FOREST BIRDS OF THE HOPE CATCHMENT, LAKE SUMNER STATE FOREST PARK, NORTH CANTERBURY

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ABSTRACT

Twenty-four bird species were recorded in the beech forests of the Hope catchment during a survey of vegetation and associated animals. Vegetation descriptions were classified into associations, and some variation in bird frequency and species was observed between associations and at different altitudes.

INTRODUCTION

In November-December 1975, the New Zealand Forest Service surveyed the forests within the Hope River catchment of the Lake Sumner State Forest Park, North Canterbury. The main purposes were to describe the composition, structure, and habitat of the forests and to establish permanent reference plots to monitor future trends in forest health. However, additional data were collected which enabled the forest bird populations to be described. The catchment covers over 19 000 hectares. Beech forest covers over half the area (Guest & Wilkinson 1977), with the upper bush edge occuring at about 1 300 metres.

A total of 137 non-areal reconnaissance plots were located at 200 m intervals along 26 randomly chosen altitudinal transects running from valley floor to tree line. A description of the vegetation was made at each plot, listing all vascular plants within the following five tiers: main canopy; 5-12 m; 2-5 m; 0.3-2 m; less than 0.3 m. The dominant species and the density of the canopy were recorded, together with the altitude, aspect, terrain, and the mean top height of trees.

At each plot, a 5-minute bird count was carried out using the methods outlined by Dawson & Bull (1975), recording all birds seen or heard within the set period. Birds flying overhead or heard at a distance of about 100 m or more were not recorded. Weather conditions, the time of observation, and the presence of running water, high wind, or other factors making aural observations difficult, were also noted.

THE FORESTS

The forest canopy of the catchment is composed almost entirely of red *(Nothofagus fusca)*, silver *(N. menziesii)*, and mountain beech *(N. solandri* var. *cliffortioides)*.

Using a group average cluster analysis similar to that described by Wardle *et al.* (1971), the forest was defined into five associations. These associations and the habitat which they occupy are briefly described below. The mean altitude of each association is shown in Fig. 1.

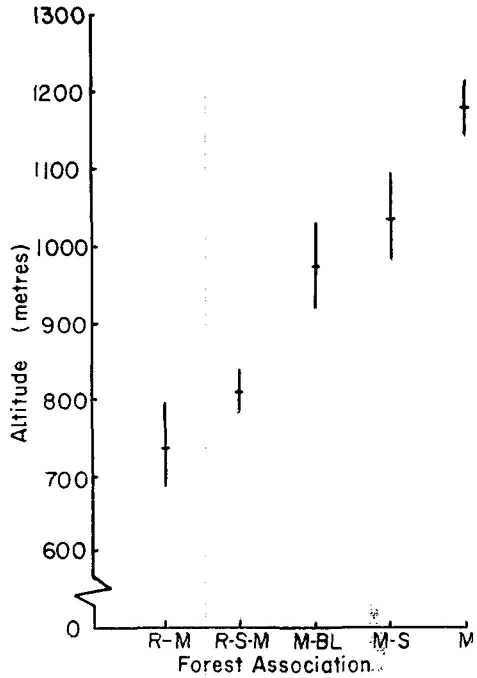

FIGURE 1 — Mean altitude of forest associations with 95% confidence limits.

1. *Red Beech - Mountain Beech Forest (coded R-M in table and figures)*

This association is found on lower slopes and terraces and is dominated by large red and mountain beech. Broadleaf *(Griselinia littoralis)* and *Coprosma pseudocuneata* are the other major species present.

2. *Mixed Beech Forest (coded R-S-M)*

The canopy of this association contains red and mountain beech, with a sub-canopy of silver beech and many other species in the lower tiers, including broadleaf, *Coprosma foetidissima, C. parviflora,* and *Polystichum vestitum.* It is most often found on terraces and lower slopes, but also at higher altitudes near the head of the valley.

3. *Mountain Beech - Broadleaf Forest (coded M-BL)*

On some steep dry sites, broadleaf is dominant beneath a mountain beech canopy. *Coprosma linariifolia* is often present, whilst *C. pseudocuneata* and *Polystichum vestitum* usually dominate the lower tiers.

4. *Mountain Beech - Silver Beech Forest (coded M-S)*

Mountain beech is much more common than silver beech in the canopy of this forest type which usually occurs on steep upper slopes near the main divide. A shrub layer containing broadleaf, *Olearia lacunosa* and *Pseudopanax simplex* is usual, and the ground cover is quite diverse.

5. *Mountain Beech Forest (coded M)*

This forest type generally has few associated species, the most common being *Coprosma pseudocuneata* and *Polystichum vestitum*. It is of simple structure compared with the other associations, and forms the tree line in most places.

TABLE 1. PERCENT FREQUENCY OF BIRD SPECIES IN THE FIVE FOREST ASSOCIATIONS AND FOR THE FOREST AS A WHOLE

Species	Total Forest	Forest Associations					CHI-Square Value
		R-M	R-S-M	M-BL	M-S	M	
	No. of Plots						
	137	16	55	20	15	31	
	PERCENT FREQUENCY						
Yellow-crowned Parakeet	11	19	18	6	7	3	6.11 not significant
SI. Rifleman	77	81	96	67	87	48	29.20 significant at .005 confidence level
Brown Creeper	28	0	29	33	27	39	5.65 not significant
Grey Warbler	54	31	65	56	53	45	7.20 not significant
Yellow-breasted Tit	62	50	56	72	60	84	8.72 significant at .100 confidence level
SI.Robin	16	19	31	0	13	3	15.50 significant at .005 confidence level
Blackbird	21	37	24	0	27	16	6.05 not significant
Bellbird	59	75	65	61	40	45	7.33 not significant
Chaffinch	70	81	84	78	46	48	17.24 significant at .005 level

THE BIRDS

1. *Bird distribution and relationship with forest composition*

Twenty-four bird species (listed in Appendix 1) were recorded within the forest area sampled. Nine of these species occurred in more than 10% of the plots. The percentage of these nine in each forest association, and for the forests as a whole, is shown in Table 1.

The frequency of four species was significantly different between forest associations, and there is a tendency for birds to be less frequent in associations at higher altitude. The Yellow-breasted Tit, however, shows an apparent reversal of this trend, with more observed at higher altitudes. Whether this fact is explained by increasing altitude or a preference for pure mountain beech by this tit is not clear. The mean numbers of birds and bird species recorded in each forest association are shown in Figs 2 and 3.

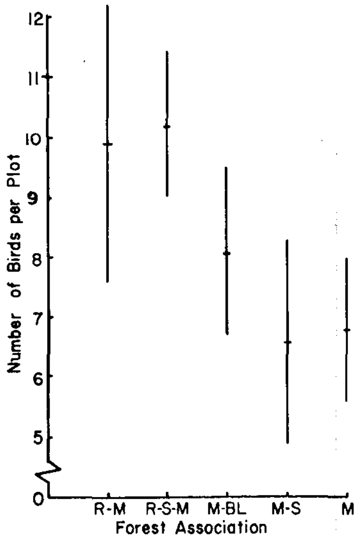

FIGURE 2 — Bird density for each forest association, mean and 95% confidence limits.

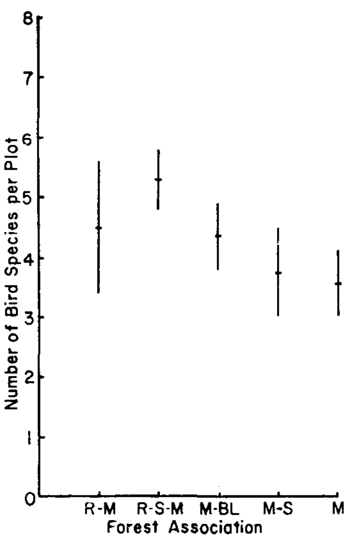

FIGURE 3 — Number of bird species, mean and 95% confidence limits, for each association.

With the associations arranged in increasing altitudinal sequence there is a trend for both numbers of individuals and number of species to decrease. An analysis of variance between associations was carried out. Significant differences existed in the mean number of birds per association ($F = 4.32_{4,132}$ df; $P = 0.010$), and in the mean number of bird species per association ($F = 4.39_{4,132}$ df: $P = 0.010$).

2. *Bird distribution and relationship with forest structure*

MacArthur & MacArthur (1961) reported work in the United States and suggested that bird species diversity could be best predicted in terms of the height profile of the vegetation. The vegetation profile was determined by measuring the density of foliage at a series of heights above the ground and expressed as the foliage height diversity (FHD). They also commented that a knowledge of plant species diversity did not enable an improved prediction of bird species diversity. Similarly, Recher (1969) and Cody (1970) both demonstrated that bird species diversity was strongly correlated with foliage height diversity. In respect of the forest areas of the Hope catchment, foliage densities per tier were not available. However, it was possible to calculate a foliage species diversity for each tier (five tiers in all) and thus express the habitat diversity in terms of both species complexity and, to some extent, density. The density component was not an absolute value per tier, but an expression of the vertical distribution of density through the presence or absence of any or all the tiers recognised. This measurement of habitat diversity was found to be strongly correlated with altitude ($r = 0.7122_{136\ df}$; $P = 0.010$), and with bird populations present, i.e. number of bird species ($r = 0.4874_{136\ df}$; $P = 0.010$) and number of individuals ($r = 0.4510_{136\ df}$; $P = 0.010$).

3. *Bird distribution and relationship with altitude*

The only clear relationship established between habitat and bird populations was that expressed by altitude. Highly significant correlations existed between altitude and the number of birds ($r = 0.6393$ 136 $P = 0.010$), and altitude and numbers of bird species ($r = 0.6313_{136\ df}$; $P = 0.010$). However, altitude is closely associated with forest structure and composition.

4. *Bird species diversity*

A bird species diversity value was calculated for the forests of the whole catchment, using the Shannon Information Index (H). (MacArthur 1965). This index of 2.24 for the Hope forests is generally a high value when compared with information summarised by McClay (1975) for *Nothofagus,* podocarp, and modified forests in Southland and on the West Coast. It is difficult to be certain that the data used by McClay (largely he used data published by Kikkawa (1966)) are entirely comparable with data from the Hope; furthermore it is not possible to determine whether the Hope bird species diversity of 2.24 is significantly higher statistically than values from other areas. However, from information and data available it would appear that the predominantly *Nothofagus* forests of the Hope catchment are comparatively rich in both introduced and native bird species.

CONCLUSIONS

The interaction of factors which affect the distribution of bird populations is complex. Altitude, vegetation type (its structure and composition), and season all probably influence bird distribution. Further, environmental factors are probably so closely associated, that to measure one is largely a surrogate value for another. These problems are compounded by other variables such as weather, time of day, and observer bias.

It seems likely that the criteria affecting bird distribution will not be identified from such broad base surveys such as this, but from repeated census work and autecological work in relatively small areas. Ordination techniques such as Principal Component Analysis could have relevance in considering the effect of environmental gradients on bird distribution.

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APPENDIX 1

BIRD SPECIES RECORDED

Paradise Duck *(Tadorna variegata)*, New Zealand Falcon *(Falco novaeseelandiae)*, New Zealand Pigeon *(Hemiphaga novaeseelandiae)*, South Island Kaka *(Nestor meridionalis)*, Kea *(Nestor notabilis)*, Yellow-crowned Parakeet *(Cyanoramphus auriceps)*, Shining Cuckoo *(Chalcites lucidus)*, Long-tailed Cuckoo *(Eudynamis taitensis)*, South Island Rifleman *(Acanthisitta chloris)*, Brown Creeper *(Finschia novaeseelandiae)*, Grey Warbler *(Gerygone igata)*, South Island Fantail *(Rhipidura fuliginosa)*, Yellow-breasted Tit *(Petroica macrocephala)*, South Island Robin *(Petroica australis)*, Song Thrush *(Turdus philomelos)*, Blackbird *(Turdus merula)*, Silvereye *(Zosterops lateralis)*, Bellbird *(Anthornis melanura)*, Tui *(Prosthemadera novaeseelandiae)*, Yellow Hammer *(Emberiza citrinella)*, Chaffinch *(Fringilla coelebs)*, Redpoll *(Acanthis flammea)*, Starling *(Sturnus vulgaris)*, White-backed Magpie *(Gymnorhina tibicen)*.

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