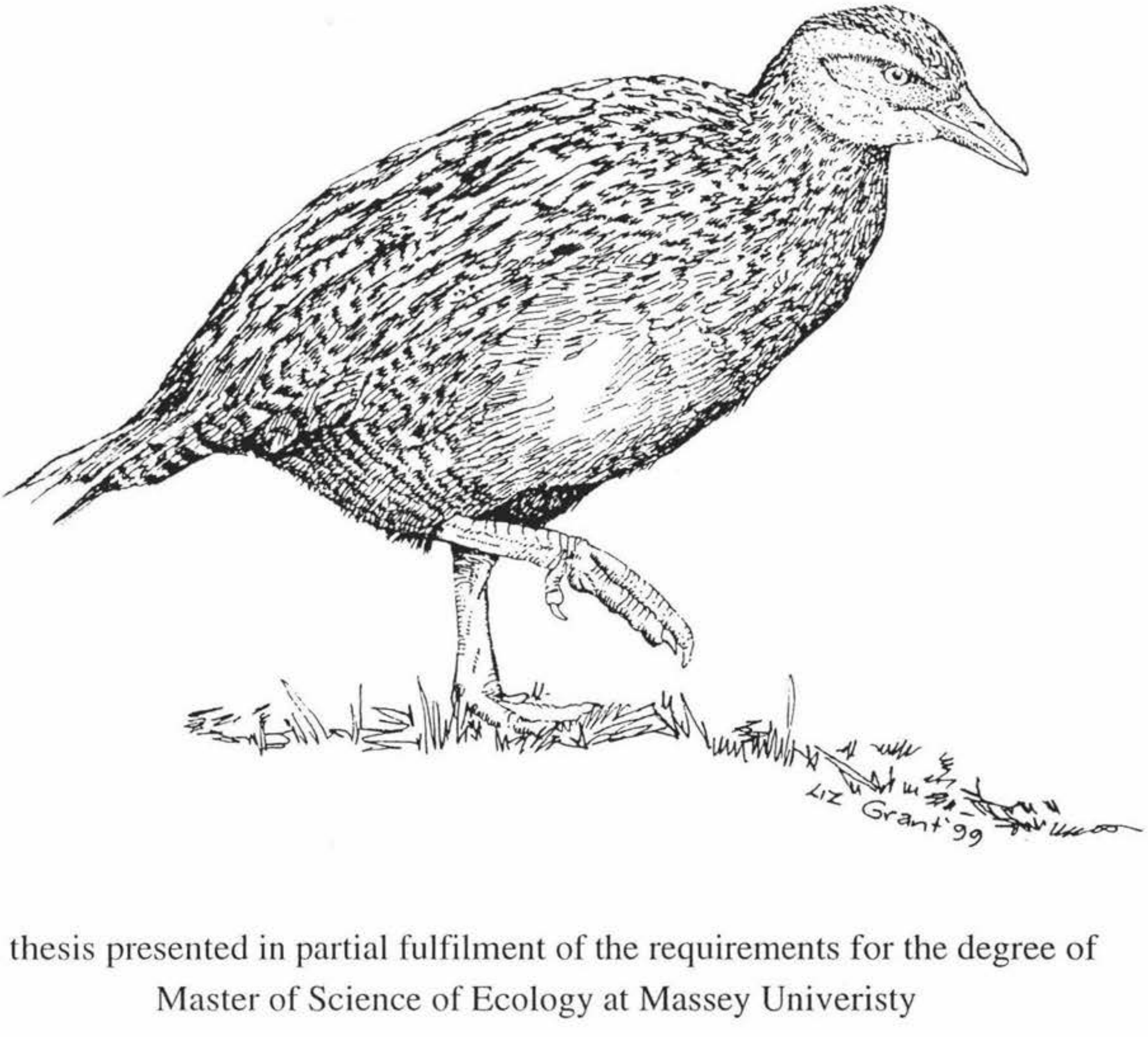
Conservation Genetics of the Weka, *Gallirallus australis*

By
Arnja Rose Dale
1999



A thesis presented in partial fulfilment of the requirements for the degree of
Master of Science of Ecology at Massey Univeristy

Acknowledgements

There are several people that I would like to thank for their help and support over the past few years. Firstly, I would like to acknowledge the help from my supervisors Dr Tania King, Dr Steve Sarre and Professor Lambert.

Also of great significance was the friendship and advice from Dr Bruce Robertson. He and his family provided me with unquestioning support when I most needed it. Other lab friends that contributed fun to a busy time and a steep learning curve were Brent Stephenson, Andrew Winnington, again Dr Tania King; how can I ever thank you.

I would also like to thank Dr Ed Minot, Professor Brian Springett, Professor Robin Fordham, Professor Ken Milne, Dominic Adams, Leon Huynin, John Perrot, Tasmin Ward-Smith, Dr Kim McBreen and an extra big thank you to Barbara Just who did everything she could for me and Liz Grant for the beautiful weka drawing.

My family, of course, deserve a special mention, providing me with enthusiam, support, love and bribes which enabled me to complete this thesis. In particular my parents, Marlene and Paul Dale, thank you for everything!

I would also like to thank my friends for their love, support and for believing in me through this difficult yet exciting time in my life: Tom Irvine, Jo Bridgford, Kelly and Conan Doyle, Duncan Emmerson, Nevaro and so on. Especially my thanks and appreciation to Gretel Fairbrother who volunteered to do the long haul with me and for which I will always be eternally grateful.

Also to everybody else who in my tired state I have missed.

Thank you.

Abstract

The weka (*Gallirallus australis*) is an endangered, flightless rail endemic to New Zealand. This ground-dwelling bird has four morphologically recognised subspecies and although was once distributed throughout New Zealand, its survival is now threatened.

Genetic methods were employed to investigate aspects of weka biology relating to their conservation in order to determine if the current taxonomy reflects the genetic diversity of weka and if the provenance of weka could be determined. These results are important as they will impact on the conservation management of weka in the future.

Weka genetic diversity was investigated by sequencing four mitochondrial DNA genes: cytochrome *b*, ATPase 6, 12S and the control region. The only region that was found to exhibit variation was the control region. Through phylogenetic analysis of a 216 base pair region, the subspecific status of some weka populations was determined. The provenance of weka of unknown origin was also able to be ascertained. Nuclear variation was investigated through a preliminary study of microsatellite variation.

Molecular sexing methods were trailed to sex this monomorphic species. These results are discussed and compared with the traditional methods of sexing weka through morphometrical techniques. It was found that molecular and morphological sexing techniques produced concordant results when sexing adult weka. Molecular sexing has an advantage over morphometric sexing as it better able to accurately sex individuals of all ages.

The relationship that the terminology of "subspecies" has on conservation management is also discussed with particular reference to the weka.

Table of Contents

Chapter 3
Investigation of DNA Variation in weka: Methods and Results

Chapter 4 104
Sexing of the weka

North Island Weka

Gallirallus australis greyi

Photo by Geoff Moon