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Gynandromorphs of New Zealand *Austrosimulium* spp. (Diptera: Simuliidae)

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Abstract

Investigations in the 1970s of *Leucocytozoon tawaki* Fallis, Bisset & Allison, a blood parasite of New Zealand's Fiordland Crested Penguins (*Eudyptes pachyrhynchus* Gray) - parasites normally transmitted by female simuliids - resulted in the trapping of some 20 thousand female *Austrosimulium* (*Austrosimulium*) adults, attracted to captive penguins. Three species were involved: *Austrosimulium* (*A.*) *australense* (Schiner), *A.* (*A.*) *dumbletoni* Crosby and *A.* (*A.*) *ungulatum* Tonnoir. Of those adults trapped, 24 were gynandromorphs; one other was obtained from elsewhere. *Austrosimulium dumbletoni* has only its female adult described; the two other species have all their stages known. Eight gynandromorphs of *A. dumbletoni* have been identified and elsewhere will be used formally to describe, for the first time, the male of this species. Here, synoptic descriptions of the gynandromorphs are provided.

Key words: Simuliidae, taxonomy, gynandromorphs, *Austrosimulium, dumbletoni, ungulatum, australense, Leucocytozoon*

Introduction

Gynandromorphs are of substantial interest, in part because they are rarely encountered, but in the main because of the unusual juxtaposition of male and female structures, in particular those of the genitalia. Such can provide information on homologies (Adler et al. 2004), particularly when alternate sides are of the other sex (Crosskey 1991).

There are two primary reasons why the gynandromorphs described here are of interest. First, with one exception, the specimens are from an intensive investigation of a bird blood parasite in New Zealand. Up until the early 1970s New Zealand's native avifauna was thought to be free of the genus of cosmopolitan blood parasite *Leucocytozoon*, which (with few exceptions) is transmitted by simuliids (black flies or sandflies) (Fallis et al. 1976). That changed in the mid-1970s when a moulting Fiordland Crested penguin (*Eudyptes pachyrhynchus* Gray) came ashore at Kaikoura (east central South Island)—well removed from the normal moulting grounds of this species (Warham 1974) in Fiordland, on the southwest coast of South Island. This penguin was positive for *Leucocytozoon*. Subsequently, in a major investigation in February 1975 at Jackson Bay, Westland (S43.972° E168.615°), other Fiordland Crested penguins were also found to be positive (Fallis et al. 1976). Moulting penguins were caged and the simuliid adults attracted to the birds captured – then, some hundreds of the insects. Three species were implicated in transmitting the *Leucocytozoon*: *Austrosimulium* (*Austrosimulium*) *ungulatum* Tonnoir, *A.* (*A.*) *australense* (Schiner) and a new species with markedly large females. The *Leucocytozoon*, a new species, was given the specific epithet of *tawaki* by Fallis et al. (1976). The new species of simuliid, a member of the *ungulatum* group, was described by Crosby (1976) as *Austrosimulium* (*Austrosimulium*) *dumbletoni*, to honour L. J. Dumbleton for his earlier work on New Zealand Simuliidae, however, only the female of this species was described, and subsequently no other stage has been found.

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