

# Preliminary studies of Chatham Island tui: January 1995 population status and aspects of ecology

SCIENCE & RESEARCH SERIES NO.99

P.J. Dilks<sup>1</sup> & J. Kearvell<sup>2</sup>

<sup>1</sup>Department of Conservation, Private Bag, Christchurch.

<sup>2</sup>11 Ayers St., Rangiora.

Published by  
Department of Conservation  
P.O. Box 10-420  
Wellington, New Zealand

© June 1996, Department of Conservation

ISSN 0113-3713  
ISBN 0-478-01818-5

Cataloguing-in-Publication data

Dilks, Peter J., 1950-

Preliminary studies of Chatham Island tui : January 1995 population status and aspects of ecology / P.J. Dilks & J. Kearvell. Wellington, N.Z. : Dept. of Conservation, 1996.

1 v. ; 30 cm. (Science & Research series, 0113-3713 ; no. 99.)

Includes bibliographical references.

ISBN 0478018185

1. *Prothemadera novaeseelandiae chathamensis* 2. Rare birds - New Zealand- Chatham Islands. I. Kearvell, J. (John) II. Title.

III. Series: Science & research series ; no. 99.

598.8099399 20

zbn96-079367

# CONTENTS

|                                    |    |
|------------------------------------|----|
| Abstract                           | 5  |
| <hr/>                              |    |
| 1. Introduction                    | 5  |
| <hr/>                              |    |
| 1.1 Historical records             | 5  |
| 2. Methods                         | 6  |
| <hr/>                              |    |
| 2.1 Tui distribution               | 6  |
| 2.2 Capture and banding of birds   | 8  |
| 2.3 Age and sex                    | 8  |
| 2.4 Foods and feeding observations | 8  |
| 2.5 Population estimates           | 9  |
| 3. Results                         | 9  |
| <hr/>                              |    |
| 3.1 Tui distribution and movements | 9  |
| 3.2 Capture and banding of birds   | 9  |
| 3.3 Age and sex                    | 11 |
| 3.4 Breeding                       | 12 |
| 3.5 Foods and feeding observations | 14 |
| 3.5.1 Nectar                       | 14 |
| 3.5.2 Fruit                        | 15 |
| 3.5.3 Invertebrates                | 16 |
| 3.6 Population estimates           | 17 |
| 3.7 Winter observations            | 17 |
| 3.7.1 Pitt Island                  | 18 |
| 3.7.2 Rangatira Island             | 18 |
| 4. Discussion                      | 20 |
| <hr/>                              |    |
| 5. Further work                    | 21 |
| <hr/>                              |    |
| 6. Acknowledgements                | 23 |
| <hr/>                              |    |
| 7. References                      | 23 |
| <hr/>                              |    |
| 8. Appendix 1                      | 25 |
| <hr/>                              |    |
| 9. Appendix 2                      | 29 |
| <hr/>                              |    |

# Abstract

Chatham Island tui have declined markedly in both range and numbers since European settlement of the islands. Tui have all but vanished from Chatham Island and breeding tui are now abundant only on Rangatira Island. In January 1995 this population was estimated at around 230 adults. Sixty tui were colour banded and measured, and feeding and breeding observations were carried out. Chatham Island tui are larger and heavier than mainland birds. During winter most tui leave Rangatira Island for adjacent Pitt Island which presumably provides a more sheltered environment.

## 1. Introduction

The Chatham Island tui (*Prothemadera novaeseelandiae chathamensis*), an endemic subspecies of the New Zealand tui (*Prothemadera n. novaeseelandiae*), was formerly widespread and common on all of the major islands of the Chatham group (Chatham, Pitt, Rangatira and Mangere Islands)(Figure 1). The tui is the only member of the honey-eater group of birds remaining on the Chatham Islands; the endemic bellbird (*Anthornis melanura melanocephala*) has been extinct since 1906. Honey-eaters are important pollinators and, along with pigeons, are important fruit dispersers. Therefore, they are an essential ecological component in the health of a forest ecosystem. Chatham Island tui, with their long distance post-breeding dispersal, and to a lesser extent starlings (*Sturnus vulgaris*), seem to be the most important species for dispersal of fruit (seeds) on and between the islands of the group. This is because parea (Chatham Island pigeon, *Hemiphaga novaeseelandiae chathamensis*) tend to be sedentary and territorial year-round.

### 1.1 HISTORICAL RECORDS

Tui were formerly abundant throughout the Chatham Islands but by 1938, when Fleming made a detailed survey of bird distribution, their range and numbers had been much reduced. Tui were found to be less common in the north of Chatham Island but plentiful in the southern parts. They were reported to be abundant on Pitt Island and in "fair numbers" on Rangatira Island (Fleming 1939). Both their range and numbers continued to decline and by the 1970s they were reported as uncommon on Pitt and Chatham (D.V. Merton and B.D. Bell: Endemic birds of the Chatham Islands, unpublished manuscript, 1975, New Zealand Wildlife Service, now department of Conservation) but still breeding in the south of Chatham Island (Hugh Robertson, pers. comm.). During recent parea research in the south of Chatham Island, tui were rarely encountered. A few birds were usually seen mid to late winter, but in summer it was extremely rare to see a tui (pers. obs., Ralph Powlesland, Ian Flux, Andy Grant, pers. comm.). A detailed bird distribution

survey of much of the Chatham Island carried out during November 1988 and November 1989 recorded few tui (Figure 1, A. Grant unpublished data).

On Pitt Island it also appears that tui numbers have declined greatly; their occurrence and conspicuousness there is now seasonal. During a botanical survey of reserves in April 1983 few tui were observed (Geoff Walls, pers. comm.) but in spring 1994 large numbers of birds were observed feeding on flowering flax (Alison Turner pers. comm.). Tui have always been recorded as present on Rangatira Island but numbers were low when the island was grazed; they were recorded as rare in 1953 (Bell 1955), seen occasionally 1954 (Dawson 1955), and 10–12 pairs estimated in 1961 (D.V. Merton and B.D. Bell 1975, as noted earlier). However, since grazing ceased in 1961 and the vegetation has started to recover, numbers have increased markedly. Tui were the second most conspicuous species recorded during bird counts on Rangatira in 1983 (West 1988), and they were recorded as abundant in the 1990s being in family groups and with a flock of 60+ birds seen in the air over Woolshed Bush (Nilsson, Kennedy & West 1994). Few tui have been observed on the largely deforested Mangere Island but birds visit on occasions and a pair has been observed breeding there recently.

Tui are now common only on Rangatira Island and although birds are seen regularly on adjacent Pitt Island, it is likely that most of the breeding population is found on Rangatira. Outside the breeding season tui are seen commonly on Pitt, with small numbers reaching Chatham and Mangere Islands.

In 1994 a research project to investigate the status, population and biology of Chatham Island tui commenced. This report outlines the findings of the first trip to Rangatira Island specifically to study tui. We flew to Waitangi, Chatham Island on 31/12/94 and spent four days based in the Awatotara before flying to Pitt Island on 5/1/95 and then to Rangatira on 6/1/95. JK left Rangatira on 20/1/95 and PJD left on 27/1/95.

A two week visit was also made during winter to carry out further observations on tui and to attach radio transmitters to some female tui on Rangatira so that breeding could be followed the next summer.

## 2. Methods

### 2.1 TUI DISTRIBUTION

We visited all parts of Rangatira Island, noting the abundance of tui, and searched for potential mist-netting sites in areas where flax (*Phormium tenax*) flowers were still being visited by birds. Once banding began all birds were checked for colour bands.

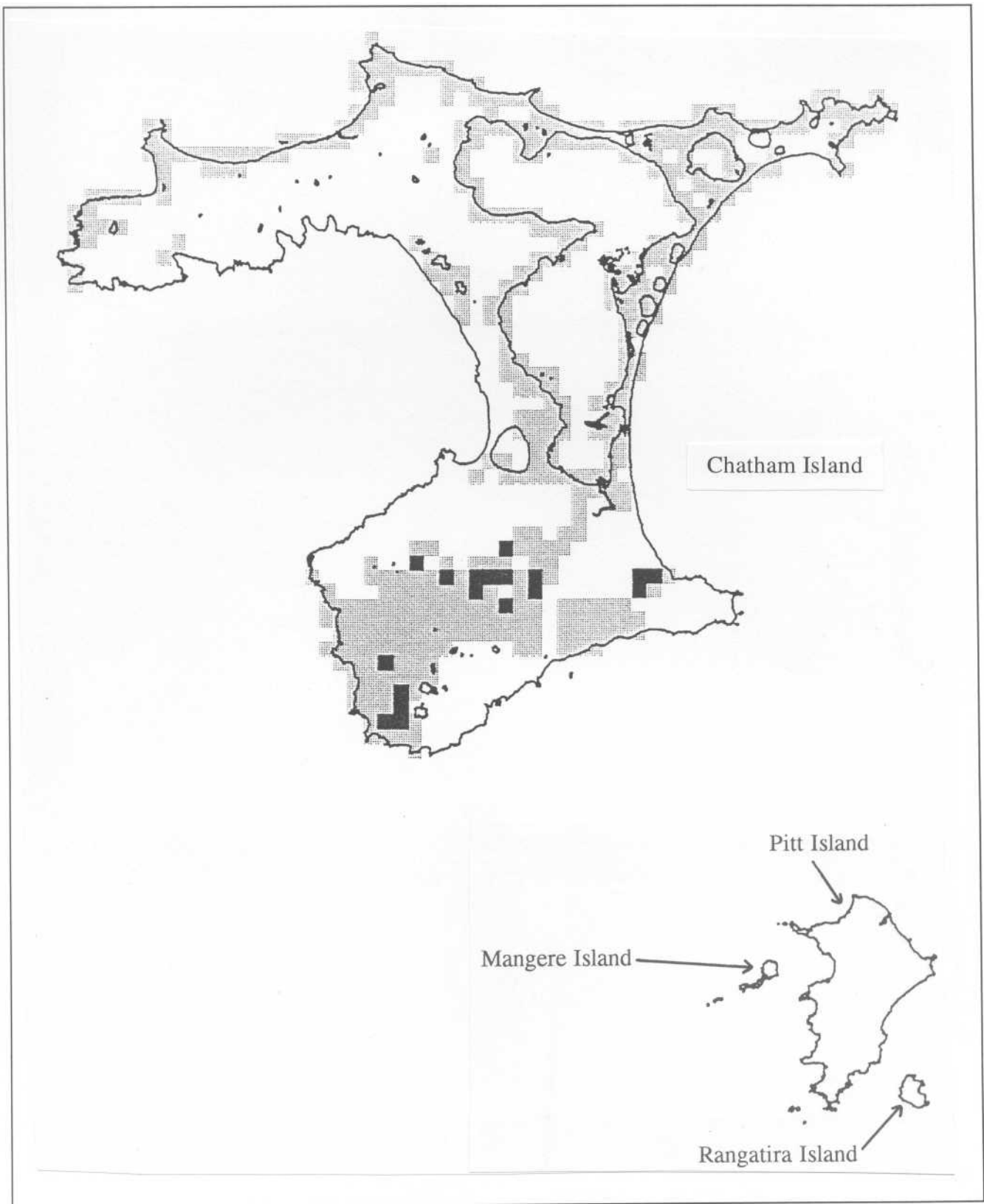


FIGURE 1 LOCALITY MAP OF SITES MENTIONED IN TEXT. TUI DISTRIBUTION ON CHATHAM ISLAND WAS MAPPED DURING NOVEMBER 1988 AND 1989. THE SHADED SQUARES WERE SEARCHED FOR TUI, BIRDS WERE RECORDED IN THE BLACK SQUARES - IN ALMOST ALL CASES ONLY ONE BIRD WAS RECORDED IN EACH SQUARE. MUCH OF THE UNSURVEYED AREA OF CHATHAM ISLAND IS NOT FORESTED.

## 2.2 CAPTURE AND BANDING OF BIRDS

Tui were fairly easily mist netted and we used three methods:

1. At the few remaining areas of flowering flax we erected two net rigs, each consisting of two mist nets, one above the other, on telescopic aluminium poles (Dilks *et al.*, 1995). This method was also used to catch birds at the hut and along the Western Landing track where large numbers of birds were feeding on insects and muehlenbeckia (*Muehlenbeckia australis*) fruit.
2. At Kokopu creek we erected one short net adjacent to a small drinking and bathing pool that was frequented by all bird species. A constant stream of birds visited this site throughout the day. A major drawback at this site was initially the large number of red-crowned parakeets (*Cyanoramphus novaeseelandiae*) that were caught. They were difficult (and painful) to untangle from the net, but fortunately they soon learned to avoid it. Other small birds were often caught but usually fell through the mesh and escaped.
3. The third method involved using short aluminium poles with only one mist net. This rig was set up along walking tracks, usually in thick vegetation with a low canopy. A stuffed and mounted tui was set up on a branch close to and midway up the net and a taped tui distress call played (a recording of a bird being removed from the mist net). Usually all birds in the area arrived and the territorial male was especially aggressive. Most birds, however, avoided the net, but as it only took about 10 minutes to set up, we moved a few hundred metres and tried again.

## 2.3 AGE AND SEX

All birds caught were weighed, aged and measured. We recorded tarsus, tail, wing and head length, and bill length, depth and width. It was soon apparent that the bill length measurement was of little use as the extent of feathering over the bill (and hence the measurement) varied enormously from bird to bird. We also checked each bird caught for signs of wing and tail moult, and the presence of a brood patch.

## 2.4 FOODS AND FEEDING OBSERVATIONS.

We noted all foods that tui were seen eating, plus seeds found in droppings when banding birds. Some habitat use observations (Powlesland *et al.*, 1992) were made. Anecdotal notes were made of foods available and photographs taken to record the extent of flax flowering.

## 2.5 POPULATION ESTIMATES.

When most of the banding had been done, we walked transects recording the numbers of tui seen and the portion of these that were banded. Initially these transects were carried out passively (i.e., only recording the birds we encountered), but towards the end of the trip transects were repeated and a "distress call" tape played at intervals to attract birds.

# 3. Results

## 3.1 TUI DISTRIBUTION AND MOVEMENTS

Birds were found in all forested areas but appeared to be most abundant in the lower parts of the island, north of Skua Gully (Fig. 2). Large numbers of birds were also found along Kokopu Creek, probably stopping off to drink and bathe as they passed to and from feeding areas. Birds that had been banded at Kokopu Creek were seen at both the northern and southern ends of the island (Fig. 2) and most birds probably visited here to drink and bathe. This was the only flowing stream on the island. We only recaptured one banded bird at this site and rarely sighted colour banded birds there. The large open areas with mounds of *muehlenbeckia* along the Western Landing Track were an important feeding area where birds gleaned fruit and insects and hawked for flying insects, at times 100 m or more above the ground. Groups of birds were also seen hawking for insects over the Clears, the seal colony, and above the summit and Skua Gully. On a few occasions these high flying flocks drifted towards Pitt and some birds may have crossed to Pitt Island instead of returning to Rangatira. On 22nd January a watch was carried out from the West Landing area and on two occasions birds were seen flying across the sea to Pitt. On the first occasion two birds flew across, the second observation was of a single bird.

## 3.2 CAPTURE AND BANDING OF BIRDS

We caught and colour banded a total of 60 birds at 11 sites (Fig. 2, Appendix 1). The drinking and bathing pool on Kokopu Creek was the most productive; we caught 24 different tui there. This stream (there were several other popular pools) seemed to be the watering spot for most of the birds on the island, and there was a constant movement of birds to drink and bathe there through the day. There were always large numbers of juveniles in the area. The only other drinking pool we found was at the top edge of the wave platform below the hut, but it was not possible to use a mist net at this site. The other productive sites for catching birds were the South Cliffs (15 tui caught) and the Swamp (6 tui caught) (both had the last of the flowering flax) and the North West Landing track (6 tui caught). The remaining birds were caught at scattered sites at the northern end of the island where we set up low nets and the decoy bird along the walking tracks.



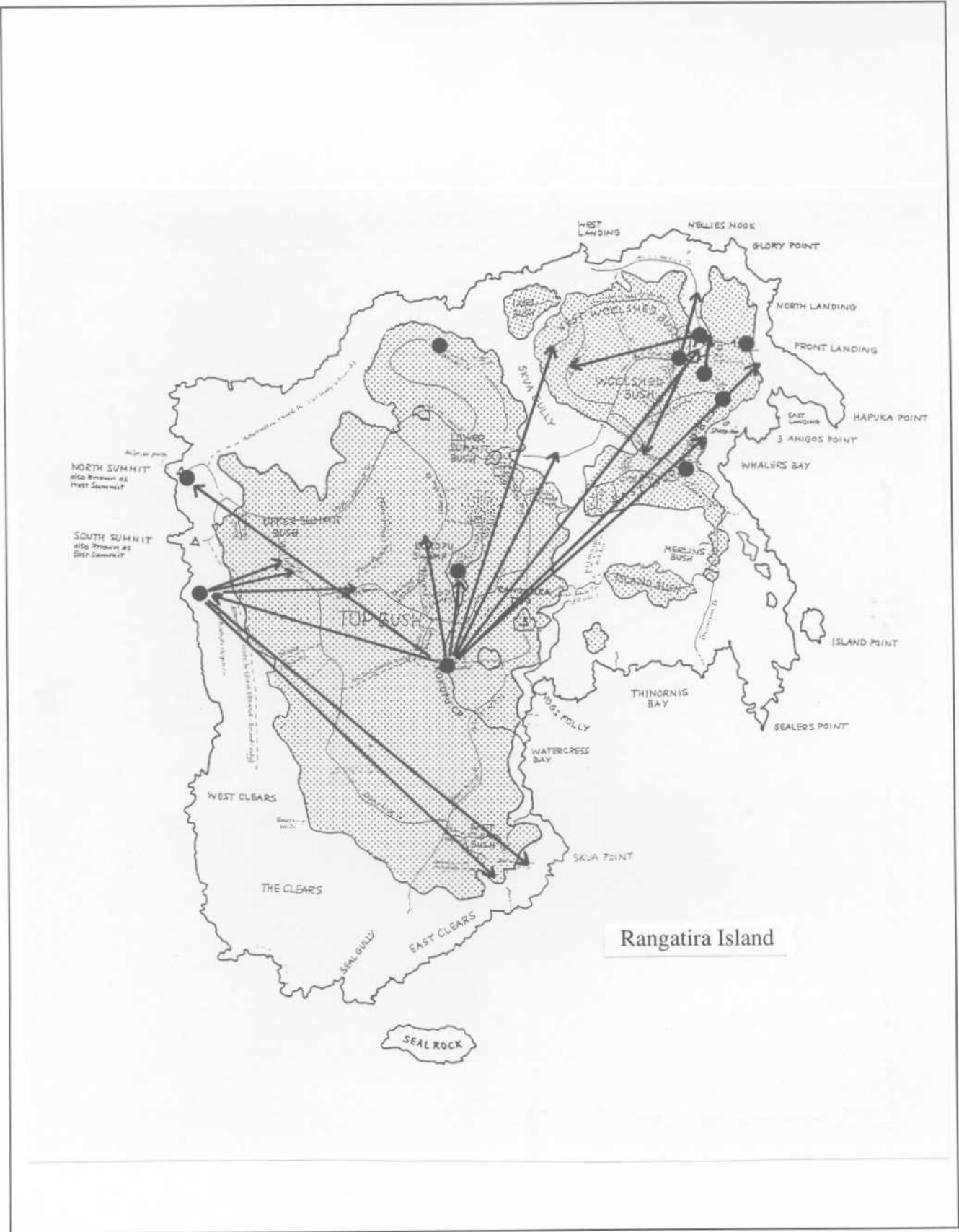


FIGURE 2: SIGHT RECORDS OF COLOUR BANDED TUI AWAY FROM THEIR BANDING SITE. THE BLACK DOTS MARK MIST NET SITES; THE SHADED AREAS THE EXTENT OF FOREST COVER.

All birds were colour banded using a metal plus three colour bands. We used D metal and wrap around colour bands but some Y bands would have been useful for the very large males. We observed, but did not catch, larger males that would have certainly required Y bands. In future, tui will be banded with Y metal bands.

Only one captured bird was moulting; a first-year female with a brood patch had both wing and tail moult in progress. One or two moulting birds were observed in flight.

### 3.3 AGE AND SEX

Birds were classed as:

**Juvenile** – very young birds had a yellow gape and no throat tassels, some still looked "fluffy". Older juvenile birds had throat tassels of varying lengths, but no white lacing on the neck feathers.

**One year olds** – these birds looked like adults in all aspects of plumage but still had some of their juvenile primaries and hence no notch on their third primary (Onley 1986).

**Adult** – glossy plumage with well-developed throat tassels and white lacing on the neck feathers. The third primary had a well-developed notch (Onley 1986).

TABLE 1 AGE AND SEX OF CHATHAM ISLAND TUI CAUGHT ON RANGATIRA ISLAND IN JANUARY 1995.

| AGE      | MALE | FEMALE | TOTAL |
|----------|------|--------|-------|
| Adult    | 11   | 22     | 33    |
| One year | 4    | 3      | 7     |
| Juvenile | 12   | 8      | 20    |
| Total    | 27   | 33     | 60    |

Once the age of each bird had been determined it could be readily sexed by wing length as found by Onley (1986). There was no overlap in wing length between the sexes within each age class (Fig. 3a). Head-bill length did not overlap between sexes (Fig. 3b), but this was a less obvious indicator of sex. All one-year and adult females (sexed by wing length) had well-developed brood patches. Data recorded for each bird are shown in Appendix 1.

Weights of birds varied enormously, from 94 g for the lightest, (a one-year old female), to 175 g for the heaviest (an adult male) (Appendix 1). The mean weight of 32 females was 106 gm, that of 28 males 146 gm.

For birds of the same age and sex, Chatham Island tui are larger and heavier than mainland tui (Table 2).

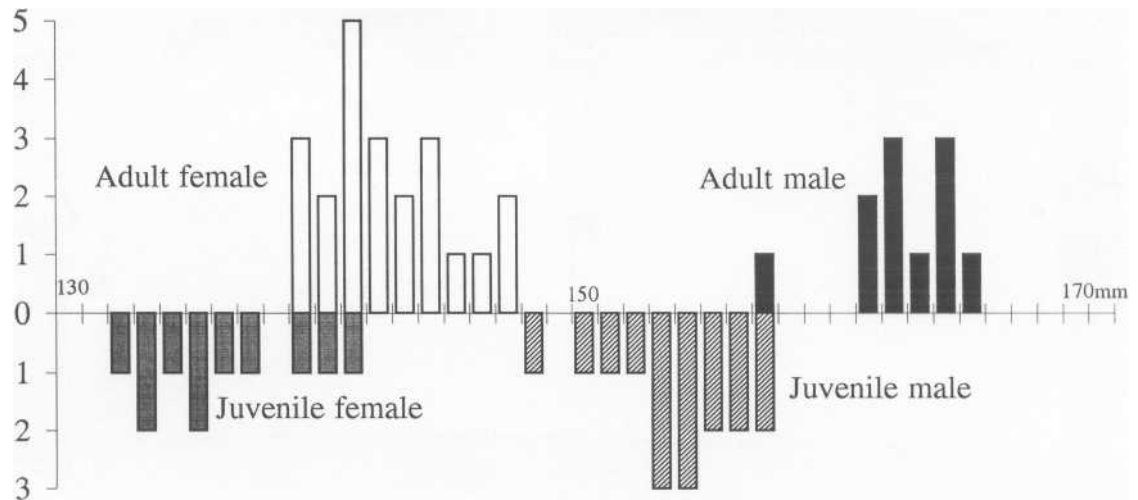


FIGURE 3A CHATHAM ISLAND TUI WING LENGTH - JUVENILES INCLUDE FIRST-YEAR BIRDS.

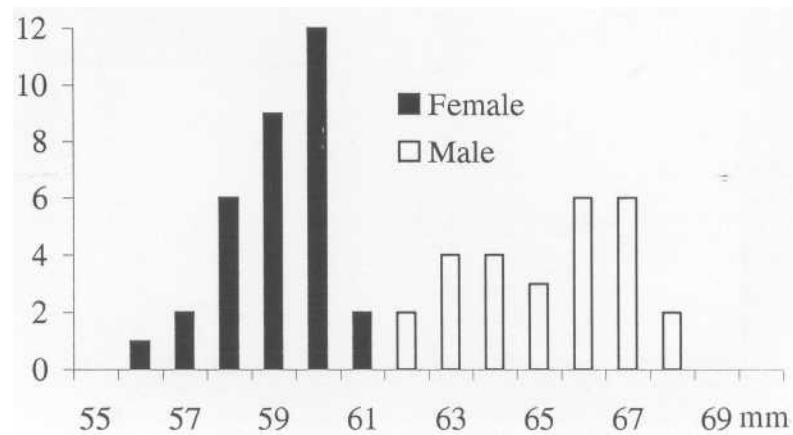


FIGURE 3B CHATHAM ISLAND TUI; HEAD (+BILL) LENGTH.

### 3.4 BREEDING

When we arrived on Rangatira in early January there were large numbers of fledged juveniles ranging in age from those in near adult plumage with long throat tassels but lacking the white lacing on neck feathers to newly fledged birds, still "fluffy" in appearance, with bright yellow gapes and no sign of throat tassels. The first fledglings of the season had been noted on 4/12/94 (S Phillipson - hut diary). However, in mid January we observed birds carrying food and in the last week of the trip three pairs were found feeding nestlings that ranged in age from probably less than a week old (naked and downy with wing quills) to nearly fledged. The pair resident at the hut were also feeding nestlings but the nest couldn't be found. It is likely that many pairs were feeding nestlings or recently fledged young.

The Whalers Bay nest was watched for three hours on 23 January and the Woolshed Bush nest for two hours on 24th to record frequency of chick feeding. In both cases it appeared that almost all of the feeding was carried out

TABLE 2 COMPARATIVE MEASUREMENTS OF TUI FROM RANGATIRA ISLAND, THE ORONGORONGO VALLEY (ROBERTSON *et al.* 1983) AND TIRITIRI MATANGI ISLAND AND THE ADJACENT MAINLAND NEAR AUCKLAND (CRAIG *et al.* 1981).

|        |             | RANGATIRA ISLAND |           | ORONGORONGO VLY |         | AUCKLAND |
|--------|-------------|------------------|-----------|-----------------|---------|----------|
|        |             | MEAN             | RANGE     | MEAN            | RANGE   | MEAN     |
| Weight | Male        | 145.8            | 120–175   | 124.9           | 97–150  | 121.2    |
|        | Female      | 106.4            | 94–130    | 89.6            | 70–105  | 87.0     |
| Wing   | Ad male     | 161.7            | 155–165   | 152.2           | 142–163 | 144.2    |
|        | Ad female   | 142.3            | 139–147   | 133.2           | 125–142 | 129.3    |
|        | Juv male*   | 153.5            | 148–157   | –               | –       | –        |
|        | Juv female* | 135.9            | 132–141   | –               | –       | –        |
|        |             |                  |           |                 |         |          |
| Head   | Male        | 65.2             | 61.9–67.9 | –               | –       | –        |
|        | Female      | 59.1             | 56.4–60.7 | –               | –       | –        |
| Tarsus | Male        | 44.9             | 42.4–47.0 | 40.9            | 38–44   | –        |
|        | Female      | 40.3             | 38.7–43.1 | 37.0            | 32–40   | –        |
| Tail   | Male        | 128.8            | 118–137   | 122.3           | 104–134 | –        |
|        | Female      | 116.1            | 109–122   | 108.8           | 100–117 | –        |

\* Juveniles include all one-year old birds (no wing notch) which still retain their juvenile primaries.

by the female. The male often followed her to the nest and sang from a nearby perch. There was no suitable vantage point for observing the third nest.

**Whalers Bay nest –23/1/95**, observations 1500–1800. It contained three nestlings about one week old. The nest was in a clump of *muehlenbeckia*, at about 6 m, near the top of a ribbonwood (*Plagianthus regius* var. *chathamicus*) tree. The nest was easily observed from below but was well screened from above.

The chicks were fed at:

1505, 07, 09, 13, 18, 24, 25, 29, 35, 37, 41, 42, 48, 49, 52, 54, 56, 57,

1601, 05, 09, 12, 15, 16, 16, 22, 35, 43,

1700, 03, 06, 10, 11, 12, 16, 17, 18, 18, 19, 22, 26, 27, 31, 33, 37, 38, 42, 45, 46, 51, 52, 56, 57.

There were 53 feeding visits in 180 minutes, giving an average of 3.4 minutes between visits. For the most frequent visits, i.e., 1716, 17, 18, 18, 19 the female flew to muehlenbeckia vines near the nest, rapidly plucked fruit and returned to feed the chicks.

**Woolshed Bush nest – 24/1/95**, feeding observations 1515–1715. An unknown age/number of nestlings. The nest was at 4 m in thick supplejack (*Ripogonum scandens*) on a ribbonwood. There was very thick vegetation above the nest which was 0.5 metres from the top of the canopy.

The chicks were fed at:

1518, 22, 29, 32, 35, 38, 40, 41, 50, 52, 54, 55,

1602, 04, 06, 07, 08, 09, 21, 30, 34, 36, 46, 52, 53, 54, 56, 56,

1705, 08, 09, 10, 11, 13, 14, 15.

Thirty-six feeding visits in 120 minutes gives an average of 3.3 minutes between feeding visits.

**Summit Track nest – 22/1/95**. This nest was just west of the Summit Track on the top edge of Skua Gully, in an isolated clump of olearia (*Olearia traversii*) covered with muehlenbeckia vines. The nest was at 3 m at the twiggy end of a branch and was constructed mostly of grass and twigs. The nest contained an unknown number of fully feathered chicks – I didn't investigate in case they fledged prematurely. The female had been banded R/M R/G on 16/1/95 at Kokopu Creek; the male was unbanded.

### 3.5 FOODS AND FEEDING OBSERVATIONS

Initially we collected habitat use observations of feeding tui using the method described for parea (Powlesland *et al.*, 1992). When first seen, each bird's food was recorded. However, we soon found that this gave very biased results. Birds feeding on flax nectar or in the open muehlenbeckia areas were easy to find and observe. Birds in the forest were hard to find and if we walked off the tracks we had to wear petrel boards (to prevent the collapse of burrows), which made progress slow and noisy. Few birds were observed feeding in the forest whereas many observations could be readily made by sitting near flax or in the favoured open areas.

#### 3.5.1 Nectar

Studies elsewhere in New Zealand have shown that nectar is the most important food for tui and birds will commute long distances to sources (Stewart and Craig 1985). On Rangatira, flax nectar is probably the most important food for breeding tui. The only other plant species from which we observed birds taking nectar was ngaio (*Myoporum laetum*). There are extensive areas of flax around much of the coastline, with smaller patches inland in clear areas. The summer had been an exceptional flowering year for flax throughout the Chatham Islands, but when we arrived on Rangatira most of the flax had finished flowering. The main areas where birds could obtain nectar were at the island's summit and along the southern cliffs (Fig. 2). However, although there were only these isolated and small areas of flax flowers, most birds we saw had "flax heads" (orange pollen on their forehead) and such birds were seen everywhere on the island.

On 13 January we spent a day (0900 – 1800) at the largest area of flowering flax, mist netting birds and monitoring feeding visits by tui.

Birds were commuting throughout the day, with the highest numbers visiting in the morning. They usually arrived flying high and dropped steeply down into the flax; when leaving most flew south out over the cliffs, gaining height quickly in the updraught, circled back and flew out of sight to the north of the island. Most of the birds arriving from afar were adults; juveniles that fed in the flax seemed to be locals and spent the whole day in adjacent areas of forest. Each of three colour banded birds seen feeding on flax nectar always fed in the same group of plants and one bird was identified feeding 11 times in one small area. The three marked birds we monitored were never seen feeding away from their usual flax clumps.

#### Visits by tui to flax flowers 0900–1800:

|           |              |                   |
|-----------|--------------|-------------------|
| 0900–1100 | 21 ad, 5 juv | (3 colour banded) |
| 1100–1200 | 10 ad, 2 juv | (5 " " )          |
| 1200–1300 | 5 ad, 2 juv  | (4 " " )          |
| 1300–1400 | 8 ad, 5 juv  | (4 " " )          |
| 1400–1500 | 7 ad, 2 juv  | (1 " " )          |
| 1500–1600 | 3 ad, 3 juv  | (1 " " )          |
| 1600–1700 | 5 ad, 6 juv  | (4 " " )          |
| 1700–1800 | 4 ad, 4 juv  | (2 " " )          |

**R/M B/R's visits:** this bird was monitored through most of the day as it was easily identified since all of its tail feathers were broken. It had been banded at Kokopu Creek and seemed to be resident along the upper Link Track. The bird had been seen early in the day but was first identified at 1120 (\* means the bird arrived or left unnoticed):

|       |                 |                |                       |
|-------|-----------------|----------------|-----------------------|
| 1120* |                 |                |                       |
| 1156* |                 | <b>Fed for</b> | <b>Between visits</b> |
| 1235  | (departed 1244) | 9 mins         |                       |
| 1317  | ( " 1325)       | 8 mins         | 33 mins               |
| 1347  | ( " 1355)       | 8 mins         | 22 mins               |
| 1454  | ( " 1503)       | 9 mins*        | 59 mins               |
| 1543* |                 |                | 40 mins               |
| 1631* | ( " 1633)       | 2 mins*        | 48 mins*              |
| 1722* | ( " 1725)       | 3 mins*        | 49 mins*              |
| 1744* | 19 mins*        |                |                       |

### 3.5.2 Fruit

Tui were seen to feed on fruits of *muehlenbeckia*, *karamu* (*Coprosma chathamicus*), *matipo* (*Myrsine chathamica*) and *mahoe* (*Melicactus chathamicus*). *Muehlenbeckia* fruit were the most often eaten; the vines cover large areas of the island that were formerly pasture. The adult females from both of the observed nests were seen to gather fruit from nearby vines and feed it to their chicks. In the open areas along the Western Landing track large numbers of birds spent much time gleaning (both fruit and insects) and scanning for insects in these vines.

Few observations were of birds eating fruit of other species, and these birds were usually juveniles. Seeds of *muehlenbeckia*, *karamu* and *matipo* were found in droppings of juveniles being banded. There was much *māhoe*, *karamu* and especially *matipo* fruit present, but most of it was unripe. We observed a family group of tui (one adult plus

four recent fledglings) testing fruit in a heavily laden matipo tree along the Whalers Bay track. They rejected or dropped the green fruit and consumed the few ripe fruit. Along the track through Island Bush to Rangatira Trig were several matipo trees heavily laden with ripe fruit but no tui were observed in the general area.

### 3.5.3 Invertebrates

Observing feeding adults in the forest proved to be difficult due to the problems of getting around off the tracks while wearing petrel boards. Birds were almost always aware of our approach and usually stopped feeding to watch us! Perhaps most of the birds were feeding on fruit, or nectar or gleaning and hawking insects in the open areas. Birds were observed gleaning in the foliage of ribbonwood and it is likely that these birds were searching for insects.

In the open areas with scattered trees and extensive areas of muehlenbeckia vines, many birds were found gleaning and hawking for insects. A majority of these seemed to be females (6 females, no males were banded on the Western Landing Track) and it is from here that we first became aware of birds commuting with their beaks crammed with insects to feed nestlings. Sometimes birds perched on muehlenbeckia mounds searching for insects in the foliage (they actively chased them through the vines) and at other times they stood on vantage points scanning for insects in flight which were pursued. From observations of colour banded birds, each seemed to have a few preferred vantage points and one colour banded bird was seen three times within one hour scanning from the same bough.

On other occasions, groups of birds hawked insects during lengthy flights. Birds were seen flying from the Top Bush out over The Clears and the seal colony, at times rising high above the island, and then dropping down to Rangatira Trig area. In the Lower Woolshed Bush/Western Landing Track area this method of feeding was common, with groups of up to 13 birds seen to rise 100 metres or so in a loose flock, circle the general area and then drop back down in ones and twos. This method of feeding seemed to be infectious and often, when a few birds started, every bird in the area flew up although not all managed to join the high flying group. On a few occasions some birds appeared to drift off towards Pitt Island and it may have been the start of a post-flax flowering/breeding dispersal behaviour that caused all local birds to join in. On 23 January, a small group of birds rose up above the island's summit and this seemed to prompt every bird in the area to fly. This resulted in a flock of 23 birds circling high above the summit before drifting off to various points of the island.

On two occasions birds were seen to fly out from the forested area to the open rocky area of the Front Landing where they foraged amongst fine gravel, presumably eating grit.

## 3.6 POPULATION ESTIMATIONS

Counts were made recording the numbers of banded and unbanded birds seen. The initial counts using a "passive" method recorded too few birds to be useful. Only those counts made while playing the taped distress call were used to estimate the total population using the Lincoln Index (Davis & Winstead 1980). Of 60 tui that had been colour banded, we saw 19 of 39 adults at least once, but only four of 20 juveniles

(Appendix II). Two population estimates have been made, one using only adult sightings and a second with all birds. The transects on the upper and lower island were walked a week apart (the upper island first), but in this time only 6 more birds were banded – all at the lower (northern) end of the island (Fig. 4). Population estimations are shown for the upper and lower island; and combined for whole island.

Population Estimates of Chatham Island tui (Lincoln Index with 95% confidence).

|                          |             |
|--------------------------|-------------|
| Upper Island – all birds | = 565 ± 440 |
| adults only              | = 322 ± 304 |
| Lower Island – all birds | = 302 ± 180 |
| adults only              | = 173 ± 102 |
| Whole Island – all birds | = 432 ± 206 |
| adults only              | = 237 ± 120 |

From our field observations of colour banded birds it seemed that juveniles were less mobile than adults. This may have resulted in a biased population estimate for juveniles when using the Lincoln Index. However, it was near the end of a very productive breeding season and it seemed that there were huge numbers of juveniles present. We have no data on survival rates for adult or juvenile tui. Dead juveniles were reported in January and February 1993, which was a poorer flowering year for flax (E Kennedy, hut log). Further banding and a census during the early breeding season (October/November), when the adults are strongly territorial and no juvenile birds are present, would give a more accurate measure of the island population. A survey of the forested areas of Pitt Island at this time would also show the size of the breeding population there.

### 3.7 WINTER OBSERVATIONS

PJD and Lindsay Smith flew to the Chathams on 21-7-95, to Pitt on 23-7-95 and boated to Rangatira on 26-7-95. We left Rangatira on 3-8-95 and flew back to Christchurch the next day. The weather throughout this trip was not conducive to field observations or getting on and off islands. We had very strong cold south west winds with rain, hail and sleet showers and the odd flurry of snow.

#### 3.7.1 Pitt Island

On Pitt Island we surveyed the Central Reserve and the Covenant area off Northead Road for the presence of tui. This was done by walking through the forest and playing tapes of tui song and distress calls at intervals. Few birds were encountered incidentally – it was too windy to hear birds at any distance. When tapes were played, tui were attracted on less than 50% of occasions – usually a lone bird. The covenant area was considerably more sheltered and on two occasions we attracted 5 and 7 birds to taped calls. One colour banded bird was seen; Red/Metal Green/Yellow who had been banded as an adult male at Ron's Track on Rangatira on 11-1-95. Later it was reported that there were large numbers of tui in the open coastal forest to north and northwest of Hakepa hill near North Head. We did not attempt to search for tui in the Southern Reserve as the constant strong wind made searching for birds in exposed areas pointless.



### 3.7.2 Rangatira Island

During a visit to Rangatira in May, large numbers of tui were still present (Steve Sawyer pers. comm.) however, as soon as we arrived on Rangatira Island it was apparent that there were few tui left on the island. Compared with the summer visit in January, Rangatira was a bleak place, as all of the deciduous ribbonwood and muehlenbeckia had lost their leaves. There were still large quantities of matipo fruit present and mahoe and ngaio trees had many flower buds - the first few had opened and were being visited by tui. The constant south-westerlies and squalls made it bitterly cold. On Pitt Island, the tui that we had observed all appeared normal but on Rangatira all birds appeared fluffed up and lethargic. We also frequently saw red-crowned kakariki feeding on the forest floor and some appeared weak and had difficulty flying. One freshly dead kakariki was found that had obviously starved.

We caught two tui whilst on Rangatira and both were uncharacteristically pleasant to handle. The first was a first year female who weighed 113 gms; above average weight for the summer females. The second bird we caught was already banded. Yellow/Metal Green/Yellow was an adult male caught nearby in Woolshed Bush in January. On 11-1-95 when he was first caught he weighed 160 gms but on 3-8-95 he weighed 238 gms.

We searched all of Rangatira for tui, playing tapes to attract birds and checking for colour-banded birds. We estimated that there was less than thirty birds remaining on Rangatira. The birds were scattered in low numbers over the island and the few feeding observations we made were of birds visiting ngaio flowers and feeding on sap bleeding from bruised and broken ngaio twigs, feeding on hoho (*Pseudopanax chathamicus*) and matipo fruit, and gleaning insects from foliage.

18/1/95 – 53 marked birds seen: 33 adults & 20 juveniles; 4 adults & 2 juveniles were banded.

- |                 |                 |             |
|-----------------|-----------------|-------------|
| 1. Ad 1; Juv 1  | 15. Ad 0; Juv 1 | Juv w/m w/g |
| 2. Ad 1         | 16. Ad 2; Juv 1 |             |
| 3. Ad 1; Juv 1  | 17. Ad 0; Juv 3 | Juv r/m r/w |
| 4. Ad 3; Juv 1  | 18. Ad 1; Juv 1 |             |
| 5. Ad 1         | 19. Ad 4; Juv 3 |             |
| 6. Ad 3; Juv 1  | 20. Ad 5; Juv 2 | Ad r/m b/g? |
| 7. Ad 1         | 21. Ad 2; Juv 1 |             |
| 8. Ad 1; Juv 3  | 22. Ad 2        |             |
| 9. Ad 3; Juv 1  |                 | Ad w/m b/g  |
| 10.             |                 | Ad w/m b/g  |
| 11. Ad 2        |                 |             |
| 12. Ad 0; Juv 1 |                 |             |
| 13. Ad 1        |                 |             |
| 14. Ad 1; Juv 2 |                 |             |



25/1/96 – 59 birds seen: 39 adults & 20 juveniles; 9 adults were banded.

- |                 |                 |            |
|-----------------|-----------------|------------|
| 23. Ad 1; Juv 1 | 33. Ad 2        | Ad y/m w/? |
| 24. Ad 3        | 34. Ad 2        |            |
| 25. Ad 4        | 35. Ad 2        |            |
| 26. Ad 1        | 36. Ad 1        |            |
| 27. Ad 1        | 37. Ad 3; Juv 2 | Ad r/m r/y |
| 28.             | 38. Ad 1; Juv 1 | Ad r/m r/y |
| 29. Ad 3        | 39. Ad y/m y/r  |            |
| 30. Ad 2        | 40. Ad 2        |            |
| 31. Ad 1        | 41.             |            |
| 32. Ad 2        | 42. Juv 2       | Ad ? b/y   |

FIGURE 4 TUI TRANSECTS, RANGATIRA ISLAND - A TUI DISTRESS CALL TAPE WAS PLAYED AT EACH SITE AND BIRDS THAT RESPONDED CHECKED FOR BANDS.

## 4. Discussion

Chatham Island tui have obviously undergone a huge decline in both population size and breeding range since the early 1800s when Europeans and Maori first arrived at the Chatham Islands, bringing predatory mammals and beginning the forest clearance. It is fortunate that Rangatira Island was established as a reserve and that grazing ceased in 1961. Prior to this there appears to have been declining numbers of birds on all of the islands. On Rangatira, numbers of tui have increased markedly since grazing ceased and the vegetation has begun to recover. The population at present seems to be healthy and higher than previously recorded, but since our visit took place during a very good breeding season, more censuses are required to determine the carrying capacity of the island. Rangatira Island may now be the only breeding site with good numbers of Chatham Island tui, small numbers of birds may breed on Pitt Island.

The few birds seen on Chatham Island are almost always observed outside the breeding season, in winter or late summer. A few birds were being reported from there at the time we left Rangatira in late January. This entails a two kilometre flight from Rangatira to Pitt Island and then a 23 km flight across open ocean from Pitt Island. Tui are often observed on Pitt Island, frequently feeding on nectar in gardens or on flowering flax. This habit of feeding on flowers near to houses may give an impression that birds are more abundant on Pitt than is the case. Up to a dozen birds can be seen in the gardens of the two houses at North Head and some breeding takes place (K. Linauze, pers. comm.)

Stewart and Craig (1985) found that around Auckland, tui would commute daily from Tiritiri Matangi Island across 4.5 km of sea to the mainland to feed on nectar, returning each afternoon. Chatham Island tui probably behave similarly, by flying across to Pitt (only 2.2 km) to feed if plants flower earlier than on Rangatira. It appears that birds also disperse to Pitt to spend the winter and probably return to Rangatira as the breeding season approaches. This could be easily investigated by monitoring the numbers of birds on Pitt in early spring and carrying out observations on the coastal areas to watch for departing and arriving tui.

It is difficult to explain why tui have all but vanished from Chatham Island. There appears to be an adequate food supply, and all food plants are found here that are found on Rangatira. Undoubtedly there has been a large reduction in the areas of forest with land clearance for farming, but this alone does not seem to explain the tui's disappearance. The major difference on Chatham, when compared with the other islands, is the presence of predators all three species of rat, mice, wild cats, weka and possums. The forest is not tall by mainland New Zealand standards and all nests would be readily accessible to rats and possums, and possibly cats. Pitt Island, however, has only mice, weka and wild cats, and it seems surprising that these have reduced tui to such low numbers when compared with Rangatira. Perhaps at some time of year tui are forced to forage low in the forest where they become accessible to wild cats. On Rangatira, tui were observed regularly bathing and at this time they would be susceptible to predation. Much of the forested areas on Pitt Island are grazed by pigs, sheep and cattle, and the resultant lack of an understorey may also mean birds are more susceptible to predation.

From the limited feeding observations that we carried out, it seems that when it is available, flax nectar is a highly preferred food. Birds were commuting from all parts of

the island to the small remaining areas of flax flowers and it seemed to be no effort to birds to fly from one end of the island to the other. When the flax flowering was at its peak, birds would have had ready access to nectar on almost all coastal areas of the island, close to all breeding areas. This past summer has seen exceptionally prolific flax flowering and probably an exceptionally productive breeding season. Juvenile tui were certainly abundant in all of the forested areas of the island. There were heavy crops of fruit ripening on karamu, mahoe and especially matipo trees, and this should enable young birds to enter the winter in good condition. Of concern, however, were the large flocks of starlings that were seen feeding on fruit. Rangatira is a roost site for starlings, with large numbers flying across each evening from Pitt Island. If starlings consume much of the available fruit well before winter, it could lead to high mortality among the juvenile tui.

During the 1994/95 summer it seemed that food for tui was abundant on Rangatira Island. It would be very interesting to compare the tui diet and breeding success during a summer when there is little or no flax flowering. Tui are probably long-lived birds and it may be that numbers are controlled by the winter food supplies. A good flax-flowering year may result in a rapid but temporary increase in numbers.

Observations during our visit to Rangatira Island in late July indicated that most tui leave the island for some of the winter period. There were still large numbers of tui on Rangatira in May; most birds must have left between then and July. With much of its forest cover being deciduous, Rangatira's winter and summer environments are very different. We found it noticeably colder and more exposed than Pitt Island at the same time of year.

Pitt Island probably has a greater variety and abundance of food compared with Rangatira. During our July visit there were large amounts of ripe hoho fruit available on Pitt Island but very little on Rangatira. Hoho is an important and preferred winter food for parea on Chatham Island. Flax flowers are also available earlier on Pitt Island than on Rangatira. These factors may encourage tui to leave Rangatira for Pitt in winter, to then return in spring to Rangatira's predator-free environment to breed.

## 5. Further work

- **Breeding distribution of tui.** It is important to survey Pitt Island during the breeding season to determine to what extent birds are resident and breeding there. It will be important to have good baseline data on tui on Pitt Island, because when the predator fence is erected in the south, tui may respond markedly to the removal of predators and to the forest recovery.
- **Detailed breeding biology. Monitor clutch and brood size, and number of breeding attempts.** Attach radio transmitters to a number of females so that all nesting attempts can be readily monitored. The breeding of these birds could be monitored by field staff present on Rangatira Island for the black robin, shore plover and Chatham Island petrel programmes. Breeding and productivity need to be monitored in both good and poor flax flowering seasons to assess how this nectar

supply relates to breeding success. If birds are found to be breeding on Pitt Island, a comparison of their breeding success with that of birds on Rangatira is essential.

- **Seasonal diet and movements.** Monitor diet throughout the year. When do birds leave Rangatira and when do they return. Do they at some times of the year commute from Pitt on a daily basis?
- **Monitor juvenile and adult survival rates, further estimates of population size.** More colour banding and population monitoring.
- **Pre and post-breeding tui distribution.** Radio-tagged birds may give some information on this. Search for colour banded birds on Pitt and Chatham Island. Appointment of staff member on Pitt Island will greatly assist this aspect.

## 6. Acknowledgements

Thanks to the DoC staff on the Chatham Islands for organising transport to and from Rangatira Island and logistic support whilst on the Chathams and to Lindsay Smith for field assistance during July. The Lottery Grants Board provided support in the form of field equipment, airfares and wages for John Kearvell. Thanks to Ralph Powlesland for comments on the manuscript.

## 7. References

- Bell, L.C. 1955. Notes on the birds of the Chatham Islands. *Notornis* 6: 65–68.
- Craig J.L.; Douglas, M.E.; Stewart, A.M.; Veitch, C.R. 1981. Specific and sexual differences in body measurements of New Zealand honeyeaters. *Notornis* 28(2): 121–128.
- Davis, D.E.; Winstead, R.L. 1980. Estimating the numbers of wildlife populations. In Schemnitz, S.D. (Ed) *Wildlife Management Techniques Manual*, The Wildlife Society, Washington, D.C.
- Dawson, E.W. 1955. The birds of the Chatham Islands 1954 Expedition. *Notornis* 6: 78–82.
- Dilks, P.J.; Elliott, G.P.; O'Donnell, C.F.J. 1995. Mist netting techniques – a method using telescopic aluminium poles. Department of Conservation Threatened Species Unit, *Ecological Management* 3: 20–28.
- Fleming, C.A. 1939. Birds of the Chatham Islands. *Emu* 38: 380–413; 492–509.
- Nilsson, R.J.; Kennedy, E.S.; West, J.A. 1994. The birdlife of South East Island (Rangatira), Chatham Islands, New Zealand. *Notornis* (Supplement) 41: 109–125.
- Onley, D.J. 1986. A method of ageing the tui (*Prothemadera novaeseelandiae*) and its use in assessing body measurements. *Notornis* 33: 45–49.
- Powlesland, R.G.; Grant, A.D.; Tisdall, C.; Dilks, P.J.; Flux, I. 1992. Ecology and breeding biology of parea (Chatham Island pigeon) on southern Chatham Island, July 1991 – April 1992. *Department of Conservation Science & Research Internal Report 134*
- Robertson, H.A.; Whitaker, A.H.; Fitzgerald, B.M. 1983. Morphometrics of forest birds in the Orongorongo Valley, Wellington, New Zealand. *N.Z. J. Zoology*. 10: 87–98.
- Stewart, A.M.; Craig, J.L. 1985. Movements, status, access to nectar, and spatial organisation of the tui. *N.Z. J. Zoology*, 12: 649–666.
- West, J.A. 1988. Bird counts on the Chatham Islands. *Notornis* 35: 159–161.

## 8. Appendix 1

DETAILS OF TUI CAUGHT ON RANGATIRA  
ISLAND

| Band No | Date    | Colours | Site          | Sex | Age   | Bill L | Bill W | Bill D | Head | Tarsus | Tail       | Wing | Weight | Comments   |
|---------|---------|---------|---------------|-----|-------|--------|--------|--------|------|--------|------------|------|--------|--|
| 89821   | 8/1/95  | R/M Y/W | Kokopu Ck     | F   | Adult | 23.6   | 8      | 7.9    | 58.5 | 41.4   | 111        | 143  | 106    | notch, brood patch, flaxhead, no moult   |
| 89822   | "       | R/M Y/B | "             | M   | Juv   | 24.3   | 8      | 7.7    | 63.2 | 44.3   | 129        | 157  | 137    | yellow gape, no notch, no moult, flax head                                       |
| 89823   | "       | R/M Y/G | "             | M   | 1 yr  | 26.5   | 9      | 8.2    | 66.7 | 46.4   | 118        | 153  | 143    | no moult, no notch, flax head, 4 broken tail feathers                            |
| 89824   | "       | R/M Y/R | "             | M   | Juv   | 23.6   | 8.8    | 7.6    | 65.5 | 44.7   | 129        | 153  | 143    | no notch, no moult, no tassles, v light flax head                                |
| 89825   | "       | R/M W/Y | "             | M   | "     | 23.6   | 8.4    | 7      | 63.4 | 42.4   | 126        | 150  | 120    | no notch, no moult, small tassles, good flax head                                |
| 89826   | "       | R/M W/B | "             | F   | Adult | 22.1   | 8.4    | 7.4    | 59.7 | 40.6   | 120        | 139  | 100    | notch, no moult, brood patch, flax head  |
| 89827   | "       | R/M W/G | "             | F   | "     | 26.3   | 8.3    | 7.5    | 58.9 | 39.4   | 121        | 140  | 109    | notch, no moult, light flax head, BP not checked                                 |
| 89828   | "       | R/M W/R | "             | F   | "     | 24.8   | 8.6    | 7.2    | 59.1 | 41.6   | 122        | 147  | 130    | notch, no moult, brood patch, flax head  |
| 89829   | "       | R/M B/Y | "             | F   | "     | 23.8   | 8.2    | 7.1    | 58.8 | 39.3   | 122        | 147  | 100    | notch, no moult, brood patch, flax head  |
| 89830   | 9/1/95  | Y/M Y/W | Hut           | M   | Juv   | 21.8   | 8.3    | 7.1    | 65   | 45     | 137        | 154  | 139    | no notch, no moult, v small tassles flax head                                    |
| 89831   | "       | W/M Y/W | South Cliffs  | F   | Adult | 23.8   | 8.2    | 7      | 59.3 | 39.4   | 112        | 144  | 102    | notch, no moult, brood patch, flax head  |
| 89832   | "       | W/M R/G | "             | M   | Juv   | 23.3   | 8.6    | 6.9    | 61.9 | 44.3   | 130        | 152  | 131    | no notch, no moult, small tassles, flax head                                     |
| 89833   | "       | W/M R/B | "             | M   | "     | 24.5   | 8.3    | 8      | 63.2 | 44.6   | 126        | 157  | 122    | no notch, no moult, no tassles, flax head  |
| 89834   | "       | W/M R/W | "             | M   | Adult | 25.9   | 8.5    | 7.7    | 66   | 46.5   | 130        | 162  | 158    | notch, no moult, light flax head   |
| 89835   | "       | W/M R/Y | "             | F   | "     | 22.4   | 8.8    | 7.3    | 59.5 | 38.8   | 114        | 146  | 102    | notch, no moult, brood patch, no flax head                                       |
| 89836   | "       | W/M G/R | "             | M   | "     | 25.8   | 9.3    | 8.4    | 67.9 | 44.4   | 124        | 163  | 149    | notch, no moult, 2 white under tail coverts, white around vent                   |
| 89837   | 10/1/95 | Y/M B/W | Whalers Tk    | M   | "     | 24.8   | 8.3    | 8.2    | 66.3 | 44.7   | 128        | 165  | 160    | notch, no moult, flax head   |
| 89838   | "       | Y/M B/G | Thinornis Tk  | M   | "     | 26.5   | 9.4    | 8.8    | 67.7 | 47     | 127        | 162  | 163    | notch, no moult, no flax head  |
| 89839   | "       | Y/M B/R | Whalers Tk    | F   | 1 yr  | 22.9   | 8.5    | 7.1    | 60.7 | 41.3   | 109 worn   | 135  | 117    | no notch, moult 1rys = 1.6 2.3 4.2 5-8 old, brood patch                          |
| 89840   | 11/1/95 | Y/M G/Y | Woolshed Bush | M   | Adult | 27     | 8.6    | 7.5    | 67   | 45.3   | 132        | 164  | 160    | notch, no moult - 4 1rys broken  |
| 89841   | "       | R/M B/W | Kokopu Ck     | F   | "     | 20.4   | 8.1    | 6.9    | 58.4 | 41     | ?          | 145  | 104    | notch, no moult, brood patch, flax head  |
| 89842   | "       | R/M B/G | "             | M   | "     | 24.6   | 7.9    | 7.9    | 63.9 | 43.4   | 129        | 164  | 137    | notch, no moult - 5th 1ry = tip broken, flax head                                |
| 89843   | "       | R/M B/R | "             | "   | 1 yr  | 24     | 7.9    | 7.3    | 63.3 | 43.5   | all broken | 148  | 121    | no notch, no moult - all tail broken off at .3, flax head                        |
| 89844   | "       | R/M G/Y | "             | "   | Adult | 26.3   | 9.3    | 8.2    | 66.9 | 44     | 133        | 161  | 152    | notch, no moult, v light flax head   |
| 89845   | 12/1/95 | B/M W/B | Swamp         | F   | "     | 23.6   | 8.4    | 6.8    | 60.3 | 40.6   | 115        | 140  | 110    | notch, no moult, brood patch, flax head  |
| 89846   | "       | B/M W/G | "             | "   | Juv   | 20.9   | 8.3    | 6.5    | 56.4 | 40.2   | 113        | 133  | 101    | no notch, no moult, yellow gape, v small tassles, light flax head                |
| 89847   | "       | B/M W/R | "             | "   | "     | 21.9   | 8.2    | 6.4    | 57.7 | 39.8   | 116        | 139  | 96     | no notch, no moult, small tassles, light flax head                               |
| 89848   | "       | B/M B/Y | "             | M   | "     | 23.6   | 8.4    | 7.3    | 65.8 | 46.2   | 125        | 155  | 139    | no notch, no moult, no tassles, yellow gape, no flax head                        |
| 89849   | "       | B/M B/W | "             | F   | "     | 22     | 8.4    | 6.7    | 57.9 | 40.8   | 117        | 140  | 105    | no notch, no moult, yellow gape, no tassles, no flax head                        |
| 89850   | "       | B/M B/G | "             | M   | Adult | 24.9   | 8.6    | 7.9    | 66   | 45     | 136        | 157  | 143    | notch, no moult, flax head, all black bill                                       |
| 89851   | "       | B/M G/B | South Summit  | F   | 1 yr  | 21     | 8.6    | 7.4    | 58.9 | 39.1   | 112        | 132  | 100    | no notch, no moult, brood patch 1 centre tail feather broken, flax head          |
| 89852   | "       | W/M G/W | "             | "   | Adult | 24.4   | 8.4    | 7.2    | 60.3 | 41.3   | 121        | 143  | 105    | notch, no moult, worn 1rys, brood patch, flax head                               |
| 89853   | 13/1/95 | W/M G/Y | South Cliffs  | M   | 1 yr  | 24.4   | 8.9    | 7.9    | 63.8 | 44.9   | 130        | 154  | 145    | no notch, no moult, tatty retricies - 2 broken, flax head                        |
| 89854   | "       | W/M B/R | "             | F   | Juv   | 21.3   | 8.6    | 6.7    | 60   | 39.4   | 113        | 135  | 110    | no notch, no moult, small tassles, flax head. Growth out of left ear             |
| 89855   | "       | W/M B/G | "             | "   | Adult | 24.3   | 8.8    | 7      | 60.6 | 43.1   | 118        | 144  | 108    | notch, no moult, brood patch, flax head  |
| 89856   | "       | W/M B/Y | "             | M   | Juv   | 24.2   | 8.9    | 7.5    | 65.5 | 43.8   | 131        | 156  | 146    | no notch, no moult, small tassles, flax head                                     |
| 89857   | "       | W/M B/W | "             | F   | "     | 19.7   | 7.8    | 7.6    | 58.1 | 38.8   | 114        | 137  | 98     | no notch, no moult, small tassles, flax head. mue fruit                          |
| 89858   | "       | W/M W/R | "             | M   | Adult | 25.2   | 8.7    | 8.5    | 65.3 | 46.1   | 132        | 164  | 154    | notch, no moult, flax head   |
| 89859   | "       | W/M W/G | "             | F   | Juv   | 21.7   | 7.4    | 7.2    | 57.2 | 40.9   | 111        | 136  | 104    | no notch, no moult, yellow gape, small tassles                                   |
| 89860   | "       | W/M W/B | "             | M   | "     | 22.7   | 8.4    | 7.5    | 63.6 | 44.2   | 125        | 155  | 134    | no notch, no moult, yellow gape, small tassles, flax head                        |
| 89861   | "       | W/M W/Y | South Cliffs  | F   | Adult | 23     | 8.3    | 6.9    | 59.1 | 41.5   | 119        | 141  | 105    | notch, no moult, brood patch, flax head, mue fruit                               |
| 89862   | 14/1/95 | G/M Y/W | Marleshes Tk  | "   | "     | 22.3   | 8.2    | 7.4    | 59.5 | 39.6   | 121        | 142  | 109    | notch, no moult, brood patch, flax head  |
| 89863   | 16/1/95 | R/M G/W | Kokopu Creek  | "   | Juv   | 21.8   | 7.7    | 6.5    | 58.1 | 39.8   | 117        | 141  | 112    | no notch, no moult, no tassles, light flax head                                  |
| 89864   | "       | R/M G/B | "             | M   | Adult | 25.9   | 9.2    | 8      | 65.4 | 45.4   | 123        | 162  | 151    | notch, no moult, no flax head  |
| 89865   | "       | R/M G/R | "             | "   | Juv   | 23.9   | 8.8    | 7.9    | 66.7 | 45.6   | 130        | 154  | 162    | no notch, no moult, small tassles, no flax head                                  |
| 89866   | "       | R/M R/Y | "             | F   | 1 yr  | 22.4   | 9      | 7      | 59.5 | 40.2   | 109        | 133  | 94     | no notch, no moult, brood patch, flax head, mue fruit, broken retricies          |
| 89867   | "       | R/M R/W | "             | M   | Juv   | 22.8   | 7.5    | 7.2    | 63.6 | 44     | 126        | 153  | 146    | no notch, no moult, small tassles, v light flax head                             |
| 89868   | "       | R/M R/B | "             | "   | 1 yr  | 25.5   | 9.4    | 8.3    | 66.7 | 46.5   | 136        | 156  | 168    | no notch, no moult, no flax head   |
| 89869   | "       | R/M R/G | "             | F   | Adult | 24.6   | 8.5    | 7.6    | 60   | 41.2   | 120        | 139  | 105    | notch, no moult, brood patch, flax head, mue fruit                               |
| 89870   | "       | B/M B/R | "             | M   | Juv   | 23.8   | 9.2    | 7.2    | 61.9 | 43.2   | 124        | 151  | 140    | no notch, no moult, yellow gape, small tassles, kar, mat mue fruit, no flax head |
| 89871   | "       | B/M G/Y | "             | F   | "     | 21.9   | 7.6    | 6.8    | 57   | 40.5   | 122        | 134  | 100    | no notch, no moult, yellow gape, small tassles, no flax head                     |
| 89872   | "       | B/M G/W | "             | "   | Adult | 21.3   | 8.2    | 7.4    | 59.1 | 39.9   | 111        | 141  | 118    | notch, no moult, brood patch, v light flax head                                  |
| 89873   | "       | B/M G/B | "             | M   | "     | 26.1   | 8.9    | 8.1    | 66.8 | 46.2   | 133        | 161  | 175    | notch, no moult, no flaxhead, mue fruit  |
| 89874   | 18/1/95 | Y/M Y/B | W Landing tk  | F   | "     | 21.8   | 9      | 8.1    | 59.1 | 38.7   | 120        | 141  | 102    | notch, no moult, brood patch   |
| 89875   | "       | Y/M Y/G | "             | "   | "     | 23.7   | 9      | 7.1    | 60.1 | 41.1   | 111        | 139  | 103    | notch, no moult, brood patch, mue fruit  |
| 89876   | "       | Y/M Y/R | "             | "   | "     | 23     | 8.6    | 7.4    | 59.5 | 40     | 114        | 142  | 107    | notch, no moult, brood patch   |
| 89877   | "       | Y/M W/Y | "             | "   | "     | 22.4   | 7.8    | 6.8    | 58.3 | 40.5   | 121        | 141  | 114    | notch, no moult, brood patch   |
| 89878   | 21/1/95 | Y/M W/B | "             | "   | "     | 24.2   | 7.9    | 7.4    | 59.7 | 38.8   | 113        | 144  | 115    | notch, no moult, brood patch   |
| 89879   | "       | Y/M W/G | "             | "   | "     | 24.2   | 8.1    | 7.6    | 60.4 | 40.2   | 120        | 141  | 101    | notch, no moult, brood patch   |
| 89880   | "       | Y/M W/R | Hut           | "   | "     |        |        |        | 60   |        | 117        | 142  | 118    | notch, no moult, brood patch   |



# 9. Appendix 2

## SIGHT RECORDS OF MARKED TUI ON RANGATIRA ISLAND

| DATE    | TIME | LEFT | RIGHT | RECOVERY SITE      | BANDING SITE             |
|---------|------|------|-------|--------------------|--------------------------|
| 10/1/95 | 1100 | Y/M  | B/G   | Thinornis Bay Tk   | Thinornis Bay Tk         |
| 13/1/95 | 1500 | R/M  | B/G   | Swamp - on flax    | Kokopu Ck 11/1/95        |
| "       | 0945 | W/M  | Y/W   | S Cliffs - flax    | S Cliffs - flax 9/1/95   |
| "       | 1120 | R/M  | B/R   | "                  | Kokopu Ck 11/1/95        |
| "       | 1136 | W/M  | R/B   | "                  | S Cliffs - flax 9/1/95   |
| "       | 1239 | W/M  | W/B   | "                  | " 13/1/95                |
| "       | 1619 | W/M  | R/Y   | "                  | " 9/1/95                 |
| 15/1/95 | 1015 | Y/M  | G/Y   | W Landing Tk       | Woolshed Bush 11/1/95    |
| "       | 1645 | Y/M  | B/G   | Thinornis Bay Tk   | Thinornis Bay Tk 10/1/95 |
| 16/1/95 | 1053 | W/M  | R/?   | Skua Point         | S Cliffs 9 or 13/1/95    |
| 17/1/95 | 1119 | R/M  | Y/W   | W Landing tk       | Kokopu Ck 8/1/95         |
| "       | 1126 | Y/M  | B/R   | "                  | Whalers tk 10/1/95       |
| "       | 1200 | R/M  | W/R   | below Swamp        | Kokopu Ck 8/1/95         |
| 18/1/95 | 1830 | Y/M  | W/Y   | W Landing Tk       | W Landing Tk 18/1/95     |
| "       | am   | R/M  | B/R   | Link Tk - on knob  | S Cliffs - flax 11/1/95  |
| "       | "    | W/M  | B/G   | " - base knob      | " 13/1/95                |
| "       | "    | W/M  | W/G   | end E Clears Tk    | " 13/1/95                |
| "       | "    | R/M  | R/W   | Karen's Tk         | Kokopu Ck 16/1/95        |
| "       | "    | R/M  | B/G   | Fran & Ruas Tk     | " 11/1/95                |
| 20/1/95 | 1154 | R/M  | R/Y   | W Landing Tk       | Kokopu Ck 16/1/95        |
| "       | 1447 | R/M  | R/G   | Skua Gully         | " "                      |
| "       | 1532 | R/M  | B/W   | South Summit       | " 11/1/95                |
| "       | 1550 | R/M  | B/G   | "                  | " "                      |
| 21/1/95 | 1007 | Y/M  | Y/R   | W Landing Tk       | W Landing Tk 18/1/95     |
| 22/1/95 | 1210 | Y/M  | Y/R   | "                  | " "                      |
| "       | 1215 | Y/M  | G/Y   | "                  | Woolshed Bush 11/1/95    |
| "       | 1354 | R/M  | R/Y   | Woolshed Bush      | Kokopu Ck 16/1/95        |
| 23/1/95 | 0930 | R/M  | B/W   | S of South Summit  | Kokopu Ck 11/1/95        |
| "       | 1136 | W/M  | G/R   | Rons/Prion Pd Jnct | S Cliffs - flax 9/1/95   |
| 24/1/95 | 1040 | Y/M  | W/G   | W Landing Tk       | W Landing Tk 21/1/95     |

|         |      |     |     |                      |                                    |
|---------|------|-----|-----|----------------------|------------------------------------|
| "       | 1050 | Y/M | Y/R | .                    | " 18/1/95                          |
| "       | 1130 | R/M | Y/W | "                    | Kokopu Ck 8/1/95                   |
| "       | 1302 | R/M | R/B | Front Landing        | Kokopu Ck 16/1/95                  |
| 25/1/95 | 0957 | Y/M | G/Y | W Woolshed Bush      | Woolshed Bush 11/1/95              |
| "       | 1026 | R/M | W/G | Jill's Tk            | Kokopu Ck 8/1/95                   |
| "       | 1034 | Y/M | W ? | Chaquitas Tk         | W Landing Tk                       |
| "       | 1105 | B/M | Y ? | Stacey's Tk          |                                    |
| "       | 1110 | Y/M | W ? | "                    |                                    |
| "       | 1147 | R/M | R/Y | Whalers/Thinornis Tk | Kokopu Ck 16/1/95                  |
| "       | 1153 | Y/M | Y/R | Whalers/E Cut Jnct   | W Landing Tk 18/1/95               |
| "       | 1210 | ?   | B/Y | Lower Woolshed Bush  | Kokopu Ck or Swamp<br>8 or 12/1/95 |