Response of Australian Grassland Thysanoptera to a Changing Climate

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Declaration

I certify that the substance of this thesis has not already been submitted for any degree and is not currently being submitted for any other degree or qualification

I certify that any help received in preparing this thesis and all sources used have been acknowledged in this thesis.

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Signature

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Thesis Abstract

Changes in climate over the coming century are expected to have a major influence on the structure of insect communities. Under a changing climate, insect species may adapt to the new conditions and stay where they are through changes to physiological or behavioural traits, change their geographic range or become extinct. Predicting how insects might respond to future climate change will provide useful data for conservation efforts. The aim of this thesis was to determine the ways in which Thysanoptera communities might respond to a changing climate, and attempt to predict what might happen in the future. This was done by studying patterns in assemblage composition and morphological trait variation across a climatic gradient, and performing a transplant experiment to determine how Thysanoptera might respond to a new host plant of the same species, but exotic genotype. Sweep net sampling was used to collect Thysanoptera from *Themeda triandra* grassland across a climatic gradient in NSW and Victoria, Australia. Thysanoptera were identified to species or morphospecies and a range of morphological measurements were taken using computer software and an imaging microscope. A multivariate generalised linear model was used to determine how different species are associated with different environmental variables. It was found that mostly microclimate data obtained at tussock level was best at explaining the variation of Thysanoptera abundances. Microclimate data at certain periods, such as during Thysanoptera growth periods and near sampling, was important to consider in addition to annual means. There were enough differences in the direction and extent of responses of Thysanoptera to predictor variables to make it beneficial to look more closely at how some of the individual species respond rather than making broad generalisations. A model based implementation of the 'fourth corner problem' was used to determine the interaction between environmental variables (matrix 'R') and morphological measurements (matrix 'Q') in determining abundance (matrix 'L'). I demonstrate that morphological traits are associated with both climate and habitat structure, which has significant implications regarding the prediction of functional diversity in a changing climate. I simulated a warmer, drier climate by performing a transplant experiment across three different sites using both diploid and

tetraploid *Themeda triandra* plants. A multivariate generalised linear model was used to determine how Thysanoptera community composition varies across different sites and on plants from different sources. I found that two species of thrips preferentially colonised foreign *Themeda triandra* when transplanted in the field. The indication that plants of foreign genotype could be particularly attractive to generalist herbivores may imply an increase in herbivory pressure on the plants when insect shift their range to accommodate changing climatic conditions.