DISTRIBUTION OF BREEDING SITES OF THE WESTLAND BLACK PETREL (Procellaria westlandica)

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ABSTRACT

During the period 25 April to 5 July 1974 observations were made of the numbers and direction of Westland Black Petrels overflying the coastal road at points between Perpendicular Point (3 km north of Punakaiki) and Barrytown (16 km south of Punakaiki), north Westland, to determine the area used for breeding. Intensive searches of known breeding areas and areas to which birds were seen flying were then made and the distribution and numbers of burrows mapped.

INTRODUCTION

Petrels, as a group, visit land only to breed and they commonly arrive at dusk and depart at dawn. Some species, including the Westland Black Petrel, tend to congregate in rafts some one to two kilometres offshore before flying inland. Most petrels nest underground in burrows and both parents share in the incubation of the egg and care of the young which is deserted by day after it starts to grow.

The Westland Black Petrel is unusual in that it is a winter breeder. The breeding ground, in forested hill country about four kilometres south of Punakaiki, north Westland (Fig. 1), was discovered in 1946 (Falla 1946).

Since that time little work has been done on the natural history of this species although Jackson (1958) gave an outline of the breeding cycle, mapped the burrow distribution and made an estimate of the population size.

In late March and early April Westland Black Petrels return to the colony and clean out their burrows in preparation for nesting. The single egg is laid between late May and the end of June and hatches over two months later (between early August and mid-September). The young do not fly until early December, though a few remain until the end of that month (Jackson 1958).

The objects of our survey were: to determine the number and extent of burrows in the present known breeding area and to discover the existence of other, yet unknown breeding areas in the immediate vicinity. Distribution maps of the number of burrows in use are necessary to define the approximate size of the breeding population and also show whether there have been changes in the population distribution.

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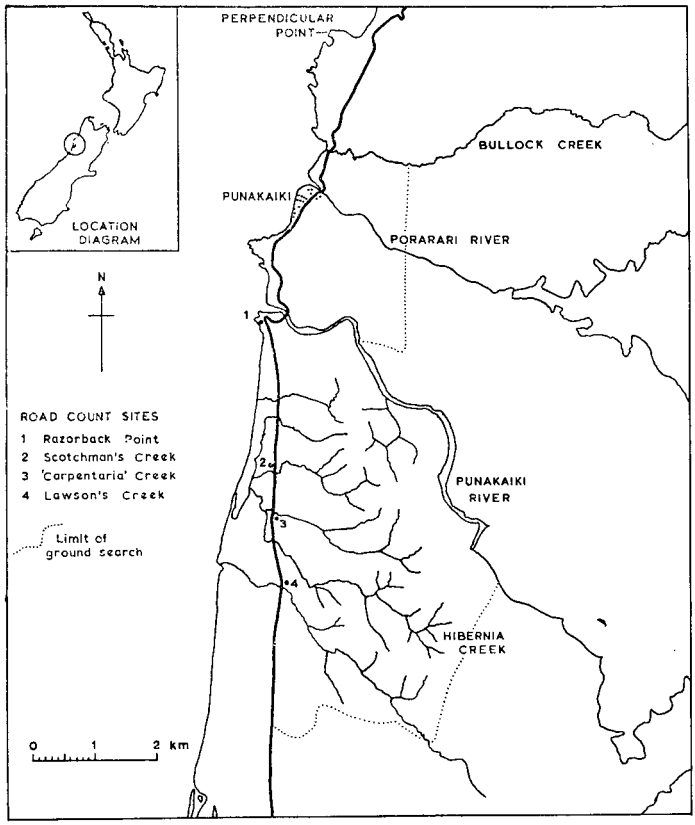

FIGURE 1 — Locality map of the Westland Black Petrel breeding area.

To determine the area where the species breeds, evening searches were made for rafting birds or birds wheeling about close inshore from Perpendicular Point to Razorback Point, and as far south as Barrytown for birds flying inland. These observations were followed by intensive ground searches. Because petrels require open areas on steep slopes to take off from, ground searches were concentrated along ridge crests and flanks and immediately above bluffs. The following features were indicative of nesting activity:

1. fresh droppings on the ground (large white fluid deposits);
2. an appreciable thinning out of the understorey and ground cover;
3. the presence of the typical strong musty petrel odour found in breeding areas;
4. vertical claw marks on trees, faces of banks and small bluffs up which birds had scrabbled to take off from; and

5. pieces of broken egg shell that birds had kicked out of their burrows.

Only occupied burrows (those which had recently been cleared out and having the typical musty petrel smell) were counted during the survey.

AREAS SURVEYED FOR BREEDING SITES

The survey was made in three adjacent areas of forested hill country, namely:

1. *Bullock Creek* (area c.1.60 km^2) — between Bullock Creek (1 km north of Punakaiki) and the Porarari River (0.5 km north of Punakaiki). The survey extended from State Highway 6 inland some 1.25 - 1.75 km to grid line 4870N on NZMS 1, Punakaiki, S37 (scale 1:63360).
2. *Porarari River* (area c. 4.21 km^2) — bounded by the Porarari River in the north, the Punakaiki River in the south, State Highway 6 to the west and grid line 4870N to the east.
3. *Punakaiki River* (area c. 13.00 km^2). The boundaries of this block were formed by the Punakaiki River to the north and east, the crest of the southern ridge of Lawson's Creek to the south (some 7 km south of Punakaiki), and State Highway 6 to the west.

The terrain in the Punakaiki River area consisted of deeply dissected hill country clad in luxuriant dense coastal forest. Long main ridges, dropping gently to the westward from an altitude of 60 m, alternated with steep-sided, deep valleys. The flanks of these ridges were dissected by series of closely spaced, steep discrete gullies which, especially along the Punakaiki River, may terminate in bluffs 20 to 100 m high. Streams drained many of the small valleys.

The vegetation consisted of very dense thickets of kie-kie *(Freycinetia banksii)*, supplejack *(Rhipogonum scandens)*, nikau palm *(Rhopalostylis sapida)* and tree ferns (*Cyathea* spp) in the valley floors and gullies. This association was replaced by a canopy of miro *(Podocarpus ferrigineus)*, rimu *(Dacrydium cupressinum)* and southern rata *(Metrosideros umbellata)* with an understorey of kamahi *(Weinmannia racemosa)*, toro *(Myrsine salicina)* and *Quintinia acutifolia* on ridges and spurs. In the highest parts of the Punakaiki River area the podocarp canopy graded into a cover of red beech *(Nothofagus fusca)* which had a characteristically sparse understorey. In areas of wind throw the ground was covered by a thick mass of rata creepers (*Metrosideros* spp), bracken, fern *(Pteridium aquilinum)*, kie-kie and a few small tree ferns and kamahi shrubs.

From the Punakaiki River north to Bullock Creek the terrain consisted of limestone mesas separated by deep sheer sided gorges some 150 to 300 m deep. The surface of the mesas comprised bluffs, potholes and deep narrow-gutted stream beds. The vegetation in this area was similar to that in the Punakaiki River block.

FLIGHT PATTERNS

The majority of petrels flying inland each evening followed set flight paths and moved directly up valleys towards specific groups of burrows. However, some birds meandered about considerably before continuing inland or swinging back to sea. In contrast, birds leaving the colonies in the morning flew directly out to sea.

The majority of birds flew into the colonies along the south bank of the Punakaiki River, or up the valleys of Scotchman's Creek or " Carpentaria "* Creek. A few birds (2 to 10) flew along the valley of Lawson's Creek (Fig. 2). No petrels were seen flying overland outside the Punakaiki River-Lawson's Creek area. Bartle (1973) saw petrels flying towards the high bluffs in the Waikori peak area from the ford on the Punakaiki River but our observations, made about three kilometres further upstream, indicate that birds flying up the Punakaiki River swing in toward the large concentration of burrows on the ridge at the eastern side of the petrel reserve (Fig. 2). No birds were seen continuing on towards Waikori itself.

The flight of Westland Black Petrels in calm conditions consists of slow, heavy, regular wing beats. However, in windy conditions, the birds wheel, soar and scud in a smooth fluid motion typical of petrels. At dusk birds fly over land at a variety of altitudes. We judged that most passed over 60 to 75 m above the ground while some flew up to 120 m overhead. In the morning, however, birds flew out to sea at heights ranging from 15 to 70 m above ground level. Late birds especially come over very low and fast, making a distinct " whoosh " as they passed.

ROADSIDE COUNTS

Morning and evening counts at a variety of sites (Fig. 1, Table 1) were made to determine the number of petrels flying into each region of the breeding area. There was considerable variation in the number moving in and out of the colonies (Table 1) and this appeared to be, in part, related to the weather and sea conditions. For example, after a period of stormy weather, 520 birds were counted flying inland over Razorback Point, Scotchman's Creek and Carpentaria Creek on the evening of 2 July. Three nights later (after three days calm settled weather) only 27 birds were recorded flying inland over the same sites. The greatest number of birds, 578 flying out from Scotchman's Creek, was also recorded during stormy weather on 26 June.

Counts made in the evening and on the following morning indicated that there could be a considerable movement of petrels in and out of the area during the night. On the evening of 3 July, 146

* This creek is not named on NZMS 1, S 37 Punakaiki. We have named the creek after the Carpentaria Mining Company's installation located where State Highway 6 crosses the creek.

birds were seen flying into the valley of Carpentaria Creek, and 65 inland over Razorback Point. The following morning 236 petrels flew out from Carpentaria Creek and only five passed over Razorback Point.

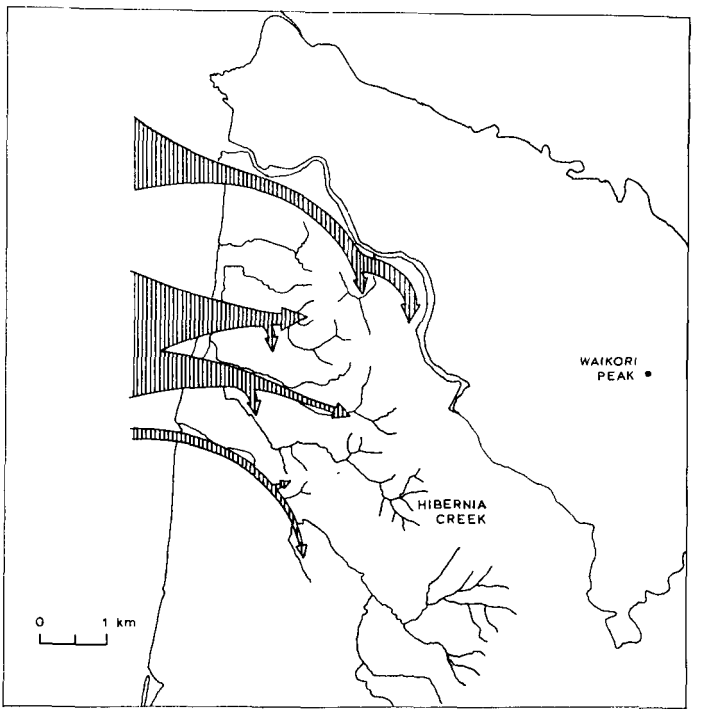

FIGURE 2 — Main flight paths of Westland Black Petrels. (No birds were observed flying on towards Waikori Peak.)

TABLE 1 Number of petrels seen flying over road-side counting sites

Site	Razorback Pt	Scotchman's Ck	"Carpentaria" Ck	Lawson's Ck.	Punakaiki River
Maximum	65	578	280	10	57
Mean	29 5	281.4	138	4.5	34.6
Minimum	0	6	21	1	11
No of observations	6	5	6	4	5

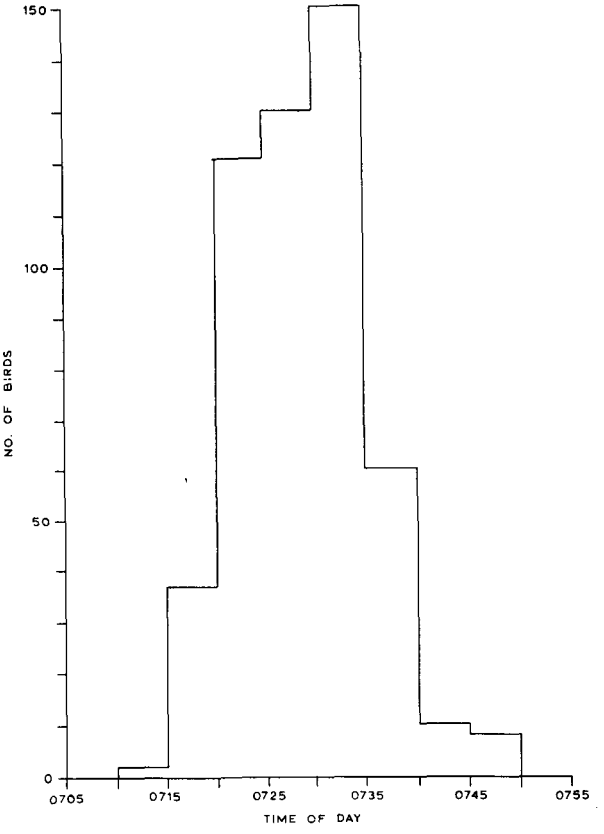

FIGURE 3 — Morning flight schedule of Westland Black Petrels over the road counting site and Scotchman's Creek, 26 June 1974.

Westland Black Petrels showed a marked punctuality in their flights to and from their colonies. The majority of birds counted passed over the observation sites within a 20 to 30 minute period (Fig. 3, Table 2). This flypast was especially pronounced at Scotchman's Creek on the morning of 26 June. The first bird was sighted at 0713 hr and thereafter birds flew over in ever increasing numbers. The peak period lay between 0730 - 0735 hrs when 150 birds flew out of the valley, and from then on the number decreased rapidly. This was the only morning when, from the roadside, we heard the morning chorus of screaming birds, although the nearest group of burrows facing us was one kilometre distant.

TABLE 2 Time range of first and last petrels seen flying over Razorback Point, Scotchman's and Carpentaria Creeks

	Morning	Evening
Earliest petrel	0713 hr	1731 hr
Latest petrel	0755 hr	1830 hr (too dark to see after this)
No. of observations	8	15

NOCTURNAL ACTIVITIES OF PETRELS IN THE COLONY

An overnight visit was made to the largest colony (265 burrows) on the night of 4-5 July. The weather was calm and clear. Birds began to fly over the colony at 1740 hrs. At first they flew above the general environs but a few which we could observe began to pass over a particular spot and, on successive circuits, came over at decreasing altitude and speed, sometimes almost stalling, before gathering speed again. On the final approach birds appeared to aim for an opening in the vegetation, and after stalling, fell heavily through the foliage, sometimes becoming tangled momentarily or turning over and over before striking the ground. After landing, birds either sat quietly for a while, or moved directly towards burrows. Most had landed by 2000 hrs, two hours after the first had arrived.

Soon after the first birds landed and had entered their burrows, subterranean calls were heard from pairs. These calls were of short duration (less than a minute) after which the birds remained silent. Surface-calling birds were first heard soon after 1810 hrs but their calls were intermittent and of low intensity. The volume and intensity of calling gradually increased, and rose to a crescendo with many birds all around shrieking in full chorus by 1830 hrs. Most surface birds were calling in pairs although some were alone or in trios. Calling ceased suddenly at 2100 hrs and was heard only intermittently thereafter except for the odd brief concerted outburst in the night. From 0530 hrs calling started very loudly in a sustained chorus until 0730 hrs, by which time birds were streaming out of the colony.

DISTRIBUTION AND DENSITY OF BURROWS

The distribution of occupied burrows has been plotted in Figure 4. The sites marked were placed as precisely as the Lands and Survey base maps (scale 1:15,840 or " 1 inch: 20 chain ") allowed. Many small gullies and spurs were not shown on these maps.

Burrows were found in groups of 1 to 265 from 30 to 215 m above sea level, 90 percent of the groups being on or near ridge crests and adjacent to a take-off area. Such areas consisted of a gap in the forest caused by wind throw, a slip or cliff face, or trees whose limbs reached out through the surrounding vegetation. The other 10 percent

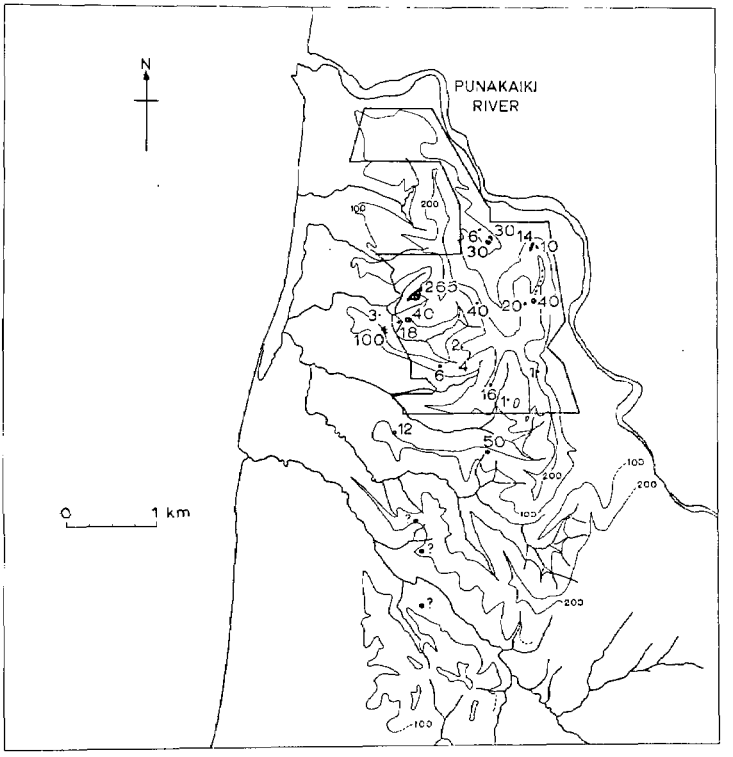

FIGURE 4 — Distribution of Westland Black Petrel burrows. The border of the present reserve for Westland Black Petrels is also shown. The six unnumbered groups of burrows overlooking the Punakaiki River consist of four groups of 10, one of 20, and one of 30 burrows. Question marks alongside sites in Lawsons Creek indicate where birds dropped into the trees, but no occupied burrows were found there. Contours are at 100m intervals.

of the groups of burrows were in small gullies and spurs on the flanks of main ridges. The breeding area occupied 3.6 km^2.

Many burrows were in areas devoid of ground vegetation, but some occurred in dense stands of kie-kie, shrubs and rata creepers which grew at the periphery of most concentrations of burrows. Burrows were excavated between the roots of trees, in the faces of banks and sides of spurs. The majority of burrow entrances faced downhill, presumably to stop rain water and debris from draining into the nesting chamber. Few burrows were found in poorly-drained sites, such as along the axis of a gully.

Because of the extremely dense vegetation flanking the ridges and the topography and large area of ground involved we have certainly not found every occupied burrow. However, it is unlikely that any

appreciable concentration has been missed between Lawson's Creek and the Punakaiki River, as any such would have been fairly obvious during our concentrated ground search. As petrels typically nest in colonies, the number of uncounted burrows occurring in twos and threes is probably very low. For example, those breeding sites containing one to ten burrows provided only 63 (7.8%) of the total; whereas sites of 11 to 20, 21 to 100, and 100 plus contained a total of 120, 360 and 265 burrows respectively. Therefore, we estimate from our count of 818 burrows that the actual number in existence does not exceed 1,000 and is likely to be less than 900.

DISCUSSION

The only other distribution map of Westland Black Petrel breeding areas is that by Jackson (1958). Unfortunately, he had neither the time nor the manpower to cover the country as thoroughly as we could, and at that time there were no topographical maps of the area. Hence, his map is not as detailed as ours. This statement is not intended to disparage Jackson's work but is to indicate the difficulty in pin-pointing an exact position in the area even with present day topographical maps.

The two distribution maps are the same in the following respects:

1. Both show a concentration of burrows on the tops of bluffs overlooking the Punakaiki River on the east side of the reserve. However, Jackson indicated that the burrows are spread over a longer stretch of ridge than we found, but this may have been a mapping error caused by the quality of maps available in 1958.

2. There is a large concentration of burrows towards the head of Scotchman's Creek.

However, there are some discrepancies:

1. We did not find any very large concentrations of burrows in the catchment of Carpentaria Creek. The sites we found contained from 12 to 50 burrows.

2. No burrows were found on the south side of Hibernia Creek; and

3. No burrows were found in the vicinity of the " Rowe " colony. Jackson's description of the " Rowe " colony is that it " is just inside the bush on the top of a terrace north of Hibernia Creek." The only terrace we are aware of in this area lies on the southern ridge flanking Scotchman's Creek. The " Rowe " colony may have been wrongly placed and should possibly lie immediately below his next most northerly concentration of burrows (265 burrows on our map). Falla (1946) did not specify the area which he visited, but he acknowledged the assistance of W. J. Rowe (then a senior pupil of the Barrytown School) in the field. Jackson's " Rowe " colony may have been the one that Falla visited.

Mr J. Arnair, a farmer who lives at Hibernia Creek, says there has been a decrease in the number of birds flying across the ridge between Hibernia and Carpentaria Creeks since 1950. This could be the result of changes in one or a few colonies rather than indicating an overall population decline. Bartle (1973) mentioned that there was a decline in the area used for breeding since 1948 but we have not found any reference to the distribution of breeding sites at that time.

Petrels are long lived birds that breed for many seasons, typically with the same mate and at the same site. Because breeding birds exhibit such strong site tenacity they would not readily move to new breeding areas. The only section of the population that would be likely to play an important role in colonising new areas would be non-breeders or first breeders. The basic similarities between Jackson's map and ours show there has been no large-scale change in the distribution of Westland Black Petrel breeding areas over the last 18 to 20 years.

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