THE EVOLUTIONARY BASIS OF MORPHOLOGICAL AND BEHAVIOURAL VARIATION IN THE NEW HOLLAND HONEYEATER (*PHYLIDONYRIS NOVAEHOLLANDIAE*)

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SUMMARY

This thesis discusses the current field of evolutionary biology and examines patterns and processes of divergence in the morphology and behaviour of a key model species, the New Holland Honeyeater (*Phylidonyris novaehollandiae*). More specifically, the cause of phenotypic divergence between island and mainland populations, and populations exposed to different climatic conditions, is investigated in *P. novaehollandiae*. Island-mainland comparisons showed that island birds were larger than mainland birds in tarsus (2.5%) and bill length (3.7%), had a wider foraging niche (mostly due to greater insect consumption), and foraged more from the bark and air (sallying). Island birds also had longer foraging times than mainland birds, which may be evidence for reduced resource availability. This evidence, and evidence from the literature, suggests that a paucity of resources on Kangaroo Island has most likely driven niche expansion, facilitated by the absence of some bird species on the island. Larger body size in island birds appears to be a response to local conditions on the island and may be driven by natural selection or population-scale phenotypic plasticity. Comparisons across a climatic cline showed that variation in all morphological traits in males and two of four morphological traits in females correlated with variation in rainfall. Additive genetic variation exceeded that of neutral genetic variation for all morphologic traits, indicating a strong signal of selection -- the observed environmental correlation suggests an environmental driver. These observations are consistent with the hypothesis that, in drier climates in South Australia, reduced and unpredictable nectar availability drives natural selection for increased aerial insect foraging (and maybe dispersal) efficiency. The lack of correlation found for some female traits was most likely explained by female biased-dispersal weakening the signal of the

selective source. The findings of this research add to a body of research that aims to understand and predict the evolutionary response of organisms under a changing climate.

DECLARATION

I certify that this thesis does not incorporate without acknowledgment any material previously submitted for the award of any other degree or diploma in any university; and that to the best of my knowledge, this thesis contains no material previously published or written by another person, except where due reference is made in the text.

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At the beginning of my PhD journey I couldn't have begun to imagine the challenges that lay ahead; but at the end of four years I've finally emerged on the other side, having overcome each one of those challenges. Now that the journey is almost over I look back and it's difficult to fathom just how far I've progressed both personally and professionally; my understanding and general outlook on the world has changed at a rate unequalled except possibly by my early years on earth. But at the same time I have to pause and look ahead to others that have completed a similar journey and have gone on to make the most of that experience, such as my supervisors and other leaders in the field. I then realise that this is only the tip of the iceberg if I want to enjoy a distinguished career in science -- but now I am prepared. This journey would not have been possible without the help and support of many people, to whom I must extend my gratitude.

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