

Plecoptera, Ephemeroptera and Trichoptera of the Pelion Valley, Tasmanian World Heritage Area

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Abstract. Dean, J.C. and Cartwright, D.I. 1992. Plecoptera, Ephemeroptera and Trichoptera of the Pelion Valley, Tasmanian World Heritage Area. *Occasional Papers from the Museum of Victoria* 5: 73-79.

A survey of the Pelion Valley yielded eighty species of aquatic insects, consisting of seventeen species of stoneflies, thirteen species of mayflies and fifty species of caddisflies. Most species featured orderly distribution patterns along the river continuum, and several examples of spatial separation of congeners are reported. There was an obvious trend of increasing species richness as one moved from small headwater streams to larger downstream sites. The Lake Ayr outlet stream was unique in yielding a number of species which are widely distributed at lower altitudes, and their presence in the study area can probably be attributed to benign physical conditions at that site. There was no evidence of endemism among the aquatic insects we collected. With a single exception, there are extensive records from elsewhere in Tasmania of all the species we have identified. The exception is the stonefly *Eusthenia reticulata*, which has seldom been collected and is apparently a rare species (Hynes, 1989). Its collection from Douglas Creek is significant. The status of species we are unable to identify is unknown. These include most of the mayflies and some caddisflies, and highlights the need for basic taxonomic investigations of these groups.

Introduction

Running water communities worldwide are usually dominated by aquatic insects. In terms of species richness and abundance, the Orders Plecoptera, Diptera, Ephemeroptera and Trichoptera are prominent. This report presents the results of a survey of three of these: Orders Plecoptera (stoneflies), Ephemeroptera (mayflies) and Trichoptera (caddisflies), in the Mount Ossa - Pelion Valley area of the Cradle Mountain - Lake St Clair National Park.

Cradle Mountain - Lake St Clair National Park is an extensive reserve which forms the northern boundary of the Tasmanian World Heritage Area. Access to most of the country within the Park is relatively difficult, and the area has not previously been surveyed for aquatic insects. Neboiss et al. (1988) have reported on the caddisflies of the extreme northern and southern ends of the Park, but pointed out that "the greatest and most exciting part of the Park from Cradle Mountain to Lake St Clair still remains unexplored as far as the aquatic insects (Trichoptera) are concerned". Limited collections of Plecoptera and Ephemeroptera have also been made in accessible parts of the Park, especially near Cradle Mountain. These collections have been far from comprehensive, and have only been reported as locality records for a few species in the taxonomic literature.

The results presented below are based on a series of

samples collected in mid-January 1990. Limited time was available for sampling at each location and, although taxa lists are extensive, it is likely that they include only the more common species from the survey area. In addition, species with life histories characterised by an absence of nymphs or larvae from streams in summer are unlikely to have been collected.

Methods

Sampling

Samples were collected from seventeen locations (Figure 1). With the exceptions of sites 1 and 6, these were all running water sites, ranging from first order headwater streams to larger third order streams (see Appendix).

Aquatic stages were primarily collected using a kick sampling technique. Bottom sediments were vigorously disturbed, either by foot or by overturning larger rocks and woody substrates. The dislodged fine material was collected in a downstream pond net, transferred to a large white tray, and individual insects picked from the debris using forceps. Larvae and pupae were also handpicked directly from the surfaces of larger rocks and solid substrates.

Adults were collected by sweeping riparian vegetation with hand nets. Battery operated light traps were employed after dark, although with limited success.

Taxonomy

The Tasmanian stoneflies are taxonomically well known. Material collected during the present study has been identified using keys to adults and nymphs (Hynes, 1989).

By contrast, the taxonomy of Tasmanian mayflies is very incomplete. Adults of fifteen species have been described from the state (Tillyard, 1936; Harker, 1954, 1957), but descriptions of many of these are inadequate for identification of collected material. This problem is compounded by the presence of an unknown number of undescribed species. Although taxonomy of the nymphs is an even more parlous state, we have concentrated our efforts on this stage. All specimens have been identified to genus using the keys of Suter (1979) and Dean (1989), and we have allocated voucher numbers to distinguish presumptive species. A voucher collection has been maintained for several years in Victoria, and the Tasmanian material has now been incorporated into this. Formal identification must, however, await a revision of the adults and the rearing of nymphs.

While adult taxonomy of the Tasmanian Trichoptera is well advanced, primarily due to the efforts of Neboiss (1977, 1986), little published information is available on immature stages. Despite this, we have been able to identify most of the larvae collected. Over the past ten years, we have accumulated a large amount of larval and reared material from both Tasmania and the mainland, and this unpublished information has been augmented with reared material collected during the present study. Larval taxonomy of the families Conoesucidae, Calocidae and Helicophidae is currently being investigated by Jean Jackson at the University of Tasmania, and she has kindly identified some of our material in these families.

Distribution and abundance

Included in the species lists are assessments of the distribution and abundance of each taxa. These assessments are based solely on the set of samples which we have collected, and give an indication of relative rather than absolute abundance. The status of individual taxa would be likely to change if sampling intensity was increased, or if samples were collected at other times of the year. Categories we have adopted are:

Restricted distribution: recorded from 1 or 2 sites only.

Limited distribution: recorded from 3 or 4 sites.

Widespread distribution: recorded from 5 or more sites.

Rare species: a total of 1-3 specimens collected from all sites.

Common species: a total of 4-30 specimens collected from all sites.

Abundant species: more than 30 specimens collected from all sites.

Results and Discussion

Plecoptera (stoneflies)

The species. — At least seventeen stonefly species were recorded from the study area (Table 1). While most of the material consisted of nymphs, adults of eleven species were also collected, allowing confirmation of nymphal identifications.

Species richness ranged from 1 to 7 at the running water sites, but there was no obvious relationship between numbers of species and stream size. Similarly, there were few well defined patterns of distribution. Several species were widely distributed (e.g., *Eusthenia costalis*, *Tasmanoperla thalia* and *Crypturoperla paradoxa*), but the majority were sporadic in occurrence, with at least eleven species recorded from only 1 or 2 sites. This makes it difficult to draw conclusions about general distribution.

Notes on selected taxa. — *Eusthenia reticulata*. This species is apparently rare. Hynes (1989) comments that it has only been collected once in recent years, from a high stream on Mount McCall. The nymph is unknown, although possible nymphs from Mount McCall are grouped with two additional species as the *Eusthenia spectabilis* group in the key of Hynes (1989). In the present study a single female was collected from site 4, while four nymphs of the *E. spectabilis* group listed in Table 1 may be nymphs of *E. reticulata*.

Leptoperla beroe. A single male of this species was collected from the shore of Lake Ayr: the nymphs probably occur in the lake, but this has not been confirmed.

Cardioperla nigrifrons. Large numbers of nymphs of this species were collected from moss in swift water on the 45° face of a waterfall at site 12.

Cardioperla sp. A. A single, very early nymph of a third species of *Cardioperla* was collected from site 5. This nymph had a very strong dorsal ridge on the abdominal terga, but was too small for positive identification. Sampling at other times of the year may yield additional specimens.

Genus *Austrocercoides*. Nymphs of the two known Tasmanian species cannot be distinguished. Adults of *A. zwicki* emerge in spring-early summer, while *A. bullata* adults have been collected from January to April (Hynes, 1989). In the present study adults of *A. bullata* were collected from site 4, while fully developed nymphs from sites 4 and 7 were probably the same species. Nymphs less than half grown were collected from sites 8, 14, 15 and 16, and these could conceivably be *A. zwicki*.

Ephemeroptera (mayflies)

The species. — Thirteen mayfly species were collected, all but three belonging to the family Leptophlebiidae (Table 2). At least four, and perhaps as many as ten of these species are undescribed, reflecting the great need for taxonomic study of Tasmanian Ephemeroptera.

Distribution patterns. — Arrangement of the running water sites in order of increasing size highlights the fact that most species featured orderly, well defined patterns of distribution (Table 3). *Ameletoides* sp. was widely distributed in fast flowing habitats of moderate size streams, while *Tasmanophlebia lucustris* avoids currents and was only collected from Lake Ayr and those few running water sites with pools and areas of slow current (sites 2, 4 and 14). Within the genus *Nousia*, *Nousia* sp. 7 was extremely widespread and recorded from most stream sites, *Nousia* sp. 6 was restricted to intermediate size tributary streams in heavy forest, while *Nousia* sp. 5 and *Nousia* sp. 9 were only recorded from larger downstream sites. *Nousia* sp. 8 was restricted to flowing water sites above and below Lake Ayr. The two species of *Austrophlebioides* were also spatially separated. *Austrophlebioides* sp. 4 was restricted to open sites on the Pelion Plain, while *Austrophlebioides* sp. 5 was only recorded from heavily forested sites further upstream.

There was an obvious tendency for species richness to increase as stream size increased (Table 3). The number of species at individual sites ranged from one at site 8 (a small headwater stream) to seven species at the furthest downstream site (site 17).

Notes on selected taxa. — *Ameletoides* sp. This genus was first recorded from Tasmania by Campbell (1981), who collected nymphs from Pencil Pine River near Cradle Mountain. He suggested that they may have been an undescribed species, and comparison of nymphs collected in the present study with specimens from the Victorian Alps supports this suggestion.

Atalophlebia albiterminata. This species is common throughout much of Tasmania (Tillyard, 1936). In the present study it was only collected from the Lake Ayr outlet stream, 100 metres downstream from the lake. Its presence at this site may be a consequence of a reduced flow and stable substrate, or perhaps is due to slightly elevated temperatures.

Genus *Nousia*. With six species, the genus *Nousia* is extremely diverse in the study area. This diversity is apparently facilitated by spatial separation of nymphs. Four species in the genus have previously been described from Tasmania, three of them only from lowland localities. Identification of the Pelion material is not possible at present, despite the collection of adults of several of the species.

Genus *D* sp. *tristis*. This species was described by Harker (1954) (as *Jappa tristis*), the type material having been collected by Tillyard in 1917 from Cradle Mountain. In a guide to Australian Leptophlebiidae, Dean (1989) established "Genus D" to accommodate several undescribed species from south-eastern Australia. Examination of nymphs and an adult male from Pelion Valley confirms that the species *tristis* belongs to this undescribed genus. The genus *Jappa* is therefore removed from the Tasmanian fauna.

Genus *Austrophlebioides*. This is the first record of this genus from Tasmania, and both species are undescribed. *Austrophlebioides* sp. 5 is characterised by a striking modification of the labrum. The fringes of setae on the anterior margin have been formed into a "suction disc" which perhaps assists the nymph when clinging to rock surfaces in fast currents. In all other aspects the nymph agrees with typical *Austrophlebioides* nymphs.

Trichoptera (caddisflies)

The species. — At least fifty species of caddisflies were recorded from the study area (Table 4). The dominant families were Hydrobiosidae (14 species), Leptoceridae (8 species), Conoesucidae (5 species) and Philorheithridae (4 species). Of the fifty species, 38 were collected as either adults or larvae which have been reared to adults, and could be identified to the species level.

Distribution patterns. — Distributions of those species which were recorded from more than one site are presented in Table 5. As with the mayflies, there was a general tendency for species richness to increase with increasing stream size.

Most of the running water species featured distribution patterns which were orderly with respect to position along the river continuum. For example, *Diplectrona* sp. was limited to small-medium size forest streams, *Hydrobiosella cognata*, *Archaeophylax ochreus*, *Caenota plicata* and *Tasmanthrus galbinomaculatus* were restricted to medium size streams but extended further downstream than *Diplectrona* sp., while *Apsilochorema obliquum*, *Taschorema asmanum* and *Conoesucus diguiferus* ranged from medium size forest streams to the furthest downstream sites, and *Taschorema viridarium*, *Hydrobiosella waddama* and *Plectrocnemia* sp. were restricted to the larger downstream sites.

Taschorema evansi, *Helicopsyche* sp. and *Tamasia variegata* were only recorded from the Lake Ayr outlet stream. In addition, *Asmicridea edwardsi* may be restricted to the outlet stream, as the only other record (site 4) was a single adult male which may have flown downstream from site 3. All of these species are widely distributed at lower altitudes, and physical conditions unique to site 3 probably explains their presence in the study area.

The leptocecid *Triplectidina nigricornis* was only recorded from site 6, which consisted of a series of small isolated pools on Pelion Plain, and was the only species of caddisfly collected from these pools.

Spatial separation of congeners was a striking feature of the genera *Tasmanthrus* and *Hydrobiosella*. *Hydrobiosella waddama* was only recorded from open sites on the Pelion Plain, whereas *H. cognata* appears to be restricted to forest sites further upstream. A single adult male of *H. cognata* collected at site 17 probably flew down from an upstream site. Similarly, *Tasmanthrus angustipennis* was restricted to the three sites downstream from Lake Ayr, while *T. galbinomaculatus* was recorded from upstream forested sites.

Notes on selected taxa. — *Moruya* sp. Larvae of the genus *Moruya* were collected from many sites, but we are unable to identify them to species. At least some specimens are probably *M.charadra*, adults of which were collected from site 17, but it is likely an additional species is also represented in the samples.

Hydrobiosidae: larval species A, B and C. These species were each recorded from a single site, and only one or two specimens were collected. It is likely that at least two of them are species of *Austrochorema*, while a third may be *Ipsebiosis*. Until adults have been reared, they must remain unidentified.

Genus *Tasmanthrus*. Male pupae and associated larval sclerites were collected, as well as numerous larvae, of two distinctive species of *Tasmanthrus*. One species is clearly *T. angustipennis*, while the male genitalia of the second species agrees with *T.galbinomaculatus* described from Cradle Mountain by Jacquemart (1965). Neboiss (1977) has placed the latter species as a synonym of *T.angustipennis*, but this decision will probably have to be reversed.

General comments

The present survey has yielded 80 species of aquatic insects, consisting of 17 species of stoneflies, 13 species of mayflies and 50 species of caddisflies. Species richness varied considerably between individual sites. At running water sites total numbers of species ranged from eight (site 9) to 28 (site 17), with an obvious trend of increasing richness as one moved from small headwater streams to larger downstream sites.

We found no evidence of endemism in the aquatic insects of Pelion Valley. While the Tasmanian mayflies are poorly known, and as a consequence we are unable to assess the wider distribution of the species we collected, Tasmanian stoneflies and caddisflies have been extensively surveyed in recent years. With the exception of *Eusthenia reticulata*, all the stonefly species from Pelion Valley are widely distributed in Tasmania (Hynes, 1989). *E. reticulata* is a species which has rarely been collected, and its presence in Douglas Creek is of significance. Similarly, the caddisfly species which we have identified are well known from elsewhere in the state (Neboiss et al., 1988). The twelve taxa which we are unable to identify were all collected as larvae only, and there is no reason to suggest that any of these are endemic or rare when none of the 38 species which we were able to identify fall into either of these categories.

The survey has highlighted deficiencies in the taxonomy of adults and nymphs of Tasmanian mayflies, and the larval taxonomy of some of the caddisflies. Aquatic insect communities are valuable indicators of general environmental quality, and are responsive to catchment disturbance and changes in such factors as hydrology, temperature and siltation. However, if they are to be fully utilised in environmental monitoring programs, it is important that basic taxonomic information is available, especially for immature stages.

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Table 1. Plecoptera (stoneflies) of Pelion Valley

	Abundance/distribution	Sites
EUSTHENIIDAE		
<i>Eusthenia costalis</i>	Abundant, widespread	7-11, 13-17
<i>E. reticulata</i> (A)	Rare, restricted	4
<i>E. spectabilis</i> group (N)	Common, restricted	3, 11
AUSTROPERLIDAE		
<i>Tasmanoperla thalia</i>	Abundant, widespread	7,8,10,11,13-16
<i>Crypturoperla paradoxa</i>	Abundant, widespread	8-15
GRIPOPTERYGIDAE		
<i>Leptoperla varia</i>	Common, restricted	2
<i>L. beroe</i>	Rare, restricted	1
<i>Cardioperla nigrifrons</i>	Common, limited	8, 10-12
<i>C. falsa</i>	Common, restricted	10
<i>C. sp. A</i>	Rare, restricted	5
<i>Dinotoperla serricauda</i>	Rare, restricted	17
<i>Trinotoperla zwicki</i>	Common, limited	7, 10, 11, 17
<i>T. tasmanica</i>	Rare, restricted	11
NOTONEMOURIDAE		
<i>Notonemoura lynchi</i>	Rare, restricted	8, 16
<i>Austrocerca tasmanica</i>	Rare, restricted	1
<i>A. riei</i>	Rare, restricted	2, 3
<i>Austrocercella christinae</i>	Rare, restricted	9
<i>Austrocercoides bullata</i> (A)	Rare, restricted	4
<i>A. sp. (N)</i>	Common, widespread	4, 7, 8, 14-16

A = adults, N = nymphs

Table 2. Ephemeroptera (mayflies) of Pelion Valley

	Abundance/distribution	Sites
SIPHONURIDAE		
<i>Ameletoides</i> sp.	Common, widespread	4,7,9-11,14,15
ONISCIGASTRIDAE		
<i>Tasmanophlebia lacustris</i>	Common, limited	1,2,4,14
BAETIDAE		
<i>Baetis</i> sp. A	Common, restricted	5,17
LEPTOPHLEBIIDAE		
<i>Atalophlebia albiterminata</i>	Rare, restricted	3
<i>Nousia</i> sp.5	Abundant, widespread	4,7,14,15,17
<i>Nousia</i> sp.6	Common, widespread	9-11, 15, 16
<i>Nousia</i> sp.7	Abundant, widespread	2,4,7-11,13-17
<i>Nousia</i> sp.8	Common, limited	2,3,5,17
<i>Nousia</i> sp.9	Common, limited	7,14,17
<i>Nousia</i> sp.10	Rare, restricted	13
Genus D sp. <i>tristis</i>	Abundant, widespread	4,7,11,14,15,17
<i>Austrophlebioides</i> sp.4	Common, restricted	5,17
<i>Austrophlebioides</i> sp.5	Common, limited	7,10,11,15

TABLE 3 Distribution of mayfly species, Pelion Valley

	Running water sites increasing catchment size →													Lake outlet sites 5 3	Moss face of waterfall 12	Standing waters 1 6
	2	8	13	9	16	10	15	11	14	7	4	17				
<i>Ameletoides</i> sp.				X	X	X	X	X	X	X	X					
<i>Tasmanophlebia lacustris</i> X									X	X						X
<i>Baetis</i> sp.														X		
<i>Atalophlebia albiterminata</i>															X	
<i>Nousia</i> sp. 5							X		X	X	X	X				
<i>Nousia</i> sp. 6				X	X	X	X	X								
<i>Nousia</i> sp. 7	X	X	X	X	X	X	X	X	X	X	X	X				
<i>Nousia</i> sp. 8	X												X	X		
<i>Nousia</i> sp. 9								X	X	X						
<i>Nousia</i> sp. 10			X													
Genus D sp. <i>tristis</i>						X	X	X	X	X	X					
<i>Austrophlebioides</i> sp. 4													X	X		
<i>Austrophlebioides</i> sp. 5					X	X	X		X							
Number of species	3	1	2	3	2	4	6	5	6	6	5	7	3	2	-	1

Table 4. Trichoptera (caddisflies) of Pelion Valley

	Abundance/distribution	Sites
HYDROBIOSIDAE		
<i>Apsilochorema obliquum</i>	Abundant, widespread	4,5,7,10,14,15,17
<i>Austrochorema pegidion</i>	Common, limited	7,8,10,13
<i>Ulmerochorema</i> sp.	Common, limited	4,5,7,17
<i>Ethochorema nesydrion</i>	Abundant, widespread	4,7,10,11,14-17
<i>Ethochorema kelion</i>	Rare, restricted	15
<i>Taschorema asmanum</i>	Abundant, widespread	4,5,7,12,14,15,17
<i>Taschorema evansi</i>	Common, restricted	3, 5
<i>Taschorema viridarium</i>	Common, restricted	4, 17
<i>Ptychobiosis nigrita</i>	Rare, restricted	15
<i>Keotonga clivicola</i>	Rare, restricted	14
<i>Moruya charadra</i>	Rare, restricted	17
<i>Moruya</i> sp.	Common, widespread	4,7,10,12,14,15,17
Unident. larva sp.A	Rare, restricted	2
Unident. larva sp.B	Rare, restricted	12
Unident. larva sp.C	Rare, restricted	12
GLOSSOSOMATIDAE		
<i>Agapetus tasmanicus</i>	Rare, restricted	5
PHILOPOTAMIDAE		
<i>Hydrobiosella cognata</i>	Abundant, widespread	7,9-17
<i>Hydrobiosella waddama</i>	Abundant, restricted	5,17
HYDROPSYCHIDAE		
<i>Smicrophylax</i> sp.	Abundant, restricted	17
<i>Asmicridea edwardsi</i>	Abundant, restricted	3,4
<i>Diplectrona</i> sp.	Abundant, widespread	8,10,11,13,15,16
POLYCENTROPODIDAE		
<i>Plectocnemia</i> sp.	Rare, restricted	4,7
<i>Tasmanoplegus spilota</i>	Rare, restricted	2
<i>Nyctiophylax repandus</i>	Common, limited	7,14,17

Table 4 continued.

LIMNAPHILIDAE <i>Archaeophylax ochreus</i>	Common, widespread	7,10,11,13-16
PLECTROTARSIDAE <i>Plectrotarsus tasmanicus</i>	Common, restricted	1
TASIMIIDAE <i>Tasimia</i> sp.	Common, restricted	17
HELICOPSYCHIDAE <i>Helicopsyche</i> sp.	Common, restricted	3
CONOESUCIDAE <i>Costora rotosca</i>	Common, limited	3,11,17
<i>Costora delora</i>	Common, restricted	4,5
<i>Conoesucus fromus</i>	Common, limited	2,4,17
<i>Conoesucus digitiferus</i>	Abundant, widespread	3,4,7,10-12,17
<i>Conoesucus nepotulus</i>	Common, restricted	12,17
CALOCIDAE <i>Caenota plicata</i>	Common, widespread	3,4,7,9-11,15
<i>Tamasia variegata</i>	Common, restricted	3
HELICOPHIDAE <i>Alloecella grisea</i>	Rare, restricted	10
<i>Alloecella longispina</i>	Common, limited	7,8,12
<i>Alloecella pilosa</i>	Rare, restricted	12
PHILORHEITHRIDAE <i>Aphilorheithrus stepheni</i>	Rare, restricted	1, 4
<i>Aphilorheithrus</i> sp.A	Rare, restricted	14
<i>Tasmanthrus angustipennis</i>	Common, limited	3,5,17
<i>T. galbinomaculatus</i>	Abundant, widespread	4,7,10-12,14-16
LEPTOCERIDAE <i>Triplectides similis</i>	Rare, restricted	1
<i>Triplectides bilobus</i>	Abundant, widespread	4,7,11,13-17
<i>Symphitoneuria opposita</i>	Common, restricted	1
<i>Triplectidina nigricornis</i>	Common, restricted	6
<i>Notalina parkeri</i>	Rare, restricted	1
<i>Notalina fulva</i>	Common, restricted	1,4
<i>Notalina</i> sp.	Common, limited	1,3,5,17
<i>Condocerus</i> sp.	Common, restricted	2,14
<i>Oecetis scirpicula</i>	Rare, restricted	1

TABLE 5 Distribution of caddisfly species, Pelion Valley (Taxa recorded from only one locality not included)

	Running water sites increasing catchment size →											Lake outlet sites 5 3	Moss face of waterfall 12	Standing waters 1 6	
	2	8	13	9	16	10	15	11	14	7	4				17
<i>Apsilochorema obliquum</i>					X	X		X	X	X			X		
<i>Austrochorema pegidion</i>	X	X			X					X					
<i>Ulmerochorema</i> sp.										X	X	X	X		
<i>Ethochorema nesydrion</i>				X	X	X	X	X	X	X	X	X			
<i>Taschorema asmanum</i>						X		X	X	X	X		X	X	
<i>Taschorema evansi</i>													X	X	
<i>Taschorema viridarium</i>											X	X			
<i>Moruya</i> sp.					X	X		X	X	X	X			X	
<i>Hydrobiosella cognata</i>	X	X	X	X	X	X	X	X	X	X	X		X		

Table 5 continued.

	2	8	13	9	16	10	15	11	14	7	4	17	5	3	12	1	6
<i>Hydrobiosella waddama</i>												X		X			
<i>Asmicridea edwardsi</i>												X			X		
<i>Diplectrona</i> sp.	X	X			X	X	X	X									
<i>Plectrocnemia</i> sp.										X	X						
<i>Nyctiophylax repandus</i>									X	X	X						
<i>Archaeophylax ochreus</i>		X			X	X	X	X	X	X							
<i>Costora rotosca</i>								X				X		X			
<i>Costora delora</i>										X				X			
<i>Conoesucus fromus</i>	X										X	X					
<i>Conoesucus digitiferus</i>						X		X	X	X	X			X		X	
<i>Conoesucus nepotulus</i>												X				X	
<i>Caenota plicata</i>				X		X	X	X		X	X				X		
<i>Alloecella longispina</i>	X								X						X		
<i>Tasmanthrus angustipennis</i>												X		X	X		
<i>Tasmanthrus galbinomaculatus</i>					X	X	X	X	X	X	X					X	
<i>Triplectides bilobus</i>		X		X		X	X	X	X	X	X	X					
<i>Notalina</i> sp.												X		X	X		X
<i>Condocerus</i> sp.	X								X								
Total number of species	4	3	5	3	6	11	12	9	12	16	16	18	9	9	10	7	1

Appendix. Details of sampling locations.

- Site 1 D. Cartwright and J. Dean, 16 January 1990, Tas., Lake Ayr, 8114.214695
- Site 2 J. Dean and D. Cartwright, 16 January 1990, Tas., Small trickle flowing into Lake Ayr, 8114.214695
- Site 3 D. Cartwright and J. Dean, 16 January 1990, Tas., Lake Ayr outlet stream, approx. 100 metres d/s Lake Ayr, 8114.211695
- Site 4 J. Dean and D. Cartwright, 16 January 1990, Tas., Douglas Creek, upstream of confluence with Lake Ayr outlet stream, 8114.206691
- Site 5 D. Cartwright and J. Dean, 16 January 1990, Tas., Lake Ayr outlet stream, upstream of confluence with Douglas Creek, 8114.205692
- Site 6 J. Dean and D. Cartwright, 16 January 1990, Tas., Isolated pools, Pelion Plains, 8114.207692
- Site 7 D. Cartwright and J. Dean, 16 January 1990, Tas., Douglas Creek, Pelion Rangers Hut, 8114.208683
- Site 8 J. Dean and D. Cartwright, 17 January 1990, Tas., Headwater stream, 100 metres North of Pelion Gap, 8114.217649
- Site 9 D. Cartwright and J. Dean, 17 January 1990, Tas., Unnamed creek, approx. 3/4 km, NW of Pelion Gap, 8114.211654
- Site 10 J. Dean and D. Cartwright, 17 January 1990, Tas., Unnamed creek, approx. 1 1/2 km, NW of Pelion Gap, 8114.209661
- Site 11 D. Cartwright and J. Dean, 17 January 1990, Tas., Sharers Hut Creek, approx., 2 1/2 km NW of Pelion Gap, 8114.208668
- Site 12 J. Dean and D. Cartwright, 17 January 1990, Tas., Douglas Creek, approx., 2 1/2 km NW of Pelion Gap, 8114.208669
- Site 13 D. Cartwright and J. Dean, 17 January 1990, Tas., Unnamed creek, approx., 2 3/4 km NW of Pelion Gap, 8114.207673
- Site 14 J. Dean and D. Cartwright, 18 January 1990, Tas., River Forth, Frog Flats, 8114.172674
- Site 15 D. Cartwright and J. Dean, 18 January 1990, Tas., Unnamed creek, approx., 1/4 km E of Frog Flats, 8114.176674
- Site 16 J. Dean and D. Cartwright, 18 January 1990, Tas., Unnamed creek, approx., 3/4 km NE of Frog Flats, 8114.179678
- Site 17 D. Cartwright and J. Dean, 18 January 1990, Tas., Douglas Creek, High Bridge, near old Pelion Hut, 8114.198690