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**Ancient DNA Analysis of Māori Feather
Cloaks and Kete:
Implications for Conservation and Culture**

Katie Hartnup

A thesis presented in fulfilment of the requirements for the
degree of Doctor of Philosophy in Molecular Biosciences at
Massey University, Auckland, New Zealand 2012

Abstract

Feather cloaks (*kakahu*) and bags (*kete*), particularly those adorned with kiwi feathers, are treasured items or *taonga* to the Māori people of New Zealand. They are considered iconic expressions of Māori culture. Despite their status, much of our knowledge of the materials used to construct these artefacts, the provenance of these artefacts and the origins of these traditions, has been lost. We used ancient DNA methods to recover mitochondrial DNA sequences from 849 feather samples taken from 109 kiwi feathered cloaks (*kahu kiwi*) and 161 feather samples from 55 kiwi feathered *kete* (*kete kiwi*). We show that almost all (>99%) of the cloaks and all (100%) of the *kete* were constructed using feathers from North Island brown kiwi (*Apteryx mantelli*). Just one cloak was found to have been constructed using feathers from little spotted kiwi (*Apteryx owenii*). The remaining three species of kiwi (*Apteryx haasti*, *Apteryx rowi* and *Apteryx australis*) were not found in any of the cloaks and *kete* sampled. Molecular sexing of nuclear DNA from 92 feather cloak samples also revealed that the sex-ratio of birds deviated from a ratio of 1:1 observed in reference populations, with a male skew observed. Additionally, a reference database of 185 North Island brown kiwi mitochondrial control region DNA sequences was constructed, comprising samples collected from 26 North Island locations together with data available from the literature. For contemporary populations, we saw a phylogeographic structuring of haplotypes using both SAMOVA and Nested Clade Analysis into Eastern, Northern and West and Central populations. Utilising this structuring, it was possible to infer the provenance of 847 kiwi feathers from 108 cloaks and 153 kiwi feathers from 52 *kete*. A surprising proportion of cloaks (15%) and some *kete* (5.5%) were found to contain feathers from different geographic locations providing evidence of either kiwi trading among Māori tribes (*iwi*), tribal displacement, or organised hunting trips into other tribal areas. The data also suggests that the east of the North Island was the most prolific of all kiwi cloak and *kete* making areas, accounting for over 50% of all cloaks analysed and over 58% of all *kete*. This could indicate that the East of the North Island was the epicentre for this cultural tradition. Also, the structuring

observed in the reference database will prove to be useful to conservationists, such as the New Zealand Department of Conservation, when deciding strategies to maintain populations of New Zealand's most iconic bird. The genetic analysis of these treasured items has been invaluable in enriching our knowledge and rebuilding their lost histories. Additionally, genetic data from historical items can aid our understanding of how populations change overtime, thus aiding conservation of valuable species.

Acknowledgements

I feel lucky to have been part of a unique and special project. As a British citizen, the opportunity to be involved in a project so central to New Zealand and Māori culture has been a privilege for which I am extremely grateful. I have my supervisors Professor David Lambert, Dr Craig Millar and Dr Leon Huynen to thank for matching my skill set to a project that has continued to interest me, challenge me and, has allowed me to immerse myself into the culture of a country I have fallen in love with and now call home. The project was conceived by my supervisors, and funding obtained, thus making this study possible. Beyond that my supervisors have provided invaluable guidance, patience and advice. I truly appreciate their individual and collaborative roles in the production of this thesis. Thanks also to Dr Evelyn Sattlegger for taking me on as an extra student when circumstances changed during the course of my study.

I would like to extend a special thank you to Rangi Te Kanawa. Rangi's collaboration on the project was pivotal in its success. Her ability to liaise with museums coupled with her experience handling such valuable objects effectively made sampling of these *taonga* possible. I travelled to museums with Rangi during sampling and was always impressed with her kindness and graciousness, even when my choice of accommodation wasn't quite what either of us was expecting. During my travels with Rangi, a number of museums allowed us to sample from their collections. I would like to thank Awhina Tamarapa and staff at Te Papa Tongawera, Chanel Clarke and staff at Auckland War Memorial Museum, Hawkes Bay Museum and Regional Trust, Waikato Museum, Whanganui Regional Museum, Canterbury Museum, The British Museum and, The Horniman Museum. Without access to samples, this study would not have been possible.

Modern kiwi DNA samples were also vital to the project's success. For this I would like to extend thanks to the Department of Conservation (DOC) for provision of blood and feather samples from current kiwi populations. Rainbow Springs, Kiwi Encounter, Rotorua, provided us with the largest number of samples. I am grateful

to all of the team at kiwi encounter for their assistance, particularly Claire Travers, Emma Bean and Beverly Wilkinson.

Lara Shepherd has been a great help throughout the project. She conducted the preliminary work on the project and was always available to give me advice and comments on my work. I appreciate her continued support.

I would like to thank all of the sources of funding. First and foremost the Royal Society of New Zealand for the Marsden Fund which made the project financially viable; Massey University for tuition fees, provision of a computer and travel money; The University of Auckland and Craig Millar for additional financial support towards sequencing costs; and The Allan Wilson Centre for travel to the Evolution conference in 2007 and to their annual meetings in Palmerston North. Thanks go to Vivian Ward, Judith Robins and Kristine Boxen at the University of Auckland for assistance with figure preparation (Vivian), sequencing (Kristine) and independent verification of results (Judith).

I would like to thank members of the lab at Albany past and present for providing me with advice, support and light relief. Thanks to Gabby Beans, Jyothisna Visweswaraiah, Martina Dautel, Elmira Mohandesan, Reynald Castaneda, Monique van Rensburg, Jarod Young, Hayley Lawrence, Chris Rodley, Muharram Khoussainova, Monica Merriman, Saumya Agrawal, Tim Heupink and John Waugh.

I am lucky to have great family friends supporting me. I thank my partner Jonathan for his enduring patience and support.

Table of Contents

	Page Number
Abstract	II
Acknowledgements	IV
Table of Contents	VI
List of Figures	VIII
List of Tables	XI
Chapter One:	General Introduction
	Thesis Rationale and Overview 1
	References 14
Chapter Two:	Materials and Methods
	Overview of methods 18
	References 30
Chapter Three:	A Molecular Study of a Rare Māori Cloak
	Introduction 33
	Methods 35
	Results 36
	Discussion 36
	References 42
Chapter Four:	Temporal and Spatial Mitochondrial DNA Structure of North Island Brown Kiwi (<i>Apteryx mantelli</i>) Populations: Implications for Conservation Management
	Introduction 45
	Methods 49
	Results 54

	Discussion	59
	References	64
Chapter Five:	Ancient DNA Recovers the Origins of Māori Feather Cloaks	
	Introduction	69
	Methods	70
	Results	71
	Discussion	113
	References	121
Chapter Six:	Ancient DNA Analysis of Kiwi Feather Bags (<i>kete kiwi</i>)	
	Introduction	125
	Methods	126
	Results	127
	Discussion	137
	References	141
Chapter Seven:	General Discussion	
	Research findings and applications to conservation	142
	Applications to culture	144
Appendix:	Supplementary Material	
	Cloak haplotypes and sexing data	147
	Kete haplotypes	191

List of Figures

	Page Number
1.1 Ethnographic artefacts from around the world	5
1.2 Example of a Māori dog (<i>kuri</i>) and dyed flax fibre (<i>muka</i>)	7
1.3 Examples of Māori textiles	9
1.4 Current distribution of kiwi (<i>Apteryx</i> spp.)	13
2.1 Sampling Technique for Feathered Artefacts	19
2.2 Random Sampling of Cloaks	20
2.3 Determining the Number of Samples	21
2.4 Amplification of mtDNA using primers Kcf / Kcr	23
2.5 Determination of sex	26
2.6 Independent Verification of Results	29
3.1 Suspected 'moa' cloak	35
3.2 Aligned Mitochondrial 12S Sequences and Neighbor Joining Tree	37
3.3 The Location of Kawau Island	39
3.4 North Island Flax Stations in the 1820's	40
3.5 An example of another possible emu feather cloak	41

4.1	(A) Map showing the locations of the four North Island brown kiwi taxa recognised by the Department of Conservation	47
	(B) Map showing sampling locations for North Island brown kiwi	47
4.2	Radial distance neighbor-joining tree for 200bp of the mtDNA HVR1 region for <i>Apteryx</i> spp.	56
4.3	Statistical parsimony networks for 200bp mtDNA HVR1 region for <i>Apteryx mantelli</i> for reference (A) and cloak samples (B)	57
4.4	Geographic distribution of mtDNA HVR1 sequences for <i>Apteryx mantelli</i>	58
4.5	Hierarchical nested clades determined for Statistical parsimony using <i>Apteryx mantelli</i> mtDNA HVR1 reference data	59
5.1	Amplification success rates of mtDNA HVR1 for each museum sampled from	72
5.2	Provenance of kiwi feathers from four representative cloaks	74
5.3	The Inland Patea as a possible trade route	119
6.1	Observed haplotype frequencies for reference samples, cloak samples and kete samples	129
6.2	Kete from Te Papa Tongawera Museum of eastern provenance	130
6.3	Kete from Te Papa Tongawera Museum of western and northern provenances	130
6.4	Kete from Canterbury Museum of eastern provenance	131

6.5	Kete from Canterbury Museum of west and central provenance	132
6.6	Kete from Canterbury Museum of mixed or inconclusive provenance	132
6.7	Provenance of kete from Waikato Museum	133
6.8	Kete from Whanganui Regional Museum of west and central provenance	133
6.9	Kete from Whanganui Regional Museum of eastern provenance	134
6.10	Kete from Auckland Museum of west and central provenance	134
6.11	Kete from Auckland Museum of eastern provenance	135
6.12	Kete from Auckland Museum of Northland and Coromandel provenance	136
6.13	Kete from Auckland Museum of mixed and inconclusive provenance	136
6.14	Kete sampled from the British Museum with Eastern Provenance	137

List of Tables

	Page Number
2.1 Number of cloaks sampled from and number of samples taken from each museum	19
2.2 Number of kete sampled from and number of samples taken from each museum	21
2.3 Independent verification of results	28
4.1 Reference database Kcf/ Kcr haplotypes obtained during this study	50
4.2 Reference database Kcf/ Kcr haplotypes from the literature	55
4.3 Significant results from NCA and inferred phylogeographic scenarios	59
5.1 Individual cloak analyses	76
6.1 Kete from which no sequence data were obtained	128