

Observations on a larval population of the Mountain Giant dragonfly *Uropetala chiltoni* Tillyard, 1921 (Odonata: Petaluridae) at Cass, inland Canterbury

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Introduction

Two articles in Volume 59 of *The Wētā* (Merien 2026, Mackenzie Dodds & de Koenigswarter 2026), deal with aspects of the biology of *Uropetala carovei* (White, 1843) (Odonata: Petaluridae), which along with *U. chiltoni* Tillyard, 1921 are New Zealand's largest dragonflies. A third article discusses the biogeography of the genus *Uropetala* in the context of tectonic uplift (Grehan & Marinov 2026). *Uropetala chiltoni*, is the subject of this note, which presents unpublished observations on a larval population made by the authors starting in the 1980s. Given the resurgence of studies on *Uropetala*, our findings may be of interest to readers.

Uropetala chiltoni was described by Tillyard (1921) from material collected in 1920 at Arthurs Pass and Cass in the central South Island. Tillyard stayed at the University of Canterbury's mountain biological station at Cass and named his new species after his host Dr Charles Chilton, Professor and Head of the Department of Biology at Canterbury College. The larvae of *U. chiltoni* (Fig. 1) live in burrows in forest clearings and treeless, upland bogs, unlike those of *U. carovei*, which are usually found in the banks of shaded, forest streams (Rowe, 1987). An intensive study of *U. chiltoni* was made by Wolfe (1953) who examined

aspects of its life history, ecology and breeding biology at several localities in the vicinity of Cass. Our investigations expand on his work.

At one of Wolfe's study sites close to the eastern shore of Lake Sarah (43° 2.80' S, 171° 46.62'E), we examined the distribution of larval burrows, measured their openings and made observations on habitat features and associated fauna. Our original aim was to monitor changes in the numbers and sizes of burrows over time, but this objective was not met as too many burrow markers were lost and one of us (RJR) emigrated to Australia. Nevertheless, we did obtain some interesting data, which add to our knowledge of this iconic dragonfly. They provide the basis of this note.

Methods

In November 1981, two adjacent quadrats, (each 25 m²) were defined with pegs at the study site close to the shore of lake Sarah at an elevation of about 580 m above sea level. The site was dominated by seepage and a gently sloping bog surrounded predominantly by tussock grassland. The surface comprised a patchwork of tussocks (*Schoenus*), mosses (including *Sphagnum*), liverworts, fine gravel, mud and a few small shrubs (Fig. 2). The roughly circular entrances to burrows of *U. chiltoni* were counted and marked with garden plant labels that were pushed into the ground. Counts were repeated in March 1984 and the diameters of 17 burrow entrances of various sizes were determined. Larvae were extracted from these burrows and their body lengths and head widths (across the eyes) were measured.

In March 1999, a further survey was undertaken within the same area, but burrow entrances were counted in 42, 1m² quadrats laid out in rows across the site. The diameters of all entrances were measured and the distance of each opening to the nearest tussock was calculated. This latter measurement was made because tussocks provide the main emergence sites of *U. chiltoni* at the Cass sites and adult females alight on them before moving down towards the ground to oviposit (Wolfe 1953). The nature of the habitat immediately surrounding each burrow was also noted as, either, bryophyte (*Sphagnum*, other mosses, liverworts), tussock, shrub, mud and gravel, or combinations of them.



Figure 1: The final instar larva of *Uropetala chiltoni* drawn by Karen Mason for MJW.



Figure 2: The late Richard Rowe (centre) At the study site in 1983.

Additionally, the ground-dwelling invertebrate fauna at the site, and therefore what potential prey species of *U. chiltoni* larvae were present, was investigated using pitfall traps left out for various periods of time. Traps were glass jars (500 ml, 75 mm diameter) containing ethylene glycol as preservative, which were buried with their openings flush with the ground surface. Lastly, gut content analyses were made on 9 *U. chiltoni* larvae collected from the site in March 1982 and March 1984, including two from pitfall traps. Some gut contents were mounted on slides and examined microscopically to aid identification.

Results and discussion

Distribution and abundance of burrow entrances

The 17 larval burrows measured in 1984 ranged in diameter from 8 – 36 mm. Larvae taken from these burrows were 14 – 45 mm long and had head widths of 4.5 – 12 mm. Body length, head width and burrow entrance diameter were strongly correlated (Table 1). Rowe (1987) stated that burrow diameter was about half the length of the occupant, whereas the length: burrow diameter ratio of our 17 larvae was somewhat greater than

that (mean ratio $0.67 \pm \text{SD } 1.0$). Mean head width, in contrast, was 0.42 of burrow diameter, and therefore very similar to the ratio indicated by the photographs of *U. carovei* in the article by Mackenzie Dodds & de Koenigswarter (2026), which show the heads and forelegs of larvae at burrow entrances.

Table 1: Pearson correlations (r) between body length, head width and burrow entrance diameter for 17 *U. chiltoni* larvae.

	Head width	Burrow diameter
Body length	0.92	0.85
Head width	-	0.85

In 1981, 124 and 62 burrow entrances were found in the two 25 m² quadrats, respectively, whereas in 1984 the same quadrats contained 118 and 53 entrances. In 1999 128 burrow entrances were located in the 42, 1 m² quadrats examined. Mean densities of burrows in the three years were therefore 3.7, 3.4 and 3.05 per m². Because some burrows can have two entrances as noted by Wolfe (1953) and Rowe (1987), counts of openings may overestimate the actual numbers of burrows present.

The 1999 data set enabled further analysis of the distribution patterns of burrows within the site. They had a highly clumped distribution (variance to mean ratio 5.63) and nine of the 42 quadrats were empty. In contrast, 16 and 17 entrances were found in two quadrats. The plot of burrow numbers versus burrow entrances diameter (Fig. 3) shows major peaks between 6–7 and 8–9 mm and three smaller peaks, all of which may represent age/year classes of larvae.

The most common immediate surrounds of burrow entrances were bryophytes (*Sphagnum*, other mosses and liverworts), and tussocks, either alone or together (Fig. 4). The surrounds of another 5% of burrows comprised bryophytes and either grass, mud or a shrub, and 6% had a tussock and either grass, mud or a shrub in their immediate vicinity. Mud, a shrub or grass alone, surrounded the remainder of the burrow openings. Most burrow entrances were close to a tussock or less frequently a shrub.

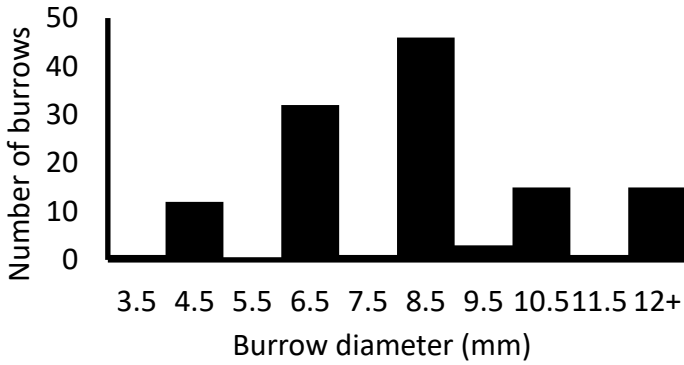


Figure 3: Numbers of burrow entrances in ten 1 mm diameter size classes at the study site in 1999.

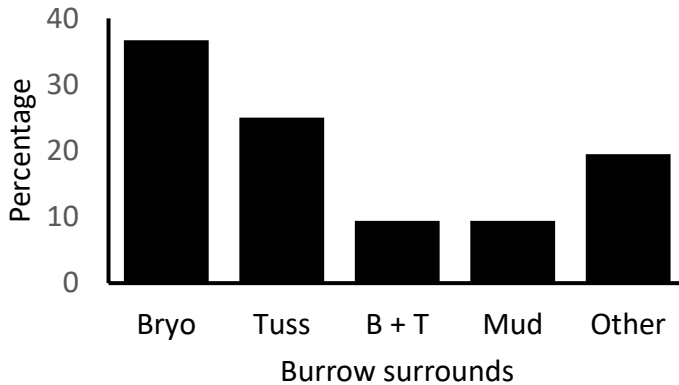


Figure 4: The percentages of plants and other materials forming the immediate surrounds of 128 burrow entrances present in the 42 quadrats examined in 1999. Bryo = bryophytes, Tuss = tussock, B + T = bryophyte and tussock.

Thus, 81 of the 128 openings were within 20 mm of a plant and only six were more than 120 mm away from one.

Wolfe (1953) did not estimate burrow density at any of his sites, but his comment that their entrances were most commonly found at the base of *Schoenus* tussocks and amongst bryophytes, is consistent with our findings. He also found them in shingle, at the edge of well-defined bog streams and in clay banks, but these habitat features were not present at our site.

Associated invertebrate fauna

Pitfall trapping indicated that a diverse invertebrate fauna was present at the site (Table 2). Thus, 584 invertebrates belonging to four phyla were taken in total. Ninety percent were arthropods, including insects (70%) and spiders (19%). Small numbers of flatworms, earthworms, small land snails, slugs and the aquatic snail *Potamopyrgus antipodarum* were also trapped. Larval and adult dipterans, and the hemipteran *Microvelia mcgregori*, which lives on the water surface, were the most abundant insects. Four *U. chiltoni* larvae, three of which were in the final instar, were found in the traps.

Gut contents of *Uropetala chiltoni* larvae

Of the nine larvae we dissected, seven were final instars, one a penultimate instar (F-1) and one a smaller individual. Eight of the larvae contained gut contents and one had an empty gut. Fragments of a spider were present in three larvae, while earthworms, identified by their chaetae, were found in two. The only other prey items seen were a mite, a weevil, a chironomid midge larva and unidentified fragments of a dipteran and a beetle. Small plant fragments were present in four larvae, two of which also contained the remains of earthworms. Therefore, it is possible that the pieces of plant came from the guts of the worms. However, the only animal material in the guts of the other two larvae, which contained plant fragments were a spider and a dipteran, neither of which would be expected to ingest plant matter. Winstanley & Rowe (1980) noted that Harding (1977) had also found 'vegetable material' in the guts of *U. carovei* larvae and speculated they may have been pieces of liverwort trimmed by the larvae around their burrow entrances.

Table 2: Total numbers of invertebrate taxa (n) taken in pitfall traps at the Lake Sarah study site in October and November 1981, March 1982 and March 1984.

Taxa	n	Taxa (continued)	n
Platyhelminthes		Coleoptera (beetles)	
Geoplanidae (flatworms)	7	Curculionidae adults	1
Annelida		<i>Liodessus deflectus</i> (Dytiscidae)	10
Lumbricidae (earthworms)	9	<i>L. deflectus</i> larvae	1
Mollusca		Scirtidae larvae	26
<i>Potamopyrgus antipodarum</i> (snails)	7	Hydrophilidae larvae	6
Small land snails	10	Staphylinidae	3
Athoracophoridae (slugs)	2	Hemiptera (bugs)	
Crustacea		<i>Microvelia mcgregori</i> (Veliidae)	130
Ostracoda (seed shrimps)	3	Aphididae	2
Arachnida		Aphrophoridae	6
Araneae (spiders)	110	Other Hemiptera	5
Pseudoscorpionida (pseudoscorpions)	1	Diptera (flies)	
Acari (mites)	1	Stratiomyidae larvae	14
Opiliones (harvestmen)	1	Chironomidae larvae	13
Collembola (springtails)	24	Mycetophilidae adults	1
Insecta		Psychodidae larvae	1
Odonata: <i>Uropetala chiltoni</i> larvae	4	Tipulidae larvae	43
Plecoptera (stoneflies)		Tipulidae adults	5
<i>Notonemoura latipennis</i> adults	54	<i>Paradixa</i> (Dixidae) larvae	1
<i>N. latipennis</i> larvae	1	<i>Neolimnia sigma</i> (Sciomyzidae) adults	1
Trichoptera (caddis)		<i>N. sigma</i> larvae	2
<i>Pseudoeconesus hudsoni</i> adults	2	Other Diptera	98
<i>Psilochorema mimicum</i> adults	1	Hymenoptera (wasps)	1
<i>P. mimicum</i> larvae	1	Lepidoptera (moths)	
<i>Oxyethira albiceps</i> adults	1	Noctuidae adults	3
<i>O. albiceps</i> larvae	1	Caterpillars	2
Orthoptera		Other moths	5
<i>Pteronemobius</i> sp. (crickets)	1		
Blattodea (cockroaches)		Total	584
<i>Celatoblatta</i> sp.	1		

Wolfe (1953) found that the food of late instars of *U. chiltoni* comprised ground-dwelling insects and arachnids, while Mackenzie Dodds & de Koenigswarter (2026) observed that insects and worms were eaten by larvae of *U. carovei*. In their study, all spiders that were attacked got away, however, like us, Wolfe (1953) found that *U. chiltoni* had successfully ingested spiders. Because larvae were never seen to leave their burrows in the *U. carovei* study, successful attacks occurred only when prey were very near a burrow. We do not know if the same is true for *U. chiltoni*, and a study with continuously-running cameras as done by Mackenzie Dodds & de Koenigswarter (2026) may well be informative. Although the final instar larvae we found in pitfall traps may have been individuals searching for emergence sites, the presence of a smaller, trapped individual suggests that at least some larvae may not be confined to their burrows at all times.

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