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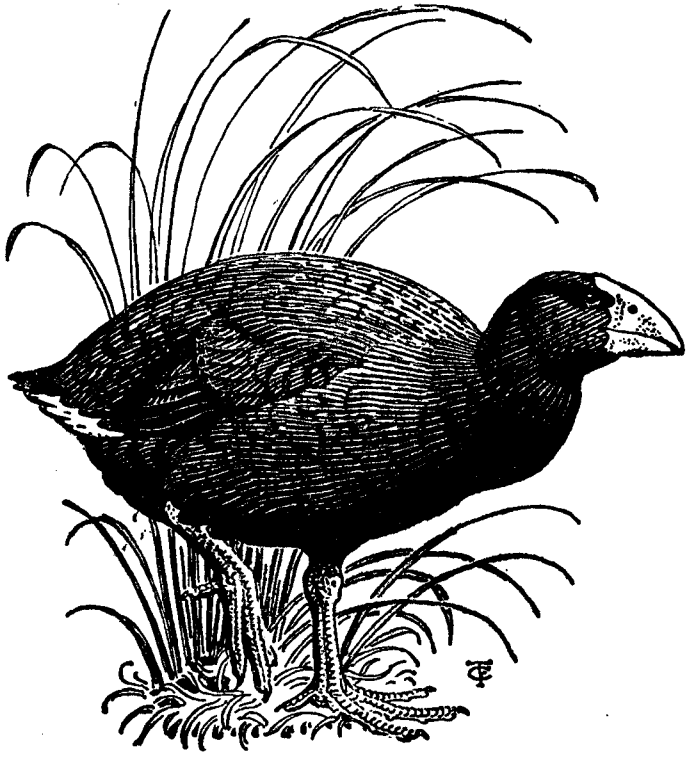

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COUNTING BIRDS IN NEW ZEALAND FORESTS

By DAVID G. DAWSON and P. C. BULL

ABSTRACT

Five-minute counts of birds at stations 200 m apart were easier to make and no less accurate as an index of numbers than were counts made while walking slowly through the same forest. The precision and errors of the technique are discussed.

INTRODUCTION

Conservation issues, raised by proposals for the commercial exploitation of South Island beech forests (Thomson 1971), require practical methods for determining the kinds and numbers of birds living in different parts of these forests. Skilled and energetic field workers can soon discover what kinds of birds are present but the question of how many is much more difficult.

Work on the numbers of birds in New Zealand forests began with Turbott's (1940) census on Taranga I. Since then three basic counting techniques have been used though the details of each have varied. Breeding pairs have been counted on plots of known size (Kikkawa 1966); transect counts have been made while walking (Stidolph 1948, Turbott & Bull 1954, Gibb 1961); and birds have been recorded in terms of their frequency of occurrence during some stated interval (Turbott & Bull 1954, Riney *et al.* 1959, Caughley 1962, McKenzie 1963, Dawson 1964, Choate & Gibbs 1964, Choate 1965 and Choate 1967). The diversity of techniques has limited the use of these counts in comparative studies such as that of McLay (1974). Emlen (1971) listed the principal overseas work.

An initial choice must be made between methods which, by mapping territories and nest sites, seek to establish the actual number of breeding birds, and methods which, by some sampling procedure, seek merely an index of numbers. Mapping is time-consuming and usually confined to the breeding season (International Bird Census Committee 1969); further, the results for some species do not relate closely to true density (Snow 1965, Haukioja 1968, Bell *et al.* 1973).

Emlen (1971) reviewed several transect methods which estimate absolute density from the distance at which a bird is first detected.

Such procedures suffer two disadvantages. In New Zealand forests far more birds are heard than seen and this often precludes accurate estimates of distance. For instance, estimates of distance made by six observers in rain forest near Wellington, varied about twofold and this degree of accuracy falls far short of " equivalent to a good 6-inch range finder " (Emlen 1971). Secondly some birds move towards or away from people while others remain undetected even when overhead, so that absolute density cannot be calculated. While not denying that information on the distance at which birds are encountered aids the interpretation of bird counts, we sought simply an efficient index of bird numbers, to measure bird populations accurately enough to detect major differences in abundance.

METHODS

The study area

Two forest areas were selected near Reefton (42°7'S, 171°52'E) on the West Coast of the South Island. The first, " Fletcher's Creek " is a remnant of the mixed podocarp and beech forest that formerly covered the valley floor; it is 230 m above sea level on a low damp terrace just north of Te Wharau creek at map reference S57-2942 NZMS 18. The second area, " Te Wharau," is a hillside of mixed podocarp and beech forest 370 m above sea level on the ridge between Te Wharau and Giles creeks at map reference S57-2739.

In 1972 a walking track was cut in each area, providing a circuit of 2 km at Fletcher's Creek and 1 km at Te Wharau.

The counts

After some preliminary counting by various methods in September, October and November 1972, four observers tested the three most promising methods in February 1973. The techniques listed below were used by each observer in both areas each day, so that a comparison of the methods could be made without error from differences between the days or between the observers.

(1) " Walking counts." An observer walked the track at about 0.8 km/hr counting every bird he saw or heard. No bird was knowingly counted twice. Subtotals were made every fifteen minutes (i.e. approximately every 200 m).

(2) " Five-minute counts." An observer walked about 200 m without counting and then stood still for five minutes, recording every bird seen or heard; he then walked another 200 m on, and counted again; and so on.

(3) " Ten-minute counts." The procedure was the same as in (2) except that each count occupied ten minutes.

COMPARISON OF THE METHODS

For each method, each circuit of the track gave a number of subtotals. The variability and magnitude of these determine the usefulness of their average as a measure for comparison with other counts. The mean count was highest for ten-minute counts, and lowest for five-minute counts (Table 1). However the average variance of the counts was least for five-minute counts and greatest for walking counts.

Also more five-minute than ten-minute counts were completed per unit time. The right-hand column of Table 1 gives an estimate of the 95% confidence of a mean count from two hours work by one observer; it shows that the three methods agree very closely, with practically no difference in accuracy.

TABLE 1. The magnitude, variability and precision of the mean count for five species[a] of bird

Counting method	Species	Mean of 64 counts	Mean of transformed counts[b]	Variance of transformed counts	100x95% conf.[c] / mean
Walking	Bellbird	2.066	1.286	0.369	40
	Tit	1.197	0.891	0.405	60
	Silvereye	1.672	1.000	0.466	57
	Fantail	0.902	0.380	0.320	124
	Warbler	2.344	1.312	0.243	31
	mean	1.636	0.974	0.361	62
Five-minute	Bellbird	1.736	1.242	0.304	32
	Tit	0.531	0.516	0.344	81
	Silvereye	1.030	0.744	0.388	60
	Fantail	0.545	0.479	0.308	85
	Warbler	1.169	1.019	0.217	33
	mean	1.002	0.800	0.312	58
Ten-minute	Bellbird	2.141	1.410	0.302	36
	Tit	0.797	0.715	0.290	70
	Silvereye	1.484	1.425	0.426	42
	Fantail	0.719	0.556	0.339	97
	Warbler	1.734	1.194	0.259	39
	mean	1.375	1.060	0.323	57

Notes:

a. The scientific names of the birds are listed in Table 2.

b. The individual counts were subjected to a square-root transformation (Snedecor and Cochran 1967, p.325) to facilitate statistical comparisons.

c. The 95% confidence value was calculated for the approximate number of counts that could be completed in two hours: eight sub-totals walking, ten five-minute counts and seven ten-minute counts. Easier walking conditions would favour the stationary counts, especially the five-minute ones.

The mean of transformed counts for five-minutes was significantly less than that for the other two techniques. The variances did not differ significantly between the methods.

The observers all preferred stationary counts because, in unfamiliar country, they allow undivided attention to the birds and are probably much less affected by variation in terrain. Such counts are also more suitable for a spot survey of the kind being used by the Wildlife Service on the West Coast (Crook & Best 1974). The five-minute count was preferred to the ten-minute one as it allows the observer to sample more forest in a given time, is no less accurate than the ten-minute count, and provides less opportunity for erroneously recording the same individual twice.

TABLE 2. Tests for a difference between the two areas, using the five-minute counts

		No. of counts	Mean of counts	Transformed Counts Mean	Transformed Counts S.E.	Probability "T-test"	Probability chi-sq.
Bellbird	Fletcher's	40	1.38	1.04	0.19	< 0.01	< 0.005
Anthornis melanura	Te Wharau	24	2.33	1.43	0.11		
Tit	Fletcher's	40	0.40	0.37	0.08	0.1-0.2	0.05-0.1
Petroica macrocephala	Te Wharau	24	0.75	0.60	0.13		
Silvereye	Fletcher's	40	1.12	0.81	0.11	0.3-0.4	0.25-0.5
Zosterops lateralis	Te Wharau	24	0.88	0.64	0.14		
Fantail	Fletcher's	40	0.62	0.54	0.09	0.2-0.3	0.25-0.5
Rhipidura fuliginosa	Te Wharau	24	0.42	0.37	0.11		
Warbler	Fletcher's	40	1.15	0.99	0.07	> 0.5	0.8-0.9
Gerygone igata	Te Wharau	24	1.20	0.90	0.13		

Notes:

The data are from February 1973, when each of four observers counted in each area.

The counts were subject to a square-root transformation to stabilise the variance, and the means and variances of these transformed data were used in the "t-tests".

The chi-squared tests were of the null hypothesis that the total count for each species would appear in the ratio of 40:24, i.e. that the mean count was identical in the two areas.

Bellbirds were statistically significantly different between the two areas, in both tests, but none of the other species was.

A COMPARISON OF BIRD NUMBERS IN THE TWO AREAS

In Table 2 the five-minute counts are examined to see if there are any differences between the two study areas in the abundance of each of the five commonest birds. Two statistical tests were

employed. The " t-test " uses the means of the five-minute counts and their variability. Unfortunately, with such low counts, the values do not fall symmetrically round their mean, and to correct this a transformation was applied. A chi-squared test on the total counts* in each area is simpler, and a comparison of the two right hand columns of Table 2 shows that the two tests agree quite well.

While in Table 2 only the Bellbird differs significantly in its density between the two areas, these tests were based on about six man-hours work in each area and more recent work with sixteen hours of counting in each area has produced a large number of significant differences (P. R. Wilson pers. comm.). Table 3 shows the size of difference between two means that leads to statistical significance; figures are given for three variations in the number of counts and for three different average counts. The precision of the technique improves with both a larger average count and with a greater counting time. One hundred and twenty-five counts will give useful results for the more abundant species, but rarer ones require much more time.

TABLE 3. The percentage[a] difference between two mean counts required for statistical significance

		Average number of birds counted in five-minutes[b]		
		0.1	1.0	10
Number of counts in each area	25	175%	55%	18%
	125	78%	25%	8%
	1250	25%	8%	2½%

Notes:

a. The percentage difference was taken as $\frac{200}{a+b}\,|a-b|$ where 'a' and 'b' are the mean counts of the species in the two areas. The 5% probability level in a chi-squared test was used as the criterion of significance.

b. The "average number of birds" is the mean of the two areas being tested. The columns span a range of abundance. For example, ten bellbirds might be recorded per five minutes in an area where they were abundant and in full song, but only one parakeet in every ten counts (0.1).

For example if 25 counts were made in each of two areas and the mean count of a species was nine in one area and eleven in the other these two averages would be significantly different, as the difference between the two averages (two) as a percentage of their midpoint (ten) exceeds the critical value from the table (18%).

* Such a test assumes that each individual bird is identified independently of the others. This will not be so for flocking species, like Silvereyes, and the test may err towards significance for such species. Conversely, the average count of territorial species may be more accurate than this test would suggest.

Five – Minute Bird Counts

P.B.1 Fletchers Ck

Date: 20-4-74

Observer: P.D.G

Counts

	1	2	3	4	5	6	7	8	9	10	
Temp °C	12·5	—							—	14·0	
Time	0952	1003	1015	1027	1038	1050	1101	1121	1132	1145	
Sun	0	0	0	3	3	2	1	0	1	0	
Wind	0	0	0	0	0	1	1	2	0	0	
Other Noise	0	0	0	0	0	0	0	0	1	0	
Precipitation	0	1	0	0	0	0	0	1	1	2	
Species	S H	S H	S H	S H	S H	S H	S H	S H	S H	S H	Total
Silvereye	8			2 3	1 4	2 4	1 9	4	4 8	2 1	47
Fantail	1 1	1		1 1	2		1 2			1	11
Bellbird	2	2	1 3	1 1	4	1 4	1 3	2 1	1 2	3	31
Tit	1	2	3		1 3	1 1	2	2		1	15
Warbler	1	1			1	1	1				5
N.Z. Pigeon	2				1	1	1		1	2	8
Robin		1	1	2		2		1 1	3	1 2	13
Song Thrush				1					1		2
Redpoll					1						1
Tui				1			1				2
Blackbird						2	1			2	5
Parakeet sp.							1				1
Chaffinch								1		1 1	3
Weka									1		1

Remarks: 2 Kakas seen in N. fusca between counts 3–4

FIGURE 1 — An example of the data recorded on a standard form.

FACTORS AFFECTING THE COUNT

The number of birds recorded will be affected by several factors apart from the number of birds present:

(1) Observers differ in their ability to see, hear and identify birds and in their judgement as to the number present, and these abilities may change with time.

(2) The birds' activity and calling change during the day and with season, and both the observers and the birds will be affected by weather and extraneous noises.

(3) The topography and density of the vegetation will influence the distance at which birds may be detected.

Current studies near Reefton seek to document these sources of variation so that they may be minimised. In the meantime we recommend that bird counts in forest be based on five-minute stationary counts as detailed in the appendix.

ACKNOWLEDGEMENTS

Many members of Ecology Division contributed to the field work and discussion which resulted in the technique described in this paper. We are, however, particularly indebted to Messrs P. D. Gaze, B. W. Thomas and A. H. Whitaker, who counted birds in February 1973, and to R. H. Taylor who contributed much of the appendix and took a prominent part in initiating the work and in discussing its results. Mr I. G. Crook (N.Z. Wildlife Service) made helpful comments on the manuscript.

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APPENDIX

The five-minute bird count

The observer stops and stands quietly for five minutes every 200 m (approximately 250 paces). If possible the counting route should be through reasonably homogeneous vegetation, and further than 200 m from its edge. At each stop all the birds seen or heard are recorded. In regularly counted areas these stations are best marked so that the counts are made from the same point each time. Each count is treated as an entity so that, even if it is thought that an individual bird was included in a previous count, it is counted again. Within each count no bird is knowingly counted twice, nor are birds assumed to be present without some visual or auditory clue to their presence (e.g. a flock of Silvereyes is noted as the number heard calling rather than the number the observer guesses such a frequency of calling would represent; if a bird calls in one place and later one of the same species calls some distance away, they are taken as two individuals unless there is evidence that the first bird moved to the second place).

Each set of counts includes the following information:

Locality (including map reference, altitude, aspect, vegetation, etc. if not a regularly counted area);

Date (day, month, year);

Observer:

Temperature: in °C or:

1	freezing	<0°C
2	cold	0-5
3	cool	5-11
4	mild	11-16
5	warm	16-22
6	hot	>22;

Showers: a note of any rain in the hour before the counts.

And for each count:

Sun: (0-5) Record the approximate duration, in minutes, of bright sun on the canopy immediately overhead;

Wind: The average for each five-minute count on a modified Beaufort scale:

0 Leaves still or move without noise (Beaufort 0 and 1),
1 Leaves rustle (2),
2 Leaves and branchlets in constant motion (3 and 4),
3 Branches or trees sway (5, 6 and 7);

Other noise: (water, cicadas, traffic, chain saws, etc): the average for the five minutes on the following scale:

0 Not important,
1 Moderate,
2 Loud;

Precipitation: the average for each count

Mist — M, Rain — R, Hail — H, Snow — S, on scale as follows:

0 None,
1 Dripping foliage,
2 Drizzle,
3 Light,
4 Moderate,
5 Heavy;

Time: 24-hour clock time at the beginning of each count.*

Extremes of weather are best avoided.

Birds which were identified by sound only are noted as heard (h), the rest are seen (s).

Distance — if a bird is judged to be more than 200 m away then exclude it from the list (this is the distance between successive counts and can be checked whenever a bird is near one counting point and audible from the next). Birds flying overhead and judged not to belong to that vegetation type should be recorded, but the record may be circled to indicate this.

The counts should be presented as in the first four columns of Table 2, as this provides sufficient information for the chi-squared tests.

Figure 1 is the record sheet used in Westland with an example of the data.

* Current work near Reefton by Ecology Division, D.S.I.R., involves counting 2 km (10 stop) loop tracks twice each day, between 0930 and 1530 hrs, and survey work by Wildlife Branch, Dept of Internal Affairs involves spot counts between 0900 and 1500 hrs, thus avoiding the rapid change in birds' conspicuousness near dusk and dawn. While not essential, the choice of a similar routine by other observers would facilitate comparison.

SOME IDEAS ON SPECIATION IN NEW ZEALAND PARAKEETS

By R. H. TAYLOR

ABSTRACT

The distribution, speciation and probable evolution of New Zealand parakeets are outlined. Specific ecological adaptations keep closely related sympatric species separate. Examples are given of such ecological isolating mechanisms in Antipodes and Chatham Island parakeets. Occasionally, where man has drastically modified the environment, these barriers break down and widespread hybridisation occurs, as on Mangere Island, Chatham Islands. The existence of the very rare Chatham Island Yellow-crowned Parakeet *(Cyanoramphus auriceps forbesi)* is endangered by habitat changes and hybridisation.

INTRODUCTION

During the Antipodes Island Expedition of 1969, I studied some aspects of the ecology of the Antipodes Island Parakeet *(Cyanoramphus unicolor)* and the Antipodes Island Red-crowned Parakeet *(C. novaezelandiae hochstetteri)*. It was then suggested that comparable observations should be made of the habitat requirements of the two endemic parakeets at the Chatham Islands. The Chatham Island Yellow-crowned or Forbes' Parakeet *(C. auriceps forbesi)* is very rare and virtually confined to about 6 hectares of forest and scrub on Little Mangere Island, whereas the Chatham Island Red-crowned Parakeet *(C. n. chathamensis)* is more common and inhabits all four of the larger man-modified islands in the group.

I was able to visit the Chathams (Fig. 1) with New Zealand Wildlife Service expeditions in November 1970 and again in November 1973. During the 1970 expedition, rough weather prevented a landing on Little Mangere so it was not possible to observe anything of Forbes' Parakeets, except for a very few seen in much-altered habitat on adjacent Mangere Island. I was, however, able to study large numbers of Chatham Island Red-crowned Parakeets on South-East Island, and others of this species on Mangere. On Mangere, where both species were present, I was surprised to find many individuals showing various combinations of characters of both Yellow-crowned and Red-crowned Parakeets. These birds were judged to be hybrids.

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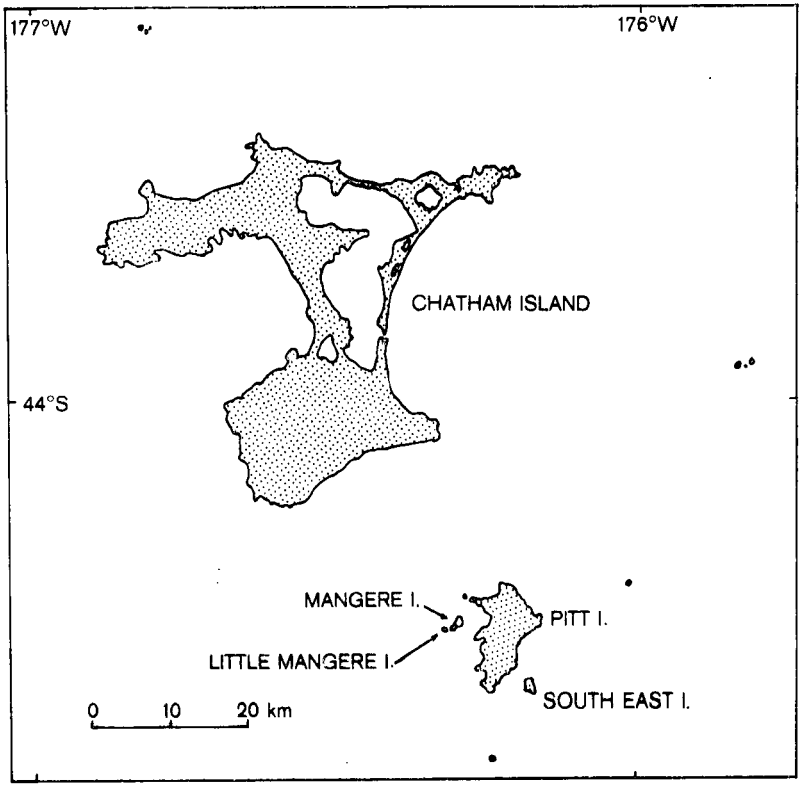

FIGURE 1 — The Chatham Islands, showing locations mentioned in the text.

During my second trip to the Chathams, in November 1973, I spent five days on Little Mangere and learned something of the habitat requirements of Forbes' Parakeets in their natural environment. And later, on the man-modified island of Mangere, I had a further look at the hybrid parakeets.

I found this striking example of natural hybridisation in a population of wild birds of great interest. It is also of considerable concern, in that it poses a possible — and novel — threat to the preservation of the last of the Forbes' Parakeets on Little Mangere Island, thus, perhaps, dashing hopes that they might eventually re-populate Mangere and other newly-reserved islands in the group.

In attempting to explain what is happening among the parakeets on Mangere Island, it is helpful to look first into the distribution, speciation, and probable evolution of New Zealand parakeets generally.

TAXONOMY AND DISTRIBUTION

In the New Zealand region live four species of parakeets of the genus *Cyanoramphus* (Fig. 2). They are the only New Zealand representatives of the very large and diverse sub-family Psittacinae. In Australia this sub-family is represented by 36 species in 17 genera including the rosellas and the Budgerigar. Common features of the group are that none of the birds displays an erectile crest and nearly all have smooth tongues (Forshaw 1973).

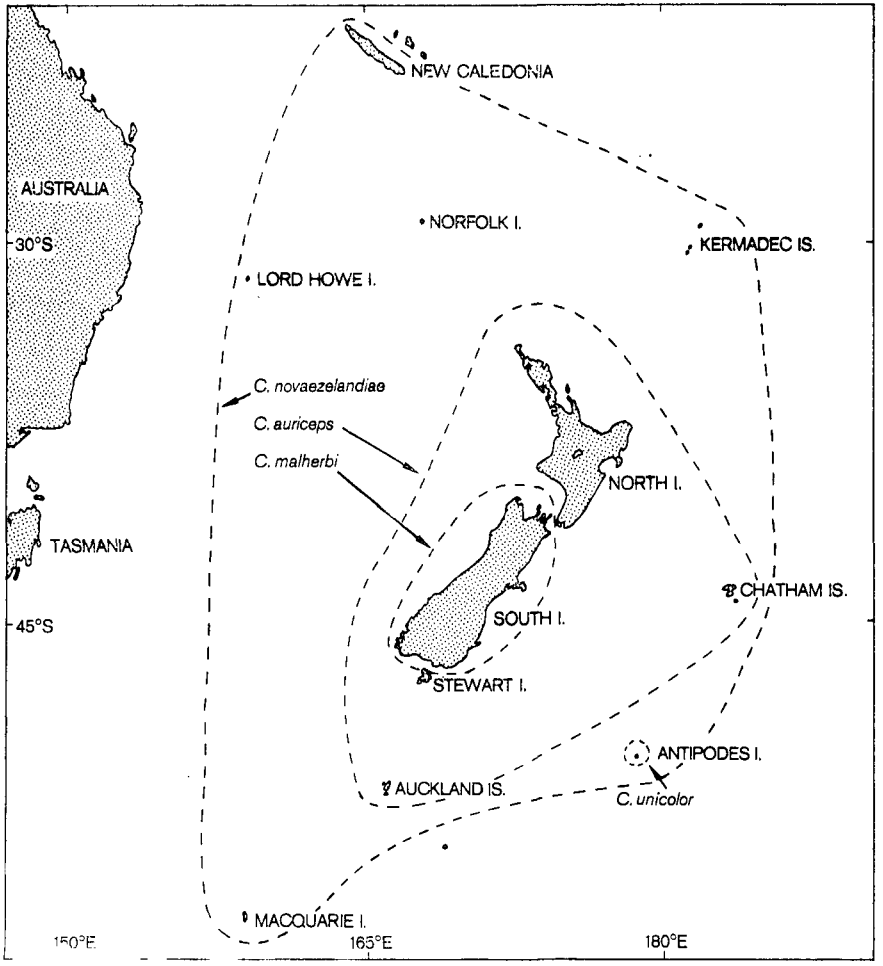

FIGURE 2 — The New Zealand region, showing the limits of distribution of *Cyanoramphus novaezelandiae, C. auriceps, C. malherbi,* and *C. unicolor.* Note: the Lord Howe Island and Macquarie Island parakeets are now extinct.

All *Cyanoramphus* species are small or medium sized parrots with long, pointed tails. Green in colour with blue on the wings, they may have crimson, yellow, and orange on their heads, and spots of the same colour on each side of the rump (Falla *et al.* 1970).

One of these species — the Red-crowned Parakeet *(C. novaezelandiae)* — comprises eight currently recognised sub-species that were once found from New Caledonia, 1300 kilometres north of New Zealand, to Macquarie Island, 1000 kilometres to the south. Two of the sub-species — the Lord Howe Island Parakeet *(C. n. subflavescens)* and the Macquarie Island Parakeet *(C. n. erythrotis)* — are now extinct, having been exterminated by introduced rats and cats about the beginning of the present century. Of the six remaining, one *(C. n. novaezelandiae)* occurs on the main islands of New Zealand, its adjacent islands and the Auckland islands; while the rest are endemic island races belonging to New Caledonia *(C. n. saissetti)*, Norfolk Island *(C. n. cooki)*, Kermadec Islands *(C. n. cyanurus)*, Chatham Islands *(C. n. chathamensis)* and Antipodes Island *(C. n. hochstetteri)*.

The slightly smaller Yellow-crowned species *(C. auriceps)* has a more limited geographical range and comprises only two sub-species. One *(C. a. auriceps)* inhabits the main islands of New Zealand, its adjacent islands and the Auckland Islands; and the other *(C. a. forbesi)* is found in the Chatham Islands.

The still smaller Orange-fronted Parakeet *(C. malherbi)* formerly occurred in most parts of the South Island and possibly on the North and on Stewart Island. It is now presumed to be rare and the only recent records are from forest areas in North Canterbury and Nelson (Harrison 1970).

The fourth New Zealand species is the Antipodes Island Parakeet *(C. unicolor)*. This relatively large species lacks coloured markings and is confined to isolated Antipodes Island where it lives sympatrically with an endemic sub-species of the Red-crowned Parakeet.

About 3000 kilometres north-eastward of New Zealand, on Tahiti and Raiatea in the Society Islands, there were once two species congeneric with those in New Zealand and both extinct since the beginning of the nineteenth century. In the Tahitian species *(Cyanoramphus zealandicus)* crimson was replaced by brownish red and the forehead was black. In the other species *(C. ulietanus)* the entire head was dark brown (Forshaw 1973).

EVOLUTION

Speciation in birds is a consequence of long isolation, heritable variation, and natural selection. The process starts simply with the division of a single, interbreeding stock into two or more geographically isolated populations. The isolates will gradually accumulate genetic differences due to the genetic variability in the founders of each population, non-adaptive random "drift" and, most importantly, different selective pressures from their respective environments. In time, major divergence between the populations may create distinct

species with fertility, behavioural, and ecological barriers to successful interbreeding (Mayr 1947, Sibley 1961, Ford 1964). Thus speciation is a process involving time, geographic isolation, ecological divergence and selection.

The *Cyanoramphus* parakeets illustrate several evolutionary concepts. The first is speciation by geographical separation. For example, the various " allopatric " island sub-species of the Red-crowned Parakeet have, in isolation, each evolved in a slightly different way from a common colonising parent stock.

The second concept involves initial physical isolation followed by ecological separation. Examples of this are found when species that have evolved apart later come together geographically but remain distinct species; as have Red-crowned, Yellow-crowned, and Orange-fronted Parakeets on the New Zealand mainland. These " sympatric " species evolved from a common ancestral form, probably during the Pleistocene (about 20 000 - 2 000 000 years ago) when fluctuating ice and sea barriers favoured speciation in then isolated refuges.

Somewhat comparable are the parakeets at the Antipodes Islands, where the two species have resulted from separate invasions of the islands by the same generic stock (Fleming 1952); the first colonisers *(unicolor)* being a distinct species by the time of the second, relatively recent, invasion by Red-crowned Parakeets.

Chances for hybridisation occur where the ranges of two once separated but closely related species now overlap, though normally behavioural and ecological isolating mechanisms — such as different calls, different habitat preferences, niche differences in the same habitat, or different times of breeding — would keep them apart. All isolating mechanisms have a genetic basis although some behavioural components may be reinforced by learning. Specific habitat preferences rank as one of the most important restrictions upon hybridisation between different species (Mayr 1963). Usually hybrids tend to be eliminated from a population because they are less well adapted than either of the parental forms (Ford 1964).

The two Antipodes parakeets provide a good example of how ecological separation works. Although the two species occur together on all parts of Antipodes Island, they have different feeding habits (Fig. 3), breed at slightly different times, and nest in different sites (Taylor unpubl. and in Forshaw 1973). So, even though fertile matings between the two species have occurred in captivity (Mr C. D. Roderick, pers. comm.), hybrids are unknown in the wild.

FOOD HABITS AND TERRITORIALITY

Little is known of the ecological factors keeping Red-crowned, Yellow-crowned and Orange-fronted Parakeets apart on the New Zealand mainland, but marked differences certainly occur. Field observations suggest that the Yellow-crowned Parakeet is adapted to forest habitats, whereas the Red-crowned is a bird of more open country

and forest margins. Ecological barriers between the species are now difficult to determine on the mainland where the relative distribution of the three parakeets has been drastically altered by man's vegetational changes and introduced predators. On off-shore islands, however, the various effects of man on parakeet distribution are often isolated and can be more clearly assessed. Thus existing island situations are extremely useful in the study of ecological differences between New Zealand parakeets.

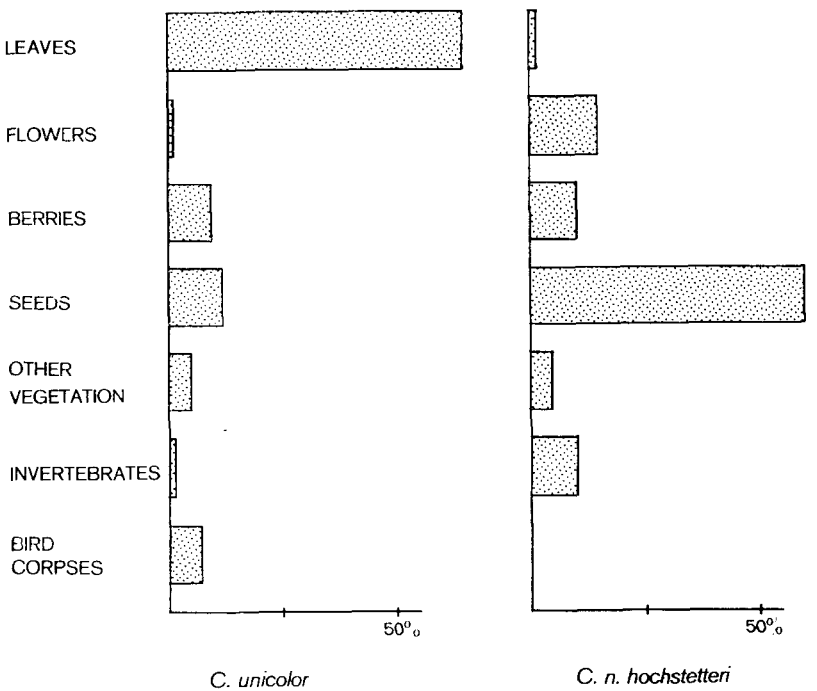

FIGURE 3 — Foods of the two Antipodes Island parakeets during February 1969. Percentages are based on 262 field observations of *Cyanoramphus unicolor* and 245 of *C. novaezelandiae hochstetteri.*

Preliminary studies of unbanded birds (Taylor unpubl.) suggest that each pair of Chatham Island Yellow-crowned (Forbes') Parakeets on unmodified Little Mangere Island restrict their activities to defended areas during the breeding season, and that in November a large proportion of their diet is made up of invertebrates — mainly caterpillars and scale insects — from the dense canopy of forest and scrub. Forbes' Parakeets were also commonly seen searching the forest floor for caterpillars dislodged from the canopy. They also eat substantial

amounts of flowers and seeds. In contrast, Chatham Island Red-crowned Parakeets on nearby South-East Island do not display territorial behaviour, eat an insignificant amount of invertebrate food, and take mainly leaves and shoots. Figure 4 summarises the differences in the October-November diets of the two species.

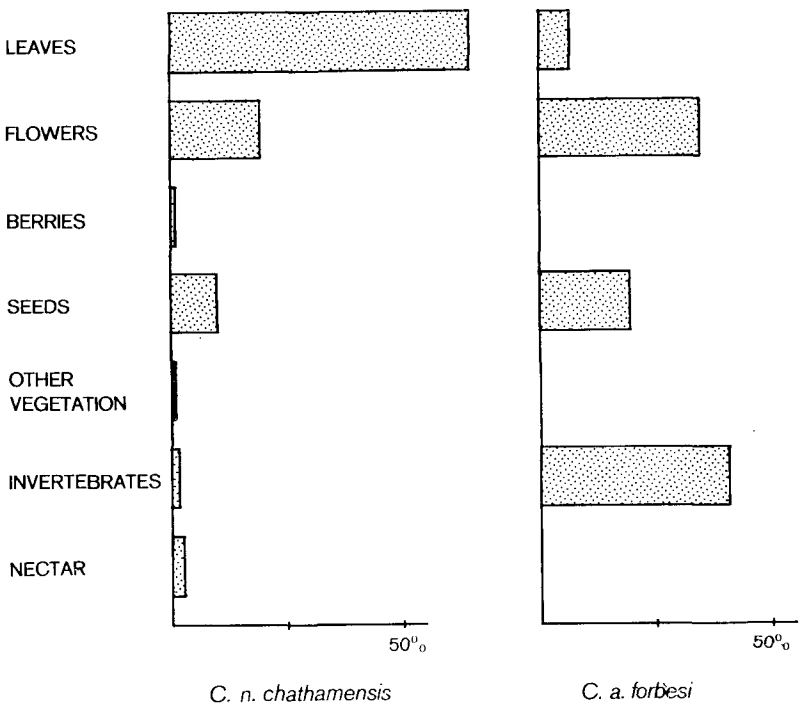

FIGURE 4 — Foods of the two Chatham Island parakeets during October-November 1970-73. Percentages are based on 465 field observations of *Cyanoramphus novaezelandiae chathamensis* and 64 of *C. auriceps forbesi.*

I interpret the feeding habits and territorialism of Forbes' parakeet as ecological adaptations to a forest habitat, which now effectively confine the breeding population to the remnant of unmodified forest and scrub on the top of Little Mangere Island (Fig. 5), and restrict the number of birds breeding there to about 10 pairs. That Forbes' Parakeets are comparatively poorly adapted to more open vegetation is further suggested by the apparent exclusion from any of their territories of the northern and eastern cliffs of Little Mangere. In November 1973, this habitat of scattered patches of scrub and herbs was left to a resident pair of Chatham Island Red-crowned Parakeets and a few others that visited from Mangere. No inter-specific territorial

encounters were observed, although red-crowned birds were not seen to enter the Forbes' Parakeet territories.

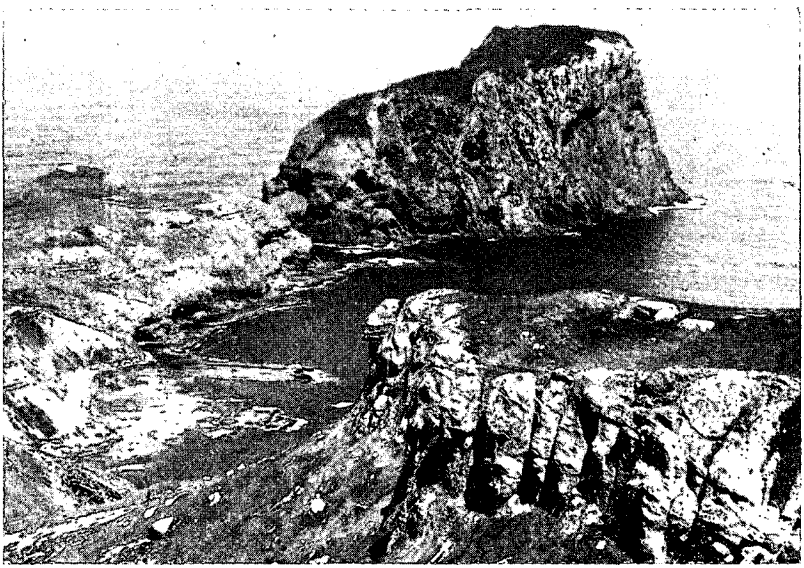

FIGURE 5 — View south-west from the summit of man-modified Mangere Island showing Little Mangere (right rear) with its cap of untouched forest and scrub. This small patch of bush is the last stronghold of Forbes' Parakeet and its preservation is essential if the species is to survive.

By spacing out a population, territorialism allows for individual food exploitation and prevents interference in foraging and over-exploitation near nest sites — distinct advantages to a species whose prey is cryptic and dispersed. By comparison, flocking is most typical of species with diets including items such as seeds and berries that occur in scattered patches of local abundance. Foraging in flocks allows improved efficiency in food finding for the individuals in them. A good example of how differences in territoriality correlate with contrasts in ecology is John Crook's work on the social organisation of several closely related species of African weaver birds *(Ploceinae)*. He found that dispersed breeding and territorialism went with insect eating and dense forest habitats, while flocking, and a lack of territories, was correlated with more open environments and seed or fruit eating habits (Crook 1965, Lack 1968).

HYBRIDISATION

In nature, however, ecological barriers between closely related species sometimes break down and widespread hybridisation occurs.

I know of two examples of this in wild populations of New Zealand parakeets. One is at the Auckland Islands where hybrid Red-crowned x Yellow-crowned Parakeets have been recorded on some of the much modified islands in Port Ross as well as at Ranui Cove and Musgrave Peninsula (Dr C. A. Fleming, pers. comm.). But perhaps better documented is the Mangere Island situation mentioned earlier. This island, of 113 hectares, has a long and varied history of modification by fire, and grazing by sheep, goats and rabbits. Cats were also introduced. From original dense forest that supported rich and varied endemic bird populations, including both Forbes' and Chatham Island Red-crowned Parakeets (Fleming 1939), it was modified to a sward of English grasses (Fig. 5). Only small patches of coastal scrub and forest were left on the cliffs and among boulder piles (Ritchie 1970). Native forest birds virtually ceased to breed on the island.

Fleming (1939) was told that in earlier times, when Mangere was forested and *forbesi* the most common parakeet there, some of these would regularly join flocks of red-crowned birds on visits to Pitt Island to feed on *Disphyma* flowers and *Acaena* fruit. But, apart from these seasonal visits to the Pitt Island coast, the Yellow-crowned Parakeet was scarcely known away from the Mangere Islands. When Archey and Lindsay (1924) spent 17 days on the then almost completely deforested Mangere Island in 1923-24 they found some Red-crowned but no Forbes' Parakeets. Later, Red-crowned Parakeets also disappeared from the island (D. V. Merton & B. D. Bell unpubl.). Of the introduced mammals, the goats and rabbits were killed or died out many years ago, and the cats disappeared in the 1950s. The sheep were destroyed by the Wildlife Service in 1968 after the island had been made a Flora and Fauna Reserve.

In relatively recent times, parakeets have recolonised the island. Red-crowned Parakeets were apparently absent and Forbes' Parakeets were rare visitors to Mangere in 1961, but by 1968, Wildlife Service parties visiting the island reported parakeets, particularly Red-crowned, as more numerous (Merton & Bell unpubl.). From counts in November 1970, I estimated there were about 60 parakeets on Mangere Island. Eight percent were classed as *C. a. forbesi,* 32% as *C. n. chathamensis,* and the remaining 60% were easily recognised as obvious hybrids in the field. By 1973, the total parakeet population of Mangere Island was estimated at about 100, of which 6% were classed as *forbesi,* 47% as *chathamensis,* and 47% as hybrids.

The hybrids varied considerably (Fig. 6). Some differed superficially from Red-crowned Parakeets only by having an orange upper edge to the red crown. Intermediates had a narrow red front, a large orange crown, and small reddish-orange patches behind the eyes and on the rump. At the other end of the range were " Forbes'-like " birds with yellow crowns and high pitched calls, but with faint yellowish-orange spots behind the eyes.

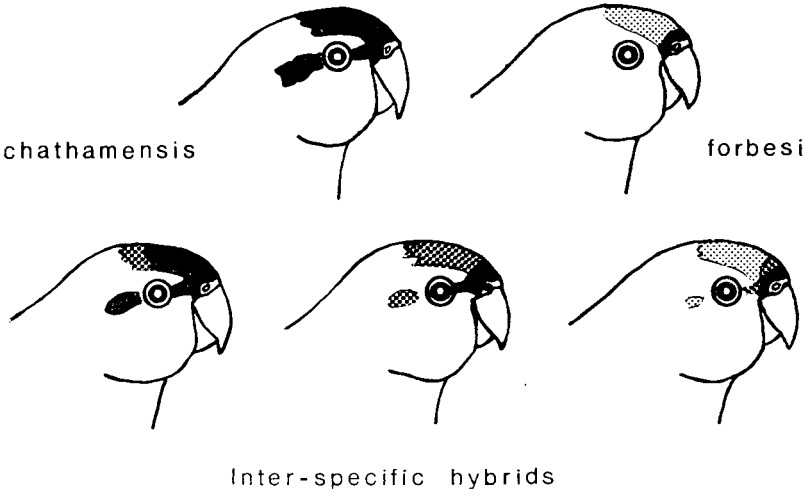

FIGURE 6 — Heads of Mangere Island parakeets showing *Cyanoramphus novaezelandiae chathamensis, C. auriceps forbesi,* and three inter-specific hybrids.
Colour key: Black = red, heavy stipple = orange, light stipple = yellow.

These observations give rise to many questions. For example: Why is this widespread hybridisation occurring on Mangere ? Why — despite ecological separation — doesn't it happen more often elsewhere ? And, most importantly, what are the implications of hybridisation on management for the continued existence in a pure form of the now very rare Forbes' Parakeet ?

The phenomenon of hybrid swarms is well known to plant ecologists. They occur when the barrier between two sympatric species breaks down so completely that the parent species are replaced locally by an interbreeding population forming a continuous bridge between the two parental extremes. Inter-specific hybrid swarms are nowhere near as common with vertebrates, though they have been recorded in birds, amphibians and fish, but not in mammal populations (Mayr 1963).

My explanation of what has happened at Mangere is that with the disappearance of cats, parakeets were able to recolonise the much modified habitat. Unlike the smaller yellow-crowned species on the main islands of New Zealand, Forbes' Parakeet is about the same size as the Chatham Island Red-crowned Parakeet; and a very few birds of both species would have recolonised together. Both these factors would favour hybrid matings. The much modified environment of Mangere, being so different from the preferred habitat of either species, gave the parental forms no real survival advantage over hybrids.

The first generation hybrids would breed among themselves as well as backcrossing with parental types as further birds reached the island from outside. Numbers of backcrosses and second generation hybrids — each with inherent individual differences and requirements (Anderson 1949) — survived in the mixed up environment. And, of considerable significance, the parakeet population on Mangere was able to expand rapidly with the sudden increase in leafy vegetation and seeds that followed the removal of sheep in 1968.

In plants, hybrid swarms are associated with widespread and drastic modification of the habitat — usually either by geological forces, or by fire or other disturbances caused by man. To quote from plant geneticist Edgar Anderson (1949): "The production of hybrid swarms is limited to particular times and places at which man or nature may have 'hybridized the habitat' . . . as the previous ecological balance is restored, recombinations closely resembling the original parents will be those most likely to survive. The commonest end result of a hybrid swarm will be the introduction of a comparatively few genes from one species into the germplasm of another."

THE FUTURE

By analogy with plant ecology, the highly disturbed environment is the key to understanding the present parakeet situation on Mangere Island. But what of the future? The re-afforestation of Mangere is now being hastened by planting to provide more forest habitat for Black Robins *(Petroica traversi)*, Forbes' Parakeets and other rare Chatham Island birds. I suggest that while the habitat slowly reverts to forest, first generation hybrids and those back-crossed towards Forbes' Parakeets will be selected against. In the mid-term the only parakeets to breed successfully on Mangere may be those of near original red-crowned or pure red-crowned stock. On Little Mangere, Forbes' Parakeets should be able to hold their unmodified stronghold — despite Red-crowned Parakeets on the cliffs and the occasional occurrence of hybrid birds. In the long-term, when Mangere Island is once more covered with dense scrub and forest, Forbes' Parakeets should be able successfully to re-colonise this habitat, to which they are ecologically adapted.

ACKNOWLEDGEMENTS

Special thanks are due to Mr Brian Bell for pointing to the need for comparative studies of the two Chatham Island parakeets, and for the opportunity to accompany Wildlife Service parties to the Chathams. I am indebted to many members of these expeditions, and of the University of Canterbury Antipodes Island Expedition 1969, for discussion and help in the field; and to Drs J. A. D. Flack, C. A. Fleming, J. E. C. Flux, and J. A. Gibb for helpful comments.

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SHORT NOTE

UNUSUAL NEST SITES OF HOUSE SPARROW AND PARADISE DUCK

On 17 November 1974, while surveying a square for the Mapping Scheme in the upper Lindis (Geordie Hills station) area, I came across two unusual nest sites. The first was that of a House Sparrow in a small matagouri bush, about 2 m from the ground, and right adjacent to, and almost touching, a nest of a blackbird. Both nests were occupied. It was in open tussock country with no large trees or buildings anywhere near, and about 2000′ (710 m) above sea-level.

About 2 km away, in an adjoining square, two local men pointed out to me a small old musterer's hut, no longer in use by the station, with about a foot of ' starling straw ' on the floor, in the middle of which a Paradise Duck had built her nest and apparently successfully hatched a clutch of about ten. The walls and roof were well inhabited by Starlings. Only the door was open.

PETER CHILD

10 Royal Terrace,
Alexandra

A BUSHMAN'S SEVENTEEN YEARS OF NOTING BIRDS

INTRODUCTION AND PART A (Bellbird and Tui)

By R. St. PAUL

(Edited by H. R. McKenzie)

ABSTRACT

This series attempts to condense observations made over seventeen years in areas being milled west of Taupo from 1944 to 1946 and in the south-west Urewera from 1946 to 1961. Daily counts were made of all birds seen and compiled into monthly charts. Estimates were made of birds heard only and notes kept of locality, weather and temperature, with sundry notes on song, calls, foods, breeding and behaviour. The files of charts are to be deposited in the library of the Ornithological Society of New Zealand Inc., Auckland Institute & Museum.

For each species there is given an account of general observations and, where significant, a breakdown of figures from the monthly charts.

Part A deals with Bellbird and Tui.

INTRODUCTION

It is hoped that this study will serve, to some extent, as a history and will be more or less applicable to the native forests of other parts of the country. It is now over fourteen years since I ceased my seventeen years of observations in 1961. If anyone begins a similar study now in the same or similar places there will be little to work on as the vital class of bush for the birds will be mostly gone. It so happens that the timber trees being milled form a major part of the seasonal food cycle, from February right through to August, so the fruit-eating birds will fade away. The insect-eating and fly-catching birds will do well in the high beech forest in spring and summer but will have no shelter to go to in the lower forest when the cold becomes severe and food scarce in the beech.

The first two years of the seventeen in which I made records of all birds seen in and about the bush were spent at Tihoi and Arataki, west and north-west of Taupo respectively, on the slopes of the northern end of the Hauhungaroa Range, where I was engaged in timber-getting and post-splitting. In each of these places I was camped in a hut at a mill and had to go about 200 m (10 chains) across tussock to the edge of the cut-over bush, then about 1.6 km (1 mile) to the bush workings. The bush and the birds were similar at each place so the name Tihoi will suffice for both henceforth. The further fifteen years were spent at Minginui where I again lived in a hut at a timber

mill and from there worked at post-splitting in and about the bush loggings. I made frequent hunting and camping trips throughout the back country as mentioned below.

THE MINGINUI STUDY AREA

The main area treated in this study is part of the Urewera ranges south-west of the road between Te Whaiti and Ruatahuna, which is a section of the Rotorua-Lake Waikaremoana road, Route 38 (Fig. 1). The north-eastern boundary runs along that road from near Te Whaiti, then south-west from the crossing of the Whakatane River about two miles past Heipipi, up the Whakatane River, over a saddle and down the Parahaki River until it meets the Waiau River and the Wairoa Stream (locally known as "The Little Wairoa"), then to the head-waters of the Whirinaki River and north to Minginui and Te Whaiti along down the Whirinaki Valley. All of the back country I am terming "Waiau."

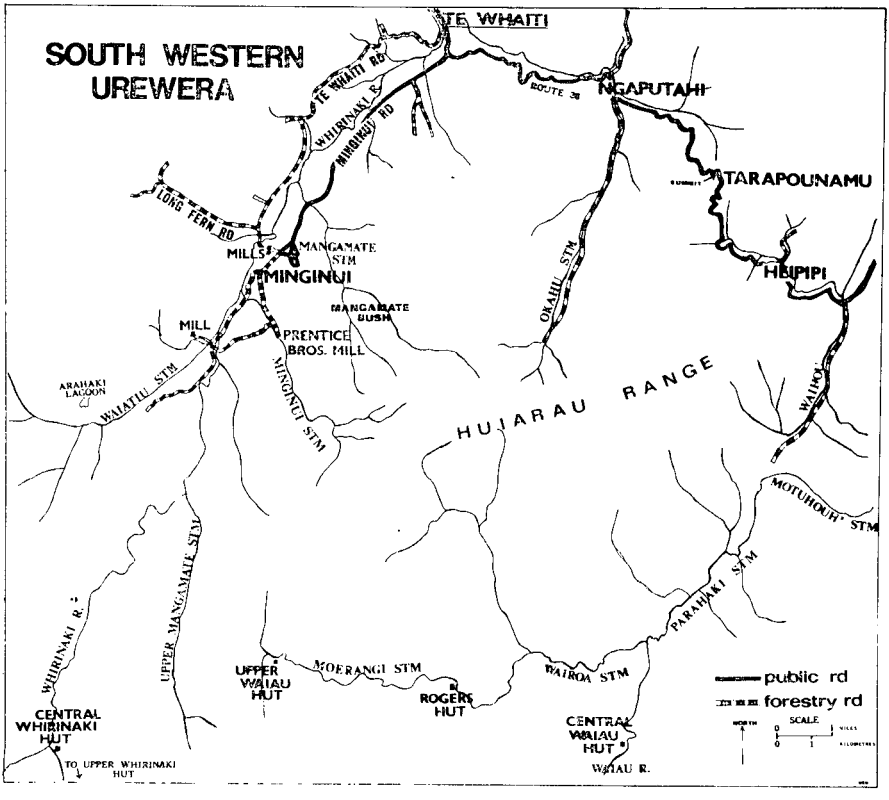

FIGURE 1 — Location of Minginui study area, south-west Urewera ranges. *del.:* Murray Douglas

The area about the timbermills of Minginui consists of cut-over bush, scrub, fern and, along the Whirinaki and Minginui Rivers, pumice flats and some shingle bed. The route to my work was usually 1 to 1.2 km (50 to 60 chains) along timber roads through cut-over bush, and, in places, scrub. Routes to the bush for hunting were more varied. Up the Whirinaki to the edge of the main bush was 2.4 km (1½ miles) mostly through tea-tree and scrub, with little bush on the way. For the first 400 m (20 chains) on the way to work or hunt there were mostly introduced birds, then with natives also occurring for the next 600 m (30 chains) of tea-tree and scrub. On both sides of the Whirinaki River valley and along the Te Whaiti-Ruatahuna road much had been milled but not burned off, enough growth being left to hold most of the native species in moderate numbers. The unexploited areas were mostly beech in the higher country and mixed bush in the valleys.

Method

To make sure that there was no duplication in the daily counts they were taken on the way either to or from work, with others made while working. The latter would be largely wandering flocks of Whitehead and Silvereye. When birds were numerous they were counted by tens and, if very many, by hundreds. I worked in the edge of the bush or along the timber tracks into it all the time so that I could get the posts carted out. When hunting I kept careful count, but at times, as when stalking a deer, I may have missed a few birds. Also there could be a discrepancy on days when I have made a nil record, not having seen a bird when I have heard quite a few.

It is to be noted that my charts show, except in a few cases, the birds seen but not those heard only. It was therefore decided that, to make for general interest, proportionate estimates of birds seen to birds heard only should be made. This was done in consultation with H. R. McKenzie, J. W. and E. St. Paul, all with lifelong experience in the birds of the bush. To the figures showing the birds seen will be added in brackets the estimate of those heard only. It will of course be realised that birds of some species, such as Australasian Harrier and North Island Kaka will at times be recorded on each of several consecutive days or more than once on the same day. The same will apply to the larger numbers of bush birds feeding on an especially heavy crop of berries for a time. However this will be roughly balanced out by birds often being present but not seen or heard. For such birds as Bellbird and Tui I have used counts made only in and about the bush and not about the mill or the rough growth of the open. For others such as North Island Fantail and Grey Warbler I have made notes for every count day as they were common to both bush and open. These notes are not claimed to be 100% accurate but were taken with consistent care.

In the analysis for each bird it will be noted that the term "count days" is used rather than "monthly." This is because of

broken months when I went on holiday in late December and early January, to Hawkes Bay for shooting in early May, or on some other occasion. For various reasons a few whole months were missed during the period. As Waiau was not covered by hunting trips after May and on to late spring there are no winter counts for it for comparison with the rest of the year.

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PART A

BELLBIRD AND TUI

BELLBIRD *(Anthornis melanura)*

STATUS AND HABITS

Habitat

One of the most common and easily seen birds of the bush in these parts, the Bellbird lives in heavy and light forest, second growth and high and low scrub. In the Urewera Ranges it is present in the highest beech forest to over 1220 m (4000 feet) but is more plentiful in the lower heavy mixed bush, as at Tihoi and Minginui, from 333.5 m (1000 feet) to about 488 m (1600 feet).

Flight

In flight it does not as a rule go very high, not as high as the Tui, or the Starling, except when moving to a distant feeding ground. Playful flight is often indulged in, when there is much singing and apparently argumentative talk. Much time is spent in fighting or simulated fighting and when a number gets going like this the noise is terrific. One way of identifying it in flight is by the belly, which appears to hang down more than with most birds.

Nesting

Nesting is mostly in fairly high trees, 9 m (30 feet) or more, but in some places, as where there is a patch of scrub against tall forest it will nest quite low down. Sometimes a rough ledge on the side of a big tree will be used. The defence of the nest is vigorous, all other small birds being kept away.

Food

It hawks for insects more than does the Tui, but also searches for them in the bark of tree trunks. In January the cicada is taken in very great numbers by Bellbirds, Tuis and House Sparrows, the bush roads being practically covered with the discarded iridescent wings. In spring and summer some of the smaller trees and shrubs provide nectar and others fruit, such as the coprosmas, Puta-puta-weta, etc. Some, like the Fuchsia, supply nectar early, then fruit in summer. The large berry food trees, such as Kahikatea, Rimu, Matai and others form the main diet for autumn and winter. The Bellbird takes only whole fruits, though some it just squashes for the juice. I have not

seen it picking pieces out of large fruits. However it breaks up cicadas and Fuchsia fruit to feed its young.

Song

The song does not vary seasonally as much as with some of the other birds, fading, but not ceasing in winter. Sometimes singing parties provide a rich concert, at any time of day. At times you will think you have a ventriloquial singer, the same song appearing to come from different places, but when you get nearer you will find it to be two birds, one a little way off from the other, singing in perfect unison.

The dawn chorus of the Bellbird is something to be sought, enjoyed and remembered. In high summer it starts in some places at 0320 hours (G.M.T.). It is really good when camping out in the bush to hear the last calls of the nocturnal Morepork as it goes to bed for the day, a Kaka raking around, then a Tui or two, then a sudden outburst of the melodious Bellbird four-note song, soon accompanied by the other small bush birds. This lasts usually for twenty minutes, then fades away. The casual day song is quite different, a kind of bubble up and over. The dawn one, which no doubt was the one which impressed Captain James Cook in Queen Charlotte Sound, is again heard to some extent in the evening. Strangely the dawn song is almost absent in some bush areas where the Bellbird is numerous. It is not a strong feature here but I have heard it well in the eastern Urewera at Lake Waikareiti, only twenty-five miles away. A well bushed valley or wide gully seems to be preferred as an amphitheatre.

ANALYSIS OF MONTHLY CHARTS

(Brackets = total birds seen plus estimate of birds heard only).
Proportion seen to heard: 1 seen to 30 heard and not seen.

TIHOI

The total of birds seen from May 1944 to April 1946 was 4183 (129,673).

Count days per month averaged 21.6; days seen 21.3; days not seen .3.

Daily counts of birds ranged from 0 to 23.

Count days totalled 519 and the total birds seen 4183, providing an average of 8.1 (251) per count day.

Notes on analysis. The daily counts, 0 to 23 indicate a very steady population compared with 0 to 500 for Minginui. However the charts show a rise for Tihoi for the winter when there is a great fall at Minginui from April-May when the main berry crop of the big trees fades. It would almost seem that the Minginui birds at that time spread out westwards, some of them to Tihoi. Records are of course not available for both places in one year but the annual trend is shown by comparing the charted months concerned, for birds seen, Tihoi

going up from April to August and Minginui going down for those months.

MINGINUI

The total of birds seen from 1946 to 1961 was 102,115 (3,165,565).

Count days per month for 146 months averaged 23.9; days birds seen 23.6; days not seen .3.

Daily counts of birds seen ranged from 0 to 500.

Count days totalled 3487 and the total birds seen 102,115, the average being 29.5 (914.5) per count day.

Notes on Analysis. Minginui showed a remarkable increase during its whole period. From early 1946 to late 1954 the average count was 13.3, while from late 1954 to early 1961 it was 47.2. It is difficult to understand this increase. My counting methods did not change. Some of the large berry trees which provide the main diet from February to June vary greatly in their annual cropping but there could be no general increase of food while this and other nearby areas were being felled. I can only conclude that the increase was temporary and that if I had been able to stay longer I would have witnessed a sorry decrease of the birds in the next few years. When a large area of habitat is destroyed the remainder will hold only its original quota eventually.

WAIAU

The total of birds seen on hunting trips for parts of 47 months (from 1 to 24 days per month) was 22,293 (691,083).

Count days per month averaged 5; days birds seen 5.

Daily counts of birds seen ranged from 6 to 600.

Total count days were 234 and the total birds seen 22,293, the average being 95.3 (2954.3) per count day.

Notes on Analysis. In the case of the Bellbird, as of other species, the counts made on my hunting trips to the Waiau and other back country yielded higher numbers because I was on the move much more than when I was working in the bush. Also the deer hunting season, from February to early May at Minginui coincided with a part of the year when the birds were at their maximum after the breeding season. I did not hunt much from mid-May to December so did not cover the high back country so well then.

TUI *(Prosthemadera novaeseelandiae)*

STATUS AND HABITS

Habitat

The Tui lives throughout the heavy bush and will frequent second growth if food is to be found there. As with the Bellbird it prefers the heavier lower bush to the high beech country but if migrating in order to follow its food cycle it will be found anywhere.

Flight

It can be told from the other birds in flight by its heavy dipping and its having to give a flutter every half chain or so to maintain height. Even if not seen it can be identified by the loud whirring of its wings. When going a long distance it flies very high, sometimes as high as it can be seen. Its display flight is accompanied by much noise. Gambolling and chasing seems to be a sport indulged in at low altitudes only.

Nesting

During nesting the male, sometimes assisted by the female, viciously drives away most other birds but tolerates the very small species. It has been seen in full cry after a Falcon. Belligerence is a prominent feature of its behaviour. As a rule it nests higher than the Bellbird but at times can vary from as low as 2.44 m (8 feet) to as high as 24.4 m (80 feet).

Food

The Tui does much hunting for insects, hawking to a limited extent. In summer, when cicadas are numerous it will alight on the sunny side of a big tree and move upward, from side to side, taking one at each move.

Its foods are varied. As with the Bellbird it is equipped with a brush tongue for obtaining nectar but insects and berries provide the major portion of its needs. Nectar seems to be a delicacy, though at times in a big way. On a riverside half acre of blooming Kowhai (Sophora sp.) I have found 30 or 40 birds making a great din and when seen closely it was found that they were absolutely drunk on nectar, wobbling from side to side, chortling and jabbering. It seemed that their nerves were all on edge and all dignity lost. Small berries of many kinds are eaten. In a good fruiting year for the Kahikatea the Tui swarms on it in hundreds. When this occurs near Minginui in the mixed lower bush I have found few or none in the Waiau area where the bush is mostly beech, though with some mixed in the valleys. On occasion, in one stretch of half a mile at Minginui, I have reckoned there were about 500 each of Tui and Bellbird on the Kahikatea. This berry has its black seed on the outside of the pulpy fruit. The Tui pulls the pulp part away and squashes it for the juice, dropping the rest on the ground, which becomes completely covered and coloured with it. Larger birds swallow the whole of this small fruit. The Tui does swallow some small fruits whole but with Miro, Supplejack and Matai it crushes the flesh off the stone and it may do this also with White Maire and others. It does not peck at large fruits.

Song

Song varies from month to month and from place to place but continues throughout the year. It can be heard from 3.15 a.m. to 8 p.m. (G.M.T.) and moonlight singing is not uncommon. The songs and calls used at Minginui at a certain time can be quite different

from those at Rotorua or even nearer places. At times parties of Tui will gather, about a foot from bird to bird and sing in a kind of chorus. The young birds learning to sing make great efforts to get the notes right and it does seem that the parents teach them.

ANALYSIS OF MONTHLY CHARTS

(Brackets = total birds seen plus estimates of birds heard only). Proportion seen to heard: 1 seen to 20 heard and not seen. (This would be in ordinary circumstances. The ratio of those seen would be greater when numbers were gathered on Kowhai, Kahikatea and other foods plentiful for a period. Numbers are very low when the food crop is poor).

TIHOI

The total of birds seen for two years, May 1944 to April 1946 was 3275 (68,775).

Count days per month for 24 months averaged 21.6; days seen 20; days not seen 1.6.

Daily counts of birds seen ranged from 0 to 47.

Count days totalled 519 and the total birds seen 3275, giving an average of 6.3 (132.3) per count day.

Notes on Analysis. Here, as with the Bellbird, the Tui shows steady figures, 0 to 47 seen per count day as compared with Minginui's 0 to 600. The monthly charts indicate that it too has a population rise in winter, perhaps due to a movement from Minginui and other places where the main berry crop has finished. This however is less definite than in the case of the Bellbird.

MINGINUI

The total of birds seen from 1946 to 1961 was 80,253 (1,685,313).

Count days per month for 146 months averaged 23.8; days seen 22.6; days not seen 1.2.

Daily counts of birds seen ranged from 0 to 600.

Count days were 3487 and the total birds seen 80,253, giving an average of 23 (483) per count day.

Notes on Analysis. For the same two periods as shown for the Bellbird the Tui, though mainly following the trend of the Bellbird, provided a little less spectacular increase. From early 1946 to late 1954 the average seen per count day was 8.8, while from late 1954 to early 1961 it was 40.

The further remarks in the analysis for the Bellbird will apply also to the Tui.

WAIAU

The total of birds seen on hunting trips for parts of 47 months was 10,709 (224,889).

Count days per month averaged 5; days seen 4.9; days not seen .1.

Daily counts of birds seen ranged from 0 to 600.

Total count days were 234 and the total birds seen 10,709, giving an average of 49.7 (1043.7) per count day.

Notes on Analysis. The notes given for the Bellbird will apply also to the Tui.

ACKNOWLEDGEMENT

We would like to thank Mr Murray Douglas for his work in producing the map used to illustrate this account.

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SHORT NOTE

SPOTTED SHAG REGURGITATING SHELLS AND STONES

During the past few years at Taiaroa Head I have noticed small heaps of shells on the cliff top two yards from the cliff edge. This area is frequented by Spotted Shags *(Stictocarbo p. punctatus)*, both adult and juveniles, during the non-breeding season at Taiaroa Head (January to June).

At 14.30 hours 5 June 1973, an adult Spotted Shag was observed in this area to regurgitate some material, preen itself, then fly off.

The material was inspected and found to contain a piece of Sea Lettuce (*Ulva* sp.), six shells of *Zethalia zelandica,* ranging from 12-15 mm, four pieces of broken shell and two stones, one round (10 mm) and one flat (15 mm).

Ten other heaps of shells, all dried, were inspected and found to contain between 4 and 12 shells, dried seaweed, fish bones and small stones.

van Tets (1968, *Emu* 67: 224) observed a White-breasted Cormorant *(Phalacrocorax fuscescens)* swallow pebbles on land at Wright's Island near Devonport, Tasmania, and pointed out that " As a morphological adaptation to lower buoyancy for locomotion underwater, cormorants have a body plumage which is impervious to water. The swallowing of stones could be a behavioural adaptation which reduces buoyancy even further."

The swallowing of shells and stones could be part of the Spotted Shag food and fishing behavviour.

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SOME OBSERVATIONS ON THE DEVELOPMENT OF FEEDING IN CAPTIVE KEA (*Nestor notabilis*)

By H. PHILIP ZEIGLER

ABSTRACT

The feeding behaviour of three young captive Kea was studied over a period of eight weeks following their emergence from the nest. The gradual development of independent feeding over this period reflects continuing changes in the relation of the parent and young with each other and with available food objects. The development of species-typical feeding behaviour involving beak-foot co-ordination was not complete by the 19th post hatching week and appears to require a prolonged period of experience with food objects.

INTRODUCTION

With the exception of naturalistic observations on its diet (Jackson 1966; Clarke 1970) little systematic data is available on the feeding behaviour of the Kea. Through the courtesy of Mr Derek Wood, Director of the Auckland Zoo, I was able to carry out some observations on the development of feeding in three fledgling Keas, hatched at the zoo during the week of 4 August 1974. The study focussed primarily on those changes in the interaction of parrots and young which accompany the development of independent feeding. It was also possible to make some preliminary observations on the development of certain of the Keas' feeding behaviour patterns, particularly those involving the co-ordination of beak and foot which are so typical of Psittacidae (Buckley 1968).

METHOD

Birds were studied in their home cage, an enclosure 17 ft long x 6 ft wide x 9 ft high (5 x 1.8 x 2.7 m), containing a nest box mounted on a stump at one end of the cage, a large sheet metal feeder several feet above the ground at the other end, and several wooden roosts. Data were obtained in 1 hr observation sessions carried out two or three times each week over the first eight weeks after the emergence of the young from the nest box, at which time they were about 11 weeks old. The study was discontinued when the young were transferred to the Kea colony cage at 20 weeks of age. The observation periods were arranged so as to coincide with the one

daily feeding (between 11 a.m. and 1 p.m.). Food was placed at one end of the enclosure approximately six feet from the nest box and included: peanuts, maize, sunflower seeds, greens, fruit (apple, banana, orange). The data were recorded at one minute intervals by an observer outside the cage. Responses to food initiated by the young were recorded as a behaviour sequence (peck, grasp, mandibulate, swallow) in order to distinguish completed from incomplete feeding responses. Other behaviour recorded included: beak contacts between adults and young, initiated by the adults; types of food eaten by young and adults; locations of young and adults; feeding behaviour patterns of young.

RESULTS AND CONCLUSIONS

The quantitative data are summarized in Table 1. Data represent means for the two or three observation periods each week. No data were taken during weeks five and six and data for the last two weeks are combined. To simplify interpretation, all beak contacts with the young initiated by the adults are treated as instances of parental feeding because it was often difficult to decide whether food was being passed.

Table 1

Development of feeding behavior in Kea

Weeks Observ.	Feeding Responses Initiated (Mean)	Feeding Responses Completed (Per Cent)	Parental Feeding (Mean)
1	5	0	41
2	25	50	12
3	59	52	22
4	68	43	5
7+8	87	43	5

It is clear from these data that over the period of observations there was an increase in the average number of feeding acts per hour initiated by the young (without any obvious improvement in feeding efficiency) and a decrease in the feeding of the young by the parents. The gradual development of independent feeding over this period reflects continuing changes in the relation of the young and adult birds with each other and with the available food objects.

Behaviour of the parents

The parental contribution to the development of independent feeding takes at least three forms. First there is the gradual decline in direct feeding of the young by parental regurgitation. Simultaneously, there is a considerable amount of what may be called indirect parental feeding of the young. In the course of their own feeding activities the parents make relatively large quantities of food available to the young either by carrying it directly to the vicinity of the nest box or

by dropping it from perches onto the floor. These behaviour sequences are sufficiently vigorous so that within the first 15 minutes of the observation period substantial amounts of food had been transported to within a foot of the young who were huddled around the nest box. Much of this food had been broken into small pieces or macerated by the parent, making it still more accessible to the young. This indirect parental feeding behaviour declined over the first month or so. As the young became more mobile, the adults would offer bits of food to young on perches. A third contribution to the development of the young's feeding behaviour is the absence of direct adult competition (i.e. by threat or other antagonistic behaviour in the presence of food). Although such behaviour patterns were sometimes shown toward the other adult they were never directed toward the young.

Behaviour of the young

On their emergence from the nest box the fledglings spent most of their time near the box and were almost completely unresponsive to food in their immediate vicinity. The development of independent feeding involves several distinct but overlapping processes. First, there is a gradual increase in locomotion, including both walking and flying, beyond the vicinity of the nest box. In the early part of this period, food encountered en route is ignored. By the end of the 4th week of observation (15th week posthatching) all three young moved easily through all parts of the cage, joining the adults at the front of the cage when food was presented. Second, there is a gradual increase in the initiation of responses to food objects, and in the variety of foods which will elicit such responses. Finally, although it is not evident from Table 1, there is a gradual improvement in the proficiency of the young's feeding behaviour. This is obscured somewhat by the fact that they are simultaneously starting to take new types of food and must develop proficiency with each of the specific foods. (Peanuts and carrots, for example, require very different feeding behaviour).

Development of species-typical feeding behaviour patterns

Adult Kea, like other parrots, have several distinctive modes of feeding. Peanuts and sunflower seeds are husked while being held in the bill. Fruit and greens, including carrots, are impaled on the upper mandible while the tongue and lower bill are moved up and down in a rasping, scraping movement. Their most striking feeding behaviour patterns involve the coordination of beak and foot, either for holding the food down while it is being nibbled or for holding the food in one foot while bringing it into contact with the beak.

Within the 8 week period covered by these observations, none of these feeding behaviour sequences was carried out by the young with a proficiency approximating that of adults. Peanuts and sunflower seeds were usually picked up and dropped without husking. Mandibulating of larger foods held in the beak was only beginning to approximate the typical "rasping" pattern. By the eighth week two birds were making rather clumsy use of the foot to hold an

object down while the beak was brought to it. However, the lack of coordination between beak and foot was striking and the bird would sometimes keep its foot on one object while bringing its beak down to nibble at an adjacent object. Finally, even by week 8 (post hatch week 19) none of the young showed the characteristic adult pattern of holding a food object in one foot and eating it, either while on the floor or while perched on a roost. Our observations suggest that the acquisition of these species-typical feeding behaviour patterns requires a prolonged period of experience with food objects. Further data on the time course of this process would be of interest.

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FOOD OF SKYLARKS AND PIPITS, FINCHES, AND FERAL PIGEONS NEAR CHRISTCHURCH

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The following notes are part of a major study entitled " Ecological aspects of the bird hazard problem at Christchurch International Airport " carried out at the University of Canterbury. Crop contents of a number of species of birds were examined during this study and some are reported upon here.

I. FOOD OF SKYLARKS AND PIPITS

INTRODUCTION

Little information is available on the food of Skylarks *(Alauda arvensis)* and Pipits *(Anthus novaeseelandiae)* in New Zealand. Oliver (1955) reported that Skylarks fed mostly on seeds, including grain, with fruit and insects; while Pipits fed on insects, spiders, earthworms and occasionally small seeds. Falla *et al.* (1970) regarded Pipits as almost entirely insectivorous though some seeds were also taken.

While investigating the food of birds at Christchurch International Airport (Moeed 1970), the gizzards of nine Skylarks and five Pipits were examined. The permanent pasture was kept mown and harboured many insects, spiders, harvestmen and earthworms as well as seeding plants.

RESULTS AND DISCUSSION

Food of Skylarks (Table 1) comprised insects from the orders Coleoptera, Hemiptera, Diptera, Lepidoptera and Orthoptera. Coleoptera, especially Carabidae and Curculionidae, occurred most frequently. Spiders eaten belonged to the family Lycosidae. No harvestmen were recorded. Small seeds were eaten more frequently than invertebrates, except in January.

Pipits fed on similar food to the Skylarks (Table 2) except that the order Orthoptera was absent and one gizzard contained harvestmen.

Seeds formed 75% or more of the items contained in the gizzards of both species but, as most of the seeds were much smaller in size than the invertebrates, their volume in the diet was less. The fewer types of food recorded in the Pipit's diet may be a result of the smaller sample.

TABLE 1— Food items in nine Skylarks (Alauda arvensis)

Food		Number of food items									
		1968							1969		Total
Date		Aug.	Oct.	Nov.	Nov.	Nov.	Nov.	Dec.	Jan.	Jan.	
Skylark Number		1	2	3	4	5	6	7	8	9	
Insects											
Adults											
Rhodopsalta sp.	(Hem.)	-	-	-	-	-	-	2	-	-	2
Nysius sp.	(Hem.)	-	-	1	2	-	-	-	-	-	3
Phaulacridium marginale	(Orth.)	-	-	-	-	-	-	1	-	-	1
Crambus sp.	(Lep.)	-	-	-	-	-	-	3	2	-	5
Costelytra zealandica	(Col.)	-	-	-	3	-	1	-	1	2	7
Carabidae	(Col.)	-	1	18	2	2	-	-	49	-	72
Elateridae	(Col.)	-	-	-	-	1	-	-	-	-	1
Curculionidae	(Col.)	-	7	4	11	-	-	4	7	8	41
Diptera		-	-	-	-	-	-	1	-	2	3
Larvae											
Coleophora sp.	(Lep.)	4	-	-	-	-	-	-	1	4	9
Crambus sp.	(Lep.)	-	-	1	1	-	-	-	-	-	2
Arachnids											
Lycosidae		-	-	-	-	-	-	2	-	-	3
Seeds											
Stellaria media		-	19	116	66	150	-	110	-	-	461
Chenopodium album		-	-	7	-	3	-	-	-	-	10
Anthoxanthum odoratum		-	-	-	13	-	21	-	-	-	34
Erodium sp.		4	11	4	2	5	16	1	-	1	44
Poa sp.		-	-	110	-	25	-	-	-	-	135
Stipa sp.		-	3	-	-	-	-	25	-	-	28
Polygonum sp.		5	-	-	-	-	-	7	-	-	12
Trifolium sp.		-	-	-	1	2	-	-	-	-	3
Oxalis sp.		-	-	-	-	-	36	-	-	-	36

Earthworm remains were not found in either Skylarks or Pipits, perhaps because most of the records were from summer months when earthworms were not present in the top soil (Moeed 1970; Moeed in prep.).

Collinge (1924-27) in the U.K. has reported that Skylarks feed more on seeds than insects (volumetric), in contrast to these data which show that the food consisted of more insects than seeds.

TABLE 2— Food items in five Pipits (*Anthus novaeseelandiae*)

Food		Number of food items					
	Date	1968					
		Jul.	Aug.	Oct.	Nov.	Nov.	Total
	Pipit Number	1	2	3	4	5	
Insects							
Adults							
Nysius sp.	(Hem.)	–	1	2	5	2	10
Coccinella undecimpunctata	(Col.)	–	1	–	–	–	1
Costelytra zealandica	(Col.)	–	–	–	2	–	2
Carabidae	(Col.)	9	1	–	–	–	10
Curculionidae	(Col.)	–	10	12	9	13	44
Diptera		9	21	–	–	–	30
Larvae							
Coleophora sp.	(Lep.)	–	–	–	–	3	3
Crambus sp.	(Lep.)	2	–	–	–	–	2
Arachnids							
Lycosidae		–	3	–	–	–	3
Phalangium opilio	(Opil.)	–	–	2	–	–	2
Seeds							
Stellaria media		–	–	130	–	–	130
Erodium sp.		–	–	26	–	31	57
Poa sp.		–	–	27	–	23	50
Polygonum sp.		–	–	–	2	–	2
Trifolium sp.		–	–	–	–	80	80
Oxalis sp.		–	–	–	–	7	7

Reporting the distribution of Pipits and Skylarks in Otago, Hamel (1972) regarded food supply as one of the factors responsible for their distribution and wrote, " it would be unwise to presume that Skylarks consume even roughly the same range of insects as Pipits." Although based on small samples, the present data show considerable overlap in the diet of Skylarks and Pipits, and competition for food may be important.

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II. FOOD OF HOUSE SPARROWS, GREENFINCHES, GOLDFINCHES AND YELLOWHAMMERS

INTRODUCTION

I examined the crop contents of 15 House Sparrows *(Passer domesticus)*, 6 Greenfinches *(Carduelis chloris)*, 6 Goldfinches *(Carduelis carduelis)* and 2 Yellowhammers *(Emberiza citrinella)* shot between March 1968 and February 1969. All birds were adults.

Except for the Yellowhammers and one Greenfinch (shot in July and September 1968), the birds were collected during the summer when they fed on airfield pasture containing many seeding plants (Moeed 1970). They also fed on adjacent agricultural fields during and after harvesting.

Foods of these birds have been reported and reviewed by many workers, including Collinge (1924-27) for House Sparrows, Greenfinches, Goldfinches and Yellowhammers; Kalmbach (1940), Southern (1945) and Hammer (1948) for House Sparrows; Newton (1967) for Greenfinches and Goldfinches; and Campbell (1972) for Goldfinches.

RESULTS AND DISCUSSION

Table 1 presents the frequency and percentage of occurrence of all food items in the four species studied. Numbers of food items and sampling dates are given in Appendix 1. Grit, in the form of stones and sand, was present in all samples.

In House Sparrows, insects (Coleoptera) formed only 0.5% of the total food. Seeds of *Stellaria media, Triticum* sp., *Lolium* sp, and *Avena* sp. occurred frequently (66.1%); other seeds were eaten either less often or in smaller numbers.

The proportion of insects in the diet was lower than reported in Britain (Collinge 1924-27, Southern 1945), in U.S.A. (Kalmbach, 1940) and in Denmark (Hammer 1948), perhaps because this small New Zealand sample came only from summer months when adult House Sparrows may have been feeding insects to their nestlings.

Greenfinches ate somewhat similar food to the House Sparrows except that Coleoptera were replaced by Lepidoptera. Seeds of *Lolium* sp., *Triticum* sp., *Chenopodium album, Stellaria media* and *Avena* sp. formed 83.4% of the food. Like House Sparrows, insects were eaten less than reported by Newton (1967) in Britain.

The food of Goldfinches differed slightly as insects were absent and some smaller seeds were eaten more frequently. Seeds of *Stellaria media, Lolium* sp., *Oxalis* sp. and *Poa* sp. formed 53.6% of the food. According to Newton (1967) *Taraxacum* sp. seeds were important over short periods, and these formed 28.9% of the food at Christchurch Airport.

In Yellowhammers, Coleoptera and Lepidoptera together amounted to 3.9% while seeds of *Lolium* sp. formed 85.8% of the total food. Although predation on insects overall was low, Yellowhammers fed more on insects than did the previous three species. Collinge (1924-27) has also reported a higher animal content (29.0%) in the diet of Yellowhammers than in House Sparrows, Greenfinches and Goldfinches.

TABLE 1 - Food items in House Sparrows, Greenfinches, Goldfinches and Yellowhammers collected near Christchurch

Food	Percentage of total number of items and frequency							
	House Sparrow n = 15		Greenfinch n = 6		Goldfinch n = 6		Yellowhammer n = 2	
	%	Frequency	%	Frequency	%	Frequency	%	Frequency
Insects								
Coleoptera (Adults)	0.5	3	-	-	-	-	1.0	1
Lepidoptera (Larvae)	-	-	0.5	1	-	-	2.9	2
Seeds								
Anthoxanthum odoratum	1.8	4	1.3	1	3.7	5	-	-
Avena sp.	9.5	9	6.1	3	-	-	-	-
Chenopodium album	3.7	3	13.9	3	3.5	4	-	-
Cytisus sp.	0.6	3	1.3	2	-	-	-	-
Erodium sp.	0.5	2	-	-	1.0	1	1.0	1
Lolium sp.	15.5	5	35.6	4	16.2	4	85.8	2
Oxalis sp.	-	-	-	-	8.0	4	0.5	1
Poa sp.	-	-	-	-	12.5	6	-	-
Polygonum sp.	1.1	2	0.8	1	-	-	-	-
Stellaria media	24.3	4	11.5	1	16.9	5	-	-
Stipa sp.	7.1	5	-	-	2.5	2	4.9	1
Taraxacum sp.	-	-	-	-	28.9	6	-	-
Trifolium sp.	7.3	6	5.3	1	-	-	-	-
Triticum sp.	16.8	13	16.3	4	-	-	-	-
Ulex sp.	0.5	2	1.3	2	-	-	-	-
Vicia sp.	4.8	3	0.8	1	-	-	-	-
Vulpia sp.	5.8	5	5.1	1	6.7	4	3.9	1

APPENDIX 1 — Number of food items in House Sparrows, Greenfinches, Goldfinches and Yellowhammers

Food	1968							1969																						Total
Date	Mar.			Jul.	Sep.			Dec.							Jan.							Feb.								
Bird no.	A1	A2	A3	A4	D1	D2	B1	A5	A6	A7	B2	B3	B4	C1	A8	A9	A10	A11	C2	C3	C4	A12	A13	A14	A15	B5	B6	C5	C6	
Insects																														
Coleoptera (Adults)	2	–	–	–	–	2	–	–	–	–	–	–	–	–	–	2	–	1	–	–	–	–	–	–	–	–	–	–	–	7
Lepidoptera (Larvae)	–	–	–	–	1	5	–	–	–	–	–	2	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	8
Seeds																														
Anthoxanthum odoratum	7	–	–	–	–	–	–	6	2	–	–	–	–	2	–	–	4	–	3	–	1	–	–	–	–	–	5	8	1	39
Avena sp.	16	7	–	–	–	–	–	19	6	17	8	8	–	–	–	–	–	4	–	–	–	8	17	–	4	–	6	–	–	121
Chenopodium album	–	–	–	16	–	–	10	–	–	6	–	–	26	–	–	16	–	–	4	2	–	–	–	–	–	16	–	6	2	104
Cytisus sp.	–	2	–	–	–	–	–	–	–	–	–	–	3	–	2	–	–	–	–	–	–	–	–	–	3	2	–	–	–	12
Erodium sp.	4	–	–	–	2	–	–	–	1	–	–	–	–	–	–	–	–	–	–	4	–	–	–	–	–	–	–	–	–	11
Lolium sp.	–	–	–	–	75	100	9	12	16	–	–	18	–	–	17	–	–	28	–	18	27	88	–	–	–	10	96	7	13	534
Oxalis sp.	–	–	–	–	–	1	–	–	–	–	–	–	–	8	–	–	–	–	6	–	12	–	–	–	–	–	–	–	6	33
Poa sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	16	–	–	–	–	11	6	4	–	–	–	–	–	–	7	6	50
Polygonum sp.	8	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	–	–	–	–	–	–	–	3	–	–	–	–	14
Stellaria media	–	13	78	–	–	–	–	–	–	–	–	–	43	12	–	107	54	–	17	–	19	–	–	–	–	–	–	11	9	363
Stipa sp.	–	–	–	21	19	–	–	7	12	–	–	–	–	4	–	–	7	–	6	–	–	27	–	–	–	–	–	–	–	94
Taraxacum sp.	–	–	–	–	–	–	–	–	–	–	–	–	–	27	–	–	–	–	21	18	16	–	–	–	–	–	–	16	18	116
Trifolium sp.	–	8	12	11	–	–	20	–	–	12	–	–	–	–	–	–	–	–	–	–	–	–	–	17	16	–	–	–	–	96
Triticum sp.	13	12	7	10	–	–	–	16	26	21	26	–	4	–	–	21	20	10	–	–	–	6	6	6	–	13	18	–	–	235
Ulex sp.	–	–	–	–	–	–	–	–	–	–	3	2	–	–	1	–	–	–	–	–	–	–	–	4	–	–	–	–	–	10
Vicia sp.	–	–	16	–	–	–	–	–	–	–	–	–	–	–	6	–	–	–	–	–	–	–	–	28	–	–	3	–	–	53
Vulpia sp.	–	–	4	18	8	–	19	–	–	–	–	–	–	–	12	–	10	–	3	10	9	16	–	–	–	–	–	–	5	114

A = House Sparrow; B = Greenfinch; C = Goldfinch; D = Yellowhammer

Although the samples are small, the results indicate that Goldfinches, which formed feeding flocks with House Sparrows and Greenfinches, fed more on *Taraxacum* sp., *Poa* sp. and *Oxalis* sp. seeds (49.5%). These seeds were not eaten by House Sparrows or Greenfinches, and formed only 0.5% of the food eaten by Yellowhammers. In accord with Gause's hypothesis (in Newton 1967), closely related species living together in the same area would be expected to differ from one another in choice of habitat, food, or feeding place, at least at certain times of the year. Goldfinches appear to have a different feeding niche from the House Sparrows, Greenfinches and Yellowhammers in the same habitat, but the latter three species may be competing for food.

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III. FOOD OF FERAL PIGEONS *(Columba livia)*

Recently, Dilks (1975) has reported in detail the food of Feral Pigeons *(Columba livia)* from Hawke's Bay. The present report gives additional information from Christchurch based on crop contents of 18 Feral Pigeons feeding on the agricultural fields surrounding the Christchurch International Airport (Moeed 1970).

The amount of each food item was assessed on an arbitrary five-point scale from 0-4, indicating absent, traces, some, several and many. The results and the sampling months are presented in Table 1.

According to Dilks, pea (*Pisum* sp.), maize (*Zea* sp.) and barley (*Hordeum* sp.) formed bulk of the food in Hawke's Bay, though other food items were also recorded. In Christchurch the food consisted entirely of pea (*Pisum* sp.), wheat (*Triticum* sp.), oat (*Avena* sp.), clover (*Trifolium* sp.) and vetches (*Vicia* sp.). Seeds of *Vicia* sp. and *Trifolium* sp. were the most consistent food items, being present in 16 out of 18 crops. The two crops in which they were lacking were collected in April. Seeds of *Pisum* sp. were abundant in December, decreased in April and were absent in the August samples. *Avena* sp. and *Triticum* sp. were recorded only in the April sample.

The presence of *Pisum* sp. in December and January and *Avena* sp. and *Triticum* sp. in April and their absence in the August sample was due to their seasonal availability in the study area. The vetches (*Vicia* sp.) were common weeds among the agricultural crops.

Grit in the form of small stones was present in all crops.

TABLE 1 - Food of Feral Pigeons shot on agricultural fields near Christchurch

		Food items and index of abundance *				
Months	Pigeon No.	*Pisum* sp.	*Triticum* sp.	*Avena* sp.	*Trifolium* sp.	*Vicia* sp.
April	1	2	3	4	1	1
"	2	2	3	3	1	1
"	3	2	2	4	0	0
"	4	1	3	4	1	1
"	5	2	3	3	0	0
"	6	1	2	4	1	1
"	7	2	3	3	1	1
"	8	2	3	4	1	1
August	9	0	0	0	4	3
"	10	0	0	0	4	4
"	11	0	0	0	3	4
"	12	0	0	0	4	4
December	13	4	0	0	2	2
"	14	4	0	0	2	2
"	15	3	0	0	2	3
"	16	4	0	0	1	3
"	17	3	0	0	2	2
"	18	4	0	0	1	3

* 0 = Absent, 1 = Traces, 2 = Some, 3 = Several, 4 = Many

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OBSERVATIONS ON ALTITUDES REACHED BY SOME BIRDS IN CENTRAL AND NORTHWEST OTAGO

By PETER CHILD

The table below lists some rather interesting and unusual sightings of 35 species of native and introduced birds from the main unforested ranges of Central Otago and some western ranges and foothills of the Southern Alps, chiefly in the region of Mount Aspiring National Park. (Actually, many of these are local populations quite typical of some of the species concerned, e.g. Rock Wren and S.I. Pied Oystercatcher, but are seldom reported from such altitudes.)

These are mainly summer/autumn records of birds inhabiting a zone (at least temporarily) and engaged in feeding or breeding activities, and do not include those merely drifting about; for instance, I have occasionally seen Black-backed Gulls over the Southern Alps at altitudes reaching at least 9000′, and Keas and Harriers well above their "normal" habitat limits, the latter soaring on mid-summer thermals to 7000′ or so. (An exception to this general limitation is the inclusion of a very unusual sighting of Redpoll at c. 5800′.) A few records of species that are more typically found near sea-level (e.g. Royal Spoonbill and Godwit) are also included.

"True forest species" such as the Cuckoos, N.Z. Pigeon, and Yellow-crowned Parakeet, have not been included although their range sometimes includes the upper limits of the beech forests at c. 3500′. A Bellbird is invariably recorded in the highest beech grove on the moutainside, but not above this level. S.I. Rifleman and Brown Creeper are occasionally found in subalpine scrub, but generally not far away from the treeline. Their range includes the narrow ecotone or transition zone between the forest and the scrub rather than the pure scrub above. The Grey Warbler is common throughout subalpine scrub.

Similarly, "lower" records of species which are common enough on main western valley floors (e.g. S.I. Pied Oystercatcher, Paradise

Duck) have not been included, even although some of these reach 2200′ or so.

Biotic communities on mountainsides are visually distinct belts corresponding to gradients in climatic and physical factors, and identified by characterisitic vegetation climax formations. On a typical " high " range of Central Otago (e.g. Old Man Range, summits 5500′), habitat zonation is as follows:—

1. To c. 2500′: Developed farmland with the common hard tussock *(Festuca novae-zealandiae)* locally abundant. Rocky and shrubby gullies dissect the slopes with matagouri *(Discaria toumatou)* fairly common.

2. To c. 4500′: The narrow-leaved snow tussock *(Chionochloa macra)* takes over and becomes dominant as the altitude increases.

3. To c. 4800′: A narrow zone (200′ - 300′ wide) of blue tussock *(Poa colensoi)* with small subalpine herbs interspersed.

4. Above c. 4800′: Alpine cushion, herbfield and " Central Otago tundra " consisting of ground-hugging herbs, mosses and lichens, with patterned ground and (near and on the broad summits) stoney areas of fellfield and erosion pavement.

Above c. 4000′ headwaters of streams, tarns, rocky cirques, and swampy seepage and meltwater basins are characteristic features, with snowbanks persisting in the highest basins most of the summer.

In the west, montane valley floors (usually carrying domestic stock) with braided shingly riverbeds lie above the southern lakes, from c. 900′ to 1500′, with occasional flats and broad stretches to 2500′ between forested valley walls. The southern beech forests characteristic of this region extend from c. 1200′ to 3400′ or so; subalpine scrub of several species occupies a zone varying from a few feet to a thousand feet wide, reaching its limit at c. 4300′; snow tussock and herbfield extend upwards for another thousand feet, with depleted herbfields and screes above that again, until the permanent rock, glaciers and snowfields are reached at c. 6500′.

Headwater cirques, alpine streams, tarns, bogs, fellfields and glacial moraines are typical of these catchments above the treeline.

For some species the high altitude populations are seemingly sufficiently isolated from their lower relatives to develop racial distinctions as, for example, in the Banded Dotterel and S.I. Pied Oystercatcher on Central Otago ranges, separated by up to 5000′ of tussock slopes from their riverbed populations in the valleys. In the

western ranges the 2000′ or so of beech forest forms an ecological barrier between the subalpine and valley populations of, for example, Yellow Hammer and N.Z. Pipit. (As yet we have no evidence that such evolutionary change has, in fact, occurred here.)

The colonisation of alpine regions in the western ranges by small introduced passerines appears to be a relatively recent phenomenon, at least in the area under discussion, and is one which is likely to continue and expand. It provides an excellent example of the occupation of vacant ecological niches in native habitats, and one is naturally led to speculate on the possible fate of such invaders had the habitats remained unaltered by exotic mammals, and had the former endemics (Bush Wren, Kokako, Laughing Owl, etc.) still been present in goodly number. In the future, it is possible that Greenfinch and Goldfinch might occupy the subalpine scrub/snow-tussock zones, at least in summer. Williams (1969: 445) reported the latter above treeline in Canterbury. Likewise the White-backed Magpie may spread into montane valleys from the Wanaka area (where they are relatively common); they are already present around the lower margins of beech forest at Arthurs Pass.

An exception has been allowed in this article from the requirement that all measurements must follow the metric system and be expressed in SI units since comparison with previously published records (as given in the " References " which follow) will be much easier. However, to convert to metric, note that 1 foot = .305 m, hence 1000′ = 305 m.

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	SPECIES	DATE	ALTITUDE (ft)	HABITAT	NOTES
1	Black Shag	10/11/73	3400	Sphagnum swamp, creek & tarns in valley floor	One immature near the Black-backed Gull colony, Campbell's Creek, W. Old Man Range
2	White-faced Heron	26/11/67	2200	Open stoney riverbed	2 adults feeding along upper Manuherikia R., above Falls Dam
		9/9/71	1300	Open shingly riverbed	1 adult, Hunter R., several miles above Lake Hawea
		10/3/73	2800	Bouldery river gorge in silver beech forest	2 immatures roosting on a boulder, upper W. Matukituki R.
3	Royal Spoonbill	21/10/72	930	Muddy shallow lake margin	1 adult feeding at the head of Lake Wanaka, Makarora
4	Paradise Duck	12/5/65	2170	Moraine lake, subalpine	24 adults, head of Waiatoto R. (An interesting winter record on the W. side of the Main Divide.)
		21/1/71	4000	Moraine lake, subalpine	6 adults, W. Hunter Valley (Rees).
		13/1/73	5100	Subalpine tarns & seepage herbfield	Pair with 4 young, S. Old Woman Ra. (Also often encountered in subalpine tarns, meltwater basins and cirques elsewhere on the unforested ranges of C. Otago, especially Rock & Pillar, Old Man and Old Woman Ranges, at altitudes from c. 3400' to 4900'.)
5	Blue Duck	18/1/74	3300	Riverbed, at tree-line	1 male above the top gorge, Rockburn (Dart). (The very few other records E. of the Main Divide in Mount Aspiring National Park are between 2000' - 2500'.)
6	N.Z. Scaup	13/1/74	3400	Moraine lake, subalpine	Pair with young, among Paradise Ducks, N. Wilkin.
7	Harrier	31/12/64	4700	Subalpine snow tussock slopes	A nest with 2 fresh eggs (bird flushed) in Fraser Basin, W. Old Man Range. (Also seen at various times quartering subalpine hillsides up to c. 5300' on the Old Man Ra., & Dunstan Mountains & elsewhere but is uncommon above c. 3000'.)
		12/4/74	3800	Subalpine scrub & tussock	A rare sighting (of 1 adult) at this height in western ranges; headwaters Blue Duck Stream (Dart).
8	N.Z. Falcon	21/2/65	6100	Alpine herbfield & rocky outcrops	One swooped down on party on ridge of Black Peak (Matukituki Valley) — possibly nesting in nearby bluffs.
		7/12/68	5200	Alpine herbfield and tundra	One calling and flying around a basin inhabited by Black-backs and S.I.P.O., N. end Old Man Ra.
		21/3/71	6888	Alpine herbfield & rocky summits	One flying about summits of Treble Cone (Matukituki Val.) searching for prey (10 a.m.).
		26/1/72	5800	Alpine tussock & herbfield	One swooped down on us near Lake Alta, Remarkables.
		9/5/72	5500	Alpine bluffs & rough gullies	One in level flight — head of Tiel Val. (Makarora). (Other sightings at high altitudes usually c. 3000' - 5000'.)

	SPECIES	DATE	ALTITUDE (ft)	HABITAT	NOTES
9	Chukor	23/1/65	5000	Snow tussock & talus	A pair below French Ridge, W. Matukituki.
		21/2/65	4500	Dense snow tussock gully	4, on slopes of Black Peak, Matukituki Val.
		14/2/70	6000	Alpine herbfield & rocky outcrops	5, on E. ridge, Mt. Aosta, E. Matukituki.
		26/1/72	6000	Alpine herbfield & snow tussock	3 on track to Lake Alta, Remarkables. Others heard among talus slopes above this altitude. 4 more at same altitude between Wye and Doolan's Creek, similar habitat. (Most other records between 2000' - 4500'.)
10	S.I. Pied Oystercatcher	31/1/64	5200	Subalpine swampy cirque	3 adults E. side, Hawkdun Ra.
		11/12/64	6000	Alpine tarns & swamp	3 adults near Lake Alta, Remarkables.
		18/12/67	5200	Subalpine tundra	Nest with 1 egg, near Gordon's Rock, Pisa Ra. (1 adult nearby.)
		20/12/67	4200-5200	Subalpine tundra, tarns, meltwater basins	42 counted, mostly paired, along summits of Old Woman Ra.
		7/12/68	5200	Subalpine tundra	Pair with freshly hatched chick and fragments of another eggshell in nest, N. end Old Man Ra. Black-backs & a Falcon nearby.
		16/2/69	5500	Subalpine tundra	Pair with 2 flying young, near L. Mackay, Pisa Ra.
		15/12/69	5500	Subalpine tundra	Pair with nest containing 2 eggs, beside Lake Mackay, Pisa Ra
		10/11/71	5300	Subalpine tundra	Pair with nest containing 2 eggs, E. side Old Man Ra.
		7/3/71	5300	Subalpine tundra & swamp	5 wheeling about with 1 Banded Dotterel, W. side Old Man Ra.
		13/11/71	5200	Subalpine tundra	1 banded adult probably with nest; summit Old Woman Ra.
		27/1/72	5800	Subalpine herbfield & tarns	3 adults at head of Wye Creek, Remarkables (probably had chicks). (Plenty of other sightings, 3000' - 5500', on and near summits of the unforested ranges of C. Otago but not above tree-line at these altitudes in western valleys near Main Divide.)
11	Spur-winged Plover	3/9/68	2000	Riverbed and short tussock	6 adults at Cattle Flat, upper Dart. (Also one pair here 12/4/74.)
		19/10/69	2200	Riverbed & river flats	6 adults mid-Nevis Valley; probably had chicks.
		19/1/70	2000	Riverbed & river flats	1 pair on airstrip flats, Wilkin Val.
		10/11/73	3400	Swampy flats & valley floor	1 pair in Campbell's Creek, W. Old Man Ra.
		2/12/73	2500	Short tussock on ridge	1 pair with young near Bridge Huts, Teviot River.

SPECIES	DATE	ALTITUDE (ft)	HABITAT	NOTES
12 Banded Dotterel	20/12/67	5100-5500	Subalpine herbfield & tundra	55 counted along summits of Old Woman Ra.
	16/3/68	5400	Subalpine herbfield & tundra	A flock of 39, including some juveniles, summit Old Man Ra.; rather restless and wheeling flights, perhaps preparatory to migration.
	13/12/68	5400	Subalpine tundra	First high altitude nest found — female sitting — 3 eggs.
	16/2/69	5600	Subalpine tundra	Still about on Pisa Ra. summits near L. Mackay.
	12/12/71	6100	Subalpine tundra & fellfield	A lone male feeding on top of the Hawkduns. Elsewhere in C. Otago regular records in suitable habitats on the unforested ranges, from 3000' - 6200', but not at these altitudes in western ranges.)
13 Eastern Bar-tailed Godwit	22/10/72	930	Swampy lakeside field & mud	4 among S.I.P.O. at West Wanaka — feeding.
	4/11/73	930	Swampy lakeside field & mud	2 in same area.
14 Pied Stilt	26/11/67	2300	Stony riverbed	A pair (probably nesting) — upper Manuherikia R.
	19/10/69	2200	Shingly riverbed & flats	16 along mid-Nevis R.; one nest seen with 3 eggs.
15 Black-backed Gull	Various	to 6000	Subalpine lakes, tarns, cirques, and swampy basins	Common along summit basins of unforested C. Otago ranges from c. 3000'-6000'; and fewer numbers between c. 3500' - 5500' in similar basins above subalpine scrub in valley headwaters and cirques of western ranges, e.g. in Mount Aspiring National Park.
16 Black-billed Gull	5/11/67	2200	Stony riverbed & islands	Colony containing 68 nests; egg-laying started; upper Manuherikia R., above Falls Dam.
	15/12/69	5500	Subalpine lake	47 among Black-backs, swimming on Lake Mackay, N. Pisa Ra. No evidence of nesting here.
	1/1/73	5300-5600	Subalpine streamsides & swampy depressions	15 in one gully, 7 in next; flying about and feeding; no evidence of nesting; S. Pisa Ra. near Mt Dotterel.
17 Black-fronted Tern	26/11/67	2200-2300	Stony riverbed & tussocky flats	71 counted along upper Manuherikia R. above Falls Dam. 3 small colonies starting, 3 nests seen with eggs.
	19/10/69	2200	Shingly riverbed & islands	32 counted along mid-Nevis R. No breeding started.
	2/11/69	2500	Streamside and lake	4 adults hawking insects over water, Fraser Dam.
	12/12/71	3500	Tussocky ridges & gullies	Several adults appeared to be hawking moths above the tussock at dusk on a very warm summer's evening, W. slopes Hawkdun Ra.
18 Caspian Tern	25/10/71	1730	Shingly riverbed & islands	2 adults calling & harassing Black-backs; no nest found but a likely habitat; Hopkins R., above L. Ohau.

	SPECIES	DATE	ALTITUDE (ft)	HABITAT	NOTES
19	Kea	Various	to 6000	Alpine scrub, bluffs, fellfield	Small numbers in all main valleys of Mount Aspiring National Park; usually below 5000', but occasionally encountered on ridges to 6000' or more.
20	Kingfisher	21/10/72	1000	Riverbed & streamside	One adult at Makarora (near Tourist Centre).
21	Rock Wren	21/2/65	7566	Alpine rock and fellfield	A pair on the summit of Black Peak, Matukituki Valley.
		22/2/69	6600	Alpine rock and fellfield	One on summit rocks of Shark's Tooth, busily foraging in crevices; Matukituki Val.
		17/1/70	7700	Alpine rock and fellfield	A pair on the summit rocks of Mt Aeolus, Wilkin Val.
		20/1/71	to 7500	Alpine rock and fellfield	Pairs up to the col between Mts Head & Moira, Rees Val.
22	Skylark	Various	to 6300	Short tussocky open ground, subalpine herbfield & tundra	Common in summer to the summits of unforested ranges of C. Otago. (Not on subalpine tussock slopes of the western ranges.)
		11/12/67	5400	Blue tussock zone	First high altitude nest found — 3 eggs — Old Man Ra.
		1/1/73	5600	Subalpine tundra	Highest nest found so far — 3 eggs — S. Pisa Ra.
23	S.I. Robin	14/4/74	to 2500	Beech forest	Found in valley floor forest as far up as Whitburn Junction, Dart Val.
24	Song Thrush	22/2/74	3300	Subalpine scrub	1 seen near Lake Diana, N. Wilkin; but quite rare in subalpine scrub in Mount Aspiring National Park.
25	Blackbird	Various	3400-4300	Subalpine scrub	Occasional birds above tree-line in most valleys of Mount Aspiring National Park east of Main Divide.
26	Hedge Sparrow	Various	3400-4300	Subalpine scrub	Not uncommon above treeline in most valleys of Mount Aspiring National Park east of Main Divide.
		25/4/74	4900	Subalpine bouldery cirque	A pair among boulders in Gorge Creek cirque, east side Old Man Ra. (no scrub here).
27	N.Z. Pipit	Various	to 6300	Tussocky slopes, subalpine tundra and fellfield	Thinly distributed in most areas at and near the summits of unforested ranges of C. Otago; and to similar altitudes (mainly on ridges) of similar subalpine habitats in the Western ranges.

	SPECIES	DATE	ALTITUDE (ft)	HABITAT	NOTES
28	Silvereye	Various	3400-4300	Subalpine scrub	Small flocks not uncommon in subalpine scrub, especially Mountain Totara & Ribbonwood, in most valleys of Mount Aspiring National Park east of Main Divide.
29	Greenfinch	10/3/73	2000	Alpine valley floor grassland	10 feeding on thistles at Shovel Flat, W. Matukituki. (But not yet recorded in subalpine scrub.)
30	Goldfinch	11/3/73	1700	Alpine valley floor grassland	A few feeding on thistles near Aspiring Hut, W. Matukituki. (But not yet recorded in subalpine scrub.)
31	Redpoll	Various	3400-4300	Subalpine scrub	Small flocks not uncommon above treeline, Mount Aspiring National Park.
		9/5/72	5800	Subalpine tussock	A flock of c. 20 flew across from Tiel to Siberia (Makarora).
32	Chaffinch	Various	3400-4300	Subalpine scrub	Not uncommon throughout above treeline in Mount Aspiring National Park east of Main Divide.
33	Yellow Hammer	Various	3400-4800	Subalpine scrub and snow tussock grassland	Rather rare — occasional birds seen in a few places above treeline to above subalpine scrub limits in Mount Aspiring National Park east of Main Divide.
		1/1/73	5100	Subalpine tussock & herbfield	2 males singing from tors, S. Pisa Ra.
34	Starling	27/9/69	4400	Subalpine tundra & herbfield	2 at old ski hut, S. end Rock & Pillar Ra.
		13/1/73	4400	Subalpine bouldery cirque	A pair appeared to be feeding young in a crevice in a hugh boulder, S. Old Woman Ra.
35	White-backed Magpie	16/11/68	3800	Subalpine swamp & tussock	4 adults feeding on the ground, N. end Rock & Pillar Ra.

SEA BIRDS FOUND DEAD IN NEW ZEALAND IN 1965 AND 1966

By P. E. ROBERTS

ABSTRACT

During 1965, 1406 sea birds and during 1966, 1102 sea birds were recovered from 1064 km and 785 km of New Zealand beaches. Monthly recovery rates indicated that sea bird mortality was usually higher in spring and summer (September to February) than in autumn and winter (March to August). Two wrecks were recorded during the two-year period, both on Wellington West coast beaches, and following periods of westerly or south-westerly winds. From September to December 1965 species affected included Fairy Prion, Sooty Shearwater, Short-tailed Shearwater, Fluttering Shearwater and Diving Petrel. In July 1966 there was a wreck of Lesser Broadbilled Prions. Uncommon species found were Blue Petrel, Fiordland Crested Penguin, Pycroft's Petrel and Antarctic Fulmar (all in 1965), and Arctic Skua (in 1966).

INTRODUCTION

The Ornithological Society of New Zealand's Beach Patrol Scheme was set up in 1951 to record the numbers of birds found on the coast, together with information on date, locality, length of beach patrolled and freshness of specimens. Since 1960, annual reports have been prepared summarizing results from this scheme (see Imber & Boeson 1969). Results from 1965 and 1966 are given below. References to weather were taken from New Zealand Meteorological Service notes published in the *New Zealand Gazette.*

RESULTS AND DISCUSSION

During 1965, 197 beach-patrol cards were completed. These showed that 1420 birds, including 1406 sea birds (Tables 1 - 3) were recovered from 1064 km (661 miles) of New Zealand coasts by 38 OSNZ members and friends. Patrols were made in 12 of 15 beach-patrol zones (see Imber & Boesen 1969, Fig. 1). However, much of the effort (61% of distance travelled) was spent in Wellington West zone (Wanganui River to Cape Terawhiti). In the text and Table 1 " km travelled " is the total distance walked by patrollers whereas " km covered " is the length of coast inspected at least once during the month and omits distances of subsequent visits to particular beaches.

The monthly recovery rate (number of birds per km covered) was high from September to February (0.7 - 7.1 birds/km) compared with other months (0.1 - 0.3 birds/km) except June (0.9 birds/km) when there was a small "wreck" of Fairy Prions (14 specimens), Sooty Shearwaters (2), Short-tailed Shearwaters (4) and Diving Petrels (27) in the Wellington West zone. Highest monthly recovery rate (7.1 birds/km) occurred during October when there was a wreck of mainly Fairy Prions (123 specimens) and unidentified prions (357 *Pachyptila* spp.) on Wellington West coast. Small numbers of Northern Diving Petrels (27), Buller's Shearwaters (9), Sooty Shearwaters (10), Short-tailed Shearwaters (10), Fluttering Shearwaters (26), Hutton's Shearwaters (7) and White-headed Petrels (2). Other less common species were also found (Table 2). Altogether 611 sea birds (43.5% of the number recovered in 1965) were recorded along Wellington West beaches in October. Beach patrols were carried out in only two other zones in this month. On one of the three other patrols made during October, 35 Fluttering Shearwaters were found on 4 km of Auckland East zone.

The Wellington West wreck continued through November and December, with Fairy Prion (68 specimens in November and 84 in December, Sooty Shearwater (19 and 48) and Short-tailed Shearwater (6 and 39) the most affected species. Although little patrolling was carried out in other zones high recovery rates in short distances of Auckland West zone in November (2.8 birds/km including 11 Sooty Shearwaters) and Taranaki zone in December (3.1 birds/km including 6 Sooty Shearwaters, 3 Short-tailed Shearwaters, 2 Fluttering Shearwaters, 2 Fairy Prions) suggested that the wreck extended along the west coast of the North Island.

Meteorological records for 1965 show that unusually persistent westerly winds affected the New Zealand region throughout September and early October. November was cold and wet as a series of depressions brought unsettled weather to the whole country. In late December a very deep depression moved from Campbell Island on to New Zealand and resulted in gale force north westerly winds in Cook Strait, and unseasonably cold weather.

The westerlies in September affected local species (e.g. Fairy Prion, Northern Diving Petrel) as well as migrants (e.g. Sooty Shearwater, Buller's Shearwater) returning to breeding grounds. Short-tailed Shearwaters were severely affected by these storms and 68 were recovered in 1965, more than in any previous year for which data are available (i.e. from 1960-64 an average of 11 Short-tailed Shearwaters were recovered each year). First recoveries were made on 6 October, soon after sexually mature adults return to Southern Australia breeding grounds, usually in the last week of September. There was a second peak of recoveries in December (Table 3), probably of immature and non-breeding birds which return later than breeders. Similar wrecks of this species have subsequently been

recorded (755 specimens in 1968, 100 specimens in 1969) on west coast beaches, again following periods of persistent westerly winds (Imber & Crockett 1970, Imber 1971).

The 3 Blue Petrels found during the above wreck were the first since 1960. The 35 Buller's Shearwaters (25 in Wellington West zone between September and December) was the highest number since annual records began in 1960. Other rarely found birds (Table 2) included 2 Fiordland Crested Penguins, 1 Pycroft's Petrel and 1 Antarctic Fulmar.

From 19 September to 16 October 371 unidentified prions *Pachyptila* spp., (90% of the 1965 total for this category) were found on Wellington West coast (Table 3). This suggests that large numbers of prion corpses float offshore in northern Cook Strait before being blown onto beaches by persistent westerly winds.

Other species not listed in the tables were Black Swan (4), Mallard (1), Pukeko (1), Oystercatcher (1), Rock Pigeon (2), Song Thrush (1), Magpie (2) and domestic species (2).

During 1966, 136 beach patrols were recorded by 60 OSNZ members and friends. Altogether 1102 sea birds and 17 other birds were recovered from 784.5 km (488 miles) of beach in 10 coastal zones (Tables 4 - 6). Most patrols (94% of distance travelled) were in four zones: Auckland West, Taranaki, Wellington West and Auckland East, and a correspondingly high proportion (i.e. 94% of total birds collected) were found in these zones. The total number of birds found was the lowest since annual records were started in 1960, but relatively little patrolling was done and the average of 1.4 sea birds per km travelled was equal to the 1960-1965 mean. As in 1965, recovery rate was lower from March to August except for a wreck of Lesser Broad-billed Prions in July, which occurred on Wellington West zone beaches.

This wreck was first noticed in early July after a period of strong south-westerly winds. During the weekend 2-3 July most beaches between Wanganui and Pukerua Bay in the Wellington West zone were examined, and 235 Lesser Broad-billed Prions (78% of the 1966 total of this species) were recovered. The wreck appeared to be a very local one, as all except one of these were found between Foxton and Pukerua Bay, in the southern half of the area patrolled. Also no fresh specimens were picked up on any beach after 3 July. Only one specimen was found in Taranaki zone (in July) and another 12 very dried specimens in Auckland West zone (all in August). Together with the Lesser Broad-billed Prions, 44 Fairy Prions were recovered. This represented 57% of the number of this species found during the year. Mortality of Fairy Prions as indicated by beach patrol records appeared to be low in 1966 with only 75 recoveries, compared with an average of 299 during the previous six years.

Two hundred and three Blue Penguins were recovered during 1966. In comparison, the annual totals between 1960 and 1965

ranged between 61 and 113 (90 per year on average over that period). About half (106 specimens) of those found in 1966 were recorded from Auckland East zone during September and October. From 1960-1965 beaches in this area have been patrolled in September and October only in 1965 (when 5 specimens were recovered from 11.4 km of beach) and the apparent low mortality of previous years probably resulted from inadequate sampling. However, New Zealand Meteorological Office records show that there were unusually frequent north-easterly winds in September 1966, and these on-shore conditions would have also helped to cast corpses on the beaches.

There was probably one other wreck during the year, on Auckland East coast in January. Only one patrol was carried out, in early February, along 6.4km of Pakiri Beach. On this occasion 64 birds of 17 species were recorded. The list included a Giant Petrel, 6 Grey-faced Petrels, 1 White-headed Petrel, 5 Cook's Petrels, 5 Short-tailed Shearwaters, and 34 other petrels and shearwaters. The corpses were all between one and four weeks old indicating the wreck occurred in January. The Short-tailed Shearwaters were probably part of the population weakened by westerly storms in the Tasman Sea in December and blown to the east coast of New Zealand before dying. However, their occurrence on the Auckland East coast was surprising as only one other specimen was found from September to December 1965 on the west coast north of Taranaki, indicating that few birds of this species were present in northern waters.

Other species found during 1966 were Black Swan (2), Mallard (2), Grey Duck (1), Australian Harrier (1), Rock Pigeon (2), Morepork (1), House Sparrow (1), Starling (1) and Magpie (6).

Specific names of sea birds mentioned in the text are:

Eudyptula minor	Blue Penguin
Eudyptes pachyrhynchus pachyrhynchus	Fiordland Crested Penguin
Macronectes giganteus	Giant Petrel
Fulmarus glacialoides	Antarctic Fulmar
Pterodroma macroptera	Grey-faced Petrel
Pterodroma pycrofti	Pycroft's Petrel
Pterodroma cooki	Cook's Petrel
Halobaena caerula	Blue Petrel
Pachyptila salvini	Lesser Broad-billed Prion
Pachyptila turtur	Fairy Prion
Puffinus bulleri	Buller's Shearwater
Puffinus griseus	Sooty Shearwater
Puffinus tenuirostris	Short-tailed Shearwater
Puffinus gavia	Fluttering Shearwater
Puffinus huttoni	Hutton's Shearwater
Pelecanoides urinatrix	Northern Diving Petrel

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TABLE 1.

ZONE	CODE		MONTH J	F	M	A	M	J	J	A	S	O	N	D	TOTAL KM	NUMBER BIRDS	BIRDS/KM COVERED
Auckland West	AW	km	6.4	3.2	2.4	2.4	3.2	5.6	1.6	54.7	4.8	-	7.2	2.4	94.1		0.5
		covered birds	1	4	3	0	1	3	1	10	2	-	20	2		47	
Taranaki	T	km	-	-	-	-	-	-	-	-	-	-	-	6.4	6.4		3.1
		birds	-	-	-	-	-	-	-	-	-	-	-	20		20	
Wellington West	WW	km	27.4	22.5	-	22.5	36.2	46.7	33.0	22.5	40.2	74.0	37.0	83.7	445.8		2.7
		birds	31	44	-	2	9	54	10	2	43	611	119	257		1182	
Westland	WD	km	3.2	-	-	-	-	-	-	-	-	-	16.1	-	19.3		0.1
		birds	0	-	-	-	-	-	-	-	-	-	2	-		2	
Auckland East	AE	km	4.8	-	3.2	-	4.8	4.8	1.6	4.8	4.8	5.6	1.6	6.4	42.6		1.4
		birds	2	-	2	-	1	2	0	1	3	43	0	6		60	
Bay of Plenty	BP	km	8.0	12.9	8.0	4.8	-	-	-	-	11.3	-	-	-	45.1		1.4
		birds	54	3	3	0	-	-	-	-	1	-	-	-		61	
Wairarapa	WA	km	-	4.8	-	-	2.4	-	22.5	-	-	-	-	-	29.8		0.1
		birds	-	1	-	-	0	-	0	-	-	-	-	-		1	
Canterbury North	CN	km	1.6	12.1	-	-	1.6	-	-	-	-	-	-	-	15.3		0.5
		birds	3	5	-	-	0	-	-	-	-	-	-	-		8	
Otago	O	km	1.6	3.2	17.7	-	3.2	4.8	4.0	-	-	12.9	1.6	1.6	50.7		0.2
		birds	3	0	0	-	1	0	1	-	-	1	1	2		9	
Wellington South	WS	km	3.2	18.5	-	-	-	2.4	-	-	-	-	-	2.4	26.5		0.3
		birds	1	6	-	-	-	0	-	-	-	-	-	0		7	
South Island North Coast	SN	km	3.2	-	-	-	-	-	-	-	-	-	-	-	3.2		0.3
		birds	1	-	-	-	-	-	-	-	-	-	-	-		1	
KM Travelled (not listed above)			74.0	80.5	61.2	44.2	60.3	92.5	67.6	88.5	89.3	174.6	86.1	144.8	1063.8		
KM Covered			59.5	70.8	43.5	29.8	49.9	64.4	64.4	82.1	61.2	92.5	64.4	103.0	785.4		
Birds Recorded			96	66	13	2	12	59	12	13	49	655	142	287		1406	
Birds/km covered			1.6	0.9	0.3	0.1	0.2	0.9	0.2	0.7	7.1	2.2	2.8				1.8

TABLE 1 — Numbers of dead sea birds recorded and distance patrolled in each coastal zone in 1965. Distances were recorded in miles and data were totalled before conversion to metric units. There are thus small differences between rows or columns and their totals.

TABLE 2.

SPECIES	NUMBER FOUND	COAST (MONTH)
Eudyptula albosignata	1	CN (3)
Eudyptes pachyrhynchus pachyrhynchus	2	WW (10) WD (11)
Diomedea exulans	3	CN (1,1,1)
D. *chrysostoma*	5	AW (8,9) WW (6,6,6)
D. bulleri	2	AW (6) WW (10)
Phoebetria palpebrata	2	AW (8) WW (9)
Macronectes giganteus	4	WW (6,7,12,12)
Fulmarus glacialoides	1	WW (10)
Pterodroma lessoni	3	AW (8) WW (10,10)
P. inexpectata	5	AW (11) WW (12,12,12) SN (1)
P. pycrofti	1	BP (1)
P. cooki cooki	1	AE (3)
Halobaena caerula	3	WW (10,10,12)
Pachyptila salvini	2	AW (8) WW (10)
Procellaria cinerea	1	WW (11)
P. aequinoctialis	1	WS (2)
Puffinus assimilis	5	WW (1, 12,12) WD (11) BP (1)
Pelagodroma marina maoriana	5	AW (11) BP (1,1,1,1)
Phalacrocorax carbo	3	T (12) WW (10,10)
P. melanoleucos brevirostris	1	WW (10)
Stictocarbo punctatus	1	AW (3)
Larus bulleri	1	O (10)
Hydroprogne caspia	1	AW (8)
Sterna striata	4	WW (12) CN (3) CS (2,2)
	58	

TABLE 2 — Less common sea birds (1-5 specimens) found dead in 1965. Zone code and month of discovery (in brackets) is given.

NOTE: The record of *Puffinus pacificus* is unconfirmed and probably erroneous (R. B. Sibson personal communication).

TABLE 3.

SPECIES	COAST AW	T	WW	AE	BP	WA	CH	CS	O	WS	MONTH 1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
Eudyptula minor	4	1	38	7	8	-	-	2	1	-	9	3	2	1	1	2	1	-	3	7	5	27	61
Diomedea cauta cauta	1	-	5	-	1	-	-	-	-	-	2	-	-	-	-	2	-	1	-	-	1	1	7
Diomedea spp.	-	-	7	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	1	3	-	1	7
Daption capensis	1	-	8	-	-	-	-	-	-	-	-	-	-	-	-	1	-	1	-	3	3	1	9
Pterodroma macroptera		1	-	-	10	-	-	-	-	-	9	1	-	-	-	-	-	-	-	-	-	1	11
Pachyptila vittata	-	-	7	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	3	-	3	7
P. desolata	-	-	8	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	7	-	-	8
P. belcheri	-	-	7	-	-	-	-	-	-	-	1	-	-	-	-	-	-	-	1	5	-	-	7
P. turtur	3	2	349	2	3	-	1	-	1	-	13	40	1	1	1	14	2	1	7	125	70	86	361
Pachyptila spp.	-	-	410	-	-	-	-	1	-	-	-	1	-	-	-	12	1	1	16	357	10	13	411
Puffinus carneipes	-	-	5	2	10	-	-	-	-	-	6	2	1	-	-	-	-	-	-	-	-	6	17
P. bulleri	-	-	26	2	7	-	-	-	-	-	7	-	1	-	2	-	-	-	5	9	2	9	35
P. griseus	11	6	95	-	2	-	-	-	2	-	16	3	-	-	-	2	-	-	-	10	31	54	116
P. tenuirostris	1	3	61	-	2	-	-	-	1	-	3	-	-	-	1	4	-	-	-	10	7	43	68
P. gavia gavia	1	2	37	37	3	-	-	-	-	-	5	-	-	-	1	1	-	-	4	61	2	6	80
P. huttoni	-	-	17	-	-	-	1	-	-	-	-	-	1	-	-	1	-	-	1	7	1	7	18
Puffinus spp.	-	2	4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1	-	-	-	5	6
Pelecanoides urinatrix	-	-	37	3	7	-	-	-	-	-	7	-	-	-	-	7	-	-	3	28	-	2	47
Sula bassana serrator	8	1	12	-	-	-	-	-	-	-	-	4	1	-	1	4	1	1	3	4	-	2	21
Larus dominicanus	4	-	19	2	-	1	1	2	4	3	3	6	2	-	4	2	4	1	2	3	3	6	36
L. novaehollandiae	3	1	2	4	2	-	-	1	-	2	2	3	-	-	-	1	1	1	-	1	2	4	15
TOTAL	37	19	1154	59	55	1	3	6	9	5	85	63	9	2	12	54	11	8	47	643	137	277	1348

TABLE 3 — Zonal (left side) and monthly (right side) distribution of more common sea birds found dead in 1965.

TABLE 4 — Numbers of dead sea birds recorded and distance patrolled in each coastal zone in 1966. Distances were recorded in miles and data were totalled before conversion to metric units. There are thus small differences between rows or columns and their totals.

TABLE 4.

ZONE	CODE		MONTH J	F	M	A	M	J	J	A	S	O	N	D	KM	TOTAL NUMBER BIRDS	BIRDS/KM COVERED
Auckland West	AW	km covered	31.4	-	9.7	-	9.7	4.0	1.6	66.8	37.0	2.4	38.6	3.2	204		0.8
		birds	14	-	0	-	4	1	7	23	15	0	74	15		153	
Taranaki	T	km	3.2	-	12.1	13.7	13.7	16.0	12.1	3.2	12.1	14.5	10.5	2.4	113.5		0.6
		birds	12	-	13	8	1	6	3	0	3	3	13	1		63	
Wellington West	WW	km	23.3	3.2	-	-	-	-	104.6	4.8	38.6	-	4.8	9.7	189.1		2.6
		birds	24	11	-	-	-	-	375	4	15	-	5	58		492	
Westland	WD	km	1.6	-	-	-	-	-	-	-	-	-	-	-	1.6		0.6
		birds	1	-	-	-	-	-	-	-	-	-	-	-		1	
Auckland East	AE	km	4.8	11.3	4.8	-	7.2	-	-	0.8	48.3	22.5	4.8	11.3	115.9		2.8
		birds	1	98	5	-	3	-	-	2	127	60	24	8		328	
Bay of Plenty	BP	km	-	5.6	-	-	-	-	-	-	-	-	-	3.2	8.8		4.8
		birds	-	4	-	-	-	-	-	-	-	-	-	38		42	
Wairarapa	WA	km	-	-	-	-	-	-	3.2	-	-	-	-	-	3.2		0
		birds	-	-	-	-	-	-	0	-	-	-	-	-		0	
Otago	O	km	-	0.8	0.8	2.4	-	-	1.6	-	0.8	1.6	-	3.2	11.3		0.5
		birds	-	1	3	1	-	-	0	-	1	0	-	2		7	
Wellington South	WS	km	-	-	-	-	1.6	1.6	-	1.6	-	-	-	8.0	12.9		1.2
		birds	-	-	-	-	1	1	-	1	-	-	-	13		16	
South Island North Coast	NCS	km	-	-	-	-	-	-	-	0.8	-	-	-	-	0.8		1.3
		birds	-	-	-	-	-	-	-	1	-	-	-	-		1	
Km travelled (not listed above)			64.4	27.4	30.6	18.5	32.2	21.7	202.8	106.2	140.0	41.0	58.7	41.0	784.5		
Km covered			64.4	20.9	27.4	16.1	32.2	21.7	123.1	78.1	136.8	41.0	58.7	41.0	661.4		
Birds recorded			52	114	21	9	9	7	335	32	161	63	116	133		1102	
Birds/km covered			0.8	5.5	0.8	0.6	0.3	0.3	3.1	0.4	1.2	1.5	2.0	3.2			1.7

TABLE 5.

SPECIES	NUMBER FOUND	COAST (MONTH)
Diomedea melanophris	1	WW (9)
Diomedea cauta cauta	1	WW (9)
Diomedea cauta salvini	1	AW (1)
Diomedea spp.	2	WS (5), WW (7)
Pterdroma lessoni	3	AE (2), WW (12, 12)
P. inexpectata	3	WW (1, 12), AW (12)
P. brevirostris	1	WW (9)
Pachyptila desolata	2	WW (7), AE (9)
P. belcheri	4	WW (7, 7, 8), AW (9)
Procellaria cinerea	3	BP (12)
Puffinus pacificus	1	AW (11)
P. huttoni	2	WW (12)
P. assimilis	4	AE (9), AW (11, 11), WW (12)
Puffinus spp.	2	WW (7)
Phalacrocorax carbo	2	AW (5), BP (12)
P. melanoleucos	2	AW (1), BP (12)
Stictocarbo punctatus	3	WW (7), AW (8, 12)
Stercorarius parasiticus	1	AE (5)
Larus bulleri	1	WD (1)
Hydroprogne caspia	1	AW (5)
	40	

TABLE 5 — Less common sea birds (1-5 specimens) found dead in 1966. Zone code and month of discovery (in brackets) is given.

TABLE 6.

SPECIES	COAST								MONTH												
	AW	T	TW	AE	BP	O	WS	NCS	1	2	3	4	5	6	7	8	9	10	11	12	Total
Eudyptula minor	30	14	22	134	-	-	3	-	4	21	5	-	2	1	5	1	75	37	34	18	203
Macronectes giganteus	2	-	-	3	-	-	1	-	-	1	-	-	-	-	-	1	2	-	1	1	6
Daption capensis	-	1	2	2	-	-	1	-	-	-	-	-	-	-	1	1	2	1	-	1	6
Pterodroma macroptera	-	-	-	10	-	-	1	-	-	7	-	-	-	-	-	-	3	-	-	1	11
P. cooki	1	-	-	9	-	-	-	-	-	7	2	-	-	-	-	-	-	-	-	1	10
Pachyptila vittata	2	-	5	-	-	-	-	-	1	-	-	-	-	-	5	-	-	-	1	-	7
P. salvini	15	1	282	1	-	-	-	-	-	-	-	-	-	-	281	14	3	-	1	-	299
P. turtur	14	-	49	10	-	-	2	-	16	9	-	-	-	-	11	1	2	4	8	24	75
Pachyptila spp.	3	-	55	4	-	-	-	-	-	3	-	-	-	-	44	3	8	4	-	-	62
Puffinus carneipes	3	-	-	12	2	-	-	-	1	11	-	-	-	-	-	-	-	-	1	4	17
P. bulleri	-	-	3	12	6	-	1	-	1	11	-	-	-	-	1	-	-	2	-	7	22
P. griseus	42	1	14	20	11	1	1	-	5	4	1	1	-	-	-	-	-	-	48	31	90
P. tenuirostris	2	-	3	6	-	-	1	-	2	6	-	-	-	-	-	-	-	-	1	3	12
P. gavia	10	6	15	43	1	-	-	-	1	14	1	-	-	-	15	4	29	7	1	3	75
Pelagodroma marina	-	-	-	8	-	-	-	-	-	2	-	-	-	-	-	-	5	-	1	-	8
Pelecanoides urinatrix	-	2	5	21	10	-	-	-	-	6	1	-	1	1	3	-	7	3	4	12	38
Sula bassana	3	1	2	11	1	-	-	-	-	5	2	-	-	-	2	-	5	1	2	1	18
Phalacrocorax varius	-	-	-	1	5	-	-	1	-	1	-	-	-	-	-	1	-	-	-	5	7
Larus dominicanus	13	8	15	8	-	2	2	-	4	1	3	3	1	4	10	2	9	1	5	5	48
L. novaehollandiae	2	22	2	8	1	2	1	-	11	3	3	4	1	1	-	2	3	3	5	2	38
Sterna striata	-	7	-	1	-	1	1	-	2	1	3	1	-	-	-	-	2	-	-	1	10
Total	142	63	474	324	37	6	15	1	48	113	21	9	5	7	378	30	155	63	113	120	1062

TABLE 6 — Zonal (left side) and monthly (right side) distribution of more common sea birds found dead in 1966.

ANNUAL GENERAL MEETING 1975

———★———

The 36th Annual General Meeting was held in Dunedin on 17 May and attended by over 40 members. The President, Mr B. D. Bell, in his report on the year's activities, paid tribute to Mr Kinsky who recently resigned from the presidency. The ornithological highlights of the year had been the attendance of many of our members at the 16th International Ornithological Congress in Canberra and the recent influx of an unusually large number of Australian birds. These included White and Glossy Ibises, Little Egrets, Cattle Egrets, Grass Whistleducks, two Australian Little Grebes and a new record for New Zealand when a Hoary-headed Grebe was reported from the Snares Islands.

Reports from the Society's Scheme Organisers and Committee Conveners were summarised and presented to the meeting. A review of the year's study courses was given, the Summer School for Ornithology having been extremely successful. It is planned that this year a Labour Day Weekend course will again be centred on South Island river-beds and for North Island members, activities in the vicinity of Tauranga Harbour and possibly the Hauhungaroa Range are envisaged.

Although five positions were vacant on Council, there have been no changes as all Councillors due to retire were re-elected, most of them unopposed.

The annual conference of Regional Representatives was held on the Saturday morning when those present exchanged suggestions and renewed their enthusiasm for a demanding task. Speakers in the afternoon provided an interesting series of lectures on a variety of topics, a river-bed survey in Southland, feeding of the Black-fronted Tern, ecological aspects of Aramoana Estuary, plumage of the Crested Grebe and territoriality in the Rifleman. The evening meeting was followed by an account from Mr D. V. Merton on efforts to save the Kakapo from extinction.

Field trips held on Sunday to Taiaroa Head and Aramoana were well patronised, providing an opportunity to observe the local birdlife and to continue the relaxed ornithological conversations which were typical of the successful weekend.

P. D. GAZE, Secretary

TREASURER'S REPORT
For Year Ended 31st December, 1974

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PRESENTED AT THE A.GM. OF THE
ORNITHOLOGICAL SOCIETY OF N.Z. (INC.)
DUNEDIN — 17 MAY 1975

During the year membership increased by 51 to a total of 1155. 125 new members were admitted, while 52 left by resignation and death and 22 were struck off because of being unfinancial. The classes of members are 2 honorary life, 76 life, 23 endowment, 722 ordinary, 62 junior, 2 family, 102 corporate bodies, 83 husband and wife, counting as two, giving the total of 1155.

The income for the year was $7669 which is an increase of $583. Subscriptions were $216 more, sale of back numbers of *Notornis* an increase of $112 and the combined income from interest and dividends $1106, is $211 greater. Profit from the sale of Christmas cards, $1462, again added materially to the Society's income. Without this source of income a deficiency of $1181 for the year would have resulted, instead of the surplus of $281 as is shown. The increase in the rates of subscription for this current year will mean that the Society will not be depending to such an extent on the sale of the cards as it has done in the past few years.

Expenses totalled $7388 an increase of $1134. Cost of printing and distribution of *Notornis*, as is the case with most present day costs, was $888 more. Reprinting of back numbers was $177. Other expenses totalled $1276 an increase of $335.

The surplus for the year, $281, has been added to the Accumulated Fund.

$358, royalties on the revised *Field Guide*, were received and added directly to the Projects Assistance Reserve. Royalties have now been received on sales of 4767 copies.

Local body loans, Waitemata County Council $1600 and Southland Hospital Board $900, matured and the amounts reinvested with the Perpetual Trustees Co. Ltd, on authorised trustee investment with interest at 9½%.

The holdings of shares in public companies were sold and the proceeds reinvested as detailed in the notes accompanying the accounts. The greater return by way of higher interest on the reinvestments will be available to meet future annual expenditure.

H. W. M. HOGG, Hon. Treasurer

THE ORNITHOLOGICAL SOCIETY OF N.Z. (INC).
STATEMENT OF ACCOUNTS FOR THE YEAR ENDED 31ST DECEMBER 1974

1973				
	INCOME WAS EARNED FROM:			
4052	Subscriptions	4268		
195	Transfer from Life Members	199	(NOTE I)	
78	Donations	118		
1455	Profit from Christmas Cards	1462		
269	Sale Back numbers	381		
81	Biology of Birds	38		
6130	TOTAL ORDINARY INCOME:			$ 6466
	PLUS INVESTMENT & OTHER INCOME:			
592	Interest	892		
303	Dividends	214		
35	Premium on Maturity of Local Body Stock	76		
20	Royalties	21	(NOTE II)	
6	Booksellers Margin on direct Checklist Sales	-		
956	TOTAL INVESTMENT & OTHER INCOME:			$1203
7086	TOTAL INCOME:			$7669
	LESS EXPENSES:			
5047	"Notornis" Printing & Distribution	5935		
9	Less Advertising	--		
5038		5935		
--	Annual General Meeting	13		
100	Audit Fee	100		
67	Beach Patrol Scheme	-		
-	Donations	40		
126	General Expenses	123		
50	Library Expenses	50		
-	Nest Record Scheme	63		
98	Postages	82		
204	Printing & Stationery	434		
20	Royal Society Affiliation	-		
276	Travelling Expenses	371		
275	"Notornis" Reprinting	177		
6254	TOTAL EXPENSES:			$7388
832	SURPLUS FOR YEAR TRANSFERRED TO ACCUMULATED FUND:			$ 281

THE ORNITHOLOGICAL SOCIETY OF N.Z. (INC).

BALANCE SHEET AS AT 31ST DECEMBER 1974

1973				
	CURRENT ASSETS:			
2729	Cash at Bank of New Zealand		3721	
756	Bank of N.Z. Savings Account		797	
1500	Term Deposit Bank of N.Z.		1500	
100	Stock of "Notornis"		100	(NOTE III)
5085	TOTAL CURRENT ASSETS:			$6113
	INVESTMENTS:			
3883	Shares in Public Companies		-	(NOTE IV)
2923	Local Body Stocks		400	
	The Perpetual Trustees Co Ltd			
7000	Group Trustee Investments		12000	
	B. N. Z. Finance Co Ltd			
--	First Ranking Compounding Debenture Stock		3200	
13806	TOTAL INVESTMENTS:			$15600
1000	Library at Valuation			1000
19891	TOTAL ASSETS:			$22718
	LESS LIABILITIES:			
1371	Amounts owed by Society		2083	
365	Subscriptions in Advance		1217	
	Reserve Funds:			
2227	Projects Assistance Reserve		2585	(NOTE V)
1756	Life Subscriptions		1797	
1000	Publications		1000	
6719	TOTAL LIABILITIES:			$8682
13172	VALUE OF ACCUMULATED FUNDS AS BELOW:			$14036
	ACCUMULATED FUNDS:			
11953	Balance at 31.12.73		13172	
100	Less Stocks "Biology of Birds" Written Off		-	
11853			13172	
	Plus Profit on Sale of Shares			
	N.Z. Forest Products	$442		
	Winstone	$272		
	Golden Bay Cement	$183		
	Less Loss			
	Wattie Industries	$ 25		
487	Andrews & Beaven	$289	583	
832	Surplus for year		281	
13172	BALANCE AT 31.12.74:			$14036

We report, that in our opinion, the foregoing accounts and notes attached of THE ORNITHOLOGICAL SOCIETY OF N.Z. (INC) for the year ended 31st December 1974 are in agreement with the books and reports of the Society and give a true and fair view of the Society's position at that date and the results of its transactions for the year. The Society has kept proper books and supplied all the information required.

THOMPSON & LANG
Chartered Accountants
Auditors

DUNEDIN: 11TH MARCH 1975

NOTE I Life members Transfer: 10% of Balance at 31/12/74.

NOTE II Royalties from Sales of Checklist.

NOTE III Stocks of "Notornis" and Valuation of Library are at Standard Values. No attempt has been made to accurately value these assets.

NOTE IV All the Society's holding in Shares in Public Companies have been sold and the proceeds invested with the Perpetual Trustees Co Ltd Group Trustee Investment Fund (interest rate 9½%) and B.N.Z. Finance Co Ltd First Ranking Compounding Debenture Stock (interest rate 10%).

NOTE V Projects Assistance Reserve.

Movement in this account during the year is as follows:—

Plus Royalty on Revised Field Guide	358
Balance at 31/12/73 was	$2227
BALANCE at 31/12/74	$2585

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INVESTMENT IN LOCAL BODY STOCKS
As at 31 December 1974

Auckland Electric Power Board ..... $400 due 15/10/75

DONATIONS 1974

The following donations of $1.00 or more were received during the year:

L. S. Rickard $6 and $4; M. G. Cheshire $1; Dr R. W. Storer $2; Mrs M. Collingwood $1; G. Foreman $1; R. Jackson $1; C. J. Foreman $1 and $2; E. St. Paul $3; W. A. Chenery $1; S. R. Emmens $10; Miss N. D. Tanner $25; R. E. Satherlry $5; M. Keillor $1; Mr & Mrs W. E. Nightingale $4; M. Lane $2; Dr M. Buchler $1; W. T. Poppelwell $1; Miss D. Steel $4; Mr & Mrs R. Pullen $4; G. Wightman $1; I. E. Cooksley $2; R. G. Mueller $6 and $6; P. Warren $6; G. I. Hunt $2; Mrs P. M. Graham $4; R. N. Cotter $1; Mrs D. F. Kay $1; Mrs H. F. Drake $1; Mrs E. Wisnesky $2; A. E. Bond $1; J. S. Thomson $4; J. A. Fowler $2.

REPORT OF THE NEST RECORD SCHEME
For the Year Ended 30 April, 1975

There are now 10,974 nest record cards covering 142 species of birds within the Scheme.

During the year ending 30 April 1975, 418 nest record cards have been received from 21 contributors. Observations were made for 21 species including the following which appeared in the Scheme for the first time:— Adelie Penguin, Marsh Crake.

Dr J. A. D. Flack made a large contribution of Nest Record Cards on the South Island Robin, resulting from his work in the Kaikoura district. Black-fronted Tern, Caspian Tern and White-fronted Tern accounted for the 9 Colonial Cards completed this year by five contributors. Despite the large number of cards forwarded to members, only a small number of cards were returned this year. I would be grateful if Regional Representatives could encourage members in this individual activity.

My sincere thanks to those who have contributed to the Scheme. Thanks go to my wife, Ruth, whose assistance with the Nest Record Scheme has been most valuable.

DAVID E. CROCKETT, Nest Records Convener

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LIST OF CONTRIBUTORS

Ben D. Bell, Mrs Beth Brown, C. Brown, W. Brown, J. A. Cowie, T. C. Crocker, A. T. Edgar, J. A. D. Flack, Miss P. Fooks, R. Guest, J. R. Jackson, I. W. Johnson, Mrs R. V. McLintock, I. A. Mathieson, M. O'Shea, Mrs S. M. Reed, H. Rook, R. R. Sutton, Mrs Juliette Urquhart, D. M. Walter, P. S. Walter.

SPECIES FROM WHICH NEST RECORDS HAVE BEEN RECEIVED

	Previous Total	Total 1974/75	New Total
N.I. KIWI	3	-	3
STEWART ISLAND KIWI	4	-	4
GREAT SPOTTED KIWI	1	-	1
ADELIE PENGUIN	-	75	75
YELLOW EYED PENGUIN	11	-	11
L.B. PENGUIN	76	-	76
WHITE FLIPPERED PENGUIN	12	-	12
N.Z. CRESTED PENGUIN	2	1	3
ROCK HOPPER PENGUIN	1	-	1
N.Z. CRESTED GREBE	3	-	3
N.Z. DABCHICK	1	-	1
WANDERING ALBATROSS	11	-	11
BLACK BROWED MOLLYMAWK	1	-	1
GREYHEADED MOLLYMAWK	1	-	1
LIGHT MANTLED SOOTY ALBATROSS	6	-	6
GIANT PETREL	4	-	4
FAIRY PRION	16	-	16
FLESH FOOTED SHEARWATER	1	-	1
SOOTY SHEARWATER	5	-	5
FLUTTERING SHEARWATER	7	-	7
ALLIED SHEARWATER	3	-	3
BLACK PETREL	1	-	1
GREYFACED PETREL	2	-	2
KERMADEC PETREL	14	-	14
CHATHAM ISLAND PETREL	1	-	1
PYCROFTS PETREL	5	-	5
WHITE FACED ST. PETREL	8	-	8
DIVING PETREL	52	-	52
GANNET	4	-	4
BLACK SHAG	73	-	73
PIED SHAG	21	-	21
LITTLE BLACK SHAG	1	-	1
WHITE THROATED SHAG	30	-	30
KING SHAG	18	-	18
CHATHAM IS. SHAG	2	-	2
SPOTTED SHAG	5	-	5
PITT ISLAND SHAG	3	-	3
BLUE HERON	37	-	37
WHITE FACED HERON	19	-	19
BITTERN	2	-	2
CANADA GOOSE	27	-	27
DOMESTIC GOOSE	2	-	2
MUTE SWAN	9	-	9
BLACK SWAN	63	-	63
PARADISE DUCK	7	-	7
GREY TEAL	9	-	9
BROWN TEAL	2	-	2
BLUE DUCK	1	-	1
GREY DUCK	10	-	10
GREY MALLARD CROSS	5	-	5
MALLARD	79	1	80
SHOVELER	16	-	16
BLACK TEAL	7	-	7
HARRIER	65	-	65
N.Z. FALCON	7	-	7
PHEASANT	23	-	23
BROWN QUAIL	5	-	5
CALIFORNIAN QUAIL	24	1	25
CHUKOR	2	-	2
MARSH CRAKE	-	1	1
BANDED RAIL	4	-	4
SPOTLESS CRAKE	8	-	8
N.I. WEKA	7	-	7
S.I. WEKA	8	-	8
PUKEKO	171	-	171

AUST COOT	16	-	16
- SOUTH ISLAND PIED OYSTERCATCHERS	119	-	119
- NORTH ISLAND PIED OYSTERCATCHERS	46	4	50
- CHATHAM ISLAND OYSTERCATCHERS	9	-	9
BLACK OYSTERCATCHER	49	-	49
SPUR WINGED PLOVER	34	-	34
BANDED DOTTEREL	283	1	284
N.Z. DOTTEREL	78	14	92
BLACK FRONTED DOTTEREL	10	-	10
SHORE PLOVER	12	-	12
WRYBILLED PLOVER	13	-	13
CHATHAM IS SNIPE	1	-	1
PIED STILT	329	2	331
BLACK STILT	8	-	8
SOUTHERN SKUA	45	-	45
BLACK BACKED GULL	461	-	461
RED BILLED GULL	131	-	131
BLACK BILLED GULL	133	-	133
BLACK FRONTED TERN	224	1	225
CASPIAN TERN	70	4	74
ANTARCTIC TERN	3	-	3
FAIRY TERN	11	1	12
WHITE FRONTED TERN	73	4	77
WHITE TERN	1	-	1
WHITE WINGED BLACK TERN	1	-	1
GREY TERNLET	5	-	5
N.Z. PIGEON	31	-	31
ROCK PIGEON	68	-	68
KAKA	10	-	10
KEA	63	-	63
CHATHAM IS RED CROWNED PARAKEET	1	-	1
N.Z. RED CROWNED PARAKEET	8	-	8
YELLOW CROWNED PARAKEET	-	-	-
SHINING CUCKOO	9	-	9
LONG TAILED CUCKOO	1	-	1
MOREPORK	13	-	13
LITTLE OWL	16	-	16
KINGFISHER	74	-	74
S.I. RIFLEMAN	129	-	129
N.I. RIFLEMAN	6	-	6
ROCK WREN	13	-	13
SKYLARK	133	-	133
WELCOME SWALLOW	268	9	277
FANTAIL	160	-	160
N.I. FANTAIL	64	-	64
N.I. TOMTIT	26	-	26
S.I. TOMTIT	40	-	40
CHATHAM IS. TOMTIT	1	-	1
N.I. ROBIN	9	-	9
S.I. ROBIN	29	268	297
N.I. FERNBIRD	14	-	14
S.I. FERNBIRD	13	-	13
STEWART ISLAND FERNBIRD	1	-	1
BROWN CREEPER	7	-	7
WHITE HEAD	12	-	12
YELLOW HEAD	17	-	17
CHATHAM ISLAND WARBLER	1	-	1
GREY WARBLER	138	-	138
SONG THRUSH	1641	7	1648
BLACKBIRD	1390	10	1400
HEDGE SPARROW	189	-	189
N.Z. PIPIT	69	-	69
BELLBIRD	28	-	28
TUI	37	1	38
WHITE EYE	217	1	218

GREENFINCH	150	-	150
GOLDFINCH	602	2	604
REDPOLL	79	-	79
CHAFFINCH	263	-	263
YELLOW HAMMER	57	-	57
CIRL BUNTING	4	-	4
HOUSE SPARROW	558	-	558
STARLING	421	9	430
MYNA	27	1	28
W.B. MAGPIE	34	-	34
MAGPIE SPECIES	7	-	7
S.I. SADDLEBACK	7	-	7

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CARD COMMITTEE REPORT

This year we departed from the historical series and started a new one using original paintings by Mrs Janet Marshall. Four subjects were used, Robin, Stitchbird, Rifleman and Falcon. Mixed packages were also available and these included some of the old historical series. 40,000 of each card were printed to ensure there was ample stocks for this year and also for mixed packages in future years. A multiple printing method held costs at a reasonable figure thus enabling us to build up stock for the future. Some 58,500 cards were sold, far more than in any previous year. Despite the increased costs because of the larger production, $1,450 profit was made.

In 1975 it is planned to add two further paintings to the series, Grey Warbler and Shoveler. Mixed packages (with five species) and some of last year's cards will be available.

On behalf of the Society, I would like to thank the Royal Forest and Bird Protection Society for addressing the brochure envelopes. I would also thank the many Wellington members for helping with the packaging of brochures and cards, and my wife who assisted throughout with the despatch.

B. D. BELL, Convener

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FIELD INVESTIGATION COMMITTEE

Only one study has been referred to the Committee for comment. This related to a study on the status and distribution of the Reef Heron in the far north. Advice on this study will be conveyed to the organisers of the project.

The Convener has continued to foster the Caspian Tern Survey and this will continue for one more season. He also plans to introduce a study on the breeding distribution and status of some shags. The co-operation of regional representatives and members would be appreciated.

Caspian Tern Survey

Reports were received from all districts but this year nesting success was very low and most colonies failed. Many colonies were flooded by high tides but this did not explain the failure at all colonies.

The successful North Island colonies were:

South Kaipara Head	c. 200 chicks
Whangarei Harbour	c. 40
Whangapoua	c. 40
Onoke	c. 20

and in the South island:

Farewell Spit	c. 200
Invercargill Estuary	c. 12

It can be seen that apart from the two major colonies production was very low. As nesting success is about 1 chick per pair and the present estimated total population of terns in New Zealand is about 1,000 this year's production was about half the breeding potential.

Because of this year's erratic breeding behaviour it is considered that one further year's study should be made before the findings are written up for publication. I would ask that all regional representatives make a real effort to locate all colonies to record the number of adults and nests and that each colony is followed through to determine the number of chicks which actually fledge. This final year's effort should round the study off and enable a really worthwhile statement on the breeding distribution and status to be made.

Once again I would like to thank all regional representatives and other members for their work and effort on this project.

B. D. BELL, Convener

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RARE BIRDS COMMITTEE REPORT FOR 1974-75

Members: F. C. Kinsky (Convener)
Sir Robert Falla
B. D. Bell
D. H. Brathwaite

Since last year's AGM, the Committee received 6 submissions, as set out below.

Submission A, B and C were received during the Convener's absence from New Zealand and Mr B. D. Bell kindly looked after them.

A. Mr A. Habraken, Papakura, concerning a Crested Tern *(Sterna bergi cristata)* sight record in the Firth of Thames.
The Committee confirmed the identification.

B. Dr K. E. Westerskov, report on " probable first breeding of the Cattle Egret in New Zealand."
The Committee considered the record as being acceptable.

C. Mr R. J. Pierce, " White-winged Black Terns nesting in New Zealand."
The Committee was not so happy with this report and suggested a change of title to the report and, although accepting the record as probably correct, recommended a cautious approach to avoid the merest possibility of error.

D. Mrs B. Brown, Papakura, sight record of a Dunlin *(Calidris alpina)* in the Kaipara Harbour.
The Committee accepted and confirmed the identification, although only 3 out of the four members of the Committee commented.

E. Miss L. J. Stopforth, Karamea, through Mr B. A. Ellis, Wellington. Sighting of a flock of 12 Plumed Whistling Ducks *(Dendrocygna eytoni)* near Karamea in January 1975.
The Committee was satisfied with the report and confirmed the identification.

F. Mrs Moncrieff and Mr Ross, Nelson, through Mr F. H. Boyce, Nelson, concerning the alleged sighting of an eagle in the Nelson District in January 1975.
This report was not circulated to members, but was only discussed by the Convener and the President. Both agreed that the report was not only not adequate but also confusing and by lack of details conveyed no impression of the bird concerned. From the " facts " submitted, it was not even possible to guess at the Order the bird, if it was a bird at all, could be classified into. This submission was rejected.

A suggestion for simplification of the set up and workings of the Rare Birds Committee in the future was conveyed to Council through the Hon. Secretary.

F. C. KINSKY, Convener,
Rare Birds Committee

★

BEACH PATROL SCHEME 1974

During 1974 there was a good level of activity by patrollers on all coasts except Fiordland. An average number of patrollers covered a slightly greater length of beach than in previous years. The total number of birds found is some four times more than ever before due to two large wrecks, both of which are considered to be due to food shortages for the species concerned.

The first wreck occurred mainly in the Auckland East area and partly in Auckland West during April and was composed entirely of Blue Penguin. The second wreck occurred along the whole of the West Coast of New Zealand during June and July, and consisted of Prions in the following order of abundance:

Pachyptila salvini, P. desolata, P. turtur, P. vittata, and *P. belcheri.* Rare species included one Soft-plumaged Petrel *(Pterodroma mollis)* and one Grey Ternlet *(Procelsterna caerulea).*

Coast	*Kilometres*	*Birds*
Auckland West	1174	13698
Taranaki	46	144
Wellington West	456	2820
Westland	2	39
Auckland East	787	5373
Bay of Plenty	193	128
East Coast North Island	43	117
Wairarapa	3	6
Canterbury North	98	153
Canterbury South	94	318
Otago	22	29
Southland	733	53
Wellington South	197	267
North Coast South Island	38	14
Outlying Islands	8	9
	3,214	23,848

There has been an encouraging increase in the number of beaches which have been regularly patrolled. I would like to thank all who have contributed to this scheme.

C. R. VEITCH, Organiser

★

BIRD DISTRIBUTION MAPPING SCHEME
Annual Report for 1974

A total of 1036 species lists, compiled during 1974, was received up to 25 April 1975; this is a marked reduction on the 1900 lists completed in 1973 and perhaps indicates a reluctance by observers to search for additional species in squares already surveyed once. Lists are now available from 89% of the 1600 squares in the North Island (up 2% from last year) and from 83% of the 2000 South Island ones (up 7%). Progress towards the goal of at least one good species list from every square has been slow during the past year, probably because many of the remaining squares are in remote areas. On the other hand, the scheme continues to enjoy the support of many members of the Society; 55 people compiled species lists for the first time in 1974, and already 88 lists have been received for 1975. Another

cause for satisfaction is that the playing of tape recordings of calls of Spotless Crakes *(Porzana tabuensis)* has been very successful in revealing the widespread occurrence of these birds even in areas where prolonged observation by conventional means had suggested their absence.

As forecast in last year's report (*Notornis* 21: 178-81), the mapping office is now devoting most of its attention to ways of making the existing information more readily available to those who need it (but more species lists are still wanted, especially from areas not previously covered). Progress with the processing of the data by computer has continued to be disappointingly slow. Mistakes were detected in the coding of some of the data and this necessitated a thorough checking of all previous work, a massive task now nearing completion. Despite these problems, several items of useful information have been extracted from the system (often by reference to the original cards) to help people with current research or with conservation issues.

The past year provided two unusual opportunities to learn how bird mapping schemes operate overseas. One of us (P.C.B.) attended the 16th International Ornithological Congress in Canberra last August and took part in three informal sessions devoted to problems of bird mapping. The New Zealand scheme was favourably commented upon by several overseas ornithologists and it was comforting to discover that we were not alone in our problems with computers and their associated costs. Discussion often centred on the relative merits of recording all species or just breeding species, and on whether or not it was worth attempting to record numbers as opposed to mere presence or seeming absence. Most of the experts held that the recording of numbers added greatly to costs without providing much of real value.

Then in October, we were privileged to have a visit from Dr F. H. Perring of the British Biological Records Centre, and we heard with envy of the automated map-making facilities available there. Dr Perring complimented New Zealand ornithologists on their mapping scheme and suggested we should now produce provisional maps to show the distribution of each species of bird. Dr D. G. Dawson of Ecology Division is currently in Britain studying methods used at the Biological Records Centre. By the time he returns with practical experience of British map-making equipment and procedures, the New Zealand data should be thoroughly checked and ready for use.

In conclusion we wish to thank all who compiled bird lists during the past year, Regional Representatives who despatched and checked cards, and the Directors of Ecology Division of DSIR and the Wildlife Service of Internal Affairs who helped by providing respectively, office facilities and computer services. Mr C. J. R. Robertson of Wildlife Service was especially helpful in dealing with computer problems.

P. C. BULL
P. D. GAZE

Ecology Division, DSIR,
P.O. Box 30466,
Lower Hutt

SHORT NOTES

FIRST SIGHTINGS OF NANKEEN KESTREL IN HAWKES BAY

On Saturday 26 April 1975, while helping to launch a glider at Bridge Pa Aerodrome, I noticed an unusual hawk thermal up out of some pine trees in the adjacent Bridge Pa Golfcourse. It was followed by a number of finches and these were making quite a noise. Fortunately, I had my 12x fieldglasses near at hand. I strongly suspected the bird was a Nankeen Kestrel *(Falco cenchroides)*, and a good look through the glasses soon confirmed this. It was similar in size to a male N.Z. Falcon but had considerably longer wings with pointed tips and its style of flight was more light and buoyant. Its colouring was quite striking with rich chestnut brown on the back contrasting with very pale creamy white on the undersides. Legs were a pale yellow.

This first sighting was at 12.15 p.m. and after it had thermalled up to about 300 feet (91 m) above the pines, it went into a semi-stoop and seemed to catch something small (insect ?). It then landed near the top of a pine where it proceeded to eat its prey. This took five minutes. The Kestrel than proceeded to preen, standing occasionally on one leg. After fifteen minutes of this, the bird flew out and came over the top of us and landed in the top of a pine next to where we were standing. It stayed there for a few minutes and then took off again disappearing behind the clump of pines. This was seen by myself and several Aero Club members. We all remarked on the bird's relative tameness. The fairly close proximity of people did not seem to concern it unduly.

Although the bird had disappeared, I felt there was a chance of sighting it again so I made a quick trip into Hastings to get my camera gear and a friend who had a zoom lens movie camera. We arrived back at the aerodrome at 1.40 p.m. and, as we were driving up the aerodrome drive, I sighted the falcon again in almost exactly the same area. It was flying around at a height of about 150 ft (45 m) occasionally performing the characteristic kestrel hover. This consisted of stopping almost stationary with wings beating, the tail fully spread and the whole body inclined at a very steep angle to the horizontal. After five to ten seconds of this the bird would carry on with ordinary flapping flight. Mr Philip Gould managed to secure about seven seconds of Super 8 colour film which shows the hover quite clearly. At this stage the kestrel allowed itself to be blown down wind towards Hastings and, as there was a moderate westerly blowing, it soon went out of sight.

The next day was unsettled with a strong southerly blowing, and I felt the bird would be blown northwards towards Napier. This was confirmed when a kestrel was sighted by a duty air traffic controller, Mr F. Benfall, on the following Tuesday. He was showing a group of young schoolchildren over the control tower when the bird was seen flying around outside. A friend of mine, also a controller at Napier Airport, has since told me that the bird was seen many times around the airport buildings for about two weeks up until about 25 May. He said it spent quite long periods sitting on one of the light standards near the tower, occasionally making quick forays out into flocks of sparrows or finches. However, it did not seem to catch any of these birds.

At the same time as this bird was being observed at Napier Airport it was also spending some time at the adjacent Lands and Survey farm where it was watched by another friend of mine who works there. He saw it twice on Thursday 1 May, the first time at 11 a.m. whilst he was mowing a paddock. It was in sight for an hour sometimes coming very close. The second time was about 3 p.m. at the same paddock as he was finishing the mowing. It was in view again for about an hour.

This bird seems to have settled, at least temporarily, in this area since it has been sighted regularly by other employees on this farm. Fortunately, the first sighting was given good publicity by the local press and radio because it was feared that the bird might be shot by uninformed duck shooters.

The presence of this Australian Kestrel in Hawkes Bay leads to some speculation as to its arrival here. This bird was either blown here from Australia by the strong westerly winds which preceded its first sighting for a few weeks or else it is a straggler from the other areas in New Zealand in which this species has also been reported.

W. J. POWELL

Box 3024,
Mahora,
Hastings

★

STREAKED SHEARWATERS *(Calonectris leucomelas)* IN THE CORAL SEA

Although there is an early specimen of the Streaked Shearwater *(Calonectris leucomelas)* in the British Museum labelled " N. Australian Seas " (Serventy *et al.* 1971: Handbook of Australian Sea-birds: 119), current references place the southern extent of its wintering range in the equatorial waters north of New Guinea.

While southbound on S.S. *Chitral* from Rabaul to Brisbane I observed Streaked Shearwaters, singly or in groups of up to four, on 29-30 January 1974 between 8°13′S 153°30′E and 14°20′S 154°18′E, i.e. centrally in the Coral Sea about 800 km east of Cape Melville on the Queensland coast.

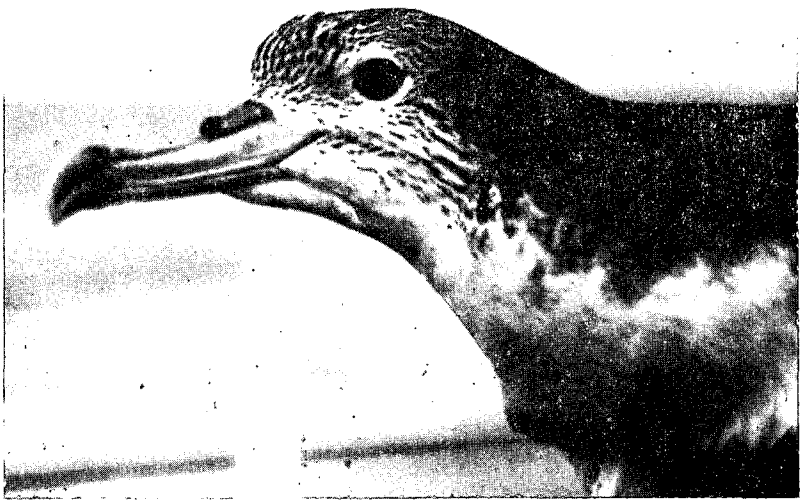

FIGURE 1 — Hand-held Streaked Shearwater photographed in mid Coral Sea. Photo: J. D. Gibson

This species, though rarely presenting close views due to its complete disinterest in shipping, is distinctive enough to be easily identified from a considerable distance. To provide confirmation, however, one was conveniently stranded on board at night and was released next morning when the accompanying photograph was taken.

The Streaked Shearwater breeds on the Bonin Islands, Izu and other islets off the coasts of Japan and Taiwan.

J. D. GIBSON

Treetop Glen,
Thirroul, N.S.W. 2515,
Australia

★

BULLER'S MOLLYMAWKS ASHORE IN OTAGO

On the afternoon of 9 September 1973, a bird, dead, bleeding at the bill and still warm was found in the hills near Earnscleugh, Central Otago, by an officer of the Ministry of Agriculture and Fisheries, Alexandra.

The following day the bird was sent to me for identification and was found to be a juvenile Buller's Mollymawk *(Diomedea bulleri)*. It was in good condition, except for a few ticks around the eyes and head, and was believed to have died from a broken neck.

Gale force winds had been experienced on the previous days with south west winds up to 50 knots. At the time of recovery the bird was 80 miles from the sea.

The specimen was deposited with National Museum, Wellington, and the ticks with Entomology Division, DSIR, Auckland.

On the following day, 11 September 1973, a message was received from Mr T. Walker of Balclutha to say that a live albatross in a healthy condition was on the property of Mr Ligget of Tuamata, near Clinton (12 miles south of Balclutha).

When collected, it was found to be another juvenile Buller's Mollymawk. The bird was held overnight, measurements taken, banded M-24018 and released at the Royal Albatross Colony, Taiaroa Head, at 9 a.m. 13 September 1973.

As with the previous bird, wind conditions had been much the same, and, at recovery time, the bird was 30 miles from the sea. It is interesting to note that other Mollymawks have been recovered (Wright 1973, *Notornis* 20: 72) from this area and from the Invercargill area (Sutton, R.R., pers. comm.).

A. WRIGHT

Wildlife Service,
P.O. Box 30,
Portobello

★

NEST OF MARSH CRAKE

On 25 November 1974, Messrs Ian Mathieson and Stuart Sutherland, Southland Acclimatization Society field officers, were banding a brood of Paradise Ducks *(Tadorna variegata)* on Mr Gibson Soper's property near Athol, Southland, when they found the nest of a Marsh Crake *(Porzana pusilla affinis)*.

The nest of this species has never been described in the literature, the only evidence of nesting (apart from the presence of the species!) being an egg from Awanui in the Buddle collection, now deposited in the Auckland War Memorial Museum. (Falla *et al.* 1967, Field Guide to the Birds of New Zealand: 107).

On 30 November 1974, we visited the area with Mr Neil Henderson. Mr Soper's property is on the flat and extends to low foothills, with the 1450 m high mass of Mid Dome towering above it. The pond measures 37 m by 11 m approximately. This is a well-stabilized pond man-made about five years ago. Bordering vegetation includes rushes, *Carex* species, flax, manuka, toitoi, sweet briar and introduced grasses with *Chrysobactron* and musk among them. The rushes and *Carex* predominate. In the water itself, *Potamogeton cheesmanii* and *Azola rubra* are growing. The pond is fed by a small marshy creek which, at the time of our visits, had no flowing water and was little more than a narrow marsh overgrown with carex, manuka, introduced grasses and bushes of black currant, flowering currant and raspberry.

The nest was in the middle of a clump of the rush *Juncus gregiflorus,* 120 cm tall and 75 cm in diameter, one of three clumps growing in the water about 60 cm from the pond edge. The nest itself was formed of dry brown rush stalks, rather loosely crossed. Its outer diameter was 13.3 cm and inner diameter 7 cm. There was a sparsely constructed dome-shaped canopy of dried rush stalks above the eggs. The nest platform was 15 cm above water level. There had been an unusually low rainfall in the area, and the pond's level was slightly below normal.

There were seven eggs, olive-brown in colour, plump ovoid in shape. The eggs were not measured because of risk of desertion by the bird, but they looked large considering the size of the bird.

FIGURE 1 — Eggs of Marsh Crake *(Porzana pusilla affinis),* Athol, Southland, November 1974. Photo: R. R. Sutton

The bird returned to the nest within ten minutes of being disturbed. It approached stealthily, with a rat-like creeping action, using rush cover where there was any. When crossing the water from pond-edge to rush-clump, it appeared to skate or scamper rapidly across the surface of the water. It was generally very inconspicuous.

A further visit was made on 12 December 1974 by RRS accompanied by Sir Robert Falla and Mr Grant Foster of the National Film Unit. The nest was empty but intact with no sign of predation or disturbance. A close search of the surrounding area disclosed the

rounded cap of one egg, symmetrical in shape, and consistent with successful hatching. The birds were not seen. On this scanty evidence, it was assumed that this was a successful hatch, and that with this species all the eggshell is removed by the incubating bird.

Some notes relating to clutch size may be of interest. On 6 November 1958, at Lake Murihiku, Invercargill, RRS saw a pair of adults with a brood of five to eight young. The chicks moved so quickly in different directions that an accurate account was impossible. In the same Lake Murihiku area RRS, with Mr R. S. Andrew, saw three chicks on 6 November 1961.

The Athol pond was visited again by MLB, wth Mrs Olga Sansom, on 7 January 1975. In a dry summer the pond level had receded still further. The day was memorable for its tussock butterflies, dragonflies and sweet wild raspberries, but no Marsh Crakes were found.

MAIDA BARLOW

36 Filleul St,
Invercargill

ROGER R. SUTTON

C/o Post Office,
Lorneville,
Invercargill

★

THE TAXONOMY AND NOMENCLATURE OF NEW ZEALAND SPUR-WINGED PLOVERS

The question of whether or not to regard morphologically distinct allopatric populations of closely related birds as of the one species is one to which there is no ready answer. Even where interbreeding along a narrow zone of distributional overlap indicates that reproductive isolation has not been achieved, opinions will probably always differ. Mayr (1942, *Systematics and the Origin of Species,* New York) has distinguished between zones of primary intergradation, in which the characters of one subspecies grade into those of another, and zones of secondary intergradation, in which the population consists of birds which are phenotypically similar to those of the allopatric populations and others which are intermediate in various character combinations. Mayr suggested that zones of secondary intergradation occur where formerly isolated populations have come into contact before developing either ecological or reproductive isolation.

Van Tets *et al.* (1967, *Emu* 67: 85-93) found that the Spur-winged Plover *(Lobibyx novaehollandiae)* and the Masked Plover *(L. miles)* form a zone of such secondary intergradation. The Spur-winged Plover breeds in south-eastern Australia and the very similar Masked Plover in northern Australia and New Guinea. *L. n. gracemeri* Mathews, 1915 is characterised by more wattle above the eye and less

black on the hind neck and shoulders than in *L. n. novaehollandiae*. Its breeding distribution is from Mackay, Queensland, southwards, grading into *novaehollandiae* somewhere near the border with New South Wales. North of Mackay, *gracemeri* hybridises with *L. miles harterti* Mathews, 1912. *L. miles* has no black on the shoulders, a thin grey line on the hind neck and the wattle extends to a point above and behind the eye. *L. m. harterti* is the same size as *L. n. gracemeri* and larger than *L. m. miles*. With care, most birds in the field and in the hand may be assigned to the correct subspecies, but intermediates are not uncommon and may turn up as vagrants or non-breeding migrants anywhere in Australasia. It is, therefore, more practical to treat the Spur-winged and Masked Plovers as a single species and refer to the subspecies only when the necessary diagnosis has been made.

The taxonomic status of these birds is of more than academic interest to New Zealand ornithologists as Van Tets considers that the New Zealand birds conform more to *L. n. gracemeri* than to *L. n. novaehollandiae*. In our opinion, until field and museum studies have established the phenotypic uniformity of the New Zealand population, it would be misleading to name it subspecifically. We must also point out that Australian ornithologists have generally adopted the recommendation of Bock (1958, *Bull, Mus. comp. Zool. Harv.* 118: 27 - 97) who has united all the vanelline plovers in the Genus *Vanellus*. We submit, therefore, that in the meantime the name *Vanellus miles* (Boddaert, 1783) should be used for the Spur-winged Plovers of New Zealand.

Another point of interest, arising from the above, is the clear indication that Australian vagrants in New Zealand can originate from areas further north than might be expected. Although the colonisation may have originated from a single pair as far back as 1932 (Barlow 1972, *Notornis* 19: 201 - 211), the possibility cannot be excluded that later arrivals might have contributed to the build-up, and that records of stragglers, particularly in the North Island, might as easily be atrributable to Australian vagrants as to Southland-bred birds. The exhausted bird picked up at Waitotara in late November 1945, might be such an example. This possibility is mentioned to emphasise the importance of a careful study of all birds seen, and to suggest an examination of museum specimens.

D. H. BRATHWAITE

P.O. Box 1447,
Christchurch

G. F. VAN TETS

Division of Wildlife Research, CSIRO,
P.O. Box 84, Lyneham,
Canberra, ACT,
Australia

LETTERS

The Editor,
Sir,

ORNITHOLOGICAL PUBLICATIONS

In *Notornis* 22 (1): 93, you ask for readers' views on lists of publications. One cannot read or even inspect all books and journals available, and so some selection must be made. I believe that it is the Society's duty to help its members make such a selection.

Lists of contents of individual issues of overseas journals are of little value but brief abstracts as have appeared for years in *Ibis* are surely the answer to an ornithologist's dream. On 22 August 1953, the Council of the Society adopted certain rules for the conduct of its business (listing incidentally, functions of and suggestions for Regional Organisers, which might well be brought up to date and followed now — how many have seen them ?).

In these rules a Library Committee was to be set up, consisting of the Librarian as chairman, the Editor and two other members with power to co-opt one other. The Committee was (clause c (3)) "to ensure that all available ornithological journals of a suitable standard, in English, and also those foreign language journals likely to be of use to ornithologists in New Zealand, are received by the Society, provided that sufficient funds for their purchase or sufficient copies of the Society's bulletin for exchange, are available."

Another function (clause c (7)) was "to set up a panel of members of the Society, to be known as the "*Reviewing Panel,*" to prepare reviews for the Society's bulletin (by title only, abstract or critical review), of: (a) all literature published concerning endemic New Zealand birds. (b) Literature published concerning indigenous birds or birds introduced to New Zealand where this is likely to be of especial interest to ornithologists in New Zealand. (c) Literature published concerning behaviour, habits, methods of study, etc., which is likely to help the study of ornithology in its widest aspects in New Zealand. Such reviews are not intended to replace those offered to the editor by other members, but to ensure that all ornithologists in New Zealand may be familiar with ornithological literature published elsewhere than in the Society's bulletin."

I recommend the above be implemented.

J. M. CUNNINGHAM

"Illawarra,"
5 Kotari Road,
Day's Bay,
Eastbourne
5 May 1975

The Editor,
Sir,

FALCON KILLING CATTLE EGRET

During the course of research on the New Zealand Falcon *(Falco novaeseelandiae)*, I came across an instance of a falcon killing a Cattle Egret *(Ardeola ibis coromanda)* on a station in the Waihopai Valley in May 1974.

The bird was completely white as regards feathering. The bill and circum-orbital ring were yellow. The legs were black with yellow-green soles and a slight green tinge above the knee. The measurements were as follows:

Culmen	60 mm
Wing length	257 mm
Tarsus	95 mm
Middle toe and claw	84 mm
Tail	86 mm

The specimen was donated to Canterbury Museum and identified by Ron Scarlett as a Cattle Egret in non-breeding plumage. This is named as *Ardeola ibis coromanda* in the British *Handbook* and as *Bubulcus ibis coromandus* in the N.Z. *Checklist.*

Although this is an unusual bird to feature on the prey list of the Falcon, it is not uncommon for immature female falcons to take White-faced Herons *(Ardea novaehollandiae)*. Cases which I have been able to verify of falcons taking poultry have also been the work of immature female falcons, these being the only ones large enough and inexperienced enough to tackle such large quarry.

It is unfortunate that, as in this case with the Cattle Egret, N.Z. Falcons coming near homesteads are still greeted with a charge of shot. There is no doubt that Man is directly (by killing) and indirectly (by habitat destruction) responsible for the decline of this unique falcon. Education is the only way of enforcing legislation in these remote areas.

N. C. FOX

Zoology Department,
University of Canterbury,
Christchurch, 1
22 January 1975

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The Editor,
Sir,

OYSTERCATCHER ETYMOLOGY

Dictionaries, as my wise old headmaster used to say, are dangerous instruments in the wrong hands. I suspect that some unwary user has rightly resorted to Liddell & Scott, but has fallen into the trap of confusing haemat-opus (with a long penultimate ' o ') with haemato-pus (with short ' o '). Thus, his references to Euripides are quite irrelevant. If he had consulted Lewis & Short's *Latin Dictionary* or Thompson's masterly *Glossary of Greek Birds* he would have found that haematopus (blood foot/leg) occurs in Pliny and was a rare

variant for himantopus (thong foot/leg), the Greek name for the Stilt. Many centuries later, Linnaeus retained himantopus for the Stilt, but used haematopus to designate the Oystercatcher.

Let us grant that the basic meaning of malacos is soft or dainty. Are Faroese oystercatchers really more partial to a soft diet than others? Most, if not all, oystercatchers eat only the fleshy insides of the larger molluscs on which they prey. They do not consume the hard shells. Thus, the polder-frequenting oystercatchers of Holland have long favoured a soft diet such as they can find in an agricultural environment; and the same applies to many of our oystercatchers in New Zealand, especially, of course, *finschi*. In short, Faroese oystercatchers have no more claim to be called malacophagous, if malacos simply means 'soft,' than many other forms of *Haematopus*.

R. B. SIBSON

26 Entrican Avenue,
Remuera,
Auckland
20 April 1975

★

The Editor,
Sir,

CLASSIFICATION OF THE RALLIDAE

Regarding Dr Fleming's suggestion that Storrs Olson's hypothesis that *dieffenbachi* was confined to the main Chatham Island and *modestus* to Mangere, could be tested by study of the abundant subfossil bone collections from the Chatham Islands, many of the earlier collections are labelled only "Chatham Islands," with no indication of the localities in the Islands from which the bones came. This is the case with the majority of the earlier collected specimens in Canterbury Museum.

However, my own collecting from 1972 to 1975 has yielded bones of *modestus* from dunes at Te One, Long Beach, Maunganui and between Maunganui and Tupuangi, Waitangi, Ouira and Cape Young in localities on the main Chatham Island (Rekohe to the Moriori, Wharekauri to the Maori) but *modestus* is not nearly as common as *dieffenbachi* which I found in nearly every dune site I have visited. Incidentally, I do not believe that *dieffenbachi* is a derivative of *philippensis*, but that *philippensis* and possibly *modestus* had a common ancestor, which may possibly yet be found in the Chathams. I certainly shall not place them in *Gallirullus*. I regard them as generically distinct. Also *dieffenbachi* did not have an "early extinction." It was still alive in the first quarter of the 19th century.

R. J. SCARLETT

Canterbury Museum,
Christchurch, 1
23 April, 1975

REVIEWS

Birds in New Zealand. Ed. by C. J. R. Robertson. Pp. 135, 68 illus. (8 colour). Wellington, &c., A. H. & A. W. Reed. 1974. $2.95.

In this handy volume, one of a series designed by the publishers for overseas tourists, are chapters on habitats, relationships between birds and man, birds of various habitats, extinct and rare birds and conservation. Chapters are contributed by experts in their own fields, nine in all, and while there may be little new information, one may assume that it is up to date and accurate. As a series of essays on bird lore of a wide range but excluding taxonomy and population dynamics and indeed current research (which could well be added in a new edition) it makes interesting reading.

A recurrent theme of most authors is that of conservation, in particular the importance placed on conservation of habitat which after all is the most vital requirement of healthy bird populations. One may detect some dissatisfaction with New Zealand's official approach to conservation: e.g. " If it is granted that the South Cape saddlebacks really were threatened, the species has certainly been saved." And how true is the concern that " It is not inconceivable that Pipits . . . could be the rare birds of tomorrow " (they may be already, see Stidolph in *Notornis* 21 (1): 79).

The illustrations, while mostly well known prints, are well selected — the mutton bird flock on p. 54 will astound tourists — but the publishers, by their method of reproduction, have done a disservice to the reputation of New Zealand photographers and ornithology.

J. M. C.

★

This small book contains eight essays on New Zealand birds with particular reference to ecological factors affecting their distribution, abundance and future survival. Each section is written by an expert on his chosen topic and each provides a succinct, up-to-date account of present knowledge. The canvas is wide and, sensibly, the introduced species so dominant over much of our agricultural land are not ignored. The chapters deal with habitats, birds and their effects on man and his activities, wading birds, mountain birds, extinct birds, sea-birds and conservation.

The information is accurate and considering that each section is from a different pen and viewpoint there is little duplication of information. There is a very short bibliography but no index.

The numerous black and white photographs are good, relevant and include both familiar examples of K. & J. Bigwood and more

recent studies mainly from members of the Wildlife Service. The colour photographs are less successful, the whites in my copy having acquired a pinkish tinge in printing.

For those requiring a concise survey of the condition of birds in modern New Zealand this book is thoroughly recommended.

J. W.

★

This book is not an identification guide, but a collection of essays by some of our most experienced ornithologists. I. A. E. Atkinson writes on the importance of bird habitats, emphasising the need for conserving them. R. B. Sibson discusses our unique forest and mountain birds, viewing them by regions throughout New Zealand, while P. C. Bull describes the relationship between birds and man, expounding the major ecological changes that have taken place. Gamebirds and their histories are presented by T. A. Caithness. H. R. McKenzie summarises information on our indigenous and migratory waders, while F. C. Kinsky and C. J. R. Robertson relate New Zealands oceanic position to the host of seabirds frequenting the adjacent seas. Extinct species, and those in danger of extinction are ennumerated by D. G. Medway, while Sir Robert Falla unifies and emphasises the themes of the previous essays with a chapter on rare birds and conservation.

This volume contains a wealth of material useful both to the new chum and the naturalist of wider experience. However, some statements raise queries: there is reference to nine breeding species of Terns, and three stragglers found in the New Zealand region — where are the three arctic migrants ? But details such as these are noticed only by the very critical reader.

Unfortunately, there are lapses in the reproduction, both of plates and of text, some colour plates especially being badly out of register and some lines of text being merely hinted at. Despite this, it is enlightening to see several fresh photographs, previously unpublished in popular works on New Zealand ornithology.

An index might have been a helpful addition. However, these are insignificant drawbacks when one considers the diversity of essential background information, from which one can gain new ideas.

This compact little volume most certainly deserves a place in the bookshelves of all who appreciate our natural history, and who are seeking more information with a view to its preservation.

T. G. L.

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The Dictionary of Birds in Colour, by Bruce Campbell. London: Michael Joseph. 352 pp., 1008 col. illus. NZ $13.10.

The bulk of this large book consists of well-produced colour photographs. It aims to be a picture distionary of birds and nearly one eighth of the world's birds are illustrated. There is also a substantial text summarising the main characteristics of birds, their classification and anatomy, followed by succinct diagnoses of each

of the 154 families into which modern birds are classified. Then follow 150 pages of colour photographs of individual species set out in scientific order and with up to eight pictures per page. Hence most of the pictures are small — often measuring only about $3\frac{1}{2}$ x $2\frac{1}{2}$ inches. The main dictionary section now follows, containing brief descriptions of the distribution, habits and habitats of some 1100 birds. The entries are arranged alphabetically by scientific name but common names are also included. For example, the information on the Kaka is found under *Nestor meridionalis* while under " Kaka " the reader is cross-referred to the entry under the scientific name.

Understandably, the photographs seem to have been selected to show the main anatomical features and plumage characters and are usually straightforward portraits. Many fine examples of nature photography are included, although because of their generally small size as reproduced, their impact is lessened. Most of the pictures are of wild animals in their natural surroundings, but there are also a lot of captives photographed against plain blue or green backgrounds or against vegetation " dollied-up " to look as though the birds were taken in the wild. This might be acceptable with little-photographed birds from South America, but it seems quite unnecessary for common Europeans like the Hawfinch and Greenfinch which have been well photographed wild and free many times. The captive birds — which include not only finches, but humming birds, parrots and a host of South Americans — tend to look artificial (particularly when we are presented with incongruities like Gouldian Finches from Northern Australia perched amid conifers !) although their diagnostic features are usually well shown. A minority of the photographs are poor. These are mostly of rare species but it is surprising that the publishers weren't able to find better pictures of common birds like the Gannet and Red-legged Partridge.

The text gives a wealth of information, mostly accurate, particularly for the northern hemisphere species. Some entries however, are quite out of date — perhaps not surprisingly in view of the vast range of species whose biology Dr Campbell has attempted to summarise. And although so many birds are described, many whole genera are omitted — 28 of those found in New Zealand, for example. These include genera like *Thinornis* (the Wrybill) containing only a single member, but also others like *Procellaria* with four members in New Zealand and *Oceanodroma* which has about seven members world-wide, so that the coverage is by no means as encyclopaedic as might at first appear. Despite its rather minor faults this book would be useful for someone seeking a broad, non-technical reference work covering a wide range of the world of birds.

J. W.

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ABOUT OUR AUTHORS

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PETER BULL is employed in Ecology Division of DSIR where he leads a small group studying bird problems of agricultural lands; earlier work on the parasites of wild rabbits gained him the Degree of D.Sc. from Victoria University of Wellington. He joined the Ornithological Society in 1940, was President 1957-60 and, at various times, has been in charge of the Society's Bird Banding, Beach Patrol and Bird Mapping Schemes. Although his ornithological publications deal mainly with introduced species, especially rooks, he has been interested in " census " methods ever since E. G. Turbott introduced him to the subject while camped on the Poor Knights in 1940.

ROWLAND H. TAYLOR is a scientist with Ecology Division, Department of Scientific and Industrial Research, and is now based in Nelson. He started work in 1950 as a Technical Trainee with DSIR, and here his early interest in birds was stimulated through working with such keen ornithologists as Drs K. Wodzicki and Peter Bull. Although his main research duties have been concerned with wild rabbits, red deer, and other introduced mammals, he has previously published a number of ornithological papers — notably on Adelie Penguins at Cape Royds, Antarctica — and is presently investigating bird populations in South Island beech forests.

After first visiting the Auckland Islands in 1954 he became intensely interested in New Zealand's outlying islands — as important areas for conservation and especially for the insight they allow into man's impact on the New Zealand environment. He has since taken part in several expeditions to Auckland, Campbell, Antipodes and Chatham Islands, studying — among other things — introduced mammals seals, vegetational changes, albatrosses and parakeets.

ABDUL MOEED has been a scientist with Ecology Division, DSIR, since 1971 and has worked on grasshopper taxonomy in Pakistan, bird hazard to aircraft at Christchurch International Airport; and feeding and breeding biology of starlings in Hawke's Bay. He is now working on invertebrates in the Orongorongo Valley, Wellington. He received his undergraduate and graduate education in Pakistan, and a Ph.D. from University of Canterbury, Christchurch.

PETER ROBERTS studied at Victoria University of Wellington from 1963 to 1968 and completed an M.Sc. degree in zoology. His thesis dealt with aspects of planktonic life in Perseverance Harbour, Campbell Island. A general interest in wildlife was directed towards seabirds following contact with Campbell Island's five species of albatrosses, together with a series of (Sandy) Bartle-induced beach patrols in 1966. His bird-watching received a further impetus when he was accepted by the Fisheries Research Division in Wellington to study the biology of albacore tuna. Since 1969 he has spent almost 400 days at sea on research and commercial vessels, and has visited Fiji, Norfolk Islands, Chatham Islands, Snares Island as well as most of the New Zealand coast (to 200 km offshore) while chasing tuna. He regards seabirds as " colourful and stimulating companions which help raise the mind above more mundane matters."