Bay of Plenty Conservancy vertebrate skull and sign reference collection

TECHNICAL REPORT SERIES 32

Department of Conservation
Te Papa Atawhai

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Technical report series 32

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Published by
Department of Conservation
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PO Box 1146
Rotorua, New Zealand

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Cover photograph: Ferret skull, frontal view. B. Christensen 2009.

ISBN (hardcopy): 978-0-478-14646-2
ISBN (web PDF): 978-0-478-14647-9
ISSN: 0114-6688

This report was prepared for publication by the Technical Support Unit, Bay of Plenty Conservancy. Publication was approved by the Acting Conservation Support Manager, Bay of Plenty Conservancy, Department of Conservation, Rotorua, New Zealand.

CONTENTS

Abstract

Having a physical reference resource for staff to identify particular pest species by sign or their impact is important to outline the best management options specific to each species. This document lists the current holdings of the Bay of Plenty Conservancy vertebrate skull and sign reference collection held at Rotorua. These are relevant to the research and management of pest and threatened species in the Bay of Plenty Conservancy. A total of 28 specimens are listed, of which 16 are skulls, and 6 are hair samples. These include 10 species of mammals and 2 species of birds.

Keywords: Bay of Plenty Conservancy, vertebrates, skull and sign, reference collection

1. Introduction

1.1 IDENTIFICATION OF SPECIES, BY SIGN OR IMPACT

The identification of particular species by sign or their impact is important for a variety of reasons:

- Island biosecurity issues: Predator free islands are highly important areas for the continued protection of threatened species. For example, Mokoia Island in Lake Rotorua has a maintenance focus for biodiversity management. Management is particularly reactive to biosecurity incursions (Christensen & Sutton (2007).
- Regional biosecurity issues: As the wallaby feral range is slowly increasing, it becomes important for DOC managers throughout the Region to know how to identify the presence of wallaby from sign such as hair sample are spreading e.g. (Dave Lumley DOC Turangi pers. comm. 2002).
- Determining what predator killed a threatened species: This can be done by examining the dentition and accompanying sign (Brown et al. 1996; Ratz et al. (1999) surrounding 'kills'. Ratz et al. (1999) also noted that conservation management (by way of better targeting of predator trapping and poisoning efforts) would be improved with more useful diagnostic tools to identify predators.
- For staff and Public: Many samples (or photographs and descriptions) are provided by the public, as they are interested in what animal is or was, and particularly; is the animal a pest? In addition, such a reference collection can be used for public interpretation events.

1.2 THE COLLECTION

We collected and processed the skulls, hair samples, and skins from the following species; mouse, rat, hedgehog, feral cat, weasel, ferret, rabbit, hare, possum, and dama wallaby. Further samples have been collected over the last five years (e.g. a feline pelt, and vertebrate skeletons) although had no fixed home. Details such as the date and location caught/found, species name, sex, weight, and other characteristics were collected along with the specimens.

Most of the collection comes from Katikati and the Rotorua Lakes areas, although some specimens also come from the wider Bay of Plenty region. It is expected that the collection will expand over time, and other important reference information. One of the research projects already identified, that could use such a collection is the possible incursion points for Mokoia Island from around Lake Rotorua (P. Corson pers. comm. 2008).

1.3 STUDY OBJECTIVE

The objective of this study is to:

- *Establish a reference library of skulls and sign of vertebrates (chiefly mammals) for staff.*

2. Methods

2.1 SKULLS AND SIGN

Full bodied specimens were collected, identified, sexed and recorded (Common name, sex, age, and locality). Three key general points were followed for health and safety;

1. No animals were processed that died of unknown causes, in case of possible zoonoses.
2. Latex gloves were used while cleaning the specimens, and all equipment was used carefully to avoid stick injuries.
3. Enzymatic proteolysis was completed using a solution that had been pre-prepared, this minimized inhalation of the powder while immersing and washing the specimen skulls.

The heads were removed, and preparation of the skulls followed (Davis & Payne 1992). The skulls had the skin, eyes and soft tissue removed (defleshed). Each skull was then placed in a separate plastic container to avoid small bones and teeth loss, and also to avoid mixing up of any of such fragments between skulls. The skulls were then processed by enzymatic proteolysis using a solution of biological washing powder dissolved in warm water. The specimen skulls were kept immersed in this enzymatic solution, and kept warm for as long as possible to extend the activity of the enzymes. The containers of the specimen skulls were then placed in a steel (bread box) container and left in direct sunlight (to continue the enzymatic process) for up to three weeks. This incubation cycle was repeated were necessary (particularly for the larger skulls – i.e. dama wallaby, possums and feral cat). Once all or the majority of the soft tissue and internal fluid material had been removed following proteolysis the specimen skulls were washed, and a mild hydrogen peroxide (conc.) was using to lightly bleach the bones. If necessary teeth were glued back into the skull using epoxy superglue.

All skulls had their accession number written onto a specimen tag, which was then tied to the skull (usually to the lower mandible or zygomatic arch) or double-bagged alongside the specimen. The skulls and other large samples were then placed into separate cardboard storage containers, and then into a large cardboard storage container. This container has been incurred/deposited into the DOC Library system:

- Reference: Bay of Plenty Conservancy vertebrate skull and sign reference collection
- Author: Christensen, B.
- Number: A1218380

Hair and feather samples were placed into paper slips, and then ordered alphabetically (by common name) into a collection index. The index holds information (see Appendix 1) on all samples and specimens.

2.2 REFERENCE LIST

The list of specimens within the Bay of Plenty Conservancy vertebrate skull and sign reference collection, had seven categories of information included under the following headings (following Baker et al. 2006);

- Family/Genus species
- Common name
- Sex
- Age
- Comp(leteness): This column indicates approximately how complete the specimen is. Thus, bones initially, then hair/sign;
  - ***1*** most or all bones and teeth are present,
  - ***2*** partial skeleton (in most cases includes the skull and a mandible, limb girdles, and one fore and one hind limb),
  - ***3*** skull and mandibles only,
  - ***4*** very incomplete,
  - ***5*** other,
  - ***6*** fore and hind main limb bones only;
  - ***c*** refers to casts
  - ***h*** refers to hair
  - ***f*** refers to feathers
  - ***s*** refers to sign (photographs, casts, etc)
- Locality (Grid reference – if available)
- Accession number

The vertebrate skull and sign reference collection is listed in Appendix 1. ***h***, ***f***, and ***s*** were additional categories from (Baker et al. 2006) added for this work.

3. Results

A summary (by Family, species, common name, locality found, and numbers) of the reference collection is given in Table 1. The full collection is given in Appendix 1. We collected and processed the skulls, hair samples, and skins from the following species; mouse, rat, hedgehog, feral cat, weasel, stoat, ferret, rabbit, hare, possum, and dama wallaby.

Table 1. Summary of reference collection specimens

FAMILY **Order** **Genus Species**	**Common name**	**Locality**	**Number**
AVES			
Phasianidae			
Phasianus colchicus	ring-necked pheasant	Kaharoa, Rotorua	2
Turdidae			
Turdus philomelos	Song thrush	Te Puke	1
MAMMALIA			
Macropodidae			
Macropus eugenii	dama wallaby	Lake Tarawera & Makatiti Dome, Rotorua	4
Phalangeridae			
Trichosurus vulpecula	Brush-tailed possum	Katikati	3
Erinaceidae			
Erinaceus europaeus	Hedgehog	Katikati	1
Mustelidae			
Mustela nivalis	Weasel	Katikati	2
Mustela furo	Ferret	Katikati	2
Felidae			
Felis catus	Feral cat	Katikati	1
Muridae			
Mus musculus	Mouse	Katikati	2
Rattus rattus	Ship rat	Katikati	3
Leporidae			
Oryctolagus cuniculus	Rabbit	Kaimai Range	1
Lepus europaeus	European hare	Lake Okareka, Rotorua	1
		Katikati	3

4. Discussion

This small project was done so as to provide a physical reference resource for staff. It is intended to be used in collaboration with biological literature, such as; '*The handbook of New Zealand mammals'* by King, C. M. 2005. When a native and especially threatened species' body is found, it is important to quickly and correctly identify the cause of death if at all possible. Predators will often leave tell-tale signs around a 'kill', such as hair, and dentition marks on a carcass (Ratz et al. 1999). Hopefully this collection of skulls and hair will be useful for the identification of a predator species, following the finding of such sign. It is useful to quickly identify the best management options specific to each predator; e.g. trapping for cats, or the use of stoat dogs, as this is likely to improve capture rates.

Another example of having such reference material available is the quick identification of mammals of Regional biosecurity concern. The dama wallaby feral range is slowly spreading, and to quickly determine the presence of wallaby in new areas would be beneficial, as they may only be few in number locally and disjointed from the main breeding populations.

Not all predatory mammal species were collected and processed by the time of this publication. The stoat will be a key voucher specimen for this reference collection. Future uses for this reference collection include research, and the collection of DNA samples to identify potential incursions areas for pest mammal free islands in the Bay of Plenty Conservancy such as Mokoia (Christensen & Sutton 2007), and Moutohora (Whale Island).

5. Acknowledgments

We would like to thank the following people for additional samples; Sally-Anne Daniels (Environment Bay of Plenty – EBOP) for the collection of ring-necked pheasant and song thrush feathers, Peter Corson and Pauline Adams (both from DOC Rotorua Lakes) for the collection of some dama wallaby samples. Matt Hickson (DOC Bay of Plenty) helped with the processing of some of the dama wallaby samples. The Jefferson & Murphy families were kind enough to host the processing of the skulls while this work was in progress. Kody Williams and Stephanie Twaddle (DOC Tauranga) transported the samples from Katikati to Rotorua. Sue Clements (DOC Bay of Plenty) provided help and advice on the establishment of this collection as a library record. Matt Hickson provided useful comments on a draft report, and greatly improved its readability.

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8. Appendix

Appendix 1: Vertebrate skull and sign reference collection

FAMILY **Order** **Genus Species**	**Common name**	**Sex**	**Age**	**Comp**	**Locality**	**Accession**
AVES						
Phasianidae						
Phasianus colchicus	ring-necked pheasant	M	A	f	Kaharoa, Rotorua	3
		F	A	f	Kaharoa, Rotorua	4
Turdidae						
Turdus philomelos	Song thrush		A	f	Te Puke	5
MAMMALIA						
Macropodidae						
Macropus eugenii	dama wallaby	F	A	3, h	Makatiti Dome, Rotorua	1
		F	A	3	Lake Tarawera	19
		M	A	3	Lake Tarawera	16, 20
Phalangeridae						
Trichosurus vulpecula	Brush-tailed possum	M	A	3, h	Katikati	7, 17
		M	Juv.	3	Katikati	10
Erinaceidae						
Erinaceus europaeus	Hedgehog	M	A	3, h	Katikati	11
Mustelidae						
Mustela nivalis	Weasel	?	A	3	Lund Road, Katikati	24, 25
Mustela furo	Ferret	M	A	3	Wright Road, Katikati	8,
		?	A	3	Tanners Point, Katikati	12
Felidae						
Felis catus	Feral cat	?	A	3	Katikati	15
Muridae						
Mus musculus	Mouse	?	A	3	Lund Road, Katikati	6, 26
Rattus rattus	Ship rat	?	A	3	Lund Road, Katikati	21-23
Leporidae						
Lepus europaeus	European hare	?	A	h	Playne's Farm, Lake Okareka	2,
		F	A	3, h	Tuapiro Road, Katikati	9,
		?	A	3, h	Katikati	13,
		M	A	3	Tuapiro Road, Katikati	14
Oryctolagus cuniculus	Rabbit	?	A	3	Kaimai Range	18

The Comp column indicates approximately how complete the specimen is, and assigned to the following key;

1 = most or all bones and teeth are present,
2 = partial skeleton (in most cases includes the skull and a mandible, limb girdles, and one fore and one hind limb),
3 = skull and mandibles only,
4 = very incomplete,
5 = other,
6 = left (occasionally right) fore and hind main limb bones only,
c = refers to casts,
h = refers to hair,
f = refers to feathers
s = refers to sign (photographs, sign casts, etc)

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