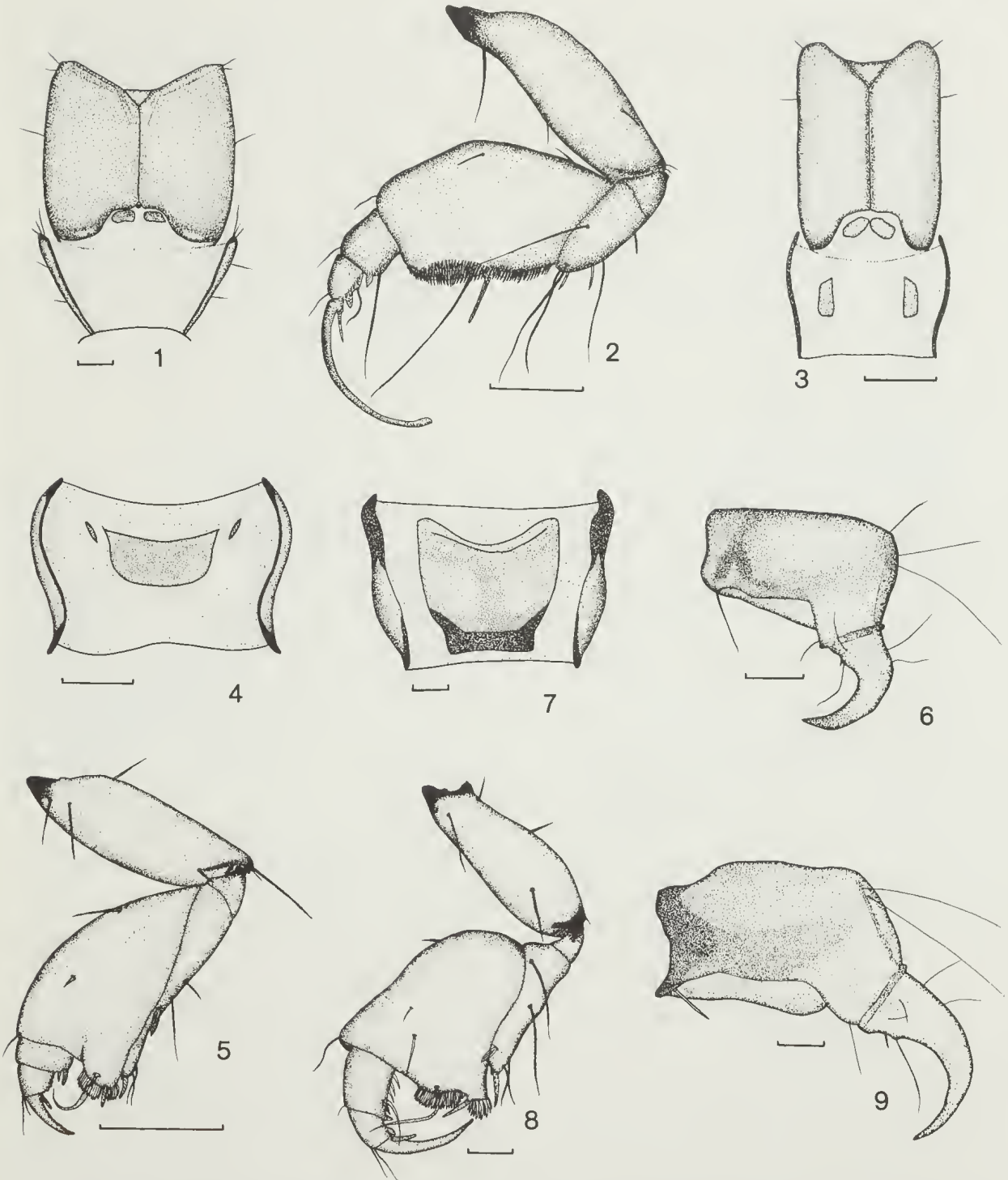
zothecula (Neboiss 1977, personal communication). In addition several species have been transferred from the genus *Taschorema* to two new genera, *Ethochorema* and *Ptychobiosis* (Neboiss, 1977). This is probably one of the few Trichoptera families for which taxonomic knowledge of the Victorian fauna is close to complete.

We have bred through to the adult all known Victorian species of the genera *Apsilochorema*, *Megogata*, *Psyllobetina*, *Koetonga*, *Ethochorema*, *Taschorema* and *Ptychobiosis*, as well as five species of *Ulmerochochorema* and one of the two *Tanjilana* species. Two additional larval types cannot be referred to the above genera, and presumably therefore represent the remaining Victorian genera, namely *Allochochorema* and *Austrochorema*. One of these larval types is very similar to confirmed larvae of *Austrochorema pegidion* from Tasmania, and is accordingly included in the key as *Austrochorema*, while the larva we have called 'Genus' A is more similar to *Apsilochorema* than other Victorian genera, and this suggests *Allochochorema* as the likely identity.

As mentioned above Neboiss (1977) transferred several species from the genus *Taschorema* to the new genera *Ethochorema* and *Ptychobiosis*. Although we have bred out and are able to recognise all Victorian species involved, we have been unable to identify reliable characters to key out the genera. Likewise we have been unable to key out the genus *Tanjilana*, and as a consequence the genera *Taschorema*, *Ethochorema*, *Ptychobiosis* and *Tanjilana* are lumped in the key as the *Taschorema* complex.

KEY TO VICTORIAN GENERA OF HYDROBIOSIDAE

1. Undersurface of head with pair of small posterior sclerites closely associated with head capsule (Figs. 1, 3).....2
- Undersurface of head without posterior sclerites3
2. Prosternum without sclerites (Fig. 1); tarsal claw of prothoracic leg twice combined length of tibia and tarsus (Fig. 2)*Apsilochorema*



Figures 1-9 HYDROBIOSIDAE

Figs. 1-2. *Apsilochorema*. 1, head and prothorax, ventral; 2, prothoracic leg.
 Fig. 3. 'Genus' A, head and prothorax, ventral.

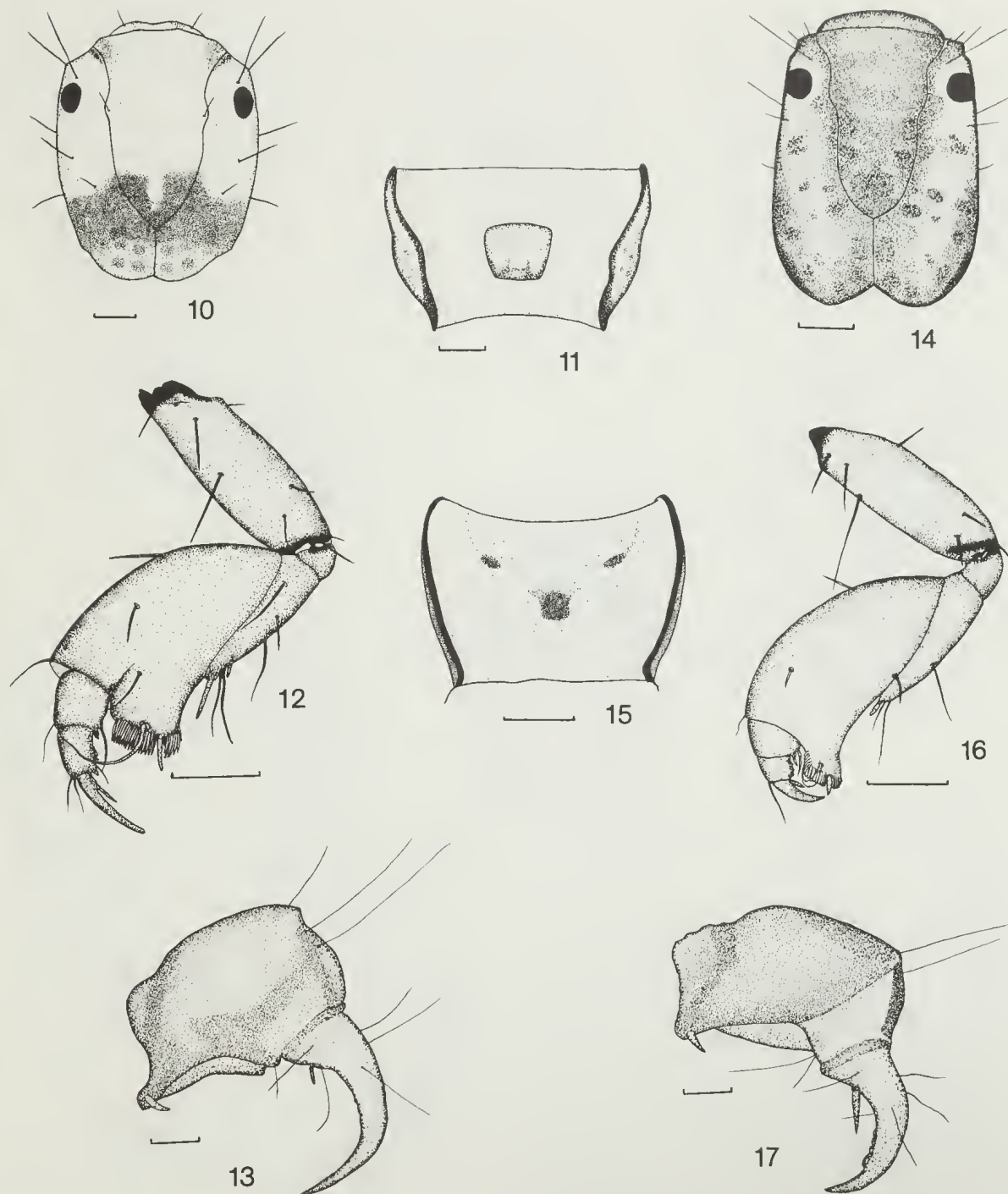
Figs. 4-6. *Austrochorema*. 4, prosternum; 5, prothoracic leg; 6, abdominal proleg.
 Figs. 7-9. *Koetonga*. 7, prosternum; 8, prothoracic leg; 9, abdominal proleg.
 Scale lines: 0.1 mm (Figs. 6, 9); 0.2 mm (Figs. 1-5, 7-8)

- Prosternum with pair of small rectangular sclerites (Fig. 3); tarsal claw of prothoracic leg only slightly longer than combined length of tibia and tarsus 'Genus' A
- 3. Prothoracic leg with femur broadened, trochanter extending at least halfway along ventral margin of femur (Figs. 5, 8, 12, 16); chela absent (Figs. 5, 8, 12) or short and not well developed (Fig. 16); prosternum generally with central sclerite reduced (Figs. 4, 11, 15) although with a single exception (Fig. 7) 4
- Prothoracic leg with femur not broadened, trochanter never extending halfway along ventral margin of femur (Fig. 20); chela long and well developed (Fig. 20); prosternum with single large sclerite (Fig. 19) 7
- 4. Apical spine of protrochanter reaching cluster of spines on apical-ventral angle of femur (Figs. 5, 8); ventral spine at base of abdominal proleg long, slender and straight (Fig. 9) or replaced by a long hair (Fig. 6) 5
- Apical spine of protrochanter not reaching cluster of spines on apical-ventral angle of femur (Figs. 12, 16); ventral spine at base of abdominal proleg short, stout and curved (Figs. 13, 17) 6
- 5. Central sclerite of prosternum twice as wide as long, two small antero-lateral sclerites also present (Fig. 4) *Austrochorema*
- Central sclerite of prosternum about as wide as long, antero-lateral sclerites absent (Fig. 7) *Koetonga*
- 6. Prosternum with single central sclerite, antero-lateral sclerites absent (Fig. 11); frontoclypeus with dark pigmentation in posterior quarter only, pigmentation extended outside frontoclypeus to cover much of posterior third of head (Fig. 10) *Ulmerochorema*
- Prosternum with pair of small antero-lateral sclerites, and in some species also with a central sclerite (Fig. 15); frontoclypeus more uniformly pigmented, dark pigmentation not restricted to posterior third of head (Fig. 14) *Psyllobetina*
- 7. Frontoclypeus long and narrow, length/width ratio greater than 2.0; lateral margins with small conspicuous rounded projections in posterior half (Fig. 21) *Megogata*
- Frontoclypeus not long and narrow, length/width ratio less than 1.7; lateral margins without conspicuous projections in posterior half (Figs. 18, 22) *Taschorema* complex

Philopotamidae

Two genera have been recorded from Australia, *Chimarra* and *Hydrobiosella*. We have bred out two species of each genus from Victoria, and have found the genera readily distinguished on the basis of the processes on the coxa of the prothoracic leg. In *Hydrobiosella* the coxa bears two sclerotised processes, each with a terminal seta, while *Chimarra* has only a single sclerotised process and basal to this a long dark seta arising directly from the surface of the coxa. Utilising these criteria we have been able to recognise additional species of both genera from mainland Australia.

It should be mentioned, however, that we have examined larvae from Tasmania which do not possess sclerotised processes on the coxa, instead having two dark setae arising directly from the surface. Neboiss (1977) has revised the adult Philopotamidae of Tasmania, and recognised nine species all placed in the genus *Hydrobiosella*. He did, however, comment on the presence of three quite distinctive species groups on the basis of male genitalia; the *H. corinna* group with four species, the *H. tasmanica* group with four species, and *H. waddama*. We have bred out *H. waddama* and a species of the *H. corinna* group from Victoria, and both have two sclerotised processes. In the collection of the National Museum of Victoria there is a pupa of the *H. tasmanica* group, and the associated larval parts do not have coxal processes. If this condition is common to all

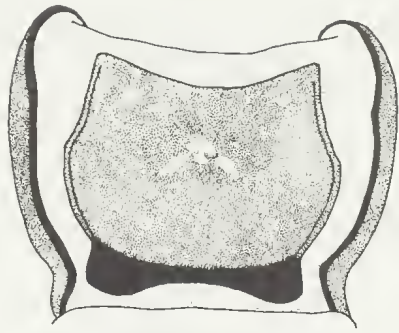


Figures 10-17 HYDROBIOSIDAE

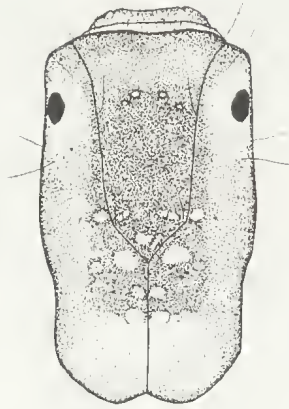
Figs. 10-13. *Ulmerochorema*. 10, head; 11, prosternum; 12, prothoracic leg; 13, abdominal proleg.

Figs. 14-17. *Psyllobetina*. 14, head; 15, prosternum; 16, prothoracic leg; 17, abdominal proleg.

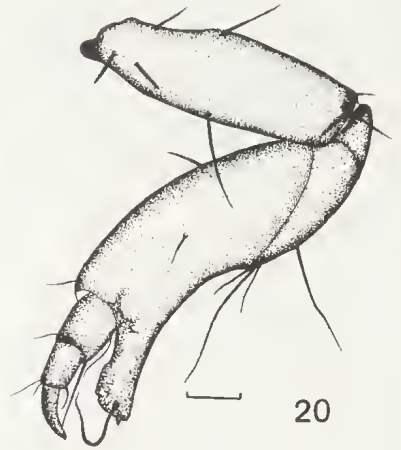
Scale lines: 0.1 mm (Figs. 13, 17); 0.2 mm (Figs. 10-12, 14-16)



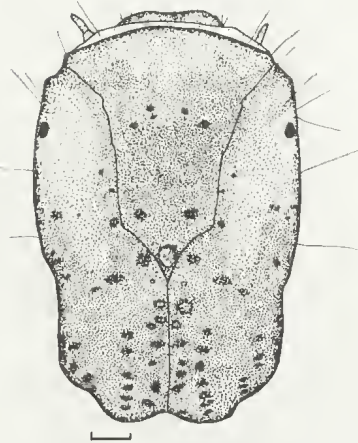
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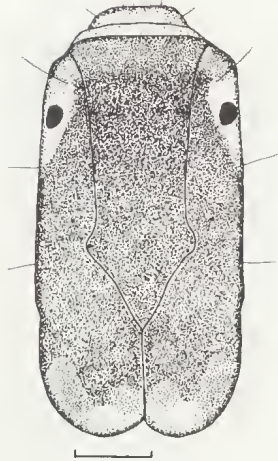
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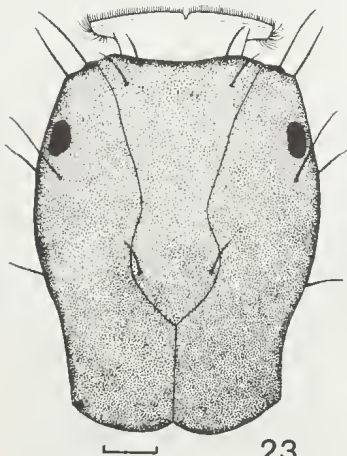
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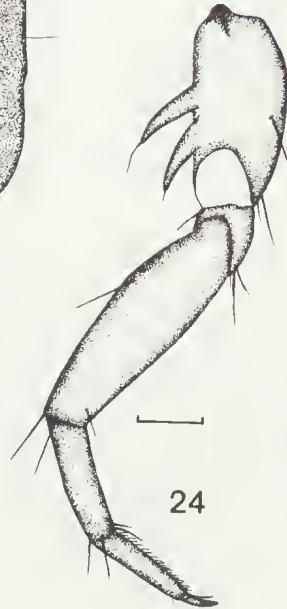
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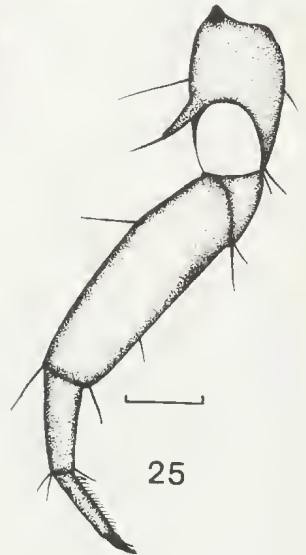
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Figures 18-22 HYDROBIOSIDAE

- Figs. 18-20. *Taschorema*. 18, head; 19, prosternum; 20, prothoracic leg.
 Fig. 21. *Megogata*, head.
 Fig. 22. Species of *Taschorema* complex, head.

Figures 23-25 PHILOPOTAMIDAE

- Figs. 23-24. *Hydrobiosella*. 23, head; 24, prothoracic leg.
 Fig. 25. *Chimarra*, prothoracic leg.

Scale lines: 0.2 mm

species of the *H. tasmanica* group, either our generic concept will have to be broadened or erection of a new genus could perhaps be justified. This, however, is outside the scope of the present study, and since larvae without coxal processes have not been recorded from Victoria they have not been considered in the key below.

KEY TO VICTORIAN GENERA OF PHILOPOTAMIDAE

1. Coxa of prothoracic leg with two sclerotised processes, each with a terminal seta (Fig. 24) *Hydrobiosella*
- Coxa of prothoracic leg with a single sclerotised process, and basal to this a long dark seta arising directly from the surface of the coxa (Fig. 25) *Chimarra*

Ecnomidae

All described Australian species have been referred to the genera *Ecnomus* and *Ecnomina*. The only Victorian species recorded in the literature are *Ecnomus tillyardi* and *Ecnomina irrorata* (Neboiss 1977, 1978). We have collected at least twelve larval species from the state, and have bred out males of seven of these.

While the species of *Ecnomus* form a well defined group, described species of *Ecnomina* fall into several distinct species groups on the basis of structure of the genitalia and minor details of the wings (Neboiss, personal communication). Future erection of new genera to accommodate some of these species groups is a definite possibility, and such an approach is supported by evidence in the larvae. In addition to species of *Ecnomus*, we have collected larvae of seven ecnomid species which we consider probably represent three different genera. We have bred out adults of two of these presumed genera, and both would be identified as *Ecnomina* using currently available adult taxonomy. Until adult taxonomy has been revised, generic identification of these larvae is not possible, and for this reason they are included in the key as 'Genus' D, 'Genus' E and 'Genus' F.

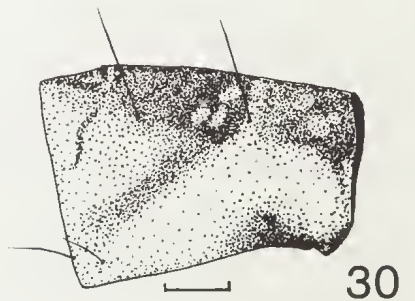
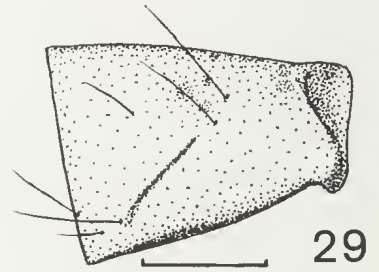
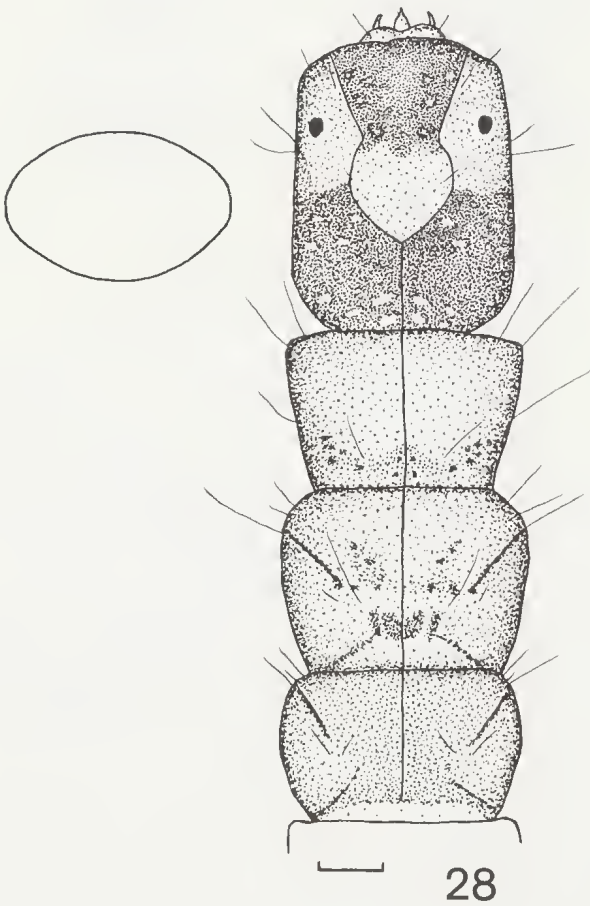
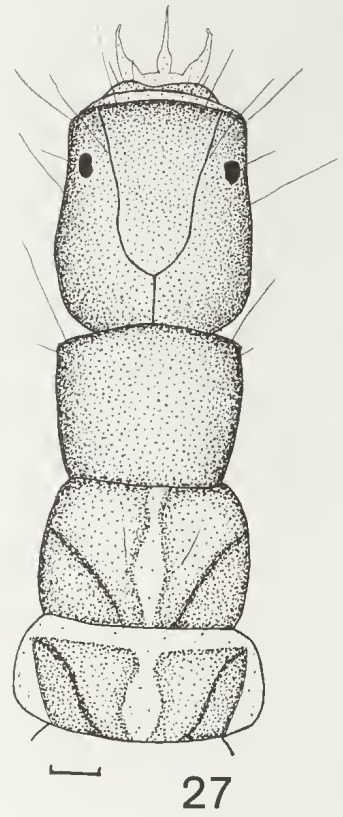
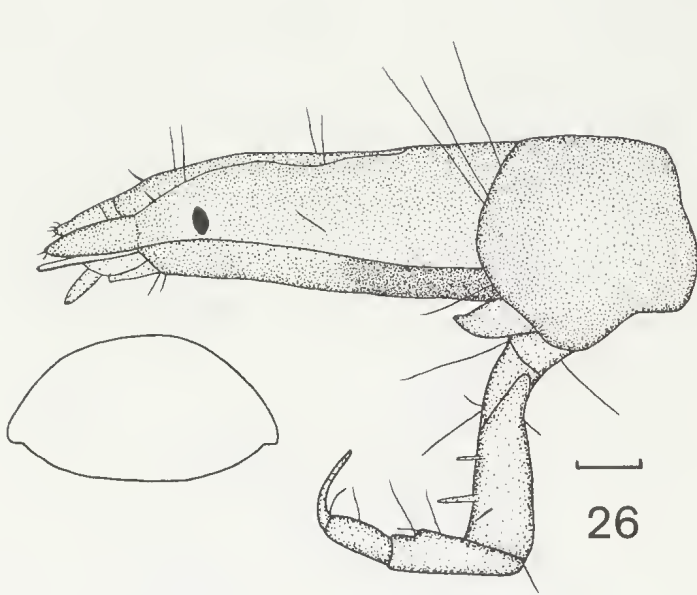
KEY TO VICTORIAN GENERA OF ECNOMIDAE

1. Head ventrally flattened, lateral margins angular with conspicuous ridge running full length of head capsule (Fig. 26) 'Genus' D
- Head not ventrally flattened, lateral margins rounded and without conspicuous ridge (Figs. 27, 28) 2
2. Frontoclypeus not obviously constricted near middle; mesonotum incompletely sclerotised, membranous along midline (Fig. 27) 'Genus' E
- Frontoclypeus obviously constricted near middle; mesonotum completely sclerotised (Fig. 28) 3
3. Mesonotum usually with broad and ill-defined dark band extending obliquely backwards from antero-lateral corner (Fig. 30), although this band may be absent in some specimens *Ecnomus*
- Mesonotum always with narrow and sharply defined dark line extending obliquely backwards from antero-lateral corner (Fig. 29) 'Genus' F

Polycentropodidae

The Polycentropodidae of Victoria remain virtually uninvestigated. The only records in the literature are *Plectrocnemia australica* and a species of *Nyctiophylax*, both collected during the Dartmouth environmental survey (Smith et al. 1977). Other genera recorded from Australia are *Polyplectropus* from New South Wales, *Tasmanoplegas* from Tasmania and *Hyalopsyche* from North Queensland (Mosely & Kimmins, 1953; Neboiss, 1977, 1980).

We have records of seven distinctive larval species from Victoria, and these are here placed into five 'genera'. We have bred out two species each of *Plectrocnemia* and *Nyctiophylax*, while the other three larval species remain unidentified. The larval type we have designated 'Genus' G is instantly recognizable by its large size and the fused tibia and tarsus in the pro- and mesothoracic legs. We suspect that this larval type will prove to be *Stenopsychodes*. However, until this is confirmed it seems more



appropriately placed with the Polycentropodidae rather than in the family Stenopsychidae. Likewise we have not bred through larvae of our 'Genus' H, which would in fact be identified as a Stenopsychidae using the key in Williams (1980). However, that key is based upon described larvae of the type genus *Stenopsyche*, which is restricted in distribution to Asia and central Africa, and which is not necessarily relevant to the Australian situation. Indeed Schmid (1969) has drawn attention to the considerable differences between *Stenopsyche* and *Stenopsychodes* in adults at least, and has suggested that the two genera should be placed in different sub-families. The status of 'Genus' I has also caused us some concern. We have examined a male pupa of a species from this group, and the genitalia appeared to be of the *Nyctiophylax* type. We have also seen larvae from Tasmania which have ventral processes on the anal claw as well as an accessory dorsal spine, and which therefore cannot be accommodated in the key below. Until a full taxonomic revision of both adults and larvae has been completed generic identity will remain uncertain.

KEY TO VICTORIAN GENERA OF
POLYCENTROPODIDAE

- 1. Pro- and mesothoracic legs with tibia and tarsus fused (Fig. 31) 'Genus' G
- Pro- and mesothoracic legs with tibia and tarsus not fused (Fig. 32) 2
- 2. Frontoclypeus not obviously constricted near middle (Fig. 36); abdominal segments without lateral fringe of fine setae 'Genus' H
- Frontoclypeus obviously constricted near middle (Fig. 34); abdominal segments with lateral fringe of fine setae (Fig. 33) 3
- 3. Anal claw without ventral teeth or processes (Fig. 35) *Plectrocnemia*

Figures 26-30 ECNOMIDAE

- Fig. 26. 'Genus' D, head and prothorax, lateral, cross section of head.
- Fig. 27. 'Genus' E, head and thorax, dorsal.
- Figs. 28-29. 'Genus' F. 28, head and thorax, dorsal, cross section of head; 29, mesonotum, lateral (anterior to left).
- Fig. 30. *Ecnomus*, mesonotum, lateral (anterior to left).

Scale lines: 0.2 mm

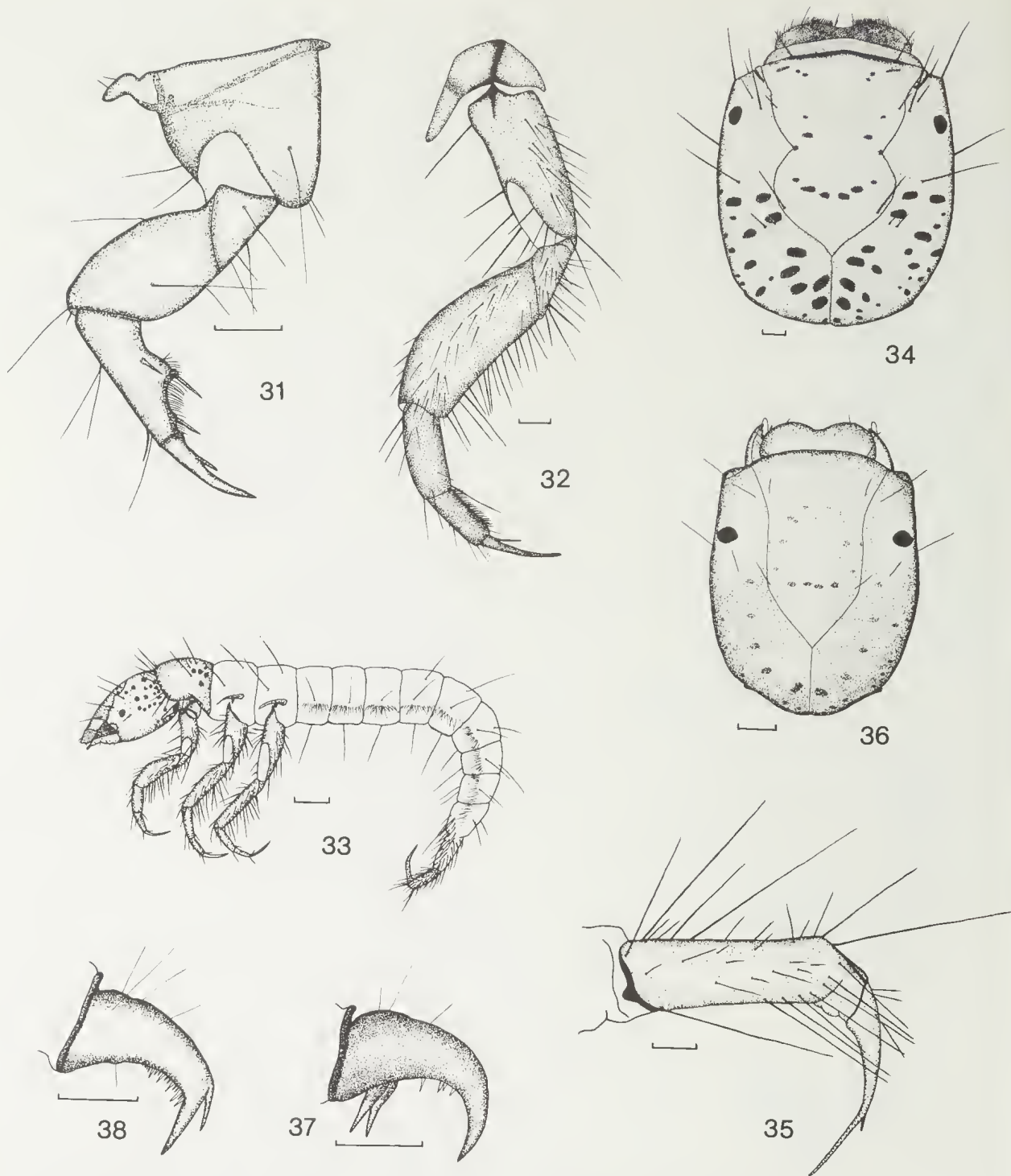
- Anal claw with ventral teeth and/or processes (Figs. 37, 38) 4
- 4. Anal claw with ventral processes near base, without accessory dorsal spine (Fig. 37) 'Genus' I
- Anal claw without ventral processes near base, accessory dorsal spine present (Fig. 38) *Nyctiophylax*

Hydropsychidae

Although eight genera of Hydropsychidae have been recorded from Australia, there are literature records for only four from Victoria. We have examined larvae of at least thirteen Victorian species, and these appear to represent six genera. We have bred out species of the genera *Asmicridea* and *Cheumatopsyche*, while the other larval types remain unidentified.

One of our larval types has been figured by Riek (1970) as *Macronema*. However, since we have not confirmed this the larva is included in the key as 'Genus' J. It should be noted that Korboot (1964) has figured a larva under the name *Macronemum torrenticola*, which obviously is not congeneric with Riek's *Macronema*. A second unidentified larval type, with at least two Victorian species, we have designated 'Genus' K. We have examined specimens of this larval type from both Tasmania and Western Australia, and the only genus known to be common to these two regions for which we have no knowledge of the larva is *Smicrophylax*.

The remaining two larval types from Victoria belong to a group which may be termed the *Diplectrona* complex. This consists of some fourteen described Australian species, which have been referred to the genera *Diplectrona*, *Austropsyche* and *Sciops*. The generic taxonomy of these species is, however, in urgent need of revision. Several species described under the genus *Diplectrona* are obviously congeneric with *Austropsyche victoriana*, while of the two species of *Sciops* one appears to be congeneric with *Austropsyche victoriana* while the second is probably congeneric with other species at present contained in the genus *Diplectrona*. We have separated larvae of this complex on the basis of the presence or absence of a transverse constriction of the pronotum. Proof



Figures 31-38 POLYCENTROPODIDAE

Fig. 31. 'Genus' G, prothoracic leg.

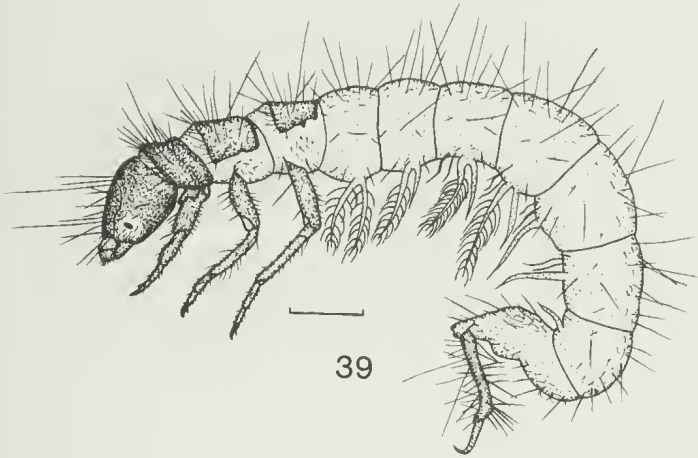
Figs. 32-35. *Plectrocnemia*. 32, prothoracic leg; 33, whole animal; 34, head; 35, abdominal proleg.

Fig. 36. 'Genus' H, head.

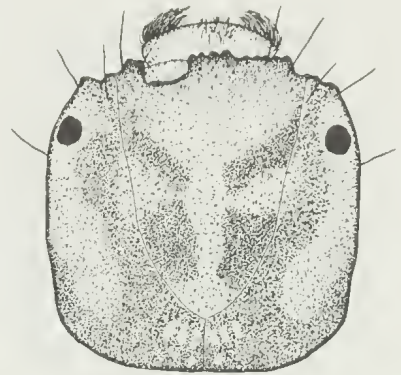
Fig. 37. 'Genus' I, anal claw.

Fig. 38. *Nyctiophylax*, anal claw.

Scale lines: 0.1 mm (Figs. 37, 38); 0.2 mm (Figs. 31, 32, 34-36); 1.0 mm (Fig. 33)



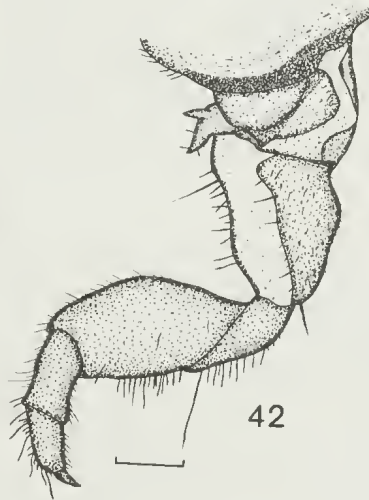
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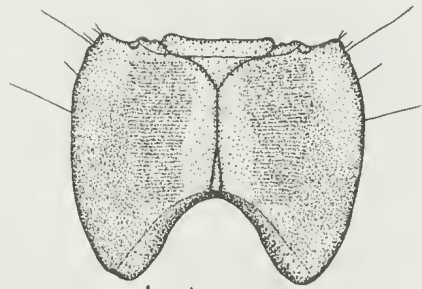
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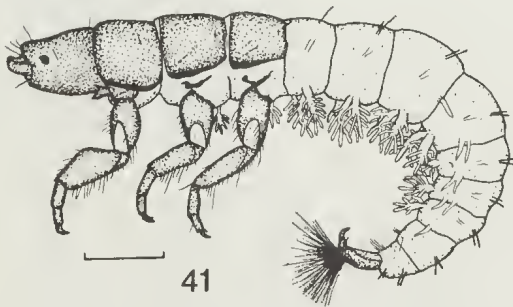
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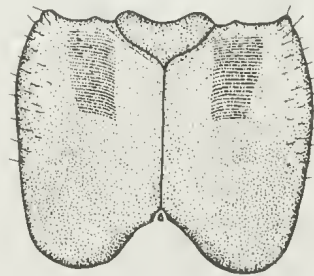
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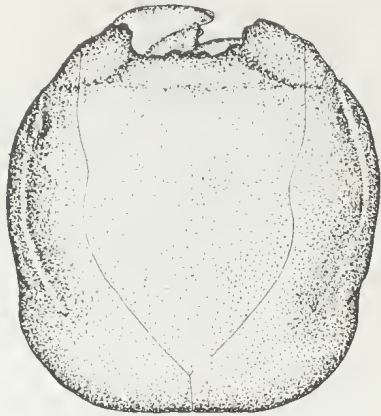
Figures 39-45 HYDROPSYCHIDAE

Figs. 39-40. 'Genus' J. 39, whole animal; 40, prothoracic leg.

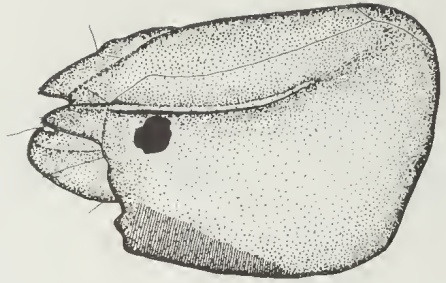
Figs. 41-43. *Cheumatopsyche*. 41, whole animal; 42, prothoracic leg; 43, head, ventral.

Figs. 44-45. *Asmicridea*. 44, head, dorsal; 45, head, ventral.

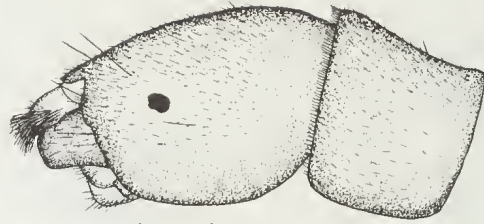
Scale lines: 0.2 mm (Figs. 40, 42-45); 1.0 mm (Figs. 39, 41).



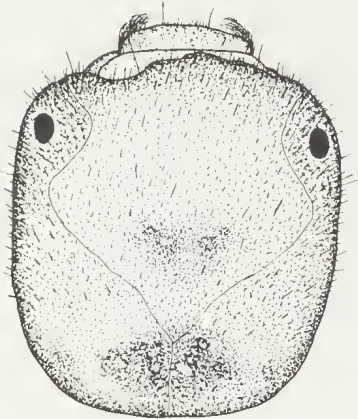
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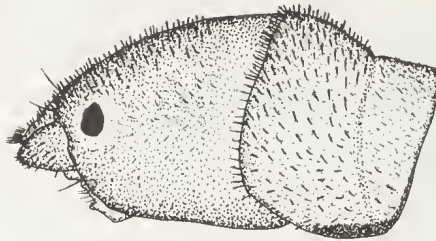
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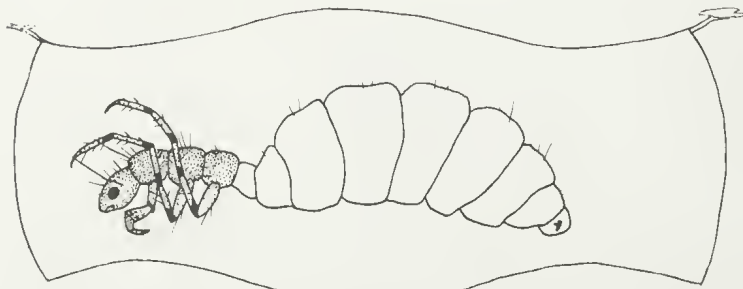
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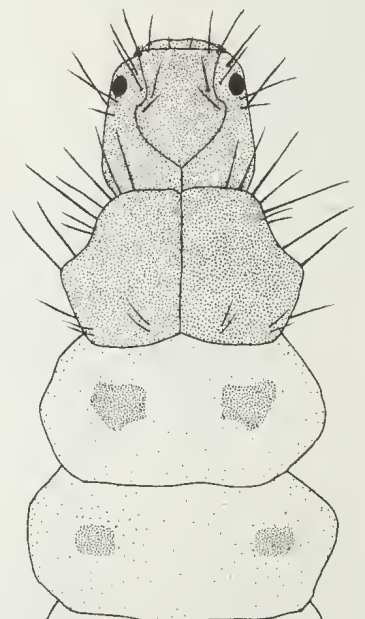
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of the validity of such a division must await extensive breeding out of adults. However, Wiggins (1977) has used the same character to separate North American genera within the subfamily Dipletroninae. Although we are not prepared to allocate generic names to the two larval types, our 'Genus' L includes *Austropsyche victoriana*, which we have bred out, while larvae of 'Genus' M agree with the description of *Dipletrona* larvae given by Wiggins (1977).

KEY TO VICTORIAN GENERA OF HYDROPSYCHIDAE

- 1. Posterior ventral apotome of head very small, much less than half as long as median ecdysial line linking it with anterior ventral apotome (Fig. 43).....2
- Posterior ventral apotome of head larger, at least half as long as median ecdysial line linking it with anterior ventral apotome (Fig. 45).....3
- 2. Protrochantin forked (Fig. 42); abdominal gills with branches stout and not linear, gills not feather-like in appearance (Fig. 41).....*Cheumatopsyche*
- Protrochantin simple (Fig. 40); abdominal gills with lateral branches slender and linear, gills feather-like in appearance (Fig. 39).....'Genus' J
- 3. Frontoclypeus either not constricted in anterior half, or with constriction very shallow (Figs. 44, 46).....4
- Frontoclypeus very obviously constricted in anterior half (Fig. 49).....5
- 4. Head with well developed carina (Figs. 46, 47).....'Genus' K
- Head without carina (Fig. 44).....*Asmicridea*

Figures 46-50 HYDROPSYCHIDAE
 Figure 51 HYDROPTILIDAE
 Figure 52 GLOSSOSOMATIDAE

Figs. 46-47. 'Genus' K. 46, head, dorsal; 47, head, lateral.
 Fig. 48. 'Genus' L, head and prothorax, lateral.
 Figs. 49-50. 'Genus' M. 49, head, dorsal; 50, head and prothorax, lateral.
 Fig. 51. Hydroptilidae, whole animal.
 Fig. 52. Glossosomatidae, head and thorax, dorsal.
 Scale lines: 0.2 mm (Figs. 46, 47); 0.5 mm (Figs. 48-52).

- 5. Pronotum with transverse constriction in posterior half (Fig. 48).....'Genus' L
- Pronotum without transverse constriction in posterior half (Fig. 50).....'Genus' M

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