Alpine Bush Blitz

Caddisflies, mayflies and stoneflies

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Nomenclature and taxonomy used in this report is consistent with:

The Australian Faunal Directory (AFD)

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List of contributors to this report.			
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Abstract

We collected 40 species of Trichoptera, 1 species of Plecoptera and 4 species of Ephemeroptera at 7 sites in the Alpine region of the Snowy River and Murray River catchments. These numbers are comparable with those recorded during previous surveys of this region.

1. Introduction

The mayflies, stoneflies and caddisflies (Ephemeroptera, Plecoptera and Trichoptera respectively or EPT taxa) occur widely in rivers and streams in south-eastern Australia and have been collected by taxonomists for the best part of a century in the alpine region of new South Wales. The EPT taxa are generally regarded as being sensitive to man-made disturbances of riverine habitats and thus their diversity is a good indication of the degree of past disturbance at a site. As most of the sites we sampled in this Bush Blitz were in Kosciuszko National Park (KNP), and were thus likely to be undisturbed, we expected a rich diversity of EPT species.

Many of the previous records for EPT taxa from the Alpine region resulted from the collections of individual taxonomists rather than from systematic surveys of this region. However, several surveys have occurred, but these have largely focused on the aquatic nymphs and larvae. For example, the NSW EPA sampled rivers throughout NSW (from the mid 1990s to the early 2000s) including several sites in KNP (Turak et al. 2002). Only nymphs and larvae were sampled and identifications only taken to the family level because few of the nymphs and larvae had been associated with adults. Most taxonomic description of EPT taxa is based on the adults. A more detailed but localised survey (Suter et al. 2002) of the upper reaches of the Snowy River (near Mt Kosciuszko) and along the Thredbo River sampled both larvae and adults with identifications generally at the species level. We sampled only adult EPT taxa over a wider range of sites and altitudes than either of these previous surveys.

2. Methods

2.1 Site selection

Sites were selected to represent a range of altitudes and river catchments. Our sampling technique, a UV light trap, is not readily carried far and thus all sampling sites (except one where a helicopter transported us and our equipment) were close to roads.

2.2 Survey techniques

Historically, adult EPT taxa have been collected using indiscriminate light traps, where night-active flying adults, attracted to a light source, fall into a volume of ethanol where they are preserved. This process can collect large numbers of individuals but has two significant disadvantages. Firstly, an excessive number of individuals can be indiscriminately collected. This has implications for biological conservation when working in areas occupied by threatened taxa, and bulk collections require many hours of sorting before identifications can commence. Secondly, all specimens die before they are examined, so details of live colourations are lost.

Our approach follows more closely that used for moths. Night-active flying adults are attracted to an illuminated surface where they are individually photographed (using a high resolution DSLR, macro lens and close-up speedlights), collected (using a compact handheld ‘pooter’)

and preserved. As this process is targeted, it allows the composition of catches to be controlled, eliminating bycatch, and avoiding unnecessary collection of vulnerable taxa. The primary advantage of this methodology is that the live colouration of all individuals is recorded prior to preservation and live images can be accurately linked to preserved specimens that are ultimately formally identified.

Our approach differs from that used for moths in two ways:

1) The lights used are battery-powered ultraviolet (UV) lights. Through trial and error, UV lights were identified that have a wavelength most suitable to attract adult EPT taxa, while attracting few moths; and

2) The surface illuminated is rigid plywood (as opposed to a sheet of cloth, generally used for moths). This is necessary to enable macro photography of the lateral aspect of adult EPT specimens, as this orientation is required to capture all discerning characters including those on the wing. The rigid plywood is attached to a stepladder and can be dismantled for transport.

Following collection, all specimens were formally identified using published keys and Museums Victoria's (MV) extensive reference collection. These formal identifications were then applied to the live images of the specimen, allowing live characters of each taxon to be distinguished and recorded. Following identification, all specimens were registered and lodged in MV's entomological collection.

2.2.1 Methods used at standard survey sites

We did not sample at either of the two standard survey sites as they were not close to running water.

2.3 Identifying the collections

Specimens were identified using the following taxonomic literature:

Trichoptera

Cartwright, D. (1990) The Australian species of *Ecnomus* McLachlan (Trichoptera: Ecnomidae). *Memoirs of the Museum of Victoria*, **51**: 1-48.

Cartwright, D. (2002) The Australian species of Chimarra Steshens (Trichoptera: Philopotamidae). *Memoirs of the Museum of Victoria*, **59**: 393-437.

Cartwright, D. (2008) A review of the Australian species of *Ecnomina* Kimmins and *Daternomina* Neboiss (Trichoptera: Ecnomidae). *Zootaxa*, **1774**: 1-76.

Johanson, K.J. (1995) Eight new species and a revised key to Australian *Helicopsyche* (Trichoptera: Helicopsychidae). *Entomologica Scandinavica*, **26**: 241-272.

Morse, J. & Neboiss, A. (1982) *Triplectides* of Australia (Insecta: Trichoptera: Leptoceridae). *Memoirs of the National Museum Victoria*, **43**: 61-98.

Neboiss, A. (1986) *Atlas of Trichoptera of the SW Pacific – Australian Region*. Junk, Dordrecht.

Neboiss, A. (1992) *Illustrated keys to the families and genera of Australian Trichoptera. 1 Adults*. Australian Society for Limnology, Special Publication No. 9.

St Clair, R.M. (1991) The genus *Notalina* (Trichoptera: Leptoceridae: Triplectidinae) in southeastern Australia, with descriptions of the larvae and pupae. *Invertebrate Taxonomy* **4**: 895-934.

St Clair, R.M. (1994) Some larval Leptoceridae (Trichoptera) from south-eastern Australia. *Records of the Australian Museum*, **46**: 171-126.

Wells, A. (2004) The long-horned caddisfly genus *Oecetis* (Trichoptera: Leptoceridae) in Australia: two new species groups and 17 new species. *Memoirs of Museum Victoria*, **61(1)**: 85–110.

Wells, A. (2010) Australian species of the genus *Agapetus* (Trichoptera: Glossosomatidae), with descriptions of 13 new species. *Zootaxa*, **2420**: 1-25.

Plecoptera

Theischinger, B.G. & Cardale, J. (1987) An illustrated guide to the adults of the Australian stoneflies (Plecoptera). *CSIRO Australia Division of Entomology Technical Paper*, **26**: 1-83.

Ephemeroptera

Suter, P.J. & Webb, J. (2010) *Key to the genera of male adult mayflies of Australia*. Second TRIN taxonomy workshop.

Identified material from the entomological collection at MV was used to confirm the identity of certain taxa. In addition, we showed specimens to Dr Ros St Clair, John Dean and David Cartwright, all acknowledged experts on various families of caddisflies. We have incorporated their expertise into the commentary attached to the un-named or not formalised taxa.

3. Results and Discussion

Appendix 1 lists all EPT taxa recorded during the Alpine Bush Blitz. Collections made during this Bush Blitz will result in 335 lots (342 specimens) being added to the entomological collection of Museums Victoria and 335 records being publicly accessible via MV's Collections Online database.

3.1 Un-named or not formalised taxa

Table 1. Putatively un-named or not formalised taxa

Taxon	Comment
Tamasia sp. 1. (Family Calocidae)	1 female specimen [NMV TRI56218], collected on the bank of the Thredbo River (under Kosciuszko Road bridge), with markedly different colouration to specimens of *Tamasia variegata* collected during this survey. A male specimen is required to resolve the identity of this species.
Asmicridea cf *edwardsii* (Family Hydropsychidae)	In line with the literature, considerable variation in size and colouration was recorded for specimens of *Asmicridea edwardsii.* 22 specimens collected during this survey with wing lengths of 7.3-8.9 mm were identified as *A. edwardsii.* A further 35 specimens representing two distinct size classes (9.1-10.1 mm and 10.8-13.1 mm wing length) were identified as *A.* cf *edwardsii*. *Asmicridea edwardsii* is the only species of the genus reported to occur in the region.
Cheumatopsyche sp. 1 (Family Hydropsychidae)	6 specimens (4 males and 2 females) were collected with live external colouration inconsistent with *Cheumatopsyche modica* specimens collected during this survey. Expert advice indicates that multiple species are currently treated under the name *C. modica* throughout south-eastern Australia.

Cheumatopsyche sp. 2 (Family Hydropsychidae)	1 large female specimen was collected with a wing length that exceeds that of known species of the genus *Cheumatopsyche* [NMV TRI56456, 11.2 mm wing length]. A male specimen is required to resolve the identity of this species.
Oecetis sp. 1 (Family Leptoceridae)	2 female specimens [NMV TRI56408 & NMV TRI56425] were collected on the bank of the Murray River (at Cowombat Flat). A male specimen is required to resolve the identity of this species.
Oecetis sp. 2 (Family Leptoceridae)	1 female specimen [NMV TRI56468] was collected on the bank of the Snowy River (at Halfway Point campground). A male specimen is required to resolve the identity of this species.
Marilia sp. 1 (Family Odontoceridae)	5 female specimens [NMV TRI56332, NMV TRI56335, NMV TRI56337, NMV TRI56338 & NMV TRI56340] were collected on the bank of the Murray River (at Tom Groggin). These specimens are inconsistent with specimens of *Marilla bola* collected during this survey. A male specimen is required to resolve the identity of this species.
Aphilorheithrus stepheni complex sp. 1 (Family Philorheithridae)	Expert advice indicates that multiple species are currently treated under the name *Aphilorheithrus stepheni*. A total of 18 lots (12 males and 8 females, including 2 mating pairs), with consistent external colouration, were collected during this survey. Further work is required to resolve the identity of this species.
Aphilorheithrus stepheni complex sp. 2 (Family Philorheithridae)	As above, expert advice indicates that multiple species are currently treated under the name *Aphilorheithrus stepheni*. Two male specimens [NMV TRI56214 & NMV TRI56394] with consistent external colouration, different from the taxon above, were collected during this survey. Further work is required to resolve the identity of this species.
Austrheithrus cf *glymma* (Family Philorheithridae)	1 female specimen [NMV TRI56454] collected on the bank of the Murray River (at Cowombat Flat) appears similar to *Austrheithrus glymma*. A male specimen is required to resolve the identity of this species.
Genus I sp. 1 (Family Polycentropodidae)	Expert advice indicates that 2 male specimens [NMV TRI56375 & NMV TRI56376] collected on the bank of the Thredbo River (under Kosciuszko Road bridge) belong to a new genus and species currently being described.
Genus I sp. 2 (Family Polycentropodidae)	Expert advice indicates that 4 female specimens [NMV TRI56479, NMV TRI56480, NMV TRI56483 & NMV TRI56484] collected on the bank of the Snowy River (at Halfway Point campground), belong to a new genus and species currently being described.
Offadens spp. (Family Baetidae)	6 female specimens were collected on the bank of the Thredbo River (under Kosciuszko Road bridge) and on the bank of the Murray River (at Tom Groggin). Male specimens are required to resolve the identities of these species.

To compare the species sampled during this survey, with previous records reported in the Atlas of Living Australia (ALA), a multipolygon encompassing all sites sampled for EPT taxa during the Alpine Bush Blitz was mapped in ALA using the following coordinates: 148.095703125 -36.8108308637733, 148.60382080078125 -36.8108308637733,

148.60382080078125 -36.39410034923188, 148.095703125 -36.39410034923188, 148.095703125 -36.8108308637733.

Of the 40 described Trichoptera species collected in this area during this survey, 21 species are new records for the area and 19 had previously been reported in ALA. ALA also reported 35 species and one family (Stenopsychidae) from the area, not encountered during this survey.

The Ephemeroptera and Plecoptera were much less diverse because these orders had largely finished emerging by the time our sampling took place (first 2 weeks of February). The single described Plecoptera species (*Illiesoperla australis*) collected in this area had previously been reported to occur in the area in ALA. ALA also reported 42 species and 3 families of Plecoptera (Austroperlidae, Eustheniidae and Notonemouridae) from the area, not encountered during this survey. The 4 described Ephemeroptera species collected in this area during this survey are new records for the area. ALA reported 3 species and 3 families (Ameletopsidae, Caenidae and Oniscigastridae) from the area not encountered during this survey.

3.2 Putative new species (new to science)

In this report, 'putative new species' means an unnamed species that, as far as can be ascertained, was identified as a new species as a direct result of this Bush Blitz.

None recorded.

3.3 Exotic and pest species

None recorded.

3.4 Threatened species

None recorded.

3.5 Range extensions

Table 5. Range extensions or significant infill in distribution records for species

Species	Location sighted/observed	Distance from nearest known record (km)	Comments
Lingora coomata (Family Conoesucidae)	Mowamba River, bridge Barry Way	65 km (ALA: Cobberas, VIC)	0 records on ALA from NSW. 9 records on ALA from VIC, 1 from ACT. AFD indicates species restricted to eastern NSW. Type locality Cooma, NSW.
Agapetus dayi (Family Glossosomatidae)	Thredbo River, bridge Kosciuszko Road.	333 km (Type locality: Bathurst, NSW)	0 records on ALA. AFD indicates species restricted to eastern NSW. Type locality Bathurst, NSW.
Psyllobetina locula (Family Hydrobiosidae)	Thredbo River, Dead Horse Gap	4 km (ALA: Thredbo Golf	Records on ALA predominantly from VIC.

		Course)	2 records on ALA reported from Kosciuszko region NSW. AFD indicates species restricted to VIC. Type locality Bogong Village, VIC.
Marilia bola (Family Odontoceridae)	Thredbo River, bridge Kosciuszko Road.	69 km (ALA: Nariel, VIC)	Records on ALA predominantly from VIC. 6 records on ALA reported from NSW. AFD indicates species restricted to eastern NSW. Type locality Bolaro, NSW.
Coloburiscoides giganteus (Family Coloburiscidae)	Thredbo River, Dead Horse Gap	2 km (Type locality: Mt Kosciusko, NSW)	0 records on ALA. AFD indicates species restricted to SE Australia (NSW and VIC). Type locality Mt Kosciusko, NSW.
Austrophlebioides pusillus (Family Leptophlebiidae)	Murray River, Tom Groggin and Cowombat Flat.	11 km (ALA: 36.7324°S 148.0642°E)	Records on ALA predominantly from VIC. 2 records on ALA from NSW. AFD indicates species restricted to SE Australia (NSW and VIC). Type locality Bolaro, NSW.
Jappa campbelli (Family Leptophlebiidae)	Murray River, Tom Groggin	124 km (ALA: 37.6167°S 147.698°E)	0 records on ALA from NSW. 2 records from VIC. AFD indicates species occurs in QLD, NSW and VIC. Type locality Wellington River, Licola, VIC.
Ulmerophlebia annulata (Family Leptophlebiidae)	Murray River, Tom Groggin	107 km (ALA: Talbingo, NSW)	13 records on ALA. 10 from VIC, 3 from NSW. AFD indicates species restricted to SE Australia (NSW and VIC). Type locality Serpentine River, Point Lookout, NSW.

3.6 Genetic information

Fourteen specimens were preserved in 96% ethanol and submitted to MV's cryogenic collection [NMV Z76076 to NMV Z76089]. These specimens were duplicates of species already collected.

4. Information on species lists

In making collections at the UV light trap we aimed to catch a male and female of each species. Unfortunately, it was not possible to catch both sexes for all species and sometimes we only trapped females. Female caddisflies are often not described and thus it is not possible

to identify them unless they are caught in copula with a male. Historic records are available on ALA and on AFD.

The following table shows the level of sampling effort (in hours) and the number of EPT families and taxa (including un-named or not formalised taxa) at each site:

	Thredbo River Kosciuszko Road	Thredbo River Dead Horse Gap	Mowamba River Barry Way	Jacobs River Barry Way	Snowy River Barry Way	Murray River Tom Groggin	Murray River Cowombat Flat
Sampling Duration (hours: minutes)	8:15	2:51	1:47	2:49	1:49	3:22	4:42
No. Trichoptera Taxa	25	10	4	11	11	14	19
No. Trichoptera Families	13	6	2	8	7	9	10
No. Plecoptera Taxa					1		
No. Plecoptera Families					1		
No. Ephemeroptera Taxa	2			1		4	1
No. Ephemeroptera Families	2			1		2	1

The number of families is comparable with those found by Turak et al. (1999) during the NSW EPA survey at a range of sites in the Alpine region. They recorded an average of 23 families per site and about half of these would have been EPT families (based on similar work in Victoria; Marchant et al. 2006). Suter et al. (2002) recorded 13 families and 36 species of Trichoptera during their survey, which is also comparable with what we found (17 families and 40 species over all sites).

A single visit to a site is never sufficient to provide a comprehensive list of EPT taxa. Our general experience indicates that 3-4 visits over the emergence season (spring to autumn) are needed to catch the majority of species likely to be present.

5. Information for land managers

The table above shows that we recorded fewer species at the Mowamba River than at other sites. This may be a result of cattle grazing and other agricultural activity upstream of this site. The upstream catchment is not within KNP and appears more disturbed than other catchments that we sampled.

6. Other significant findings

None.

7. Conclusions

We collected specimens of 12 un-named Trichoptera taxa that will likely aid new species descriptions. Our records of 8 EPT species will improve the resolution of the distribution of these taxa as depicted on the Atlas of Living Australia. The numbers of species recorded at each site are what might be expected at undisturbed river sites, with one exception where some upstream disturbance was evident.

Acknowledgements

We would like to thank the Bush Blitz organisers Kate Gillespie and Helen Cross for their wonderful efforts in making our survey possible.

References

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Turak E., Flack L.K., Norris R.H., Simpson J. & Waddell N. (1999) Assessment of river conditions at a large spatial scale using predictive models. *Freshwater Biology*, **41**: 283-298.

Appendix 1. List of EPT taxa (including un-named or not formalised taxa) recorded during the Alpine Bush Blitz

Family	Species	Common name	Putative new species	Threatened (EPBC Act)	Threatened (State/Territory Act)	Exotic/pest
Atriplectidae	*Atriplectides dubius*	Caddisfly	No	No	No	No
Calamoceratidae	*Anisocentropus bicoloratus*	Caddisfly	No	No	No	No
Calamoceratidae	*Anisocentropus latifascia*	Caddisfly	No	No	No	No
Calocidae	*Caenota plicata*	Caddisfly	No	No	No	No
Calocidae	*Tamasia variegata*	Caddisfly	No	No	No	No
Calocidae	*Tamasia* sp. 1	Caddisfly	No	No	No	No
Conoesucidae	*Coenoria boera*	Caddisfly	No	No	No	No
Conoesucidae	*Hampa patona*	Caddisfly	No	No	No	No
Conoesucidae	*Lingora coomata*	Caddisfly	No	No	No	No
Ecnomidae	*Ecnomina bula*	Caddisfly	No	No	No	No
Ecnomidae	*Ecnomus continentalis*	Caddisfly	No	No	No	No
Ecnomidae	*Ecnomus tillyardi*	Caddisfly	No	No	No	No
Ecnomidae	*Ecnomus turgidus*	Caddisfly	No	No	No	No
Glossosomatidae	*Agapetus dayi*	Caddisfly	No	No	No	No
Helicopsychidae	*Helicopsyche ptychopteryx*	Caddisfly	No	No	No	No
Helicopsychidae	*Helicopsyche heacota*	Caddisfly	No	No	No	No
Hydrobiosidae	*Apsilochorema obliquum*	Caddisfly	No	No	No	No
Hydrobiosidae	*Ethochorema turbidum*	Caddisfly	No	No	No	No
Hydrobiosidae	*Koetonga clivicola*	Caddisfly	No	No	No	No
Hydrobiosidae	*Psyllobetina locula*	Caddisfly	No	No	No	No
Hydrobiosidae	*Taschorema evansi*	Caddisfly	No	No	No	No
Hydrobiosidae	*Ulmerochorema membrum*	Caddisfly	No	No	No	No
Hydrobiosidae	*Ulmerochorema seonum*	Caddisfly	No	No	No	No

Hydropsychidae	*Asmicridea edwardsii*	Caddisfly	No	No	No	No
Hydropsychidae	*Asmicridea* cf *edwardsii*	Caddisfly	No	No	No	No
Hydropsychidae	*Cheumatopsyche modica*	Caddisfly	No	No	No	No
Hydropsychidae	*Cheumatopsyche* sp. 1	Caddisfly	No	No	No	No
Hydropsychidae	*Cheumatopsyche* sp. 2	Caddisfly	No	No	No	No
Hydroptilidae	*Orthotrichia aberrans*	Caddisfly	No	No	No	No
Leptoceridae	*Notalina bifaria*	Caddisfly	No	No	No	No
Leptoceridae	*Notalina fulva*	Caddisfly	No	No	No	No
Leptoceridae	*Notalina ordina*	Caddisfly	No	No	No	No
Leptoceridae	*Oecetis inscripta*	Caddisfly	No	No	No	No
Leptoceridae	*Oecetis* sp. 1	Caddisfly	No	No	No	No
Leptoceridae	*Oecetis* sp. 2	Caddisfly	No	No	No	No
Leptoceridae	*Triplectides altenogus*	Caddisfly	No	No	No	No
Leptoceridae	*Triplectides ciuskus ciuskus*	Caddisfly	No	No	No	No
Leptoceridae	*Triplectides proximus*	Caddisfly	No	No	No	No
Leptoceridae	*Triplectides truncatus*	Caddisfly	No	No	No	No
Limnephilidae	*Archaeophylax ochreus*	Caddisfly	No	No	No	No
Odontoceridae	*Marilia bola*	Caddisfly	No	No	No	No
Odontoceridae	*Marilia* sp. 1	Caddisfly	No	No	No	No
Philopotamidae	*Hydrobiosella waddama*	Caddisfly	No	No	No	No
Philorheithridae	*Aphilorheithrus stepheni* complex sp. 1	Caddisfly	No	No	No	No
Philorheithridae	*Aphilorheithrus stepheni* complex sp. 2	Caddisfly	No	No	No	No
Philorheithridae	*Austrheithrus dubitans*	Caddisfly	No	No	No	No
Philorheithridae	*Austrheithrus* cf *glymma*	Caddisfly	No	No	No	No
Philorheithridae	*Kosrheithrus tillyardi*	Caddisfly	No	No	No	No
Polycentropodidae	*Plectrocnemia australica*	Caddisfly	No	No	No	No
Polycentropodidae	Genus I sp. 1	Caddisfly	No	No	No	No

Polycentropodidae	Genus I sp. 2	Caddisfly	No	No	No	No
Tasimiidae	*Tasimia palpata*	Caddisfly	No	No	No	No
Gripopterygidae	*Illiesoperla australis*	Stonefly	No	No	No	No
Baetidae	*Offadens* spp.	Mayfly	No	No	No	No
Coloburiscidae	*Coloburiscoides giganteus*	Mayfly	No	No	No	No
Leptophlebiidae	*Austrophlebioides pusillus*	Mayfly	No	No	No	No
Leptophlebiidae	*Ulmerophlebia annulata*	Mayfly	No	No	No	No
Leptophlebiidae	*Jappa campbelli*	Mayfly	No	No	No	No