

# Taxonomic and life history notes on Australian *Nousia* and *Koorrnonga* (Ephemeroptera: Leptophlebiidae)

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A study is underway to revise the taxonomy of two closely related genera of mayflies from the Leptophlebiidae; *Nousia* (Navás 1918) and *Koorrnonga* (Campbell and Suter 1988). Nymphs continue to be collected extensively throughout Victoria, New South Wales and Tasmania to be reared in specially designed chambers in the laboratory. Two or three species of *Koorrnonga* and 17 species of *Nousia* have so far been identified but are yet to be confirmed by adult association. Factors affecting rearing success have been examined.

## INTRODUCTION

### *Current status of Australian Ephemeroptera*

The taxonomy of Australian mayflies requires further investigation and revision. At present there are around 100 described species (Peters and Campbell 1991; Dean and Suter 1996). Estimates of the total number of species range from "over 200" (Dean and Suter 1996) to "possibly around 500" (Hubbard and Campbell 1996).

The Leptophlebiidae is the largest family of Australian Ephemeroptera representing at least 50% of described genera and over 60% of described species in Australia (Campbell 1990). They therefore constitute a very important, widespread and commonly collected taxon worthy of further study. Most species are found in the highlands of southeastern Australia and Tasmania (Peters and Campbell 1991); much of this fauna has Gondwanan origins and is strikingly similar to the New Zealand and temperate South American fauna. It therefore represents a biogeographical entity which is highly diverse, endemic and phylogenetically interesting.

Two Leptophlebiid genera, *Nousia* and *Koorrnonga* are very closely related and their included species have proved difficult to identify. The original description of the genus *Koorrnonga* (Campbell and Suter 1988) included six species, some of which were tentatively placed. Present estimates of the number of species in this genus in southeastern Australia total three (J. C. Dean, Environment Protection Authority, pers. comm.) The genus *Nousia* was first described in South America by Navás (1918) and was re-examined by Pescador and Peters (1985), who also redescribed the type species, redefined the genus and revised the South American species. Campbell and Suter (1988) erected the subgenus *Australonousia* to distinguish between the Australian and closely related South American species. They

included only two species in this subgenus, yet it is thought that there are at least 15 species which occur in southeastern Australia (J. C. Dean, Environment Protection Authority, pers. comm.). Differences between the two genera appear minimal and are based on labrum sub-apical fringe setae, gill morphology and general appearance of the nymphs only.

## THE STUDY

Revision of the existing collections of *Nousia* and *Koorrnonga* from southeastern Australia is being undertaken by the author. There are extensive collections at various institutions such as Museum of Victoria, the Environment Protection Agencies of Victoria and New South Wales, the Murray Darling Freshwater Research Centre and the Australian National Insect Collection. However, most collections consist only of nymph or adults, and in many cases no definitive link has been made between them, thus confounding the taxonomy. Field collection of live nymphs is required so that an association can be made by rearing them to adults (Fig. 1). Field collections can also provide information from new or poorly known locations, thus helping to refine geographical distributions.

Field work is carried out over the main emergence period of the genera, an extended summer period ranging from about October to March. The delicate insects are most readily collected by carefully brushing them directly off rocks and vegetation in the stream. They are then placed in a bottle of the water from the stream for transportation back to the laboratory and are kept cold in an ice-filled insulated container. Each bottle is also individually aerated using a battery operated pump connected to a flow controller. In the laboratory, the mayflies are kept in a controlled temperature environment usually around 5 to 6°C warmer than the water from which they came. Individual mayflies are



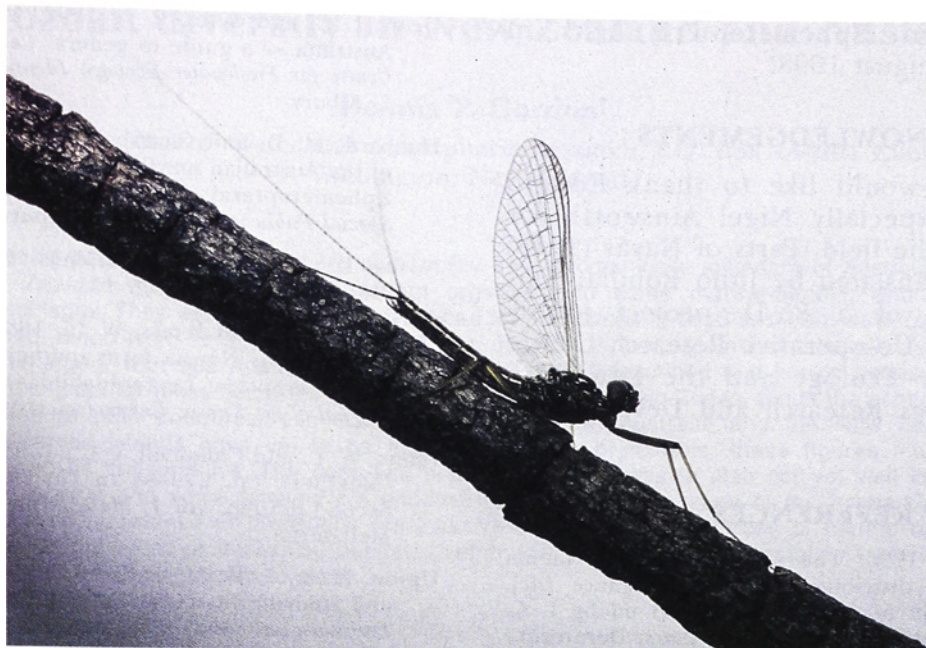


Figure 1. *Nousia* imago (unnamed species), one of the taxa being revised in the present study. Photo: K. J. Finlay.

then placed in a single rearing chamber specifically designed by the author for the purposes of this study. Each chamber has its own aeration supply. The insects are then left to emerge through the subimago stage into the imago. The exuviae of the nymph and subimago and imago are then preserved in Kahle's solution (Upton 1991) so that future associations can be made.

### PRELIMINARY RESULTS

Of the 214 collections made in Victoria, southern New South Wales and Tasmania, *Nousia* was found in 179 sites and *Koornonga* in a mere 19.

*Nousia* are widespread and abundant in southeastern Australia being found at an average altitude of 601 m. They were, however, sensitive to transport and changes of environment. Of the mayflies reared in the laboratory during this period 36% became adults, 9% emerged only to subimago stage and 55% died as nymphs. The mean time taken to become imagos in the laboratory was seven days.

*Koornonga*, however, had a more restricted range and were found at a lower average altitude (366 m) than *Nousia*. The mayflies were strongly associated with the presence of logs and organic matter making them difficult to locate and collect. Laboratory rearing yielded 66% adults, 11% subimagos and 22% nymphs. Rearing time for *Koornonga* was similar to *Nousia*; a mean of eight days to emerge to the imago stage.

Various attempts are being made at present to refine the collecting techniques and rearing process to produce better results. Four different rearing temperature have been used: 16, 18, 20 and 22°C and preliminary results suggest 18°C provides the greatest success. Alternate photoperiods of 12 hours daylight and 14 hours daylight have also been investigated yet no difference has been so far found between the two. Surprisingly, altitude of collection and days the animals were kept in storage, either in the field or in the laboratory while waiting to be placed into the rearing chambers, also had little effect on rearing success. Lastly, the data show that males rear neither more nor less successfully than females. It is concluded that species data are needed to determine the optimum rearing conditions for these mayflies.

The author has currently identified two (possibly three) nymphal species of *Koornonga* and 17 nymphal species of *Nousia* in southeastern Australia. Present work focuses on rearing adults to verify these species and describe the adult taxonomy. It is too early to tell whether *Nousia* and *Koornonga* are indeed congeneric although the egg morphology and genitalia of at least one species of *Koornonga* is noticeably different from some of the *Nousia* species.

### Postscript

Subsequent to "The Other 99% Conference", rearing success has been investigated more fully and reported in a paper for the Proceedings of the IXth International

Conference on Ephemeroptera held in Argentina in August 1998.

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