The breeding biology of northern white-faced storm petrels (*Pelagodroma marina maoriana*) and a feeding trial in preparation for translocation, New Zealand

A thesis presented in partial fulfilment of the requirements for the degree of Master of Science in Conservation Biology,

at Massey University, Albany, New Zealand

Megan Young

2013

Plate 1.1 Captured in paint - a white-faced storm petrel foraging in the Hauraki Gulf, New Zealand. Photograph by Neil Fitzgerald. Artist: Thomas Young.

Abstract

As keystone species and ecosystem engineers, petrels are integral to ecosystem restoration. However, many petrel breeding populations are currently reduced from their former ranges due to marine and terrestrial threats. Consequently, seabird translocation is now a rising species management tool for establishing/re-establishing colonies. The goals of this study were to investigate the expansion of translocation from medium sized *Pterodroma* and *Puffinus* species too much smaller storm petrels and to generate customised translocation protocols for white-faced storm petrels (*Pelagodroma marina maoriana*). This project aimed to 1) monitor and measure chick growth, 2) quantify chick provisioning: feeding frequency and meal size, 3) describe emergence periods and fledging morphology, and 4) undertake a mini-translocation to trial current petrel feeding practices on this relatively small species and outline a suitable artificial feeding regime. The breeding biology of a northern white-faced storm petrel (WFSP) population was monitored during the breeding season of 2011/2012 on Burgess Island, Hauraki Gulf. Results were compared with a southern WFSP population from previous research.

Northern WFSP bred one month earlier than southern populations and fledged at smaller weights and sizes. Chick rearing was longer (68 days) than expected and burrow emergence began 2–6 nights before fledging. Growth patterns generally aligned with Procellariiform chick development. Mean overnight provisioning masses delivered to chicks by parents were similar between northern and southern populations (7.8 g and 6.4 g respectively), however mean feeding rates were lower in the north (57.1% of monitored nights vs. 71.7%). Periods of fasting were longer than expected, frequently lasting 4–7 days. This low provisioning rate may reflect limited prey availability; possibly from the concurrent La Niña-Southern Oscillation climate. Stable isotope analysis of adult blood showed an increase in δ^{15}N between burrow prospecting and chick rearing phases; indicating a shift in trophic level potentially due to a behaviour change in adult foraging or prey availability. Analysis of δ^{13}C shows WFSP potentially foraging at greater ranges than expected.

During the feeding trial, a 10 Fg x 70 mm PVC crop tube was used to successfully feed chicks until fledging. Chick weight was maintained on a daily 7–8 ml regime of sardine puree diet. This research shows that WFSP are suitable candidates for translocation operations. Future translocations of northern WFSP are recommended to transfer chicks at 10 days before fledging, selected by criterion of wing lengths ranging from 120.9–129.7 mm and weights greater than 55 g. Translocation management should consider population variability due to

environmental and climatic fluctuations, and also latitudinal gradients as factors influencing temporal planning and chick selection.

Acknowledgements

There are many people who have supported me during this incredible journey to whom I cannot give enough thanks for their assistance and encouragement.

Firstly I extend acknowledgement and sincere gratitude to my supervisors Prof. Dianne Brunton (Massey University) and Dr. Matt Rayner (University of Auckland). Dianne Brunton has been greatly supportive in my decision to pursue an expensive and logistically difficult study. For applying such highly regarded experience to encourage and guide me through the preliminary project set up, data collection, analysis, final write up and arduous edits, I am so grateful. Matt Rayner initially proposed this project and with his own enthusiasm and passion for seabird biology I was sold within moments. The directions and advice from Matt were fundamental in setting up and implementing this project. I must also acknowledge his entertaining enthusiasm in the field and easy-going patience when teaching me field skills. Matt's motivation really propelled this project from an exciting proposition into a truly amazing adventure.

To Chris Gaskin I must give very special thanks. The multiple ways in which Chris has supported me and this project are difficult to describe. Chris's devotion to seabirds, his expertise and local knowledge have been of paramount importance to his assistance in field and logistical support. Chris's contributions to this project were limitless and I am truly grateful.

The feeding trial was an exciting and integral part of this project and could not have been done without the help of The Cape Sanctuary, Tamsin Ward-Smith and Cathy Mitchell (veterinarian). The Cape Sanctuary funded the trial and Tamsin really saved the day with her last minute visit and chick feeding expertise. Cathy oversaw and ran the feeding trial; her knowledge and proficiency were invaluable to this project. I am very grateful to Cathy for taking such wonderful care of the chicks and I learned a great deal from her.

I would like to thank those who kindly gave their time in training and specialist advice. Thank you to Graeme Taylor for the first hand introduction to grey-faced petrels and for accommodating my stay on Ihumoana Island. Graeme's advice was invaluable in setting up this project and his keen sixth petrel sense was fantastic for finding WFSP burrows in the field. Thank you also Graeme for the many discussions and personal communication references as I studied for exams while we were island bound during bad weather. A big thank you to Neil Fitzgerald who so patiently taught me how to attach radio transmitters onto

tail feathers and for loaning me the necessary equipment (as well as the early morning breakfast deliveries). I would also like to extend great thanks to Stuart Cockburn at the Department of Conservation for his advice on RFID readers and PIT tags and his efforts in helping me acquire the equipment. Without Stu incorporating PIT tag methods could not have been possible. Thank you also to Helen Gummer for her advice in setting up the feeding trial and Steffi Ismar for sharing with me some of her preliminary stable isotope results.

I must send my sincere thanks to the people and organisations which helped to fund this project, which was far from modest. I would like to openly thank the New Zealand Coastal Society for awarding me their Masters Scholarship and Massey University for the award of a Masterate Scholarship. The funds from these scholarships have helped me beyond words in getting the necessary work done and removing the confinements of monetary stress. Thank you to The Cape Sanctuary for funding the feeding trial, covering equipment, food for chicks and people as well as a boat charter. In addition, The Cape Sanctuary also supported the presentation of this research by covering my conference fees at the fifth International Albatross and Petrel Conference held in Wellington. Lindsay Rowe at The Hutton's Shearwater Charitable Trust kindly loaned me the use of their RFID readers for which I am very grateful and Stuart Cockburn at the Department of Conservation who found the funds to provide me with the additional equipment needed to set up the RFID readers. I am so grateful for the generosity. Chris Gaskin and his New Zealand storm petrel research has also been of great financial (and logistical) support in allowing me to piggyback on field trips and taking care of site amenities such as plumbing and power. I would also like to thank my father, Thomas Young for supplying and cutting the 150+ burrow lids plus other miscellaneous pieces of field equipment. Not to mention the wonderful white-faced storm petrel painting featured on the inside cover of this thesis. Thank you also to my Mum, Marlyn Young (and Cecilie), for your outstanding craftsmanship in sewing 80+ bird bags.

After all the help which was so kindly offered to me in setting up this project, I could not have accomplished these results without the help of such incredible volunteers. I must give special acknowledgement to Derek Bettesworth who committed so much time and effort. I am so very grateful to have had such a knowledgeable companion during those long days of burrow searching. Also thank you very much Lucy Bridgman who so kindly kept me company while I was marooned in the colony with an ankle injury and picked up the slack of my immobilised state. Lucy was the ideal person to entrust the work and welfare of the chicks to; I am very lucky to have had her on site. Thank you so very much to the many others who gave up their

time and came out to experience this amazing island and the gorgeous birds. Deep thanks to Andy Farrant who has been of great motivational support from the get go and created some wonderful supporting media. Samantha Clews who was very quickly inducted into the world of seabirds. Big thanks also to Rob Dunn who had to cut his own field season short to join us. Thank you very much Marleen Baling whose field and bird handling skills were particularly useful and much appreciated. I extend my deepest gratitude to Kay Clapperton, Fiona McKenzie, Sarah Wells, Dylan van Winkle (best snorkelling cohorts), Hamish Syrett, Marieke Tichler, Amy Brunton Martin, Abe Borker, Alex Leonard, Todd Landers and Jingjing Zhang. Finally a huge wrapping up thank you to Jacinda Woolly who came out at such short notice and was so amazing in helping me pack up and finally depart the island. Thank you to all of you who put up with any crazy moments of un-showered island fever and super-yacht envy.

During the less invigorating write up phase of this project I must express appreciation and acknowledge the supportive efforts and endless love from my family and friends. In addition I am truly indebted to those who gave up their time to edit chapters for me, in particular thanks to Marleen Baling (you are an editing machine!), Cecilie Klemet-Pedersen, Hamish Syrett, Phuong Tran, Marlyn Young, Josie Galbraith and Cara Browne. The Ecology and Conservation Group at Massey Albany has been a fantastic work place and I am so grateful to have shared this incredible journey with such wonderful people and great scientists.

Plate 1.2 The wonderful volunteers who together made this project a success.

Contents

List of Figures

List of Tables

List of Maps

List of Plates