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CODFISH ISLAND
PETREL SURVEY: 28 MARCH - 9 APRIL 1990

by

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ABSTRACT

Burrows of Cook's petrel, mottled petrel and sooty shearwater on Codfish Island, off Stewart Island, were visited in March/April 1990. The status of the burrows was analysed, and frequency of adult visits was recorded. Chicks were weighed whenever found; some chicks and adults were banded. Recommendations are made for immediate and long-term Codfish Island research projects important for these three species and for South Georgian diving petrels, broad-billed prions, Codfish Island fernbird, South Island saddlebacks, and brown teal.

1. INTRODUCTION

The aim of the study was to inspect known Cook's petrel *(Pterodroma cookii)* burrows for current use and ascertain status of burrows, to weigh and band any chicks found in study burrows with nest access and weigh and band any adults encountered. We monitored frequency of visits to burrows by adults and searched for new burrows as time and weather permitted.

We surveyed the 50 study burrows of mottled petrels *(Pterodroma inexpectata)* for chicks and determined the burrow status of nest without chicks. Chicks found were weighed and banded, and regurgitated material was collected.

The 50 study burrows of sooty shearwaters (*Puffinus griseus*) were surveyed for chicks and to determine other burrow status. Chicks found were weighed.

2. COOK'S PETRELS

2.1 Methods

Within the first few days on the island, I visited all known burrows. Study burrows were opened up and the status of each nest chamber determined. When chicks were present, they were banded and weighed; some were reweighed about 10 days later. All burrows

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[1] The research described in this report was done under contract to the Department of Conservation, Science and Research Division.

had the entrances screened with a fence of light twigs which could be easily knocked aside by adults visiting the nest. Burrows in the lower study area were then monitored daily to record visitation frequencies.

2.1 Results and Discussion

There are now 67 marked Cook's petrel burrows, 25 in the East Hut area (14 of these are study burrows), three south of the Eric track (one study), one near Roger's Head (also study) and 38 (24 study) in the Dunes/Loop track area. (See Figures 1, 2 and 3 for map and specific burrow locations.) Eight of these were not in use this season, including three study burrows (12, 17 and 15). Burrows 12 and 17 have not been used since the last year of predation by wekas (1984), when dead adults were found outside both of these. Burrow 15 appears to have been taken over by blue penguins (*Eudyptula minor*).

Five new burrows were located in the lower study area. Two of these (63 and 64) are on the loop track, near Burrow 13 and above Burrow 8. One (65) is on the dune track near Burrow 15, while the remaining ones (66 and 67) are on the New Forest track close to the other known burrows. Burrow 65 was opened and is now a study burrow, while 64 and 66 have tunnels but no nest chamber yet. The last burrow found (67) has a nest chamber, but it was too deep to access. It may contain a chick.

Two burrows (49 and 56) are now study burrows; Burrow 5, which did have access to the nest, no longer does. There are now 40 study burrows. There were 22 chicks in the study burrows this year: 12 in the lower area, eight in the upper area and one each at Roger's Head and the Eric track area. All but the chick in burrow 26 were banded. Burrow 27 had chick down at the entrance and almost certainly contained a chick. All chicks were in healthy condition and quite well feathered on wings, tail and head; by the second weighing on April 8 most of them had down remaining on the neck and back only. This year there were no dead chicks in burrows and only one nest had egg shell remains, suggesting failed breeding. Burrow 30 in the upper area contained feathered skeletal remains of a well feathered bird and was probably a chick from 1989.

No adults were seen either in burrows by day or at night; feeding visits were less frequent than in previous years at this slightly later time in the breeding cycle. Because non-breeding activity had ceased, continuing visits to non-study burrows may indicate a chick was present. However burrow 43 which is a study burrow containing a dry nest, was visited six times in 11 nights, though the adults never remained by day.

Table 1 gives band numbers, weights at 25/3/90, number of visits and weights at 8/4/90 are given. Chicks 4 and 18 were not weighed the second time, as they moved out of reach. The number of chicks produced from these burrows in the years known is shown in the last column. Some burrows were checked by Ralph Powlesland in January 1989; these data are included.

Of the 40 burrows that have nest access, only six have not produced a chick in the years known; one of these (49) did contain shell remains in 1990, and five (47, 48, 49, 56 and 65) have been found in the last two years and seem to be newly dug burrows.

Table 1. Band numbers, weights, visits and breeding success of Cook's petrels.

Burrow	Band	Initial weight (g)	No. of visits	Second weight	Chicks/no. of years
3	D-101843	356	4	345	7/7
4	D-101844	268	8	-	7/8
6	D-101845	386	1	285	7/8
7	D-101850	416	2	360	3/7
8	D-101847	366	1	310	2/7
10	D-101849	296	6	320	4/7
11	D-101848	366	2	305	6/7
18	D-101846	276	4	-	5/7
19	D-101853	388	*		6/7
22	D-101857	330	*		1/7
23	D-101856	350	*		5/7
25	D-101858	290			3/7
26	not banded		*		4/7
31	D-101855	320	*		3/7
34	D-101859	320	*		1/5
35	D-101860	380	*		2/5
36	D-101861	340	*		1/5
45	D-101854	390	*		2/5
55	D-101841	346	3	385	2/2
57	D-101812	366	0	315	2/2
58	D-101851	286	2	266	2/2
59	D-101852	336	4	325	1/2

* not monitored

Table 2 the status of all known burrows and compares this with data from three previous seasons; percentage breeding success is shown in Table 3.

Table 2. Burrow status for Cook's petrels 1986-1990.

Status	1986	1987	1988	1990
Study Burrows	31	33	38	40
Chicks	15	12	18	22
Dead Chicks	5	0	1	0
Egg shell remains	2	8	4	1
Dry empty nest	4	4	4	6
Digging	3	7	9	8
Not in use	2	2	2	3
Other Burrows	19	22	24	27
Chick down in entrance	3	1	3	3
Possible chicks	4	2	3	4
Uncertain - in use	7	14	14	12
Not in use	5	5	4	5
Access to tunnel			3	

Table 3. Percentage success of Cook's petrel chick production 1983-1990.

Year	Number of burrows		Chicks		%	
	Total	Study	Total*	Study	Total	Study
1983	38	21	11	10	29	48
194	45	28	11	09	24	32
1985	48	31	16	14	34	45
1986	50	31	20	15	40	48
1987	55	33	14	12	26	36
1988	62	38	22	18	35	47
1990	67	40	29	22	43	55

* Includes probables and possibles

A mean weight was calculated for 21 chicks over 31 weighings (10 of them weighed twice). Data are presented in Table 4, with comparative weights from three earlier years.

Table 4. Weights of Cook's petrel chicks 1986-1990.

Year	Range (g)	Mean (g)
1986	280 – 363	356.8
1987	229 – 399	290.6
1988	278 – 423	341.0
1990	266 – 416	331.9

This year all weighings were carried out between March 28 and April 8; data from 1988 were collected over from March 16 to April 7. Visits to burrows at night by adults to feed their chicks were less frequent than in previous years due to the later timing of the trip. As the chicks lose the last of their down, and the meals become less frequent, their weights decline towards that of an adult bird by the time they fledge in late April; this slow-down was apparent this year.

After I left the island some burrows were monitored for visits with a view to establishing the status of some non-study burrows. Down was found outside the entrance to burrows 28 and 29 bringing the total in this category to three; visits continued at burrows 2, 5, 13 and 16 suggesting the presence of a chick in each. Three burrows (3, 7, and 55) that contained chicks were not visited after 7, 1 and 3 April respectively; these three chicks were the heaviest on the 8/4/90 so may have fledged by mid April.

On Codfish Island, this species appears to be in a good position to recover population. However it will take an extremely long time for it to reach its former numbers of 20 000 to 40 000 (Stead 1935). All newly discovered burrows have been in the lower study area, and a large number of these appear to be freshly dug burrows in sandy substrate. This tends to suggest that the remnant few successfully breeding birds that held on in this old dune area, now have offspring returning to the natal area. It may be possible to verify this by a monitoring trip early in the breeding season. In the upper study area there has been less successful chick-rearing up to now so few chicks have fledged from the known burrows. The soil in that area is much more dense and wet, and it seems less

likely that new burrows will be excavated. New pairs will be more likely to seek and reopen old disused burrows, of which there are thousands over much of the island.

On the night of 23/4/90 a fully feathered bird was found on the ground on the NW Bay track near the Whetu junction. As it was too late in the season for non-breeders to be around, it was either an adult in for feeding or a fledgling leaving. This area can be marked for future searches for further active burrows; disused burrows are common and widespread there (M. Imber, pers. comm.).

The 1989-90 breeding season has certainly been the most successful since monitoring began, and it shows that the weka removal programme was extremely timely. It will be an uphill struggle for Cook's petrels on the island, but given an adequate and accessible food supply they should continue to flourish.

3. MOTTLED PETRELS

On 4-5 April, all 50 study burrows were located and checked for their status. Chicks were found in 24 burrows; 21 were removed, banded and weighed. As in previous years some of these chicks regurgitated food remains and oil from their stomachs; 15 samples were collected, washed and sorted for later identification of prey items. The burrows were all in good condition, but because sooty moulds had grown on the labels, it took some time to identify them correctly. This was done by using a previously prepared map of their positions relative to each other. A new set of labels was prepared, using orange metal primer to write the numerals, and these have been used to re-mark the study burrows.

The chicks were all healthy and strong, and most of them actively objected to being handled. They seemed more aggressive than in previous years, probably because they were a little older. All chicks had good feather development on wings, head and tail, with down on the body only.

Burrows have been classified, and these data are presented in Table 5 with data from other years for comparison.

Table 5. Burrow status for mottled petrels 1986-1990.

Burrow Status	1986	1987	1988	1990
Chick	19	15	21	24
Dead Chick	2	0	0	0
Egg shell (some with digging)	5	7	4	0
Dry well-formed nest	8	13	9	8
Chamber with leaves (some with feathers)	8	9	3	6
Digging in progress	8	6	8	4
Empty chamber	0	0	5	8
TOTAL	50	50	50	50

Since the burrow total reached 50, eleven of the burrows have not yet produced a chick. Of this group, five of the nest chambers had either nests or nest material and feathers (33, 34, 36, 37 and 39) so may have chicks next year. This area was originally selected because it had been particularly affected by weka predation, thus providing an opportunity to study recovery on a small scale. It does seem that a gradual increase is occurring with three burrows holding chicks for the first time (24, 28 and 46). Percentage success over the last six years studied is shown in Table 6; band numbers and weights are given in Table 7.

Table 6. Percentage breeding success for mottled petrels 1984-1990.

Year	No. of Burrows	% Success
1984	19	47
1985	35	28.5
1986	50	38
1987	50	30
1988	50	42
1990	50	48

Table 7. Band numbers and weights of mottled petrel chicks 1990.

Burrow No.	Band No.	Weight (g)
3	D-101865	440
4	D-101864	520
6	D-101871	430
7	D-101872	490
8	D-101870	530
12	D-101881	540
13	D-101862	460
14	D-101863	550
08	D-101866	490
22	D-101882	360
23	D-101879	510
24	D-101878	490
25	D-101874	500
27	D-101877	490
28	D-101875	570
31	D-101876	530
41	D-101873	570
42	D-101880	500
44	D-101868	670
46	D-101869	580
47	D-101867	480

Burrows 2, 29 and 35 also contained chicks.

All these chicks were weighed on either 4 or 5 April. In 1988 weighing was done on 21-23 March; in 1987, on 26 March or 4 April. In it was done 21-30 March. Weights were averaged for all chicks, and results are shown in Table 8.

Table 8. Weights of mottled petrel chicks 1986-1990.

Year	Range (g)	Mean (g)
1986	390 – 578	488.7
1987	409 – 509	467.5
1988	360 – 497	425.7
1990	360 – 670	509.5

The average weights indicate that the chicks were still gaining weight at this time, slightly later than other years. The food supply for this species must be adequate this year. So long as this is the case, the future for mottled petrels on Codfish Island looks much better than it did ten years ago, when predatory wekas were ravaging the colonies.

4. SOOTY SHEARWATERS

All study burrows were opened and checked for chicks, and 17 were found. Four of these were not removed because they moved out of reach of the access hole. When there was no chick present, the status of the nest chamber was determined as with the other two species. Chicks that removed were weighed but not banded this year, owing to the author's difficulty in closing the bands. The chicks were all in strong, healthy condition with feathering well advanced on their wines and tails; only four of the 13 weighed more than 1 kg. Their weights ranged from 640 g to 1100 g, with a mean of 895.4 g.

A summary of burrow status is given below.

Table 9. Burrow status of sooty shearwaters.

Burrow Status	1986	1987	1988	1990
Chicks	13	14	26	17
Dry nest material present	9	12	8	9
Empty with no material	12	11	15	10
Digging in chamber	4	13	1	12
Not in use	2			
TOTAL	38	50	50	50
% Burrows with chicks	34	28	52	34

Penguin feathers were found in five study burrows (1, 8, 43, 46 and 48); three of these held chicks in previous years. Burrows 33 and 34 had chicks this year for the first time in the study, but there are still 19 burrows that have not produced at all. One burrow had completely collapsed, so a replacement was identified (16).

Sooty shearwaters have not been as successful at breeding this year as in 1988, and the chicks generally were not as heavy as those in 1988. This species feeds closer to shore

than the gadfly petrels do during the breeding season so this could be a reflection of the availability of oceanic prey items. As with yellow-eyed penguins who also feed close to shore, the food supply for both species may be somewhat depleted thus contributing to lower breeding success and lighter chicks.

5. OTHER BIRDS

As is usual at this time of year, the burrows of the South Georgian diving petrels (*Pelecanoides georgicus*) are not easy to locate. However, searching near some of the number tags did turn up a few burrows which seemed to have been open and probably in use this season.

No broad-billed prions (*Pachyptila vittata*) were seen on Codfish Island, and no searches were conducted for evidence of recolonisation. The best time of year to do this would be pre-Christmas.

Yellow-eyed penguins (*Megadyptes antipodes*) were not as numerous as in other years; most had finished their moult. Two dead juveniles were found on the Mephistopheles trail, and a banded adult was found dying on the beach (5/4/90). Two other banded adults were recorded, and band information was sent to John Darby. The dead adult (J9322) was a female banded on Codfish Island on 5/1/90; 51561 was banded as an adult on 22/3/80 and J2649 was a juvenile on 4/10/84 - both on Codfish.

Long-tailed cuckoo calls were heard on 6/4/90 only and probably were from a single bird.

Kakapo feeding signs in the form of grubbing were seen on the top of the island mainly where the Valley track comes out on to the pakihi. Droppings were seen in several places including the track near the upper Cook's study burrows.

Fernbirds were seen on a number of occasions but there appear to be fewer than would have been expected after the weka removal. (Since they often nest in low scrub, they would have been targets for egg predation by wekas.) It may be that kiore have an effect on this species.

6. RECOMMENDATIONS

The **South Georgian diving petrels** should be surveyed this year. This species begins breeding activity in September, and the best time to survey them is during the burrow cleaning out and mating period. At this time, sand excavation makes the burrows more obvious. No attempt should be made to open any burrows for study, as the substrate is fragile. The last survey was 2-10 October 1985.

Cook's petrels should continue to be monitored. It would be of great interest to visit when adults could be checked to confirm that banded youngsters from 1982-1988 are indeed breeding in their natal areas. If the field trip were made in late January/early February, this could be done in conjunction with the breeding success study. There

would be a greater chance of catching feeding adults and pre-breeders at this time; chicks would have hatched and pre-breeding activity could still be in progress. This should be done in 1991 or 1992.

The productivity study on **Mottled petrels** should continue to monitor breeding success in the years while recovery from predation occurs. It may be possible to correlate breeding success fluctuations with changes in availability of pelagic food items as they are affected by both natural and induced environmental factors. This study can also be done with the Cook's petrel work. A census of mottled petrels should be carried out soon, along with a census on Big South Cape Island.

The study of breeding success in **sooty shearwaters** on Codfish Island should be continued. It may be possible to glean some information from the muttonbirders on the 'Titi' islands and use these data for comparisons between non-birded and birded islands. As with the pelagic feeding gadfly petrels, a good food supply at sea is critical if breeding is to be successful. A study of this type could be an indicator of the abundance of inshore marine prey items. The timing of this study ties in with that of the previous two species.

Broad-billed prions might recolonise Codfish Island if they can withstand kiore. In December, pre-breeders will be prospecting for burrows; headland areas could be checked at night to confirm the presence of this species. One of the first areas to be used would probably be that adjacent to the island at the eastern end of Sealers Bay, taking overflow from the islet. Wekas were also active on the small offshore islets, and prion recovery there should soon reach saturation. Staff on the island at this time in 1990 could carry out a preliminary check for these birds.

A study of breeding in the endemic Codfish Island should be made. This small bird is endemic to Codfish Island and appears to be sparse, in spite of much suitable habitat being available. In 1988 a parakeet nest was found preyed on, presumably by kiore, and that nest would have been less accessible than a fernbird nest in a *Gahnia* clump. Kiore may be having more of an impact on bush birds than we are aware of, and a study could provide both data on effects of kiore and the status of the birds itself.

In earlier years there were regular visits to certain islands off Stewart Island for transfers of South Island saddlebacks. This species was multiplying rapidly on several islands and must have reached its limits on some. These birds should be released on Codfish Island.

Until 1945, brown teal lived in the creeks in the main valley catchment of Codfish Island (Dell 1950). Some of these are being captive-reared for release into the wild; some could certainly be released into Sealers Creek.

7. ACKNOWLEDGEMENTS

Thanks to Shane Hancox and Travis Hughes of the Department of Conservation, Stewart Island for their company and willing help with my field work and for the additional monitoring of burrows through April.

8. REFERENCES

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Stead, E.F. 1935. Codfish Island, an unspoilt resort for the naturalist. *The Press,* Chrisrchurch. 19 January 1935, p.17.

Figure 1: Petrel and shearwater study areas and track network.

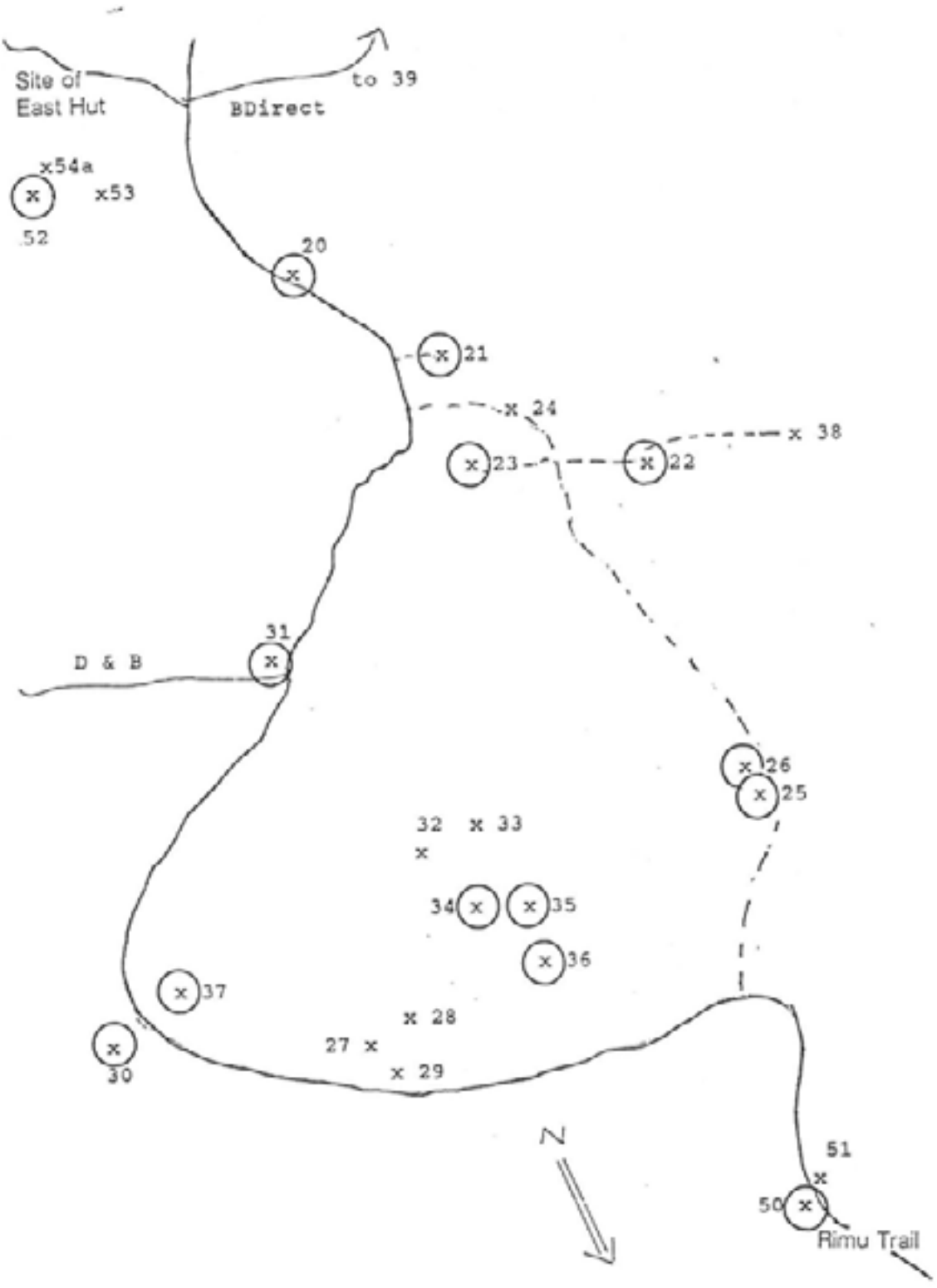

Figure 2. Cook's petrel burrows (high-altitude study area). Study burrows = 14.

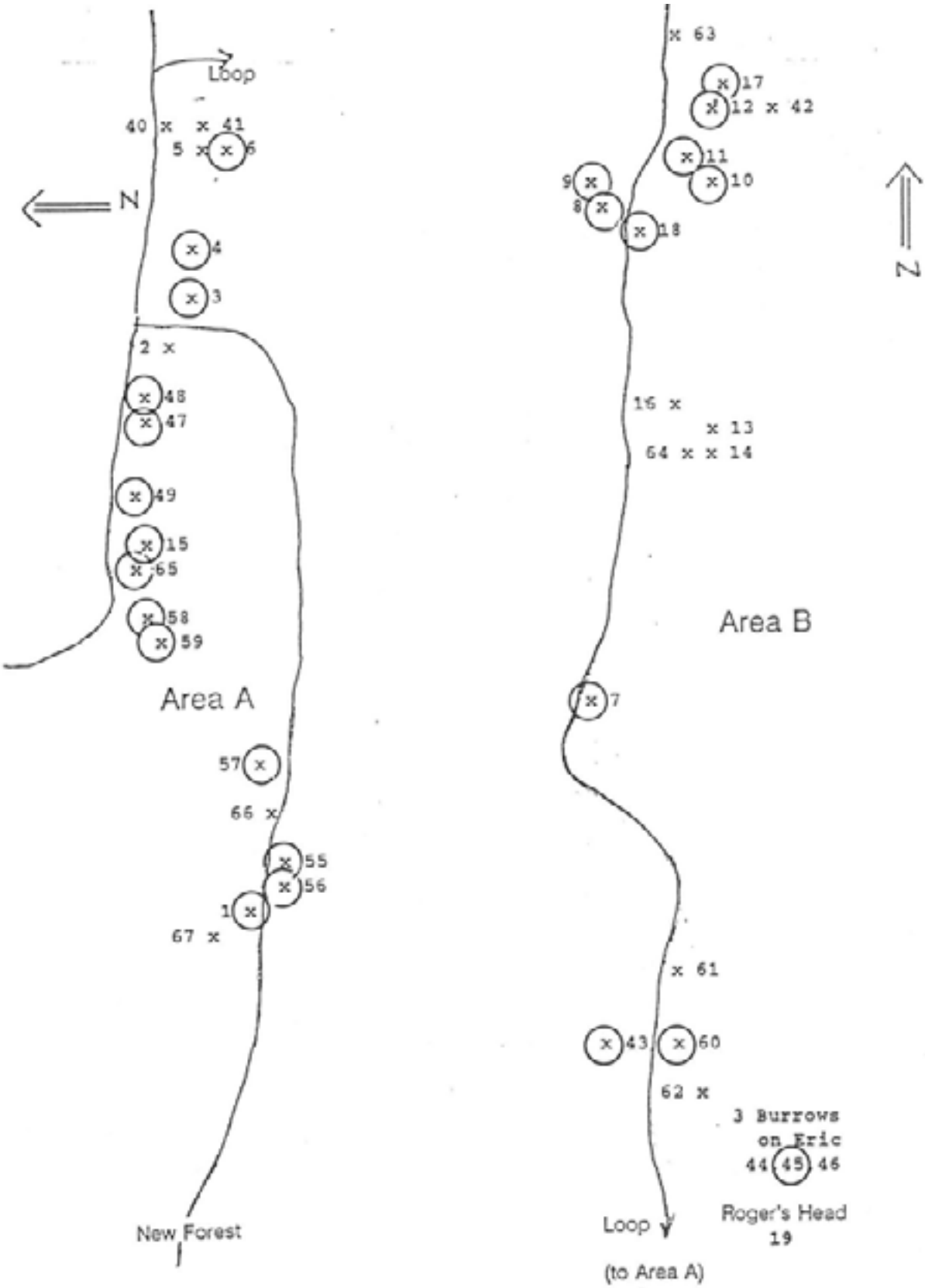

Figure 3. Cook's petrel burrows (low-altitude study area). Study burrows = 26.