

**PRELIMINARY GUIDE TO THE
IDENTIFICATION OF LATE INSTAR LARVAE
OF AUSTRALIAN PHILORHEITHRIDAE,
CALAMOCERATIDAE AND HELICOPSYCHIDAE
(INSECTA : TRICHOPTERA)**

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Cover: left photo *Anisocentropus latifascia* (Calamoceratidae)
right photo *Aphilorheithrus* sp. (Philorheithridae)
Photographs by John H. Hawking MDFRC/CRCFE

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Family Philorheithridae

INTRODUCTION

Philorheithridae are found in South America, New Zealand and Australia with most species recorded from Australia. The family is one of wetter areas, occurring mostly along the east coast of Australia, particularly Tasmania. One species is found in southern Western Australia. Philorheithridae is a small family represented by five described genera in Australia, with several more awaiting description.

There has been no revision of the Australian fauna as a whole but all described species are included in Neboiss 1983 and 1986.

Larvae are identified by modification of the fore and mid legs for prey capture. The mid leg has the tibia and tarsus fused (Fig C). Note that fusion of the tibia and tarsus of both the front- and mid leg occurs in larvae of the Kokiriidae. **Early instar larvae of Philorheithridae do not have the mid tibia and tarsus fused and can easily be confused with Odontoceridae larvae.**

BIOLOGY

Larvae are predatory, using their highly modified legs for prey capture, and as a result are usually found singly or in low numbers. Little is known about the biology of Philorheithridae larvae.

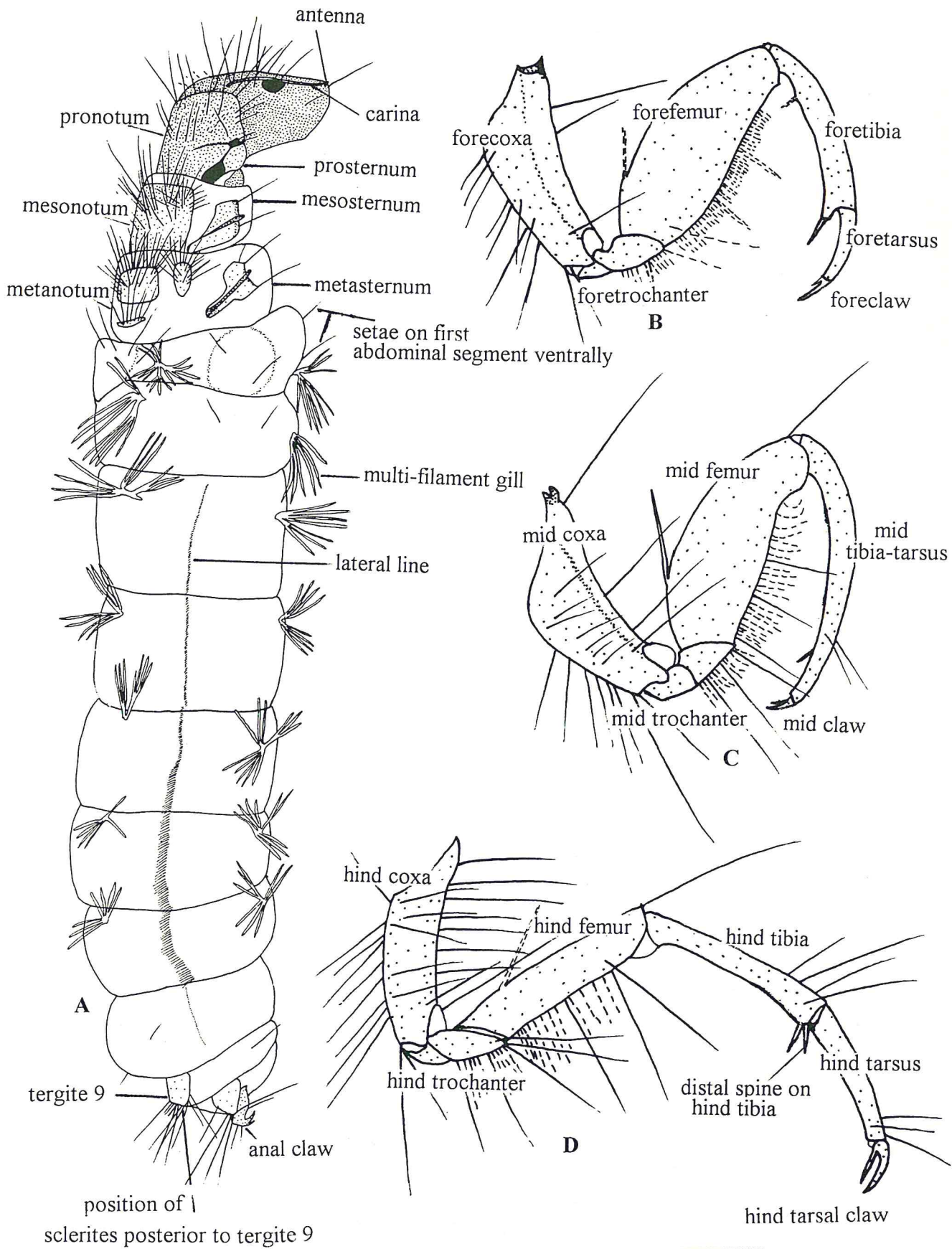
MORPHOLOGY

Figures A to I are included to indicate all characters used in the keys and diagnoses. They represent examples that are adequate to allow recognition of the characters, and do not reflect the exact morphology of all Philorheithridae species. Dashed lines represent pale setae and spines.

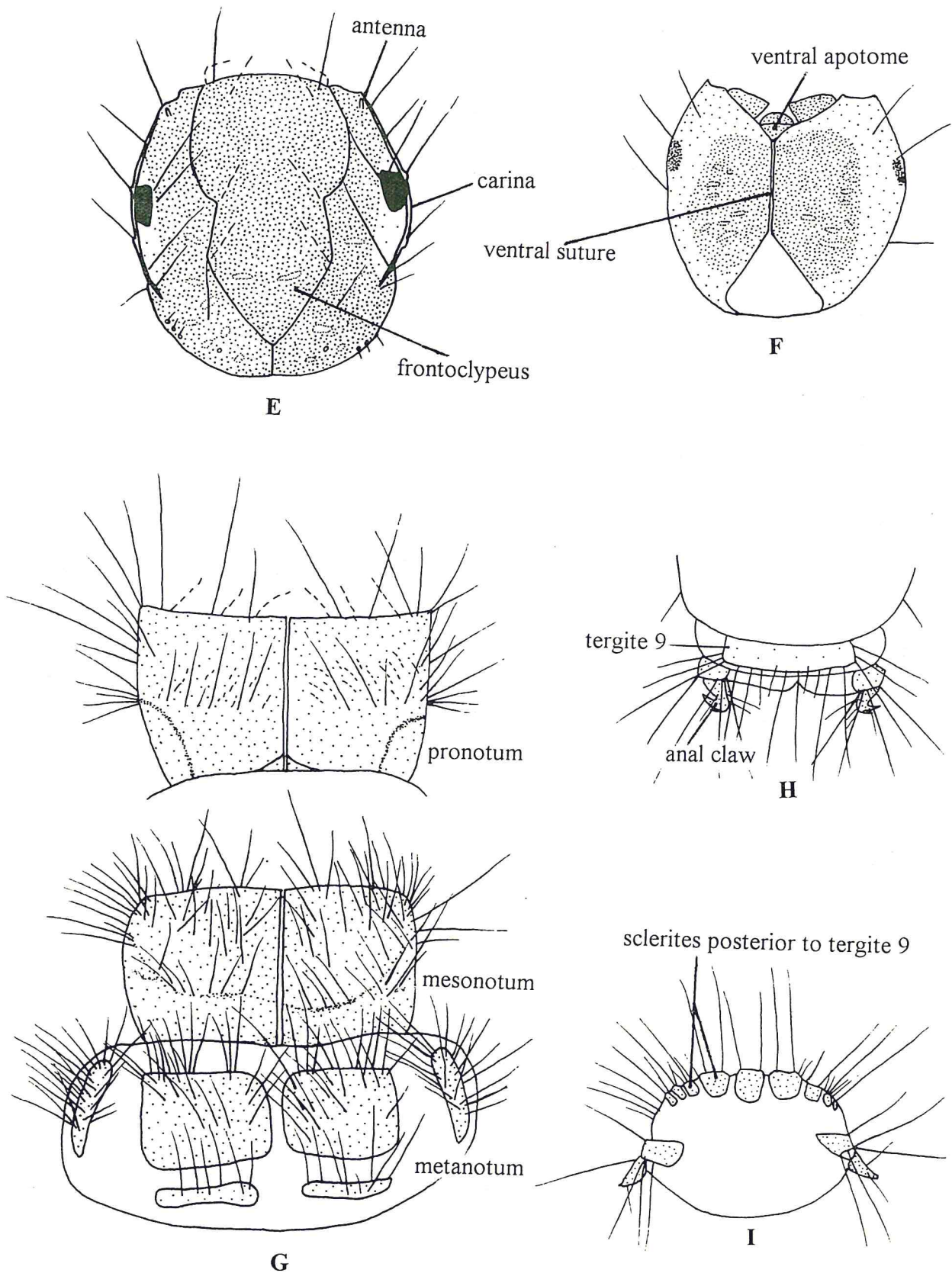
TAXONOMY

Adults of 13 species belonging to five genera have been described from Australia with a further two genera and six species known but not yet described. In addition, adults thought to belong to the NZ genus *Philorheithrus* have recently been found in Australia (A. Neboiss pers. comm.). The incorporation of new genera and species may require changes in generic definitions (A. Neboiss pers. comm.)

Larvae of seven species from four genera have been associated with adults, but insufficient to adequately define the genera, particularly as it appears that there is variation within the genera. Larvae of an additional four species have been assigned to a further three genera. Some of the species included here based on larval information appear to be from undescribed species as the distributions do not agree with that of the adults. Further association of larvae with adults is required to help refine the generic placement. The larvae of *Ramiheithrus* is unknown.



Figures A-D
Tasmanthrus galbinomaculatus: A, body, lateral; B, foreleg; C, mid leg; D, hind leg.



Figures E-I

Tasmanthrus galbinomaculatus: E, head dorsal, F, head ventral; G, thorax dorsal; H last abdominal segment and anal claws, dorsal. Genus *Philor B*: I, anal end, posterior.

* Aphilorheithrus Mosely	Qld, NSW, Vic, Tas
* Austrheithrus Mosely	NSW, Vic, Tas
* Kosrheithrus Mosely	NSW, Vic, Tas, WA
Ramiheithrus Neboiss	Vic, Tas
* Tasmanthrus Mosely	Tas
"Philorheithrus" Hare	NSW, Tas
Genus Philor B	Qld
Genus Philor D	NSW

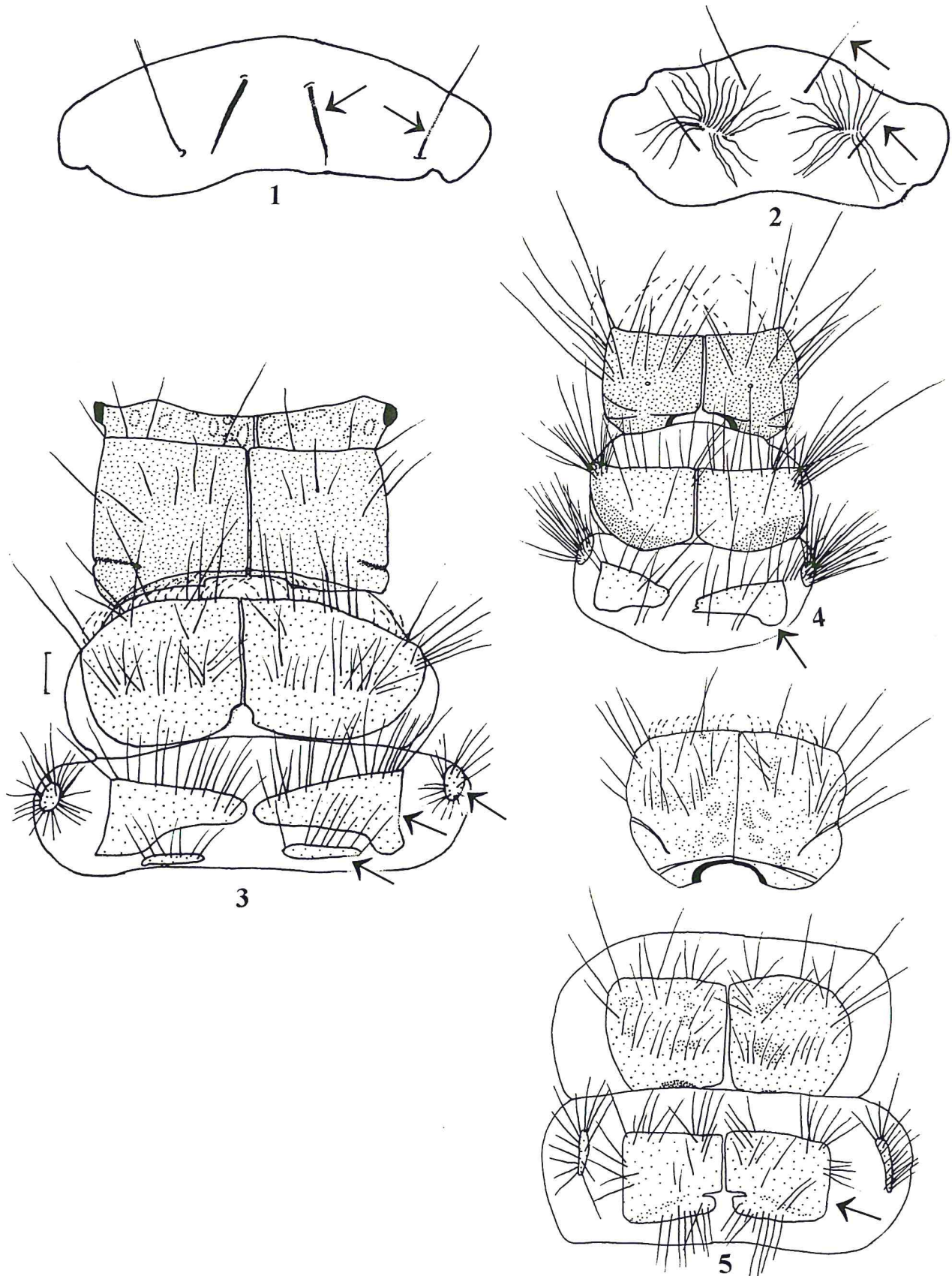
* Associated larvae known.

Diagnosis: Final instar larvae small, (*Austrheithrus*, body length 5 mm), to large (*Kosrheithrus*, body length about 20 mm). The head may be flattened with carinae or rounded, short or elongate. Antennae situated on or near the anterior margin of the head capsule and minute to short. The head ventrally with ventral apotome usually short, the ventral suture can be almost as long as the head ventrally. Pro- and mesonotum sclerotised, metanotum with two or three pairs of sclerites variously arranged. Pro- and mesosternum with sclerites. The mid leg has the tibia and tarsus fused. The foreleg is modified similarly to the mid leg but the final step of fusion of the tibia and tarsus is not achieved. First abdominal segment ventrally with two pairs or numerous setae; if two pairs, median pair may be very dark and stout. Tergite 9 variously developed, may be raised and with small sclerites posterior to the tergite, setae few or forming a fringe. Gills multi-filamented.

Case. Larvae construct tapered sand grain cases, circular in cross section, which in some species are strongly curved. Most species use small sand grains but some use flat mineral particles and some have a few larger grains in addition to the small grains.

Key to genera for mature *Philorheithridae* larvae

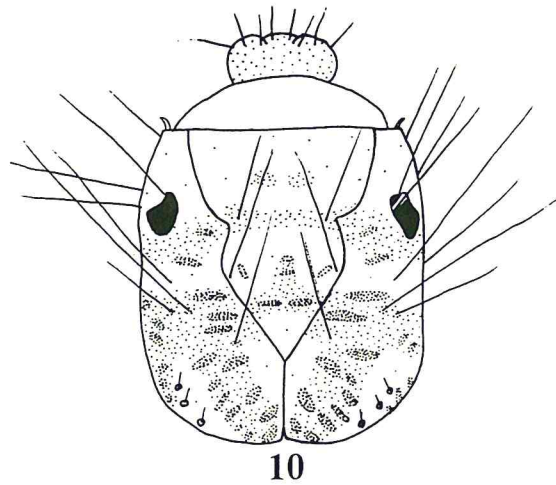
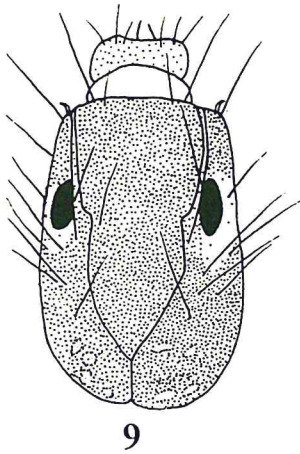
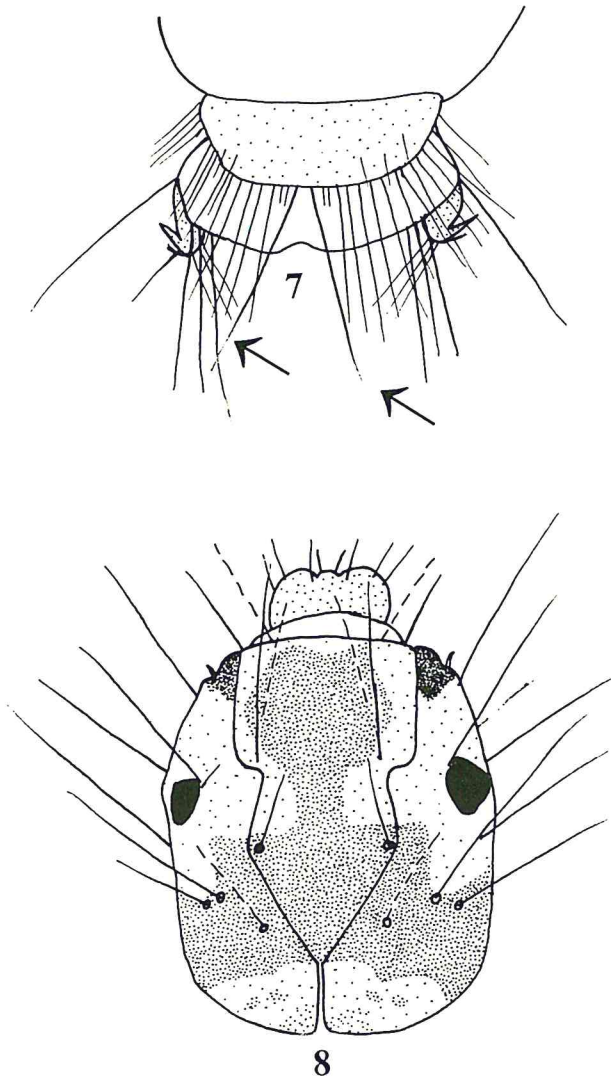
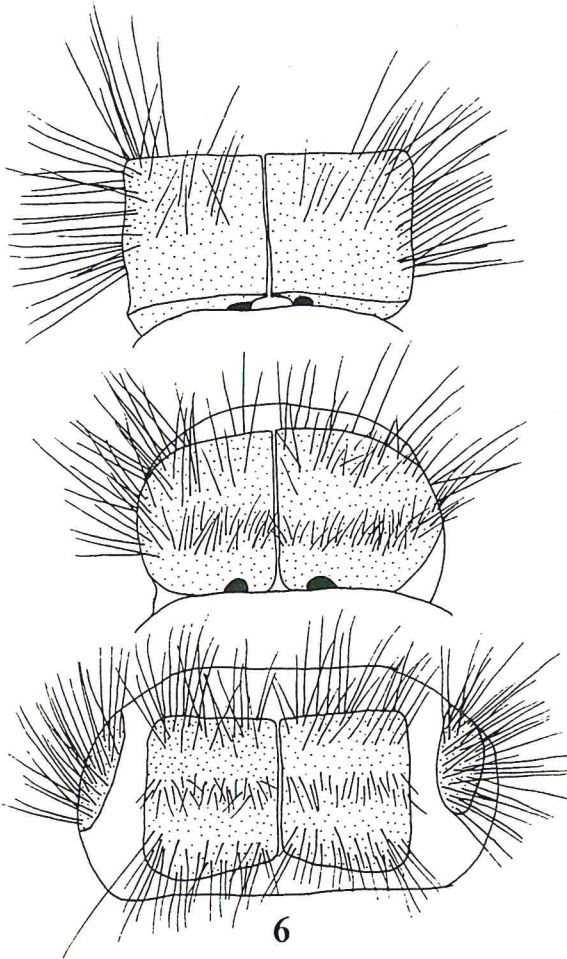
- 1 First abdominal segment with medial ventral setae stouter and darker than other setae, at least twice the diameter (Fig 1) 2
- First abdominal segment with medial ventral setae not different to other setae (Fig 2) 4
- 2 (1) Metanotum with three pairs of sclerites, anterior medial pair almost triangular (Fig 3) **Genus Philor A**
[Distribution: Northern NSW]
- Metanotum with two pairs of sclerites, medial pair almost triangular or rectangular (Figs 4,5) 3
- 3 (2) Medial metanotal sclerites almost triangular (Fig 4) ***Austrheithrus***
[Distribution: NSW, Vic, Tas]
- Medial metanotal sclerites approximately rectangular (Fig 5) ***Kosrheithrus***
[Distribution: NSW, Vic, Tas, WA]



Figures 1-5

Austrheithrus sp.: 1, first abdominal segment ventral. *Aphilorheithrus* sp AV 3: 2, first abdominal segment ventral. Genus *Philor* A: 3, head and thorax, dorsal. *Austrheithrus* sp.: 4, thorax, dorsal. *Kosrheithrus* sp.: 5, thorax, dorsal.

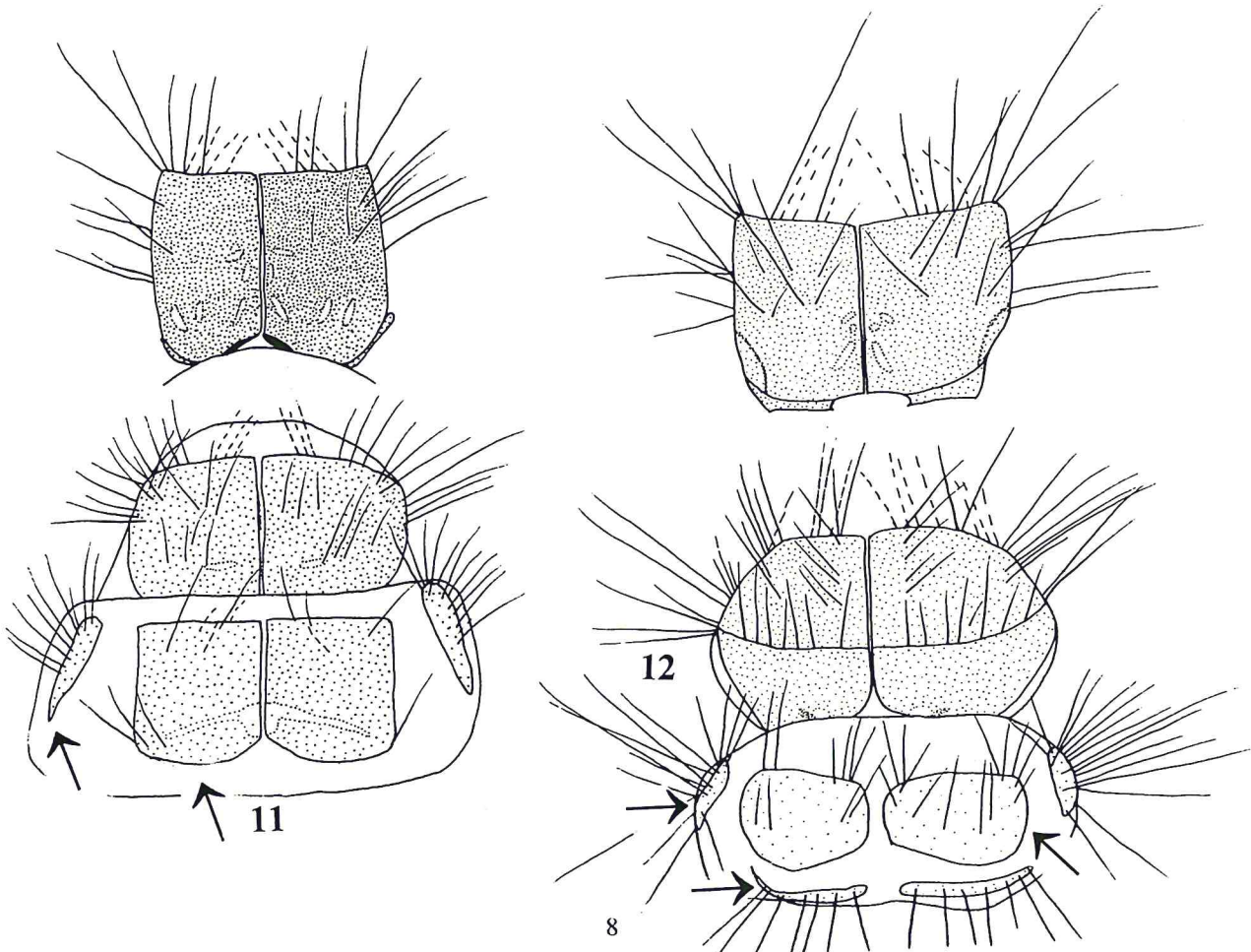
- 4 (1) Thorax with extremely numerous setae (Fig 6); tergite 9 with a fringe of setae, median pair of setae strongly diverging (Fig 7) ***Aphilorheithrus* (part)**
 [Distribution: NSW?, Vic, Tas]
- Thorax with many fewer setae than shown in Fig 6, tergite 9 with setae arranged other than in Fig 7 5
- 5(4) Head elongate, distinctly longer than wide (Figs 8 and 9) 6
- Head not elongate, about as long as wide (Fig 10) 8

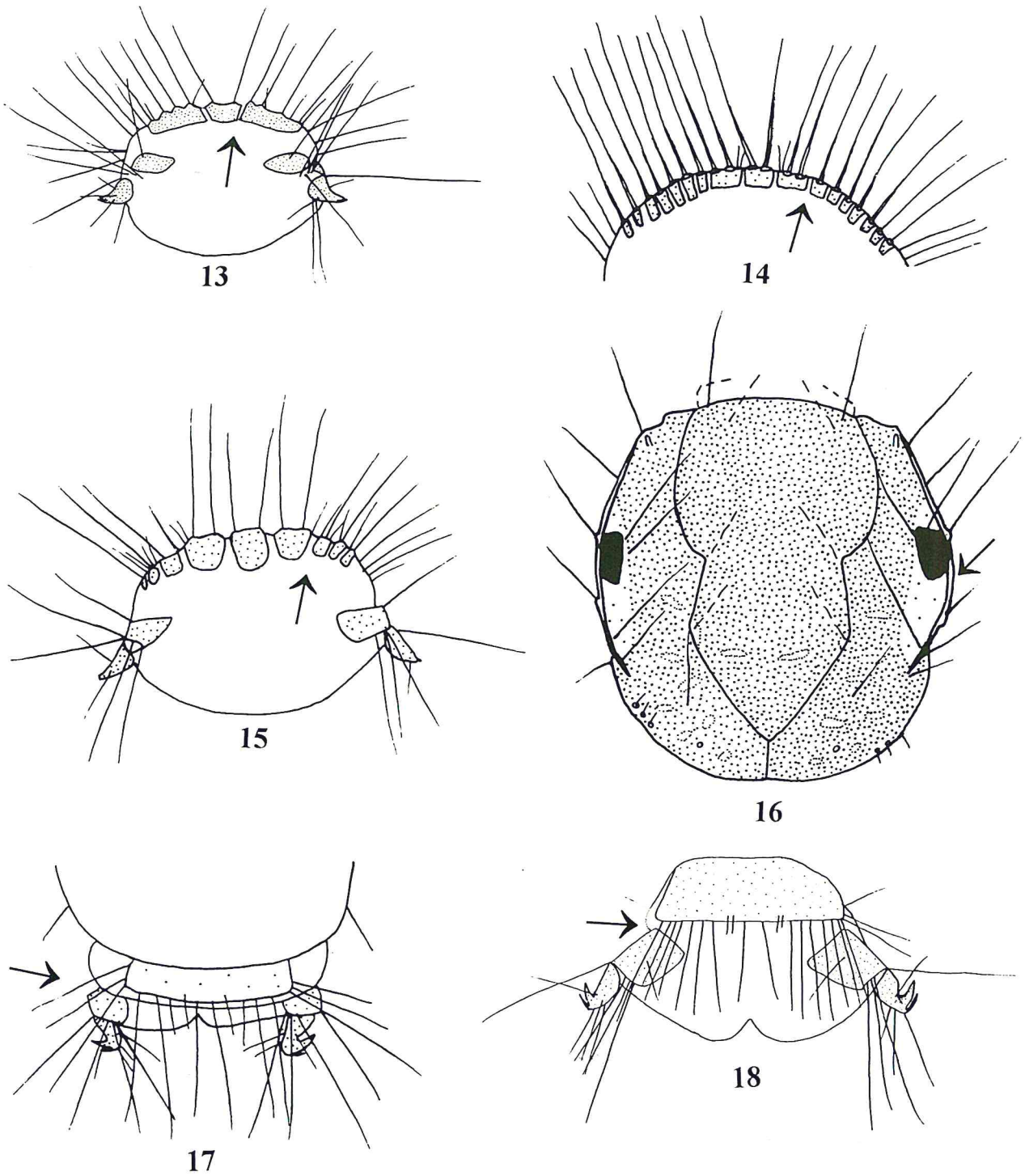


Figures 6-10

Aphilorheithrus sp AV 1: 6, thorax, dorsal; 7, tergite 9. *Aphilorheithrus* sp AV 3: 8, head dorsal. Genus *Philor* B: 9, head, dorsal. *Aphilorheithrus* sp AV 2: 10, head dorsal.

- 6(5) Metanotum with two pairs of sclerites (Fig 11); mature larvae with 9 or more sclerites posterior to tergite 9 (Figs 14,15) 7
- Metanotum with three pairs of sclerites (Fig 12); mature larvae with 3 sclerites posterior to tergite 9 (Fig 13) "*Philorheithrus*"
[Distribution: NSW, Tas]
- 7(6) Mature larvae with about 18 sclerites (may be very pale) posterior to tergite 9 (Fig 14); head and thorax with at least some yellow patches, usually strongly contrasting yellow and brown, rarely predominantly yellow.
..... *Aphilorheithrus* (part)
[Distribution: Qld, NSW, Vic, Tas]
- Mature larvae with 9 sclerites posterior to tergite 9 (Fig 15); head and thorax fairly uniform red brown, no yellow patches **Genus Philor B**
[Distribution: N Qld]
- 8(5) Head comparatively flat dorsally and with carinae (Figs A,16); head and thorax fairly uniform red-brown; tergite 9 with about 12 long setae forming a sparse fringe (Fig 17) *Tasmanthrus*
[Distribution: Tas]
- Head not as flattened dorsally and without carinae; head and thorax pale with darker contrasting spots and patches; tergite 9 with a strong fringe of at least 20 long setae (Fig 18) *Aphilorheithrus* (part)
[Distribution: Qld, NSW, Vic, Tas]





Figures 11-18

Genus *Philor* B: 11, thorax, dorsal; "*Philorheithrus*" sp.: 12, thorax dorsal; 13, anal area posterior. *Aphilorheithrus* sp. AV 3: 14, anal area posterior. Genus *Philor* B: 15, tergite 9 posterior sclerites. *Tasmanthrus galbinomaculatus*: 16, head, dorsal; 17, tergite 9. *Aphilorheithrus* sp. AV 2: 18, tergite 9.

Genus *Aphilorheithrus* Mosely

Larvae of three distinct types are included in this genus. Association of more species may result in some being transferred to other genera but this is where they fit best at present. The generic diagnosis is given separately for the three species groups.

Aphilorheithrus sp AV 1, 4 and 5

Diagnosis: Head about as long as wide, with at most a short carina over each eye; ventral apotome about 1/3 the length of the ventral suture; frontoclypeus distinctly wider anteriorly; fore- mid and hind claws all about half as long as the tarsus; hind tibia with two spines distally; thoracic setae extremely numerous; metanotum with two pairs of sclerites, medial pair large and contiguous; first abdominal segment ventrally with two pairs or numerous setae, all of similar diameter; lateral line short but distinct; tergite 9 as wide as segment, with a fringe of setae and middle pair strongly diverging, without sclerites posterior to the tergite. Body length about 10 mm.

Case: Tapering tubular, made of sand grains, often flat and shiny grains.

Aphilorheithrus sp AV 2

Diagnosis: Head about as long as wide (slightly longer), with a short carina over each eye; ventral apotome about 1/3 the length of the ventral suture; frontoclypeus distinctly wider anteriorly; foreclaw very much shorter than the tarsus, mid claw very short and stout, hind claw about 1/3 the length of the tarsus; hind tibia with two spines distally; at least some thoracic setae longer than the segment they are on; metanotum with three pairs of sclerites medial pairs close together; first abdominal segment ventrally with two pairs of setae of similar diameter; lateral line short but apparent; tergite 9 as wide as segment, with a fringe of setae, middle pair of setae not strongly divergent, without sclerites posterior to the tergite. Body length about 20 mm.

Case: Tapering tubular, made of sand grains.

Aphilorheithrus sp AV 3 and 6

Diagnosis: Head longer than wide but not greatly so, with a short carina over each eye; ventral apotome either 1/3 or 1/4 the length of the ventral suture; frontoclypeus slightly wider anteriorly; fore- and hind claw about half the length of the tarsus, mid claw very short and either stout or narrow; hind tibia with two spines distally; at least some thoracic setae longer than the segment they are on; metanotum with two pairs of sclerites; first abdominal segment with two pairs of ventral setae of similar diameter; lateral line short but apparent; tergite 9 as wide as segment, with a fringe of setae, middle pair of setae not strongly divergent, without sclerites posterior to the tergite. Body length about 10 to 15 mm.

Case. Tapering tubular, made of sand grains and sometimes a little detritus.

Taxonomy: Well developed male pupae with larval sclerites of *Aphilorheithrus* sp AV 3 were identified as *Aphilorheithrus stepheni*, however, one pupae was somewhat different to the standard *A. stepheni* suggesting that this is a species complex. As the larvae are so variable as well, it is not appropriate to use this name at present. A well developed male pupa with sclerites of *Aphilorheithrus* sp AV 4 was identified as an undescribed species of *Aphilorheithrus*.

Comments: In most or all species in this genus, the colour pattern is quite variable so many specimens differ from those figured. In general the basic pattern of pale specimens with darker spots or dark specimens with paler spots. The areas coloured vary in extent and depth of colour. This variation may indicate that some AV species are species complexes. This is particularly true of *Aphilorheithrus* sp AV 3 and sp AV 4.

Checklist of Australian species

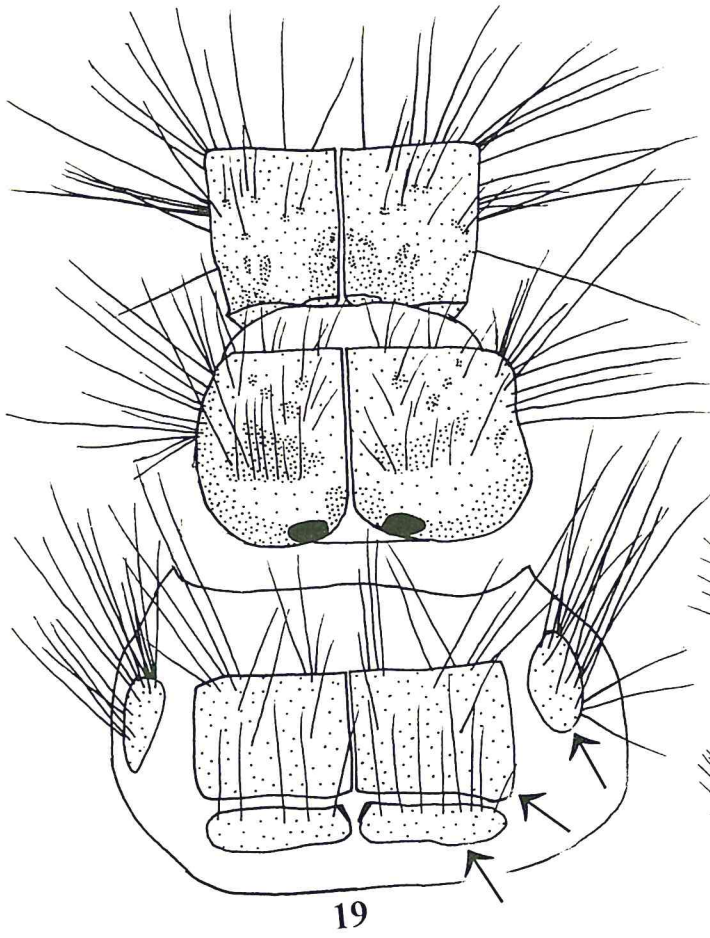
<i>Aphilorheithrus decoratus</i> Neboiss	Tas
<i>Aphilorheithrus luteolus</i> Neboiss	Tas
<i>Aphilorheithrus pauxillus</i> Neboiss	Tas
<i>Aphilorheithrus stepheni</i> Mosely	NSW, Vic, Tas

Unidentified larvae included in the key:

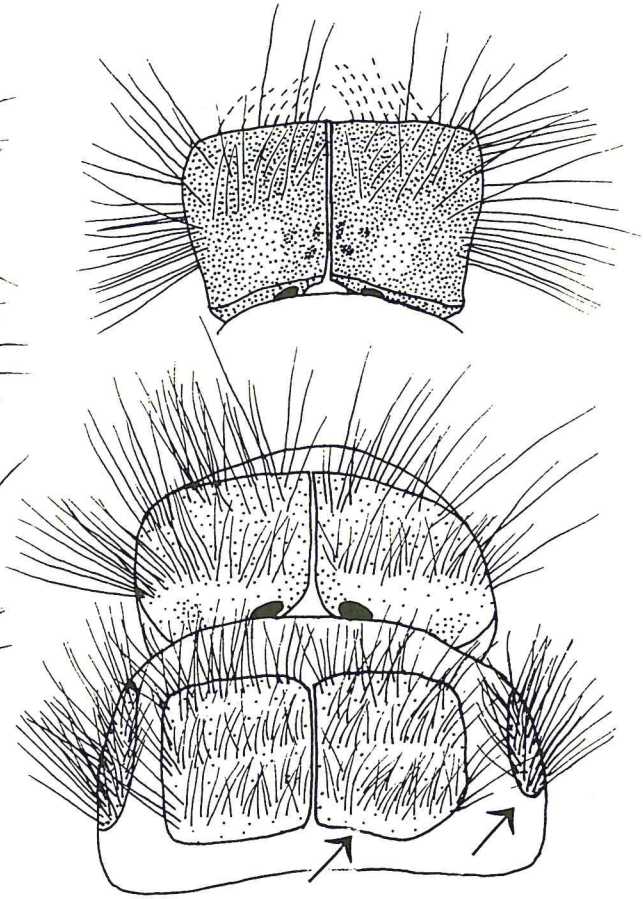
<i>Aphilorheithrus</i> sp AV 1	Tas
<i>Aphilorheithrus</i> sp AV 2	Tas
<i>Aphilorheithrus</i> sp AV 3	NSW, Vic, Tas
<i>Aphilorheithrus</i> sp AV 4	Vic
<i>Aphilorheithrus</i> sp AV 5	Tas
<i>Aphilorheithrus</i> sp AV 6	N Qld

Key to species for mature *Aphilorheithrus* larvae

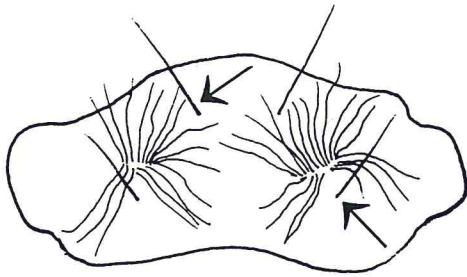
- 1 Metanotum with three pairs of sclerites (Fig 19) *Aphilorheithrus* sp AV 2
[Distribution: Tas]
- Metanotum with two pairs of sclerites (Fig 20) 2
- 2(1) Thoracic sclerites and coxae of all legs covered in extremely numerous setae
(Fig 20) 3
- Thoracic sclerites and coxae of all legs covered in extremely numerous setae,
not as in Fig 20 5
- 3(2) First abdominal segment with a pair of lateral setae and a pair of medial
setae (Fig 21) 4
- First abdominal segment ventrally with a pair of lateral setae and two clumps of
setae medially (Fig 22). *Aphilorheithrus* sp AV 4
[Distribution: Vic]



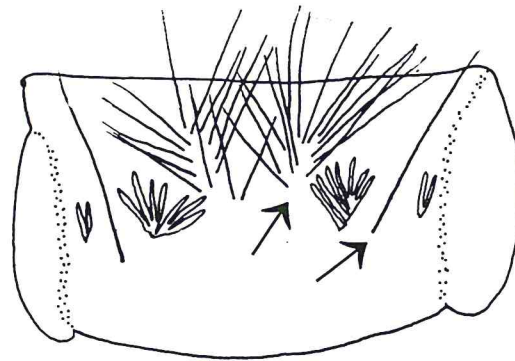
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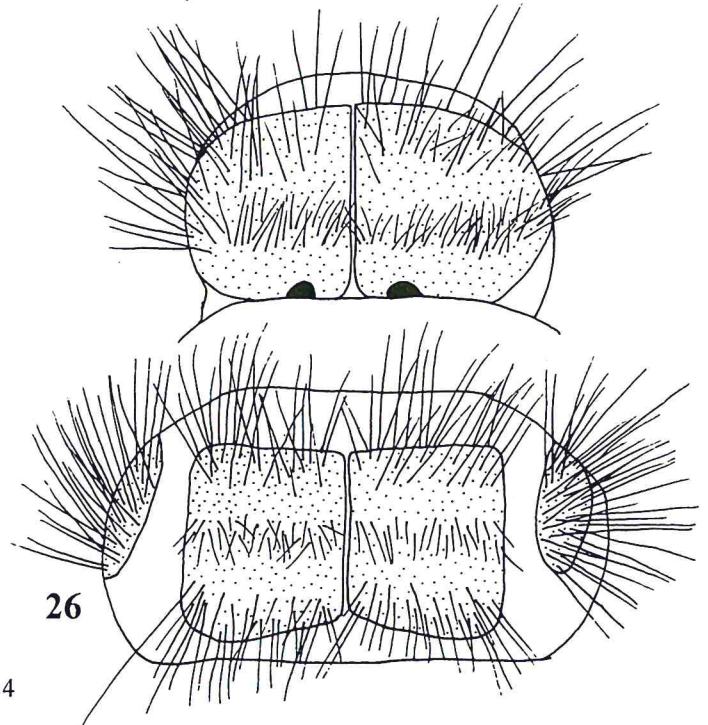
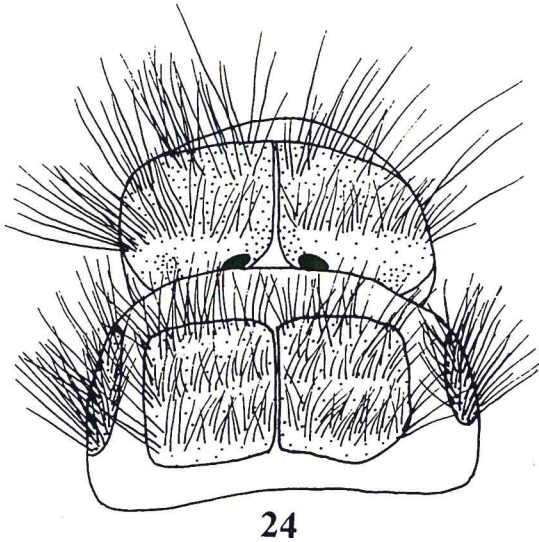
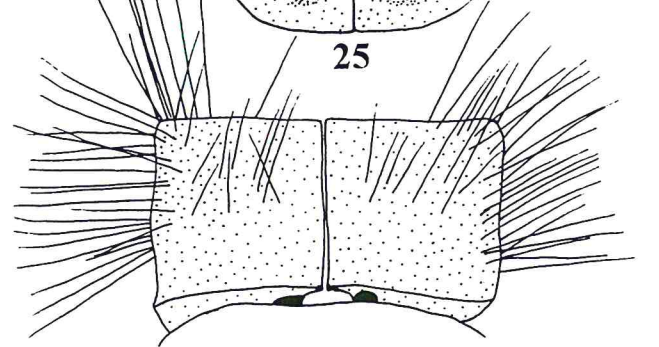
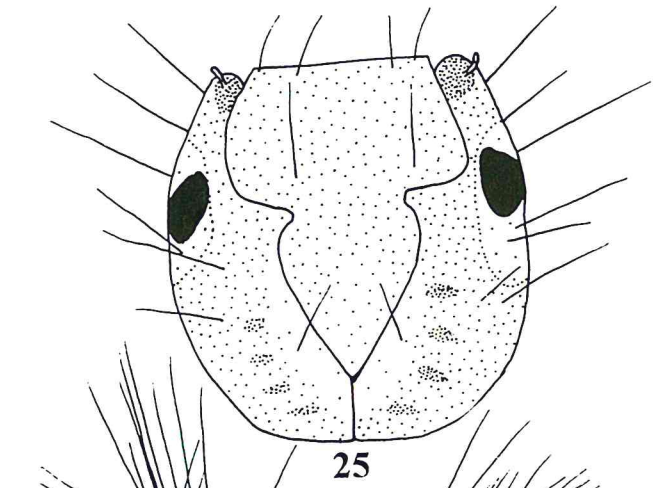
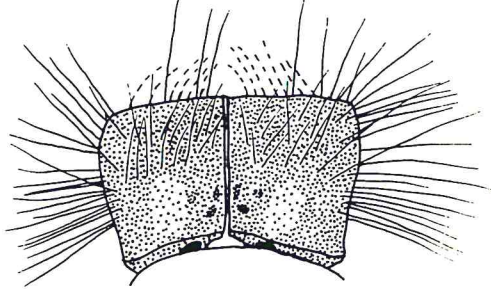
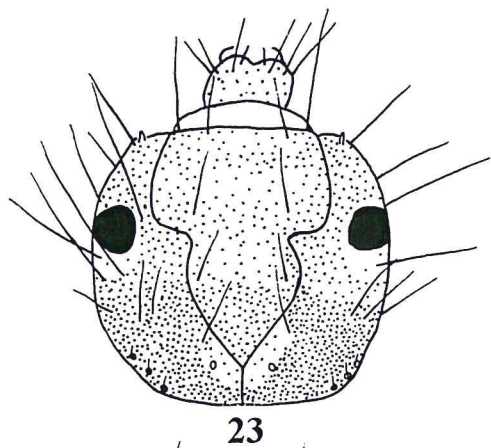


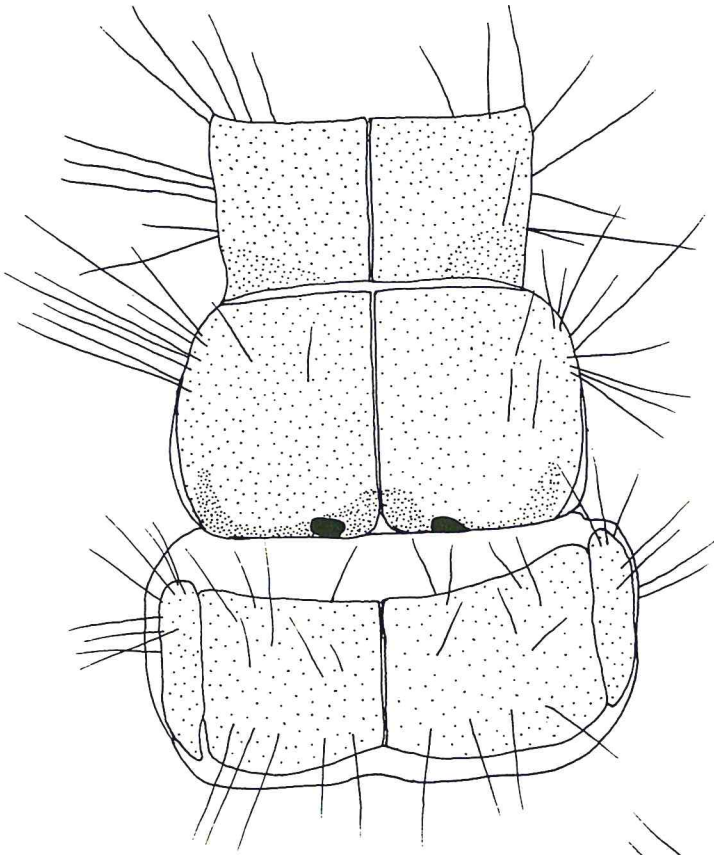
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Figures 19-22

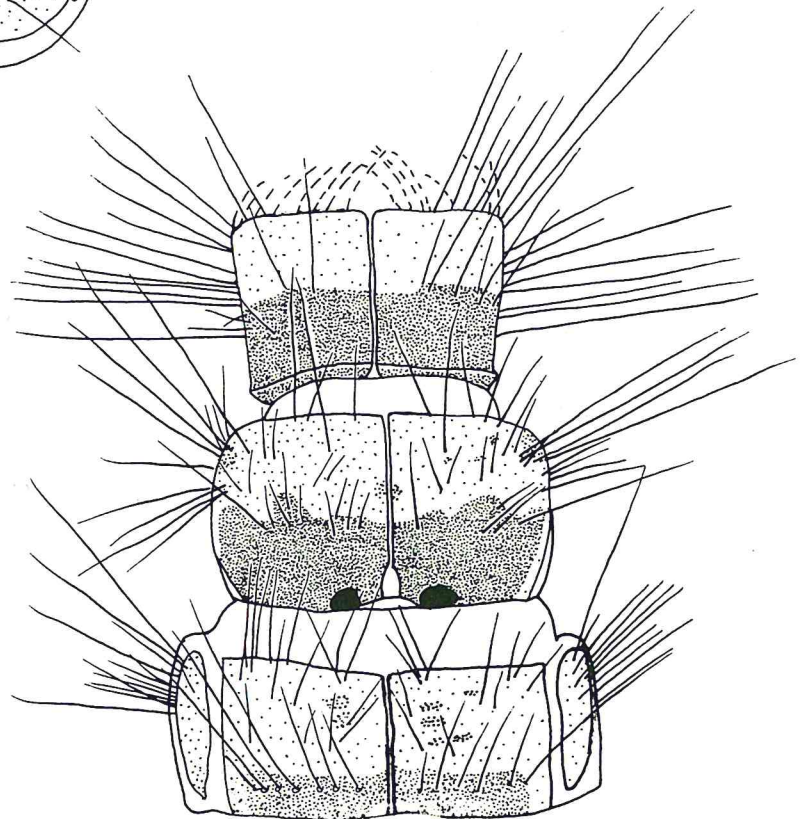
Aphilorheithrus sp. AV 2: 19, thorax, dorsal. *Aphilorheithrus* sp. AV 5: 20, thorax, dorsal. *Aphilorheithrus* sp. AV 3: 21, first abdominal segment, ventral. *Aphilorheithrus* sp. AV 4: 22, first abdominal segment, ventral.

- 4(3) Head and thorax predominantly dark (Figs 23 and 24) *Aphilorheithrus* sp AV 5
 [Distribution: Tas]
- Head and thorax predominantly pale with darker spots (Figs 25 and 26) ..
 *Aphilorheithrus* sp AV 1
 [Distribution: Tas]
- 5(2) Thorax with sparse setae (Fig 27) *Aphilorheithrus* sp AV 6
 [Distribution: N Qld]
- Thorax with more numerous setae (Fig 28) *Aphilorheithrus* sp AV 3
 [Distribution: NSW, Vic, Tas]





27



28

Figures 23-28

Aphilorheithrus sp. AV 5: 23, head, dorsal; 24, thorax, dorsal. *Aphilorheithrus* sp. AV 1: 25, head, dorsal; 26, thorax, dorsal. *Aphilorheithrus* sp. AV 6: 27, thorax, dorsal. *Aphilorheithrus* sp. AV 3: 28, thorax, dorsal.

Genus *Austrheithrus* Mosely

Diagnosis: Head slightly flattened dorsally with a short carina over each eye; ventral apotome either much shorter than or about 1/3 the length of the ventral suture; foreclaws very much shorter than the tarsus and mid claws very much shorter than the tibiatarso, mid claw either stout or narrow, hind claw either very short or about 1/4 the length of the tarsus; hind tibia with one spine distally; thoracic setae usually much shorter than the segment they are on, some very pale; metanotum with two pairs of sclerites, medial pair almost triangular; first abdominal segment ventrally with two pairs of setae, medial pair dark and about three times the thickness of lateral setae; lateral line not apparent; tergite 9 narrower than segment, without sclerites posterior to the tergite, with 6 long setae. Body length about 5 mm.

Case. Very broad anteriorly, strongly curved, constructed of small sand grains.

Taxonomy: No species can be distinguished reliably as larvae at this stage and so no key is provided to species. One species is figured here to show features of the genus (Figs 4, 29-35).

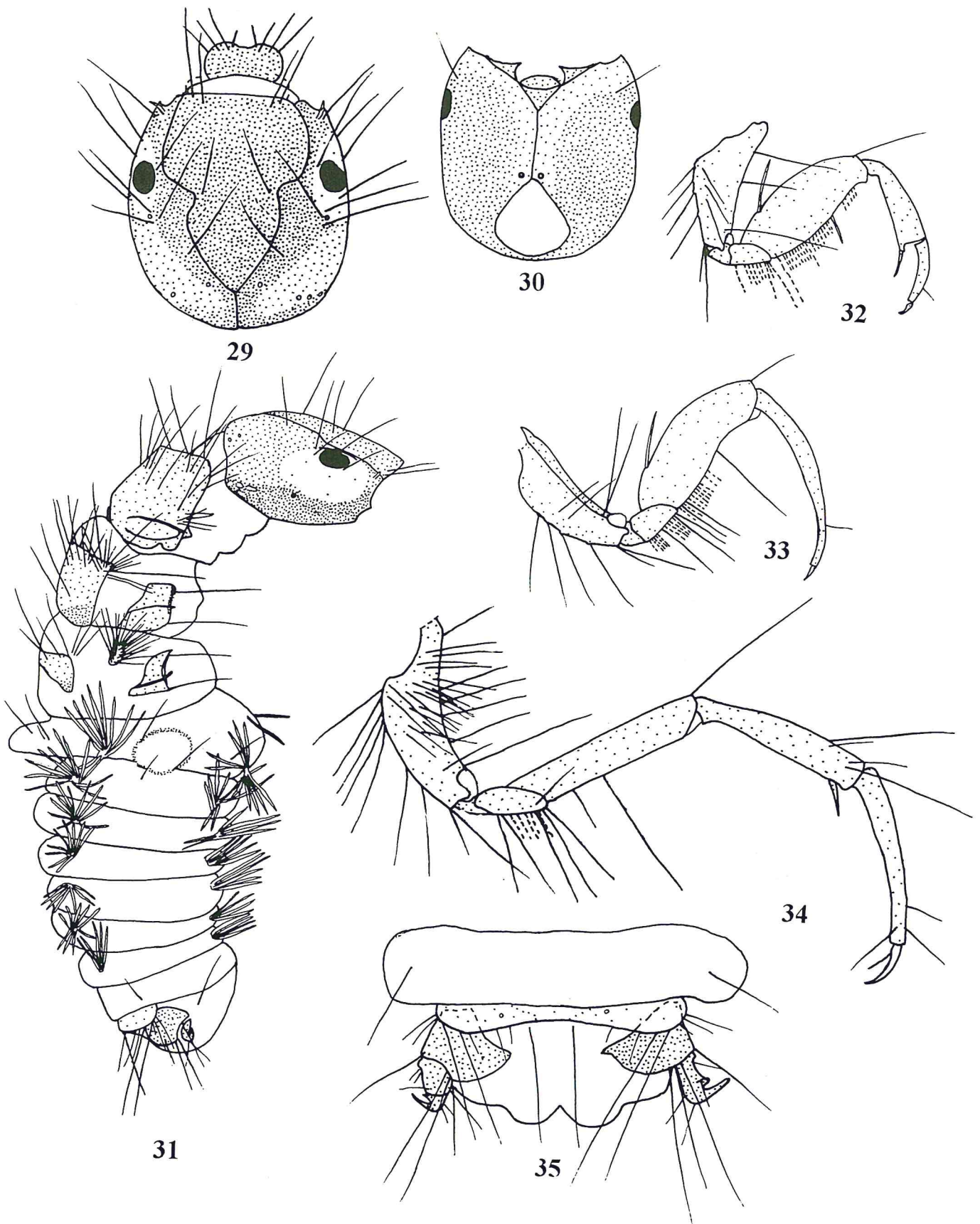
An undescribed species is known, found at a few sites in the Tasmanian World Heritage area (Neboiss *et al.* 1989).

Checklist of Australian species

* <i>Austrheithrus dubitans</i> Mosely	NSW, Vic
<i>Austrheithrus glymma</i> Neboiss	Vic?, Tas
<i>Austrheithrus ronewa</i> Mosely	NSW, Vic, Tas

* larvae associated with adults

Comments: *A. glymma* may occur in Victoria as a pupa from the Otways with the distinctive antennae of this species is in the Museum of Victoria collection.



Figures 29-35
Austrheithrus sp.: 29, head, dorsal; 30, head, ventral; 31, body, lateral; 32, foreleg; 33, mid leg; 34, hind leg; 35, last abdominal segment and anal claws, dorsal.

Genus *Kosrheithrus* Mosely

Diagnosis: Head rounded, slightly longer than wide, with a short carina over each eye; ventral apotome half to 1/3 the length of the ventral suture; foreclaw either about half the length of the tarsus or much shorter than the tarsus, mid claw much shorter than the tibia-tarsus, either stout or narrow, hind claw about 1/3 the length of the tarsus; hind tibia with two spines distally; thoracic setae usually much shorter than the length of the segment they are on; metanotum with two two pairs of sclerites; first abdominal segment ventrally with two pairs of setae, medial pair dark and at least two times the thickness of lateral setae; lateral line short but apparent; tergite 9 as wide as sclerite, moderately sclerotised, without sclerites posterior to tergite, with a sparse fringe of long setae. Body length about 20 mm.

Case. Large tapering tubular, made of sand grains, only slightly curved, if at all.

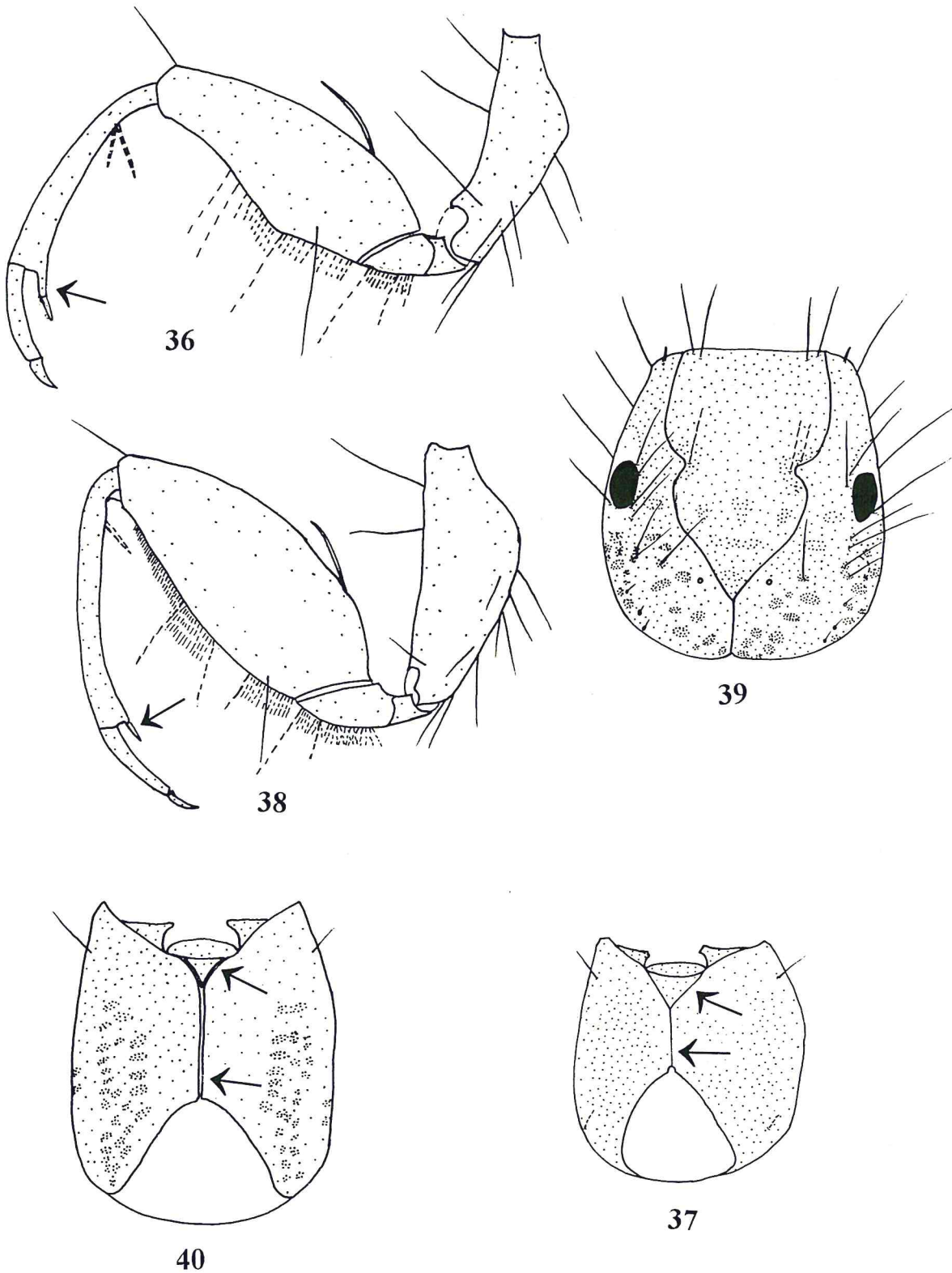
Taxonomy: An undescribed Tasmanian species has been recorded from two sites one kilometre apart in the World Heritage Area (Neboiss *et al.* 1989).

The larvae of the Tasmanian and Victorian specimens look very similar although very few Tasmanian specimens are available for comparison. Colour pattern is very similar and variable for both eastern species. A Tasmanian specimen is figured here (Figs 5, 36, 39, 40). The few Western Australian specimens differ from those from eastern Australia in the smaller size of the ventral apotome compared with the ventral suture (Fig 37) and in the spine and extension of the tibia bearing it, on the foreleg (Fig 38). Due to the possible presence of other species and the similarity of the eastern species, it is probably best to identify specimens to genus only at this stage.

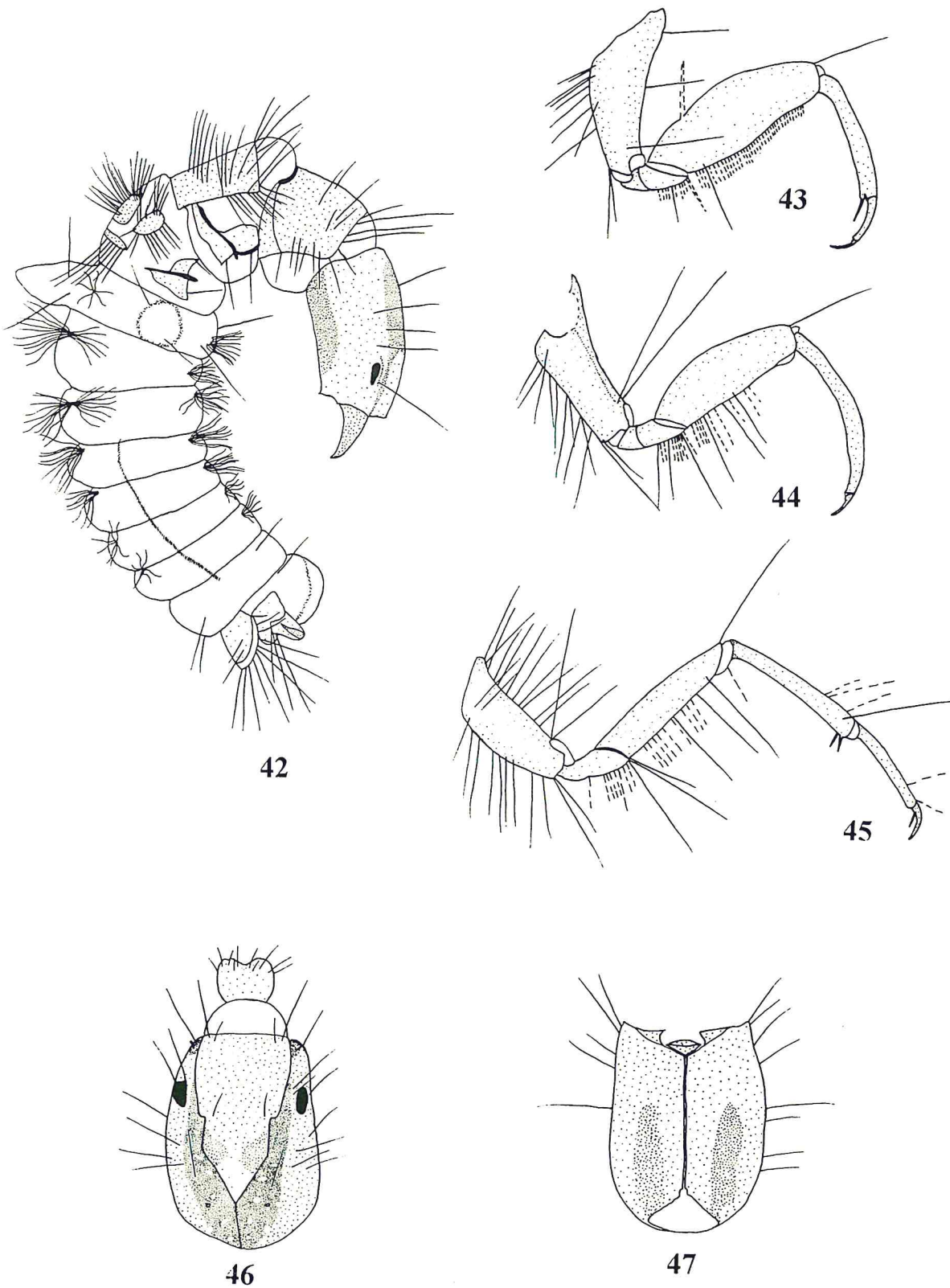
Checklist of Australian species

<i>Kosrheithrus boorarus</i>	Neboiss	WA
<i>Kosrheithrus remulus</i>	Neboiss	Tas
* <i>Kosrheithrus tillyardi</i>	Mosely	NSW, Vic

* larvae associated with adults



Figures 36-40
Kosrheithrus sp. (Tas): 36, foreleg. *Kosrheithrus* sp. (WA): 37, head, ventral; 38, foreleg. *Kosrheithrus* sp. (Tas): 39, head, dorsal; 40, head, ventral.



Figures 41-47

"Philorheithrus" sp AV 1: 41, last abdominal segment and anal claws, dorsal; 42, body, lateral; 43, foreleg; 44, mid leg; 45, hind leg; 46, head, dorsal; 47, head, ventral.

Genus *Ramiheithrus* Neboiss

No larvae have been associated with adults belonging to this genus so no key is provided. Larvae may have been included under other genera.

Checklist of Australian species

<i>Ramiheithrus kocinus</i> Neboiss	Tas
<i>Ramiheithrus virgatus</i> Neboiss	NSW, Vic

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Page

Genus *Tasmanthrus* Mosely

Diagnosis: Head flattened dorsally with strong carina over each eye on the lateral margin of the head; frontoclypeus wider anteriorly; ventral apotome much shorter than ventral suture; fore claw about 1/2 the length of the tarsus, mid claw very much shorter than tibia-tarsus, hind claw about 1/3 the length of the tarsus; hind tibia with two spines distally; thoracic setae usually much shorter than the segment they are on; metanotum with three pairs sclerites, anterior medial pair roughly rectangular; first abdominal segment ventrally with two pairs of setae, medial pair about the same thickness as other setae; lateral line short but apparent; tergite 9 moderately sclerotised, as wide as segment with about 12 long setae, no sclerites posterior to tergite. Body length about 10 mm.

Case. Tubular, slightly curved, made of sand grains.

Taxonomy: This genus has only been recorded from Tasmania to date. Originally two species were described, *Tasmanthrus angustipennis* and *T. galbinomaculatus*. Neboiss (1977) recognised only *T. angustipennis* and most records since that date refer to just this species, however, Dean and Cartwright (1992) consider these are two species. Neboiss *et al.* (1989) listed an undescribed species from one site in the World Heritage area. Thus three species are recognised.

Larvae of the two described species have been associated and both species are common and widespread in Tasmania. The larvae of the third species is unknown. *Tasmanthrus galbinomaculatus* is figured in full in Figures A to H on pages 2 and 3.

Biology: Larvae of both known species are usually found in flowing waters but also occur in lakes. They can occur in very large numbers which is unusual for Philorheithridae and predators in general.

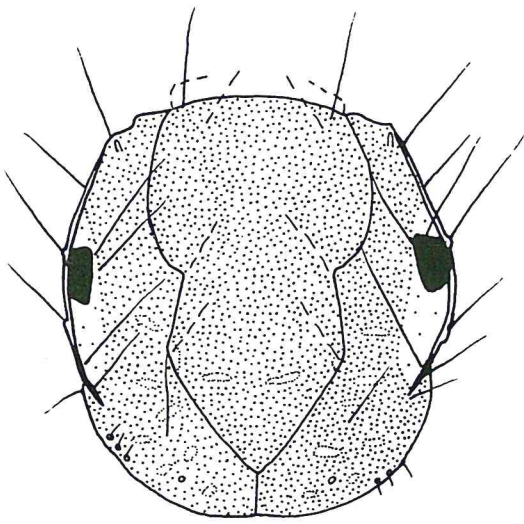
Checklist of Australian species

- * *Tasmanthrus angustipennis* Mosely Tas
- * *Tasmanthrus galbinomaculatus* Jacquemart Tas
- * larvae associated with adults

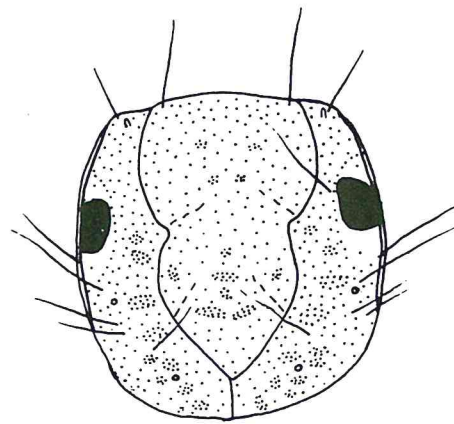
Key to mature larvae of known *Tasmanthrus* species

- 1 Head with spots paler than head colour (Fig 48)
..... *Tasmanthrus galbinomaculatus*
- Head with spots darker than head colour (Fig 49)
..... *Tasmanthrus angustipennis*

The key indicates the similarity between the two species as they only vary in colour. The character is also influenced by moult stage. As with the adults, the species are extremely similar and it is difficult to be sure if they are distinct species.



48



49

Figures 48-49

Tasmanthrus galbinomaculatus: 48, head, dorsal. *Tasmanthrus angustipennis*: 49, head dorsal.

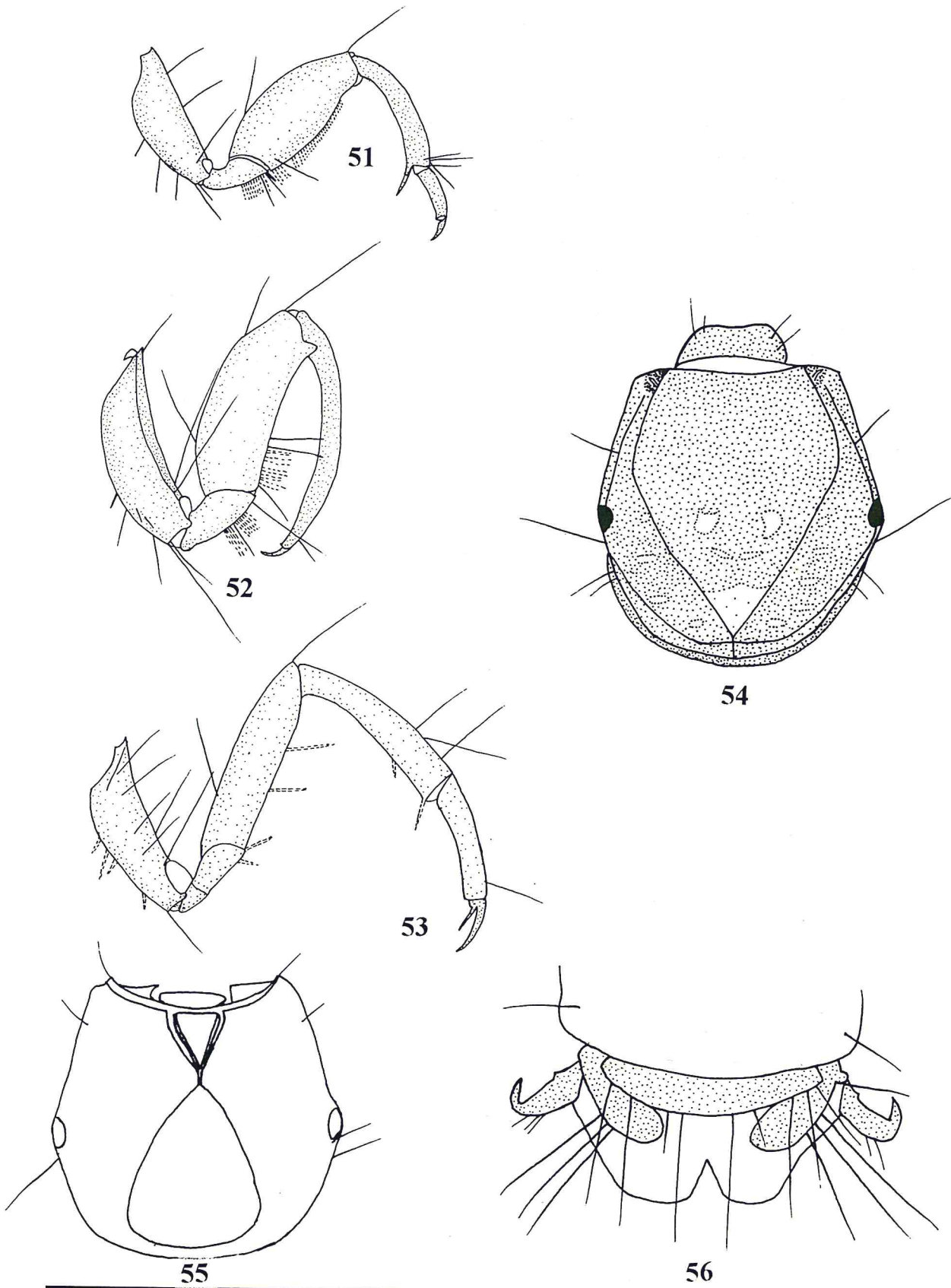
Genus *Philor* A

Diagnosis: Head very flattened dorsally with very strong carina over each eye; frontoclypeus covering most of head; ventral apotome much longer than ventral suture; fore- and mid claw very much shorter than the tarsus, hind claw about 1/4 the length of the tarsus; hind tibia with 1 spine distally; thoracic setae usually shorter than the length of the segment they are on; metanotum with three pairs of sclerites, anterior medial pair almost triangular; first abdominal segment ventrally with two pairs of setae, median pair wide apart and stout, about three times the thickness of lateral setae; lateral line not apparent; tergite 9 not as wide as segment and without sclerites posterior to tergite, with 6 long setae. Body length about 5 mm.

Case. Made of small sand grains, very broad anteriorly, strongly curved.

Taxonomy: Only one species (Figs 3, 50 to 56) is known for this genus from northern NSW. It does not fit well into existing genera and has not been associated with an adult.





Figures 50-56

Genus *Philor* A: 50, body, lateral; 51, foreleg; 52, mid leg; 53, hind leg; 54, head, dorsal; 55, head, ventral; 56, last abdominal segment and anal claws, dorsal.

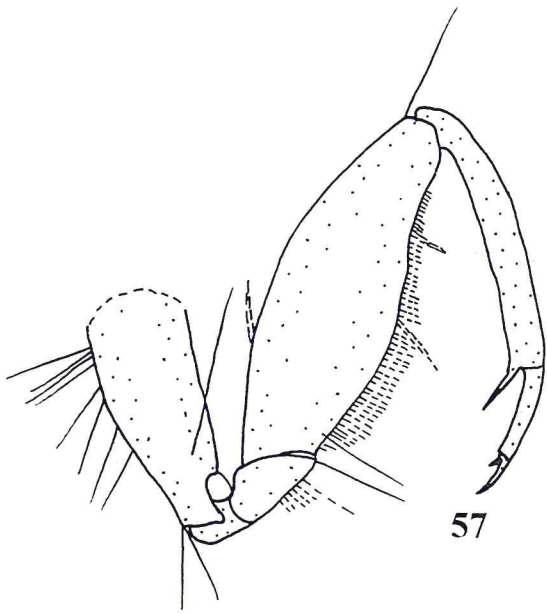
Genus *Philor* B

Diagnosis: Head elongate with short carinae restricted to area over eyes; frontoclypeus slightly wider anteriorly; ventral apotome very much shorter than ventral suture; fore- and mid claws much shorter than the tarsus, hind claw about 1/3 the length of the tarsus; hind tibia with two spines distally; thoracic setae usually shorter than the length of the segment they are on; metanotum with two pairs of sclerites; first abdominal segment ventrally with two pairs of setae of similar thickness; lateral line short but apparent; tergite 9 strongly developed, with 9 sclerites posterior to tergite, with a fringe of setae.

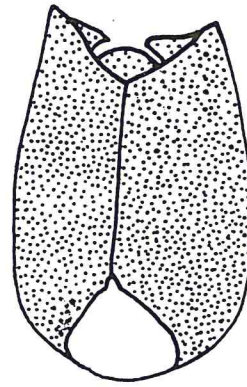
Body length about 10 mm.

Case. Tapering tubular, made of sand grains.

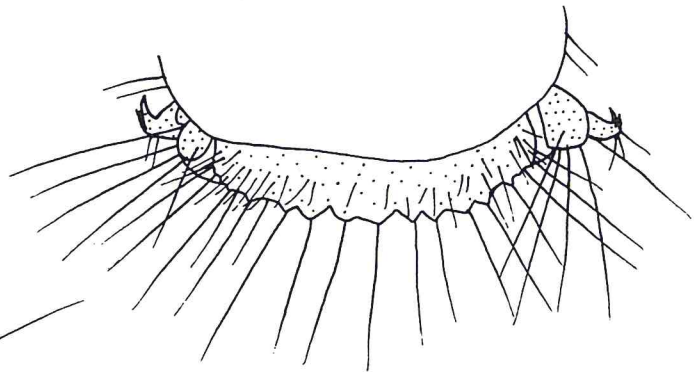
Taxonomy: Only one species is known from this north Queensland genus at present. This species has been associated with the as yet undescribed adult species referred to as Gen. Nov. (PT-1837) in Walker *et al* (1993) and is shown in Figs 9, 11, 15, 57-61.



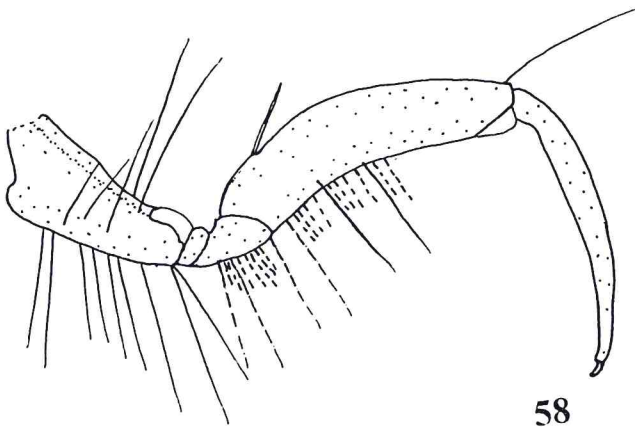
57



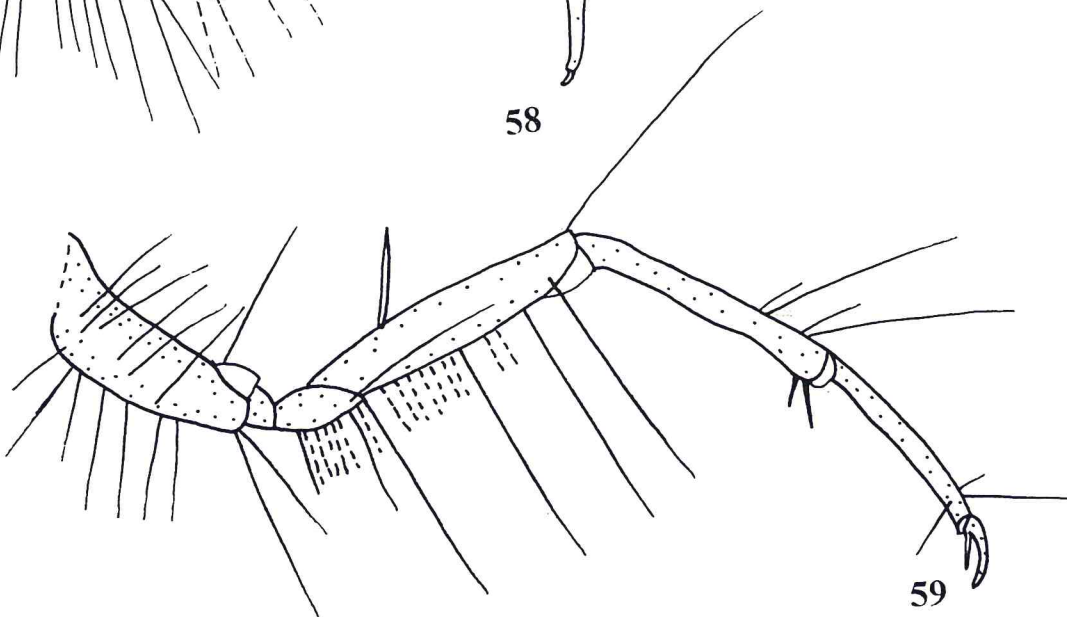
60



61



58



59

Figures 57-61

Genus *Philor* B: 57, foreleg; 58, mid leg; 59, hind leg; 60, head, ventral; 61, tergite 9 and anal claws, dorsal.

Family Calamoceratidae

INTRODUCTION

Calamoceratidae is a family of few species in Australia. Larvae are found throughout the country, except southern Western Australia and central Australia. The greatest number of species are found in the north, particularly Queensland.

Although little work has been done on this family in Australia, it seems adequate. It is unlikely many more species will be found.

The larvae of this family are readily recognised by the distinctive flat case made of only two strong pieces of old leaf (Fig 62). The larvae are also readily recognised by the very flat body with a long dense lateral fringe of setae and by the elongate corners of the pronotum.

BIOLOGY

In Queensland, calamoceratid larvae are found in cool streams at high altitudes in both riffle and slow flow areas or in backwater areas of large, warm lowland rivers or lakes. In most other states they are more a feature of warm lowland streams and lakes. The larvae are usually found associated with their main food, coarse particulate detritus. They tend to occur in still areas of slowly flowing rivers where the detritus accumulates.

The life history of *Anisocentropus kirramus* was studied by Nolan and Pearson (1992) who found this species had almost continuous emergence and development as is typical of many species in the tropics. Nolan and Pearson (1993) studied the affects of this species on breakdown of leaf detritus.

MORPHOLOGY

Within the genus, the larvae are extremely uniform. One specimen is figured here to show the distinctive features of the genus *Anisocentropus*.

TAXONOMY

The family Calamoceratidae is represented in Australia by one genus, *Anisocentropus*. Neboiss (1980) revised the genus in Australia, recognising 10 species. At this stage no reliable characters have been found to distinguish the larvae of any species. Two main larval types are apparent but variation is continuous between them.

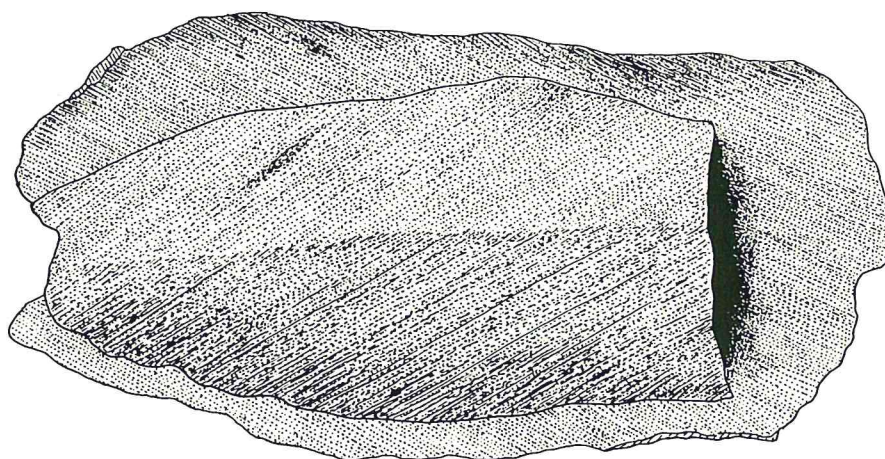
Checklist of Australian species

<i>Anisocentropus banghaasi</i> Ulmer	NT, N Qld
<i>Anisocentropus bicoloratus</i> (Martynov)	S Qld, NSW, Vic
<i>Anisocentropus corvinus</i> Neboiss	N WA
<i>Anisocentropus eungellus</i> Neboiss	Central Qld
<i>Anisocentropus kirramus</i> Neboiss	N Qld
* <i>Anisocentropus latifascia</i> (Walker)	S Qld, NSW, Vic, SA, Tas
<i>Anisocentropus muricatus</i> Neboiss	N WA, NT
<i>Anisocentropus semiflavus</i> Banks	N Qld
<i>Anisocentropus torulus</i> Neboiss	N Qld
<i>Anisocentropus valgus</i> Neboiss	NSW, Vic

* Associated larvae known

Family diagnosis: Final instar larvae about 8-12 mm long. Pronotum with long rounded projections at the anterolateral corners; mesonotum moderately sclerotised and usually with a dark inverted "V" of stronger sclerotisation; metanotum with three pairs of very small sclerites each with long setae; metasternum without setae. Hind legs very long, at least twice the length of the forelegs. Abdomen flattened, with divided gills and with a strong lateral fringe of setae.

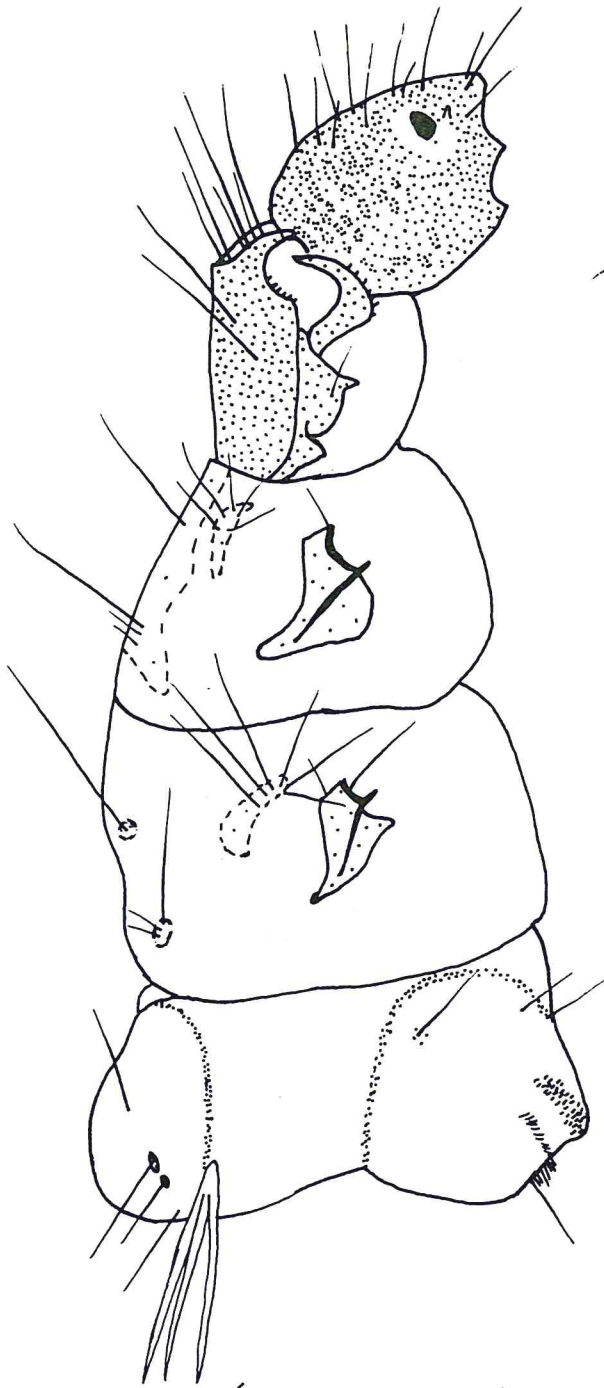
Case: Flat, made of only two pieces of leaf material.



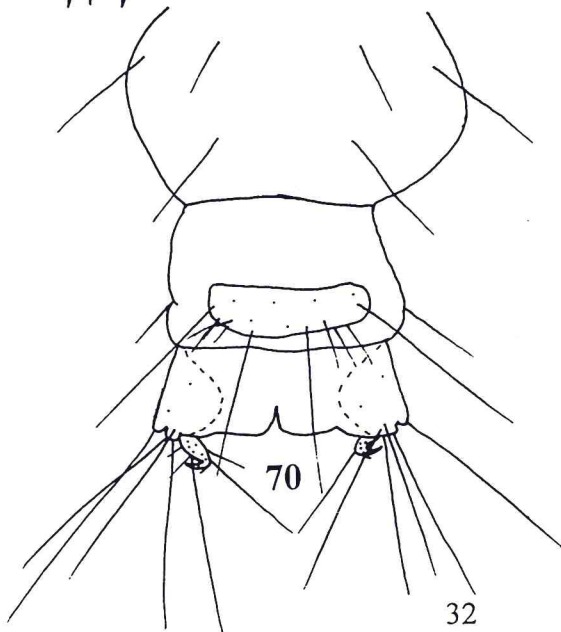
62

Figure 62

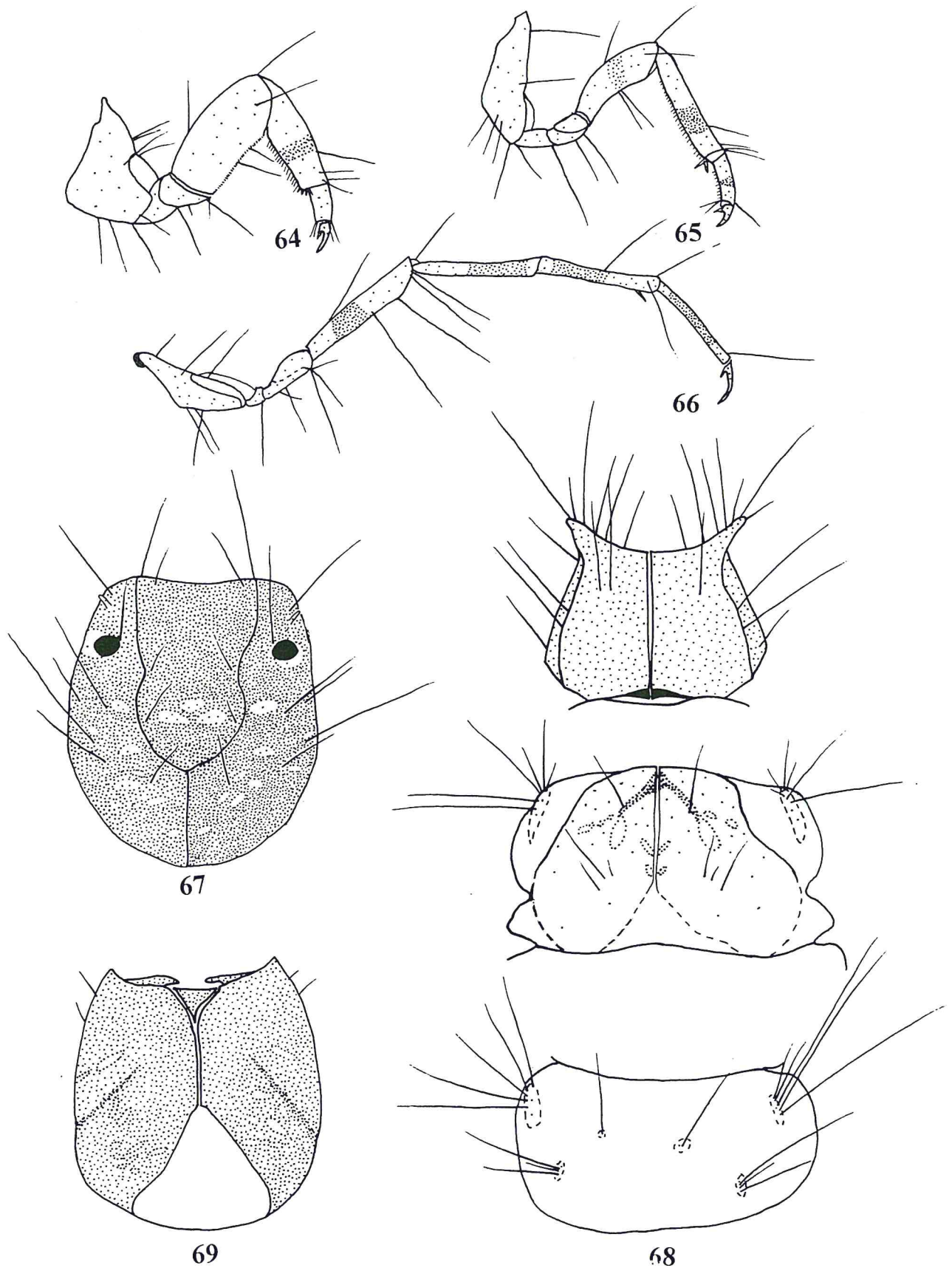
Anisocentropus sp.: 62, case, ventral.



63



70



Figures 63-70
Anisocentropus sp.: 63, body, lateral; 64, foreleg; 65, mid leg; 66, hind leg; 67, head, dorsal; 68, thorax, dorsal; 69, head, ventral; 70, eighth and ninth abdominal segments, dorsal.

Family Helicopsychidae

INTRODUCTION

This family is found worldwide. Adults of the only Australian genus were revised recently and 14 species are currently recognised (Johanson, 1995). The species occur along the northern and eastern seaboard, from northern Western Australia to Tasmania. Three species range from north Queensland to Victoria while eight species have very restricted ranges.

The highly distinctive case (Fig 71) is helical and no more than about 6 mm in diameter. The larvae are not found out of the case and are extremely difficult to remove from it in one piece. It is recommended that the case should be gently broken away from the larvae until the head and thorax are exposed. This is sufficient for identification of larvae.

BIOLOGY

Larvae are typical of cool flowing streams but some species are found in warmer waters. They are usually found on stones where they graze on algae.

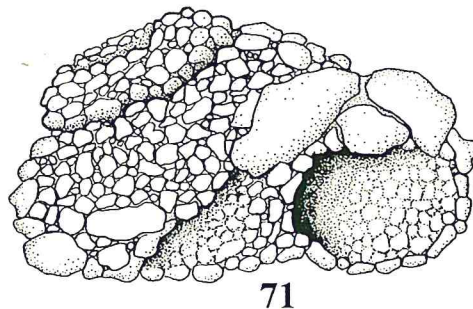
MORPHOLOGY

Helicopsychidae larvae are unique in Australia in having a helical shaped body. Only features of the head and pronotum were found to be useful in identification and so only these are figured in this work. Terminology follows that shown in figures A to I on pages 2-3.

TAXONOMY

Of the 14 Australian species, larvae of eight species have been associated, usually by identifying the male genitalia of mature pupae found associated with the larvae. Few additional species are likely to be found.

The case is usually distinctive of the species but can vary at times so is not used as a character. Careful observation of the case may aid in identification.



71

Figure 71
Helicopsyche sp: 71, case, ventral.

Checklist of Australian species

<i>Helicopsyche albidela</i> Johanson	N WA
<i>Helicopsyche alicae</i> Johanson	N WA, NT
* <i>Helicopsyche bartona</i> Mosely	Tas
<i>Helicopsyche bellangrensis</i> Johanson	NSW
<i>Helicopsyche braueri</i> Johanson	NSW
* <i>Helicopsyche cochleaetesta</i> Korboot	Qld, NSW, Vic
* <i>Helicopsyche curva</i> Johanson	N Qld
* <i>Helicopsyche heacota</i> Mosely	Qld, NSW, Vic
<i>Helicopsyche kakadu</i> Johanson	NT
* <i>Helicopsyche neboissi</i> Johanson	N Qld
* <i>Helicopsyche murrumba</i> Mosely	S Qld, NSW, Vic, Tas
* <i>Helicopsyche ptychopteryx</i> (Brauer)	S Qld, NSW, Vic
* <i>Helicopsyche tillyardi</i> Mosely	Qld, NSW, Vic
<i>Helicopsyche tribulationa</i> Johanson	N Qld

* Associated larvae known

Unidentified larvae included in the key

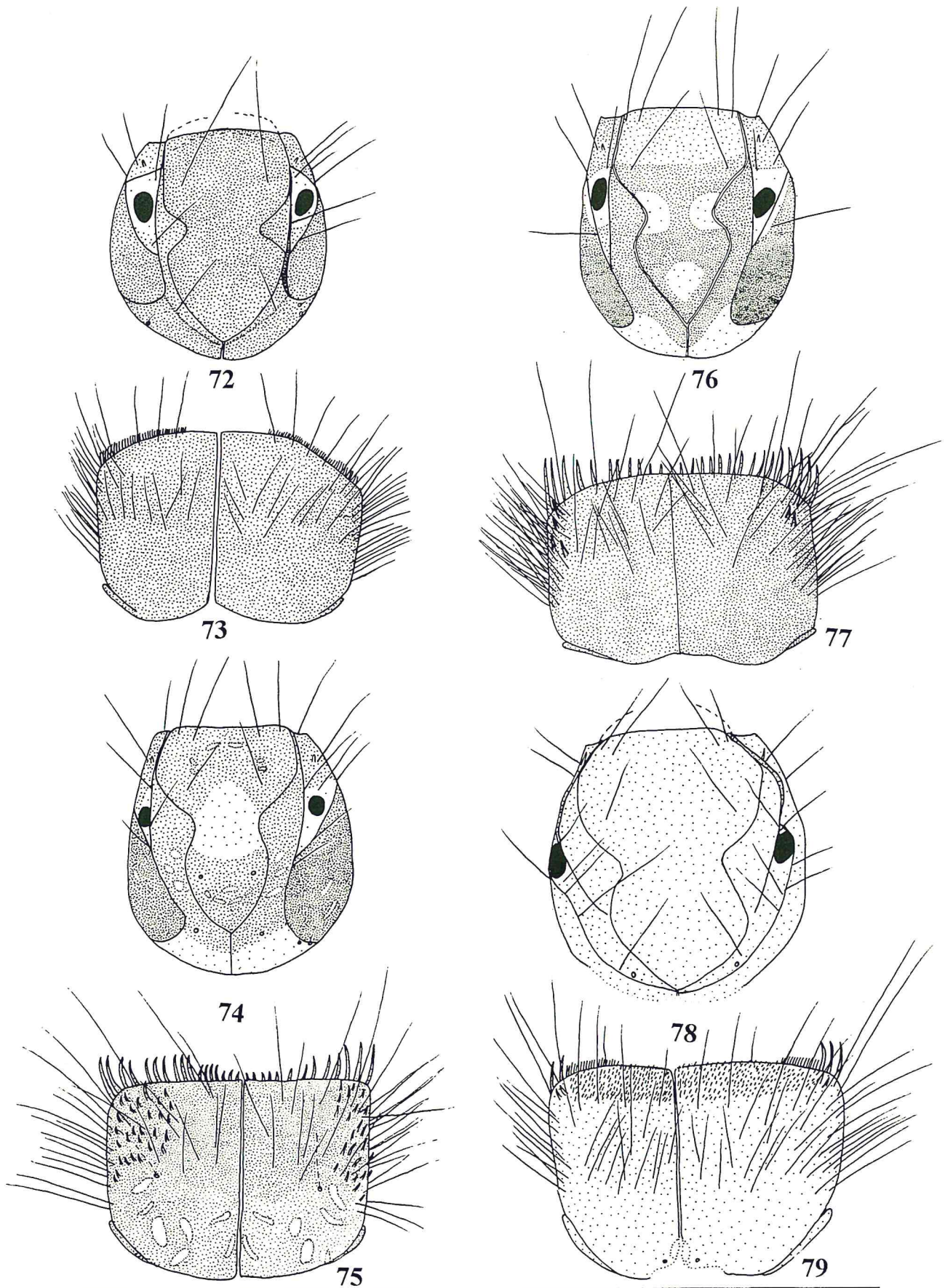
<i>Helicopsyche</i> sp AV 1	Vic
<i>Helicopsyche</i> sp AV 5	N WA, NT
<i>Helicopsyche</i> sp AV 12	Vic

Diagnosis: Larvae small, about 10 mm long. Head usually flattened dorsally to some degree and with carinae. Antennae minute, positioned near the front margin of the head capsule. Ventral apotome very difficult to discern due to the very light sclerotisation on the head ventrally. Pronotum heavily sclerotised and bearing long setae and short spines. Metanotum usually very pale so the shape of the sclerites is difficult to discern, usually three main sclerites and a very small fourth one medially, posteriorly. Legs short, hind leg about one and a half times the length of the foreleg. Coxae often lightly sclerotised. Gills usually absent but multi-filament gills present on first abdominal segment. Lateral line absent. Anal claw with a comb of small teeth.

Case: Helical, made of sand grains.

Key to mature larvae of Australian *Helicopsyche* species

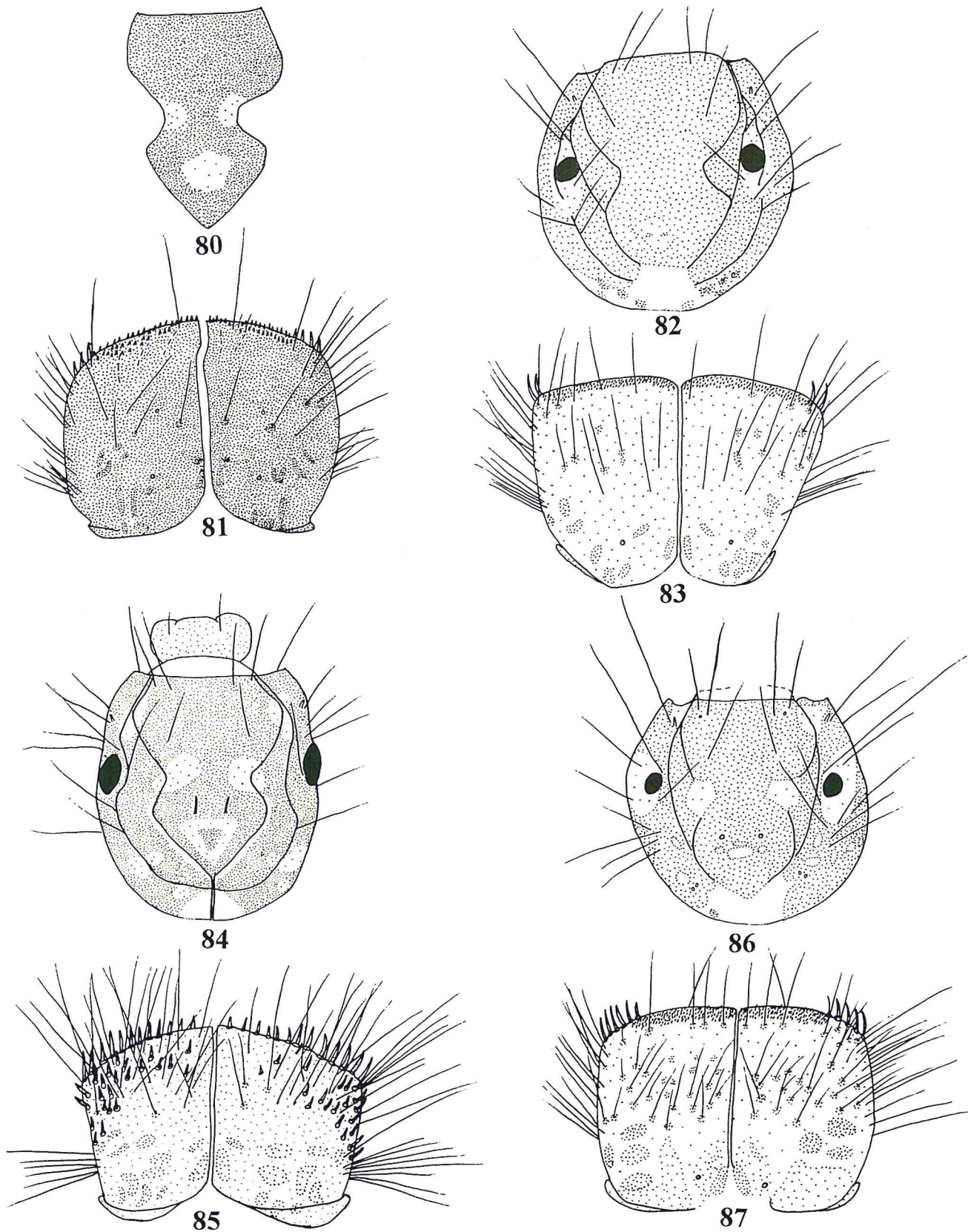
- 1 Head with a large depression on each side posteriorly (Fig 72) 2
- Head smoothly rounded, without a depression as shown in Fig 72 4
- 2(1) Head uniform in colour (Fig 72); pronotum with a row of fine spines on
anterior margin only (Fig 73) *Helicopsyche heacota*
[Distribution: Qld, NSW, Vic]
- Head dark with contrasting pale areas (Figs 74, 76); pronotum with fewer,
thicker spines on anterior margin and at least a few spines on sclerite
(Figs 75, 77) 3
- 3(2) Frontoclypeus with a pale band between constrictions, no pale area posterior to
constriction (Fig 74); pronotum with many spines on sclerite (Fig 75)
..... *Helicopsyche cochleaetesta*
[Distribution: Qld, NSW, E Vic]
- Frontoclypeus with a pale area at each constriction and a pale triangle posterior
to constrictions (Fig 76); pronotum with few spines on sclerite (Fig 77)
..... *Helicopsyche curva*
[Distribution: N Qld]
- 4(1) Lateral carinae on head very strong anteriorly and reaching lateral margin of
head anteriorly (Figs 78); pronotum with small spines present on anterior
margin and in a band adjacent to anterior margin (Fig 79)
..... *Helicopsyche murrumba*
[Distribution: S Qld, NSW, Vic, Tas]
- Lateral carinae less well developed and not reaching the lateral margin of the
head; pronotum with a different combination of spines 5



Figures 72-79

Helicopsyche heacota: 72, head, dorsal; 73, pronotum, dorsal. *Helicopsyche cochleaetesta*: 74, head, dorsal; 75, pronotum, dorsal. *Helicopsyche curva*: 76, head, dorsal; 77, pronotum, dorsal. *Helicopsyche murrumba*: 78, head, dorsal; 79, pronotum, dorsal.

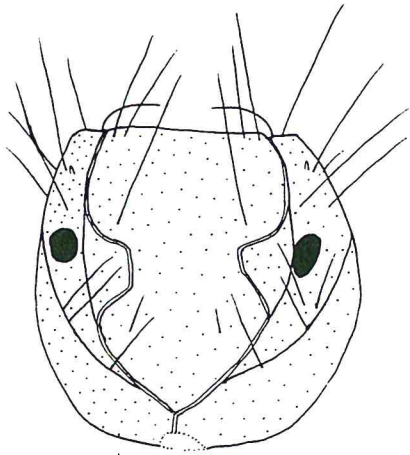
- 5(4) Head with some pale areas dorsally, with or without pale areas at posterior margin of head; head and pronotum brown 6
- Head without pale areas, but may have one pale area at back of head at posterior margin; head and pronotum yellow or yellow/brown. 9
- 6(5) Pale area absent on posterior margin of head; pale triangular area present posteriorly on frontoclypeus (Fig 80); spines present on pronotum in a band adjacent to anterior margin (Fig 81) *Helicopsyche ptychopteryx*
[Distribution: S Qld, NSW, E Vic]
- Pale area present at posterior margin of head, often reaching frontoclypeus (Figs 82, 84, 86); spines other than in Fig 81 7
- 7(6) Pale area not present on frontoclypeus at constriction (Figs 82)
..... *Helicopsyche sp*
[Distribution: WA]
- Pale areas present on frontoclypeus at constriction (Figs 84, 86) 8
- 8(7) Spines present on anterior third of pronotum (Fig 85) .. *Helicopsyche sp AV 5*
[Distribution: WA, NT]
- Spines in a band adjacent to anterior margin (Fig 87) .. *Helicopsyche sp AV 12*
[Distribution: Vic]



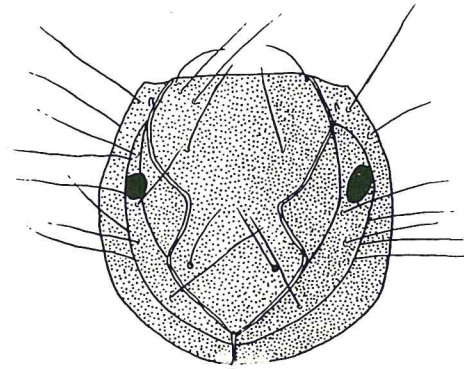
Figures 80-87

Helicopsyche ptychopteryx: **80**, frontoclypeus; **81**, pronotum, dorsal. *Helicopsyche* sp: **82**, head, dorsal; **83**, pronotum, dorsal.: *Helicopsyche* sp AV 5: **84**, head, dorsal; **85**, pronotum, dorsal. *Helicopsyche* sp AV 12: **86**, head, dorsal; **87**, pronotum, dorsal.

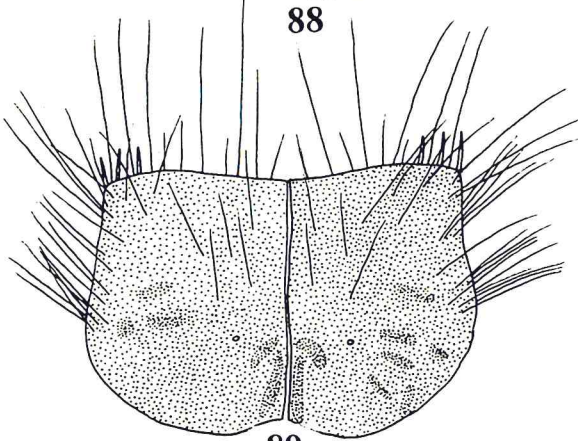
- 9(5) Occurs at the tip of Cape York Peninsula (Figs 88, 89) . *Helicopsyche nevoissi*
 [Distribution: N Qld]
- Does not occur at the tip of Cape York Peninsula 10
- 10(9) Tasmania; pronotum with a broad band of spines near anterior margin (Fig 91)
 *Helicopsyche bartona*
 [Distribution: Tas]
- Mainland Australia 11
- 11(10) Frontoclypeus with strong constriction (Fig 92); head and pronotum red-
 brown; pronotum with spines in a broad band along anterior margin (Fig 93)
 *Helicopsyche sp AV 1*
 [Distribution: Vic]
- Frontoclypeus with a comparatively shallow constriction (Fig 94); head and
 pronotum pale yellow brown, sometimes with darker spots or patches;
 pronotum with spines on anterior margin only (Fig 95) . *Helicopsyche tillyardi*
 [Distribution: Qld, NSW, Vic]



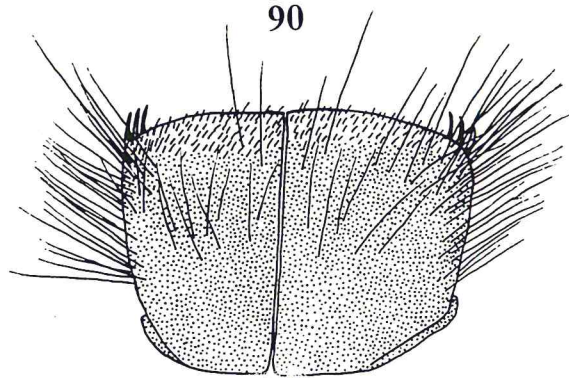
88



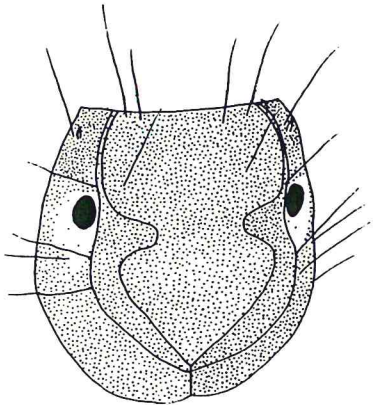
90



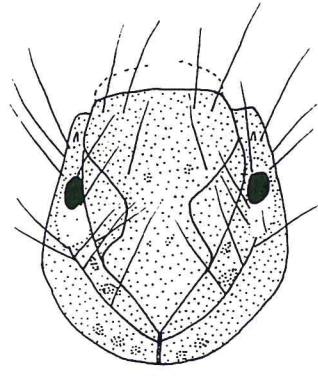
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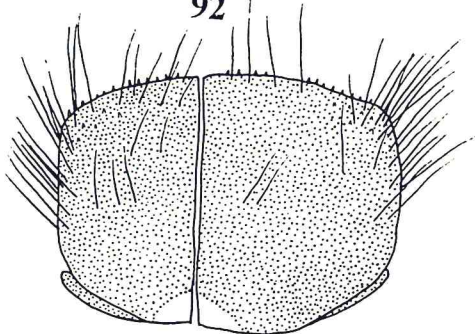
91



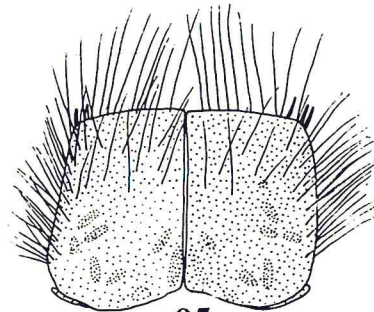
92



94



93



95

Figures 88-95

Helicopsyche nevoissi: 88, head dorsal; 89, pronotum, dorsal. *Helicopsyche bartona*: 90, head, dorsal; 91, pronotum, dorsal. *Helicopsyche* sp AV 1: 92, head, dorsal; 93, pronotum, dorsal. *Helicopsyche tillyardi*: 94, head, dorsal; 95, pronotum, dorsal.

Acknowledgments

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