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# MAPPING THE DISTRIBUTION OF FOREST BIRDS

by

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## FIGURES

# MAPPING THE DISTRIBUTION OF FOREST BIRDS

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## SUMMARY

a) A method is described for recording the distribution of birds in forest.

b) Species lists for 1000-yard or 1000-metre grid squares may be compiled by recording birds while walking a transect through each square in a chosen survey area.

c) The scale of the survey enables observers to sample large areas of forest in a relatively short time, and the method provides more detailed information on bird distribution than have previous mapping schemes used in New Zealand.

d) Transect counts are the most effective method for recording the number of species in a square, and are particularly useful for detecting small, rare or sparsely distributed species.

e) The method is also the most practicable under field conditions as constant recording of birds allows large areas of forest and a variety of landforms and forest types to be surveyed in each 1000-yard square.

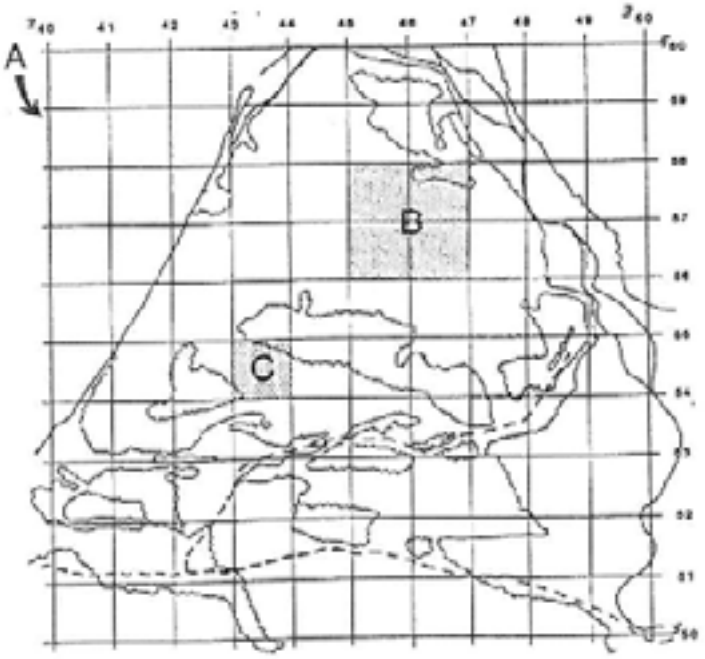
## INTRODUCTION

Until now most surveys of bird distribution in New Zealand have used 10,000-yard grid squares as the mapping base. This scale was used by the Ornithological Society of New Zealand when it compiled a bird distribution atlas for the country (Bull et al. 1985) and by the N.Z. Wildlife Service in its nation-wide survey of sites of special wildlife interest (e.g. Coker and Imboden 1980, Morse 1981, Ogle 1982, O'Donnell 1983). However, each square encompassed about 90 $km^2$ (Figure1) and included a wide variety of habitats, landforms, microclimates and altitudes, all of which influence the distribution patterns of birds. Such a coarse scale is unsuitable for many present-day purposes because it cannot provide sufficiently detailed information on bird distribution to guide land-use planning. Therefore we have developed a more sensitive means of mapping the distribution of forest birds.

The 1000-yard or 1000-metre grid scales give considerably more detailed coverage (100 squares for each old 10,000-yard grid square) and so allow comparison of different distribution patterns over wide geographical areas. The presence of birds in the squares can be related to forest type and landform, thereby identifying areas with the richest populations.

This report is a summary of our more detailed paper (O'Donnell and Dilks 1988).

**Figure 1 : Scale of mapping used on various surveys.**




A 10,000-yard grid square
(Ornithological Society and Fauna Unit).

B 2,000-yard grid square
(Department of Lands and Survey).

C 1,000-yard grid square
(this method and N.Z. Forest Service).

# THE LINE TRANSECT METHOD

## Synopsis

a) Whole geographic units (e.g. valley systems) should be chosen for study areas, and all grid squares in the unit should be surveyed.

b) The line-transect method involves walking a line transect across a 100-yard/metre grid square; compiling a bird species list; describing the forest type typical of the square; and undertaking a 5-minute bird count in that forest type.

c) Each transect should sample the full range of forest types, topography and altitude within the square.

d) At least 30 minutes (preferably more than 40 minutes) should be spent on each transect, and all birds seen or heard in the square should be recorded.

e) When traversing the transect in each square the observer should walk for 100 m or so and then pause for 2-3 minutes to count and identify birds.

f) Ideally each study area should contain at least 100 grid squares.

g) Using the transect method the number of forest bird species recorded in study areas is twice as great as that previously recorded during 10,000-yard mapping of the same areas.

## Scale

Use either the standard 1000-metre grid square on metric maps (New Zealand Map Series 260 maps), or where these are not available, the 1000-yard grid system (NZMS 1 maps, Figure 1).

## Selection of transects

Transects should be planned to traverse each grid square in the study area. They do not normally follow marked or cut routes. Their length and location depend on several factors:

- Topography. Ridges often provide the only feasible routes in steep country, especially where streams and gullies are made impassable by waterfalls or bluffs.

- Forest type and extent of forest cover. When surveying swamp forest- pakihi (bog) mosaics, or squares near the bushline, the amount and location of forest in the grid square determine the route followed.

- The next square to be surveyed. This is probably the most important factor in determining each transect route. To make the best use of field time, the route should cross as many squares as possible (while still allowing sufficient recording time in each square), and at the end of the day reach a suitable exit point for the observers.

An example of survey coverage in a block of 184 squares in the Big Bay area, South Westland, is shown in Figure 2.

Observers should always work in pairs for safety.

## Line transect walking bird count

The observers walk slowly along the transect recording all birds seen or heard. Birds flying high overhead are circled on the recording sheet (Figure 3) because they may not be resident in this habitat type. Each species and the number of individuals counted are listed in separate columns according to whether they are seen or heard. Counting while walking is often impractical because of the noise made when moving through dense forest, when this is a problem, 2-3 minute "listening stops" are made at approximately 100-metre intervals. Counts should not be made when other noises mask bird calls during strong wind or rain, or near running water.

A 5-minute count is made in the dominant vegetation type along each transect; all birds seen or heard are recorded. This count gives a measure of abundance which can be correlated with physical features such as forest type and landform, and it has been used in many New Zealand studies of forest birds (e.g. Best and Ogle 1979, Coker and Imboden 1980, Crook et a1.1977, Dawson et al. 1978, Harrison and Saunders 1981, Moynihan 1980).

We carried out trials to determine the optimum length of time which should be spent on each transect in order to record the maximum number of species in each square (O'Donnell and Dilks 1988). Because observers need to cover many squares each day, a compromise must be found between spending as long as possible in each square, and the need to keep moving. Our tests showed that a period of 30-40 minutes per transect was adequate for recording the range of species present in each grid square.

## Vegetation description

Emergent and canopy plants should be recorded at the site of each 5-minute bird count. Plants within line of sight are listed, and their percentage cover estimated to the nearest 5%. Allen and (1983) estimated that this method sampled, on average, 500 $m^2$ of forest. Such information provides a broad indication of forest type within each square and can be correlated with the more detailed forest information collected in the past by the New Zealand Forest Service or by Botany Division, Department of Scientific and Industrial Research.

**Figure 2 The Big Bay Survey Block. One of 15 completed during a survey of forest bird distribution in South Westland (O'Donnell and Dilks 1986). Continuous transect lines are usually one days field survey. Note that in hilly country transect lines generally follow ridge systems.**

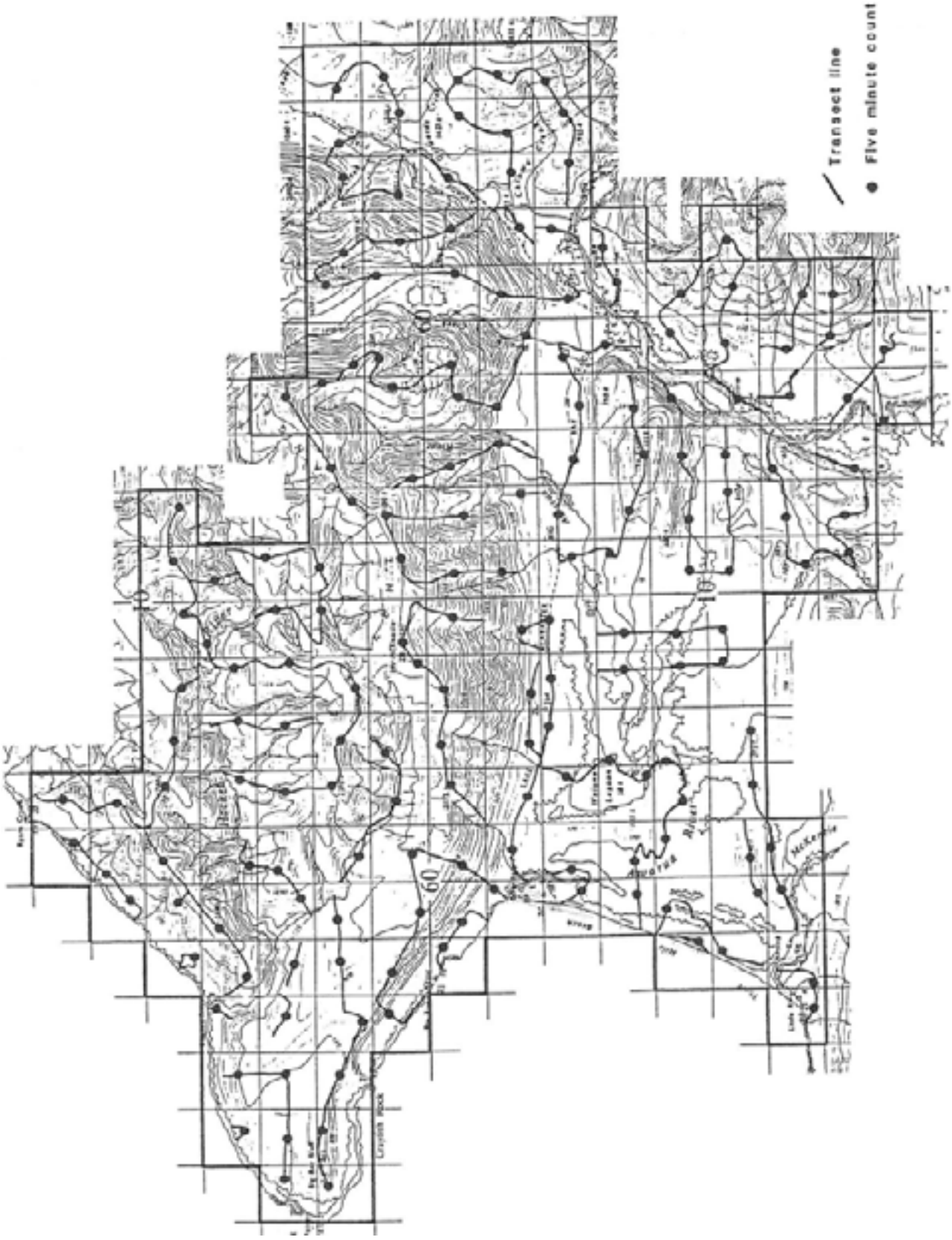
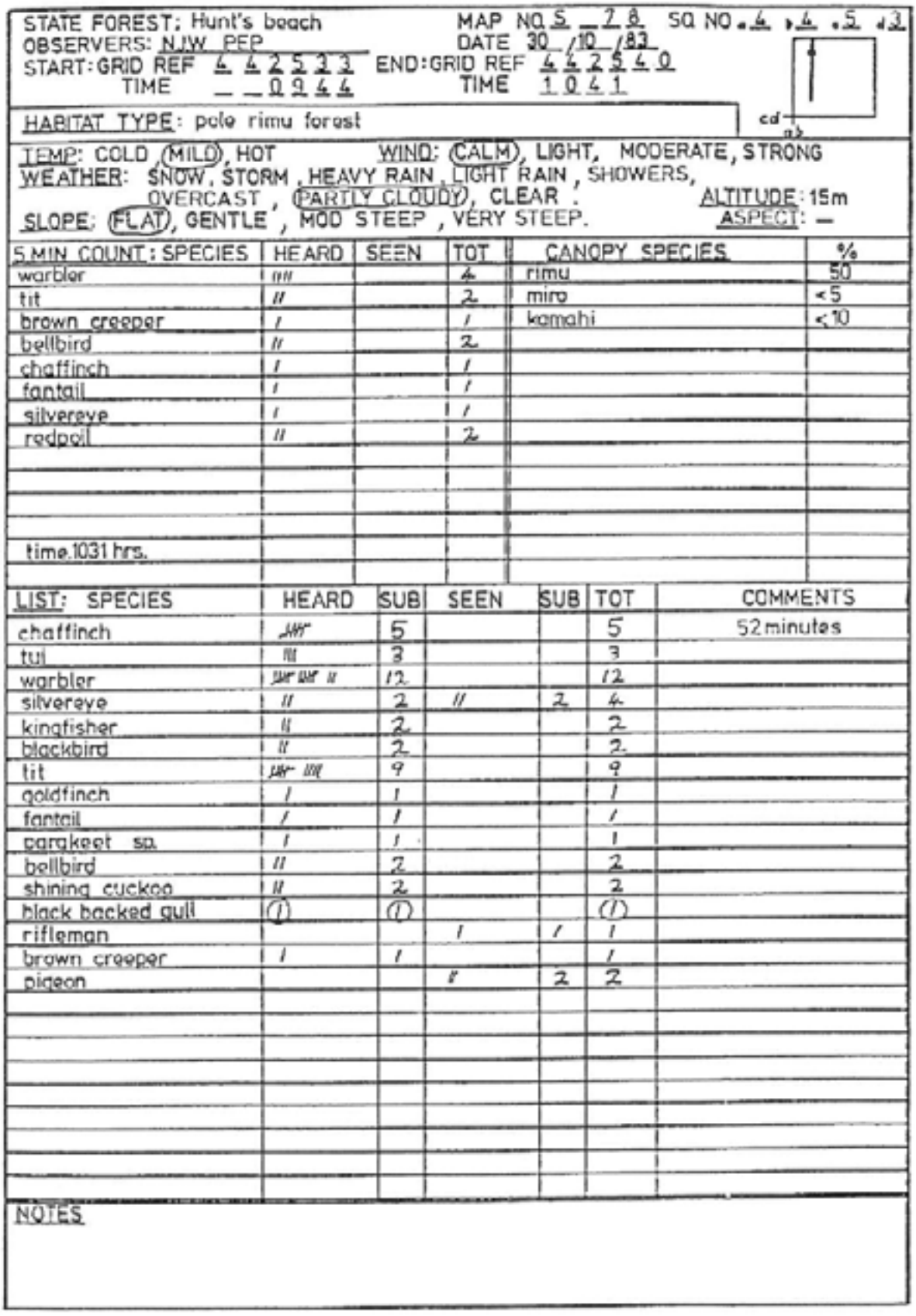


**Figure 3** : **Example of a fieldsheet for bird distribution mapping.**



STATE FOREST: Hunt's beach MAP NO S 28 SQ NO 4 4 5 3
OBSERVERS: NJW PEP DATE 30 / 10 / 83
START: GRID REF 4 4 2 5 3 3 END: GRID REF 4 4 2 5 4 0
TIME 0944 TIME 1041

HABITAT TYPE: pole rimu forest

TEMP: COLD, (MILD), HOT WIND: (CALM), LIGHT, MODERATE, STRONG
WEATHER: SNOW, STORM, HEAVY RAIN, LIGHT RAIN, SHOWERS,
OVERCAST, (PARTLY CLOUDY), CLEAR. ALTITUDE: 15m
SLOPE: (FLAT), GENTLE, MOD STEEP, VERY STEEP. ASPECT: —

| 5 MIN COUNT: SPECIES | HEARD | SEEN | TOT | CANOPY SPECIES | % |
|---|---|---|---|---|---|
| warbler | /// | | 4 | rimu | 50 |
| tit | // | | 2 | miro | <5 |
| brown creeper | / | | / | kamahi | <10 |
| bellbird | // | | 2 | | |
| chaffinch | / | | / | | |
| fantail | / | | / | | |
| silvereye | / | | / | | |
| redpoll | // | | 2 | | |
| | | | | | |
| | | | | | |
| | | | | | |
| | | | | | |
| time 1031 hrs. | | | | | |
| | | | | | |

| LIST: SPECIES | HEARD | SUB | SEEN | SUB | TOT | COMMENTS |
|---|---|---|---|---|---|---|
| chaffinch | ///// | 5 | | | 5 | 52 minutes |
| tui | /// | 3 | | | 3 | |
| warbler | ///// ///// // | 12 | | | 12 | |
| silvereye | // | 2 | // | 2 | 4 | |
| kingfisher | // | 2 | | | 2 | |
| blackbird | // | 2 | | | 2 | |
| tit | ///// //// | 9 | | | 9 | |
| goldfinch | / | 1 | | | 1 | |
| fantail | / | 1 | | | 1 | |
| parakeet sp. | / | 1 | | | 1 | |
| bellbird | // | 2 | | | 2 | |
| shining cuckoo | // | 2 | | | 2 | |
| black backed gull | (1) | (1) | | | (1) | |
| rifleman | | | / | / | 1 | |
| brown creeper | / | 1 | | | 1 | |
| pigeon | | | // | 2 | 2 | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
| | | | | | | |
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| | | | | | | |

NOTES

Completion of field sheets

Field observations are entered on a record sheet with eight compartments (Figure 3):

a) Location data. These include name of the study area, map reference of the start and end of the transect in each square, time of beginning and end of each transect, observer's name, and date. The location of the transect, site of the vegetation description and any other features (e.g. bush edge, sighting of a rare species, 5-minute bird count site) are drawn diagrammatically in the box at the top right corner of the sheet

b) Habitat type. A general description of the forest and vegetation changes along the transect.

c) Weather. Subjective assessments of temperature, wind, cloud cover, and precipitation; the relevant description is circled.

d) Landform. A subjective assessment of slope, and specific measures of altitude and aspect (a flat area has no aspect).

e) 5-minute count. Details of the count with columns for subtotals of numbers of birds seen or heard and a space for the time of the count.

f) Vegetation description. Under "canopy" the emergent and canopy plants are listed with percentage cover estimated visually to the nearest 5%. Estimation of canopy heights is also useful, as is a description of the composition of other tiers within the forest (e.g. a list of understory species). Plant names should be written in full to avoid confusion between species with similar names.

g) Line transect count. Details of this count are given under the heading "List". Columns are provided for the subtotals of numbers heard or seen ("SUB"), as well as the grand total ("TOT").

h) Comments and notes. Space is provided for recording any notable information such as feeding or breeding observations, the total time (minutes) spent in the square, plants which are fruiting or flowering, and animal sign encountered. Any new bird species recorded in the square outside the "official" survey time (e.g. while walking out) is recorded here. It is useful to note habitat details when rare birds are seen (e.g. slope, aspect, altitude and tree species used by yellowheads (*Mohua ocrocephala*)).

## ANALYSING MAPPING INFORMATION

We surveyed 147,000 ha of forest in South Westland between 1983 and 1986 using this 1000-yard grid square mapping method and 1986. The information was presented in a number of ways:

a) Distribution maps showing presence in grid squares. For example, we mapped the distribution of South forest birds in nearly 2000 squares (e.g. Figure 4);

b) Tables showing frequency of occurrence in grid squares (i.e. the percent of squares in which each species was found in the study area). Frequency of occurrence gives insight into how common species are (e.g. Figure 5);

c) Figures showing frequency of occurrence of birds at different altitudes (e.g. Figure 6);

d) Figures comparing bird distribution maps for the same study area in winter and summer (e.g. Figure 7);

e) Figures comparing frequency of occurrence of birds in different forest or landform types;

f) Five-minute bird counts (average number of each bird species per 5-minute count) showing broad differences in the magnitude of counts for the same species between study areas (e.g. Figure 8).

**Figure 4 : Distribution of N.Z. pigeon in 15 survey areas in South Westland.**

**Figure 5 :Frequency of occurrence of NZ pigeon in survey areas in South Westland.**

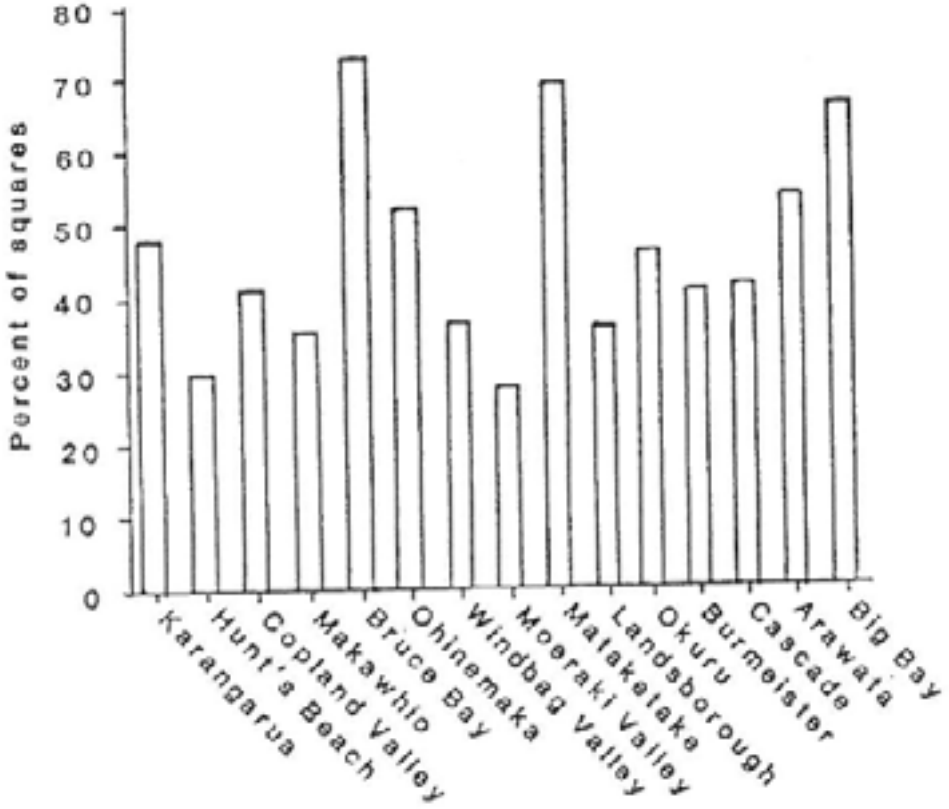



**Figure 6 : Changes in frequency of occurrence of birds with altitude the Mataketake survey area (percent of squares recorded in).**

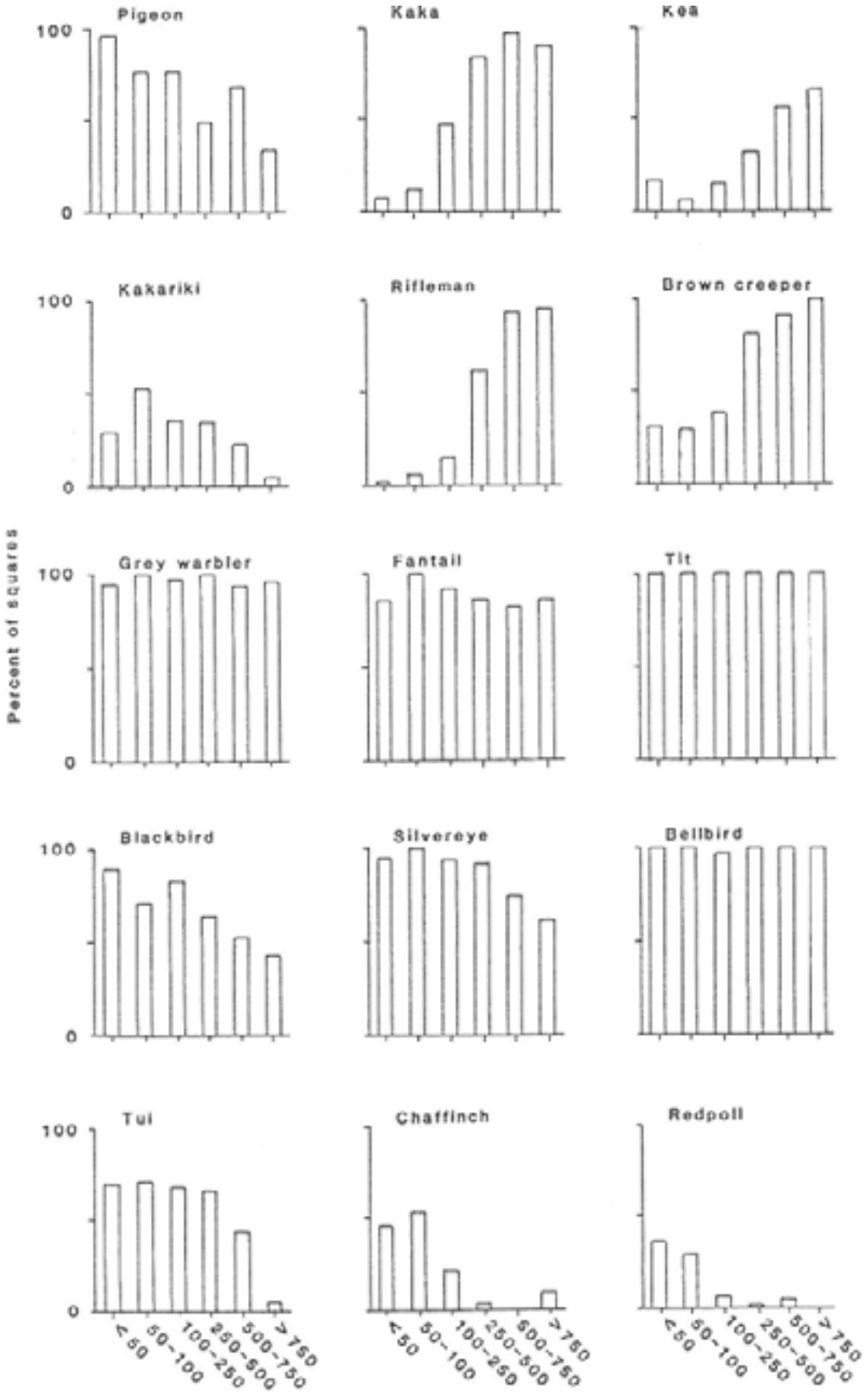

Pigeon
Kaka
Kea
Kakariki
Rifleman
Brown creeper
Grey warbler
Fantail
Tit
Blackbird
Silvereye
Bellbird
Tui
Chaffinch
Redpoll
100
0
Percent of squares
<50
50-100
100-250
250-500
500-750
>750

**Figure 7: Summer and winter distribution pattern of NZ pigeon and fantail in the Windbag Valley, South Westland.**

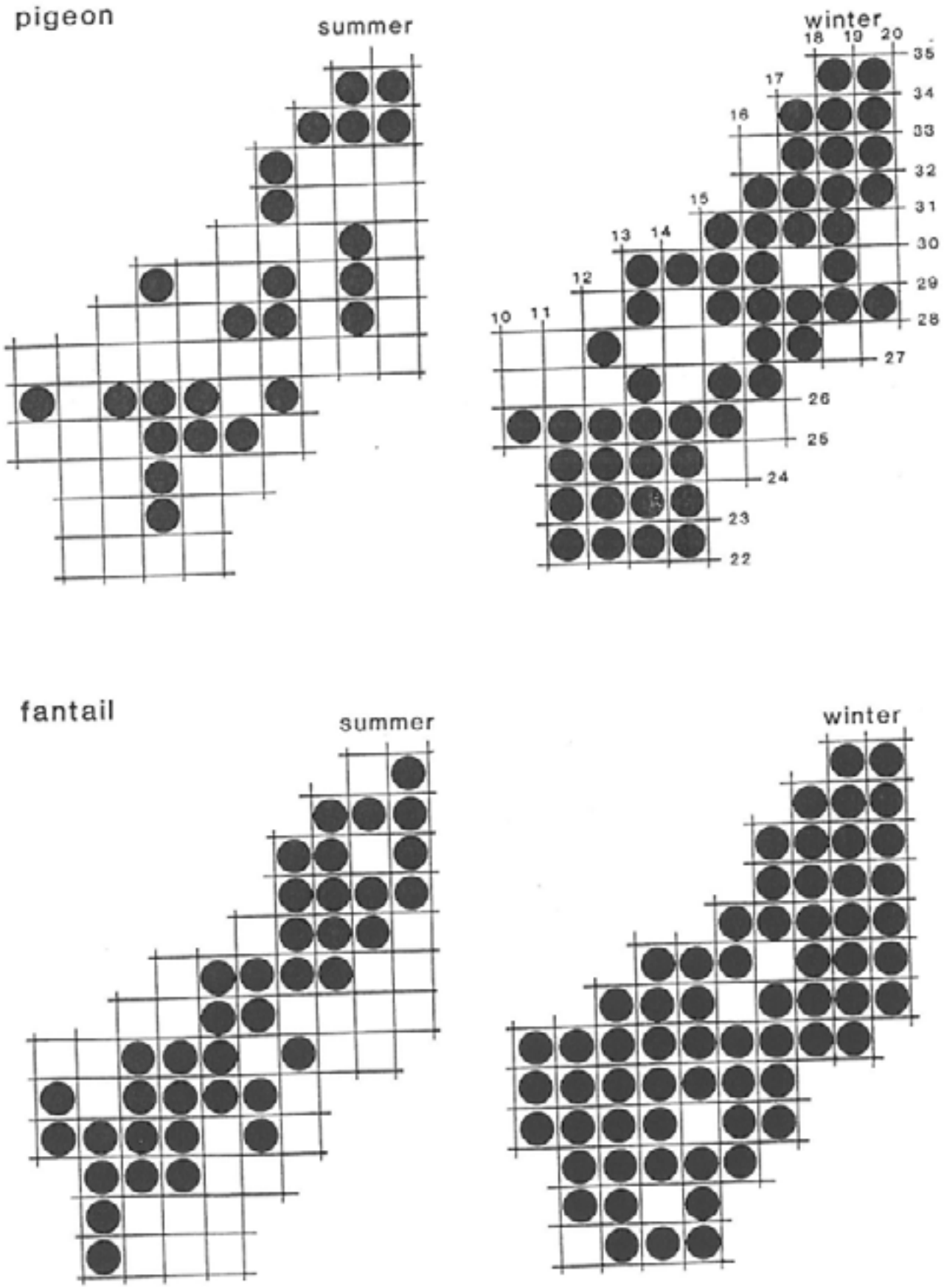
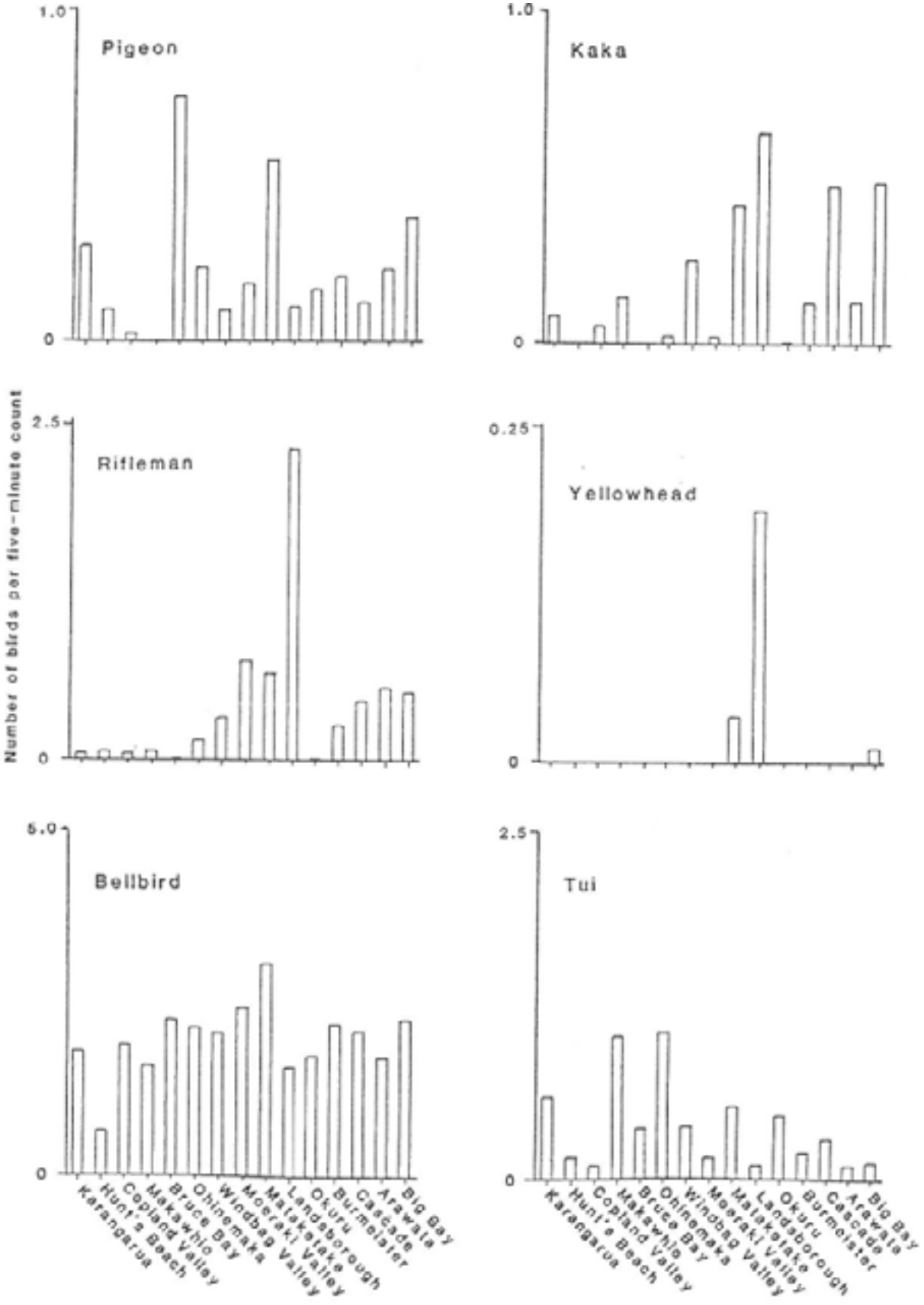


**Figure 8: Number of forest birds per 5-minute count in South Westland study areas.**



## CONCLUSIONS

The 1000-yard grid square forest bird surveys provide more detailed information than previous mapping methods used in New Zealand. The main objective of this type of bird mapping is to record as many as possible of the species actually present in each square. It is logical that the longer an observer spends in a square, the greater the number of species which will be recorded. Time must be balanced, however, between the need to cover large areas of forest (many squares) and the minimum time needed in each square. Our data suggest that a transect count lasting about 40 minutes results in the large majority of forest species in the square being recorded. The amount of time spent surveying each square depends on a variety of factors, including the amount of forest it contains, the density of the forest, ease of access, and terrain. Consequently, transect length (time and distance) will vary greatly.

Counts of birds can be used to assess how common each species is in a square, particularly rare species, which are usually found as single birds. Five-minute counts (Dawson and Bull 1975) can be carried out in conjunction with bird mapping if indices of abundance are required. Five-minute bird counts are also broadly comparable with those of a large number of other forest bird studies in New Zealand.

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