

SYNOPSIS OF THE GENUS *OLINGA* (TRICHOPTERA: CONOESUCIDAE) WITH A COMPARATIVE SEM STUDY OF THE MALE FOREWING ANDROCONIA AND THE DESCRIPTION OF A NEW SPECIES

JOHN B. WARD¹ & JAN C. MCKENZIE²

¹Canterbury Museum, Rolleston Avenue, Christchurch 8001, New Zealand. ²Department of Zoology, University of Canterbury, Private Bag 4800, Christchurch, New Zealand

(Received 1 October 1996; revised and accepted 26 March 1997)

ABSTRACT

Ward, J.B. & McKenzie, J.C. (1997). Synopsis of the genus *Olinga* (Trichoptera: Conoesucidae) with a comparative SEM study of the male forewing androconia and the description of a new species. *New Zealand Natural Sciences* 23: 1-11.

Olinga is an endemic New Zealand genus of Trichoptera (caddis) containing three named species. This paper adds another, *Olinga christinae* new species, summarises the habitats and distributions of all four species and gives characters useful for distinguishing the adult males. A comparative scanning electron microscope (SEM) study of the modified hairs (androconia) on the male forewings shows that they have characteristic shapes in each species.

KEYWORDS: Trichoptera - Conoesucidae - electron microscopy - androconia - *Olinga* - new species - New Zealand.

INTRODUCTION

The caddis genus *Olinga* (Trichoptera: Conoesucidae) is endemic to New Zealand and contains three named species, *Olinga feredayi* (McLachlan, 1868), *Olinga fumosa* Wise, 1958 and *Olinga jeanae* McFarlane, 1966. There is a colour photograph of an adult male of *O. feredayi* in "Natural History of New Zealand" (Bishop 1992, p. 100). The larva of *O. feredayi* is well-known to anglers and naturalists as the "homy-cased caddis" (Winterbourn & Mason 1983, Ford 1990), common in a wide range of stony streams throughout the North and South Islands of New Zealand, but apparently absent from Stewart Island (Henderson 1985, Ward & Henderson 1993). It is replaced in some of the smaller, steeper South Island streams by *O. jeanae*. *O. fumosa*, earlier thought to be endemic to Dunedin City (Patrick 1994, Peat & Patrick 1995), has recently been collected from two additional sites, both in South Canterbury. *Olinga christinae* (new species, described in this paper) is a small caddis known from only two

localities in upland northern Otago.

Cowley (1978) described the larvae of *O. feredayi* and *O. jeanae*, listing differential characters in the case structure, the length/width ratio of the head and of the prothorax, the antero-lateral prothoracic angles and the number of metanotal hairs. Other workers (Winterbourn 1978, Winterbourn & Gregson 1989) have found these characters to be inconsistent. Winterbourn and Gregson (1989) remarked on the close similarity of *O. fumosa* and *O. jeanae* to *O. feredayi* as adults and suggested the three species be synonymised. At that time (1989), males of *O. fumosa* and *O. jeanae* were known only from the type series.

Patrick (1994) rediscovered *O. fumosa* in a stream below Swampy Summit, Dunedin, close to its probable type locality, and found the adults to be active in the day-time, but not attracted to a light trap. *O. feredayi* is purely nocturnal, and can be collected in large numbers in a light trap at 0.5-1.0 h after sunset (Ward *et al.* 1996). Patrick concluded that *O. feredayi* and *O. fumosa* were indeed distinct species on the basis of colour, size, male

genitalia, adult activity and habitat.

A characteristic, derived feature of the genus *Olinga* is the presence on the male forewing of a "longitudinal pouch" (McLachlan 1868, p. 197) running along the Cu2 vein and gradually approaching the wing's rear margin (dorsum) (Fig. 1a). Near the wing's outer rear angle (tornus), the pouch connects into an "impressed furrow" which parallels the wing's outer margin (termen). Both pouch and furrow contain androconia (modified setae), perhaps functioning to diffuse pheromones. Androconia also occur on the forewing membrane, and as localised tufts near the base of the forewing. The pouch and furrow join smoothly and we refer to them collectively in this paper as the "groove", which has two parts, dorsal and terminal.

Androconia are found in many trichopteran families but have been studied in only a few species (e.g. Moretti & Bicchierai 1981). They can occur on the forewing upper or lower surfaces, hindwing upper surface, within abdominal pouches or on the genitalia. In the New Zealand trichopteran fauna, androconia have been reported in *Pseudoecones* Mosely, 1953 and *Zepsyche acinaces* McFarlane, 1960 (Oeconesidae), *Oecetis iti* McFarlane 1964 (Leptoceridae), *Philorheithrus* species (Philorheithridae) and *Alloecentrella* species (Calocidae) (both of Henderson 1985) and they will undoubtedly be found on other species when these are examined under high magnification.

This paper summarises the diagnostic differences between adult males of the four *Olinga* species.

MATERIALS AND METHODS

The light trapping of caddis adults was carried out using a flat plastic dish of 50-70% industrial methylated spirit in water, and a 6 W ultraviolet fluorescent tube. This and other procedures are described in Ward (1995). Site coordinates are from the metric grid on the 1:50 000 NZMS260 series of maps; latitude and longitude are also given. The two-letter abbreviations for New Zealand regions are listed in Crosby *et al.* (1976).

Caddis wings, selected for the SEM study, were transferred from the storage medium of

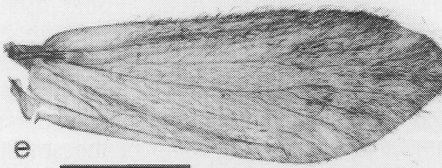
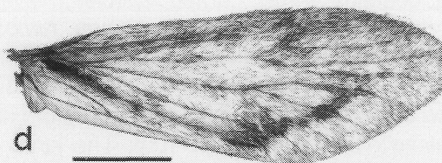
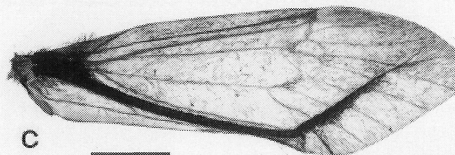
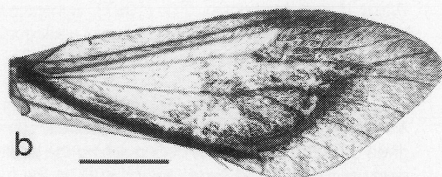
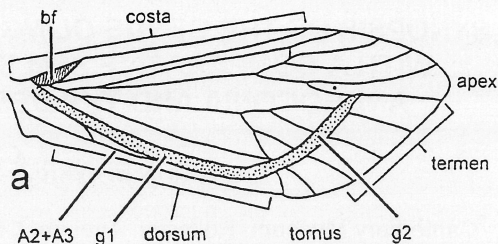


Figure 1. Male *Olinga* forewings a. Drawing, showing diagnostic features. b. - e. Optical micrographs by transmitted light. b. *O. feredayi* (Dog Stream). c. *O. jeanae* (Dog Stream). d. *O. fumosa* (McQuillans Creek). e. *O. christinae* paratype (Maungatika). Scale bars = 2 mm. Symbols: bf = basal fold of costa, g1 and g2 = dorsal and terminal parts of groove.

80% ethanol into 90% and 100% (twice) ethanol with several hours in each solution. When fully dehydrated, they were dried, out of alcohol, in a vacuum desiccator overnight. To prevent curling of the wing margins during drying, some wings were secured flat under the weight of a piece of glass slide. The dried wings were mounted on 1 cm aluminium stubs using conductive carbon glue and sputter-coated with 50 nm of gold, prior to viewing with a Leica S440 SEM. The microscope was operated at accelerating voltages of 10-20 kV, and micrographs were taken using Ilford FP4 Plus film. To increase the electron density of some specimens where flaring was a problem, additional samples were prepared by fixation in osmium tetroxide. After re-hydration from 80% ethanol through 70% and 50% ethanol into distilled water, with several hours in each solution, they were placed in 2% OsO₄ for 4 hr, washed in distilled water, then dehydrated and dried as described above.

Wings observed and photographed using the light microscope were mounted dry on glass slides, held flat under a cover slip secured with beeswax and shellac. A Wild M400 stereo microscope was used for viewing the samples, and photographs taken using Ilford Pan F film.

All wing length measurements are averages, in mm, with sd = standard deviation and n = number in the sample. Measurements of male forewing vestiture, however, are taken from one or just a few examples on the SEM micrographs and should be regarded as approximate estimates.

MORPHOLOGY AND SYSTEMATICS

FOREWING VESTITURE OF *OLINGA* MALES

The "normal" male forewing vestiture (i.e. of areas where there are no androconia) of all four *Olinga* species consists of two kinds of hairs (Fig. 2): microtrichia, which are short, curved, tapering, about 0.4 μm wide at their maximum and about 7 μm long; and macrotrichia, about 2 μm wide and 65 μm long, widest in the middle and tapering towards each end. This type of vestiture is found in all four *Olinga* species in the areas between the groove and the wing edges (dorsum, termen). Within the groove, the microtrichia are almost

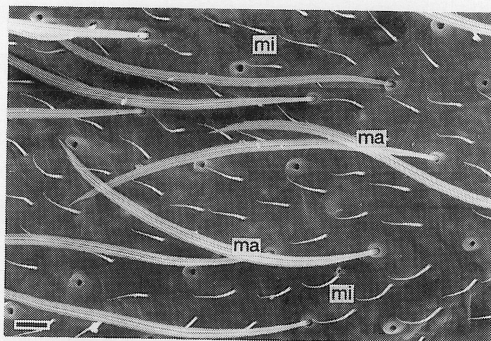


Figure 2. SEM micrograph of male *Olinga feredayi* (Dog Stream) forewing in the region between the groove and the termen. Scale bar = 5 μm . Symbols: ma = macrotrichia, mi = microtrichia.

or completely absent and the macrotrichia have been replaced by androconia, of a shape characteristic for each species (Figs 3a, 4a, 5a, 6a).

In the central region of the forewing proximal to the groove, the microtrichia are present. The macrotrichia have again been largely or completely replaced by shorter and wider androconia, but these are of a shape different from those in the groove (Figs 3b, 4b, 5b, 6b).

These androconia are easily abraded from the wing and it is common to find, e.g. in a light-trap catch, male specimens of *O. feredayi* or *O. jeanae* with the forewings almost denuded of androconia. Those in the wing centre are more easily lost than those in the groove.

COMPARISON OF *OLINGA FEREDAYI* WITH *O. JEANAE*

McFarlane (1966) described *Olinga jeanae* from adults caught at MC Reservoir Bush, Cass on 30 December 1964 by his granddaughter Jean McFarlane. The type series comprises the male LECTOTYPE, seven male and two female PARALECTOTYPES (all hereby assigned) and is held in Canterbury Museum. Storage is in alcohol, plus three slides of wings mounted dry. Apart from the types, McFarlane never identified any other male specimens as this species, although he did identify some later catches of larvae and females as *O. jeanae*. No other workers have assigned specimens of caddis adults to this taxon.

In order to assess the status of this

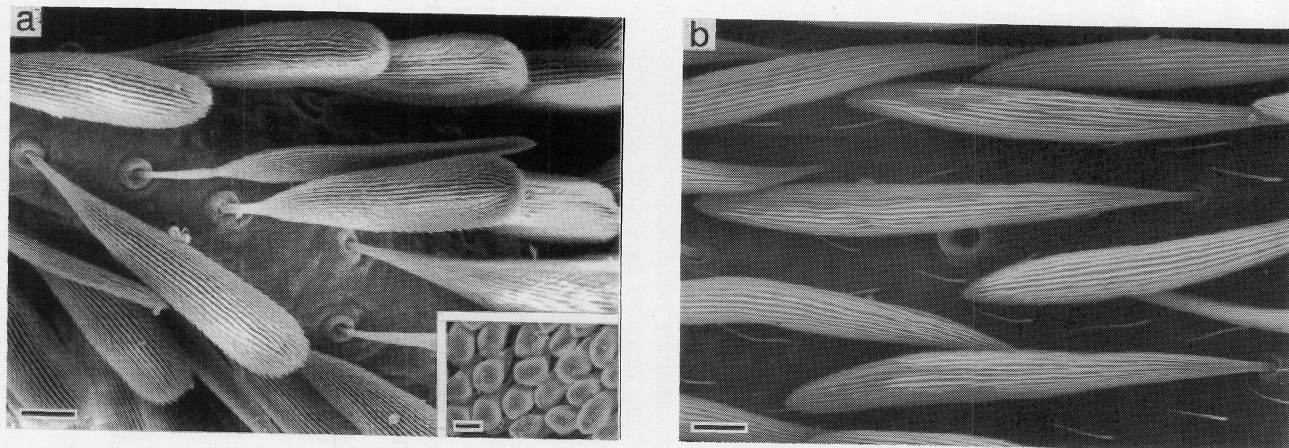


Figure 3. SEM micrographs of upper surface of male *Olinga feredayi* (Dog Stream) forewing. a. within groove at angle. b. near centre of wing. Inset shows typical close packing of androconia in the groove. Scale bars = 5 μ m.

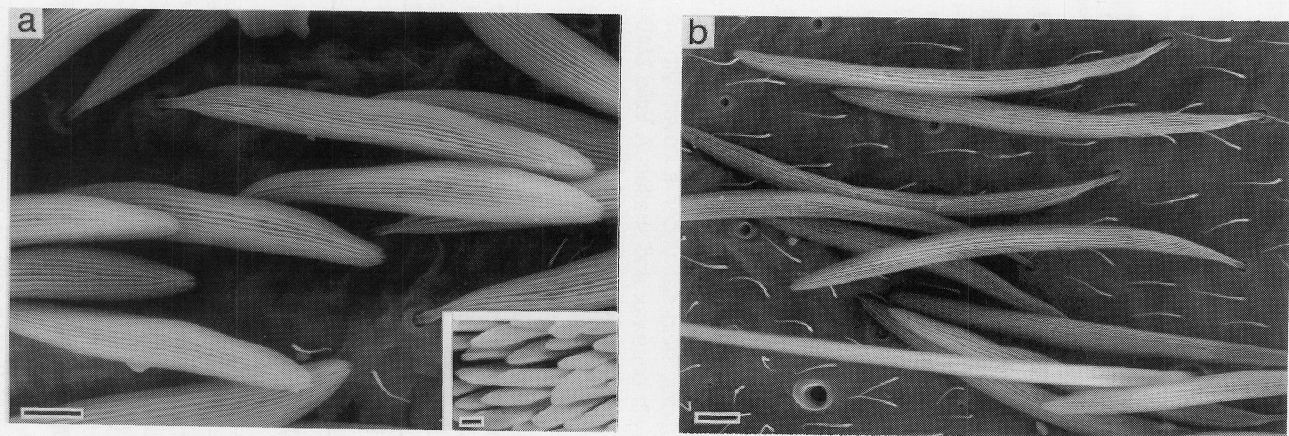


Figure 4. SEM micrographs of upper surface of male *Olinga jeanae* (Dog Stream) forewing. a. within groove just beyond angle. b. near centre of wing. Inset shows typical close arrangement of androconia within the groove. Scale bars = 5 μ m.

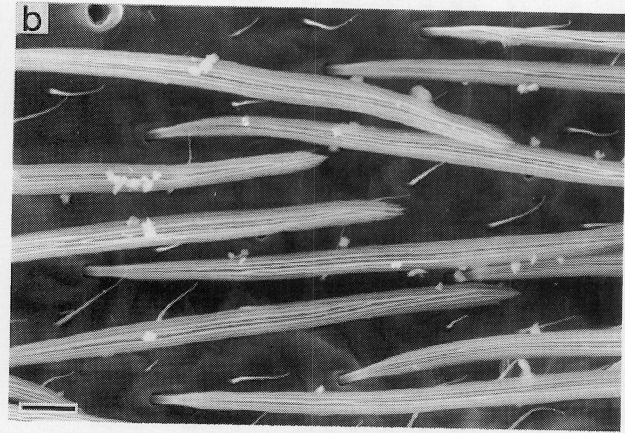
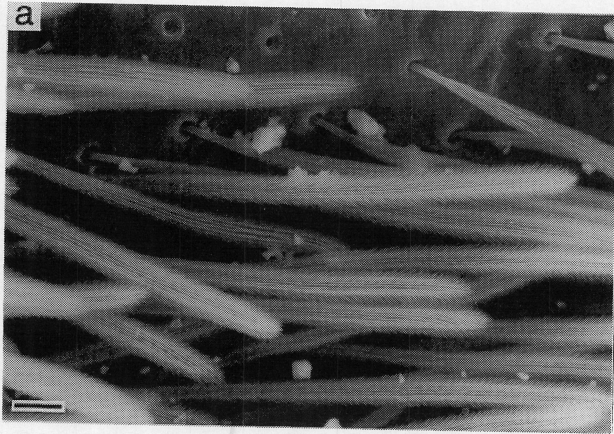


Figure 5. SEM micrographs of upper surface of male *Olinga fumosa* (McQuilkans Creek) forewing. a. within groove near angle. b. near centre of wing. Scale bars = 5 μ m.

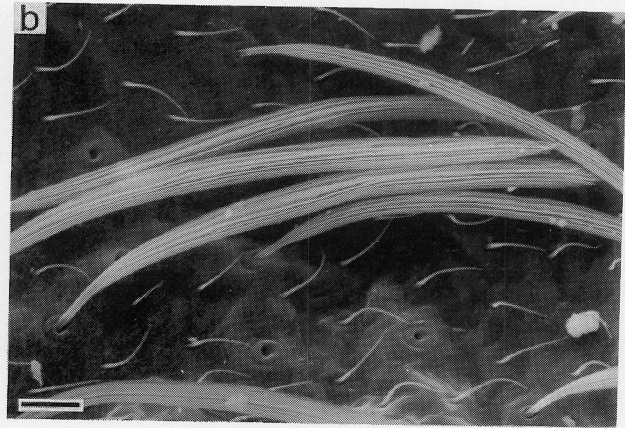
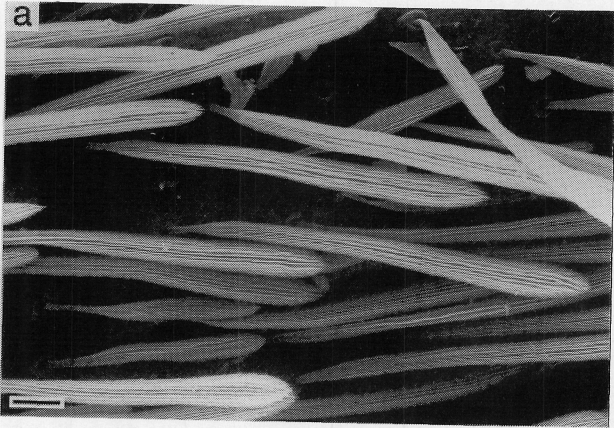


Figure 6. SEM micrographs of upper surface of male *Olinga christinae* paratype (Maungatika) forewing. a. within groove. b. at centre of wing. Scale bars = 5 μ m.

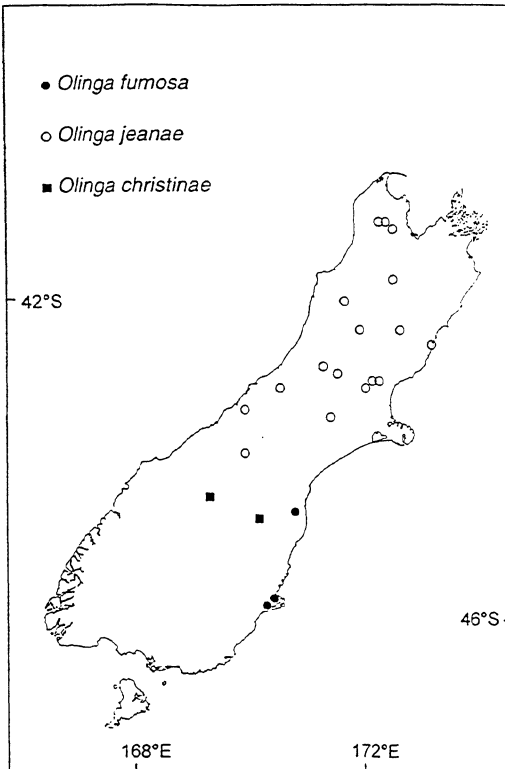


Figure 7. Map of the South Island of New Zealand showing collection sites of *Olinga fumosa*, *O. jeanae* and *O. christinae*, based on the NZMS260 metric grid with site locations rounded to the nearest 10 km. (Note that *O. feredayi* is distributed throughout the North and South Islands of New Zealand and its collection sites are not shown).

species, J.B. Ward re-examined the *O. jeanae* type material and checked all male specimens of *Olinga* in the Canterbury Museum Collection (54 catches, about 250 specimens) using the characters given by McFarlane (1966). I.M. Henderson similarly examined all the male *Olinga* in his personal collection (36 catches, about 200 specimens). We identified males of *O. jeanae* from eleven additional localities. Catches of *O. jeanae* during last summer have revealed another six locations. All known sites are shown in Fig. 7; they range over the northern two-thirds of the South Island from Nelson to the Mackenzie Basin and from Westland to the Canterbury foothills and Kaikoura, and in altitude from 100 to 1160 m. There have been no males captured at North Island sites, although McFarlane labelled as *O. jeanae* some

catches of larvae and/or adult females from Banks Peninsula and from several North Island sites. These identifications need to be confirmed by the capture of males.

In comparing *O. jeanae* with *O. feredayi*, McFarlane (1966, p. 144) stated that "...the habitats are distinctive, that of [*O. jeanae*] being in swift rocky streams in deep bush while *O. feredayi* occupies less swift streams in open country". We have found this to be true in at least some sites: e.g. a light-trap catch of 16 *Olinga* males from MB Dog Stream in Hanmer Springs at the Jollies Pass Road bridge, altitude 390 m (14 December 1990, J.B. and G.M. Ward) were all *O. feredayi*. The site is semi-open and the stream, emerging from exotic forest, is about 4 m wide, with a bed of 2-20 cm diameter pebbles and a gradient of 1:40. By comparison, 12 males light-trapped on the same night beside the upper part of the same stream at the end of Mullans Road, altitude 490 m, were all *O. jeanae*. Here Dog Stream is about 2.5 m wide with an average gradient of 1:5. It runs through beech forest in a bed of rocky shelves and stones mostly larger than 10 cm diameter. *O. jeanae* has also been collected from small forested streams in the Canterbury foothills (Coopers Creek; Glentui River; Okuku River tributary; Grey River), where the species appears to be widely-distributed.

In addition to habitat differences, McFarlane (1966, p. 144) used the following morphological features to define *O. jeanae* in comparison with *O. feredayi*: 1. Larger size. 2. Forewing anal veins "a little more clearly visible (not partly involved by the groove)". 3. Scales [androconia] "more slender and more sparse and lighter in colour, both on the wing membranes and in the groove." 4. "Inferior appendages shorter and more robust, bulging basally mesiad". 5. Segment X chitinised processes (= upper penis cover of Mosely and Kimmins 1953, p. 130) "relatively longer than those of *O. feredayi*". A re-assessment of these characters using the additional *O. jeanae* material now available indicates the following:

1. *Forewing length*: for the Dog Stream catches: *O. jeanae* males 11.5 mm (sd = 0.6 mm, n = 12); *O. feredayi* males 10.5 mm (sd = 0.5 mm, n = 16). Thus *O. jeanae* males > *O.*

feredayi males by about 1 mm, but the size distributions of the two overlap.

2. *Forewing anal veins and groove*: in *O. feredayi*, the A2+A3 vein runs freely for a short distance before entering the groove (Figs 1a, 1b). This distance is longer in *O. jeanae* (Fig. 1c). However, there is some variation between individuals and this character does not appear to be useful in practice.

3. *Forewing androconia*: in *O. feredayi*, the androconia in the groove are shaped rather like baseball bats i.e. widest distally, tapering gradually to their points of attachment. Their maximum width is about 7 μm and length about 35 μm (Fig. 3a). They are packed very closely together (Fig. 3a inset). Over the centre of the wing, the androconia are narrower and longer, about 4.5 X 45 μm (Fig. 3b). In *O. jeanae*, the androconia in the groove are

somewhat herring-shaped, i.e. widest in the closely and in contact (Fig. 4a inset). Those in middle and tapering towards each end, about 4.5 X 45 μm (Fig. 4a). They also are packed very the wing centre are more elongated, about 3.5 X 60 μm (Fig. 4b).

4. *Inferior appendages*: in side view, broader and slightly straighter in *O. jeanae* (cf. McFarlane 1966, Fig. 18 with Mosely & Kimmins 1953, Fig. 85c). In ventral view, narrowing much more abruptly at the halfway point in *O. feredayi* (cf. McFarlane 1966, Fig. 20 with Mosely & Kimmins 1953, Fig. 85e).

5. *Upper penis cover*: (upc in Figs 8d, 8e of *O. christinae*). This feature is approximately the same size and shape in both species and McFarlane's character does not appear to be valid.

The following additional characters have

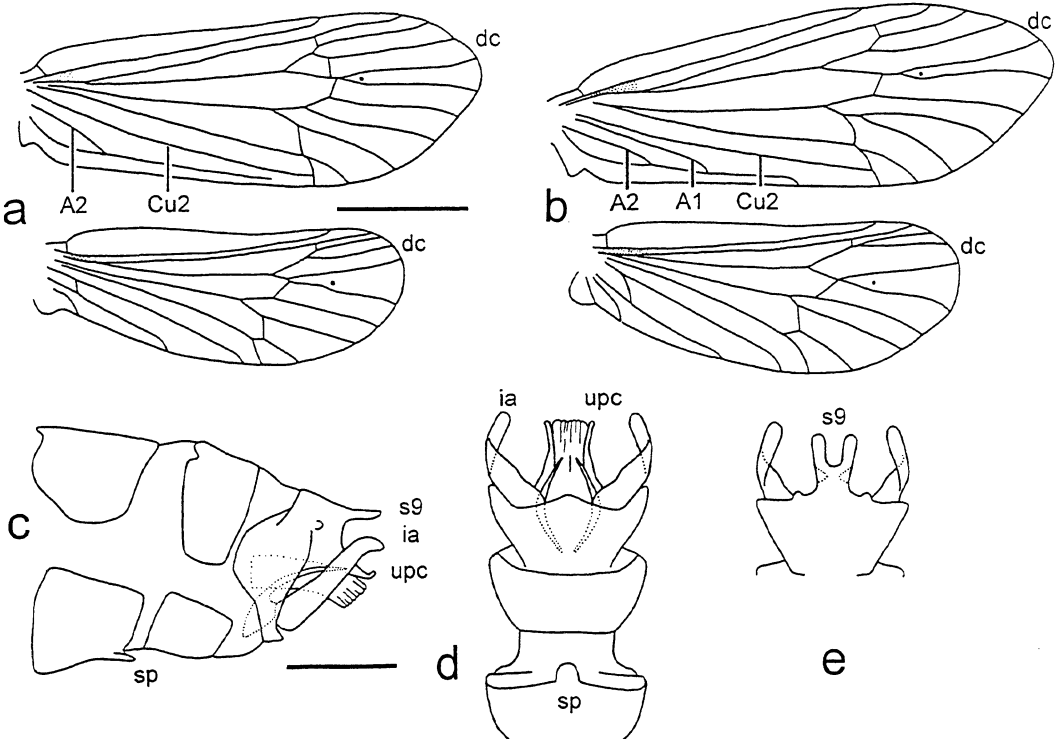


Figure 8. Drawings of *Olinga christinae* paratypes. a. male wings. b. female wings. c. male abdominal segments 7-10, left lateral. d. same, ventral. e. same, segments 9-10, dorsal (lower part of segment 10 omitted). Scale bars: wings = 2 mm, abdomen = 0.5 mm. Symbols: dc = discoidal cell, ia = inferior appendages, s9 = segment 9 projections, sp = spatulate process of sternite 7, upc = upper penis cover.

been discovered.

6. *Forewing basal costal fold-over:* (Fig.1a). The base of the forewing costal region (anterior margin) is greatly expanded and folded over dorsally, such that the costa overlaps the Sc or R1 veins in *O. feredayi* (Fig. 1b). It is deeper in *O. jeanae*, with the costa overlapping the M or Cu veins (Fig. 1c).

7. *Shape and width of the forewing groove:* the groove is deeper and narrower in *O. jeanae* than in *O. feredayi*. The two parts (dorsal, terminal) meet at a definite angle, and the terminal part is almost straight in *O. jeanae* (Fig. 1c); in *O. feredayi* the two parts are smoothly curved at the join, and the terminal part is curved (Fig. 1b).

We have found it possible to differentiate clearly between males of *O. jeanae* and *O. feredayi* using characters 3, 4, 6 and 7 above. The wide *O. feredayi* androconia show very clearly at 20-40X magnification (Fig. 1b), while the narrower *O. jeanae* androconia are less obvious (Fig.1c). No intermediate specimens have been found. We therefore conclude that *Olinga jeanae* McFarlane, 1966 is a valid species, distinct from *Olinga feredayi* (McLachlan, 1868). We recommend that more work be done to establish characters for separating the females and larvae of the two species.

OLINGA FUMOSA WISE, 1958

Wise (1958, p. 52-53) described *Olinga fumosa* from a male specimen caught by C.E. Clarke and deposited in the Auckland Museum Collection. He contrasted it with *O. feredayi* as "...smaller and darker and with differences in the genitalia and process of the seventh sternite." There is another male specimen of *O. fumosa* in the Museum of New Zealand Collection (pinned, with exuviae in a gelatine capsule), with a printed label "Waitati P. Line" and "25/11/21" added in ink. No collector's name is given, but the writing resembles that of W.G. Howes (K.A.J. Wise, pers. comm.). Howes is known to have kept an aquarium and bred caddis, e.g. *Helicopsyche howesi* Tillyard, 1924.

Apparently, no further adults of *O. fumosa* were collected until December 1992, when B.H. Patrick rediscovered the species at 320 m on McQuilkans Creek below Swampy Summit, in the Dunedin area close to its presumed type

locality (the pipeline from the Waitati River). Patrick (1994) used his observations to report on the differences between *O. fumosa* and *O. feredayi* adults in colour, appearance, size, activity and habitat, as follows.

The *O. fumosa* male forewing (Fig. 1d) is slenderer, shorter by about 1 mm, its apex more pointed, its colour uniform black (grey-brown in *O. feredayi*) with an orange groove with its terminal part at a larger angle to the dorsal part than in *O. feredayi*. *O. fumosa* adults were active by day. Patrick observed them at rest on rocks just above the water surface, flying readily in the sunshine when disturbed. However, they were not attracted to a light trap at the same site at night. McQuilkans Creek at this point is small, open, flowing amongst 50 - 100 cm diameter rocks. Patrick's colour photograph of a male *O. fumosa* appears in "Wild Dunedin" (Peat & Patrick 1995, p. 8).

The difference in the male genitalia is as follows: in *O. fumosa*, the inferior appendages in ventral view have an obtuse angle on their inner margin (much sharper in *O. feredayi* and *O. jeanae*) and the spatulate appendage on sternite 9 is smaller (cf. Wise 1958, Figs 6c, 6d; McFarlane 1966, Fig. 20; Mosely & Kimmins 1953, Fig. 85e).

The male forewing androconia are as follows: in the groove, they are about 55 μm long by 3 μm wide, parallel-sided for most of their length, with a very furry (fimbriate) surface (Fig. 5a). Over the wing centre the androconia are also about 55 X 3 μm but with an almost smooth surface (Fig. 5b). Basally, the costal area is turned upwards but not folded over (the small fold shown in Fig. 1d results from the mounting procedure).

Last summer, J.B. and G.M.Ward discovered *O. fumosa* in two additional places near Waimate, South Canterbury (Fig. 7). At the SC Gunns Bush site, J40 475138, 44°40'00"S, 170°57'05"E, 305 m, 26 December 1996, the habitat was similar to that at DN McQuilkans Creek, namely, an open situation with the stream flowing around 20-100 cm diameter rocks. On a warm, sunny day the caddis were active, resting on rocks close to the water, easily disturbed and hard to catch. At SC Waimate Creek tributary, Kelceys Bush, J40 488099, 44°42'10"S, 170°58'00"E, 215 m, no adults

were seen during the day, but a male and female adult were caught in a light trap on 25 December 1996 and another pair was taken at rest on the outside of the trap. Nine male and 7 female *O. feredayi* were also in the trap. The site was covered by dense regenerating native forest and the stream was about 1 m wide. The trap was 200 m from another light trap on the much wider and more open Waimate Creek. This second trap caught many males and females of *O. feredayi* and one female *O. fumosa* on the same night.

OLINGA CHRISTINAE NEW SPECIES (Figs 1e, 6-8)

Diagnosis: a small, dark, conoesucid caddis from the northern Otago greywacke mountains. Superficially similar to *Periwinkla childi* McFarlane, 1973 in size and colour, but forewings more rounded and with a pale line parallel to rear margin in males. Genitalia closest to *O. fumosa*, but tergite 9 projections broader and more rounded, inner margins of inferior appendages almost straight in ventral view.

Etymology: dedicated, on Brian Patrick's suggestion, to his wife Christine for her continued support of his scientific work and for her company on field trips.

Known distribution: CO: St Marys Range near Kurow. OL: Maungatika, east of Lake Hawea.

Habitat: at Maungatika, tam in high alpine grassland. Adults found under 10-20 cm diameter stones at outlet stream. Mass emergence of adults but none seen flying. St Marys Range: pupae attached to stones in small tam edged with prostrate *Epilobium*, in a grass and herb field.

Type series: HOLOTYPE male, PARATYPES as follows: 2 males (pinned, Canterbury Museum), 13 males and 22 females (alcohol, Canterbury Museum), 2 males and 2 females (pinned, Brian Patrick collection), OL Maungatika, tam outlet str, NZMS260 G39 284314, 44°29'S, 169°28'E, 1600 m, 13 February 1992, B.H.Patrick.

None-type material: 4 pupae, 1 larva and 1 empty pupal case (alcohol), same data as type series. 38 pupae + cases (alcohol), 14 empty pupal cases (card), CO St Marys Range, tam, NZMS260 140 958980, 44°47'45"S, 170°17'34"E, 1610 m, 19 February 1989, J.B.

and G.M.Ward. All in Canterbury Museum.

Description: forewing length: males 6.8 mm (sd = 0.4 mm, n = 14), females 7.8 mm (sd = 0.4 mm, n = 22). Membrane pale grey, vestiture dark brown. Shallow dorsal groove along the Cu₂ vein filled with whitish hairs; part of groove parallel to the termen (present in the other *Olinga* species) missing in *O. christinae*. SEM micrographs show that the androconia within the groove are about 3.5 µm wide at their maximum, tapering gradually from their distal ends, and about 45 µm long (Fig. 6a). In the wing centre, the androconia are about 3 µm wide at their maximum, tapering towards each end, about 55 µm long (Fig. 6b). Costal area not expanded nor folded over. Venation (Figs 8a, 8b) similar in both sexes, except that the A1 vein is missing in the male. (An examination of de-haired forewings shows that A1 is similarly missing in the male forewings of *O. feredayi*, *O. jeanae* and *O. fumosa*). Venation somewhat variable; discoidal cell (dc) cross-vein in both fore- and hindwings often absent. Body black on top, sternites paler. Male maxillary palpi as in other *Olinga* species i.e. two-segmented, upwards-pointing, long thick hair tuft on basal segment.

Male genitalia (Figs 8c-8e) closest to *O. fumosa*, but segment 9 projections more rounded in dorsal view, and inner margin of inferior appendages almost straight in ventral view, cf. Figs 8d, 8e with Wise (1958, Fig. 6b, 6c). Sternite 7 with a small spatulate process, as in *O. fumosa*.

Remarks: this is the "new undescribed species of *Olinga*" of Patrick (1994, p. 79). It was accompanied at Maungatika by larvae of *Hudsonema aliena* (McLachlan, 1868) and adults of *Hydrobiosis kiddi* McFarlane, 1951. The species was accompanied in the St Marys Range tam by larvae of *Psilochorema cheirodes* McFarlane, 1981 and *Hudsonema aliena*. No adults of *O. christinae* were caught at this second site, but the genitalia of the male pupae collected there are very similar to those of the types.

CONCLUSIONS

There are four *Olinga* species, identifiable by the characters listed below.

Forewing colour, size and vestiture: *O. feredayi*, grey-brown with orange groove curved at and beyond tomos, androconia broad and clearly visible over centre of wing (easily abraded and can be missing); *O. jeanae*, also grey-brown, slightly longer forewing, orange groove with a definite angle at tomos, straight beyond, androconia narrower and not so obvious; *O. fumosa* forewing shorter and more pointed, black with an orange groove; *O. christinae*, even shorter, dark brown, groove whitish and extending only to tomos.

Male genitalia: *O. feredayi* and *O. jeanae* inferior appendages viewed ventrally abruptly narrowing at half their length; *O. fumosa* and *O. christinae*, narrowing more gradually.

Habitat: *O. feredayi*, medium to large open, low gradient stony streams; *O. jeanae* smaller, faster streams in forest; *O. fumosa* small bouldery streams at ca. 300 m, open or in forest; *O. christinae* tarns and outlet streams at ca. 1600 m.

ACKNOWLEDGEMENTS

The authors gratefully acknowledge Ian Henderson (Massey University), Peter Johns and Mike Winterbourn (University of Canterbury), Brian Patrick (Department of Conservation, Dunedin) and Keith Wise (Auckland Museum) who read the preliminary draft; their suggestions have greatly improved it. Ian Henderson discovered the characters in the forewing groove shape that differentiate *O. feredayi* from *O. jeanae*. We are also grateful for the support provided by the Canterbury Museum Trust Board. Brian Patrick thanks Mike Clare (Department of Conservation, Canterbury) for his company on the Maungatika expedition and Guy and Davina Mead (Dingleburn Station) for helicopter transport to the site.

REFERENCES

Bishop, N. (1992). Natural History of New Zealand. Hodder and Stoughton, Auckland, New Zealand. 199 pp.
 Cowley, D. R. (1978). Studies on the larvae of New Zealand Trichoptera. *New Zealand Journal of Zoology* 5: 639-750.

Crosby, T. K., Dugdale, J. S. & Watt, J. C. (1976). Recording specimen localities in New Zealand: an arbitrary system of areas and codes defined. *New Zealand Journal of Zoology* 3: 69 + map.
 Foord, M. (1990). The New Zealand Descriptive Animal Dictionary. Published by the author, 39 Park Street, Dunedin 9001, New Zealand. 502 pp.
 Henderson, I. M. (1985). Systematic studies of New Zealand Trichoptera and critical analysis of systematic methods. Unpublished Ph.D. thesis, Victoria University of Wellington, New Zealand. 340 pp.
 McFarlane, A. G. (1966). New Zealand Trichoptera (part 6). *Records of the Canterbury Museum* 8: 137-161.
 McLachlan, R. (1868). On some new forms of trichopterous insects from New Zealand; with a list of the species known to inhabit those colonies. *Journal of the Linnean Society of London, Zoology* 10: 196-214, 1 plate.
 Moretti, G. P. & Bicchierai, M. C. (1981). Comparative SEM and TEM studies on the androconial structures of *Lasiocephala basalis* Kol. and other Trichoptera. In *Proceedings of the Third International Symposium on Trichoptera* (ed. G.P. Moretti), pp 193-198. W. Junk Publishers, The Hague.
 Mosely, M. E. & Kimmins, D. E. (1953). The Trichoptera (caddis-flies) of Australia and New Zealand. British Museum (Natural History), London. 550 pp.
 Patrick, B. H. (1994). A reassessment of the status of *Olinga fumosa* Wise, 1958 (Trichoptera: Conoesucidae) as a valid species. *New Zealand Entomologist* 17: 78-80.
 Peat, N. & Patrick, B. H. (1995). Wild Dunedin: enjoying the natural history of New Zealand's wildlife capital. University of Otago Press, Dunedin, New Zealand. 144 pp.
 Tillyard, R. J. (1924). Studies of New Zealand Trichoptera, or caddis-flies. No. 2. Descriptions of new genera and species. *Transactions and Proceedings of the New Zealand Institute* 55: 285-314; 1 plate.
 Ward, J. B. (1995). Nine new species of New Zealand caddis (Trichoptera). *New Zealand Journal of Zoology* 22: 91-103.
 Ward, J. B. & Henderson, I. M. (1993). The

- New Zealand Trichoptera database. *The Weta* 16: 10-11.
- Ward, J. B., Patrick, B. H., Henderson, I. M. & Norrie, P. H. (1996). Seasonality, sex ratios and arrival pattern of some New Zealand caddis (Trichoptera) to light-traps. *Aquatic Insects* 18: 157-174.
- Winterbourn, M. J. (1978). The macroinvertebrate fauna of a New Zealand forest stream. *New Zealand Journal of Zoology* 5: 157-169.
- Winterbourn, M. J. & Gregson, K. L. D. (1989). Guide to the aquatic insects of New Zealand. *Bulletin of the Entomological Society of New Zealand* 9: 1-95.
- Winterbourn, M. J. & Mason, K. (1983). Freshwater Life: streams, ponds, swamps, lakes and rivers. Reed, Wellington. 76 pp.
- Wise, K. A. J. (1958). Trichoptera of New Zealand. 1. A catalogue of the Auckland Museum collection with descriptions of new genera and new species. *Records of the Auckland Institute and Museum* 5(1,2): 49-63.