PRELIMINARY GUIDE TO THE IDENTIFICATION OF LATE INSTAR LARVAE OF AUSTRALIAN ECNOMIDAE, PHILOPOTAMIDAE AND TASMIIDAE (INSECTA: TRICHOPTERA)

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Cover: Upper left - *Ecnomus pansus* (Ecnomidae)
Upper right - *Chimarra monticola* (Philopotamidae)
Lower - *Tasimia palpata* larva and case (Tasimiidae)
Photographs by John H. Hawking, MDFRC/CRCFE

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INTRODUCTION

Twenty-six families of Trichoptera are recognised from Australia, and family and generic keys have been prepared previously (Dean et al. 1995; Dean et al. 1996). New and updated preliminary keys to species are provided for three families (Ecnomidae, Philopotamidae and Tasimiidae).

Some of the illustrations used in the following keys are originals, others, however are based on figures in publications listed in the references. Many larval 'species' or taxa are not positively identified. Some have been reared to undescribed adults. There is probably lumping of some valid species and possibly splitting of others. Until all remaining larvae have been reared to adults and/or identified, these problem 'taxa' cannot be resolved. The designation "sp. AV" is used to indicate an Australian Voucher taxa.

Finally, it should be emphasised again that the keys are for late instar larvae. Identification of early instars should only be attempted with extreme care.

Comments and feedback are sought on these keys as they will be updated in the future. Problem areas and characters in the keys need to be identified and specimens which do not key out readily (new taxa?), need to be incorporated into the keys and voucher system.

NOTES ON KEY TO SPECIES

The key to families is not reproduced here as it was presented at the Monitoring River Health Initiative Taxonomic Workshop (MDFRC, Albury, 6-7 Feb. 1995) and published in the workshop handbook (J. Hawking, editor). Likewise, the key to genera has been prepared as an unpublished draft (Dean et al. 1996), and so will only be duplicated here, where necessary.

The keys for the families Ecnomidae and Philopotamidae, supercede unpublished ones provided by Cartwright (1991). At this stage, the keys for *Ecnomus* and *Hydrobiosella* have not been updated significantly since the 1991 version, but for completeness are reproduced here.

NOTES ON DISTRIBUTION TABLES

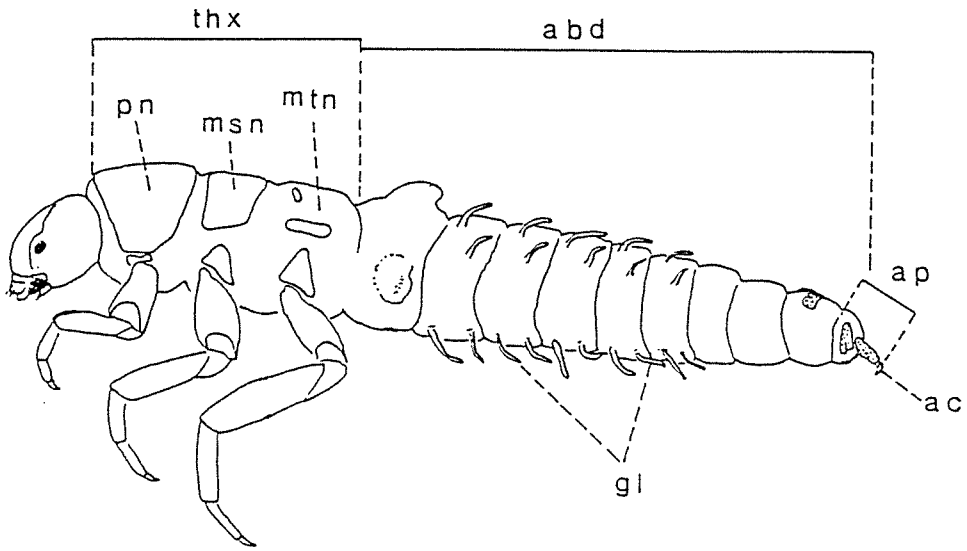
Distribution tables based on published and unpublished adult and larval records are presented. However, distribution records are incomplete for some taxa. Records are based on recognized faunal regions. Abbreviations and definitions for distributional areas are: NW-AUST = northwest Australia (Kimberley and NT), NE-QLD = northeast Queensland, SE-AUST = southeast Australia (SE-Qld, NSW, and Vic), TAS = Tasmania, SE-SA = southeast South Australia, SW-AUST = southwest Australia, EYREAN = Eyrean province of central Australia (including the Pilbara region of N-WA), Pil = Pilbara. Undescribed adults have been given a CT- or PT- number. CT- numbers refer to the author's notebook, PT- numbers refer to the notebook used by Dr Arturs Neboiss (NMV). When these adults are eventually described, there will be a reference to the CT- or PT- number. Note: Cart. unpubl. = Cartwright unpublished information.

LARVAL STRUCTURES AND TERMINOLOGY

General terminology used in these keys is shown in Figs a, b, c and d. Additional terms are shown at the start of the families Ecnomidae (page 4) and Philopotamidae (page 16).

"Generalized" larva

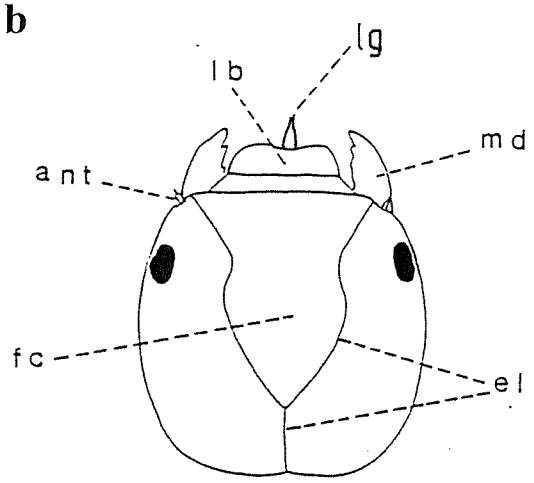
a



THORAX AND ABDOMEN (Fig. a, whole animal lateral)

abd	abdomen
ac	anal claw
ap	abdominal prolegs
gl	abdominal gills
msn	mesonotum
mtn	metanotum
pn	pronotum
thx	thorax

b



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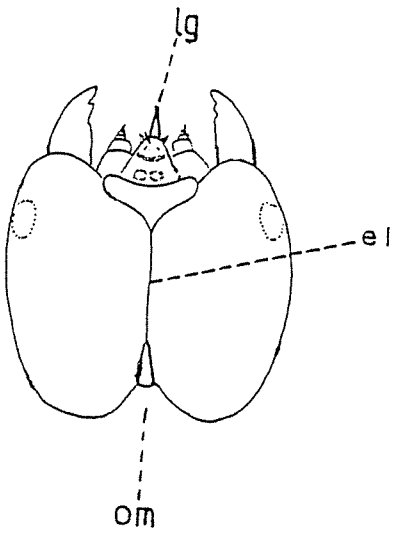


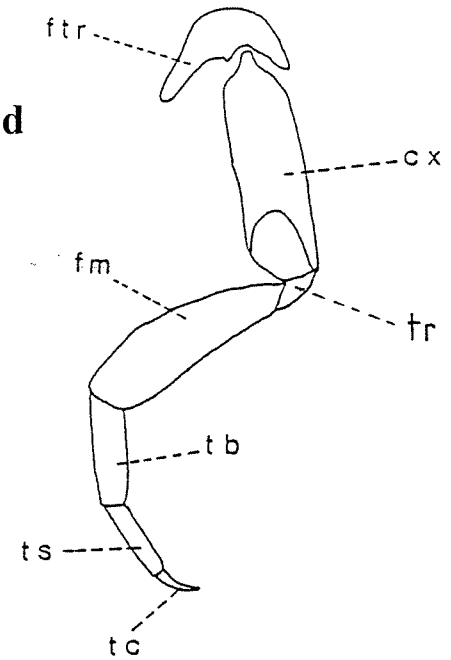
HEAD (Figs b, dorsal & c, ventral)

ant	antenna
el	ecdysial line
fc	frontoclypeus
lb	labrum
lg	ligula
md	mandible
om	occipital margin

FORELEG (Fig. d, lateral)

cx	coxa
fm	femur
ftr	fore trochantin
tr	trochanter
tb	tibia
tc	tarsal claw
ts	tarsus

d



1 FAMILY ECNOMIDAE

Two genera, *Ecnomus* and *Ecnomina* are known from Australia.

Genus *Ecnomina*

Morphology. Small to medium larvae, ranging in body length from 5 to 10 mm. Head and all thoracic nota sclerotised, mesonotum and metanotum each comprising two sclerites separated by median ecdysial line, although in some species the meso- and metanotum are membranous along the midline. Fore trochantin elongate, usually slender, pointed apically, sometimes bladelike. Abdominal gills absent. Abdominal prolegs strongly developed with large, curved anal claws, usually bearing small teeth along concave margin.

Biology. Larvae are predatory and free living. Larvae construct fixed tubes or retreats of silk on rocks or logs. The genus is found in lentic and slower flowing lotic waters.

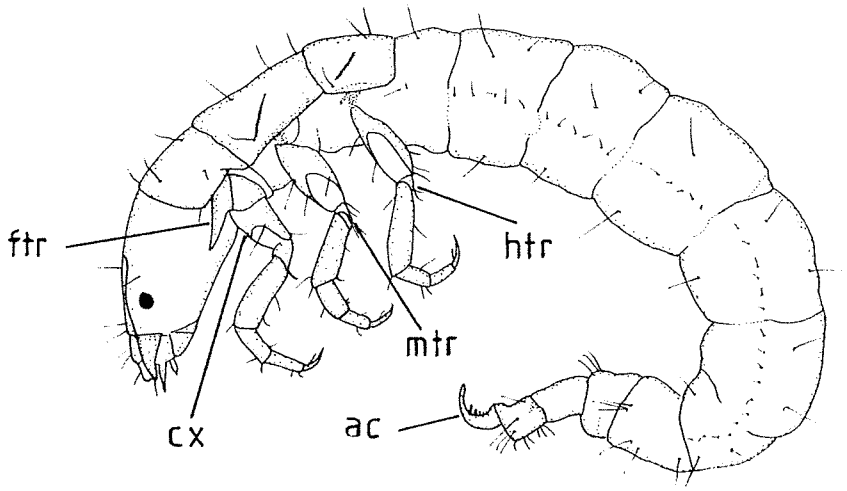
Taxonomy. Neboiss (1982) noted that species of *Ecnomina* (adults) from SW-Australia fell into two distinct groups. This separation has been supported by the description of two species groups of larvae (Dean and Bunn 1989). Cartwright and Dean (1982) speculated on the erection of new genera for two of the three species groups of *Ecnomina* in Victoria. For the present *Ecnomina* will be considered as a single genus consisting of three species groups D, E and F.
Fifteen species have been described and at least an additional 10 undescribed species are known.

Notes on key to Ecnomina. A total of 20 *Ecnomina* taxa are keyed out including one non-voucher taxa (*Ecnomina* D sp. 4) from S-WA. In addition, the heads of six non-voucher taxa placed in *Ecnomina* F group are figured at the end of the key. These seven non-voucher species will not be included within the voucher system (as AV species) until voucher material is obtained.

"Generalised" *Ecnomina*

Additional terminology

ac	anal claw
cx	(fore) coxa
ftr	fore trochantin
htr	hind trochanter
mtr	mid trochanter



CHECK LIST AND DISTRIBUTION OF KNOWN AUSTRALIAN SPECIES

Distribution. *Ecnomina* species are recorded from all states of Australia.

GENUS & SPECIES	ASSOC. LARVA(*)	NW-AUST	NE-QLD	SE-AUST	TAS	SE-SA	SW-AUST	EYR EAN	Ref. Source
1. *Ecnomina batyle* Neboiss, 1977	*			+	+				Neboiss 1986
2. *Ecnomina chorisis* Neboiss, 1978				+					Neboiss 1986
3. *Ecnomina cohibilis* Neboiss, 1982							+		Neboiss 1986
4. *Ecnomina irrorata* Kimmins, 1953	*?			+	+				Neboiss 1986
5. *Ecnomina krokale* Neboiss, 1978				+					Neboiss 1986
6. *Ecnomina legula* Neboiss, 1977					+				Neboiss 1986
7. *Ecnomina merga* Neboiss, 1982							+		Neboiss 1986
8. *Ecnomina scindens* Neboiss, 1982							+		Neboiss 1986
9. *Ecnomina spinosa* Kimmins, 1953				+					Neboiss 1986
10. *Ecnomina thinotes* Neboiss, 1978				+					Neboiss 1986
11. *Ecnomina trifurcata* Kimmins, 1953				+					Neboiss 1986
12. *Ecnomina trulla* Neboiss, 1982	*?						+		Neboiss 1986
13. *Ecnomina vega* Neboiss, 1977					+				Neboiss 1986
14. *Ecnomina viatica* Neboiss, 1982							+		Neboiss 1986
15. *Ecnomina* sp. nov. PT-1590		+	+						Walker et al 95
16. *Ecnomina* sp. nov. PT-1591			+						Walker et al 95
17. *Ecnomina* sp. nov. PT-1592			+						Walker et al 95
18. *Ecnomina* sp. nov. PT-1651			+						Walker et al 95
19. *Ecnomina* sp. nov. CT-229			+						Walker et al 95
20. *Ecnomina* sp. nov. CT-230			+						Walker et al 95
21. *Ecnomina* sp. nov. CT-231			+						Walker et al 95
22. *Ecnomina* sp. nov. CT-232			+						Walker et al 95
23. *Ecnomina* sp. nov. CT-235			+						Walker et al 95
24. *Ecnomina* sp. nov. CT-236			+						Walker et al 95

KEY TO SPECIES OR TAXA OF LATE INSTAR LARVAE OF *ECNOMINA*

1. Head ventrally flattened, lateral margin angular with conspicuous ridge running full length of head capsule (Fig. 1.1).....*Ecnomina* D group.....17
(Distribution: S-WA, Vic, NSW, NE- Qld)

- Head not ventrally flattened, lateral margin rounded and without conspicuous ridge (Fig. 1.2).....2

2. Meso- and metanotum incompletely sclerotised, membranous along midline; ligula developed as a long needle-like process (Fig. 1.3) (*E. scindens* group, Fig. 21 Dean and Bunn 1989).....*Ecnomina* E group.....3
(Distribution: S-WA, Tas, Vic, NSW, Qld)

- Meso- and metanotum completely sclerotised; ligula not needle-like (Fig. 1.4) (*E. sentosa* group, Fig. 20 Dean & Bunn 1989).....*Ecnomina* F group.....10
(Distribution: Australia wide)

3. Both mid- and hind trochanter without processes on ventral margin distally (Fig. 1.5).....4

- Mid- and/or hind trochanter with processes on ventral margin distally (Figs 1.7, 1.8).....6

4. Anal claw without teeth (Fig. 1.9).....*Ecnomina* E sp. AV8
(Distribution: CE-NSW)

- Anal claw with teeth (Figs 1.6, 1.10).....5

5. Anal claw with > 7 teeth (Fig. 1.6).....*Ecnomina* E sp. AV5
(Distribution: S-WA)

- Anal claw with < 7 teeth (Fig. 1.10).....*Ecnomina* E sp. AV1
(Distribution: Tas, Vic, NSW, SE-Qld)

6. Hind trochanter with 2 small processes on ventral margin distally (Fig. 1.7).....
.....*Ecnomina* E sp. AV3
(Distribution: E-Vic)

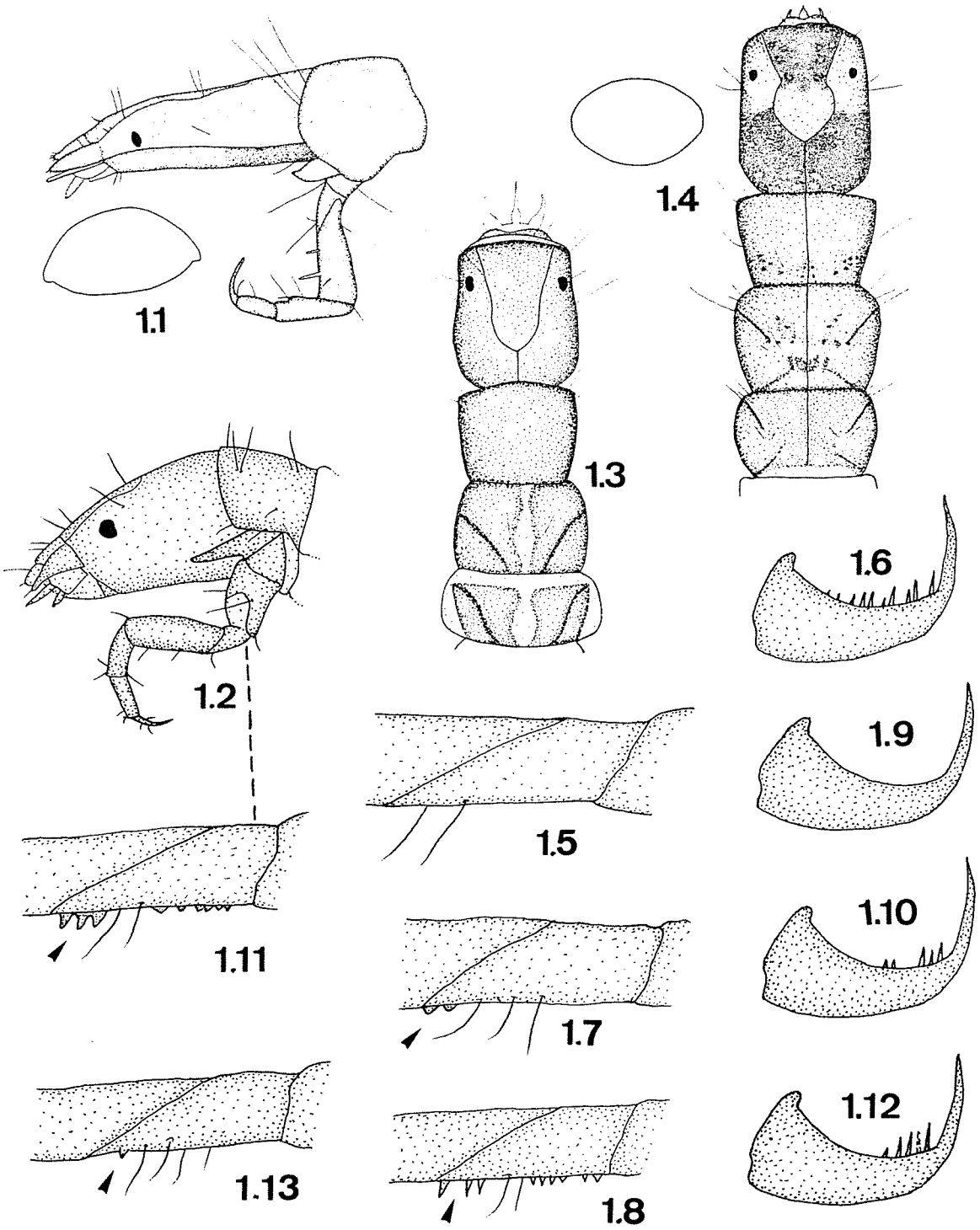
- Hind trochanter with 3 or more processes on ventral margin distally (Fig.1.8)...7

7. Mid trochanter with 3 or more processes on ventral margin distally (Fig.1.11)..8

- Mid trochanter with 1 or 0 processes on ventral margin distally (Fig.1.13).....9

8. Anal claw with (4-5) ventral teeth (Fig. 1.12).....*Ecnomina* E sp. AV4
(Distribution: S-WA)

- Anal claw without ventral teeth (similar to Fig. 1.9).....*Ecnomina* E sp. AV7
(Distribution: S-WA)



Family Ecnomidae, Genus *Ecnomina*
Fig. 1.1 *Ecnomina* D sp. AV1 head and prothorax, lateral, cross section of head; **Fig. 1.2** *Ecnomina* F sp. head and prothorax, lateral; **Fig. 1.3** *Ecnomina* E sp. head and thorax, dorsal; **Fig. 1.4** *Ecnomina* F sp. AV2 head and thorax, dorsal, cross section of head; **Fig. 1.5** *Ecnomina* E sp. AV5 hind trochanter; **Fig. 1.6** anal claw; **Fig. 1.7** *Ecnomina* E sp. AV3 hind trochanter; **Fig. 1.8** *Ecnomina* E sp. AV4 hind trochanter; **Fig. 1.9** *Ecnomina* E sp. AV2 anal claw; **Fig. 1.10** *Ecnomina* E sp. AV1 anal claw; **Fig. 1.11** *Ecnomina* E sp. AV7 mid trochanter; **Fig. 1.12** *Ecnomina* E sp. AV4 anal claw; **Fig. 1.13** *Ecnomina* E sp. AV2 mid trochanter.

9. Hind trochanter with 3 processes on ventral margin distally (Fig. 1.14).....
.....*Ecnomina* E sp. AV2
(Distribution: C-Vic)

- Mid trochanter with > 4 processes on ventral margin distally (Fig. 1.15).....
.....*Ecnomina* E sp. AV9
(Distribution: NE-Qld)

10. Head uniformly pale (or faded?)(Fig. 1.16).....*Ecnomina* F sp. AV5
(Distribution: E-Vic, E-NSW, Qld?, NT?)

- Head with some dark pigmentation dorsally (Figs 1.17, 1.19).....11

11. Head with pigmentation restricted to frontoclypeus (Figs 1.17, 1.18).....12

- Head with pigmentation inside and outside frontoclypeus (Figs 1.19, 1.21).....13

12. Frontoclypeus darkly pigmented in anterior half (Fig. 1.17).*Ecnomina* F sp. AV3
. (Distribution: C-Vic, Tas)

- Frontoclypeus uniformly darkly pigmented (Fig. 1.18).....*Ecnomina* F sp. AV4
(Distribution: E-Vic, SE-NSW)

13. Frontoclypeus not pigmented in posterior 1/2 (Figs 1.19, 1.20).....14

- Frontoclypeus pigmented in posterior 1/2 (Figs 1.21, 1.22, 1.23).....15

14. Frontoclypeus mostly pale with two lateral areas of darker pigmentation in anterior half (Fig. 1.19).....*Ecnomina* F sp. AV9
(Distribution: E-Vic)

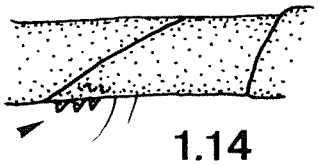
- Frontoclypeus pigmented in anterior half (Fig. 1.20).....*Ecnomina* F sp. AV2
(Distribution: C, E-Vic)

15. Head without darker pigmentation in posterior 1/4, pigmentation basically restricted to frontoclypeus (Fig. 1.21).....*Ecnomina* F sp. AV7
(Distribution: Tas)

- Head with darker pigmentation in posterior 1/4, extensive pigmentation outside frontoclypeus (Figs 1.22, 1.23).....16

16. Head and frontoclypeus uniformly very darkly pigmented in posterior 3/4 (Fig. 1.22).....*Ecnomina batyle*
(Distribution: Tas, E-Vic, SE-NSW, SE-Qld)

- Head and frontoclypeus uniformly lightly pigmented in posterior 2/3 (Fig. 1.23)
.....*Ecnomina* F sp. AV8
(Distribution: S-WA)



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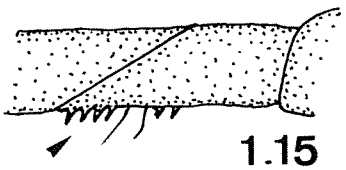

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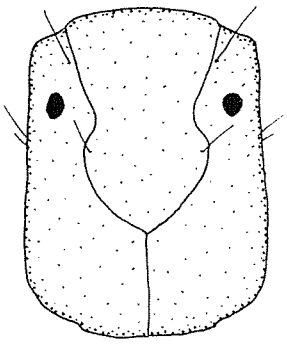

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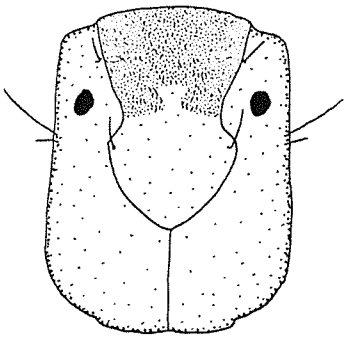

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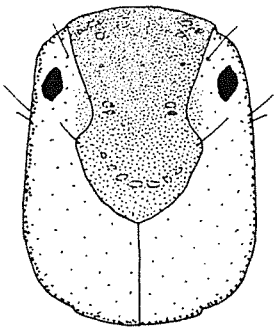

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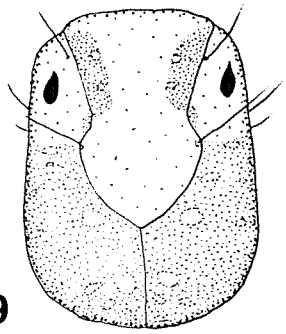

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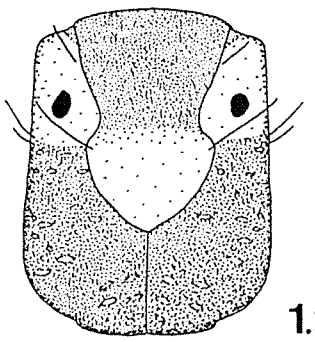

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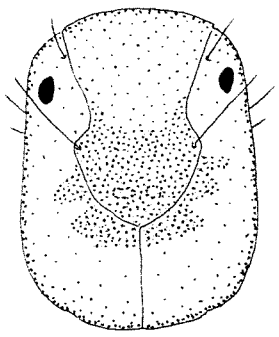

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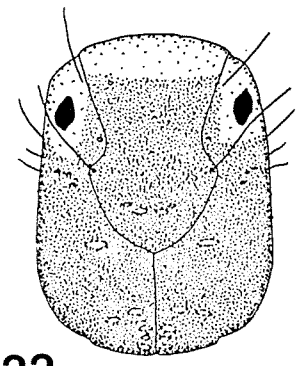

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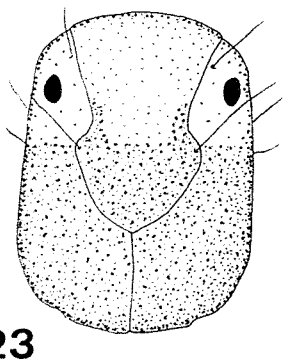

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Family Ecnomidae, Genus *Ecnomina*
Fig. 1.14 *Ecnomina* E sp. AV2 hind trochanter; **Fig. 1.15** *Ecnomina* E sp. AV9 hind trochanter; **Fig. 1.16** *Ecnomina* F sp. AV5 head, dorsal; **Fig. 1.17** *Ecnomina* F sp. AV3 head, dorsal; **Fig. 1.18** *Ecnomina* F sp. AV4 head, dorsal; **Fig. 1.19** *Ecnomina* F sp. AV9 head, dorsal; **Fig. 1.20** *Ecnomina* F sp. AV2 head, dorsal; **Fig. 1.21** *Ecnomina* F sp. AV7 head, dorsal; **Fig. 1.22** *Ecnomina batyle* head, dorsal; **Fig. 1.23** *Ecnomina* sp. AV8 head, dorsal.

17. Ventral surface of head with darker pigmentation posteriorly (Fig. 1.1); anal claw without teeth (Fig. 1.24).....*Ecnomina* D sp. AV1
(Distribution: C,E-Vic, SE-NSW)

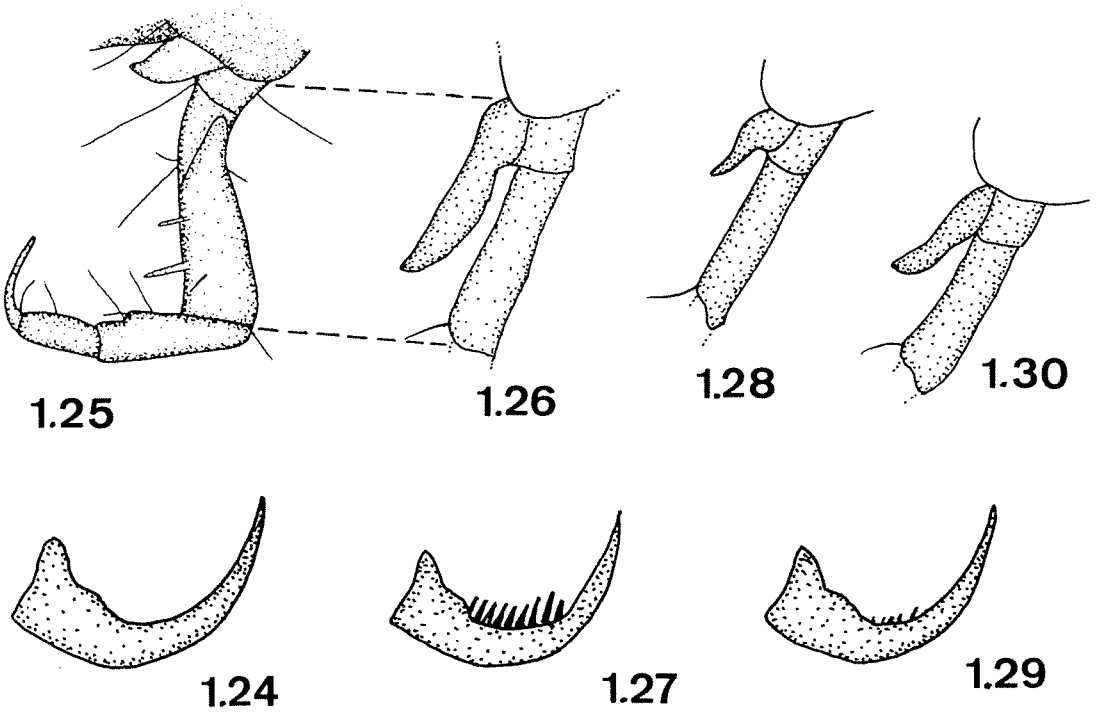
\- Ventral surface of head uniformly pale; anal claw with teeth (Figs 1.27, 1.29)...18

18. Head length/width ratio about 2; fore trochantin long, extending to about 3/4 length of coxa (Fig. 1.26).....*Ecnomina* D sp. AV3
(Distribution: NE-Qld)

\- Head length/width ratio about 1.5; fore trochantin short, extending to < 1/2 length of coxa (Figs 1.28, 1.30).....19

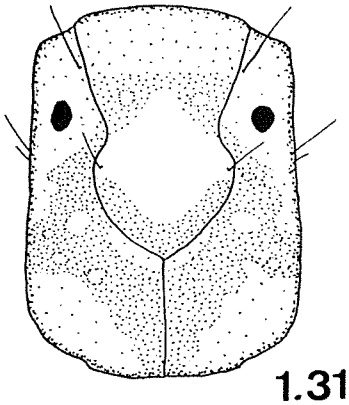
19. Anal claw with > 7 (large) teeth (Fig. 1.27); fore trochantin in apical half, slender and pointed (Fig. 1.28).....*Ecnomina* D sp. 4
(Distribution: S-WA)

\- Anal claw with < 7 (small) teeth (Fig. 1.29); fore trochantin in apical half, robust and flattened (Fig. 1.30).....*Ecnomina* D sp. AV2
(Distribution: C,E-Vic, E-NSW)



Family Ecnomidae, Genus *Ecnomina*
Fig. 1.24 *Ecnomina* D sp. AV1 anal claw; **Fig. 1.25** fore trochantin and foreleg ; **Fig. 1.26** *Ecnomina* D sp. AV3 fore trochantin and coxa; **Fig. 1.27** *Ecnomina* D sp. AV4 anal claw; **Fig. 1.28** fore trochantin and coxa; **Fig. 1.29** *Ecnomina* D sp. AV2 anal claw; **Fig. 1.30** fore trochantin and coxa.

Ecnomina group F, additional non-voucher taxa.



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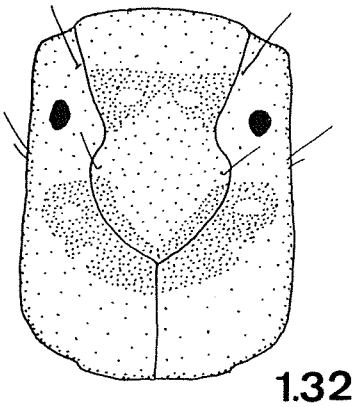

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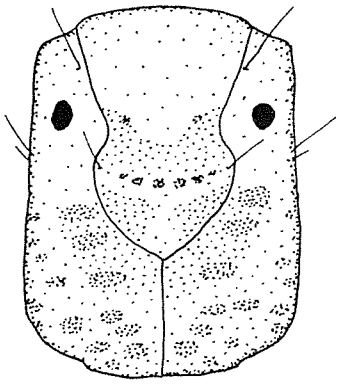

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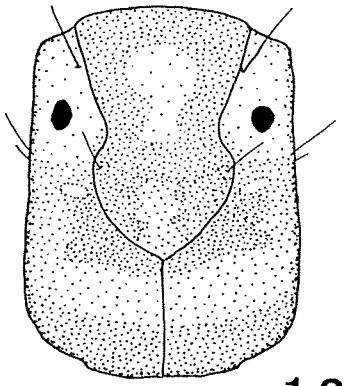

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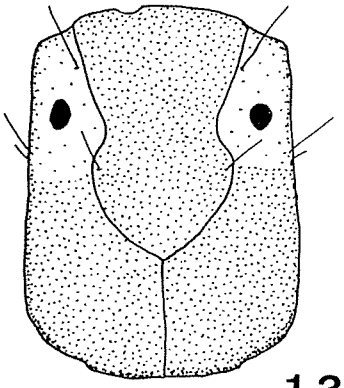

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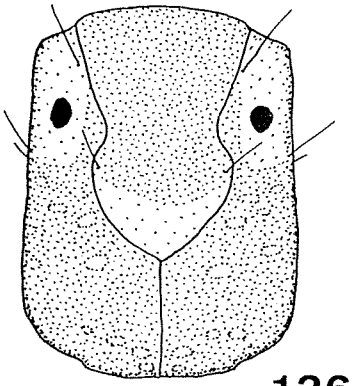

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Family Ecnomidae, Genus *Ecnomina*
Additional non-voucher taxa, head, dorsal: **Fig. 1.31** *Ecnomina* F sp. 10, NT; **Fig. 1.32** *Ecnomina* F sp. 14, NE-Qld, NT; **Fig. 1.33** *Ecnomina* F sp. 16, S-WA; **Fig. 1.34** *Ecnomina* F sp. 17, S-WA, NE-Qld; **Fig. 1.35** *Ecnomina* F sp. 18, S-WA; **Fig. 1.36** *Ecnomina* F sp. 20, S-WA.

Genus *Ecnomus*

Morphology. Medium size larvae, ranging in body length from 7 to 10 mm. Head and all thoracic nota sclerotised. Mesonotum and metanotum each comprising a single sclerite. Fore trochantin elongate, slender, pointed apically. Abdominal gills absent. Abdominal prolegs strongly developed with large, curved anal claws, bearing small teeth along concave margin.

Biology. Larvae are predatory and free living. Larvae construct fixed tubes or retreats of silk on rocks or logs. The genus is found in lentic and slower flowing lotic waters.

Taxonomy. Cartwright (1990b) revised the adults; forty species have been described. Wells (1990) shows illustrations of the head colour patterns for 15 species or taxa from the Alligator Rivers Region (ARR), NT.

CHECK LIST AND DISTRIBUTION OF KNOWN AUSTRALIAN SPECIES

Distribution. The genus is recorded from all states.

GENUS & SPECIES	ASSOC. LARVA(*)	NW-AUST	NE-QLD	SE-AUST	TAS	SE-SA	SW-AUST	EYR EAN	Ref. Source
1. *Ecnomus ancisus* Cartwright, 1990	*	+							Cart. 1990b
2. *Ecnomus apiculatus* Cartwright, 1990		+		+					Cart. 1990b
3. *Ecnomus bishopi* Cartwright, 1990		+							Cart. 1990b
4. *Ecnomus blythi* Cartwright, 1990	*	+							Cart. 1990b
5. *Ecnomus centralis* Cartwright, 1990		+						+	Cart. 1990b
6. *Ecnomus clavatus* Cartwright, 1990	*	+	+	+					Cart. 1990b
7. *Ecnomus continentalis* Ulmer, 1916	*		+	+		+		+	Cart. 1990b
8. *Ecnomus cuspidis* Cartwright, 1990	*								Cart. 1990b
9. *Ecnomus cygnitus* Neboiss, 1982	*			+	+	+			Cart. 1990b
10. *Ecnomus deani* Cartwright, 1990	*			+					Cart. 1990b
11. *Ecnomus digrutus* Cartwright, 1990	*	+	+ Wells 1993						Cart. 1990b
12. *Ecnomus ingibandi* Cartwright, 1990								+ **Pil**	Cart. 1990b
13. *Ecnomus jimba* Cartwright, 1990	*	+							Cart. 1990b
14. *Ecnomus kakaduensis* Cartwright, 1990	*	+							Cart. 1990b

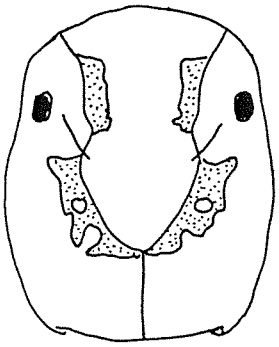
GENUS & SPECIES	ASSOC. LARVA(*)	NW-AUST	NE-QLD	SE-AUST	TAS	SE-SA	SW-AUST	EYR EAN	Ref. Source
15. *Ecnomus karakoi* Cartwright, 1990									Cart. 1990b
16. *Ecnomus karawalla* Cartwright, 1990				+					Cart. 1990b
17. *Ecnomus kerema* Cartwright, 1990			+						Cart. 1990b
18. *Ecnomus kinka* Cartwright, 1990	*	+	+						Cart. 1990b
19. *Ecnomus kitabal* Cartwright, 1990	*	+	+	+					Cart. 1990b
20. *Ecnomus larakia* Cartwright, 1990	*	+	+						Cart. 1990b
21. *Ecnomus miriwud* Cartwright, 1990	*	+	+						Cart. 1990b
22. *Ecnomus myallensis* Cartwright, 1990	*			+					Cart. 1990b
23. *Ecnomus neboissi* Cartwright, 1990				+					Cart. 1990b
24. *Ecnomus nibbor* Cartwright, 1990				+					Cart. 1990b
25. *Ecnomus pakadji* Cartwright, 1990			+						Cart. 1990b
26. *Ecnomus pansus* Neboiss, 1982	*	+		+		+	+	+	Cart. 1990b
27. *Ecnomus pilbarensis* Cartwright, 1990	*	+	+					+ **Pil**	Cart. 1990b
28. *Ecnomus russellius* Neboiss, 1977	*			+	+				Cart. 1990b
29. *Ecnomus tillyardi* Mosely, 1953	*			+	+	+			Cart. 1990b
30. *Ecnomus tropicus* Cartwright, 1990	*	+	+						Cart. 1990b
31. *Ecnomus tridigitus* Cartwright, 1990				+					Cart. 1990b
32. *Ecnomus turrbal* Cartwright, 1990	*	+	+	+					Cart. 1990b
33. *Ecnomus turgidus* Neboiss, 1982	*			+		+	+	+	Cart. 1990b
34. *Ecnomus veratus* Cartwright, 1990	*	+	+						Cart. 1990b
35. *Ecnomus volsellus* Cartwright, 1990				+					Cart. 1990b
36. *Ecnomus walajandari* Cartwright, 1990	*	+							Cart. 1990b
37. *Ecnomus wagengugarra* Cartwright, 1990			+	+					Cart. 1990b
38. *Ecnomus wellsae* Cartwright, 1990			+	+					Cart. 1990b
39. *Ecnomus woronan* Cartwright, 1990	*	+	+						Cart. 1990b
40. *Ecnomus yabbura* Cartwright, 1990	*	+							Cart. 1990b

Note: Cart. 1990b = Cartwright (1990b), Wells 1993 = Wells and Cartwright (1993)
Pil = Pilbara region of N-WA

KEY TO SPECIES OR TAXA OF LATE INSTAR LARVAE OF *ECNOMUS*

No formal key is presented, however figures of the head of selected species from SE-Australia are shown. Wells (1991) contains illustrations of the head colour patterns for 15 species or taxa from the Alligator Rivers Region (ARR), NT, but notes that larvae are difficult to identify, identifications can only be tentative, and the extent of intraspecific variability appears to be considerable.

At present, the colour pattern on the dorsal surface of the head (and nota), is the only character for differentiating species. However, due to the variability in the colour patterns within species, caution should be used. (Species identification can be confirmed by breeding out, or collecting male pupae or adults, however, in some sites in northern Australia up to ten species of *Ecnomus* have been collected).



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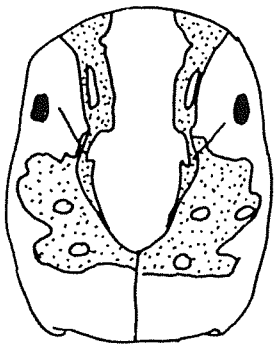

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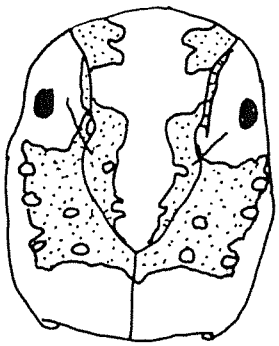

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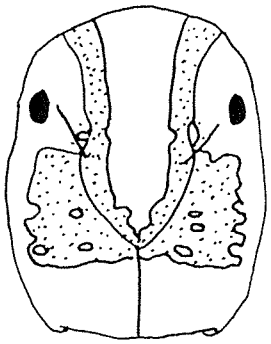

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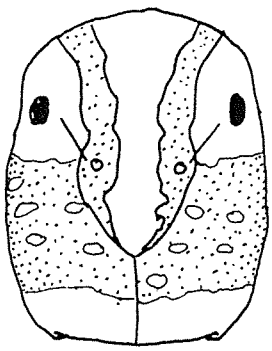

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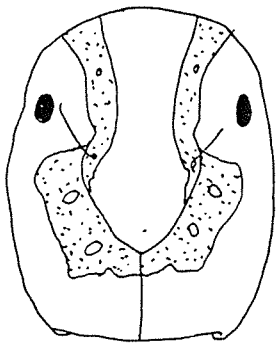

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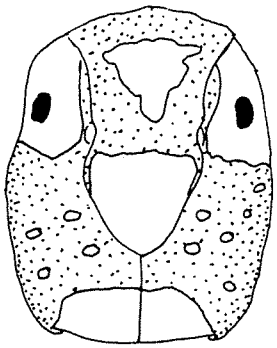

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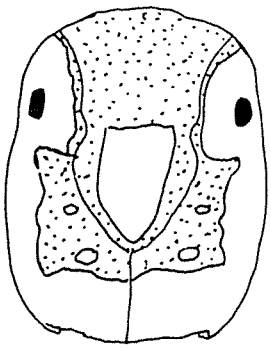

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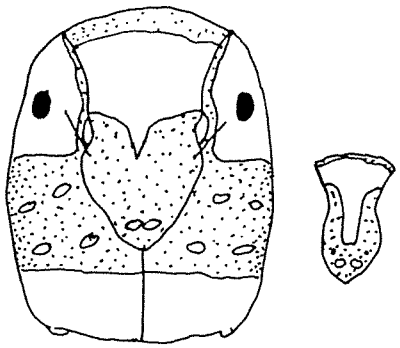


1.45

Family Ecnomidae, Genus *Ecnomus*, Head, dorsal
Fig. 1.37 *Ecnomus pansus*; **Fig. 1.38** *Ecnomus continentalis*; **Fig. 1.39** *Ecnomus tillyardi*; **Fig. 1.40** *Ecnomus russellius*; **Fig. 1.41** *Ecnomus cygnitus*; **Fig. 1.42** *Ecnomus myallensis*; **Fig. 1.43** *Ecnomus turgidus*; **Fig. 1.44** *Ecnomus nibbor*; **Fig. 1.45** *Ecnomus deani* head and variant frontoclypeus.

2 PHILOPOTAMIDAE

Two genera, *Chimarra* and *Hydrobiosella* are known from Australia.

Genus *Chimarra*

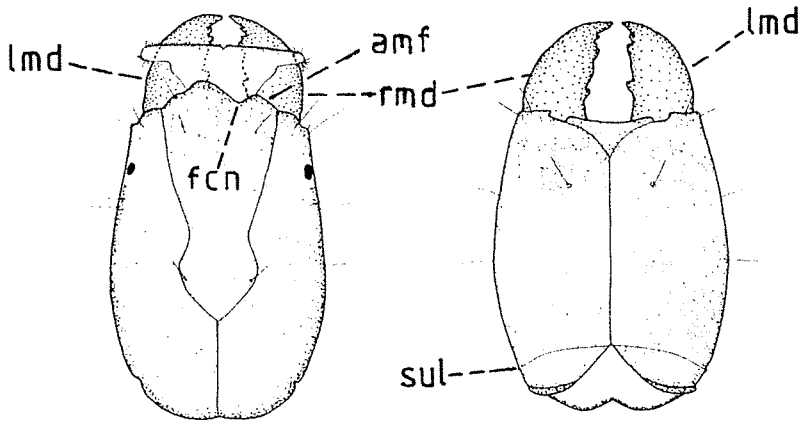
Morphology. Medium size larvae, ranging in body length from 8 to 12 mm. Head and pronotum sclerotised, brownish-orange, meso- and metanotum membranous. Labrum membranous, anterior margin broader than posterior margin. Abdomen white or yellowish, without gills. Abdominal prolegs strongly developed, anal claws terminal. Ventral surface of head with transverse sulcus or ridge adjacent to occipital margin, fore coxa with one sclerotised process on anterior margin.

Biology. Larvae construct silken tubes or sack- like nets on the underside of rocks in flowing water. The larva feeds by cleaning the fine detritus and algae from the net with its highly specialised labrum. The larvae are found mainly in faster flowing streams.

Taxonomy. Four species have been described and at least 20 additional undescribed adults are known, mainly from northern Australia. Cartwright (1990a) described the two Victorian larvae, and Wells (1991) provided a key for three NT (ARR) species. Only seven larvae have been associated with adult males; three to described adults and 4 to undescribed adults.

Notes on key to Chimarra. (see comments at start of *Chimarra* key).

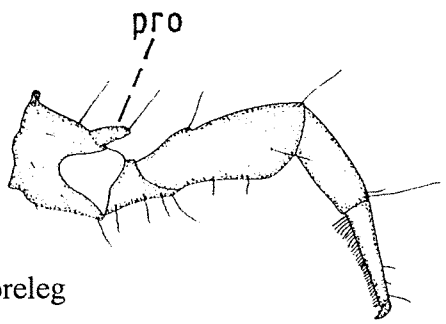
Chimarra larva



Head, dorsal Head, ventral

Terminology

amf	anterior margin of frontoclypeus
fcn	frontoclypeal notch
lmd	left mandible
pro	process on forecoxa
rmd	right mandible
sul	sulcus



Foreleg

CHECK LIST AND DISTRIBUTION OF KNOWN AUSTRALIAN SPECIES

Distribution. *Chimarra* species are recorded from all states, although the only Tasmanian record is a single *C. monticola* male. *Chimarra* is not recorded from SW Australia.

GENUS & SPECIES	ASSOC. LARVA(*)	NW-AUST	NE-QLD	SE-AUST	TAS	SE-SA	SW-AUST	EYREAN	Ref. Source
1. *Chimarra australis* (Navas, 1923) (female only) (valid sp?)									Neboiss 1986
2. *Chimarra australica* (Ulmer, 1916)	*		+	+					Neboiss 1986
3. *Chimarra monticola* Kimmins, 1953	*		+?	+	+?				Neboiss 1986
4. *Chimarra uranka* Mosely, 1953	*	+	+						Neboiss 1986
5. *Chimarra* sp. nov. CT-221		+	+						Walker et al 95
6. *Chimarra* sp. nov. CT-222	*C. sp. AV5		+						Walker et al 95
7. *Chimarra* sp. nov. CT-223			+						Walker et al 95
8. *Chimarra* sp. nov. CT-224	*C. sp. AV3			+					Cart. unpubl.
9. *Chimarra* sp. nov. CT-225			+						Walker et al 95
10. *Chimarra* sp. nov. CT-226			+						Walker et al 95
11. *Chimarra* sp. nov. CT-227			+						Walker et al 95
12. *Chimarra* sp. nov. CT-228			+						Walker et al 95
13. *Chimarra* sp. nov. CT-262								+ Pil.	Cart. unpubl.
14. *Chimarra* sp. nov. CT-264		+						+ Pil.	Cart. unpubl.
15. *Chimarra* sp. nov. CT-266		+							Cart. unpubl.
16. *Chimarra* sp. nov. CT-267		+							Cart. unpubl.
17. *Chimarra* sp. nov. CT-268		+							Cart. unpubl.
18. *Chimarra* sp. nov. CT-269	*C. sp. AV14	+							Cart. unpubl.
19. *Chimarra* sp. nov. CT-270	*C. sp. AV12	+	+						Cart. unpubl.
20. *Chimarra* sp. nov. CT-271			+						Cart. unpubl.
21. *Chimarra* sp. nov. CT-272		+							Cart. unpubl.
22. *Chimarra* sp. nov. E (CT-)		+							Cart. unpubl.
23. *Chimarra* sp. nov. T (CT-)		+							Cart. unpubl.
24. *Chimarra* sp. nov. U (CT-)		+							Cart. unpubl.

KEY TO SPECIES OR TAXA OF LATE INSTAR LARVAE OF *CHIMARRA*

Note: Fourteen larval taxa are keyed out of which only three are identified to a known species. This key should be used with caution in northern Australia, where there are about ten unknown larvae. The mandibles are referred to as left and right in dorsal view, although the ventral view is shown. (Key characters such as small or large (opening) are used in relative terms, not absolute). This key supercedes one provided by Cartwright (1991). One voucher species (*Chimarra* sp. 8), included in the 1991 version is omitted from this key due to the lack of voucher specimens (frontoclypeus is shown in Fig. 2.23).

1. Frontoclypeal notch small and with narrow opening i.e. with sides parallel (Figs 2.1, 2.3).....2

\- Frontoclypeal notch small with wide opening or large (Figs 2.7, 2.9).....4

2. Frontoclypeal notch open anteriorly (Fig. 2.1); head length/width ratio >1.5.....3

\- Frontoclypeal notch closed anteriorly (Fig. 2.5); head length/width ratio < 1.5 .....*Chimarra* sp. AV6
(Distribution: NE-Qld)

3. Process on forecoxa with small apical pimple (Fig. 2.2).....*Chimarra uranka*
(Distribution: NE-Qld, NT, N-WA)

\- Process on forecoxa without small apical pimple (Fig. 2.4)....*Chimarra* sp. AV14
(Distribution: NT)

4. Anterior margin of frontoclypeus with two shallow notches (Fig. 2.6)..... .....*Chimarra* sp. AV11
(Distribution: NE-Qld)

\- Anterior margin of frontoclypeus with one notch only (Fig. 2.7).....5

5. Left mandible with a prominant projection on inner margin (Fig. 2.8).....6

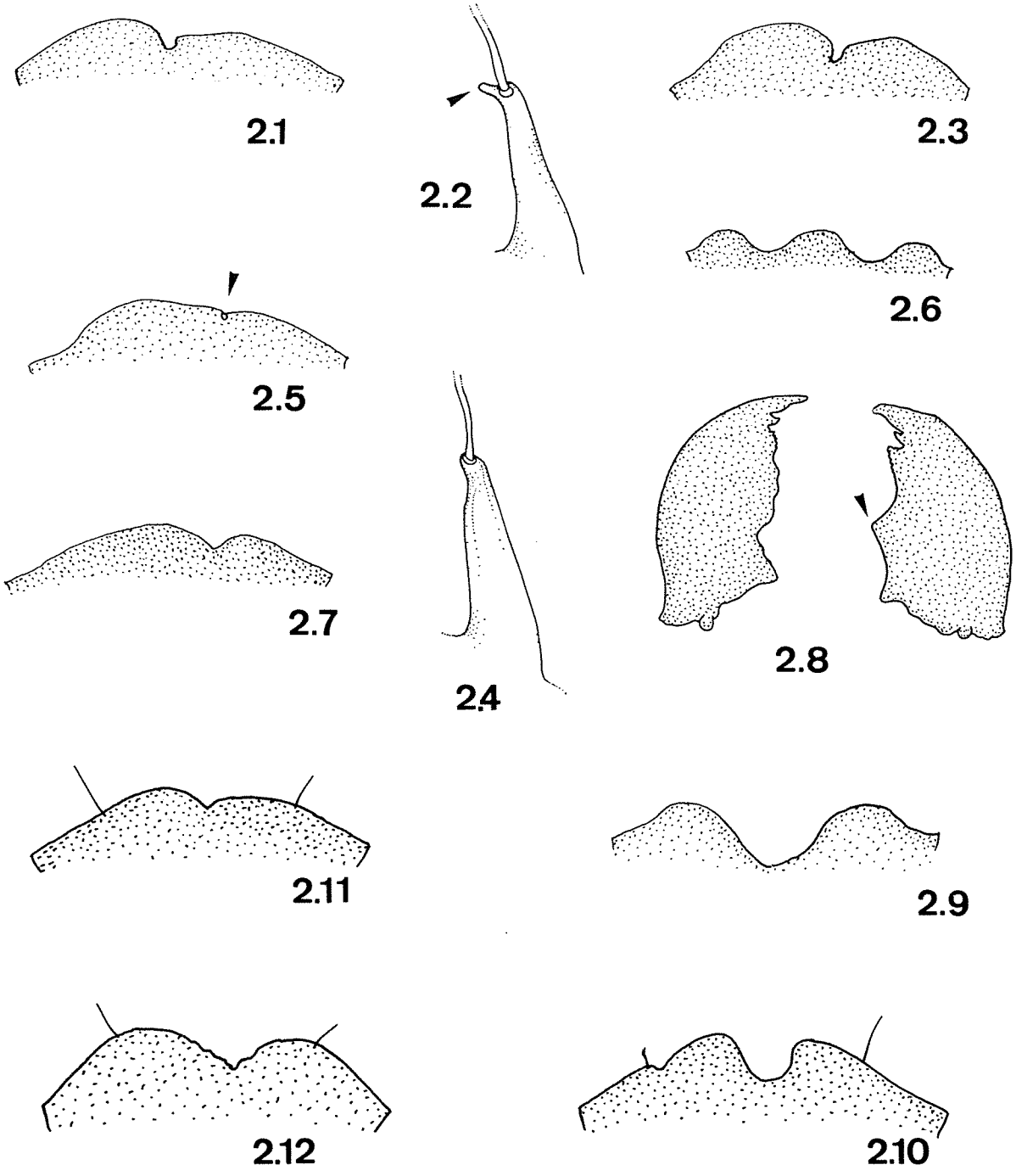
\- Left mandible without a prominant projection on inner margin.....12

6. Frontoclypeal notch deep U-shaped (Figs 2.9, 2.10).....7

\- Frontoclypeal notch shallow &/or V-shaped (Figs 2.11, 2.12).....8

7. Frontoclypeal notch relatively wide U-shaped, parallel sided and flat based in earlier instars (Fig. 2.9).....*Chimarra* sp. AV5
(Distribution: NE-Qld)

\- Frontoclypeal notch relatively narrow U-shaped, nearly parallel sided (Fig. 2.10).....*Chimarra* sp. AV16
(Distribution: NT)



Family Philopotamidae Genus *Chimarra*
Fig. 2.1 *Chimarra uranka* anterior margin of frontoclypeus (ant. mar. fr.); **Fig. 2.2** process on forecoxa; **Fig. 2.3** *Chimarra* sp. AV14 ant. mar. fr.; **Fig. 2.4** process on forecoxa; **Fig. 2.5** *Chimarra* sp. AV6 ant. mar. fr.; **Fig. 2.6** *Chimarra* sp. AV11 ant. mar. fr.; **Fig. 2.7** *Chimarra* sp. AV7 ant. mar. fr.; **Fig. 2.8** *Chimarra* sp. AV3 mandibles, ventral; **Fig. 2.9** *Chimarra* sp. AV5 ant. mar. fr.; **Fig. 2.10** *Chimarra sp.* AV16 ant. mar. fr.; **Fig. 2.11** *Chimarra* sp. AV17 ant. mar. fr.; **Fig. 2.12** *Chimarra* sp. AV4 ant. mar. fr.

8. Right mandible with a prominant projection on inner margin (Fig. 2.13).....9

- Right mandible without a prominant projection on inner margin (Fig. 2.20).....10

9. Left and right sections of anterior margin of frontoclypeus similar in size and shape (Fig. 2.12); hair on process on forecoxa about 1/2 length of process (Fig. 2.16).....*Chimarra* sp. AV4
(Distribution: NE-Qld)

- Left section of anterior margin of frontoclypeus different in size and shape (larger) than right section (Fig. 2.14); hair on process on forecoxa about same length as process (Fig. 2.15).....*Chimarra monticola*
(Distribution: Vic, E-NSW, SE-Qld, NE-Qld?)

10. Frontoclypeal notch wide V-shaped without flat base, with right side short, almost perpendicular to base and left side longer, more angled (Fig. 2.17).....
.....*Chimarra* sp. AV12
(Distribution: NT, NE-Qld)

- Frontoclypeal notch wide with flat base, with right and left sides of similar angle (Figs 2.18, 2.19).....11

11. Hair on process on forecoxa about same length as process (as in Fig. 2.15); projection on left mandible broadbased (Fig. 2.8).....*Chimarra* sp. AV3
(Distribution: E-NSW)

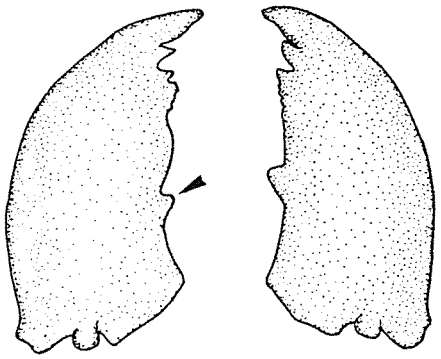
- Hair on process on forecoxa about 1/2 length of process (as in Fig. 2.16); projection on left mandible digitiform (Fig. 2.20).....*Chimarra australica*
(Distribution: Vic, E-NSW, E-Qld)

12. Head length/width ratio < 1.4; hair on process on forecoxa about same length as process (as in Fig. 2.15).....*Chimarra* sp. AV7
(Distribution: NE-Qld)

- Head length/width ratio > 1.4; hair on process on forecoxa at least 1½ X length of process (Fig. 2.21).....13

13. Hair on process on forecoxa about 1½ X length of process; process on forecoxa without small apical pimple (Fig. 2.21).....*Chimarra* sp. AV 17
(Distribution: NT)

- Hair on process on forecoxa about 2 X length of process; process on forecoxa with small apical pimple (Fig. 2.22).....*Chimarra* sp. AV 18
(Distribution: N-WA Pilbara)



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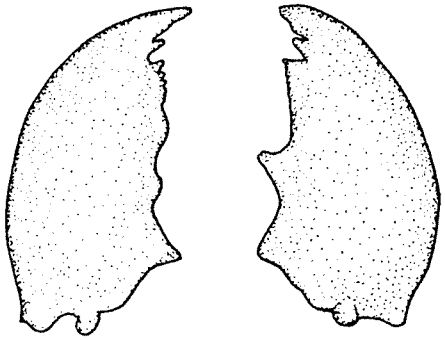

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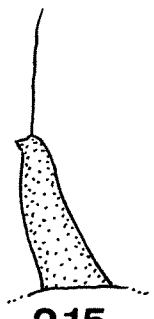

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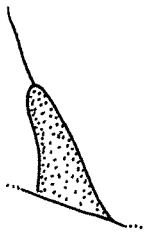

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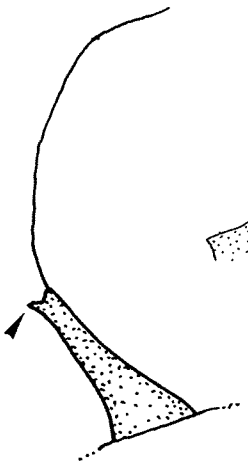

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2.23

Family Philopotamidae Genus *Chimarra*
Fig. 2.13 *Chimarra monticola* mandibles, ventral; **Fig. 2.14** ant. mar. fr.; **Fig. 2.15** process on forecoxa; **Fig. 2.16** *Chimarra* sp. AV4 process on forecoxa; **Fig. 2.17** *Chimarra* sp. AV12 ant. mar. fr.; **Fig. 2.18** *Chimarra* sp. AV3 ant. mar. fr.; **Fig. 2.19** *Chimarra australica* ant. mar. fr.; **Fig. 2.20** mandibles, ventral; **Fig. 2.21** *Chimarra* sp. AV17 process on forecoxa: **Fig. 2.22** *Chimarra* sp. AV18 process on forecoxa; **Fig. 2.23** *Chimarra* sp. 10 ant.mar. fr.

Genus *Hydrobiosella*

Morphology. Medium size larvae, ranging in body length from 8 to 12 mm. Head and pronotum sclerotised, brownish-orange, meso- and metanotum membranous. Labrum membranous, anterior margin broader than posterior margin. Abdomen white or yellowish, without gills. Abdominal prolegs strongly developed, anal claws terminal. Ventral surface of head without transverse sulcus or ridge adjacent to occipital margin, fore coxa with two or no sclerotised processes on anterior margin.

Biology. Larvae construct silken tubes or sack- like nets on the underside of rocks in flowing water. The larva feeds by cleaning the fine detritus and algae from the net with its highly specialised labrum. The larvae are found mainly in faster flowing streams.

Taxonomy. Fourteen species have been described and at least 7 additional undescribed species are known. Neboiss (pers. comm.) suggests there may be a total of about 40 Australian species. Dean and Bunn (1989) figured 3 larvae from SW Australia; the corresponding adult has not been collected for at least one larva. One species from North Queensland is included in the table as Gen. nov. sp. nov.

Notes on key to Hydrobiosella. (see comments at start of *Hydrobiosella* key). Additional terminology is shown on page 16.

CHECK LIST AND DISTRIBUTION OF KNOWN AUSTRALIAN SPECIES

Distribution. *Hydrobiosella* species are recorded from all states except NT. *Hydrobiosella* is also not recorded from N-WA.

GENUS & SPECIES	ASSOC. LARVA(*)	NW-AUST	NE-QLD	SE-AUST	TAS	SE-SA	SW-AUST	EYRE AN	Ref. Source
1. *Hydrobiosella amblyopia* Neboiss, 1982							+		Neboiss 1986
2. *Hydrobiosella anasina* Neboiss, 1977					+				Neboiss 1986
3. *Hydrobiosella arcuata* Kimmins, 1953				+					Neboiss 1986
4. *Hydrobiosella armata* Jacquemart, 1965					+				Neboiss 1986
5. *Hydrobiosella bispina* Kimmins, 1953	*			+					Neboiss 1986
6. *Hydrobiosella cerula* Neboiss, 1977					+				Neboiss 1986
7. *Hydrobiosella cognata* Kimmins, 1953	*				+				Neboiss 1986
8. *Hydrobiosella corinna* Neboiss, 1977					+				Neboiss 1986
9. *Hydrobiosella letti* Korboot, 1964				+					Neboiss 1986
10. *Hydrobiosella michaelseni* (Ulmer, 1908)	*						+		Neboiss 1986
11. *Hydrobiosella orba* Neboiss, 1977					+				Neboiss 1986
12. *Hydrobiosella sagitta* Neboiss, 1977					+				Neboiss 1986
13. *Hydrobiosella tasmanica* Mosely, 1953					+				Neboiss 1986
14. *Hydrobiosella waddama* Mosely, 1953	*			+	+				Neboiss 1986
15. *Hydrobiosella* sp. nov. PT-1037			+						Walker et al 95
16. *Hydrobiosella* sp. nov. PT-1038			+						Walker et al 95
17. *Hydrobiosella* sp. nov. PT-1039			+						Walker et al 95
18. *Hydrobiosella* sp. nov. PT-1768			+						Walker et al 95
19. *Hydrobiosella* sp. nov. PT-2029			+						Walker et al 95
20. *Hydrobiosella* sp. nov. (A or B larva)							+		Dean & Bunn 89
21. Gen. nov. sp. nov. PT-1640			+						Walker et al 95

KEY TO SPECIES OR TAXA OF LATE INSTAR LARVAE OF *HYDROBIOSELLA*

Note: Thirteen larval taxa are keyed out of which only two are identified to known species. This key should be used with caution in eastern Australia, where there are at least twenty unknown larvae. The mandibles are referred to as left and right in dorsal view, although the ventral view is shown. Key characters such as small or large (projection) are used in relative terms, not absolute.
This key supercedes one provided by Cartwright (1991).

1. Fore coxa with two sclerotised processes on anterior margin (Figs 2.24, 2.25)....2

- Fore coxa with no sclerotised processes on anterior margin (Figs 2.35, 2.36)....11

2. Fore coxa with apical process about 2 X length of basal process (Figs 2.24, 2.26) 3

- Fore coxa with apical process about same length as basal process (Fig. 2.25).....4

3. Head ventrally flattened, lateral margins angular with conspicuous ridge running length of head capsule (Fig. 2.27), maximum width in posterior 1/3 (Fig. 2.28).... .....*Hydrobiosella* sp. AV2
(Distribution: E-Vic, SE-NSW)

- Head not ventrally flattened, lateral margins rounded without conspicuous ridge running length of head capsule (similar to Fig. 2.29), maximum width at about midlength of head (Fig. 2.30).....*Hydrobiosella michaelseni*
(Distribution: S-WA)

4. Anterior margin of frontoclypeus strongly convex (similar to Fig. 2.30).....5

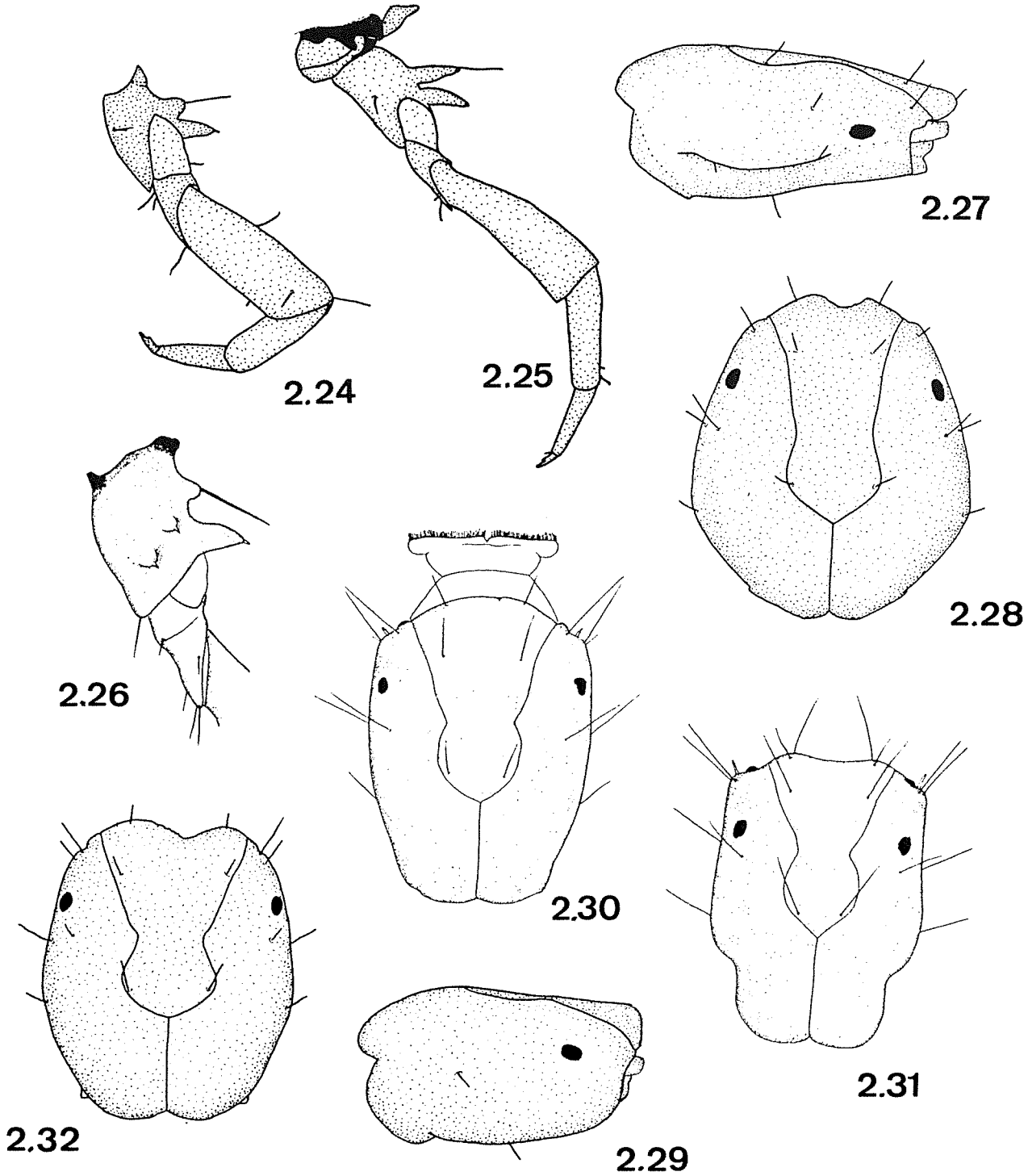
- Anterior margin of frontoclypeus straight or concave (similar to Figs 2.31, 2.32) 6

5. Head length /head width ratio < 1.55; mandibles as in Fig. 2.33..... .....*Hydrobiosella* sp. AV8
(Distribution: E-NSW, SE-Qld)

- Head length /head width ratio > 1.55; mandibles as in Fig. 2.34..... .....*Hydrobiosella* sp. AV15
(Distribution: E-Qld)

6. Anterior margin of frontoclypeus with a wide central V-notch (similar to Fig. 2.32).....*Hydrobiosella* sp. AV13
(Distribution: E-Vic, E-NSW)

- Anterior margin of frontoclypeus straight or smoothly concave, without a V notch (similar to Fig. 2.31).....7



Family Philopotamidae Genus *Hydrobiosella*
Fig. 2.24 *Hydrobiosella* sp. AV2 foreleg; **Fig. 2.25** *Hydrobiosella waddama* foreleg; **Fig. 2.26** *Hydrobiosella michaelseni* forecoxa, inner surface; **Fig. 2.27** *Hydrobiosella* sp. AV2 head, lateral; **Fig. 2.28** head, dorsal; **Fig. 2.29** *Hydrobiosella* sp. head, lateral; **Fig. 2.30** *Hydrobiosella michaelseni* head, dorsal; **Fig. 2.31** *Hydrobiosella* sp. AV17 head, dorsal; **Fig. 2.32** *Hydrobiosella* sp. AV10 head, dorsal.

7. Head length /head width ratio > 1.55; mandibles as in Fig. 2.37..... .....*Hydrobiosella* sp. AV1
(Distribution: E-Vic)

- Head length /head width ratio < 1.55; mandibles as in Figs 2.38, 2.39.....8

8. Inner margin of right mandible with a shallow concavity (Fig. 2.38)..... ..... *Hydrobiosella* sp. AV5
(Distribution: W-Vic)

- Inner margin of right mandible with a deep concavity (Figs 2.39, 2.40).....9

9. Inner margin of left mandible without a small projection but with a slight swelling (Fig. 2.39).....*Hydrobiosella* sp. AV4
(Distribution: CE-Vic, SE-NSW)

- Inner margin of left mandible with a small projection (Figs 2.40, 2.41).....10

10. Inner margin of left mandible with a broad apically flattened projection (Fig. 2.40).....*Hydrobiosella waddama*
(Distribution: Tas, Vic, SE-NSW)

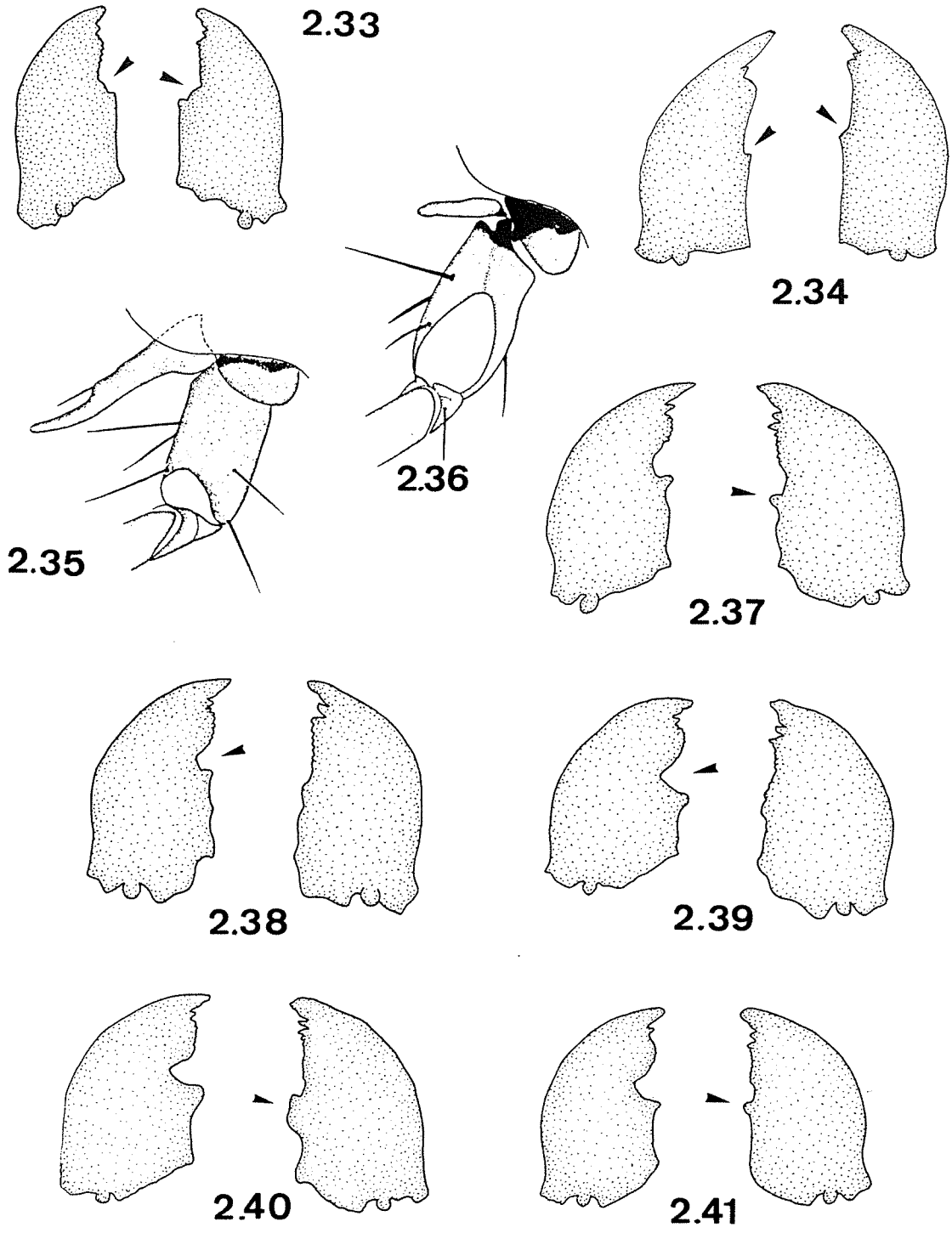
- Inner margin of left mandible without a broad apically flattened projection, but with a small rounded projection (Fig. 2.41).....*Hydrobiosella* sp. AV7
(Distribution: E-Vic, SE-NSW)

11. Anterior margin of frontoclypeus with a central V-notch (Fig. 2.32)..... .....*Hydrobiosella* sp. AV10
(Tasmanian larvae; not separated further due to lack of adequate material)

- Anterior margin of frontoclypeus with a shallow concavity (Fig. 2.31) (S-WA larvae).....12

12. Foretrochantin elongate, length similar in length to fore coxa (Fig. 2.35; *Hydrobiosella* sp. B, Fig. 17, Dean and Bunn 1989)....*Hydrobiosella* sp. AV17
(Distribution:S-WA)

- Foretrochantin not elongate, length < 1/2 length of fore coxa (Fig. 2.36; *Hydrobiosella* sp. A, Fig. 15, Dean and Bunn 1989)....*Hydrobiosella* sp. AV16
(Distribution:S-WA)



Family Philopotamidae Genus *Hydrobiosella*
Fig. 2.33 *Hydrobiosella* sp AV15 mandibles, ventral; **Fig. 2.34** *Hydrobiosella* sp mandibles, ventral; **Fig. 2.35** *Hydrobiosella* sp. AV17 forecoxa and trochantin; **Fig. 2.36** *Hydrobiosella* sp. AV16 forecoxa and trochantin; **Fig. 2.37** *Hydrobiosella* sp. AV1 mandibles, ventral; **Fig. 2.38** *Hydrobiosella* sp. AV5 mandibles, ventral; **Fig. 2.39** *Hydrobiosella* sp. AV4 mandibles, ventral; **Fig. 2.40** *Hydrobiosella waddama* mandibles, ventral; **Fig. 2.41** *Hydrobiosella* sp. AV7 mandibles, ventral.

3 TASIMIIDAE

Two genera, *Tasiagma* and *Tasimia,* have been recorded from Australia.

Genus *Tasiagma*

Morphology. Moderately small larvae ranging in body length from 5 to 6 mm. Head rounded, eyes bulging. Head and pronotum sclerotised, mesonotum with pair of large sclerites, metanotum with two pairs of small sclerites. Pronotum with antero-lateral corners rounded; posterior flange broad. Abdomen with strongly developed lateral fringe of setae. Abdominal gills present.

Biology. Larvae construct dorsoventrally flattened portable cases constructed of small stones, with ventral opening. Larvae inhabit clear, fast-flowing streams.

Taxonomy. Only one species has been recorded from Australia.

CHECK LIST AND DISTRIBUTION OF KNOWN AUSTRALIAN SPECIES

* *Tasiagma ciliata* Neboiss, 1977 — Tas., Vic., NSW, Qld

* Associated larvae known

Genus *Tasimia*

Morphology. Moderately small larvae ranging in body length from 5 to 6 mm. Head rounded, eyes bulging. Head and pronotum sclerotised, mesonotum with pair of large sclerites, metanotum with two pairs of small sclerites. Pronotum with antero-lateral corners acute, projecting; posterior flange narrow. Abdomen with strongly developed lateral fringe of setae. Abdominal gills present.

Biology. Larvae construct dorsoventrally flattened portable cases constructed of small stones, with ventral opening (Fig. 3.1). Larvae inhabit clear, fast-flowing streams.

Taxonomy. Five species have been recorded from Australia. Larvae of all five have been associated.

CHECK LIST AND DISTRIBUTION OF KNOWN AUSTRALIAN SPECIES

Distribution. Species of the genus *Tasimia* are restricted to the eastern states including SE-SA, and so are not recorded from WA and the NT.

GENUS & SPECIES	ASSOC. LARVA(*)	NW-AUST	NE-QLD	SE-AUST	TAS	SE-SA	SW-AUST	EYR EAN	Ref. Source
1. *Tasimia atra* (Banks, 1939)	*			+					Neboiss 1986
2. *Tasimia denticulata* Jacquemart, 1965	*			+	+				Neboiss 1986
3. *Tasimia drepana* Neboiss, 1977	*?				+				Neboiss 1986
4. *Tasimia natasia* Mosely, 1953	*			+					Neboiss 1986
5. *Tasimia palpata* Mosely, 1936	*			+	+	+			Neboiss 1986

KEY TO GENERA AND SPECIES OF LATE INSTAR LARVAE OF TASIMIIDAE

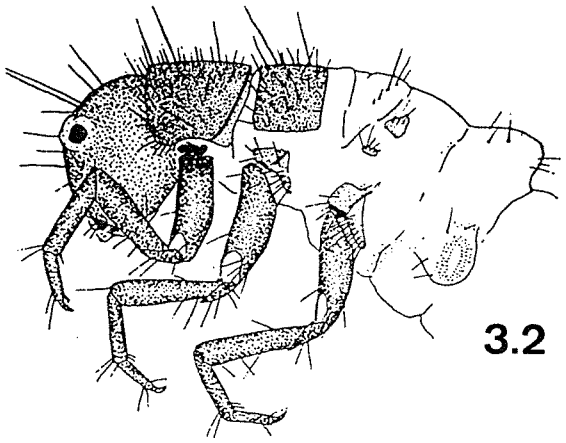
1. Pronotum with antero-lateral corners rounded; posterior flange broad (Figs 3.2, 3.3).....*Tasiagma ciliata*
(Distribution: Tas, Vic, NSW, Qld)

- Pronotum with antero-lateral corners acute; posterior flange narrow (Figs 3.4, 3.5).....*Tasimia*.....2

2. Pronotum with antero-lateral corners produced into a short projection, projection length about half width (Fig. 3.4) Vic., NSW.....*Tasimia natasia*
(Distribution: E-Vic, E-NSW)

- Pronotum with antero-lateral corners produced into a long projection, projection length about same as width (Figs 3.5, 3.6).....*Tasimia* sp. AV1
(*Tasimia palpata, Tasimia atra, Tasimia denticulata?,* and *Tasimia drepana?*)
(Distribution: SE-SA, Tas, Vic, NSW, SE-Qld)

Note: Larvae of *Tasimia palpata, T. atra,T. denticulata?* and *T. drepana?* cannot be separated at this stage and have been lumped in the key as *Tasimia* sp. AV1. (The adults of the latter three species cannot be separated easily at present and may eventually prove to be only one species ie *T. atra*).



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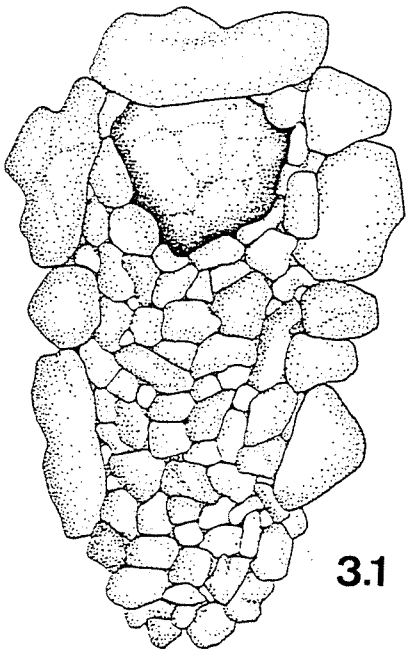

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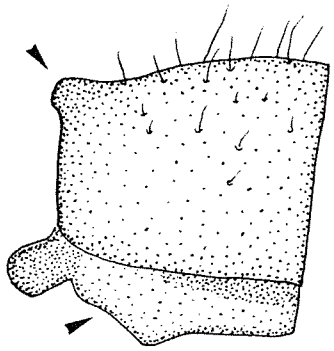

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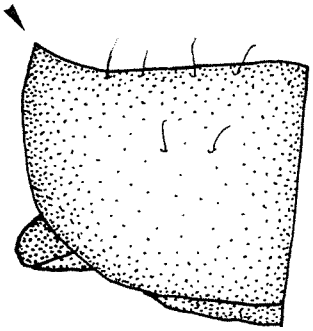

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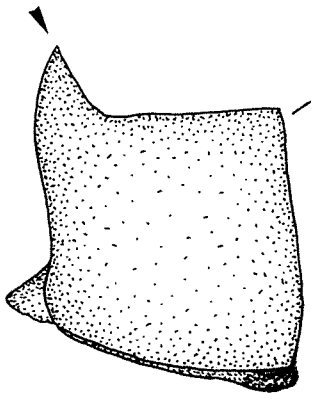

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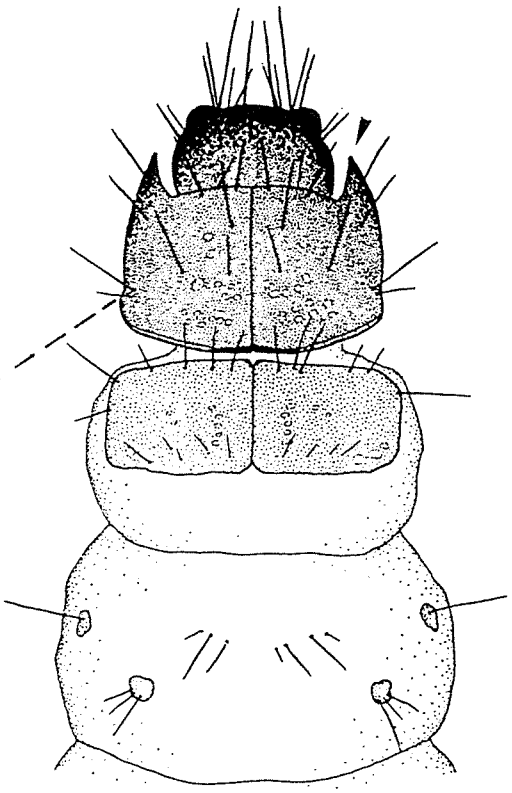

3.6

Family Tasimiidae
Fig. 3.1 *Tasiagma ciliata* case, ventral; **Fig. 3.2** head and thorax, lateral; **Fig. 3.3** pronotum, left, dorsal; **Fig. 3.4** *Tasimia natasia* pronotum, left, dorsal; **Fig. 3.5** *Tasimia* sp. AV1 pronotum, left, dorsal; **Fig. 3.6** head and thorax, dorsal.

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