



***Cowanomyia hillaryi* gen. et sp. n., a remarkable new gnoristine (Diptera: Mycetophilidae: Sciophilinae) from New Zealand**

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Abstract

A new genus and a new species, *Cowanomyia hillaryi* **gen. et sp. n.**, of Gnoristini (Mycetophilidae: Sciophilinae) is described from New Zealand. A striking feature of *Cowanomyia* is the one-branched media in combination with the furcate anterior cubitus, which is a pattern found among Mycetophilidae only in *Adicroneura*. *Cowanomyia* and *Adicroneura* are evidently not closely related. The position of *Cowanomyia* among world Gnoristini, as presently known, remains unresolved for the time being.

Key words: Diptera, Mycetophilidae, Gnoristini, new genus, new species, wing venation, New Zealand

Introduction

The wing venation of Mycetophilidae typically includes two forks, an anterior (median) and a posterior (cubital) fork (e. g. Sjøli *et al.* 2000: fig. 44). This pattern is variously modified in different mycetophilid lineages. Occasionally forks are incomplete, with one of the tines being evanescent basally or one of the median or cubital branches totally missing. A striking number of variants of this pattern are realized among mycetophilids, many of which are independently derived. One of the wing venation patterns, however, is found only once: the one-branched media in combination with the furcate cubitus as met in *Adicroneura* Vockeroth 1980 (Vockeroth 1980: fig. 4). This genus has two species in the southern Neotropics (south Chile), *A. meridionalis* Matile 1995 and *A. disjuncta* Matile 1995, besides the type species, *A. biocellata* Vockeroth 1980 from the Nearctic Region (Oregon). One may dispute whether *Adicroneura* is monophyletic. In any case, an *Adicroneura*-like vein pattern is found also among Mycetophilidae of New Zealand, in a single new species that is here classified in a new genus, *Cowanomyia hillaryi*. In the following we describe the new taxa and discuss the affinity of *Cowanomyia* to other mycetophilids.

Among the Mycetophilidae in New Zealand *Cowanomyia* is unmistakable, but its venation is almost identical to that of the supertribe Micromyidi in the Lestremiinae (wood midges), a subfamily of Cecidomyiidae (gall midges). The only differences in venation between Micromyidi and *Cowanomyia* are the presence of two anal branches in the mycetophilid (Micromyidi usually lack anal veins) and a costal break at the juncture with R5 in Micromyidi (as well as in most other Lestremiinae, while Mycetophilidae lack that break). There are other differences of course, such as the presence of tibial spurs in the mycetophilid and the absence of those in the cecidomyiid. Micromyidi are abundant in New Zealand (cf. Jaschhof & Jaschhof 2003, 2004a, b), while *Cowanomyia* is apparently a great rarity.

Material and methods

The three specimens available for study were collected by Alexander B. Miller (at that time Park Ranger with the Westland National Park in Franz Josef Glacier) in Westland, New Zealand's South Island, in 1982. They were picked, together with other fungus gnats, from unsorted Malaise samples deposited with the New Zealand Arthropod Collection (NZAC) during our visit there in 2002. We mounted the specimens in Canada balsam for light microscope study, following the procedure outlined by Jaschhof and Jaschhof (2009). Morphological terminology, including abbreviations, follows largely Sjøli et al. (2000) and, for a few additional terms, Jaschhof & Kallweit (2009). Types are deposited in NZAC, Tamaki, Auckland, New Zealand, and in the Senckenberg Naturhistorische Sammlungen, Museum für Tierkunde, Dresden, Germany (SMTD).

Taxonomy

Cowanomyia Jaschhof & Jaschhof new genus

Type species. Cowanomyia hillaryi Jaschhof & Jaschhof new species, by monotypy.

Diagnosis. This new genus includes a single species of which males are only 1.5 mm long and of dark brown color, the legs being somewhat lighter than thorax and abdomen. Wing venation is characterized by presence of only 1 medial branch in combination with a furcate cubitus (Fig. 3), which is an unusual pattern among Gnoristini and other Mycetophilidae. Further characters in combination add to the generic distinctiveness: the presence of 3 ocelli; the enlarged proepimeron; the faint, free-ending Sc; the short R1; and the absence of setae on the wing membrane. Females and preimaginal stages are unknown.

Description (based on males). **Head.** Figs 1–2. In lateral view head capsule higher than long, slightly flattened on top. Foramen situated above midheight of head. Median convexities of postgenae membranous. Frons asetose, in lateral profile strongly protruding. Frontal tubercle 2-pointed. Antennae inserted above midheight of head. Scape smaller than pedicel, both setose. Fourteen flagellomeres (Fig. 4), subcylindrical, with short stalks, nodes darker than stalks, slightly longer than wide, covered densely with trichia arising from large, circular basal pores, longest trichia little shorter than width of node, setae absent. Interommatidial setae numerous. Three ocelli in line, the laterals remote from eye margins. Postocular bristles about 8. Face setose, subrectangular, much larger than clypeus. Clypeus narrow, with 2 or so setae. Labrum subtriangular, asetose. Maxillary palpus short, 5-segmented, 2 segments present proximally to presumed third, third segment thickest of all, with sharply delimited mesal pit of sensilla. Premental apodemes fused mesally, with 2 posterior processes. Labellum small.

Thorax. Fig. 5. Proepimeron comparatively large, extending posteriad of proepisternum. Basisternite 1 setose. Scutum with lateral and dorsocentral setae of various sizes. Scutellum with 2 large lateral setae and several smaller setae elsewhere. Mediotergite and laterotergite asetose. Anapleural suture declining posteriorly. Mesopreepisternum setose ventromesally. Anepimeron short, ending far before ventral margin of laterotergite. Mid-pleural pit well developed. Metepisternum finely setose posteroventrally. **Wing.** Fig. 3. Membrane transparent, with dense, irregular microtrichia on both sides, setae absent. C extending much beyond apex of R5 and up to apex of wing. Sc very weak, ending free. R1 short, ending in proximal half of wing. Rs oblique, about as long as r-m, situated in proximal half of wing. R-m oblique. Bm-cu comparatively weak throughout. R5 almost straight. M simple, wide, not sharply delimited from membrane which applies also to CuA. CuA furcate, stem and fork subequal in length. CuP weak, wide, extending to point of furcation of CuA. Both A1 and A2 weak, wide, comparatively long, A2 curved slightly anteriorly. Dorsal setae on R, R1 and R5 proximally. **Legs.** Fore and mid coxae setose, hind coxa with 1–2 setae in upper third and 3–4 setae apically. Femora with setae and microtrichia. Tibiae covered with large microtrichia sparsely intermingled

with setae including 2 sparse rows of strong, semi-erect setae, longest setae shorter than tibial diameter. Fore tibial organ with semicircular rim and regular comb of some 15 trichia. Tibial spurs 1:2:2, with serrated rims, on mid and hind tibiae unequal in length. Mid and hind tarsi with sole of semi-erect setae. Empodia slightly shorter than pretarsal claws. Claws each with 1 large tooth, thus seemingly split in 2 tines.

Abdomen. Segments 1–6 evenly setose, segment 1 short, segments 2–6 longer, subequal in length, only sternites of segments 7–8 visible, setose. Presence of foldlines uncertain. Tergal plaques absent.

Male terminalia. See under *C. hillaryi*.

Etymology. We name this new genus to honour Pat and Arthur B. Cowan of Otorohanga, North Island, New Zealand, for their contribution to forest conservation and restoration in the Waikato region and many other parts of New Zealand. Among manifold other capacities, Arthur was a founding member of the New Zealand Native Forests Restoration Trust and, in spite of being in his nineties now, is still actively involved in pest control and native tree planting.

Cowanomyia hillaryi Jaschhof & Jaschhof new species

(Figs 1–7)

Description. Male. **Head.** Figs 1–2. Antennal flagellomeres 3–5, see Fig. 4.

Thorax. Fig. 5. **Wing.** Fig. 3. Length 1.5 mm.

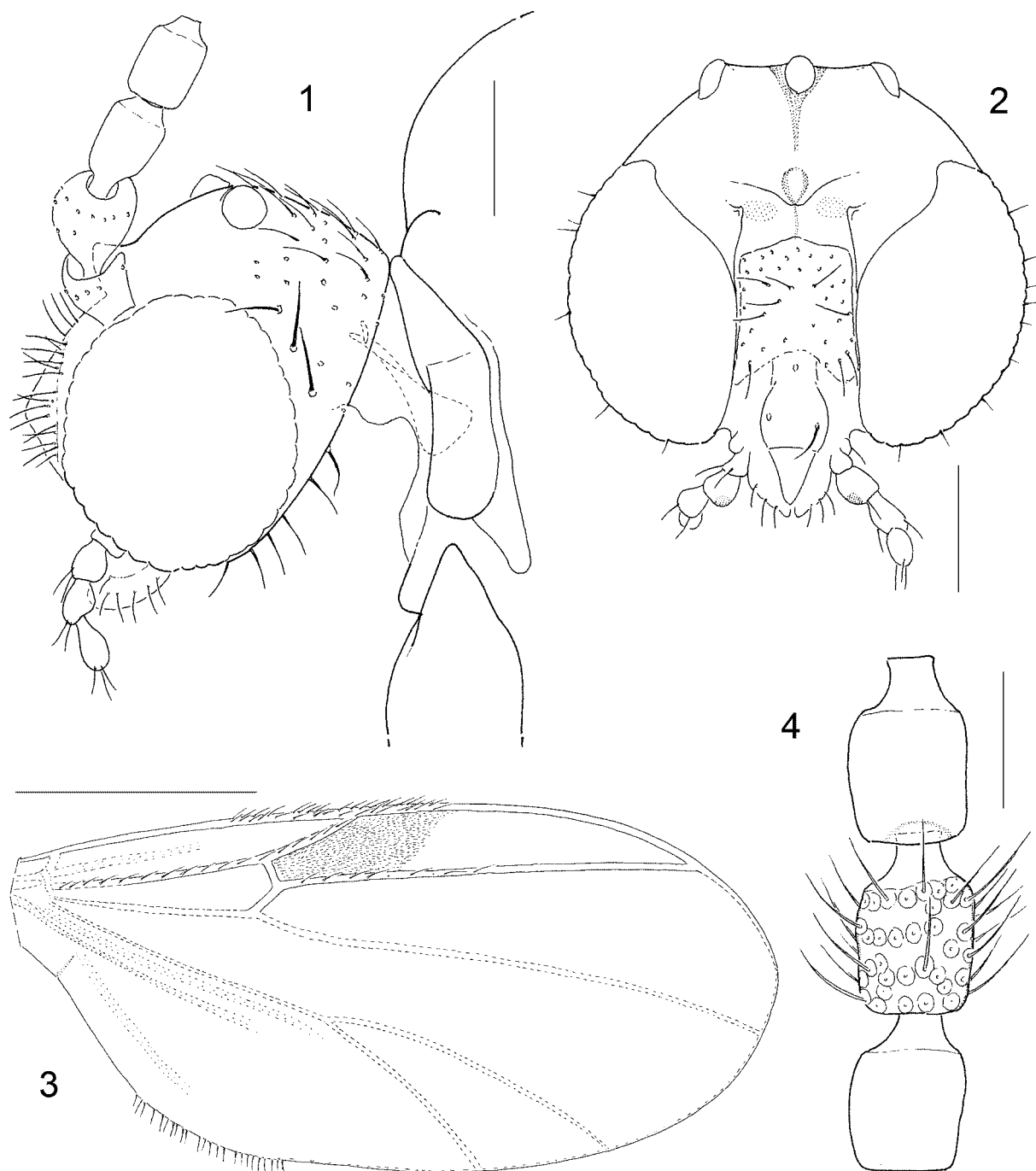
Male terminalia. Figs 6–7. Not rotated. Sternite 9 not traceable. Tergite 9 with straight apical margin and strongly concave basal margin, setae concentrated apicolaterally. Gonocoxites broadly merged ventrobasally, ventrobasal portion without mesal and basal setae; apicolateral processes terminating in narrow, bare projections that cross each other. Gonostylus inserted at midlength of gonocoxite, elongate, narrow, with apical broadening and 2 fine subapical setulae, otherwise bare. Ejaculatory apodeme with rodlike basal portion and complex, rhomb-shaped apical extension. Aedeagus/paramere complex largely membranous. Sternite 10 unipartite, with 2 large apical setae. Cerci rounded, with numerous dorsal and 4 large apical setae.

Etymology. We name this new species in memory of Sir Edmund Hillary, the Patron of the New Zealand Native Forests Restoration Trust until his death in January 2008, and to honour the Trust's dedicated work from which forest-dwelling arthropods, such as fungus gnats, should benefit greatly.

Types. *Holotype.* Male, New Zealand, South Island, Westland, Westland National Park, Canavan's Knob, in grassy clearing in mixed podocarp forest, 140 m, Oct.–Nov. 1982, by Malaise trap, A. B. Miller (in NZAC).

Paratypes. 2 males, same data as the holotype (in NZAC and SMTD).

Discussion. *Cowanomyia* and *Adicroneura* are the only Mycetophilidae known to have only one complete median branch in combination with a furcate anterior cubitus. Apart from that, these two genera have little in common and are evidently not closely related. Even their vein patterns include a number of differences (character states in *Cowanomyia* in parentheses): in *Adicroneura biocellata*, the type species, Sc is strong and reaches C (faint and ending free); R1 is very long and ends far in the distal half of the wing (much shorter and ending in the basal half of the wing); Rs and r-m form almost a right angle (oblique); the basal half of M is very faint (M is comparatively faint throughout); and all longitudinal veins except CuP are described to have dorsal and ventral setae (only dorsal setae present on R, R1 and a part of R5). As regards characters other than those of wing, in *Adicroneura biocellata* the mesal ocellus is missing (present); mediotergite and laterotergites are setose (asetose); the hind coxae bear a vertical row of setae (such row absent); and the fore tibial organ is missing (well developed). There might be further differences, for instance in thorax structure, which however do not become apparent from Vockeroth's description that does not fully illustrate the thorax of *A. biocellata*. Matile (1995) described and discussed a number of morphological differences between *A. biocellata*, on the one hand, and *A. meridionalis* and *disjuncta*, on the other hand. Contrary to his conclusion, we are not convinced that the species from Chile are congeneric with the type species. Further, there is no indication for the affinity of the two Chilean species and *Cowanomyia hillaryi*. If our view is correct, then the *Adicroneura*-like vein pattern must have evolved two or even three times in Mycetophilidae.



FIGURES 1–4. *Cowanomyia hillaryi* **gen. et sp. n.**, male. 1: Head, lateral view. 2: Head, frontal view. 3: Wing, dorsal view, alar microtrichia and marginal setae drawn only partially. 4: Antennal flagellomeres 3–5, lateral view. Length of scale bar = 0.1 mm (for 1 and 2), 0.5 mm (for 3) and 0.05 mm (for 4).

The genus *Cowanomyia* fits well the diagnosis for the Gnoristini as revised by Väisänen (1986: 203), irrespective of the fact that he did not distinguish between apomorphic and plesiomorphic character states. Characters supporting the affiliation of *Cowanomyia* to the Gnoristini are: the presence of 3 ocelli, the laterals distant from the eye margins; the sharply delimited sensory depression on the third palpus segment; the anapleural suture declining posteriorly; the bare mediotergite; the absence of setae on the wing membrane; the short, oblique r-m; CuA with a long stem; and CuA2 evenly bent, not sinuous. Among Gnoristini sensu Väisänen (1986), *Cowanomyia* is peculiar for its enlarged proepimeron; the lack of distinct bare stripes on the

scutum; the faint, free-ending Sc; the short R1; the one-branched media; and the sparsely setose hind coxae. Some of these peculiarities, such as those regarding wings and legs, might result from miniaturisation: *Cowanomyia* males are among the smallest mycetophilids known to us and are actually as small as the micromyid gall midges with which they share the similar venation pattern.



FIGURES 5–7. *Cowanomyia hillaryi* **gen. et sp. n.**, male. 5: Thorax, lateral view. 6: Terminalia, ventral view. 7: Terminalia, dorsal view. Length of scale bar = 0.1 mm (for 5) and 0.05 mm (for 6 and 7).

Due to its peculiar assemblage of characters, the relationship of *Cowanomyia* to other Gnoristini remains obscure. To our knowledge there are no gnoristines in New Zealand and Australia, particularly Tasmania, in

which adult morphology indicates an affinity to *Cowanomyia*. The same applies to the Gnoristini described from other southern hemisphere landmasses, which however are poorly known even on the generic level. For the time being this remarkable new genus holds an undefined position among world Gnoristini, both extant and fossil.

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