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# Estimating the Population Size of Two Critically Endangered South Pacific Parakeets: The Tasman Parakeet and Malherbe's Parakeet

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

Massey University  
New Zealand

Michael John Adam Skirrow

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## DECLARATION

I declare that this thesis is an accurate and original account of my research and that the contents have not previously been submitted for a degree at Massey University, nor any other tertiary institution. Except where acknowledged within, the material contained in this thesis has not been written or published by any other individual and to the extent of my knowledge, does not infringe upon copyright restrictions. The information presented contributes to a broader research programme examining the ecology and conservation of South Pacific parakeet species. This programme was developed in 2013 by Luis Ortiz-Catedral and is part of a collaborative research agreement involving Massey University and the Department of the Environment Australia (Appendix A). The programme has since expanded to include research on the offshore islands of New Zealand and has been granted authority for research by the New Zealand Department of Conservation (Appendix B).

In preparation for submission to journals, several of the chapters have been prepared as manuscripts. I am the primary author of each of these manuscripts, though the first person plural ‘we’ and the determiner ‘our’ is used throughout the text in recognition of the contributions made by my supervisors. As the primary supervisor of my research, Luis Ortiz-Catedral provided advice and support that was crucial to developing various components of this thesis; and as co-supervisor, Adam Smith provided valuable assistance and feedback on statistical analysis. In acknowledgement of their contributions, they will be granted co-authorship of the manuscripts that are submitted for publication. To the best of my knowledge, the research associated with these manuscripts and the remaining thesis was conducted in accordance with the protocols of Massey University, the Department of the Environment Australia, and the New Zealand Department of Conservation.

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Michael John Adam Skirrow  
2018

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## ABSTRACT

The *Cyanoramphus* parakeets are a cryptically coloured group of birds that are distributed across the islands of the South Pacific region. Due to their restricted range and island distributions, species belonging to this genus are considered vulnerable to extinction. However, the extent to which these parrot species are threatened is difficult to determine due to an absence of accurate and reliable population estimates. This research aims to contribute to the conservation of two critically endangered *Cyanoramphus* parakeets by evaluating the survey methods currently used to estimate population densities. This thesis details the precision and efficiency of distance sampling methods used for monitoring low-density parrot populations on small islands. Specifically, examining the annual variation in population size for the critically endangered Tasman Parakeet (*Cyanoramphus cookii*) and their introduced competitor, the Crimson Rosella (*Platycercus elegans*), to evaluate the effectiveness of conservation management and species control on Norfolk Island. In addition, the size of three translocated populations of the critically endangered Malherbe's Parakeet (*Cyanoramphus malherbi*) were examined to identify if this endemic New Zealand parrot requires further management.

Of the distance sampling methods used to monitor parrots, the fixed point survey method was the most suitable method for surveying Tasman Parakeets. This method yielded the highest number of parakeet detections per survey and offered the greatest count precision of the methods examined. On Norfolk Island, the Tasman Parakeet population increased by 126% over four years of intense predator management and nest provisioning. In comparison, the Crimson Rosella population remained stable, despite regular culling to control the population which competes with the Tasman Parakeet. In New Zealand, Malherbe's Parakeets were detected with varying degrees of success. On Maud Island, no parakeets were detected; however, they were detected on both Blumine Island and Chalky Island. On Blumine Island, the Malherbe's Parakeet population was moderately abundant, consisting of  $202 \pm 67$  individuals distributed through the mature forest. In comparison, the Chalky Island population of Malherbe's Parakeet was less extensive and consisted of  $84 \pm 58$  parakeets. This research illustrates the importance of regularly monitoring the size of threatened parrot populations for conservation.

# THESIS OUTLINE

## CHAPTER 1 Introduction

This chapter provides an overview of global parrot diversity, outlining the major threats faced by parrot species, with an emphasis on parrot conservation and species found on islands. The challenges of monitoring parrot populations are discussed, with consideration given to different survey techniques, and their value in assessing the success of conservation management efforts. An overview of each study site is presented, including descriptions of each study species, their conservation status, and the difficulties encountered during monitoring and management. In addition, the research rationale and main research objectives are summarised.

## CHAPTER 2 Using Statistical Resampling to Identify an Efficient Method for Surveying Tasman Parakeets (*Cyanoramphus cookii*)

In this chapter, statistical resampling is used to assess the suitability of two survey methods for monitoring the critically endangered Tasman Parakeet (*Cyanoramphus cookii*) population in the Mount Pitt section of the Norfolk Island National Park, Norfolk Island. The precision of the count estimates obtained by each survey method (fixed point surveys and line transect surveys) are compared. The findings are then discussed with reference to the advantages of using this standardised survey method for monitoring the parakeet population, highlighting the need for a systematic approach to long-term monitoring of the Tasman Parakeet population on Norfolk Island.

### **CHAPTER 3 Interannual Estimates of Density for Tasman Parakeets (*Cyanoramphus cookii*) and Crimson Rosellas (*Platycercus elegans*) on Norfolk Island**

In this chapter, fixed point surveys are used to examine temporal variation in the population size of two parrot species on Norfolk Island: The Tasman Parakeet (*Cyanoramphus cookii*), an endemic species which is critically endangered; and the Crimson Rosella (*Platycercus elegans*), an introduced competitor. The population estimates produced by this standardised survey method are used to compare the two species, which exhibit marked differences in abundance within the Mount Pitt section of the Norfolk Island National Park. The findings are discussed in relation to interannual variation in population size, the effect of conservation management efforts, and the need for regular monitoring of the Tasman Parakeet and Crimson Rosella populations.

### **CHAPTER 4 Estimating the Density of Malherbe's Parakeet (*Cyanoramphus malherbi*) Populations Established on Offshore Islands**

This chapter investigates the density of the critically endangered Malherbe's Parakeet (*Cyanoramphus malherbi*) populations established on three offshore island sanctuaries in the South Island of New Zealand: Maud Island, Blumine Island, and Chalky Island. The estimates of population size produced for this species and other common species are used to examine the applicability and performance of the fixed point survey method across a range of island habitats. The challenges associated with monitoring the Malherbe's Parakeet populations are then discussed and recommendations are provided for future monitoring of Malherbe's Parakeet and their management on offshore islands.

## **CHAPTER 5 Conclusions and Recommendations**

In this chapter, the key findings of the research are discussed, with reference to the estimates produced for the Tasman Parakeet population found within the Mount Pitt section of the Norfolk Island National Park and those produced for the Malherbe's Parakeet populations established on offshore island sanctuaries in New Zealand. In addition, the analysis of survey precision is discussed and an emphasis is placed on the importance of a systematic approach to monitoring these and other populations of threatened parrot species that occur in low densities. From the findings, recommendations for the future monitoring and conservation management of Tasman Parakeets and Malherbe's Parakeets are presented, with a list of the priority research needs outlined for each population surveyed during this research.

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