

**REPORT ON THE CHATHAM ISLAND TAIKO AND CHATHAM ISLAND
PETREL RECOVERY PROGRAMMES (1990/91)**

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REPORT ON THE CHATHAM ISLAND TAIKO AND CHATHAM ISLAND PETREL RECOVERY PROGRAMMES (1990/91)

SUMMARY

Two visits were made to the Chatham Islands in September 1990 and January 1991 to assist with the Chatham Island taiko and Chatham Island petrel recovery programmes. Four new CI taiko were caught and another was recaptured at the three main breeding burrows. A new CI taiko burrow was found this season. The nest chamber of burrow Tuku No. 10 was located and an adult CI taiko was found incubating a starred egg on 14 January. A downy chick was present in this burrow on 8 February. These are the first reported observations of a CI taiko egg and young chick.

A survey of CI petrels in January 1991 located 13 new burrows and 30 new birds were banded. There were ten recaptures of birds caught in previous seasons. CI petrel burrows were mostly in friable soil in the Kokopu Creek catchment; burrows located in previous seasons have been in firm soil. Laying dates, morphometrics, weight changes and duration of incubation shifts are also documented. Most birds lay in early to mid-January, there is no obvious sexual dimorphism and incubation shifts last 12-13 days. Competition for burrows with broad-billed prions is likely to be the major factor threatening the status of CI petrels.

INTRODUCTION

I visited the Chatham Islands from 17 September to 4 October 1990 and again from 12 January to 9 February 1991. The first visit was to assist with the Chatham Island taiko (*Pterodroma magentae*) and Chatham Island pigeon (*Hemiphaga novaeseelandiae chathamensis*) recovery programmes on main Chatham Island. The second visit was to assist with the survey and monitoring of Chatham Island petrels (*Pterodroma axillaris*) on South East (Rangatira) Island. We stayed on South East Island from 15 January to 6 February. A small amount of work was done on CI taiko and CI pigeon during the second visit. The following report is a summary of the major findings of these trips.

CHATHAM ISLAND TAIKO

Fieldwork on CI taiko began for the 1990 season by the employment of two predator trappers; Murray Blake and Simon Whiting. They set out the traplines in conjunction with Geordie Murman and Trevor from the Chatham Island Field Centre. Predator trapping commenced in mid-September. All known CI taiko burrows were inspected and fenced by the trapping staff at the outset of the trapping programme. Before leaving for the Chatham Islands, I prepared a standard sheet for recording observations on the state of each burrow at each visit. The trappers and other Department of Conservation staff filled in these sheets after each visit. These have provided us with a useful schedule of CI taiko activity at each burrow (see Table 1).

TABLE 1. Chatham Island Taiko - occupation of burrows 1991/92 season

Tuku No.1

19-24 September:	fence intact, no activity
24 September:	fence intact 1930 h, fence down 2115 h, taiko seen at entrance, came to surface in response to war-whoops
25-28 September:	fence down, excreta present, bird visiting during this period
29 September:	taiko E-127229 caught at 0030 h using war-whoops
30 September:	fence intact
1-15 October:	fence down on 1/10, 2/10, 5/10, 12/10, 15/10, fresh excreta, taiko visiting
16-22 October:	fence intact, no activity
23-25 October:	fence down, fresh digging, feather, taiko visiting during this period
26 October:	fence down, taiko visiting burrow
27-29 October:	fence down, taiko visiting during this period
30 October - 2 November:	fence intact, no activity
3-11 November:	fence down, taiko visiting during this period
12-18 November:	fence intact, no activity
19-28 ?November:	fence down, excreta, fresh digging, taiko presumably present
29 ?November - 7 January:	fence down, excreta, taiko visiting during this period
8-14 January:	fence down, fresh excreta, taiko visiting during this period
15 January - 4 February:	fence down, feathers + excreta at entrance, taiko visiting during this period
5-7 February:	fence down, fresh excreta, feathers, taiko visiting during this period
8 February:	fence intact

Status: occupied by taiko, possible breeding pair

Tuku No.10

19-25 September:	fence intact, no activity
26-28 September:	fence down, taiko visiting during this period
29 September:	taiko E-177254 caught at 1230h, using war-whoops
1-15 October:	fence down on 1/10, 2/10, 5/10, 12/10, 15/10, fresh excreta, taiko visiting during this period
17 October - 18 November:	fence intact, no activity
19-28 November:	fence down, fresh excreta, taiko visiting during this period
29 November - 7 January:	fence down, taiko presumably incubating during this period
14 January:	taiko E-177591 caught at 1420 h, on egg
15 January - 4 February:	fence down, fresh excreta + feathers at entrance
5-7 February:	fence intact, fresh excreta
8 February:	fence intact, taiko chick present

Status: occupied by breeding pair E-177254 and E-177591, egg and chick present

Northern No.1

18-27 September:	fence intact, no activity
28 September - 1 October:	fence down, fresh excreta, taiko visiting during this period
2 October:	taiko pair E-177255 and E-177256 caught 2000 h
3 October:	fence intact, pair still occupying burrow
4-9 October:	fence down, taiko visiting during this period
10-12 October:	fence intact
13-16 October:	fence down, taiko visiting during this period
17 October:	fence down, fresh excreta, taiko visiting during this period
18-20 October:	fence down, fresh excreta, taiko visiting during this period
21 October - 1 November:	fence intact
2-13 November:	fence down, taiko visiting during this period
14-21 November:	fence intact
22-28 ?November:	fence down, fresh excreta, taiko visiting during this period
7 January:	fence down, fresh excreta, digging, taiko presumably incubating
8 January - 6 February:	fence down, old excreta, taiko visiting during this period

Status: occupied by breeding pair E-177255 and E-177256, chick raised

TABLE 1. cont.

Northern No.3

18 September - 17 October:	fence intact, no activity
18-20 October:	fence down, ?taiko visiting during this period
21 October - 13 November:	fence intact, no activity
14-21 November:	fence down, fresh excreta, taiko visiting during this period
22-27 November:	fence down, excreta present, taiko visiting during this period
28 November - 7 January:	fence down, excreta present, taiko visiting during this period
8-15 January:	fence down, taiko visiting during this period
16 January - 6 February:	fence down, no other sign of recent activity, ?taiko visiting

Status: taiko visiting burrow, lack of activity prior to 18 October would indicate that a non-breeding taiko is visiting this burrow.

There was no petrel activity reported at any of the known burrows by 23 September. On the evening of 21 September, Geordie Murman and I ran a light at the Tuku lights site (near Taiko Town) and spotlighted for CI taiko from 2230-0130 hours. No CI taiko were observed but three broad-billed prions (*Pachyptila vittata*) and several grey-backed storm petrels (*Garrodia nereis*) were caught.

The first CI taiko came ashore on 24 September 1990. The Tuku No. 1 burrow was checked at 1930 h and the fence was intact. However at 2115 h the fence was down. I then gave a two minute war-whoop (a human call which attracts *Pterodroma* petrels) and a CI taiko came out of its burrow in response. This bird re-entered the burrow before it could be captured; it moved extremely rapidly when I shone my torch at the burrow. A CI taiko was also seen at the entrance of this same burrow at 2100 h on 28 September. I heard a movement at the entrance and when I shone my torch, the head of the CI taiko was visible. It quickly retreated into the burrow. Later that night, Geordie and I tried a variety of war-whoops, other petrel sounds and tape recordings of petrel calls but got no response from the bird. Finally, at midnight, I gave a soft persistent war-whoop call into the burrow entrance. I heard a taiko moving up the burrow in response and this was caught c.30 cm below the entrance. The bird was already banded (E-127229) and had been caught by David Crockett on 11/1/86 at the Tuku lights (at Taiko Town). This was the first recapture of a CI taiko away from the lights site. When handled, the bird gave several high pitched calls, which I taped. The probable mate (E-127241) was caught by Mike Imber in the same burrow on 27/10/88.

The camp burrow (Tuku No. 10) was re-occupied by a CI taiko between 26 and 28 September 1990. No bird was seen at the burrow entrance on the evening of 28/9/90 nor was there any response to our war-whoops and playback of petrel calls. However, a few shuffling sounds were heard within the burrow. The following morning, when passing this burrow, a series of muted calls were heard. I mimicked these calls and was able with the help of Simon Whiting to pinpoint their origin. This site was about 2m from the entrance. By inserting a stick into the ground, I was able to find a hollow area. I then dug down 30cm and found I had located the back of the nest chamber. A CI taiko was felt within this chamber and was duly extracted. The bird was unbanded so measurements were taken and the bird was banded (E-177254), photographed and its calls taped (see Table 2). The new hole was plugged with punga and soil and marked with tape before returning the bird to the burrow by its normal entrance.

TABLE 2. Chatham Island taiko - measurements (mm) and weight (g).

Band	Bill length	Bill depth	Wing length	Tail length	Tarsus length	Mid-toe + claw	Weight
E-127229	32.2	15.4	305	132	40.8	55.0	455
E-177254	34.3	16.9	297	127	41.4	52.9	560
E-177255	32.5	15.8	310	134	42.0	54.0	445
E-177256	32.6	16.9	300	128	42.2	57.1	435
E-177591	33.2	16.5	305	132	41.5	56.7	535

On 2 October 1990, Geordie, Simon and I visited the northern CI taiko burrows just on dusk. We sat near the burrows for a while to see if there was any CI taiko activity. At 2000 h, I quietly approached the burrow and gave a series of soft war-whoops. Within a minute, I heard a bird moving up the burrow and it gave several high pitched squeaky calls. The bird then stopped moving so I put my arm into the burrow entrance and caught the bird c.30cm inside the burrow. The CI taiko was unbanded so the bird was then weighed, measured and banded (E-177255) (see Table 2). I thought a second bird may be present so after processing the first bird, I gave another series of war-whoops. Initially nothing was heard but finally I heard a gentle rustle so I put my arm into the burrow c.50 cm inside the burrow and felt a bird peck on my fingers. The second bird when extracted was also found to be unbanded. This bird was more aggressive than the first but only gave a few squeaky calls while being handled whereas the first bird gave a number of squeaky high pitched calls while in the holding bag. When the second bird was returned to the burrow, I taped a series of "oi" calls given by one of the birds when the pair reunited in their nest chamber.

Both birds were back in the burrow by 2045 h. No further calls were heard from that pair or other CI taiko that evening even though tapes of CI taiko and grey-faced petrel (*Pterodroma macroptera*) were played and I gave a loud war-whoop sequence for 10 minutes. The following morning the fence on this burrow was still intact so neither bird had left the burrow as a result of our handling these birds. Subsequently this pair fledged a chick in May 1991 (Mike Imber pers. comm.).

On 14 January 1991, Alan Tennyson and myself visited the southern burrows in the Tuku Valley. We checked the camp burrow (Tuku No. 10). About five white and green fresh bird droppings were noted outside the burrow entrance but two were seen on the track near a log crossing about 2m away. The fence was down and the burrow looked clean and active. No scent of petrel was detected by us. We opened up the study hole at the back of the chamber to check the nest contents. No bird was initially felt so I removed some nest lining. There was no sign of egg shell fragments but several old and two very new white feathers were present. I felt in the burrow with a stick and immediately a bird pecked at the stick from about an arms length into the burrow. After several attempts, I managed to extract the bird but the opening had to be enlarged slightly. The bird was unbanded. Therefore, we proceeded to band (E-177591), measure and weigh it (Table 2). The bird had a bare brood patch with downy midline feathers; it was just beginning to refeather. The CI taiko had fresh plumage with no sign of moult but some old feathers were present on the upper wing coverts. The plumage was dark slate grey (almost blackish) above and white below. There was some white scalloping on the forehead and also a white patch on

the throat (below the bill). The bird was very aggressive and was constantly biting. While being handled, it gave several loud clear calls; a strong "oi-of-oi" call or "or-wik" type call very similar to grey-faced petrel calls. It also gave both loud and quiet high pitched calls. The bird settled down quickly when returned to the holding bag.

An egg was felt in the burrow and after some effort was removed, measured and weighed (Table 3). This was the first CI taiko egg seen since the species was rediscovered. The egg was then returned to the burrow, the study entrance blocked off and the adult returned via the main entrance. A close inspection of the soil in the burrow entrance revealed egg shell fragments proving that breeding had occurred in this burrow in previous seasons.

TABLE 3. Taiko egg and chick measurements (mm); Tuku No.10 burrow

Egg measurement; 64.8 x 47.0; Weight 66 g.

Egg started and chick calling on 14/1/91; estimated hatching c.18-20/1/91

Chick present on 8/2/91; c.17-19 days old.

Bill length	Bill depth	Wing length	Tarsus length	Mid-toe + claw	Weight (g)
23.5	12.8	37.5	31.0	35.8	240

Chick downy, down brownish-grey above, underside light grey. Bill dark, foot colour flesh with dark on distal part of toes, webs and all of the outer toe.

The Tuku No. 1 burrow also showed sign of activity on 14/1/91. Fresh droppings were present at the entrance and the fence was down. The burrow had a cleaned out appearance but no petrel odour was detected. No response was made to war-whoops, or mimics of the "oi" and squeaky calls during this daytime visit.

The Tuku No.2 burrow had an intact fence so is currently inactive. The Tuku No.3 burrow had its fence partly down and pushed into the burrow. There were no droppings present. Clearly, something disturbed the burrow entrance but it may not have been a CI taiko.

Further searching in the vicinity of the Tuku No. 1 burrow on 14/1/91 revealed a new burrow (Tuku No.4) c.15-20m directly upslope from Tuku No. 1 burrow. The new burrow is at the base of a small *Dracophyllum* and goes in 40cm straight then curves down to the right at a 35-40° slope and is at least 80cm long. A second tunnel ran back directly into the slope. Tuku No.4 seemed freshly dug and had the entrance scraped out with a slight mound of soil. There was one fresh taiko feather in the entrance but no droppings.

On 8 February 1991, we opened up the study entrance into Tuku No. 10 burrow and found a 17-19 day old chick present. This is the first time a taiko chick of this age has

been seen since the rediscovery of the species. The chick was photographed, measured and the plumage described (Table 3). The chick was then returned to its burrow and the entrance sealed off firmly.

I also measured some of the known CI taiko burrows (Table 4).

TABLE 4. Chatham Island taiko burrow dimensions (height and width at entrance and tunnel length).

Burrow	Height (cm)	Width (cm)	Length (cm)
Tuku No.1	17	26	150+
Tuku No.2	12	18	85
Tuku No.3	19	17	50
Tuku No.4	15	18	120+
Tuku No.10	12	22.5	260+
North 1	17	19	140+
North 3	11.5	20	115

Predator trapping/poisoning

I helped out for several days with the cat/possum/weka trapping programme. In addition, I set five fenn traps near the southern burrows on 19/9/91 and five near the northern burrows on 21/9/91 to index rat numbers near these burrows. The traps were spaced at 50m intervals and were baited with peanut butter.

On 25/9/91, the southern set of traps caught one female frugivorous ship rat; the remaining four were unsprung. On 29/9/91, all the southern traps were unsprung. All these traps were then removed. The uncorrected capture ratio for this trapline was 1 ship rat per 50 trap-nights (TN) or 2 rats/ 100TN. On 23/9/91, there were three ship rats caught in the northern traps (two mature males and one mature female frugivorous) and two unsprung traps. On 3/10/91, the northern traps contained one ship rat, one weka, one juvenile male possum, one sprung trap with fur and one unsprung trap. The traps were then removed. The uncorrected capture result was 4 ship rats per 60 trap-nights or 6.6 rats/ 100TN.

The number of ship rats caught was quite high. In addition, many frugivorous and alexandrinus ship rats were caught in the leg-hold traps. Ship rat numbers may be increasing in response to the reduction in the cat population. On 25/9/90, about 50 TALON 50WB rat poison baits were placed within 100m of Tuku No. 1 burrow and on 29/9/90, a further 50 rat poison baits were put out near Tuku No. 10 burrow. More poison was laid near these burrows on 14/1/91.

Conclusions from 1990/91 season

The 1990/91 CI taiko breeding season gave many notable successes. Six CI taiko have now been caught at the three main breeding burrows. Probably only two other burrows are being visited regularly by CI taiko. At least two burrows (Tuku No. 10 and Northern 1) had breeding pairs present and there is probably a breeding pair in Tuku No. 1. The

breeding status of Tuku No.4 and Northern 3 is still uncertain. Fencing burrow entrances from early in the season has given us a much better indication of CI taiko activity ashore. The breeding season is now known to begin from 24 September to early October. CI taiko visit burrows frequently during early to mid-October. Some breeders, probably males, continue to visit their burrows during late October and early November. The birds appear to return to lay in late November and the incubation period continues until mid to late January. The egg found on 14 January was starved and would have hatched around 18-20 January. Each chick is then fed sporadically until they fledge in early May. An egg and young chick of a CI taiko were also measured and described for the first time this season.

CHATHAM ISLAND PETREL

An intensive survey and monitoring programme was carried out on CI petrels during a visit to South East Island (see Fig. 1 for place names) from 15 January to 6 February 1991. The information was collected by Euan Kennedy, John Andrew, Sharon Walker, Alan Tennyson and myself. The work plan was to monitor the known burrows and to survey for new burrows using a variety of techniques. Much of the survey work was carried out at night while monitoring of burrows was usually done during the day.

Chatham Island petrels were located by five main methods: spotlighting, ground searches at night, daytime burrow searches, war-whooping and checking previously located burrows. The methods by which new burrows were located are shown in Table 5.

TABLE 5. Method of locating new Chatham Island petrel burrows: 1991

BURROW	METHOD
11	Collapsed burrow by track
12	Collapsed burrow by track
13	War-whooping
14	Checking location where birds on ground in 1989
15	War-whooping
16	War-whooping
17	War-whooping
18	War-whooping
19	Bird seen on surface at night by burrow
20	War-whooping
21	Burrow search where bird on ground at night
22	Burrow search where bird on ground at night
23	Burrow search where bird on ground at night

Spotlighting was used on several dark nights to land birds in the Rangatira Trig area. Five birds were caught by this technique. Searches were made at night along tracks and in areas of suitable habitat where aerial calling was particularly vocal. Seven new CI petrels were found by this technique and six of these were subsequently found to be associated with a nearby burrow during daytime searches of these areas. One pair were found in a burrow next to where they were seen on the surface two years earlier. Two burrows were located by accidentally trampling the burrow during observations on black robins (*Petroica traversi*). War-whooping was carried out on most nights but the response of

SOUTH EAST ISLAND

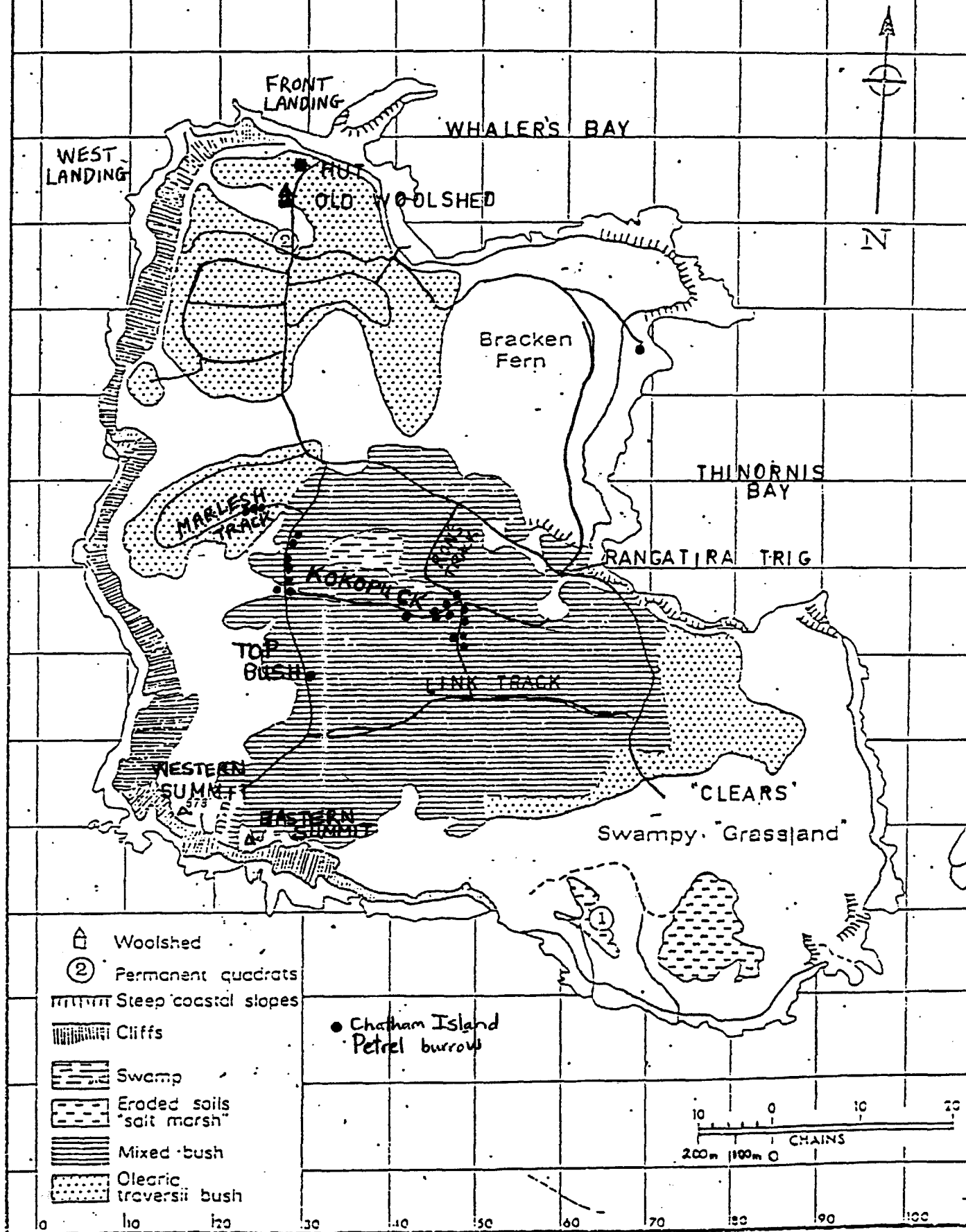


FIGURE 1 MAP OF SOUTH EAST ISLAND

birds in burrows and on the surface was rather poor (Table 6). Nevertheless, six birds were found after they called repeatedly in response to war-whoops; all these birds were incubating in burrows. Six of the 13 new burrows located on this trip were found by war-whooping.

TABLE 6. Response of Chatham Island petrels to war-whooping: January - February 1991
Recaptures denoted by (*).

BAND	SEX	RESPONDED TO WAR-WHOOP
101659*	M	NO
101677*	F	NO
101818*	M	NO
101822*	M	NO
101823*	M	NO
101831*	M	NO
101835*	F	NO
101836*	M	-
143483*	F	NO
143489*	F	NO
143491	-	-
143492	F	NO
143493	-	POSSIBLY
143494	-	POSSIBLY
143495	F	NO
143496	M	-
143497	M	YES
143498	-	-
143499	-	-
143715	F	NO
143716	M	YES
143717	F	NO
143718	M	YES
143719	M	YES
143720	F	NO
143721	F	NO
143722	M	NO
143723	?M	NO
143724	-	NO
143725	F	NO
143726	M	YES
143727	-	NO
143728	?F	NO
143729	F	NO
143730	M	NO
143731	M	NO
143732	M	YES
143733	M	NO
143734	M	NO
143735	F	-

Nine CI petrel burrows were known from surveys carried out in previous seasons (West 1989, 1990). The Burrow #10 area was identified by the presence of a sick CI petrel chick in April 1990 but the actual burrow was not located (O'Donnell and Dilks 1990). New birds were found by checking the occupancy of these known burrows.

A total of 40 CI petrels were captured during our visit (Table 6). Ten of these were recaptures and 30 were new birds. The recaptures included two birds banded in January/February 1986 by Mike Imber, four banded in January/February 1989 by Jill West, one banded in April 1989 by Ron Nilsson, one banded-in December 1989 by Don Merton and one banded in November 1990 by Phil Todd. One of the birds banded by Mike Imber (D101677) was found on the surface in the Kokopu Creek area. No tracks were present in this area in 1986 and the bird was probably caught in the upper summit track area, some distance from Kokopu Creek (M. Imber pers. comm.).

The distribution of known CI petrel burrows falls into three main locations. Ten burrows are situated on or near the main summit track, 11 are in the valley floor of Kokopu Creek and one is just behind Thinornis Bay. A description of each burrow site is given in Table 7. The burrows found in previous surveys all occurred in fairly firm soil. However, only one of the 13 new burrows found this season was in firm soil; The rest were in very friable soil in areas dominated by white-faced storm petrels (*Pelagodroma marina*) and occasional broad-billed prions. All the burrows were situated on a north or east facing aspect and on flat or gently sloping ground (0-10). Some burrows were in open clearings amongst pasture grass or in low shrublands, the remainder were in areas of tall coastal forest. Burrow entrance dimensions are also given in Table 7. These were variable depending on the friable nature of the substrate.

TABLE 7. Chatham Island petrel - burrow description

BURROW	HEIGHT X WIDTH (mm)	SLOPE°	ASPECT	SOIL
1	65 x 155	0	N ridge	Firm
2	70 x 120	0	N ridge	Firm
3	70 x 190	0-5	N	Mod Friable
4	90 x 270	0-5	N	Mod Friable
5	85 x 130	0	N ridge	Firm
6	55 x 170	0	N ridge	Firm
7	30 x 150	0	N ridge	Firm
8	(modified)	0	E	Firm
9	70 x 120	0	N ridge	Firm
11	110 x 145	5	E	Friable
12	(modified)	5	E	Friable
13	130 x 105 (160)	5	NE	Friable
14	100 x 120	10	NE	Friable
15	(modified)	5	E	Friable
16	90 (120) x 170	5-10	E	Friable
17	90 x 165	5-10	NE	Friable
18	85 x 180	5	ENE	Friable
19	90 x 110	10	NE	Friable
20	90 x 150	0-5	E	Firm
21	105 x 140	0	ENE	Friable
22	90 x 125	0-5	ENE	Friable
23	100 x 145	5-10	ENE	Friable

Sixteen CI petrel burrows had an egg present during our visit (Table 8). Each egg was measured and weighed, and those eggs found early in the trip were reweighed subsequently to assess whether they were developing (fertile eggs lose weight). All the eggs that we reweighed had lost weight so they were apparently fertile. Table 8 also

shows the spread of egg-laying dates. Burrow #8 was extremely early and had an egg present in late December (South East Island Log Book) while the female in Burrow #1 laid during the night of 24/25 January, about four weeks later. Evidently most birds lay around early to mid-January. This agrees with the observations from previous seasons (West 1989, 1990).

TABLE 8. Laying dates and egg measurements of Chatham Island petrels: 1990/91 season.

BURROW	DATE LAID	LENGTH X WIDTH (mm)	WEIGHT g
1	24-25/1/91	49.0 x 37.1	37 (25/1/91)
			36.5 (1/2/91)
3	before 15/1/91	53.4 x 40.1	45 (15/1/91)
			45 (20/1/91)
			45 (25/1/91)
			44 (26/1/91)
			43.5 (1/2/91)
5	before 15/1/91	50.4 x 38.8	41 (15/1/91)
			40.5 (26/1/91)
			39.5 (1/2/91)
6	17/1/91	52.8 x 37.6	45.5 (17/1/91)
			40.5 (20/1/91)
			39.5 (30/1/91)
			39 (1/2/91)
8	c.28/12/91	52.7 x 38.1	40.5 (16/1/91)
			38.5 (25/1/91)
			38 (1/2/91)
11	before 19/1/91	52.5 x 40.7	45 (19/1/91)
			43 (27/1/91)
			43.5 (1/2/91)
12	before 19/1/91	48.6 x 39.3	40 (19/1/91)
13	before 19/1/91	51.7 x 38.5	42 (19/1/91)
14	before 20/1/91	51.1 x 37.7	40.5 (1/2/91)
			38 (20/1/91)
15	before 24/1/91	54.6 x 37.6	40 (24/1/91)
16	before 25/1/91	52.2 x 38.6	42 (25/1/91)
17	before 25/1/91	50.7 x 38.4	40 (25/1/91)
			39.5 (1/2/91)
18	before 1/2/91	51.4 x 38.0	40 (1/2/91)
20	before 2/2/91	53.0 x 37.5	35 (2/2/91)
21	before 3/2/91	53.3 x 37.6	39 (3/2/91)
22	before 3/2/91	53.9 x 38.1	41.5 (3/2/91)

The CI petrels were carefully examined when first handled. Each bird was weighed, measured, brood patch checked and the cloaca examined to determine sex (the cloaca of females is enlarged for 1-2 weeks after egg-laying). The data for male CI petrels are given in Table 9, for females in Table 10 and for birds of uncertain sex in Table 11. Chatham Island petrel D143735 in Burrow #16 was the only bird handled but not measured or weighed by us as it was caught just prior to our departure from the island.

There does not appear to be any sexual dimorphism in the measurements we took of CI petrels. Only mid-toe plus claw length tended to be slightly longer in males (although no statistical tests were made). Future sexing of CI petrels probably will depend on cloacal sexing.

TABLE 9. Measurements (mm) of Chatham Island petrels: males

BAND	BILL LENGTH	BILL DEPTH	TARSUS	MID TOE + CLAW	WING LENGTH	TAIL LENGTH	WGT g	CLOACA	BROOD PATCH
101659	24.0	12.0	30.5	37.8	219	97	245	small	bare, downy midline
101818	23.7	11.5	30.0	38.5	213.5	92	205	small	bare
101822	24.6	11.7	31.5	38.8	216	96	240	small	bare, downy midline
101823	23.9	11.8	30.1	38.5	215	92.1	235	s-mod	bare, downy midline
101831	24.3	11.6	31.6	39.7	212	96	215	small	bare, downy midline
101836	25.0	11.3	30.2	39.9	217	94	225	small	bare, downy midline
143496	24.6	11.2	33.5	39.4	212	94	205	small	bare, downy midline
143497	24.0	11.5	32.8	39.8	216	91	-	small	bare, downy midline
143716	23.6	11.4	32.9	40.1	211	94	230	small	bare, downy midline
143718	23.0	11.3	29.8	37.8	217	95	205	small	bare, downy midline
143719	25.3	12.0	30.6	39.1	221	98	230	small	bare, downy midline
143722	24.4	11.4	33.1	40.4	215	93	230	s-mod	bare, downy midline
143726	24.7	11.2	31.3	39.2	219	98	275	small	bare, downy midline
143730	24.9	11.7	33.1	40.8	216	98	215	small	bare
143731	26.7	11.8	31.8	38.7	212	94	220	small	bare, downy midline
143732	24.0	11.1	32.0	38.7	214	95	225	small	bare
143733	24.5	11.6	30.8	40.4	222	94	210	small	bare, downy midline
143734	25.6	11.3	32.3	41.3	223	102	230	small	bare, downy midline

	n	X	SE	RANGE
Bill length	18	24.5	0.20	23.0 - 26.7
Bill depth	18	11.5	0.06	11.1 - 12.0
Tarsus	18	31.6	0.28	29.8 - 33.5
Mid toe + claw	18	39.4	0.23	37.8 - 41.3
Wing length	18	216	0.84	211 - 223
Tail length	18	95	0.64	91 - 102

TABLE 10. Measurements (mm) of Chatham Island petrels: females

BAND	BILL LENGTH	BILL DEPTH	TARSUS	MID TOE + CLAW	WING LENGTH	TAIL LENGTH	WGT g	CLOACA	BROOD PATCH
101677	23.7	11.0	30.1	38.1	218	97	185	mod	bare, downy midline
101835	24.7	11.7	31.3	37.8	219	97	258	m/large	bare, downy midline
143483	24.4	11.6	30.3	38.5	228	105.4	235	mod	bare, downy midline
143489	24.1	11.4	31.7	39.3	223	101	255	m/large	bare
143492	23.2	11.4	31.6	39.4	212	96	-	swollen	bare
143495	25.5	11.2	31.8	38.8	218	92	235	m/large	bare
143715	24.7	12.1	32.5	39.7	216	96	250	m/large	bare, downy midline
143717	24.1	11.2	31.1	37.9	218	96	210	swollen	bare, downy midline
143720	24.3	11.7	33.5	37.8	219	95	250	s/mod	bare, downy midline
143721	25.3	11.3	31.2	37.7	222	98	235	s/mod	bare, downy midline
143725	23.7	11.6	33.1	39.9	217	95	260	mod	bare, downy midline

	n	X	SE	RANGE
Bill length	11	24.3	0.21	23.2 - 25.5
Bill depth	11	11.5	0.09	11.0 - 12.1
Tarsus	11	31.7	0.32	30.1 - 33.5
Mid toe + claw	11	38.6	0.25	37.7 - 39.9
Wing length	11	219	1.25	212 - 228
Tail length	11	97	1.06	92 - 105.4

TABLE 11. Measurements (mm) of Chatham Island petrels: sex unknown

BAND	BILL LENGTH	BILL DEPTH	TARSUS	MID TOE + CLAW	WING LENGTH	TAIL LENGTH	WGT g	CLOACA	BROOD PATCH
143491	25.0	11.4	31.4	39.5	213	93	205	large ?F	downy
143493	24.7	11.4	32.0	37.4	216	97	180	mod	downy
143494	23.6	11.1	31.0	39.5	214	96	195	small	downy
143498	23.5	11.0	30.1	38.2	214	95	160	small	downy
143499	24.0	10.9	31.2	38.0	219	92	193	small	downy
143723	23.9	10.8	30.6	37.3	216	92	215	small ?M	bare, downy midline
143724	24.3	11.1	31.4	39.8	213	99	240	small ?F	bare
143727	25.1	11.6	31.6	39.7	220	95	225	s/mod	bare
143728	24.8	11.4	31.5	39.9	221	100	195	s/mod ?F	bare, downy midline
143729	24.0	11.6	32.0	39.8	223	98	213	s/mod ?F	bare, downy midline

Chatham Island petrel burrows were checked frequently during the visit to collect information on occupancy of burrows, pair bonds, weight change during incubation, length of incubation shifts and to document any potential interference from prions (table 12). No bird deserted directly as a result of handling nor did any birds stop incubating their egg even though some individuals were handled frequently. To reduce handling, we fenced burrows and only checked nest contents when the fence was disturbed or just prior to the expected departure of incubating birds so that we could collect information on their body weight change. Two birds were handled on six occasions; one of these birds was in Burrow #11 which subsequently produced a chick (Euan Kennedy pers. comm.).

TABLE 12. Chatham Island petrel - occupation of burrows January/February 1991

(*FI = fence intact, no change since previous visit; FD = fence down; E = egg; WFS = white-faced storm petrel; weights in (g) of banded birds)

DATE	BURROW 1	BURROW 3	BURROW 5	BURROW 6
15/1/91	-	101818 E 205	101822 E 240	EMPTY WFS
16/1/91	EMPTY	*FI	*FI	EMPTY FD
17/1/91	*FI	*FI	*FI	143492 E
18/1/91	*FI	*FI	*FI	*FI
19/1/91	-	-	-	-
20/1/91	*FI	101818 E 185	*FI	101823 E 235
21/1/91	-	-	-	-
22/1/91	*FI	*FI	*FI	*FI
23/1/91	*FI	*FI	*FI	*FI
24/1/91	143717 E 210	143489 E 255	*FD	*FD
25/1/91	*FI	-	*FI	101823 E 220
26/1/91	-	143489 E 248	101822 E 198	*FI
27/1/91	101659 E 245	*FI	101835 E 258	*FI
28/1/91	*FI	*FI	*FI	*FI
29/1/91	*FI	*FI	*FD	*FI
30/1/91	*FI	*FI	*FI	101823 E 202
31/1/91	*FI	-	*FI	*FI
1/2/91	101659 E 225	143489 E 225	101835 E 235	143492 E 255
2/1/91	*FI	*FI	*FI	*FI
3/2/91	*FI	*FI	101835 E 222	*FI
4/2/91	*FI	*FI	*FI	*FI
5/2/91	*FI	-	*FD	*FI

TABLE 12. cont.

DATE	BURROW 8	BURROW 11	BURROW 12	BURROW 13
16/1/91	143483 E 235	-	-	-
17/1/91	-	-	-	-
18/1/91	-	-	-	-
19/1/91	-	143495 E 235	143496 E 205	143497 E
20/1/91	-	*FI	E only	*FI
21/1/91	-	-	-	-
22/1/91	-	*FI	143715 250	*FI
23/1/91	-	143495 FD	E only	*FI
24/1/91	-	*FI	143715	*FI
25/1/91	101836 E 225	*FI	E only	-
26/1/91	-	-	-	-
27/1/91	-	143722 E 230	E only	143721 E 235
28/1/91	-	*FI	E FI	*FI
29/1/91	-	*FD	E FD	*FI
30/1/91	-	143722 E 217	E FI	*FI
31/1/91	-	143722 E 215	E FI	*FI
1/2/91	143483 E 252	143722 E 210	E FI	143721 E 213
2/2/91	-	*FI	E FI	*FI
3/2/91	-	143722 E 200	E removed FI	*FI
4/2/91	143483 E 237	143722 E 197	FI	143721 E 202
5/2/91	-	*FD	FI	-
6/2/91	143483 E 235	-	-	-

DATE	BURROW 14	BURROW 15	BURROW 16	BURROW 17
20/1/91	101831 E 215	-	-	-
21/1/91	-	-	-	-
22/1/91	-	-	-	-
23/1/91	-	-	-	-
24/1/91	*FI	143716 E 230	-	-
25/1/91	143720 E 250	*FI	143718 E 205	143719 E 230
26/1/91	-	-	-	-
27/1/91	*FI	*FI	143718 E 197	*FI
28/1/91	-	143716 E 215	143718 E 195	*FI
29/1/91	-	*FI	-	-
30/1/91	143720 E 237	*FI	*FI	*FI
31/1/91	-	143724 E 240	143718 E 185	143719 E
1/2/91	-	*FI	*FI	143725 E 260
2/2/91	*FD	*FI	143718 E 178	*FI
3/2/91	-	*FI	*FI	*FI
4/2/91	143720 E 212	143724 E 217	143718 E 170	*FI
5/2/91	-	-	143735 E	-

DATE	BURROW 18	BURROW 19	BURROW 20	BURROW 21
1/2/91	143726 E 275	-	-	-
2/2/91	143726 + 143729 E 213	143730 215	143732 E 225	-
3/2/91	143726 + 143729 E	EMPTY	-	143733 E 210
4/2/91	143726 E 260 + 143729 207	FI	*FI	*FI
5/2/91	143726 E	-	*FI	-
6/2/91	E only (infertile)	FI	*FI	-

TABLE 12. cont.

DATE	BURROW 22	BURROW 23
3/2/91	143734 E 230	143731 220
4/2/91	*FI	143731 212
5/2/91	*FI	-
6/2/91	*FI	PRIONS

Newly returned CI petrels were very heavy at the start of their incubation shifts. The weights of birds 1-3 days after their arrival ranged from 230g to 260g. The heaviest bird was D143726 which weighed 275g when captured on the surface on 1/2/91. Daily weight loss in incubating birds varied between 3-6g per day. Incubation shifts appear to be around 12-13 days with five minimum shift durations of 11-12 days being recorded and one maximum of 13 days (Table 13). The average weight loss per shift is about 40-50g.

TABLE 13. Length of main incubation shifts (days) for some Chatham Island petrels: 1990/91 season.

Burrow	Band	Minimum duration	Maximum duration
1	101659	10	-
3	101818	9	-
3	143489	12	-
5	101822	12	-
5	101835	10	-
6	101823	12	13
8	101836	-	15
11	143722	10	-
13	143721	9	-
14	143720	11	-
16	143718	11	-

Aerial activity was monitored in some detail this season. Chatham Island petrels were heard calling in flight on most dark nights. Activity was greatest over the lower eastern end of the swamp at the head of Kokopu Creek but birds were heard in flight from Rangatira Trig through to the Summit Track near Burrow #1. Several calls were also heard over Woolshed Bush, Whalers Bay and near the hut. When using spotlights, we frequently saw CI petrels in flight, especially over Kokopu Creek and Rangatira Trig. Most of these birds were engaged in pair chases and were flying very fast. At least six and possibly 10+ birds were noted on the best nights.

The calls of CI petrels sounded very similar to those of black-winged petrels (*Pterodroma nigripennis*). However, the main CI petrel flight call was delivered slightly slower than that of the black-winged petrel, e.g. "whiss--whiss--whiss" compared to "whis-whis-whis". Other calls given by CI petrels included "boon", "oi" and "kek-kek-kek" and a low pitched "ehh-ehh-ehh" or "eeg-eeg-eeg". Chatham Island petrels called most actively during the dark nights of 16-25/1/91. We heard no aerial calling from CI petrels on bright moonlit nights.

A check was made of the Burrow #10 area (below Rangatira Trig) on 17/1/91 to try and locate this burrow. The contents of 52 burrows were inspected within 10m of the tape marking the location where the CI petrel chick was found in April 1990 (O'Donnell and Dilks 1990). Only white-faced storm petrels were present in these burrows (18 chicks, pair of adults, single adult, adult + chick and an adult incubating a pipping egg). There were several larger burrows present but all were empty.

Conclusions from 1990/91 season

A number of new burrows and unbanded birds were found this season which suggests that the population is larger than previously thought. New burrows were also located in areas of friable soil which suggests they are more widely distributed than was indicated by the locations of burrows found in recent seasons (West 1989, 1990). We now have a variety of techniques to catch birds and locate their burrows. We also have a greatly improved knowledge of their breeding biology (laying dates, incubation spells, weight changes) and some observations of aerial behaviour and vocalisations. On the down side, the number of breeding burrows appears to be decreasing. Only five of the nine burrows known from previous seasons had CI petrels visiting or breeding this season. Also three of the ten known breeding birds (30%) were not reported this season and had been replaced by new mates. This would indicate some instability in the pair bonds.

The presence of a pair of broad-billed prions in Burrow #23 on 6/2/91 and the failure of many breeding pairs this season (when nests were checked in April) would suggest that egg or chick mortality is high. Some breeding adults are also being lost, e.g. a dead adult CI petrel was found by Burrow #16 in April (Euan Kennedy pers. comm.). Clearly, more detailed observations on egg fertility, hatching success and prion competition/interference are needed. A visit to South East Island in late February and early March may resolve some of these unknowns.

OTHER OBSERVATIONS

Black-winged and Juan Fernandez petrels

Several visits were made to the summit of South East Island to look for black-winged petrels and Juan Fernandez petrels (*Pterodroma externa*), both of which have been reported there in previous seasons (West 1989, 1990). Black-winged petrels were observed on all visits to the summit. The birds responded strongly to war-whoop calls both day and night. Five birds called from the ground on 15/1/91 and a new bird was caught (D143490). A pair were together in a burrow on the Eastern Summit on 17/1/91. They were incubating a rotten egg. The female was a new bird (D156401) while the male (D101825) had been previously captured by Jill West on 26/1/89. Four new birds (D156402-5) were caught on the Western Summit on 20/1/91 (two adult females on an egg and a pair amongst the four burrows located). One new bird (D156406) was landed by spot-light on 26/1/91. A black-winged petrel was heard calling over Skua Gully on the evening of 30/1/91. Five black-winged petrels called from the ground on the Western Summit in response to war-whoops on 5/2/91. Three were caught; one was the bird caught on 26/1, the other two were recaptures of birds banded in previous seasons.

D101601 was caught by Colin Miskelly on 30/11/83 and D101662 was caught by Mike Imber in January 1986. Small numbers of black-winged petrels continue to breed on South East Island but as in previous trips, several fresh corpses were found in skua-middens. The species still appears to be struggling to colonise South East Island.

No Juan Fernandez petrels were seen or heard during this visit. Several birds have been seen from the summit in previous seasons (West 1989, 1990).

Broad-billed prions

Broad-billed prions were virtually absent during our visit to South East Island. A few late chicks were seen on most nights until 22/1/91; the last sighting was a chick with down on its nape on 1/2/91. The first confirmed adult prion was seen on 26/1/91. Three prions were heard calling from burrows on 29/1/91 but only 1-5 adults were seen on the surface each night from 30/1/91 to 3/2/91. Prions were noticeably more common ashore on 4/2/91 and were back in large numbers on 5/2/91. That evening six were seen between the camp and the front landing, 20 were seen in Woolshed Bush and at least 20 others were heard calling. The dominant call in the Top Bush was given by prions; hundreds were seen or heard. One pair of prions were found in CI petrel Burrow #23. These were removed. The return of prions was sudden and spectacular. Their early return may have a significant role in the high failure rate of CI petrel nests.

Sooty shearwaters

Sooty shearwaters (*Puffinus griseus*) were checked for the presence of any white-breasted birds after the discovery last season of an aberrant white-breasted bird (West 1990). Of the many hundreds of shearwaters checked during our visit, all had normal plumage. A sample of measurements (Appendix 1) were taken from birds in the Marlesh Track and Whalers Bay regions to compare with the study skin of this aberrant bird now held at the National Museum. All the sooty shearwaters measured had much shorter tails than the white-breasted bird. Sooty shearwaters appeared to be most abundant around the fringe of the island, especially behind Whalers Bay and near the Eastern and Western summits.

Penguins

A small sample of Chatham Island blue penguins (*Eudyptula minor*) were captured, banded and measured to compare with measurements taken from penguins from central New Zealand (Appendix 2). These were requested by Rod Cossee (Science and Research Division). Blue penguins were very common around the coastline of South East Island especially at Whalers Bay, Front Landing and West Landing. Up to 50 penguins were seen one evening on coastal rocks at West Landing. Many skua-killed corpses were found on the coastal rock platforms during our visit.

A yellow-eyed penguin (*Megadyptes antipodes*) was heard calling on most evenings and was seen on several occasions. It was caught by Euan Kennedy on 4/2/91. Several measurements were taken (Table 14).

TABLE 14. Measurements of yellow-eyed penguin, South East Island.

	(mm)
Bill Length	56.6
Bill Depth at base	25.0
Head Length + bill	143.0
Heel to mid claw pad	123.5
Flipper Length	234.0

Chatham Island Pigeon

During the September visit, I carried out a number of observations of CI pigeons, in particular obtaining feeding and movement data from the two birds that had transmitters attached in July 1990. All these observations were put onto the Chatham Island Field Centre pigeon database so I will not summarise them here. One unusual sighting was a group of five CI pigeons together in a tarahinau in the Awatotara Valley on 27/9/90. These birds were displaying and chasing each other. A CI pigeon was seen in the Tuku Valley up from Taiko Hill on 24/9/90. Chatham Island pigeons were seen eating CI mahoe flowers and leaves, hoho leaves and green fruit, *Hebe barkeri* leaves, and karamu flowers and green fruit during September. A CI pigeon watch carried out by Andy Grant, Sharon Walker, John Andrew, Euan Kennedy and myself located 25 CI pigeons using the Awatotara and mid to lower Tuku Valley on 8/2/91.

One CI pigeon was seen roosting in a ribbonwood tree in the Kokopu Creek catchment on South East Island on 28/1/91. The bird seemed plump and healthy. No bands were visible when checked carefully from below.

Flora of South East Island

While on South East Island, I recorded the species of plants present on the island and estimated their relative abundance (Appendix 3). The flora includes 134 species of vascular plants, 93 (70%) of which are native. Several plants were extremely rare and were known from less than five individuals. These included *Hebe barkeri*, *Dicksonia squarrosa*, *Corokia macrocarpa*, *Linum monogynum* and *Schoenoplectus pungens*.

In a survey of the summit area and western cliffs on 31/1/91, I noted that *Festuca coxii* was extremely abundant (1000's of plants). On a steep slope directly south of the Western Summit is a herbfield dominated by *Myosotidium hortensia* (100's of plants) and *Aciphylla dieffenbachii* (50-100 plants), some with yellow flower heads and others with seeds. I saw no evidence of *Aciphylla* weevil chewing on the stems of these plants. Three plants of *Embergeria grandifolia* were present (one large plant with green seed capsules, one large plant with no seed capsules and one seedling). A few plants of *Lepidium oleraceum* were also present and at least 11 plants were found on the ridge east of the Eastern Summit.

RECOMMENDATIONS

1. The timing of CI taiko activity at the known burrows has been closely monitored in the 1990/91 season. From the information collected, I would recommend a slight change to the predator control programme in future seasons.

a) An initial six week trapping period beginning mid-September and extending to late October to remove cats and reduce the number of possums and weka near the burrows prior to the arrival of breeding adult CI taiko. Rat poison should be laid near burrows at the end of this trapping spell to remove resident rodents (these may have experience with seabird egg or chick predation).

b) A four week trapping period from early January to early February to remove cats, possums and weka. This will protect breeding adults which frequently visit the burrows to feed newly hatched chicks (hatching c.20 January). Non-breeding taiko are also likely to be more active on the surface around the time of hatching. Rodent poison should be laid in the burrow areas at the beginning, middle and end of this spell to protect the newly hatched chick which is left unguarded after the first day.

c) A final four week trapping period from early April to early May to remove cats, possums and weka. This is to protect the CI taiko fledglings which will spend up to a week exercising and exploring near their burrows prior to departure in early May.

2. That a trained dog and handler be contracted to search for remaining burrows in the Tuku region. This should concentrate on areas in the head of the Tuku valley and on the ridges near the northern burrow. The best times for searching are late November to mid-February when adult taiko are incubating or just after hatching when a chick is present and adults are frequently visiting the burrow. Scent should be detectable both from birds inside the burrows and from their droppings near the entrance.

3. That a predator-free enclosure be built on the hill 200m east of the Tuku lights site (near Taiko Town) and within the Tuku Nature Reserve. This new site will be used for attracting non-breeding taiko to establish a protected colony. The enclosure should be at least one hectare in size.

4. That urgency be given to ring-fencing the Awatotara and lower Tuku Valley (c.100-200 ha block) and removing all feral stock from within these areas. These are the priority areas remaining on the main Chatham Island for the protection of CI pigeon. Even in low densities, intermittent browsing by feral stock is preventing the regeneration of trees and shrubs important in the CI pigeon diet.

5. That a further survey for CI petrel be carried out on South East Island in November and early December using war-whoops to locate burrows.

6. Once the distribution pattern of CI petrel burrows is established in the Kokopu Creek catchment, an area (c.2-4 ha) dominated by storm petrels should be marked off and all broad-billed prions present within should be removed from active burrows and prevented from recolonising. The status of CI petrels within this area should then be monitored and compared to a similar area with no prion control.

7. Consideration should be given to establishing several rare Chatham Island plant species on South East Island. Potential species include *Myrsine coxii* (there are suitable swamp areas in the central part of the island) and Chatham Island nikau. These may have been present prior to the island being cleared for farming as neither species is able to survive in a heavily grazed environment. Possibly cuttings or seeds of *Hebe barkeri* should be grown on the island to increase the numbers of this endangered species (currently only one tree present).

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APPENDIX 1. MEASUREMENTS (mm) AND PLUMAGE OF CHATHAM ISLANDS BLUE PENGUIN ON SOUTH EAST ISLAND

BAND	WEIGHT (g)	BILL LENGTH	B DEPTH BASE	B DEPTH NOSTRIL	FLIPPER LENGTH	WHITE MARGIN*	TAIL COLOUR
21501	1500+	36.2	21.8	17.9	133	4	-
21502	1500+	36.6	21.0	19.1	133	3	-
21503	1500+	38.6	22.2	19.2	131	4	blue
21504	1500+	33.1	20.0	16.3	128	4	blue
21505	1500+	33.9	20.1	17.0	117	5	blue
21506	1500+	36.5	20.7	16.2	127	5	blue
21507	1500+	38.0	17.6	13.8	131	4-5	whitish tips
21508	1500+	34.8	18.6	16.8	131	4	blue
21509	1500+	34.8	18.8	16.4	124	3	blue
21510	1495	34.6	20.4	16.8	135	5	blue, pale tips
21511	1500+	39.8	22.0	19.5	130	4	blue
21512	1500+	34.3	18.8	15.2	124	5	blue, pale brown tips
21513	1500+	36.5	21.0	18.4	129	4	blue
21514	1500+	36.6	22.8	19.4	132	5	blue
21515	1500+	37.3	21.0	17.7	132	3	blue

	n	X	SE	RANGE
Bill length	15	36.1	0.48	33.1 - 39.8
Bill depth - base	15	20.5	0.38	17.6 - 22.8
Bill depth - nostril	15	17.3	0.43	13.8 - 19.5
Flipper length	15	129	1.2	117 - 135

* White margin = mean width (mm) of trailing white margin on the upper flipper surface

APPENDIX 2. MEASUREMENTS (mm) OF SOOTY SHEARWATERS ON SOUTH EAST ISLAND (30/1 - 1/2/91)

BAND	BILL LENGTH	BILL DEPTH	UNGUIS DEPTH	TAIL LENGTH	WEIGHT (g)
27001	42.4	9.8	12.4	92	775
27002	43.7	10.0	13.3	92	900
27003	38.4	9.4	12.3	86	755
27004	44.8	10.5	14.9	87	975
27005	41.2	11.0	14.9	89	885
27006	45.2	10.2	14.4	91	800
27007	39.8	9.5	12.9	88	780
27008	42.6	10.6	13.9	87	825
27009	40.1	10.1	12.6	87	830
27010	41.4	11.0	12.6	88	860
27011	41.4	9.6	13.0	90	800
27012	44.9	10.8	14.1	87	800
27013	37.9	9.6	12.9	91	790
27014	41.7	10.8	14.0	87	910
27015	40.3	10.3	13.4	85	830
27016	43.6	10.4	14.5	88	850
27017	41.9	10.1	13.4	88	860
27018	43.4	9.3	13.2	87	740
27019	37.6	9.9	12.9	88	890
27020	41.1	9.9	14.3	89	830
27021	40.2	9.2	12.4	87	1030
27022	39.6	10.0	13.0	88	760
27023	42.2	10.5	13.5	85	790
27024	41.0	10.2	13.0	84	835
27025	44.3	10.1	14.1	87	750
27026	41.3	10.0	13.5	90	740
27027	43.3	10.0	15.2	83	865
27028	39.8	10.2	12.3	88	705
27029	38.8	10.0	13.0	88	730
27030	42.3	10.2	14.7	88	840

	n	X	SE	RANGE
Bill length	30	41.5	0.38	37.6 - 45.2
Bill depth	30	9.8	0.35	9.2 - 11.0
Unguis depth	30	13.5	0.16	12.3 - 15.2
Tail length	30	87.8	0.39	83.0 - 92.0
Weight	30	824.0	13.2	705 - 1030

APPENDIX 3. FLORA OF SOUTH EAST ISLAND

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE SCALE
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FERNS (16)

<i>Asplenium bulbiferum</i>	hen and chickens fern	R
<i>A. chathamense</i>	-	C
<i>A. oblongifolium</i>	shining spleenwort	R
<i>A. obtusatum</i>	shore spleenwort	O-C
<i>Blechnum</i> sp. 1 "capense"	kiokio	L
<i>B. durum</i>	-	O
<i>B. penna-marina</i>	-	L
<i>Cyathea dealbata</i>	silver fern	R
<i>C. ?smithii</i>	soft tree fern	R
<i>Dicksonia squarrosa</i>	rough tree fern	R
<i>Histiopteris incisa</i>	water fern	A
<i>Hypolepis lactea</i>	-	L
<i>Phymatosorus diversifolius</i>	hound's tongue	L
<i>Polystichum "chatham"</i>	shield fern	O
<i>Pteridium esculentum</i>	bracken	C
<i>Pyrrosia eleagnifolia</i>	leather-leaf fern	O

TREES, SHRUBS AND CLIMBERS - Native Dicots (22)

<i>Calystegia soldanella</i>	shore bindweed	R
<i>C. tuguriorum</i>	-	O
<i>Coprosma chathamica</i> "repens form"	karamu	O
<i>C. chathamica</i>	karamu	A
<i>Corokia macrocarpa</i>	-	R
<i>Corynocarpus laevigatus</i>	kopi	O
<i>Dracophyllum arboreum</i>	tarahinau	L
<i>Haloragis erecta</i>	toatoa	L
<i>Hebe barkeri</i>	koromiko	R
<i>H. chathamica</i>	-	O
<i>H. dieffenbachii</i>	-	A
<i>Macropiper excelsum</i>	kawakawa	A
<i>Meliccytus chathamicus</i>	Chatham Is mahoe	A
<i>Muehlenbeckia australis</i>	-	A
<i>Myoporum laetum</i>	ngaio	C
<i>Myrsine chathamica</i>	matipo	A
<i>Olearia chathamica</i>	keketeruhe	LC
<i>O. traversii</i>	akeake	A
<i>Plagianthus regius</i>	lowland ribbonwood	A
<i>Pseudopanax chathamicus</i>	hoho	C
<i>Solanum aviculare</i>	poroporo	O
<i>Urtica australis</i>	southern nettle	C

TREES, SHRUBS AND CLIMBERS - Introduced Dicots (3)

<i>Calystegia sepium</i>	pink bindweed	L
<i>Physalis peruviana</i>	Cape gooseberry	R
<i>Rubus fruticosus</i>	blackberry	C

TREES, SHRUBS AND CLIMBERS - Native Monocots (2)

<i>Phormium tenax</i> "chatham"	NZ flax	C
<i>Ripogonum scandens</i>	supplejack	C

DICOT HERBS - Native (35)

<i>Acaena novae-zelandiae</i>	bidibid	C
<i>Aciphylla dieffenbachii</i>	coxella	L
<i>Apium prostratum</i>	native celery	C
<i>Chenopodium glaucum</i>	glaucous goosefoot	C
<i>Colobanthus muelleri</i>	-	R
<i>Cotula coronopifolia</i>	buttonweed	O
<i>Crassula moschata</i>	-	LA
<i>Dichondra repens</i>	Mercury Bay weed	O
<i>Disphyma papillatum</i>	Chatham ice plant	A
<i>Einadia allanii</i>	-	L
<i>E. trigonos</i>	-	C
<i>Embergeria grandifolia</i>	Chatham sowthistle	R
<i>Epilobium billardioreanum</i>	-	O
<i>Geranium traversii</i>	-	O
<i>Hydrocotyle novae-zeelandiae</i> "chatham"	pennywort	R
<i>Lagenifera pumila</i>	-	O
<i>Lepidium oleraceum</i>	Cook's scurvy grass	R
<i>Leptinella ?squalida</i>	bachelors'buttons	C
<i>Linum monogynum</i>	rauhua	R
<i>Lobelia anceps</i>	shore lobelia	O
<i>Myosotidium hortensia</i>	Chatham forget-me-not	L
<i>Oreomyrrhis colensoi</i>	-	R
<i>Parietaria debilis</i>	-	O
<i>Potentilla anserinoides</i>	silverweed	L
<i>Pratia arenaria</i>	-	O
<i>Pseudognaphalium luteoalbum</i>	Jersey cudweed	C
<i>Ranunculus reflexus</i>	hairy buttercup	O
<i>Rumex neglectus</i>	shore dock	O
<i>Samolus repens</i>	-	C
<i>Sarcocornia quinqueflora</i>	glasswort	LC
<i>Selliera radicans</i>	-	O
<i>Senecio lautus</i>	shore groundsel	C
<i>S. radiolatus</i>	-	C
<i>Stellaria parviflora</i>	native chickweed	O
<i>Tetragonia trigyna</i>	native spinach	O

DICOT HERBS - Introduced (26)

<i>Achillea millefolium</i>	yarrow	R
<i>Anagallis arvensis</i> s.s.	scarlet pimpernel	O
<i>Carduus tenuiflorus</i>	winged thistle	R
<i>Cerastium fontanum</i>	mouse-ear chickweed	O
<i>C. glomeratum</i>	annual mouse-ear chickweed	R
<i>Chenopodium murale</i>	nettle-leaved fat-hen	LC
<i>Cirsium vulgare</i>	Scotch thistle	O
<i>Coronopus didymus</i>	twin cress	R
<i>Geranium molle</i>	dove's foot cranesbill	R
<i>Hypochoeris radicata</i>	catsear	L
<i>Leontodon taraxacoides</i>	hawkbit	O
<i>Lotus pedunculatus</i>	birdsfoot trefoil	L
<i>Plantago ?australis</i>	hairy plantain	O
<i>P. coronopus</i>	buck's horn plantain	C
<i>P. lanceolata</i>	narrow-leaved plantain	L
<i>Rorippa nasturtium-aquaticum</i>	watercress	O
<i>Rumex acetosella</i>	sheep's sorrel	O
<i>R. pulcher</i>	fiddle dock	O
<i>Sagina procumbens</i>	pearlwort	O
<i>Solanum tuberosum</i>	potato	L
<i>Sonchus oleraceus</i>	puha	C
<i>Taraxacum officinale</i>	dandelion	R
<i>Trifolium dubium</i>	suckling clover	O

<i>T. repens</i>	white clover	O
<i>Vicia sativa</i>	vetch	O
<i>Vicia sp.</i>	-	O

MONOCOT HERBS, RUSHES, SEDGES (11)

<i>Carex trifida</i>	-	A
<i>Carex sp.</i>	-	A
<i>Eleocharis acuta</i>	-	L
<i>Isolepis cernua</i>	-	C
<i>I. nodosa</i>	-	O
<i>Luzula banksiana</i> var. <i>acra</i>	coastal woodrush	L
<i>Microtis unifolia</i>	onion orchid	O
<i>Schoenoplectus pungens</i>	-	R
<i>Thelymitra sp.</i>	sun orchid	O
<i>Triglochin striatum</i>	arrow-grass	L
<i>Uncinia uncinata</i>	hook grass	R

GRASSES - Native (7)

<i>Dichelachne crinita</i>	plume grass	O
<i>Deyeuxia billardierei</i>	sand wind-grass	O
<i>Festuca coxii</i>	-	A
<i>Hierochloa redolens</i>	holy grass	L
<i>Poa chathamica</i>	-	C
<i>Rytidosperma sp</i>	-	R
<i>Trisetum antarcticum</i>	-	O

GRASSES - Introduced (12)

<i>Agrostis tenuis</i>	browntop	A
<i>Aira caryophylla</i>	silvery hair-grass	C
<i>Anthoxanthum odoratum</i>	sweet vernal	R
<i>Bromus hordeaceus</i>	soft brome	C
<i>B. willdenowii</i>	prairie grass	C
<i>Dactylis glomerata</i>	cocksfoot	A
? <i>Digitaria sanguinalis</i>	summer grass	L
<i>Holcus lanatus</i>	Yorkshire fog	C
<i>Hordeum murinum</i>	barley grass	O
<i>Lolium perenne</i>	perennial ryegrass	C
<i>Poa annua</i>	annual poa	L
<i>Vulpia bromoides</i>	squirrel-tail fescue	O

ABUNDANCE SCALE

A = Abundant O = Occasional L = Local
 C = Common R = Rare