

Copyright is owned by the Author of the thesis. Permission is given for a copy to be downloaded by an individual for the purpose of research and private study only. The thesis may not be reproduced elsewhere without the permission of the Author.

**The Prevalence of Psittacine Circovirus
in Native and Exotic Parrots
in New Zealand**

**A thesis presented in Partial fulfilment
of the requirements for the degree of**

Master of Science in Conservation Biology

**At Massey University
Palmerston North, New Zealand**

Hyejeong Ha

2005

Abstract

Psittacine circovirus (PCV) has been identified in more than 60 psittacine species worldwide in both aviary and wild populations. The virus is a causative agent of psittacine circoviral disease (PCD), a highly infectious disease characterised by beak and feather dystrophy, high juvenile mortality or long-term immunological suppression. The virus is known to be very difficult to control or eradicate and among wild Australian parrots, the prevalence of infection is 10-20 %. No information on the incidence of PCV in parrots in New Zealand was available. The aims of this study were 1) to determine the prevalence of PCV in wild exotic parrots, 2) to determine the prevalence of PCV in wild native parrots, 3) to identify the incidence of PCV in captive native parrots, and 4) to suggest recommendations for the future conservation management of native parrots populations in New Zealand. Two species of exotic parrots; eastern rosella and sulphur-crested cockatoo, and four species of native parrots; kakapo, kaka, kea and parakeet were examined. Feathers of these parrots were collected from different regions in New Zealand and PCR assay was conducted to identify the presence of PCV.

The prevalence of PCV in wild exotic parrots in New Zealand was considerably high in both species of exotic parrots, as the prevalence of PCV at the 95% confidence intervals ranged from 19.17 - 44.02% in eastern rosellas and 22.04 - 33.07% in sulphur-crested cockatoos. No wild native parrots showed any evidence of PCV in PCR assay and given the sample sizes in this study, the prevalence of PCV was estimated as less than 4-7% if PCV is present in the populations. However, the first isolation of PCV in

native parrots occurred in two species of parakeets in captivity: red-crowned parakeets and Antipodes Island parakeets. No significant abnormalities were detectable in the red-crowned parakeets but the Antipodes Island parakeet died shortly after translocation. The presence of PCV was confirmed in contact birds in both cases.

Recommendations

I recommend the following future avenues of investigation, from the results of this study.

1. Attempts to determine the population size, distribution and ecology of exotic parrots in the wild are recommended. This will allow us to identify the risk of native parrots from contact with exotic parrots.
2. Further sampling of both wild and captive parrots to identify the prevalence and seroprevalence of PCV is required.
3. Intensive monitoring programmes should be undertaken for PCV positive parakeets to identify the impact of PCD in native parrots.
4. Experimental infection of native parrots will provide crucial information not only on the susceptibility, sensitivity, and immunity of native parrots to PCV but also on the ecology of PCV in those species.

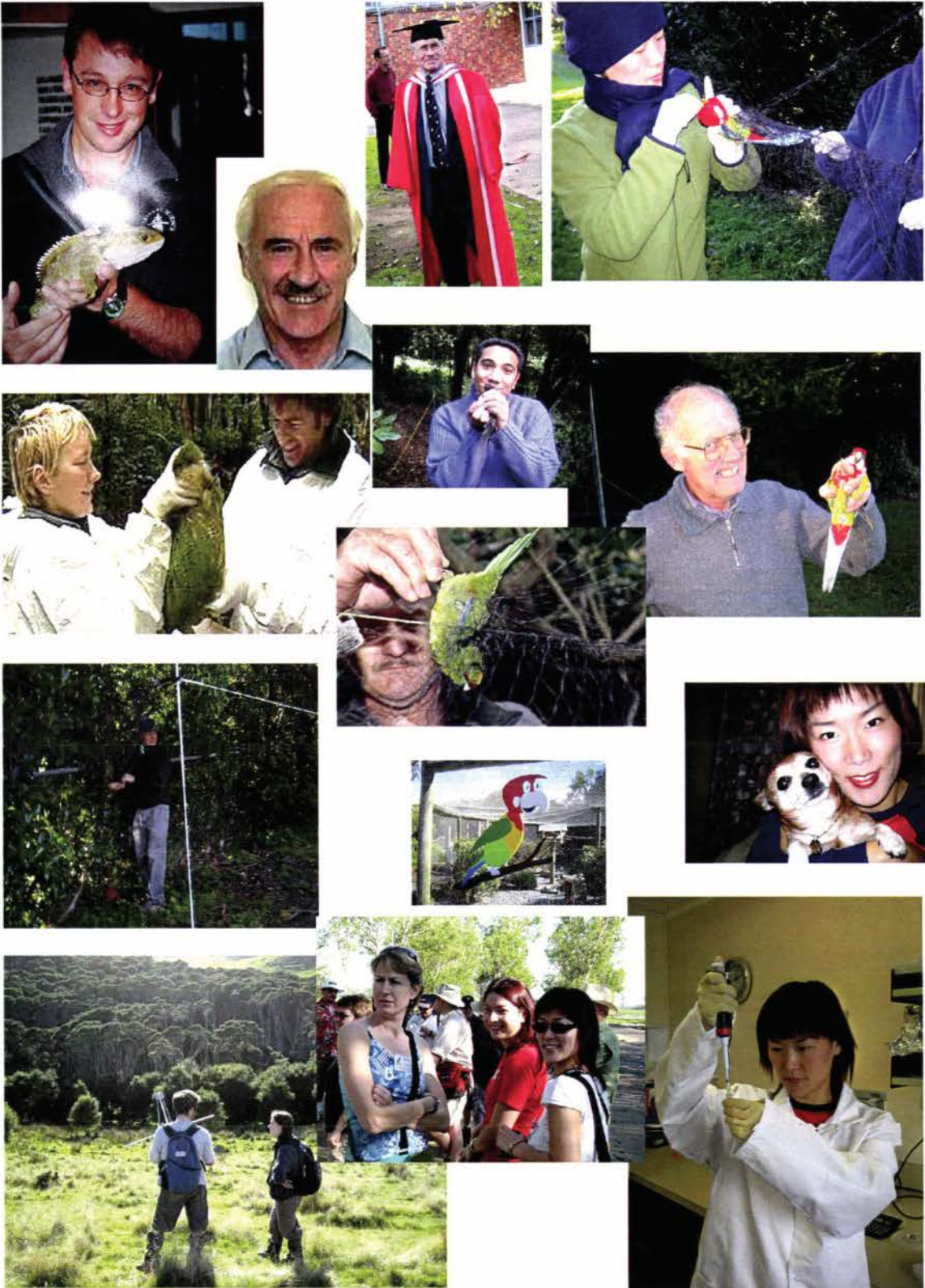
The following recommendations for the management of native parrots can be concluded from this study. Prior to translocation or reintroduction of native parrots, the presence of exotic parrots, the prevalence and seroprevalence of PCV should be investigated. Psittacine circovirus should be included in health check and quarantine protocols in the management of native parrots in the wild and in captivity. Nature reserves and captive facilities should be aware of the presence of exotic parrots in the environment and the prevalence and seroprevalence of PCV through regular sampling efforts. The identification of cause of death of parrots that may happen around nature reserves or captive facilities is also essential to identify the presence of PCV.

Additionally, strict hygiene protocols, isolation of native parrots from exotic parrots, and disease screening for PCD in the event of importation of new parrots should be applied in captivity. Vaccination should be investigated as a preventative measure.

Table of Contents	Page
Title Page	1
Abstract	2
Recommendations	4
Table of Contents	6
Acknowledgements	7
Chapter One	13
<i>General introduction</i>	
Chapter Two	50
<i>The Prevalence of Psittacine Circovirus in Wild Exotic Parrots in New Zealand.</i>	
Chapter Three	79
<i>The Detection of Psittacine Circovirus in Wild Native Parrots in New Zealand.</i>	
Chapter Four	105
<i>The Isolation of Psittacine Circovirus in Captive Native Parrots in New Zealand.</i>	
Chapter Five	125
<i>General Discussion</i>	

Acknowledgements

Acknowledgements



Acknowledgements

First of all, I would like to say that I have been very fortunate to have wonderful supervisors; Brett Gartrell (Institute of Veterinary, Animal and Biomedical Sciences; IVABS, Massey University), Brian Springett (Ecology Department, Institute of Natural Resources, Massey University) and Maurice Alley (IVABS, Massey University).

I would like to express my deep gratitude to my chief supervisor, Brett Gartrell for the unconditional support and encouragement. The strength and the inspiration from him enabled me to get through so many difficult moments. When everything appeared to be impossible and I was struggling with my project, he was always there to help me. Thank you, Brett for the patience, consideration, effort, and care.

I will never forget the first time that I met Brian two years ago, as he encouraged and accepted me to join Massey University. If I hadn't met him at that time, I would be living a totally different life. It has been a great pleasure to have him as one of my supervisors. Thank you for believing in me and for the constructive advice about my project and life.

I have always enjoyed Maurice's humour and wit. In fact, they did add brightness in the smelly, scary post mortem room. His depth of knowledge is so impressive and there have been many things that I have learnt from him.

I'd like to thank the Department of Conservation (DOC) for their generous funding contribution for the PCR assays. The funding support from the Ecology Department and IVABS allowed me to complete my field trips. The Wildlife Society of

Acknowledgements

New Zealand granted funding for attending the Annual Conference of Australian Committee, Association of Avian Veterinarian. Thanks for their support.

The sampling period was the most difficult time in terms of being patient and traveling around constantly. Without help from many people, it would not have been possible to get through that period.

I'd like to thank DOC for providing me with feather and blood samples of native parrots. I received excellent advice from Don Merton (especially for taking days-off just to help me with sampling), Ralph Powlesland, Kate McInnes, Terry Greene, Art Polkanov, Peter Dilks and Ron Moorhouse. Thank you for this advice.

A big thanks to Bruce and Rhys at Nga Manu Nature Reserve, Raelene at Mt. Bruce Wildlife Sanctuary, Richard Jakob-Hoff at Auckland Zoo Wildlife Health Centre, Katja Geschke at Wellington Zoo Trust and Guss Knopers at Aotearoa Wildlife for providing me with samples and allowing me to access results of PCR assays.

The Ornithological Society of New Zealand (OSNZ) and Bird & Forest provided great help during the sampling period, especially the Wellington Zoo Banding Group. Thanks to Peter Reese, Ros and Derek Batcheler, Sheelah and Gordon, and many people whose names I can not remember, sorry!

Special thanks to Christine Mander and Stewart Fata for their big supports as volunteers and for providing me with wonderful accommodations.

Acknowledgements

In February 2005, there was sad news for the Zoo Banding Group as Roderick Cossee passed away due to ill health. I hope he rests in peace.

I am grateful to Morag and Simon Fordham, Allen and Anna Brown for the help during the period of sampling in the Auckland region. I would also like to thank the School of Biological Sciences, Auckland University; especially Luis Ortiz Catedral.

Many thanks to the OSNZ members in Dunedin who helped with my sampling while I was staying in the cold, snowy southern land. Thank you to Jon Van Turnhout, Louise Foord, Peter Schweigman, Tony Pullar (Botanical Garden, Dunedin City Council) and the Department of Zoology, University of Otago.

Working at Massey University was great fun, with brilliant facilities and wonderful support. In a word, it was a place of making the impossible possible. I appreciate all the staff at the Ecology Department for everything they've done for me. Thank you to Doug Armstrong, Murray Potter, Ed Minot, Isabel Castro, Mike Joy, Russell Death, Robin Fordham, Ian Henderson, Jill Rapson, Alastair Robertson, Masha Minor, Jay McCartney, Barbara Just, Erica Reid, Carol Nicholson, Merryn Robson, Cleland Wallace, Scott Carver and Tracy Harris.

Many thanks goes to Allain Scott, Clare Green, Kerri Morgan, Mike Hogan, Richard Norman, Padraig Duignan and Ted Kirk at IVABS, Massey University.

I'd like to thank Ian Anderson, Mitchell Houston, Janine Kenny and Danielle

Hubbard - the staff at the Equine Parentage and Animal Genetics Service Centre, Massey University. Thanks to them I have learnt a lot about molecular biology and PCR assays. It was fantastic to work with you and I really enjoyed our last Christmas dinner.

I would like to thank Ian Langstaff at the EpiCentre, Massey University for his help with veterinary epidemiology. I can imagine it must have been horrible to teach a person like me who had never dealt with epidemiology before. Thanks for your kindness and generosity.

A huge thanks to Kathy Hamilton at the College of Sciences for all your help with my administrative problems!!

To my friends at Massey University. Without them it would have been impossible for me to complete my two year's study. Charlotte Minson (especially for being my mum for two years, you know what I mean, yeah?). Troy Makan, Amy Wake, Kiryn Weaver, Anna Gsell, Mark Fraser, Rowena Teal, Logan Brown, Nadine Fletcher, Pepe Barquin, Zoe Dewson, Alex James, Matt Low, Kate McArthur, Richard Seaton, Deb Anthony, Emily Atkinson, Clare Brown, Dorothee Durpoix, Jessica Costall, Shaun Nielsen, Rebecca Boulton and Lee Shapiro.

I appreciate Len Blackwell, Delwyn Cooke and Ashwini Loganathan at the Institute of Fundamental Sciences for the friendship.

Also, I would like to thank all my friends. Even though I decided not to list all the names, you are always in my mind.

My final thanks goes to my family: my beloved parents -Sang Geun and Jung Sun-, my brother -Choong Hwan-, my two sisters Joo Hwa and Ji Myung-, my brother-in-law -Eun Sung- and my lovely dogs. Your endless love, faithfulness, and support are the greatest strength for me. I love you so much.

This project would not have been possible without help and support from lots of people and organizations. I'm sorry if I have failed to mention someone. It is simply because so many people have helped me and my brain is no longer active due to my thesis. I am sorry, but thanks for everything. Thank you once again, everyone!!!