The Feeding and Breeding Ecology of Little Blue Penguins (*Eudyptula minor*) from Tiritiri Matangi Island, New Zealand

A thesis submitted in partial fulfilment of the requirements for the degree of

Master of Science in Conservation Ecology,

Massey University, Auckland.

Jacqueline Lee Geurts

2006

Arara te manu whakarongo tīpuna, te manu nei a te kororā

Kororā-ā-uta, kororā-ā-tai

Kowhetewhete mai o ngutu

Nau na Tane, naku na Tane

Hui e taiki e

Listen attentively for it is the bird that converses with our ancestors

This bird the blue penguin

The *land* blue penguin, the *sea* blue penguin

Your lips are murmuring to us

You are of Tane and we are of Tane

Bind us together

Let it be so!

(By Laurie Porima and Jacqueline Geurts)

Finding the connection between the land and the sea

Abstract

At present the New Zealand populations of Little Blue Penguins (LBP: *Eudyptula minor*) are classified as 'Threatened' and in 'Gradual Decline' by the Department of Conservation. Effective conservation management of the North Island sub-species requires an understanding of the factors affecting their survival and breeding success. There is little information on the breeding ecology of the *E. minor*, especially in the North Island of New Zealand. The overall goal of this study was to establish baseline data on a North Island population of LBP in New Zealand. The aims of this study were to 1) identify population demographics, 2) quantify breeding success and identify abiotic and biotic parameters influencing nesting success, 3) identify feeding ecology based on diet and trophic level assessment, and 4) identify cause of death and underlying patterns associated with mass mortalities of the LBP species. Breeding success was quantified by monitoring the nesting activity of 87 nesting attempts during the 2005/06 breeding season. Nest monitoring also involved identifying risks associated with both the egg and chick stage. Diet analysis involved comparing stomach regurgitation samples and isotope samples of feathers spanning a 120 year period. The cause of death for the mass occurrence of beach wrecked birds found during 2005/06 was established through necropsies and histological tests. The major cause of death was compared to patterns of past beach wreck events that has occurred in New Zealand over a 33 year period, obtained through the Ornithological Society of New Zealand. Where possible, both short- and long-term comparisons were made to establish a sound understanding of the key factors that are influencing breeding success, foraging, and survival.

Results showed that 2005/06 was a poor breeding year which was the result of a large number of nest desertions. Furthermore, analysis of stable isotopes shows that the LBP

have been feeding at low trophic levels over the past 120 years and that 2005 was significantly lower in carbon levels suggesting a low year of marine productivity. The largest cause of death associated with mass beach wrecks was starvation. Analysis of past beach wrecks suggest that during the year LBP are at a greater risk of death after the breeding season, after moult, and during winter which are energetically expensive periods. A more long-term study is required to identify the trends in LBP breeding success and to ascertain the primary reason as to why they are unable to obtain enough food. Seabirds are increasingly being used as biological indicators since they are largely influenced by changes associated with the marine environment. The use of LBP as biological indicators may have limitations depending on the parameters being used. However stable isotope measures may be one of the easiest methods to achieve this and allows for reconstruction of past ecological histories through analysis of historical tissues.

Acknowledgments

Firstly, I would like to thank my supervisor Dianne Brunton who initially introduced me to the idea of studying Little Blue Penguins and for whom I deeply respect. As a student I was fortunate to receive supervision by someone that would encourage individual thinking and allow me to investigate and research new ideas. Dianne encouraged me to apply these ideas and consistently showed enthusiasm towards my thesis. I am grateful to be included into a group that supports a positive working environment and a co-operative approach to science.

In the beguinning there were many people that helped me with learning new skills and techniques. These techniques included specialist training such as otolith analysis and stomach sample analysis, necropsy procedure, applying the stomach pumping method and stable isotope analysis. For this i am in debt to Lorraline Meyner (Massey University, Palmerston), Richard Jacob-Hoff (Auckland Zoo) and Nigel Adams (Auckland University of Technology) and Sarah Bury (NIWA) since each analysis took patience and personal time. I am also thankful to Brian Gill and Ramola Prasad from Auckland Museum for allowing me to access and sample museum specimens. A big thank you goes to Brett Gartrell and his team of pathologists who were able to provide histology tests.

I would also like to thank the National Institute of Water and Atmospheric Science for providing the weather data for analysis of the mortalities over time.

Furthermore I would like to acknowledge the A.W.C at Massey University and Leon Huynen for the gender analysis of the feathers. I also appreciate and acknowledge the help received through Jo Evans from Auckland University, at Leigh Marine Laboratory for providing the sea surface data and also Heath Allen from Ag Research who identified parasite specimens.

Apart from finding people with the rare skills to asist with my research, one of the hardest parts of creating this thesis was the time spent in the field gathering the initial data. To ease this burden I had several collegues and friends that assisted with editing chapters, analysis, and assistance within the field or provided a well deserved drink and laughter after a long day. Therefore, to all the people that were enthusiastic and positive about my project and helped to relieve frustrations within the field or lab, a huge thank you as it meant a lot: Luis Ortiz Catedral, Rose Thoroughgood, Kevin Parker, Monique Van Rensburg, Mary Geurts, Rosemary Barrowclough, Mark Seabrook-Davison and Michael Anderson. A very special thank you to Marleen Baling who gave me hours of her time to proof read all the final chapters and set up my very own template. Together Marleen and Michael Anderson helped me put it all together during early hours of the morning. A tip to fellow students do not aim to bind a 250 page thesis at 2.30am after 3 days of no sleep as it just creates further frustration. I owe thanks to Ray and Barbara for making sure that I returned each night and was still alive the next day. Lastly, I would like to recognise the rest of the Ecology and Conservation Group which I have loved spending time with attending conferences, lab meetings (and parties) or just having lunch with. I have valued your friendship, your support for my research, your valued opinions and glasses of bubbly provided over the past year. A special acknowledgment to Laurie Porima who worked with me to create a proverb that

signifies the special link that I understand to exist between the Little Blue Penguin with the land and the sea but also the need and want to understand this.

Finally, mum and dad, thank you for all your support, belief, enthusiasm, and encouragement during the five years of study it has meant a lot and has really helped me achieve this large final monstrosity of a thesis.

This project was supported (in part) by funds from the PADI Foundation and the Supporters of Tiritiri Matangi Island which allowed me to take on the new endeavour of isotope sampling.

Table of Contents

List of Plates

List of Figures

List of Tables