# HABITAT USE AND SPRING MOVEMENTS OF NEW ZEALAND PIGEONS AT LAKE ROTOROA, NELSON LAKES NATIONAL PARK

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ABSTRACT

Monthly counts of New Zealand Pigeons (*Hemiphaga novaeseelandiae*) in lakeside habitat at Lake Rotoroa (Nelson Lakes National Park) over 20 months showed that they were most abundant from June to September. Pigeons were seen to feed exclusively on fruits from February to May, but mainly on foliage from June to January, when kowhai (*Sophora microphylla*) leaves were the main food (96 of 126 observations). Kowhai leaf fall in October/November coincided with a marked drop in pigeon counts, which was possibly caused by birds leaving the area. Two pigeons captured while feeding in lakeside kowhai in June and August 1984 were fitted with radio transmitters. Both were initially sedentary, but they left the lakeside area in October/November 1984 and travelled at least 2.8 km and 11 km respectively, outside the National Park, to areas of silver beech (*Nothofagus menziesii*) forest at over 1100 m a.s.l. One of the radio-tracked birds nested unsuccessfully at this altitude, where it fed on strawberry fungus (*Cyttaria gunnii*) parasitising silver beech. Both radio-tracked birds returned to the kowhai at Lake Rotoroa in 1985 (by July and September respectively). The lakeside habitat may be an important overwintering area not only for local pigeons, but also for some which breed in forests outside the National Park.

## INTRODUCTION

New Zealand Pigeons (*Hemiphaga novaeseelandiae*) are characteristic inhabitants of lowland forest throughout New Zealand and regular visitors to farmland and suburban gardens with nearby native forest. They eat the fruits, leaves, buds and flowers of a wide variety of plants (McEwan 1978), and probably play a major role in dispersing the seeds of large-fruited native trees.

Although New Zealand Pigeons are conspicous, widely distributed birds and are of considerable ecological interest, their behaviour, movements and breeding biology remain little studied. They are generally regarded as being highly mobile, but this opinion is based only on casual observations and on seasonal fluctuations in the numbers of pigeons counted in native forest during general avifaunal studies (e.g. Dawson *et al.* 1978, Clout & Gaze 1984). These studies have shown that apparently fewer pigeons are in forests in late winter and spring, when there is an influx of birds to more open lowland habitats, such as farmland and riverbanks, where they feed on the leaves and buds of leguminous and deciduous plants. Long-distance movements can only be inferred from this sort of information; to confirm them and to find how far pigeons travel it is necessary to mark and follow individual birds.

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In this study we investigated the seasonal use of lakeside habitat by New Zealand Pigeons and fitted radio transmitters to two birds to follow their movements.

## STUDY AREA

Our study was conducted at Lake Rotoroa (455 m a.s.l.) in the Nelson Lakes National Park around the base of Mt Misery (41°56'S, 172°41'E) and the mouth of the D'Urville River at the southern end of the lake (Fig. 1). This end of Lake Rotoroa is the main focus of pigeon distribution within the Nelson Lakes National Park (D. Butler pers. comm.). The vegetation consists of a lakeside fringe of kowhai (*Sophora microphylla*), flax (*Phormium tenax*) and low shrubs, small areas of matai (*Prumnopitys taxifolia*)/kahikatea (*Dacrycarpus dacrydioides*) forest on river silts, and extensive sequences of beech (*Nothofagus* spp.)/podocarp and pure beech forest on the surrounding slopes.

## METHODS

*Transect counts:* Previous surveys of the altitudinal distribution of bird species on Mt Misery over a 10-year period had revealed that pigeons occur there mainly in lakeside vegetation and beech/podocarp forest less than 5 m above lake level (R.H. Taylor, pers. comm.). On the basis of this information we established a transect for monthly counts of pigeons in lakeside vegetation, podocarp forest and beech/podocarp forest around the mouth of the D'Urville River and the base of Mt Misery. This transect (Fig. 1) comprised a 1.5 km stretch of lakeshore, a 300 m length of track passing through lakeside forest of matai, kahikatea and kowhai and a 1.3 km length of track passing through beech/podocarp forest and stream-bank vegetation.

From June 1983 to January 1985 we counted pigeons along the transect in mid-morning (0930-1100 NZST) and mid-afternoon (1430-1600) on at least one day at the end of each month. This usually involved two observers, each doing one morning and one afternoon count, for a total of four separate counts per month. The lakeshore part of the transect was observed from a motorboat cruising at 6 km/h about 15 m offshore. The forest tracks were traversed slowly on foot. For each pigeon seen, we recorded its location, activity and (where applicable) the trees species it was using.

*Plant phenology:* The phenology of 16 plant species which were known pigeon foods was recorded at the end of each month by noting the degree of leaf production, flowering and fruiting of six tagged plants of each species.

*Radiotelemetry:* Pigeons were captured in mist nets set among kowhai trees near the mouth of the D'Urville River. Two birds were each tagged with a coloured leg jesse of PVC-coated nylon (orange and pink respectively) and fitted with a radio transmitter. Each transmitter package weighed c. 19 g and was mounted on the bird's back by a nylon harness containing a cotton link which was designed eventually to abrade, rot or snap and so release the harness and transmitter from the bird. The transmitters were on different channels on the 160 MHz waveband and delivered pulsed signals which were received on AVM or 'Merlin' receivers via a collapsible three-element yagi antenna. The theoretical life of each transmitter was c. 6 months, with a 'line of sight' range of up to 10 km. Each bird carrying an active transmitter was located at least once per month and its position and behaviour were recorded.

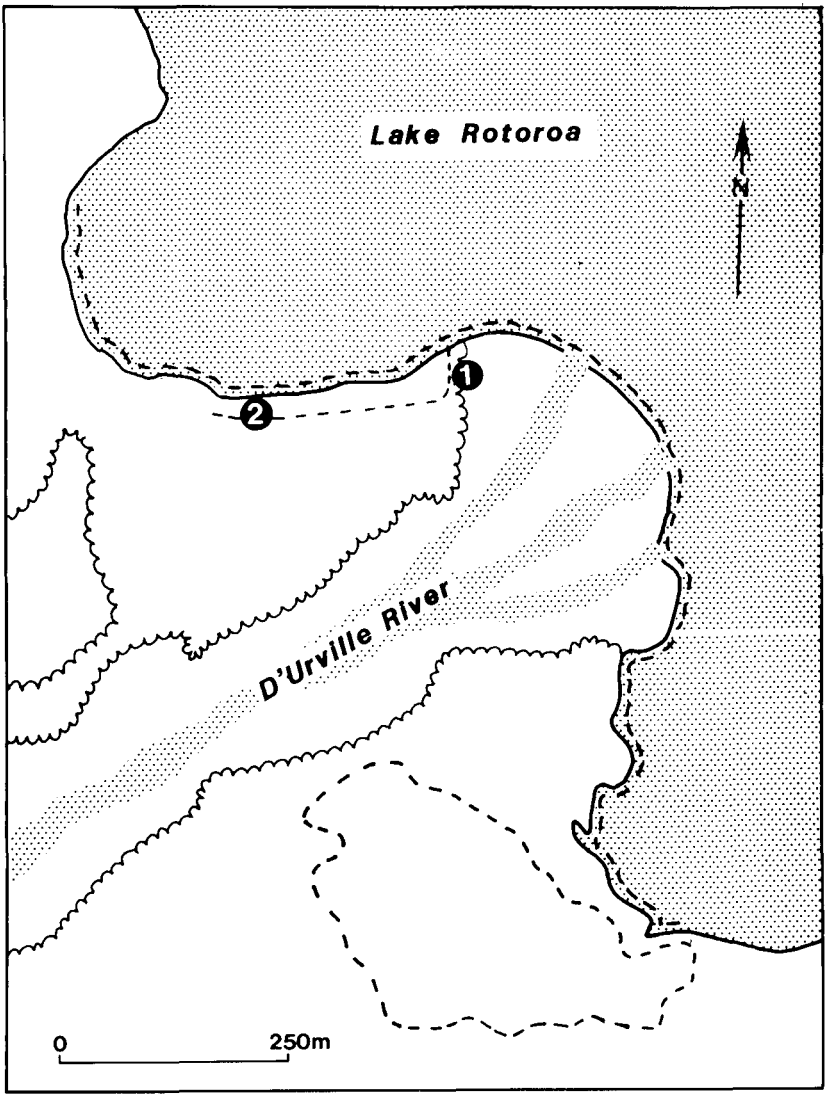


FIGURE 1 — The southern end of Lake Rotoroa, showing the study transect (dotted line) and capture sites of bird 1 (❶) on 28 June 1984 and 26 October 1984 and bird 2 (❷) on 28 August 1984.

## RESULTS

### Pigeon numbers and activity

The mean number of pigeons counted on the transect varied from 14.5 in June 1984 to 1.5 in November and December 1984 (Fig. 2). A marked seasonal pattern was evident, with transect counts being significantly higher from June to September than in other months (Mann-Whitney 'U' = 1314.5, $p < 0.005$). This pattern largely reflected the heavy use of kowhai by pigeons from winter to early spring.

Of the 423 separate observations of pigeons along the transect, 146 were of birds feeding. The diet revealed by these observations was exclusively fruits from February to May (23 observations) and almost exclusively leaves from June to January (123 observations). Foods seen to be eaten from February to May were fruits of *Fuchsia excorticata* (8 observations), *Coprosma rotundifolia* (4), *Pseudowintera colorata* (3), matai (3), *Carpodetus serratus* (2), *Prumnopitys ferruginea* (1), *Aristotelia serrata* (1), and *Griselinia littoralis* (1). Foods eaten from June to January were leaves of kowhai (96 observations), *Coprosma rotundifolia* (13), *Parsonsia heterophylla* (5) and *Clematis* sp. (1), together with kowhai leaf buds (5) and kowhai flowers (3), which were both eaten only in late September and October.

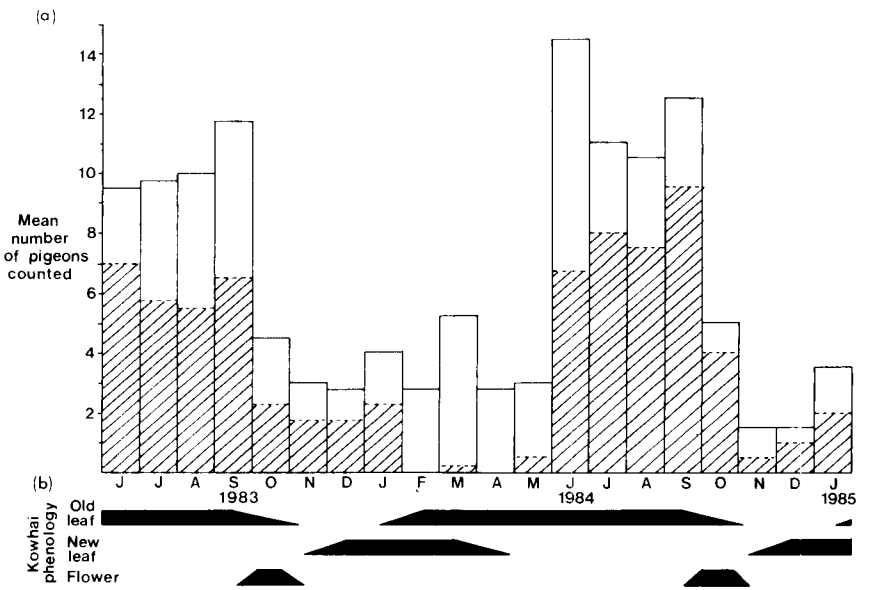


FIGURE 2 — (a) Mean number of pigeons counted in the study transect from June 1983 to January 1985. Hatched part of each column shows the proportion which were in Kowhai trees.
(b) The phenological state of Kowhai at Lake Rotoroa from June 1933 to January 1985, assessed from 6 tagged trees in the study area. Solid bar indicates presence of each phenological stage.

Pigeons were seen eating kowhai leaves in every month from June to January, apart from October, when kowhai feeding was restricted to flowers and leaf buds in both 1983 and 1984. This is a consequence of the phenological pattern of kowhai in the study area. By the end of October in both years, these trees had lost their old leaves and bore only leaf buds and flowers (Fig. 2). From June to September, pigeons fed on old kowhai leaves, whereas from November to January they consumed young newly expanded foliage. By February, the fruits of *Fuchsia excorticata, Aristotelia serrata* and *Coprosma rotundifolia* were available and the local pigeons apparently abandoned kowhai feeding for the rest of the fruiting season, returning to it in June.

**Pigeon movements**

The seasonal pattern of pigeon abundance on our study transect in 1983 suggested that some of the birds using the kowhai fringe from June to September left the area in October (or thereabouts). As a preliminary test of this hypothesis we fitted transmitters to two pigeons caught in the kowhai fringe on 28 June 1984 (bird 1) and 28 August 1984 (bird 2) (Fig. 1).

Bird 1 (orange jesse) weighed 560 g when caught, but its sex was unknown because New Zealand Pigeons cannot be sexed from plumage or measurements. It was radio tracked on 29 June, 11-13 July, 16 August, 25 August, 28-29 August, 11-13 September and 26-28 September 1984. On each occasion it was located within 50 m of its capture site at the mouth of the D'Urville River (Fig. 1). The bird was feeding mainly on kowhai leaves, but also took some *Parsonsia heterophylla* foliage and (on 26-28 September) flower buds of kowhai. On 23 October 1984 the transmitter from bird 1 was found on the ground at the mouth of the D'Urville River, but the bird was seen c. 30 m away, feeding on kowhai flowers, in close association with another pigeon. It was recaptured in a mist-net on 26 October and fitted with a new transmitter. It then weighed 595 g, appeared very healthy and active, and was seen feeding on kowhai flowers about 2 h after release. Bird 1 was radio tracked and observed with another bird in the same localised area on 29-31 October (feeding on kowhai leaf buds), but on our next visit to the area (13-15 November) it had gone. A strong transmitter signal from the NE slopes of Mt Hutton (Fig. 3) on 14 November indicated that the bird had moved about 2 km from its previous location, but no sighting was made. On 29 November the transmitter from bird 1 was found detached and lying on the ground in silver beech (*Nothofagus menziesii*) forest at 1100 m a.s.l., about 1.5 km to the north of the summit of Mt Hutton (Fig. 3). The bird itself was not seen again until 30 July 1985, when it was feeding on kowhai leaves at the mouth of the D'Urville River, less than 30 m from its original capture site.

Bird 2 (pink jesse) weighed 680 g when caught on 28 August 1984 among lakeside kowhai, c. 250 m west of the D'Urville River mouth (Fig. 1). It was radio tracked and observed on 29 August, 11-13 September and 26-28 September 1984. On each of these occasions it was located in the same group of kowhai trees, within 20 m of its capture site. It was seen to feed on kowhai leaves and was always accompanied by another pigeon. On 23 October we again visited the study area, but could not find bird 2, although at a point high on Mt Misery we eventually detected its transmitter signal coming from the northwest of Lake Rotoroa. We subsequently discovered that the bird had

been seen at the northern end of the lake on 11 October 1984, feeding on willow (*Salix* sp.) foliage at the source of the Gowan River (Fig. 3) (J. Gould, pers. comm.). On 30 October, we returned to Lake Rotoroa to search for bird 2 and eventually found it at 1150 m a.s.l. in pure silver beech forest to the northwest of Lake Rotoroa, over 11 km from its capture site (Fig. 3). The bird was seen feeding on the expanding leaf buds of silver beech. When it was next located, on 14 November 1984, it was within 100 m of this feeding site, accompanied by another pigeon and building a nest in a silver beech tree on a steep eastern-facing slope. The surrounding habitat was a dense stand of pure silver beech with a sparse understorey. On our next visit to the area, 27-30 November, bird 2 and its mate were sharing incubation on the nest. Bird 2 was radio tracked when off the nest on the morning of 30 November and was seen to feed on young silver beech leaves and the fruiting bodies of strawberry fungus (*Cyttaria gunnii*). This fungus is restricted to silver beech, and its fruiting bodies were abundant on outer branches of many of the trees in the vicinity. The bird did not travel more than 200 m from the nest while being radio tracked.

We next radio tracked bird 2 on 17-18 December 1984 and once again found it near the nest site, accompanied by another pigeon and feeding on strawberry fungus. However, neither bird visited the nest itself, which was partly collapsed and had obviously been abandoned. We found no remains of an egg or a chick nor any sign of a predator at the nest site, and so the cause of the nest failure remains uncertain. Bird 2 made some long flights downslope from the nest area on 18 December, travelling at least 1.5 km on one occasion. On 8 January 1985 there was no signal from the transmitter on bird 2. We searched extensively around both ends of Lake Rotoroa but did not find the bird again until 13 September 1985, when it was seen (without its transmitter) in lakeside kowhai trees at the mouth of the D'Urville River, less than 20 m from where it had been captured the previous year.

## DISCUSSION

This short term study shows the potential of radiotelemetry for studying the habitat requirements of large highly mobile birds such as New Zealand Pigeons. It also illustrates the value of combining this technique with the more conventional one of standardised counts.

Our transect counts (Fig. 2) and observations of feeding birds emphasise the likely importance of kowhai as a food source for New Zealand Pigeons in the Nelson Lakes region. Further evidence for this is that, at Lake Rotoiti (15 km east of Lake Rotoroa), kowhai does not occur naturally and New Zealand Pigeons are infrequent visitors only. Kowhai foliage was the main food of pigeons in our Lake Rotoroa study area from June to January and especially important from June to September when pigeon numbers were at their peak. The abrupt fall in pigeon abundance on our transect, which occurred in October of both years, coincided with the period when the kowhai trees were almost bare, before the growth of new leaves. It also coincided with the departure of our two radio-tracked birds from the lakeside habitat (bird 1 between 31 October and 13 November; bird 2 between 28 September and 11 October), which lends weight to the argument that the fall in numbers revealed by counts was caused by a real exodus of birds from the area.

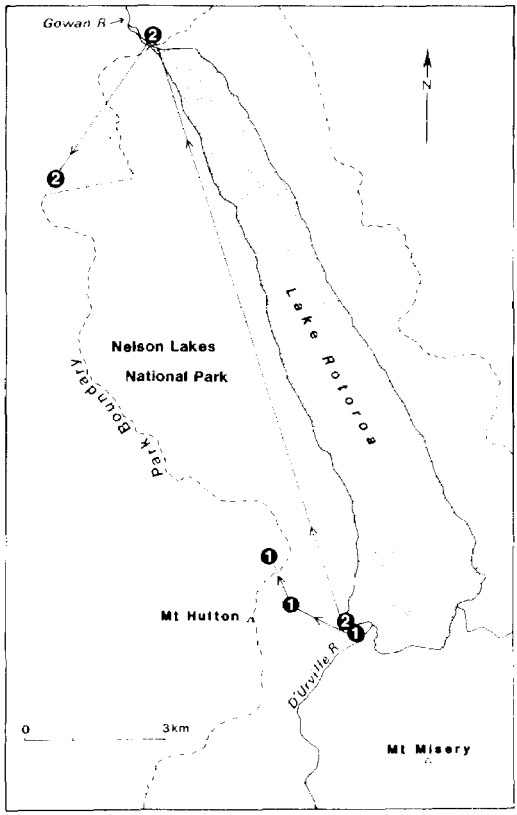


FIGURE 3 — The Lake Rotoroa district, showing long-range movements of radio-tracked pigeons. ❶ = bird 1 between 31 October 1984 and 29 November 1984. ❷ = bird 2 between 28 September 1984 and 30 October 1984. Arrowed lines show the direction and sequence of movement.

Kowhai leaf fall in the spring may cause most pigeons to abandon these trees temporarily, but this should not by itself prompt them to travel over 11 km, as bird 2 did. Other likely factors prompting this movement were the onset of the breeding season and the availability of strawberry fungus in high-altitude silver beech stands at that time of year. Strawberry fungus has been recorded before as food of New Zealand Pigeons (McEwan 1978), but its

potential importance as a seasonal food of pigeons in beech forest has not previously been realised. We were surprised to discover bird 2 feeding in high-altitude beech forest, and even more surprised when it attempted to breed in this habitat, because New Zealand Pigeons are normally regarded as birds of lowland forest. However, the fact that the transmitter from bird 1 was shed in very similar habitat suggest that, in this region at least, the spring movement of pigeons to high-altitude silver beech forest may not be as unusual as we had thought. This view is further supported by data from the long-term study of the altitudinal distribution of birds on Mt Misery, where the only pigeons recorded above 650 m a.s.l. were two birds in high-altitude beech forest at 1150 and 1250 m a.s.l. on 22 November 1976 and 30 November 1977 respectively (R.H. Taylor, pers. comm.). In a more recent recent record from Mt Misery, a pigeon was seen in silver beech at 1150 m a.s.l. on 30 November 1983, feeding on strawberry fungus (B.W. Thomas, pers. comm.).

A few pigeons were present in the lakeside habitat throughout the summer and autumn, and so not all behaved like bird 2. At least some remained to breed locally, because on 8 January 1985 a newly fledged pigeon (with a dark bill and downy feathers on the head) was seen feeding on young kowhai foliage at the mouth of the D'Urville River. This young bird could fly only short distances and must therefore have been raised very close to where it was seen.

It is most likely that the long movements which we recorded for bird 2 and (less conclusively) for bird 1 represent abandonment of their winter feeding range and a return to their summer breeding range. For some pigeons these two ranges may be in the same local area, but for bird 2 (and possibly bird 1), they were widely separated. According to this interpretation of our results, the lakeside area at the head of Lake Rotoroa, with its kowhai trees and other foliage foods such as *Parsonsia heterophylla* and *Coprosma rotundifolia*, may be vital winter habitat, not only for local pigeons, but also for some which breed many kilometres away. At least some of these latter birds use areas outside the current boundaries of the Nelson Lakes National Park. A larger sample of radio-telemetered pigeons would be necessary to find what proportion of the pigeons overwintering at Lake Rotoroa travel outside the park to breed.

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### LITERATURE CITED

CLOUT, M.N.; GAZE, P.D. 1984. Effects of plantation forestry on birds in New Zealand. J. Applied Ecol. 21: 795-815.

DAWSON, D.G.; DILKS, P.J.; GAZE, P.D.; McBURNEY, J.G.R.; WILSON, P.R. 1978. Seasonal differences in bird counts in forests near Reefton, South Island, New Zealand. Notornis 25: 257-278.

McEWAN, W.M. 1978. The food of the New Zealand pigeon (*Hemphaga novaeseelandiae novaeseelandiae*). N.Z. J. Ecol. 1: 99-108.

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