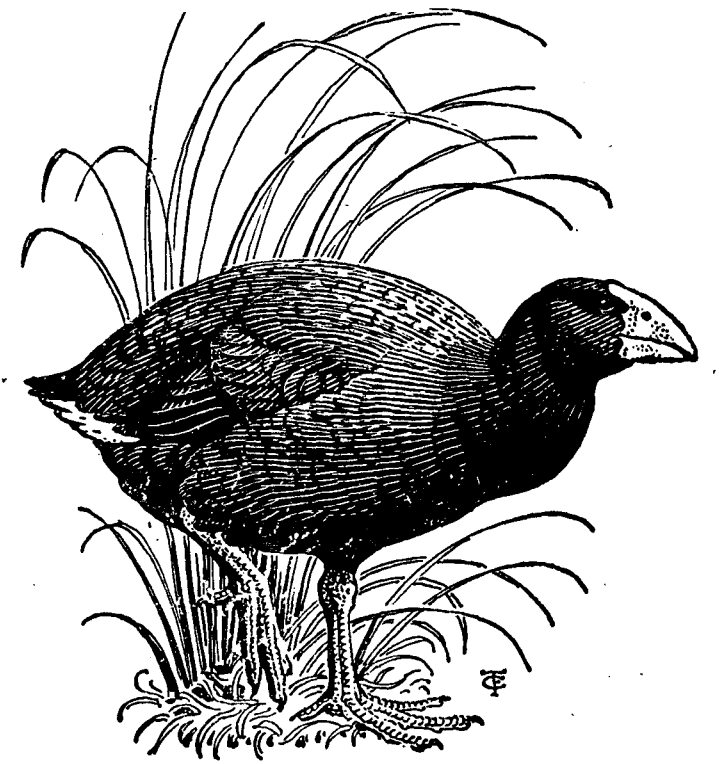
NOTORNIS



QUARTERLY JOURNAL

of the

Ornithological Society of New Zealand

(Incorporated)

Volume Twelve, Number Three, September, 1965

NOTORNIS

In continuation of New Zealand Bird Notes

Volume XII, No. 3 - - - SEPTEMBER, 1965

JOURNAL OF THE ORNITHOLOGICAL SOCIETY OF NEW ZEALAND
(Incorporated)

Registered with the G.P.O., Wellington, as a Magazine

Edited by R. B. SIBSON, 18 Entrican Avenue, Remuera, S.E. 2

Annual Subscription: Ordinary Member, £1; Endowment Member, 30/-
Life Membership, £20 (for members over thirty years of age)

Contents of Vol. 12, No. 3: September, 1965

BREEDING OF THE NORTH ISLAND FANTAIL

By A. BLACKBURN

(This paper was given as a Presidential Address at the Annual General Meeting of the Society in May, 1965)

SUMMARY

The nesting of two pairs of N.I. Fantails, *Rhipidura fuliginosa placabilis,* in isolated territories throughout two seasons is recorded in detail. Nest construction, clutch size, incubation and nestling periods, hatching, fledging, and survival successes are discussed, as are the division of labour between the sexes, the effect of isolation on fertility, and of weather conditions on nesting. The details from 68 cards in the Society's Nest Records Scheme are summarised and commented upon.

INTRODUCTION

In the spring and summer of the years 1959 and 1964 I was able to follow closely the nesting of two pairs of Fantails, and so make a number of observations on their breeding behaviour which do not appear to be recorded in the literature on the species. Two rather isolated study areas were used, both adjacent to my home, so that observations were possible at any hour of the day. The areas were isolated in the sense that in one of them at no time during the breeding season was a strange Fantail observed to enter the area, or appear on the periphery, and seldom did this occur in the other. This isolation possibly resulted in a low hatching success which is referred to later in this paper.

In any study of this nature, it is necessary to be able to distinguish between the sexes, not always easy in the case of the Fantail. Fortunately for me, although not so for the bird, the female in one area, both in 1959 and in 1964, was troubled with lice, so that preening, scratching and ruffling was throughout each season a full spare time activity; and thus she was easily distinguished. Quite often I have found the nests of various species to be heavily infested with lice during and at the end of the nestling period; but an examination of the nests of these two females disclosed a quite heavy infestation shortly after brooding began. However, lice apparently do not inhibit breeding success, for it will be seen later that one of these birds had 15 fledged young during the season. As the season advances, sexual differences become noticeable, particularly in the wearing of the tail feathers. Subsequent to the first nest, the female appears to do all the brooding, so that the tips of her tail feathers become much more worn than those of the male, even to the loss, in two observed cases, of all or part of one of the central dark feathers.

But there is a reasonable division of labour between the sexes. Oliver (1955) states "both sexes build and both incubate," but it will be seen from my observations that this applies mainly to the first nest of the season. The female does most or all of the building of subsequent nests, and the brooding of the eggs, while the male is occupied in feeding the fledged young.

Nests were extraordinarily easy to find in the two study areas, but not in the Buller (1888) tradition. The activity of one or both birds soon disclosed the location of the first nest of the season; and on the day after the fledging of each clutch, a minute or so of watching usually revealed the beginning of a new nest. Fig. 1 shows the locations of the several nests, and indicates that the birds mostly favoured a limited portion of their territories for nesting.

I must stress the fact that my observations and conclusions relate to the breeding histories of but two pairs of birds over two seasons. In consequence, further study may possibly show that some aspects of their behaviour may be atypical of the species.

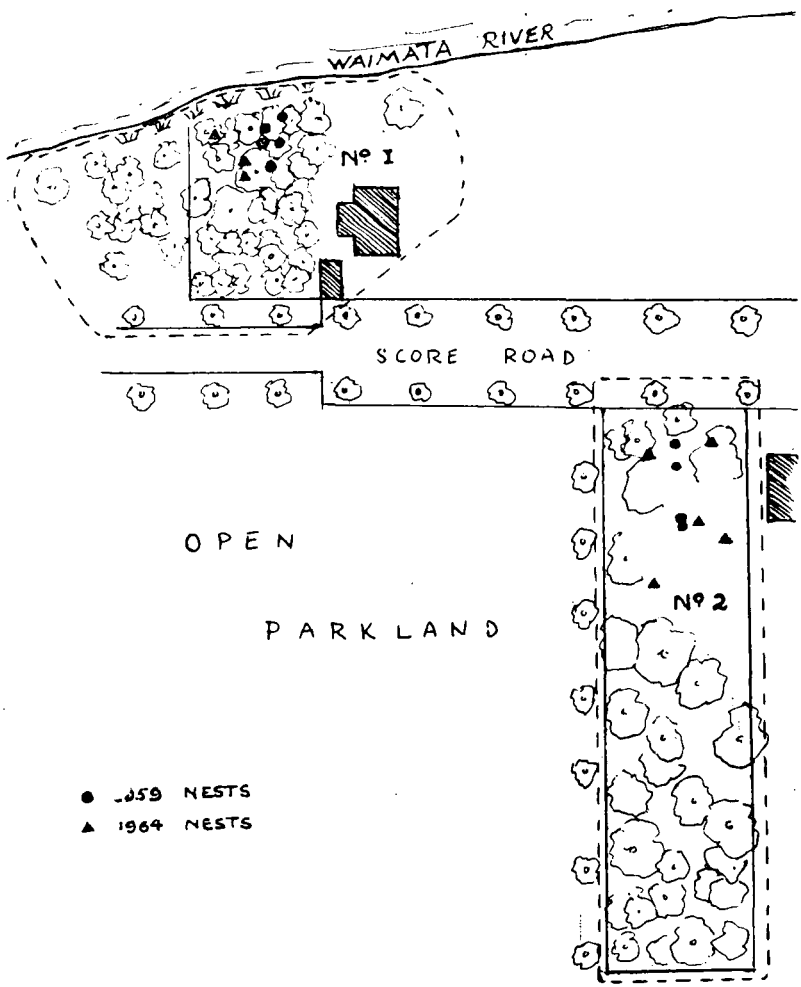


Fig. 1 — Sketch Plan of Territories

Description of Territories. What is designated as No. 1 Territory consists in part of an area of mixed native plantation 38 x 24 yds., bounded on the north by a tidal river, on the east by my house, and the other sides enclosed with a manuka breakwind. Fig. 1 shows that the territory extended to the west into some scattered native trees, to the south into silver birches lining a park roadway, and to the east to a very large myrtle tree on a neighbouring property. No. 2 Territory comprised an area of rather open mixed native plantation 124 x 34 yds. Both plantations are 40 years old.

Sequence of Nesting. The following tables 1 to 4 set out the details of breeding by each pair in both territories for 1959 and 1964.

TABLE 1 — No. 1 Territory 1959

	1st nest	2nd nest	3rd nest	4th nest	5th nest
Building started	—	—	—	28/12/59	
Building completed	17/8/59	11/10/59	23/11/59	10/1/60	no observ-
First egg laid	22/8/59	14/10/59	24/11/59	10/1/60	ations but
Number in clutch	3	3	4	3	3 newly
Brooding began	25/8/59 (a.m.)	16/10/59 (a.m.)	28/11/59	12/1/60	fledged with parent
Young hatched & No.	8/9/59 3	30/10/59 3 (p.m.)	12/12/59 3	27/1/60 3	on 21/3/60
Young fledged & No.	23/9/59 3	14/11/59 3	27/12/59 3	11/2/60 3	
Young surviving after 1 week	3	3	3	3	

Bad weather from 18/8/59 to 21/8/59 affected the first nest, which was temporarily deserted for this period. Heavy continuous rain from 2/10/59 to 9/10/59 also delayed completion of the second nest, but similar conditions on 14/10/59 and 15/10/59 did not affect laying. The general effect of weather on nesting is discussed later.

TABLE 2 — No. 2 Territory 1959

	1st nest	2nd nest	3rd nest	4th nest
Building started		8/9/59	—	—
Building completed		17/9/59	28/10/59	2/12/59
First egg laid	Nest	19/9/59	29/10/59	5/12/59
Number in clutch	destroyed	3	4	3
Brooding began	after completion	22/9/59 (a.m.)	2/11/59	8/12/59
Young hatched & No.		6/10/59 3 (p.m.)	71/11/59 2	23/12/59 3
Young fledged & No.		21/10/59 3	30/11/59 1	7/1/60 3
Young surviving after 1 week		2	1	3

The building of the fourth nest was interesting in that on 30/11/59, the date of fledging of the single young, the female was observed to be completing the rim of another nest, in the same mahoe tree as the third nest. Such behaviour may, or may not, be unusual in the Fantail, and has been recorded in other small passerines. Berger (1961) mentions that the Cedar Waxwing of America may lay the first egg in a second nest the day before the young leave the first nest. In the above table, the single young in the third nest fledged in 13 days.

TABLE 3 — No. 1 Territory 1964

	1st nest	2nd nest	3rd nest
Building started	17/9/64	28/10/64	3/12/64
Building completed	24/9/64	3/11/64	7/12/64
First egg laid	26/9/64	4/11/64	8/12/64
Number in clutch	3	4	3
Brooding began	28/9/64 (a.m.)	7/11/64	10/12/64
Young hatched & No.	13/10/64 3 (a.m.)	22/11/64 1 (4 p.m.)	24/12/64 1 (2 p.m.)
Young fledged & No.	28/10/64 3	3/12/64 1 (9 a.m.)	6/1/65 1 (3 p.m.)
Young surviving after 1 week	2	1	1

The male deserted the territory at 8 a.m. on 4/1/65, although three days earlier he was observed displaying vigorously to the female, which was unresponsive. The reasons for his desertion, and for the low hatching success in the second and third nests are discussed under "Hatching success."

TABLE 4 — No. 2 Territory 1964

	1st nest	2nd nest	3rd nest	4th nest	5th nest
Building started	Eggs	3/10/64	8/11/64	12/12/64	19/12/64
Building completed	destroyed	—	10/11/64	16/12/64	23/12/64
First egg laid	in a.m.	6/10/64	10/11/64	16/12/64	27/12/64
Number in clutch	29/9/64	3	4	Eggs	Eggs
Brooding began		8/10/64	13/11/64	destroyed	destroyed
Young hatched & No.		23/10/64 3	28/11/64 3	in p.m.	in p.m.
Young fledged & No.		7/11/64 3	12/12/64 3	18/12/64	30/12/64
Young surviving after 1 week		3	1	? mynas	? mynas

With the fifth nest of this pair, the reproductive urge was probably weakening. On 25/12/64, I found the hen on the nest at 7 a.m., and she vacated it at 8.30 a.m. without producing an egg. At

6 a.m. next day she was again on the nest, and was still there at 10 a.m. without laying. Again at 3 p.m. I found her on the nest, and she apparently laid the first egg in the late afternoon, for at 6 a.m. on on 27/12/64 the nest contained one egg. Subsequent to predation of this nest, the hen deserted the territory, and was not seen after 5 a.m. on 31/12/64, when I observed both birds flying frequently to the nest and inspecting the damaged eggs. The male remained on the territory, and on 2/1/65 was observed still feeding the single surviving young bird which fledged from the third nest on 12/12/64.

Nest Construction. The appearance of the nest is delightfully described by Buller (1888), who mentions a few of the infinite variety of materials used in construction. I examined the series of nests in Tables 2 and 3, to find that for each series the materials used were precisely the same, except that the first nest in Table 3 contained three tiny feathers from the bird itself, and a small wad of cat's fur, presumably from the only feline predator, which unwisely entered the area early in the nesting season. So having examined one nest of a particular pair, another nest of the same pair could be positively identified as belonging to them. This applied even to the two or three inch-long chips of decayed wood incorporated in the tails of one series. But a particular pair may, or may not, commence their nest by building a tail. For instance, in Table 3 the first two nests, built in rather open situations, had distinctive tails, whereas the third, in an enclosed position, completely lacked a tail. To list the materials used in different parts of the nests by the same and different pairs, to show up similarities and differences, would extend this paper beyond reasonable length, and may provide the basis for a later paper.

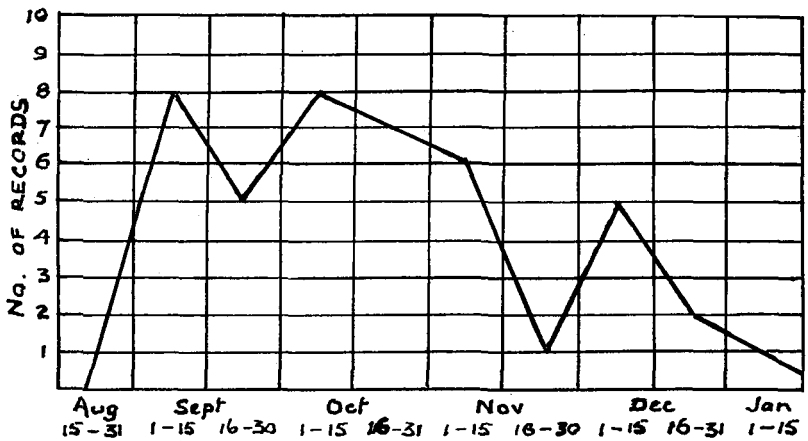
Construction begins with the plastering of wisps of dried grass, fibre, etc., to the three twigs forming the branches of the fork selected. This is effected mainly with cobweb, well wiped on with the bill; but in the case of the first nest in Table 3, following heavy rain, the hen bird was observed to supplement the cobweb with innumerable minute particles of sodden, decayed wood. Subsequent examination proved the effectiveness of this plaster. The tail is then made by joining the three lots of fibre, etc., together with cobweb, and extending the tail thus formed by joining on more fibre, bark, small chips of decayed wood, etc. The base of the nest, about 1 inch in diameter and $\frac{1}{2}$ inch thick, is then woven into the material already cemented to the three branchlets. Next come the walls, about $\frac{1}{2}$ inch thick, built up from the base, the bird at this stage working as much from inside the growing nest as from the outside. Much time and care is given to binding the rim with cobweb; and a suitable lining, frequently of root fibre, or treefern hairs, completes the structure. The shortest period occupied in construction of the nests under observation was approximately 48 hours.

Height of Nest. The height of nests in the study areas varied between 5 and 23 ft., the latter height making observation an arduous business. An examination of 68 records in the Nest Records Scheme shows a minimum height of 2 ft. 6 ins. and a maximum of 25 ft., except for one record of 50 ft., which is treated with some reserve. The following summarises the information on the cards:

	No.	%
Up to 5 ft.	13	19
6 to 9 ft.	23	34
10 to 19 ft.	25	37
20 ft. and over	7	10
	68	100

Records of First Eggs. The graph in Fig. 2 summarises the information gathered from the Nest Record cards. The two August records, and the single January record, are my own. It may be that most observers do not expect to find, and so do not look for, nests as early as August, whereas in a favourable season there is little doubt that a large proportion of the species is then nesting. Except in confined study areas such as mine, nests become progressively harder to find as the season advances, because (a) fledged young remain more or less on the territory of the parents for some weeks, usually accompanied by the male, and so confuse the issue, and (b) building by the hen is speeded up, and so this favourable opportunity for finding the nest is probably missed.

There are insufficient nest record cards (38) to give a true picture of the sequence of nesting.



Clutch Size. Oliver (1955) states the clutch as 3, which is not correct. Fifty-one records of clutch size reveal the following:

	No.	%
3-egg clutches	31	61
4-egg clutches	20	39
	51	100

A further dissection of these records to show when the 4-egg clutches occur reveals:

Up to 31st October	6 4-egg clutches	20
	24 3-egg clutches	80
		100
Average clutch 3.2		
After 31st October	14 4-egg clutches	74
	5 3-egg clutches	26
		100
Average clutch 3.7		

It is highly probable that the 6 4-egg clutches up to 31st October all relate to second nestings, as none were recorded prior to 16th September. Late nesting records are so sparse that I do not think the true clutch pattern is revealed for third and subsequent nestings. The 3 - 4 - 3 pattern clearly emerges in Tables 1 to 4, and it is perhaps significant that where there were more than three nestings, the pattern is 3 - 3 - 4 - 3. Lack (1954) says "In treble-brooded species, the second brood is larger than the first or third. Day length has perhaps some influence, for with a longer working day, the parents can collect more food, hence they can raise a rather larger brood." The probable selective advantage to the Fantail in laying 4-egg clutches is discussed under "Fledging success."

Incubation Period. As stated by Cunningham (1954), there is an almost complete absence in the literature of data relating to the incubation period. Oliver (1955) states that this period was recently determined by J. M. Cunningham as almost exactly 15 days; but Cunningham says ". . . if it is assumed that eggs were in fact laid before 8 a.m., and that hatching took place about the same time, the period was almost exactly 15 days." Skutch (1952) found that many song-birds such as finches, wrens, tanagers, wood-warblers and hummingbirds lay around sunrise; and Weidmann (1964) states the time interval between the laying of successive eggs is 20 to 24 hours for most but not all passerines. Many more careful observations are required to establish a definite time and pattern of laying; and such observations are difficult, for one is loth to disturb even so accommodating a bird as the Fantail when it is likely to be performing this important function. I have 10 clear records of a bird being on the nest at 10 a.m. after having laid that morning; and the hen will quite usually be found still on the nest in the afternoon subsequent to laying in the morning. On the other hand, I have two records of eggs being laid after 9 a.m., and three clear records of laying in the afternoon. I have also several observations of hatching occurring in the afternoon.

In stating the period of 15 days, Cunningham (1954) gives a tolerance of up to 19 hrs., and in this I am inclined to agree, in the light of the following table:

In these examples it is fairly assumed that the laying of the last egg took place at 7 a.m. or 6 a.m. according to season, and that brooding began at that time.

TABLE 5 — Incubation Periods

Reference	Table 1	Table 1	Table 2	Table 3	Table 3
	1st nest	2nd nest	2nd nest	1st nest	3rd nest
Brooding began	25/8/59 a.m.	16/10/59 a.m.	22/9/59 a.m.	28/9/64 a.m.	10/12/64 a.m.
Hatching occurred	8/9/59 p.m.	30/10/59 3 p.m.	6/10/59 4 p.m.	13/10/64 7 a.m.	24/12/64 2 p.m.
Brooding period	14 days 8 hrs.	14 days 8 hrs.	14 days 10 hrs.	15 days	14 days 9 hrs.

I cannot say with certainty that the male takes no part whatever in the incubation of eggs subsequent to the first clutch, but the evidence points that way. Changing over at the nest is a frequent and obvious occurrence with first nests, and with the second if there are no surviving fledged young from the first, such as with the second nests in Tables 2 and 4. But on no occasion did I record a change over when there were fledged young in the territory.

Hatching Success. Some 53 nest record cards give sufficient detail to allow a fairly accurate assessment of hatching success:

Of 19 4-egg clutches (76 eggs) 58 hatched, or 76 per cent.

Of 34 3-egg clutches (102 eggs) 80 hatched, or 78.5 per cent.

These figures give an overall percentage of 77.25.

The low fertility of the pair on No. 1 Territory in 1964 (see Table3) led me to seek a cause for their lack of hatching success. I have already mentioned the isolation of this study area from other Fantails. The Fraser Darling (1938) effect would have provided one answer to the problem, for he believed that sociality, expressed in display and song, has survival value, and had this to say concerning territory: "One of the important functions of territory in breeding birds is the provision of periphery" i.e. the border along which the bird is in relation with a neighbour. And I quote Fisher (1954) at some length on this subject: "The effect of the holding of territory by common passerines is to create 'neighbourhoods' of individuals which are the masters of their own definite and limited property, but which are bound firmly, and *socially,* to their next door neighbours by what in human terms would be described as a dear enemy or rival friend situation, but which in bird terms should be more safely described as mutual stimulation." But Dr. John Gibb (*pers. comm.*) considers that this lack of fertility may have been due to some unsuspected deficiency in the territory, or perhaps to the age of the birds (if they were both young, born late in the previous season), or even to chance.

The male of this particular pair was observed on occasions to display to the female under circumstances when copulation could have been expected as a climax . But the female appeared to me unresponsive, either because of some lack in the male's display, or perhaps, to anthropomorphose the situation, because she "took him for granted." The end result was that the male completely deserted the territory 2 days 7 hrs. before the single nestling of the third nest fledged; and thus dashed my hopes of a fourth nest in the study area.

Nestling, or Fledging Period. Oliver (1955) gives the fledging period, on the authority of Wilkinson (1952), as 15 days, and Cunningham (1954) recorded it from his observation as 14 days. It is of interest to note that Serventy and Whittell (1962) give the hatching and fledging periods of the Australian race of *Rhipidura fuliginosa* each as 15 days. I have found the period to fluctuate from almost exactly 14 days to almost exactly 15, even with successive clutches of the same parents. But this period only applies to a full clutch. There were three cases of single fledglings in my study areas, and the periods in the nest were 13 days (table 2), 11 days 17 hrs., and 13 days (table 3). These young appeared extremely immature when first out of the nest, but all survived for at least several weeks after fledging, and finally left the areas. There may be two contributing causes to the early fledging of single nestlings: (a) The food supply develops them more quickly; or (b) The lack of companionship causes premature departure from the nest.

The faecal sac ceases to be produced just before fledging, so that typically two or three fresh droppings will be found in a nest from which the young have just flown.

For three or four days after fledging, the young remain mostly in a tight group, which then tends to break up, but reforms at times, particularly towards evening, for two or three days longer.

Fledging Success. It is interesting to note that the nest record cards provide evidence that the percentage of fledging success from 4-egg clutches is almost identical with that from 3-egg clutches.

Of 13 4-egg clutches (52 eggs) 47 hatched and 37 fledged.
Percentage of fledged to hatched 79
Percentage of fledged to eggs 71

Of 21 3-egg clutches (63 eggs) 60 hatched and 47 fledged.
Percentage of fledged to hatched 78
Percentage of fledged to eggs 75

The nestling mortality in 4-egg clutches is therefore 21 per cent., and 22 per cent. in 3-egg clutches. Thus, whilst the percentage of fledged to eggs is rather higher in the 3-egg clutches, the difference is so slight that there would appear to be a definite selective advantage to the species in the production of 4-egg clutches in the second nesting. But as Dr. Gibb (*pers. comm.*) points out, this advantage is not to be measured solely by the number of young fledged, their subsequent survival being just as important.

Survival after Fledging. Young surviving for more than one week after fledging should have a reasonable chance of reaching maturity. Records of such survival are almost impossible to make under normal conditions, so the record cards contain none. However, no difficulties were experienced in my study areas, the fledged young remaining on territory for some weeks as a rule, and normally being fed by the male. The records of survival from Tables 1 to 4 are as follows:

12 clutches (43 eggs) from which 30 fledged, and 26 survived to the stage of independence.
Percentage of survival to fledged birds 87
Percentage of survival to eggs 60

Thus 4 pairs of birds had 26 surviving young in the two nesting seasons, averaging 3.2 young per pair per season. If the species is maintaining its population at a fairly constant level, as it appears to be, this result would indicate that the average life span of a Fantail is extremely short; but it would be reasonable to assume that survival of young in the rather protected study areas was considerably above the average for the species. Added to this, as stated by Dr. Gibb (*pers. comm.*), judging from other birds, there is likely to be specially heavy mortality immediately after the young become independent.

Effect of Weather Conditions on Nesting. The early nesting of the two pairs in August, 1959, compared with the late nesting in September, 1964, naturally leads one to seek a cause of the variation of more than 4 weeks. Rowan (1925) was the first to discover that increasing daylight leads to the development of a bird's gonads. All things being equal, one would expect sexual activity and nesting to begin at about the same time each season. The only variable factor would appear to be the weather, with its consequent effect upon food supply. The year 1959 was remembered as having a wet winter and early spring, while in 1964 the winter and spring were exceptionally dry, later developing into drought conditions. So meteorological records were examined, and the following information extracted:

TABLE 6 — Meteorological Data, 1959 and 1964

	1959				1964			
	June	July	Aug.	Sept.	June	July	Aug.	Sept.
Days with rain	14	15	18	11	23	16	17	14
Hours of sunshine	146	158	160	165	97	128	175	185
Rainfall	1.01	6.22	6.31	2.34	7.05	0.86	1.58	2.35

The heavy rainfall of July and August, 1959, was possibly the main factor leading to the early nesting that year, or it may have been that the rain combined with many hours of sunshine led to a substantial increase in the food supply. Conversely, the lack of rain in July and August, 1964, may have delayed nesting by decreasing the food supply. In this connection, Serventy and Whittell (1962) are quoted at some length: "Light is by no means the only probable activator and among land and fresh water birds other external factors are capable of stimulating the pituitary; among those which have been suggested are temperature, humidity, rainfall and water levels, and food supply. It is difficult to isolate the effective factor out of a number which might be acting simultaneously." Referring to rain in particular as a factor, they say, "It might be the sight of drenching rain itself . . . acting through the eye as the receptor organ. . . . The process is quite involuntary and outside the control of the will of the individual." Our Fantail is the Australian Grey Fantail represented here by a distinct sub-species, which Fleming (1962) suggests has developed within no more than 20,000 years. In Australia, rainfall is recognised as a major factor in the breeding of very many species, and our Fantail

could possibly retain an ancestral response to factors other than increasing hours of daylight in the control of its breeding season. I put these suggestions forward more with the idea of provoking thought on this interesting subject, rather than providing the probable cause of the early or late beginning of the nesting season.

DISCUSSION

It would appear that 4 nests, excluding renesting, are quite a normal number for the Fantail in a season, with a minimum of 3, and under most favourable circumstances, 5. Both sexes share in the construction of the first nest and in brooding the first clutch, and thereafter it appears that the male mainly cares for the fledged young, while the female does most of the nset-building and brooding. It appears quite usual for the female to commence building a subsequent nest on the day the young fledge, and even earlier on occasions. Many more detailed records are required to define accurately the normal time of the laying of eggs, and consequently of the time when brooding begins. From the evidence available, the hatching period varies between 14 days 8 hrs. and 15 days.

Nests of one pair are constructed of identical materials throughout the season, and it would be interesting to know whether this characteristic is carried on from on season to another. Banding may provide the answer. The provision of a tail to the nest seems to depend on its situation, no tail being made when the nest is in an enclosed position; but more observations are required. The fledging or nestling period varies between 14 and 15 days, but where there is only one fledgling, this period may be less than 12 days, without prejudicing its survival.

The Nest Record cards have been of considerable assistance in writing this paper, but are lamentably few in number for such a common species. So members of the Society are urged to give the system its full value by supplying records wherever possible. In observing the nests of tree-nesting birds, and in particular in a series of observations, the use of a mirror on an extensible rod is strongly recommended, as making easy many observations which would otherwise be impossible, causing a minimum disturbance of the nesting bird, and reducing or totally removing the risk of predation which so often follows human interference.

ACKNOWLEDGEMENTS

I am indebted to Mr. Graham Turbott of the Auckland Institute and Museum, and to Dr. John Gibb of Animal Ecology Division, D.S.I.R., for reading this paper and suggesting certain alterations and additions to the text.

REFERENCES

BERGER, A. J. (1961): Bird Study, 202.
BULLER, W. L. (1888): A History of the Birds of N.Z. I, 70-71.
CUNNINGHAM, J. M. (1954): Three observations of Fantails, Notornis VI, 47.
DARLING, F. Fraser (1938): Bird Flocks and Breeding Cycle, Cambridge U.P.
FLEMING, C. A. (1962): History of N.Z. Land Bird Fauna, Notornis IX, 270.
FISHER, J. (1954): Evolution and bird sociality, in Evolution as a Process, 73.
LACK, D. (1954): The evolution of reproductive rates, in Evolution as a Process, 146.
OLIVER, W. R. B. (1955): New Zealand Birds, 492.
ROWAN, W. (1925): Relation of light to bird migration and developmental changes. Nature 115: 494/5.
SERVENTY, D. L., & WHITTELL, H. M. (1962): Birds of Western Australia, 3rd Ed. 8/9, 344.
SKUTCH, A. F. (1952): On the hour of laying and hatching of birds' eggs, Ibis 94: 49-61.
WEEDMAN, U. (1964): Laying, in A New Distionary of Birds, 422.
WILKINSON, A. S. (1952): Kapiti Bird Sanctuary, 63.

THE SULPHUR POINT (LAKE ROTORUA) GULL COLONY

By DENISE and BRIAN REID

INTRODUCTION

The New Zealand gull population comprises two endemic forms; the Black-billed *(Larus bulleri)* and the Red-billed *(L. novaehollandiae scopulinus)*, as well as the circumaustral Black-backed Gull *(L. dominicanus)*. All three breed on the volcanic plateau, the first two in the Rotorua district and the last around Taupo and possibly at Rotorua. The main Rotorua breeding area for both Red-billed and Black-billed gulls is along the city margin of the lake where they have colonised part of Sulphur Point and several of the small silica islets in the surrounding bay. This area will be discussed more fully later.

Other known breeding grounds at Rotorua include a small thermal lakelet (Roto-a-tamaheke) in the Whakarewarewa reserve and the Arikikapakapa golf-course. The age of the Whakarewarewa colony is not known but the writers remember gulls congregating there in the 1949-50 and 1950-51 seasons. It is not known whether they bred. Daniels (1963) records the 1962-63 breeding population as 40 pairs of Black-bills and one pair of Red-bills. According to Black (1960), Red-bills first bred on a mud flat at the golf course in 1959. He has since given the size of this 'subsidiary' colony as about 200 pairs.

The breeding of both Red-billed and Black-billed Gulls in Rotorua district is interesing, as neither species would normally be expected to occur there. Their establishment in the district has undoubtedly followed 'in the wake of the plough.'

Red-billed Gulls are widely distributed, breeding around the coast of New Zealand and on outlying islands from Campbell and the Auckland Islands in the south-west, to the Chathams in the east and the Three Kings in the north. They can, in general, be regarded as coastal breeders (i.e. near salt water), but at Rotorua they are inland.

The Black-billed Gull is mainly a South Island species. Although they breed around the coast they are specially characteristic of rivers and inland lakes. They have long been known as visitors to the southern regions of the North Island. The Rotorua population is well removed from the normal range.

PREVIOUS RECORDS

Records of Black-billed and particularly Red-billed Gulls at Rotorua are few. Available information is summarised below.

Red-bills: A considerable population has been in the Rotorua district for many years. G. A. Buddle reports them breeding with Black-billed gulls on small rocky islets off the mouth of the Whaka stream during the 1939-40 summer. In April 1941 C. A. Fleming counted over 400 (including many immature) behind the Ward Baths; i.e. the present colony site. Over 1,000 birds were noted in this general vicinity in May 1945 by R. B. Sibson.

M. S. Black (1961) is of the opinion that the population has increased during the last 20 years. He considers the winter populations

are larger than formerly and are also probably greater than the summer breeding population as many wintering birds appear to depart for coastal breeding grounds.

Although spot counts are of limited value in indicating the size of a breeding colony the following figures do point to a population increase.

On 17/11/45 H. R. McKenzie counted over 50 birds and 27 nests. On about the same date two years later (i.e. 21/11/47) J. M. Cunningham recorded 44 birds and 21 nests. It can be reasonably assumed that in both these years the breeding population was much the same. Black states that about 70 pairs nested in both the 1951-52 and 1954-55 seasons (i.e. roughly twice the 1945 and 1947 number). His figure for the 1956-57 season is about 150 pairs, which is twice that for the 1951-52 and 1954-55 summers.

In some years breeding occurs early, in others later. During 1958 the birds started gathering at Sulphur Point in August. In 1954 a flock of 300 had arrived by September 10th and there was much activity claiming territories (M.S.B.). Laying had just started on 2/10/57 (D. Merton). In 1945 it appears to have been about a month later, for according to H. R. McKenzie only seven nests out of the 27 built on 17/11/45 contained clutches.

The nearness of the colony to the city has heavily handicapped the breeding success. For example, of the 1945-46 season — "the colony was later completely destroyed by vermin" (H.R.McK.); 1947-48 season — "Later the entire colony was robbed of eggs by humans" (J.M.C.); 1954-55 season — "not one chick left the nest, all were ruthlessly destroyed by humans" (M.S.B.). However Black mentions that 'many young' were successfully fledged from the 1956-57 season and Cunningham notes the successful re-nesting of some birds. These notes on losses and re-nesting refer to Black-bills also.

Black-bills: These have been known in the Rotorua district for a long time; e.g. Oliver, 1930 writes "Has been recorded (*not recently*) from Lakes Tarawera and Rotomahana." They were first reported breeding in the district on the Sulphur Point islets in May 1932 by M. E. Fitzgerald and A. H. Hooper; and independently by C. A. Fleming. In 1939 Buddle records that between 75 - 100 pairs were nesting on rocky islets off the mouth of the Whaka Stream (i.e. Puarenga Stream which flows into Sulphur Bay about 650 yards S.E. of the present Sulphur Point colony). During the early 1940's the Rotorua district was the only known breeding area of *L. bulleri* in the North Island, although Sibson (1953) considered that they may breed elsewhere on the volcanic plateau and mentions "a rather inaccessible lake on Mount Tongariro." The knowledge of Rotorua breeding grounds at that time appeared to be confined to Sulphur Point as a definite area and Lake Rotomahana as a probable area.

Sibson thought it possible that odd pairs may nest elsewhere in the North Island and this has since been confirmed. (e.g. Porangahau Estuary, Hawkes Bay; first recorded 11/1/45 by K. A. Wodzicki and J. M. Cunningham. Ngaruroro River, Hawkes Bay; first recorded 9/1/54 by D. H. Brathwaite. Gisborne harbour, first recorded 19/1/54; and Murphy's Beach, Gisborne, first record 19/1/59, both by A. Blackburn. These are all small colonies.

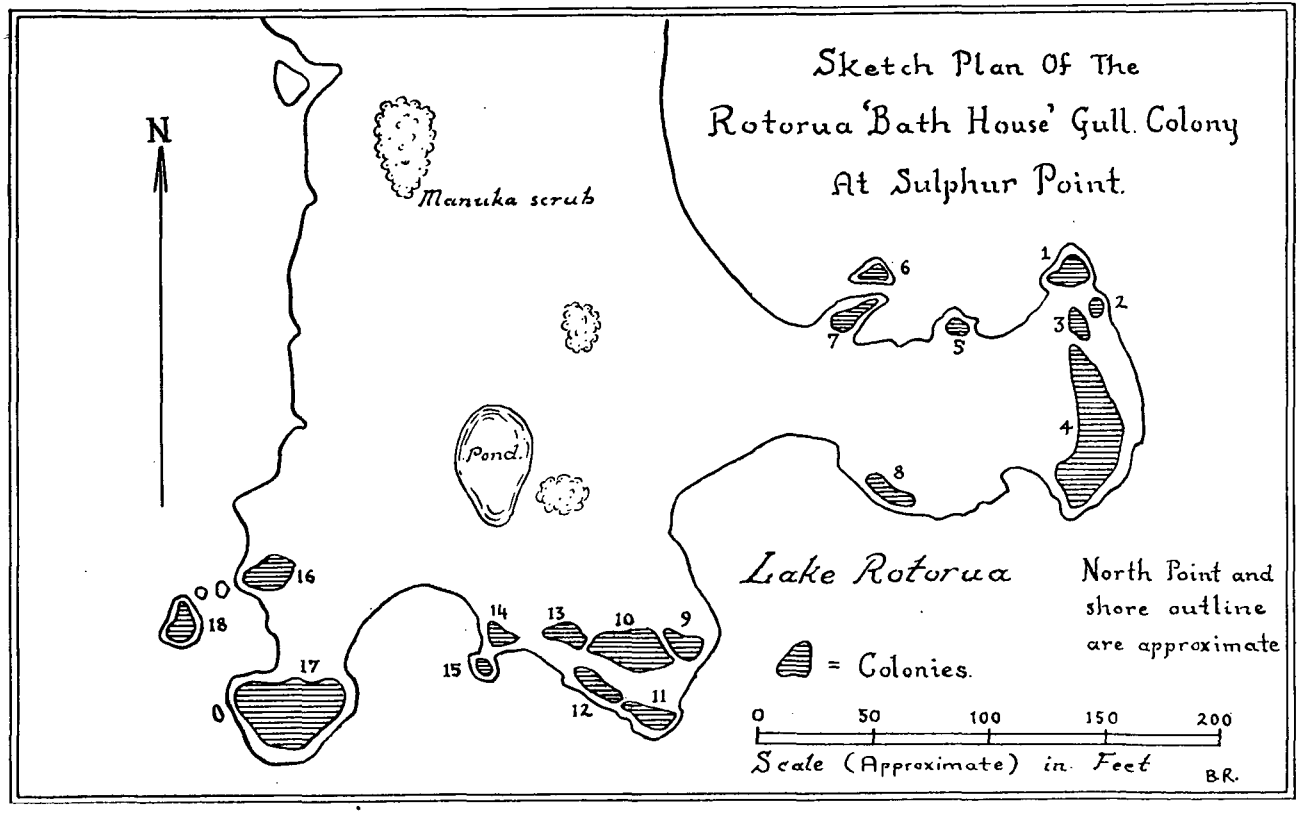
Black (1955) mentions that the vanguard of the Rotorua Black-billed summer-breeding population appears in August (e.g. 3/8/54 — 30 birds; 7/8/53 — 40 birds; 17/8/48 — 200 birds; 18/8/58 — 200 birds, M.S.B.). The numbers swell throughout September and October reaching their maximum in November. Counts recorded in the *Classified Summarised Notes* indicate that the population build-up varies from year to year — e.g. September counts: 9/9/41 — 200 birds (R.B.S.); 13/9/46 — 500+ birds (C.A.F.); 20/9/54 — 200+ birds (M.S.B.). One October count is available when only 160 birds were noted on the first day of that month by M.S.B. Three November counts give: 20/11/44 — 400 birds (H.R.McK.); 17/11/45 — 500 birds (H.R.McK.); and 21/11/47 — 600+ birds (J.M.C.). The November counts suggest a steady increase in the population over the four-year period 1944-47. This may be a gradual, steady increase which is still continuing; for Fleming (1947) considered the population had probably increased since 1932 and the writers' counts in 1961 show that the upward trend is being maintained.

The start of laying does not appear to bear directly on the population build-up. Laying may begin early or late regardless of the percentage of the total breeding population that is present. On 17/11/45 H.R.McK. counted 500 birds but these had not started nesting. At the same period two years later (i.e. 18/11/47) 99 nests were counted (84 with one egg, 15 with two eggs) and yet the adult tally was roughly 100 fewer than in 1945. F. C. Kinsky (*pers. comm.*) visited the colony on 21/12/59. Of subcolony 16 — he mentions this was composed of Black-bills with the exception of one Red-billed pair — most of the nests still contained eggs; a few had chicks. Hatching had started within the last few days as no chicks were running around. In 1961 this stage was reached by November 1 or seven weeks earlier. In 1961 the colony composition was the same — all Black-bills except for one pair. Black gives the following routine sequence for the Sulphur Point colony — "after the arrival of the main body comes the claiming of territory which goes on for several weeks before any attempt is made at nest building. This starts in earnest about mid-October. After the nests are built comes a period of inertia lasting 5 - 10 days. Then the first egg is laid."

Of the breeding population Black states — "The most successful season for many years was that of 1951-52 when a maximum of 220 nests contained clutches — in mid December when nesting was at its peak." He also records that 200 pairs bred in 1956-57.

The main exodus from the breeding to the wintering grounds usually occurs between mid-April and the end of May but the decline in numbers is not particularly apparent until mid-May. A few stragglers remain behind at Rotorua over the winter months but the population is not stable. Flocks may suddenly appear in Sulphur Bay, and just as suddenly disappear. Black records two such occasions; — in June 1952 when over 200 were counted; and in July 1954 when over 160 were seen.

As early as 1942 Sibson suggested that the Black-bills frequenting the Firth of Thames coast around Miranda in the winter months probably came from Rotorua, and considered that if such were the case, "the Rotorua population must run into several hundreds."


Sketch Plan Of The
Rotorua 'Bath House' Gull Colony
At Sulphur Point.
N
Manuka scrub
Pond.
Lake Rotorua
North Point and shore outline are approximate
= Colonies.
0 50 100 150 200
Scale (Approximate) in Feet
B.R.
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18

Fleming (1947) endorses this view and writes — "The differences between summer and winter numbers (at Rotorua and along Firth of Thames) supports the hypothesis that the winter flock at Miranda is composed of Rotorua breeders." Black agrees in part but is also of the opinion that some move north-eastward to the Bay of Plenty, where as long ago as September 1940, Sibson found small numbers at Matata lagoon and the estuaries of the Tarawera and Rangitaiki. This view is held by the writers, as considerable numbers of Black-bills have now been seen in newly ploughed fields on "Windermere" and neighbouring farms at Edgecumbe.

THE 1961-62 BREEDING SEASON

During the 1961-62 breeding season the writers tried to assess the proportions and numbers of the two gulls in the various 'sub-colonies' of the Sulphur Point colony. Observations and counts were confined to the birds breeding on the silica spit and one or two closely adjacent islets. Birds on islets further out in the bay are not included in the counts and the writers cannot even hint at what percentage of the total breeding population were on these islets. The area covered by the census is that which will form the proposed wildlife sanctuary.

The first visit was made on 4/10/61 and two aspects of the colony caused surprise. Firstly, the population was much greater, and secondly, breeding had begun appreciably earlier than available records indicated. At a comparable date in 1957 (i.e. 2 October) Merton found that Red-bills had just started to lay while the Black-bills were still nest-building. On 4/10/61 a rough check showed that (a) over 350 Red-bill nests were occupied and about 300 of these contained eggs; (b) roughly 250 Black-bill nests were occupied and 40+ had eggs.

The Colony — Description

The colonised area of Sulphur Point is the tip of a low-lying silica spit situated about 200 yards east of the Ward Baths. This protrudes southwards into the southernmost bay of Lake Rotorua. The spit is susceptible to flooding. Its shape and area vary according to the level of the lake. When the level is low the spit outline is similar to a spurred boot, there being three extensions at the far end roughly the shape of toe, heel and spur (see plan). When the level is high much of both the toe and heel are either submerged or awash and the spur is cut off to form an islet. The gulls nest on the three extensions. There are seven sub-colonies on the toe, seven on the heel and two on the spur. Another sub-colony (No. 6) is on an islet a few feet north of the toe and sub-colony 18 is on an islet just west of the spur. The spit is geo-thermal. There are several steam vents and three or four hot to boiling pools. A fairly large pool lies between sub-colonies 10, 11 and 12 (not shown on plan). This claimed a considerable number of chicks. The foot of the spit (i.e. toe, heel and spur) is about 400 feet long.

Population Size (Field Data)

The total breeding population was counted twice; on 5 October 1961 and again on 19 October 1961. These counts give a different picture of the colony (in terms of both size and composition), because proportionately more Red-bills were in residence when the first census was made. They breed earlier.

TABLE 1 — Number Occupied Nests; Sulphur Point Colony

Date	5 October 1961				19 October 1961				
Species	Red-bills		Black-bills			Red-bills		Black-bills	
Nests with	0	Eggs	0	Eggs	0	Eggs	Chicks	0	Eggs
Sub Col. 1	3	24	–	–	1	17	8	–	–
2	3	3	–	–	–	4	–	–	–
3	7	8	5	–	–	10	2	2	3
4	9	41	84	9	1	45	2	2	99
5	4	–	–	–	1	1	–	–	–
6	–	1	–	3	–	1	–	1	4
7	2	2	1	–	–	5	–	1	1
8	1	6	2	1	–	6	1	1	2
9	1	2	3	–	–	3	–	1	4
10	7	35	3	4	1	32	12	2	41
11	6	23	–	–	3	20	3	–	–
12	3	18	2	–	1	16	4	2	3
13	1	8	2	–	–	6	3	1	1
14	1	3	5	1	–	3	1	1	7
15	2	4	1	1	–	4	2	2	5
16	–	1	22	13	–	1	–	4	67
17	20	128	55	22	3	123	21	10	163
18	2	16	11	7	–	13	5	–	28
Total Nests	72	323	196	61	11	310	64	30	428
Per Cent. composition	60.6		39.4		45.7			54.3	

From Table 1 it can be seen that there were —

1. a. 652 occupied nests on 5 October 1961. These included 395 (60.6%) Red-bills and 257 (39.4%) Black-bills.
   b. Whereas 323 (81.8%) of the Red-bill nests present contained eggs.
   c. Only 61 (23.7%) of the Black-bill nests present contained eggs.

2. a. 843 occupied nests on 19 October 1961. These included 385 (45.7%) Red-bills and 458 (54.3%) Black-bills.
   b. Whereas the number of occupied Red-bill nests had decreased by 10 (2.5%).
   c. The number of occupied Black-bill nests had increased by 201 (78.2%).
   d. 374 (97.1%) of the Red-bill nests occupied contained eggs or chicks.
   e. 428 (93.4%) of the Black-bill nests occupied contained eggs.

The nest composition data from these two counts is presented in Appendix 1. In addition, extra counts were made of selected sub-colonies to obtain fuller information (Appendix 2). Sub-colonies 1, 11 and 12 were used for Red-bills as there were very few Black-bills in these three breeding congregations and their nests were easily recognised. Sub-colony 16 gave fuller Black-billed data. It contained only one breeding pair of Red-bills.

TABLE 2 — Counts of Selected Sub-colonies

	Black-bills (sub-colony 16)				
	Nests Occupied		Nests with E/Ch.		
Date	No. (A)	%	No. (B)	% (A)	% (B)
5/10	35	46.1	13	17.1	17.8
10/10*					
19/10	71	93.4	67	88.2	91.8
26/10	75	98.7	72	94.7	98.6
28/10*	76	100.0	73	96.0	100.0
2/11	73	96.0	69	90.8	94.5
9/11	52	68.4	48	63.2	65.8
14/11	19	25.0	17	22.4	23.3
21/11	10	13.1	10	13.1	13.7

* Estimated population peaks based on plotting above figures

	Red-bills (sub-colonies 1, 11, 12)				
	Nests Occupied		Nests with E/Ch.		
Date	No. (A)	%	No. (B)	% (A)	% (B)
5/10	77	97.5	65	82.3	90.3
10/10*	79	100.0	72	91.1	100.0
19/10	73	92.4	68	86.0	94.4
26/10	54	68.4	46	58.2	63.9
28/10*					
2/11	29	36.7	26	32.9	36.1
9/11	20	25.3	19	24.0	26.4
14/11	19	24.0	19	24.0	26.4
21/11	15	19.0	15	19.0	20.8

* Estimated population peaks based on plotting above figures

Calculated Breeding Population (1961-62)

By plotting a curve based on the counts (Table 2) of the selected sub-colonies it is possible to obtain the probable maximum number of pairs for these colonies, along with the approximate date when the peak number for each species was reached. If these data are equated with the total counts made on 19/10/61 an estimate of the colony size may be made. With Red-bills it is also possible to arrive at the maximum number of nests used during the occupation peak by using the total count made on 5/10/61 together with the figures for sub-colonies 1, 11 and 12. The total obtained from using the 5/10/61 count agrees within 2.5% with the tally based on the 19/10/61 figures. In the case of the Black-bills there were not enough present for the 5/10/61 count to be reliable.

Red-bills: On 5/10/61 occupied nests = 395 (total colony count).

On the same date 97.5% of the total number of nests were occupied (derived from sub-cols. 1, 11 and 12 data).

Therefore maximum number nests occupied at peak $= \frac{395 \times 100}{97.5}$

$= c.405$

On 19 October 1961 occupied nests = 385 (total colony count). On the same date 92.5% of the total number of nests were occupied (derived from sub-cols. 1, 11 and 12 data).

Therefore maximum number of nests occupied at peak $= \frac{385 \times 100}{92.5}$

$= c.415$

On 19/10/61 374 nests contained clutches (total colony count).

On the same date 94.5% of the maximum number of clutches were present (sub-cols. 1, 11 and 12).

Therefore number of clutches at peak $= \frac{374 \times 100}{94.5}$

$= c.395$

Black-bills: On 19/10/61 occupied nests = 458 (total colony count).

On the same date 93.5% of the total number of nests were occupied (sub-col. 16).

Therefore maximum number nests occupied at peak $= \frac{458 \times 100}{93.5}$

$= c.490$

On 19/10/61 428 nests contained clutches (total colony count).

On the same date 92.0% of the maximum number of clutches were present (sub-col. 16).

Therefore number of clutches at peak $= \frac{428 \times 100}{92.0}$

$= c.465$

Peak Nesting Population

The peak nesting population is estimated at c.900 pairs comprising c.410 (45.5%) Red-bills and c.490 (54.5%) Black-bills. On the data available the probable size and species composition of the 18 sub-colonies is as follows (Table 3).

TABLE 3 — Probable Peak Number of Nesting Pairs

Sub-col.	Red-bill	Black-bill	Total	Sub-col.	Red-bill	Black-bill	Total
1	28	–	28	10	48	46	94
2	5	–	5	11	28	–	28
3	13	6	19	12	23	5	28
4	50	106	156	13	10	3	13
5	4	–	4	14	5	9	14
6	2	6	8	15	7	8	15
7	5	3	8	16	1	76	77
8	7	4	11	17	151	181	332
9	3	6	9	18	20	31	51

Total Breeding Population

It is highly improbable that the peak breeding population for each species would equal their total breeding population as this would imply that no clutches had been lost in the four-week period extending from when the first clutch was laid to the time when the maximum number was reached.

In sub-colony 16 the contents of two nests were lost in the seven day period extending from 26/10/61 to 2/11/61. The number of nests with clutches or chicks had decreased by three (from 72 to 69) but two chicks from one nest were roaming freely. This information permits a rough estimate of Black-billed clutch losses, e.g.

2 clutches were lost in c.500 nesting days (72 nests x 7 days)

Total Black-billed nesting days = No. nests x incubation period
= 465 x 22 = c.10200

Therefore $\frac{102 \times 2}{5}$ = c.40 clutches were lost.

If the same rate of clutch loss is assumed for Red-bills it is found that

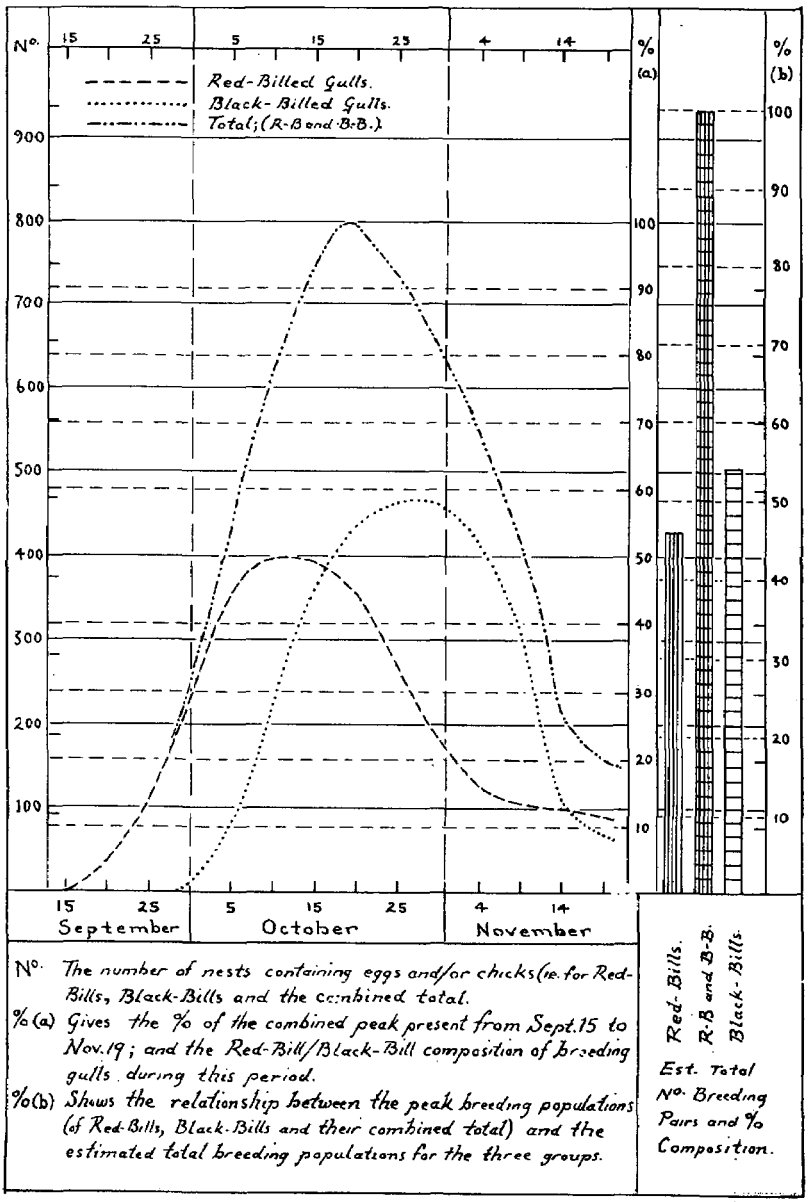
$\frac{87 \times 2}{5}$ = c.35 clutches were lost.

This method suggests that only 8.0% of the total breeding nests lost their clutches. Considering the internal congestion of the colony and the inter-play of the two species along with its susceptibility to outside interference this loss is very low. The actual loss would probably be considerably higher but is masked by the re-laying of lost clutches. The acceptance of an 8.0% clutch loss for Red-billed and Black-billed gulls places the total breeding population of the Sulphur Point colony at c.935 pairs (430 Red-bills and 505 Black-bills).

The Population Build-Up and Breeding

It is not known when the gulls started gathering at Sulphur Point for breeding. The start of egg laying and build-up of nests has been determined in part by extrapolation of curves based on counts starting on October 5 and in part by the beginning of hatching and the subsequent increase in chick numbers.

With both these methods of determining earliest laying dates it appears that the Red-bills started approximately 14 days before the Black-bills. The Red-bill nesting peak was reached 16 days earlier;



N°. The number of nests containing eggs and/or chicks (ie. for Red-Bills, Black-Bills and the combined total.

%(a) Gives the % of the combined peak present from Sept. 15 to Nov. 19; and the Red-Bill/Black-Bill composition of breeding gulls during this period.

%(b) Shows the relationship between the peak breeding populations (of Red-Bills, Black-Bills and their combined total) and the estimated total breeding populations for the three groups.

TABLE 4 — Estimated Population Size and Composition During the 1961 - 62 Breeding Season

Date 1961	Calculated Number of Nests with Clutches				Per Cent. Composition		Total Nests with Clutches	Per Cent. of Colony Peak (800 pairs on 19/10/61)			% of Total Breeding Pairs (935 prs.)
	Red-bills		Black-bills		Red-bills	Black-bills		Red-bills	Black-bills	Total	
	No.	%	No.	%							
20/9	35	9	–	–	100	–	35	4.5	–	4.5	4.0
25/9	122	31	–	–	100	–	122	15.5	–	15.5	13.0
30/9	237	60	10	2	96	4	247	29.5	1.5	31.0	26.5
5/10	356	90	83	18	81	19	439	44.5	10.5	55.0	47.0
10/10	395	100	223	48	64	36	618	49.5	27.5	77.0	66.0
15/10	392	99	358	77	52	48	750	49.0	44.5	93.5	80.0
20/10	356	90	437	94	45	55	793	44.5	54.5	99.0	85.0
25/10	268	68	461	99	37	63	729	33.5	57.5	91.0	78.0
30/10	185	47	461	99	29	71	646	23.0	57.5	80.5	69.0
4/11	126	32	414	89	23	77	540	16.0	51.5	67.5	58.0
9/11	106	27	307	66	26	74	413	13.5	38.0	51.5	44.0
14/11	102	26	112	24	48	52	214	12.5	14.0	26.5	23.0
19/11	91	23	70	15	56	44	161	11.5	8.5	20.0	17.0

i.e. on 10/10/61 as against 26/10/61 for Black-bills. (It is possible that the earliest Red-bill clutches were lost, in which case laying could have started a day or two before the estimated date.) Black records that Red-bills as a rule breed from two to three weeks earlier. During the 1947-48 season population and nest counts made on November 18 and 21 indicate that the number of nests with clutches increased at about the same rate in both species. This suggests that both started breeding on about the same date with possibly the Red-bills leading by 2 - 4 days (J.M.C.).

The probable nesting population of the colony (i.e. Red-bills, Black-bills and total) is given in *Table 4* and *figure 1*.

Egg-Laying

Red-billed Gulls: The first egg was laid around 15 September, the last sometime between 9 and 14 November. This gives an egg-laying period in excess of 55 days. Most clutches were laid in late September — early October; over 70% of the total being produced in a two-week period extending from September 22nd to October 6th. A nest in sub-col. 8 contained one teal-blue egg.

Black-billed Gulls: Egg-laying began about September 28th-29th. It lasted about 45 days; the last clutches being completed sometime between 9 and 14 November. Over 70% of the eggs were laid in the two-week period between 5 and 9 October.

Clutch Size

Oliver (1955) gives two eggs in the Red-billed and two or three eggs in the Black-billed clutch. Black (1955) states two eggs is the normal clutch for both species and then gives the following clutches for the Sulphur Point Black-billed population:— One-egg clutches 10%, two-egg clutches 75%, three-egg clutches 15%. He cautions against accepting counts at face value because of the losses that can occur through various causes. Intra and inter-specific competition is quite strong in the mixed Sulphur Point population. Coupled with this internal bickering are the disturbances caused by intruders, both human and animal. The sum effect is a considerable loss of eggs.

An effort was made to determine the clutch sizes during the 1961 season. All nests in the colony were checked twice in October and five additional egg counts were made in colonies 1, 11 and 12 for Red-bills and colony 16 for Black-bills. Corrections based on these counts give the following clutch sizes (Table 5):

TABLE 5

No. Eggs	Per Cent.		Eggs per 100 Nests	
	Red-billed	Black-billed	Red-billed	Black-billed
1	13 max.	12 max.	13	12
2	51 app.	40 app.	104	80
3	34 *min.*	47 min.	102	141
4	1 app.	1 app.	4	4
	Eggs per 100 nests =		223	237
	Mean clutch size =		2.23	2.37

These percentages which give a mean clutch size of 2.23 eggs for Red-billed and 2.37 for Black-billed probably understate the true mean clutch sizes. They are based on the maximum counts of nests with three eggs and the minimum number of nests with one egg. Proportionately more pairs possibly have three eggs and fewer have one egg than the above figures indicate as a maximum count of three egg clutches will most likely be short of the mark because some clutches are still incomplete and others have lost an egg. The percentages given for two-egg clutches are probably fairly accurate if it is accepted that eggs are lost at the same rate from all nests.

About one per cent. of the nests contained four eggs or chicks. It is not known whether these represent the effort of the occupying female or whether the fourth egg or chick has rolled or wandered in from a neighbouring nest. The latter is more likely as fourth eggs always appeared well after the clutch of three had been laid, and were not known to hatch. Moreover, if the fourth arrival was a chick, it was present several days before the three eggs present hatched. The exact incubation time is not known but is thought to be 22 days ± 1.

Egg and Chick Losses

Several hundred chicks fledged. Direct counts of these were not possible because many of the early hatched birds had left the colony area at a time when chicks of late breeders were still downy and confined to the nest. An estimate of the number of Black-billed eggs and chicks lost during the season, and therefore of the number of chicks that reached flying age can be made from the following figures and observations.

Eggs Laid. It is estimated that c.505 pairs of Black-bills bred and these produced an average clutch of 2.37 eggs. Therefore c.1197 eggs were laid.

Eggs Lost. About 8% of the clutches were lost completely. In the remaining nests (c. 92%) the average clutch was 2.33 eggs at the breeding peak (i.e. on both 26/10/61 and 2/11/61). The mean clutch is taken as at least 2.37 eggs. Therefore about 2% (1.7%) of the eggs were lost from the successful nests.

$$\text{Number of eggs left} = \frac{1197 \times 92 \times 2.33}{100 \times 2.37} = \text{c. } 1082 \quad (90.4\%).$$

Chicks Hatched. About 1080 chicks hatched from the 1197 eggs laid. This gives a 10% recruitment mortality up to the date of hatching.

Chicks Lost. Checks made of dead chicks (Red-billed and Black-billed) in the nests and around the colony indicate that proportionately more die during their first week of life than in subsequent weeks where the mortality rate is similar for all age groups (i.e. from 1 - 2 to 4 - 5 weeks). 15 - 20% of all chicks hatched died in their first week (starved, smothered, driven from nests by disturbances, etc.). Chick losses during subsequent weeks up to the time they are fully fledged, capable of flight and independent, are about half as heavy; i.e. 6 - 9%. As allowance must be made for dead chicks not noticed for various reasons (died under ledges, lost in fissures or hot pools, washed away

by the lake, carried off by intruders, etc.) the writers have taken a 12% mortality as a working estimate. If roughly 12% of all chicks alive at the beginning of each weekly age interval (after the first, i.e. 1 - 7 days) die during it, and observations indicate that the young are flying at five weeks, the Black-billed chick losses would equal c. 560 birds (Table 6).

TABLE 6 — *Estimated Mortality of Black-billed Chicks*

Age Interval Days	Number Alive at Start	Per Cent. Lost	Number Lost	Number Alive at End
1-7	1080	20	215	865
8-14	865	12	105	760
15-21	760	12	90	670
22-28	670	12	80	590
29-35	590	12	70	520

About 520 chicks fledged from a total of c.505 Black-billed nests. Therefore productivity equalled one chick per breeding pair. Of the c.1200 eggs laid 115 (9.5%) were lost during incubation, and 560 (47.0%) were lost as chicks between the age of one and 35 days. 520 fledged young from 1200 eggs gives a 43.5% survival. Red-billed egg and chick losses were similar.

Late Summer Check

The colony was again visited by one of the writers (D.R.) on 20/2/62 when the following conditions were found:—

Toe Section (Sub-cols. 1-8)

All the sub-colonies in this section were deserted. Sub-colony six was joined to the spit as the lake level had dropped. Over 100 birds were congregated along the lake-line to the east of sub-colony four. These included 4 or 5 Black-billed and 90+ Red-billed adults as well as 5 - 6 fully fledged and flying young. There were also two unfledged Red-billed chicks tended by a pair of adults.

Heel Section (Sub-cols. 9-15)

Sub-colonies 9, 10, 13, 14 and 15 deserted. About 30 Red-bills were gathered on the shore line by sub-col. 9. They included 2 - 3 of the season's flying young. Twelve Red-billed and one Black-billed adults, along with 4 - 5 Red-billed flying young were present on sub-col. 12. Around the margin of sub-colony 11 there were 100+ Red-billed adults and 10 - 15 fledged Red-billed chicks. A younger pair of Red-billed chicks were swimming with two adults. Another pair of chicks were on their own in the lake.

Spur Section (Sub-cols. 16-18)

Sub-colonies 16 and 18 were deserted. Four eggs were present in sub-col. 16; three were in abandoned nests, the fourth lying free. Sub-col. 18 was joined to the spit now that the lake level had dropped. Sub-col. 17 contained two single eggs in deserted nests. There were 51 birds present, one Black-billed and 39 Red-billed adults and eleven

fully fledged Red-billed young. Two younger Red-billed chicks were swimming with a pair of adults.

By this date there were only c.325 birds in the colony. These included c.315 Red-bills (270 adults; 45 young) and fewer than 10 adult Black-bills.

THE 1962-63 BREEDING SEASON

During 1962 excessive rain fell in the Rotorua district (about twice the mean annual). The lake level rose by several feet and many low-lying areas around the lake margin including the colony spit were inundated. Three visits were made to the colony.

6/10/62: All the islands used for breeding (i.e. sub-cols. 6 and 18 as well as those further off-shore which were not included in the population counts made during the 1961-62 season) were submerged. The spit itself was greatly reduced in area and several parts were inaccessible.

The 'toe' was cut off from the rest of the spit by a broad channel of water while smaller channels dissected it into two or three small islets. A small population of both Red-billed and Black-billed was present on these islets and some appeared to be nesting.

It was estimated that about 70% of the 'heel' was flooded. Most of the area occupied by sub-cols. 9, 10, 11, 12 and 13 was submerged and the birds were gathered on a higher area just north of sub-col. 14. Whereas on this date in 1961 the 'heel' population comprised about 120 pairs of Red-bills (95+ with clutches) and 25 pairs of Black-bills (5+ with clutches) in 1962 there were c.50 Red-billed nests, one of which contained one egg, and a few Black-billed nests without clutches.

The 'spur' like the 'toe' was cut from the spit by water. Sub-colonies 16 and 18 were under water and sub-col. 17 was an islet. A small mixed population (predominantly Red-billed) was settling in to nest on sub-col. 17.

The next visit was made on 15/11/62. During the intervening 40 days the lake level had risen appreciably and partially flooded some of the occupied areas; but by 15/11/62 the level had dropped to about that of 6/10/62. There were a few nesting birds and young chicks on the islets formed by the highest parts of the 'toe' and 'spur.' There were no chicks on the 'heel' section (spit proper) and only 13 nests with clutches (2 Red-billed, 11 Black-billed). At sub-col. 16 Black-bills were settling in water 2-4 inches deep as if endeavouring to establish themselves on their old sites.

The final visit was made on 6/12/62. Heavy rain had fallen during the preceding three weeks and the lake level was higher than on 6/10/62 or 15/11/62. A few adults and a mere handful of chicks were present. Whereas the 1961-62 breeding season was undoubtedly the most successful in the history of this colony (for both Red-billed and Black-billed gulls) the 1962-63 season was probably the worst.

THE 1963-64 BREEDING SEASON

The colony was visited by one of the writers (D.R.) on 31/1/64. By the population and nest composition: — ratio of Red-bills to Black-bills present and the approximate number of nests with eggs and/or chicks for both species breeding seemed to have started very much

later than in the 1961-62 season. The following position was found on this date:

Toe. Sub-colonies 1, 2, 3, 5, 6, 7 and 8 abandoned and little evidence of nesting on any of these with the exception of sub-colony 1 where 2 - 3 deserted eggs were found. No chicks were seen at sub-col. 1 but these had probably fledged. Several Red-bills were still present among a considerable number of Black-bills breeding on sub-colony 4. Whereas most of the Red-billed nests were deserted the Black-billed nests ranged form new (as yet without clutches) to nests with chicks up to 10 - 12 days old. As in 1961 - 62 the Red-bills of this colony were largely confined to the northern half and the Black-bills to the south end. With the altered state of the spit it is possible that many of the birds which bred on sub-cols. 2, 3, 5, 6, 7 and 8 in 1961 fused with the sub-col. 4 birds in 1963.

'Heel.' The 1962 flooding altered the shape and size of the heel. It is smaller and much of the loose surface material (sand, etc.) has been washed away. Also, while some earlier vents and hot pools have dried up and been replaced by new fissures others have changed in shape and position. These changes have affected the positions of the sub-colonies. Sub-colonies 9, 10 and 13 were fused into one larger colony of c.45 Black-billed ane one or two Red-billed nests. Sub-col. 11 contained only Red-bills (as in 1961-62). These had passed the breeding peak. Sub-col. 12 contained several Red-billed nests (mostly deserted) and four Black-billed nests.

'Spur.' Sub-colony 16 contained 65-67 Black-billed nests. The one Red-billed nest present in the 1959-60 and 1961-62 breeding seasons was not seen, possibly because of the lateness of the visit. A few nests were new and without clutches, others contained one, two or three eggs. Some eggs were pipping. About one third of the nests contained chicks. The biggest Black-billed chicks were less than 10-12 days old. Sub-colony 17 contained many nesting pairs, but appreciably more Black-bills than Red-bills, as many of the latter had finished breeding and their chicks were roaming free. About 60 - 70% of the Black-billed nests had eggs and 30-40% had chicks. A few were new and empty. Sub-colony 18 also contained Black-billed nests at all stages and some Red-billed chicks estimated to be up to six weeks old.

On 31/1/64 it was estimated that the biggest Red-billed chicks were about six weeks old and the biggest Black-billed chicks about 12 days old. This places the start of egg laying for Red-bills somewhere between the 25 - 30 November (9 - 10 weeks later than in 1961); and for Black-bills somewhere around 25 December (11-12 weeks later than in 1961). Black-billed nest composition figures (number eggs/number chicks) for 31/1/64 are also comparable with those obtained 11 - 12 weeks earlier in 1961 (i.e. 2 & 9/11/61).

Chick-Banding

Recoveries of banded birds can give definite evidence on a species' mortality and longevity, breeding age, migration routes and dispersal patterns and can indicate whether the young return to the same colony or area within a colony when they reach breeding age. One of the more interesting questions concerning the Black-billed component of the Sulphur Point colony is where they winter — i.e.

whether the Miranda (Firth of Thames) winter population is in fact composed of Rotorua breeders. During the 1951 - 52 breeding season Turbott and Black banded c. 30 chicks in the hope that light would be thrown on this question. It was a small sample and to the writers' knowledge no significant information has come from their effort. Black points out the difficulties of trying to band in this congested mixed colony.

During the 1961 - 62 season one of the writers (D.R.) banded 184 chicks (112 Red-bills; 72 Black-bills). The details of this banding are given below as, although the same was small, it may at least be adequate to suggest whether the young return to the same colony or sub-colonies to breed. The Red-billed chicks were banded when between 7 - 12 days old and the Black-billed when 7 - 14 days old. Band numbers used: 13701 - 13812 on Red-bills; 14229 - 14300 on Black-bills — distributed thus:—

Sub. Col.	Band Numbers Used	No. Banded
1	13708-19, 23, 29	14
2	13780-81, 803-04, 810-12	7
4	13720-22, 24-28, 82-88, 805	16
11	13703-07, 30-50, 58-77, 90-802, 06-09	63
12	13757	1
15	13778-79, 89	3
18	13701-02, 51-56	8
4	14229-46, 51-52, 62-68, 94,300	34
12	14276, 88-93	7
16	14247-50, 53-61, 69-75, 77-87	31

In the course of banding the operator noticed that the Black-billed chicks have pinkish-brown legs and bills while the Red-billed chicks have grey-black legs.

Ten of the banded Red-billed and one of the banded Black-billed chicks were found dead later in the season. It is not considered that handling while fitting the bands in any way contributed to their deaths.

ACKNOWLEDGMENTS

The writers wish to thank Mrs. G. Mees for assisting with the counts; Dr. R. A. Falla and Messrs. B. D. Bell and L. Gurr for information on the species of gulls discussed and Mr. F. C. Kinsky for making available his notes on the colony and for kindly reading the text.

LITERATURE

BLACK, M. S., 1955: Some notes on the Black-billed Gull at Lake Rotorua. **Notornis**, Vol. 6, No. 5, pp. 167-170.

The other information cited comes from the Classified Summarised Notes in the various volumes of **Notornis**.

APPENDIX 1 — Nest Counts of the Sulphur Point Colony (i.e. Nest with Eggs and/or Chicks)

Col. No.	5th October, 1961				19th October, 1961									
	Nests with			Total Nests	Nests with									Total Nests
	1 E	2 E	3 E		1 E	2 E	3 E	OE 1C	1E 1C	2E 1C	OE 2C	1E 2C	3 C	
1	6	12	6	24	3	9	5	2	3	1	–	2	–	25
2	1	2	–	3	1	2	1	–	–	–	–	–	–	4
3	2	3	3	8	2	7	4	1	–	–	1	–	–	15
4	17	24	9	50	14	71	59	–	1	1	–	–	–	146
5	–	–	–	–	–	1	–	–	–	–	–	–	–	1
6	1	3	–	4	1	3	1	–	–	–	–	–	–	5
7	–	2	–	2	2	2	2	–	–	–	–	–	–	6
8	–	6	1	7	–	7	1	–	–	–	1	–	–	9
9	2	–	–	2	1	2	4	–	–	–	–	–	–	7
10	4	14	21	39	3	41	29	1	3	1	2	4	1	85
11	1	16	6	23	2	11	7	–	1	1	1	–	–	23
12	5	9	4	18	4	10	5	–	1	–	2	1	–	23
13	–	4	4	8	2	2	3	–	1	1	1	–	–	10
14	1	2	1	4	–	5	5	–	–	–	–	1	–	11
15	–	3	2	5	–	4	5	–	–	1	1	–	–	11
16	6	6	2	14	13	30	25	–	–	5	4	5	2	68
17	26	69	55	150	40	135	111	–	5	–	–	–	–	307
18	5	11	7	23	5	17	19	1	–	–	1	2	1	46
Total	77	186	121	384	93	359	286	5	15	11	14	15	4	802
Tot. Eggs	77	372	363	= 812	93	718	858	0	15	22	0	15	0	= 1721
Tot. Chicks	–	–	–	–	–	–	–	5	15	11	28	30	12	= 101
Total E. & Ch.	–	–	–	812	All chicks hatched up to 19/10/61 were Red-bills									1822

APPENDIX 2 — ADDITIONAL COUNTS OF SELECTED COLONIES 1961

Colonies 1, 11 and 12; Red-bills (The few Black-bill nests excluded)

Date	Total Nests	Nests with													Total E/C	Nests with E and C			
		0	1 E	2 E	3 E	4 E	0E 1C	1E 1C	2E 1C	0E 2C	1E 2C	0E 3C	1E 3C	E/C		1	2	3	4
5/10	77	12	12	37	16	–	–	–	–	–	–	–	–	65	134	12	37	16	–
5/10	73	5	8	29	16	–	2	5	2	3	3	–	–	68	147	10	37	21	–
19/10	54	8	9	12	7	–	2	3	2	7	3	–	1	46	128	11	22	12	1
19/10	29	3	9	11	2	–	1	–	2	–	–	1	–	26	47	10	11	5	–
26/10	20	1	4	13	2	–	–	–	–	–	–	–	–	19	36	4	13	2	–
26/10	19	–	3	12	–	–	–	3	–	–	2	–	–	19	37	3	14	2	–
2/11	15	–	3	9	–	–	–	1	–	2	–	–	–	15	27	3	12	–	–
Colony 16; Black-bills (one Red-bill nest excluded)																			
2/11	35	22	6	6	1	–	–	–	–	–	–	–	–	13	21	6	6	1	–
9/11	71	4	13	30	24	–	–	–	–	–	–	–	–	67	145	13	30	24	–
9/11	75	3	9	31	30	1	–	1	–	–	–	–	–	72	167	9	32	30	1
14/11	73	4	9	17	25	1	2	4	1	4	5	1	–	69	161	11	25	32	1
14/11	52	4	13	5	11	–	4	5	2	2	2	3	1	48	99	17	11	18	1
21/11	19	2	6	1	4	–	2	2	2	–	–	–	–	17	32	8	3	6	–
21/11	10	–	5	1	3	–	1	–	–	–	–	–	–	10	17	6	1	3	–

ADDENDA

THE 1964-65 BREEDING SEASON

By DENISE REID

The Sulphur Point colony was visited on 23/11/64 and some marked changes were observed in the breeding areas. On the Toe, sub-colonies 5, 6, 7 and 8 were more populated than in the 1961-62 season; both sub-cols. 5 and 8 contained c.20 nests.

All the sub-cols. on the Heel (i.e. 9, 10, 11, 12, 13, 14, 15) as well as sub-col. 17 were deserted and a new area on the western shore of the spit, situated just north of sub-col. 16, had been colonized by an estimated 1000+ birds. Many of these birds presumably came from the above mentioned colonies as the sand and loose soil covering the heel and sub-col. 17 was washed away during the 1962-63 floods and the exposed irregular, sharp underlying rock made their old sites unsuitable for nesting. Sub-colony 16 was not yet occupied.

The breeding of Red-billed Gulls was at all stages — from fully fledged chicks (sub-col. 1) to newly formed nests. Several birds, banded as chicks in Nov. 1961, were sitting on nests containing eggs.

The Black-billed Gulls were just starting to breed as only seven nests were present (i.e. two nests in sub-col. 8, two nests in sub-col. 18, two nests on a small rock between sub-cols. 16 and 18, and one nest near the inner margin of the large new colony).

Black-backed Gulls

Two Black-backed Gull nests were seen, each containing three eggs and attended by a solitary adult, just north of the hot pool shown on the map. The writers have not previously known nor seen any Black-backed Gulls nesting in this colony before.

★

SHORT NOTE

ARCTIC TERN ON FOXTON BEACH

During early November, 1963, fresh to strong westerly winds prevailed over central New Zealand. In the course of a beach patrol on 13/11/63 the remains of an Arctic Tern *(Sterna paradisea)* were found on Foxton Beach. The specimen consisted of the entire skeleton with bill, feet and plumage of head, wings and tail intact, the body having been picked clean by fish and/or birds. It was estimated that the bird had died within the last three days, the remains being fresh.

The plumage of crown, nape and forehead to the bill was black; the bill red with the distal one-third blackish; the feet red. On the inner web of the outer primaries next the shaft there was a narrow strip of grey. The tern was evidently an adult. There was no indication of post-breeding moult in the plumage of the head, but the blackening of the bill suggests that the processes of assuming winter appearance had begun.

Measurements taken the following day were:—

Culmen 30.4 mm.; Wing 273; Tarsus 16.2; Tail 164; Toe and claw 24.6.

— M. J. IMBER

SOME NOTES ON BIRDS OF THE FIJI ISLANDS

By BARRY and JOANNA MORGAN

The Fiji Islands are centred on the 180° Meridian, 18° south, of volcanic origin and surrounded by barrier reefs. The larger islands are heavily forested on the mountainous southeast slopes where the rainfall exceeds 120 inches a year. The northwest is dry and flat to undulating hills where canefields cover much of the landscape.

During our 13 months' stay on the island of Viti Levu, we were able to record more than 60 species and make notes on permanent and migratory birds. Also a four-day visit to the island of Koro was made in April.

Detailed information was difficult as our time was usually limited to week-ends, and the density of the rain forest on the southeast part of the island made it difficult to observe, move freely, and find nesting birds. Lack of local observers in Suva added to the problem. The Fijians were not too helpful and we found that they had several names for one bird.

Of much help to us was Robin Mercer who has spent most of his life in the Islands and has observed and collected birds for the museum in Suva. He is a taxidermist and has done an excellent job in getting mounted specimens organized in display cases in the museum.

Of particular interest were the Giant Petrel *(Macronectes giganteus)* record and the ten weeks' stay of two Banded Dotterels *(Charadrius bicinctus)*.

Regular counts of migratory waders were made at one particular spot — Suva Point — for a complete year. This area was a tidal flat clear of mangroves with a mixture of sand, mud and broken coral. The count was always made as the incoming tide forced the birds to feed in tight groups close to shore. Golden Plover counts were made on a large school lawn in the same vicinity where they regularly rest during high tide. Blank spaces in chart indicate no count was made.

SPECIES LIST

WANDERING ALBATROSS *(Diomedea exulans)*

Nearest sighting to Fiji was at 27° latitude S. on 22/9/62 while on ship to New Zealand.

GIANT PETREL *(Macronectes giganteus)*

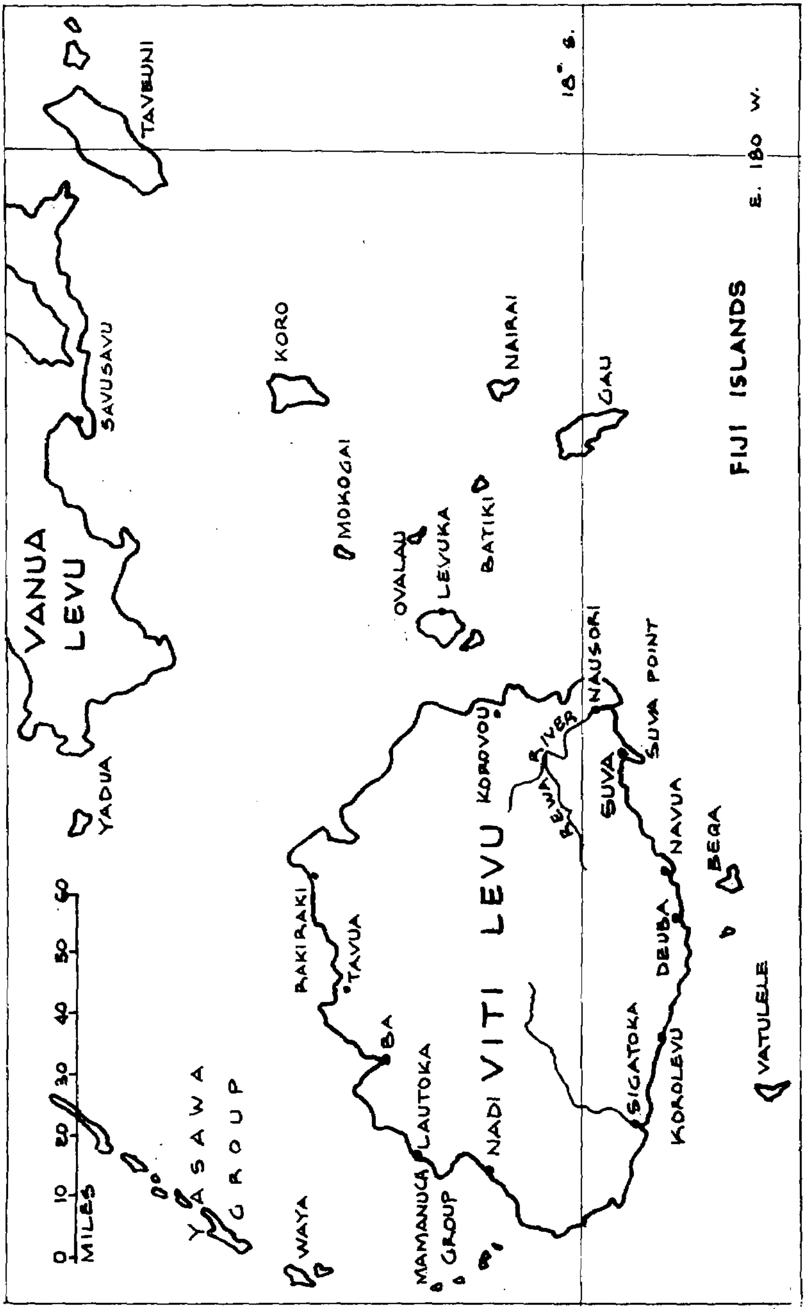
A dark grey immature bird was picked up off Suva Point on 22/8/61 by a fisherman. Band on left foot had following words: "Wildlife" C.S.I.R.O. Canberra Australia 1302513. It died a few days later. We found later that it had been banded as a nestling on Macquarie Island in January, 1961.

RED-TAILED TROPIC BIRD *(Phaethon rubricauda)*

An injured adult was picked up in Suva Harbour by a Fijian fisherman on 8/8/62. We nursed in for three weeks until its wing was strong enough for it to fly away. Other sightings were distant ones beyond the reef.

BROWN BOOBY *(Sula leucogaster)*

Only two sightings of this bird, one on 23/12/61 at Ba and the other was seen on 29/7/62 at Suva Point.


FIJI ISLANDS
VANUA LEVU
TAVEUNI
SAVUSAVU
KORO
NAIRAI
GAU
MOKOGAI
OVALAU
LEVUKA
BATIKI
18° S.
E. 180 W.
YADUA
VITI LEVU
KOROVOU
NAUSORI
REWA RIVER
SUVA
SUVA POINT
NAVUA
BEQA
DEUBA
VATULELE
SIGATOKA
KOROLEVU
RAKIRAKI
TAVUA
BA
LAUTOKA
NADI
MAMANUCA GROUP
WAYA
YASAWA GROUP
MILES
0
10
20
30
40
50
60

RED-FOOTED BOOBY *(Sula sula)*

Several small flocks seen only outside the reef near the island of Koro on 20/4/62. These were often in groups of four in adult and immature plumage. Two or more of these birds were usually noted in every flock of White-capped Noddies.

BLUE-FACED BOOBY *(Sula dactylatra)*

Seen 6/8/61 on ship between New Zealand and Fiji at 21° latitude s., one immature and one in near adult plumage.

LESSER FRIGATE BIRD *(Fregata ariel)*

Usually seen singly but occasionally several of both sexes noted soaring high overhead. More common on the dry northwestern side of Viti Levu. During our stay only 12 were seen.

BLACK-NAPED TERN *(Sterna sumatrana)*

On 26/3/62 R. Mercer saw five of these terns near Suva. Also on 9/9/62, 24 were seen on a sand bar about a mile off shore from Deuba. On the Island of Koro 15 were resting on rocks just off shore.

CRESTED TERN *(Sterna bergii)*

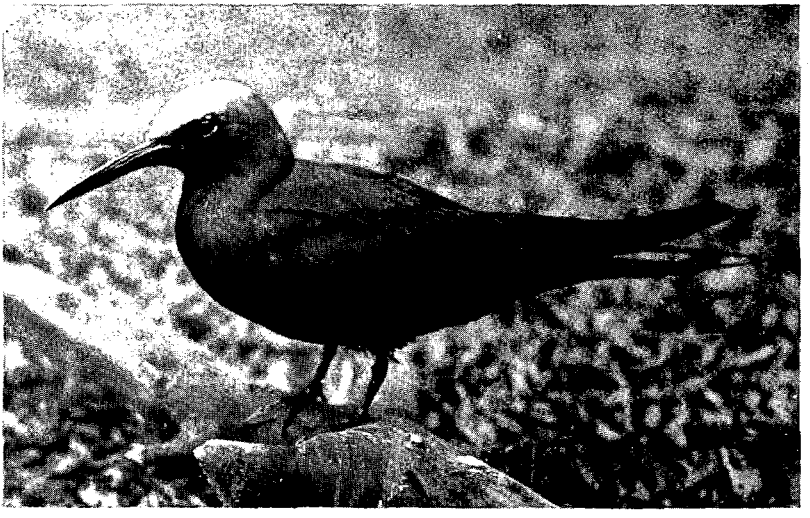
The most common and widespread tern along the coastal waters and reefs of Viti Levu and other islands of the Fiji group. Possibly nesting on small adjacent islands. This tern, because of its large size, is often thought to be a gull by local inhabitants.

SOOTY TERN *(Sterna fuscata)*

On 23/4/62 between Koro and Viti Levu, three seen at different times, all flying south-east towards a small island named Nairai.

WHITE-CAPPED NODDY *(Anous minutus)*

Generally seen just outside the reef in large flocks feeding on schools of small fish. At one time we counted up to 300 feeding in this manner (v. Pl. XVIII).



[B. & J. Morgan

XVIII — White-capped Noddy **(A. minutus)**, Fiji.

MIGRANT WADERS SEEN AT SUVA POINT FROM SEPT 9, 1961 TO SEPT 1, 1962.

SPECIES DATE	SEP 9	SEP 19	SEP 23	OCT 1	OCT 3	NOV 11	NOV 20	NOV 24	DEC 3	JAN 14	FEB 19	MAR 18	APR 1	APR 7	MAY 5	MAY 20
WANDERING TATTLER		172							231	150	125	75+	170	125	125	
GOLDEN PLOVER	26	33	42		47	30	37	86	48	15+	40	20+	80	101	17	29
BAR-TAILED GODWIT	3	2	1	7					15	12	20	6+	12	—	1	
WHIMBREL	SEE UNDER SPECIES LIST															
ASIATIC CURLEW	—	—	—	—					—	—	1	—	—	—	—	
TURNSTONE	26	21	3	9	30				16	2	40	20	2	1	—	
MONGOLIAN DOTTEREL	—	—	—	—					—	—	—	—	—	—	5	
BANDED DOTTEREL	SEE BELOW															

DASH INDICATES SPECIES NOT SEEN

SPECIES DATE CONT.	MAY 30	JUN 9	JUN 14	JUN 24	JUN 30	JUL 4	JUL 8	JUL 15	JUL 18	JUL 27	JUL 29	AUG 9	AUG 16	AUG 25	AUG 29	SEP 1
WANDERING TATTLER	72	45	81	80	63	55	75	53	30	36	52	57				175
GOLDEN PLOVER	23	22	23	31	31	23	26	27	30		26	29	23	29	26	
BAR-TAILED GODWIT	2	—	1	2	5	5	1	2	2	4	8				—	
WHIMBREL	SEE UNDER SPECIES LIST															
ASIATIC CURLEW	SEE REG. 16 ABOVE															
TURNSTONE	—	—	2	—	—	—	—	—	3	—	—	—				1
MONGOLIAN DOTTEREL	SEE MAY 5 AND UNDER SPECIES LIST															
BANDED DOTTEREL	1	2	2	2	2	2	2	2	2	2	2	2	—	—	—	—

GOLDEN PLOVER *(Pluvialis dominica)*

Present in Fiji throughout the year. The largest numbers seen were at the Rewa River estuary where we counted 200+ on a large tidal flat in February 1962.

MONGOLIAN DOTTEREL *(Charadrius mongolus)*

Not noted regularly. Ten were seen on 18/2/62 at the Rewa River estuary and five at Suva Point on 20/5/62.

BANDED DOTTEREL *(Charadrius bicinctus)*

Two of these dotterels were first noticed with Golden Plovers on grass near Suva Point on 26/5/62 in non-breeding plumage. It was not until 1/7/62 that one began to change into breeding plumage. Full plumage was complete on 15/7/62. On 25/7/62 the other began to come into breeding plumage. They were last seen on 9/8/62.

WHIMBREL *(Numenius phaeopus)*

First sighting was one bird on 17/9/61 along the east coast in flight. At the Rewa River estuary, three were seen on 14/10/61 and 50 on 10/2/62.

ASIATIC CURLEW *(Numenius madagascariensis)*

Only noted once, a single bird at Suva Point on 16/2/62.

BAR-TAILED GODWIT *(Limosa lapponica)*

Seen throughout the year in small numbers of up to 20. No Black-tailed Godwits were sighted.

WANDERING TATTLER *(Heteroscelus incanus)*

The most common wader in Fiji with sightings throughout the year. During the months June, July and August the numbers were from 30 to 80 (probably non-breeders). The remaining months gave us counts of 125 to 230 with the peak about December, although a large number of about 400-500 were seen on 14/10/61 at the Rewa River estuary. During high tide the tattlers were often seen resting on mangrove roots about water. A careful watch for the Grey-tailed Tattler *(H. brevipes)* proved unsuccessful.

TURNSTONE *(Arenaria interpres)*

Present throughout the year; up to 40 seen during January and February.

REEF HERON *(Egretta sacra)*

Common on Viti Levu and other islands feeding along shores at low tide. White phase was more common in some areas while in others the grey was predominant. Only a few of the mottled phase were seen (v. Pl. XIX & XX).

LITTLE MANGROVE BITTERN *(Butorides striatus)*

Seen only in the Suva area near mangroves occasionlly moving onto open flats where it is difficult to see. It is very shy and hard to approach.

AUSTRALIAN GREY DUCK *(Anas superciliosa)*

Not seen by us along coastal regions but reported to be a short distance up the rivers.

FIJI GOSHAWK *(Accipiter rufitorques)*

Ten sightings throughout the year. Often in settled areas, but mostly in the bush and open forest.

SWAMP HARRIER *(Circus approximans)*

Not common, but noted throughout the year in several types of habitat such as mangroves, estuaries, bush and grasslands.

WHITE-BROWED RAIL *(Poliolimnas cinereus)*

Rails were thought to be extinct on Viti Levu because of the introduced mongoose. This rail was first seen on 20/5/62 in a very large swampy area of about 100 acres, approximately ten miles from Suva on the King's Road. A week later we saw another White-browed Rail on the opposite side of the road. It was lacking the white superciliary but in similar plumage to the first rail. No other rails were seen on Viti Levu although R. Mercer has seen Banded Rails *(Rallus philippensis)* on small offshore islands.

MANY-COLORED FRUIT DOVE *(Philinopus perousii)*

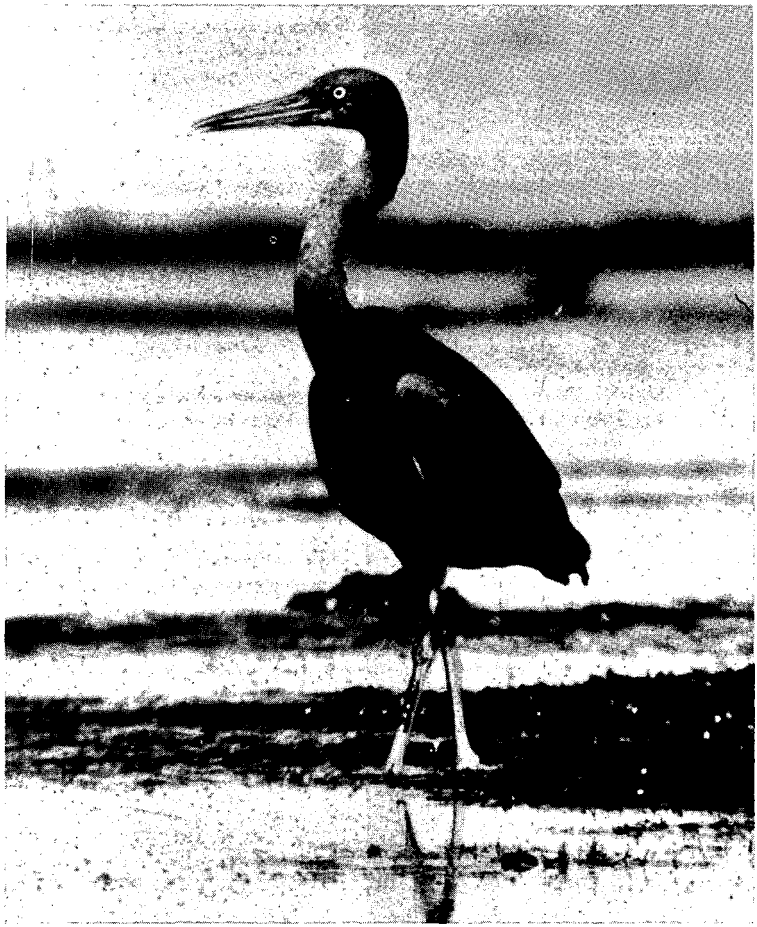
Recorded several times but difficult to see. This bird is very partial to fruiting fig trees.

GOLDEN DOVE *(Ptilinopus luteovirens)*

Fairly common in thick forest but not seen as much as heard. The call is similar to the barking of a dog.

[B. & J. Morgan

XIX — Reef Heron **(E. sacra)**, White phase, Fiji.



[B. & J. Morgan

XX — Reef Heron **(E. sacra)**, grey phase, Fiji.

PACIFIC PIGEON *(Ducula pacifica)*

This pigeon, which is noted as being widespread in the Fiji Islands, was not seen at all. However, R. Mercer states that it is present on some of the islands of the Lau group.

PEALE'S PIGEON *(Ducula latrans)*

A shy pigeon of the forest that has been seen regularly throughout the year. Its large size could only be confused with the White-throated Pigeon.

WHITE-THROATED PIGEON *(Columba vitiensis)*

Only two sightings on the dry side of Viti Levu near Ba. Six of these pigeons were seen on the island of Koro which is mostly rain forest.

FRIENDLY GROUND DOVE *(Gallicolumba stairii)*
Seen only once in hilly forest country near Korolevu where we flushed it from the ground. It flew a short distance and then ran along the ground out of sight. The red feet were most noticeable.

CHINESE DOVE *(Streptopelia chinensis)*
A common introduced dove on Viti Levu and other islands in populated areas.

COLLARED LORY *(Phigys solitarius)*
Commonly seen feeding on coconut blossoms in numbers of two and three but sometimes more. Invades gardens in larger numbers when the Erythrina (Coral) trees are in blossom.

RED-BREASTED MUSK PARROT *(Prosopeia tabuensis)*
Supposedly introduced on Viti Levu but only one or two were seen in the Suva area and these were assumed to be cage escapes. It was noted on the island of Koro where it is endemic.

YELLOW-BREASTED MUSK PARROT *(Prosopeia personata)*
The common large parrot on Viti Levu which is usually seen in heavy forest country. It has a loud raucous call which can be heard for quite a distance.

FAN-TAILED CUCKOO *(Cacomantis pyrrhophanus)*
Noted mostly on the dry side of the island where it appears to prefer more open country.

BARN OWL *(Tyto alba)*
One seen at dusk flying along shoreline near Suva. In open grassland near Rakiraki we watched a pair hunting until two hours after sunrise. The following evening while still light, we saw another pair working the fields near Ba.

WHITE-RUMPED SWIFTLET *(Collocalia spodiopygia)*
Common and widespread throughout all the islands. A cave near Suva was visited several times where hundreds of these swiftlets nest.

WHITE-COLLARED KINGFISHER *(Halcyon chloris)*
The only kingfisher found in Fiji. Occasionally seen along shores and rivers but more often seen inland perched on power lines or trees. Fairly common.

PACIFIC SWALLOW *(Hirundo tahitica)*
Only two sightings on wet side of island but noticed commonly on dry side where it nests under shop porches, bridges and wharves.

POLYNESIAN TRILLER *(Lalage maculosa)*
Common in Suva gardens, coastal villages and forest edges. Found nesting in August, October and December.

RED-VENTED BULBUL *(Pycnonotus cafer)*
An introduced Indian bird common everywhere on Viti Levu and other islands except forest country.

ISLAND THRUSH *(Turdus poliocephalus)*
Not common. Usually inhabits dark undergrowth in forest country. Dark grey above, chestnut below, with striking orange bill. A pair observed near Deuba were continually singing a flute-like song which faded away on an ascending scale.

FIJI WARBLER *(Vitia ruficapilla)*

Not common. We only saw this bird a few times in hill forest country after being in Fiji nine months. It feeds in low bushes and on the ground. Often seen with Spotted Fantail.

SPOTTED FANTAIL *(Rhipidura spilodera)*

Can be seen from gardens to hill-forest.

SLATY FLYCATCHER *(Mayrornis lessoni)*

Can usually be seen in rain forest and often in more open forest.

FIJI SHRIKEBILL *(Clytorhynchus vitiensis)*

Always seen in dark forest. Noted from several places on wet side as well as on the island of Koro.

BLACK-FACED SHRIKEBILL *(Clytorhynchus nigrogularis)*

Not common and usually in dark forest. Only seen in two areas — Korolevu and 17 miles out King's Road. It searches for food amongst dead leaves attached to trees and vines. Voice of male is whistled high-pitched staccatto *whee-e-e-e-e* and same notes at lower pitch.

VANIKORO BROADBILL *(Myiagra vanikorensis)*

Seems to prefer gardens and forest edges to rain forest. Common throughout Viti Levu. Call is a sparrow-like chirp.

BLUE-CRESTED BROADBILL *(Myiagra azureocapilla)*

Although not common, this beautiful bird was seen in several areas of high forest country. Occasionally the male would raise its sky-blue crest which is most striking.

SCARLET ROBIN *(Petroica multicolor)*

Not common but seen frequently near forest edge and in cleared areas.

GOLDEN WHISTLER *(Pachycephala pectoralis)*

Males were seen in four different areas usually in rain forest. It lacks the black throat-bar of the Australian species.

WHITE-BREASTED WOOD SWALLOW *(Artamus leucorhynchus)*

Very common throughout Fiji and can often be seen perched on wires or dead limbs. It differs from the Australian species in having an all white breast.

POLYNESIAN STARLING *(Aplonis tabuensis)*

This bird is supposed to be common and widespread — in the forest as well as along the shore and near human habitation. Yet no one here knew of it and we did not see one until our last month in Fiji. Four were seen in a high tree feeding on fruit and later two singing from an exposed branch. Near this area we saw one fly into a hole in a dead Pandanus tree and we were able to watch it more carefully as it was nesting. This area, Wailoku Road, is forest country and about ten miles from Suva.

INDIAN MYNA *(Acridotheres tristis)*

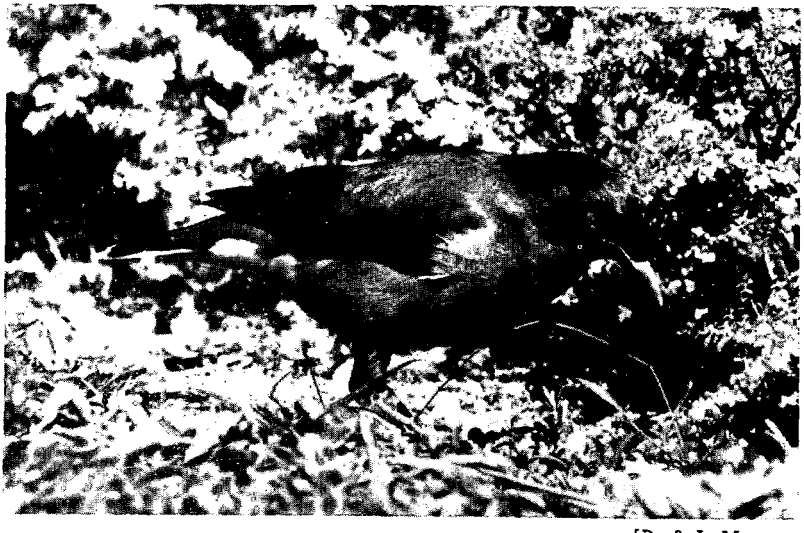
Introduced. Very common in gardens and inhabited areas.

DUSKY CRESTED MYNA *(Acridotheres fuscus)*

Now almost as common as the Indian Myna. These two birds, plus the bulbul, have now become pests because of their great numbers and their liking of fruit. [The identity of this myna has long been uncertain. It is now generally agreed that it is not *cristatellus*. Ed.] (v. Pl. XXII.)

[B. & J. Morgan

XXI — Wattled Honeyeater **(Foulehaio carunculata)** feeding on pedilanthus blossoms, Fiji.



[B. & J. Morgan

XXII — Dusky Crested Myna, Fiji.

ORANGE-BREASTED HONEYEATER *(Myzomela jugularis)*

A very common bird around Hibiscus and other flowering plants in gardens. Also amongst flowering mangroves and coconut palms in country areas. Bill is black, not red as is stated in "Birds of the Southwest Pacific."

WATTLED HONEYEATER *(Foulehaio carunculata)*

As widespread as *M. jugularis* but not quite as numerous. It has a loud clear song often heard first thing in the morning and sometimes after dark. (v. Pl. XXI).

GIANT FOREST HONEYEATER *(Gymnomyza viridis)*

Found in forest country where it is more often heard than seen. It is not uncommon as the call can be heard ringing out over the valley on most visits to the forest. It sometimes begins calling two hours before dawn.

LAYARD'S SILVEREYE *(Zosterops explorator)*

Fairly common. Seems to prefer forest areas.

GREY-BACKED SILVEREYE *(Zosterops lateralis)*

Commonly found in gardens, forest and open country throughout Fiji.

RED-HEADED PARROT FINCH *(Erythrura cyanovirens)*

Common on Viti Levu and usually seen feeding under trees on roadside. Probably was a bird of the true forest as Mayr states, but now appears to be common in open country bordering forest and built-up areas. A pair nested in the Botanical Gardens in Suva on 5/5/62. Also 50 were seen feeding in a rice field near Deuba and several could always be seen on large school lawns near the sea at Suva Point.

STRAWBERRY FINCH *(Estrilda amandava)*

Introduced from Asia and very common. Large flocks can be seen in any grassland area around Suva and other settled areas. Flocks numbering over 100 birds can frequently be seen in cultivated fields.

JAVA SPARROW *(Padda oryzivora)*

Introduced and probably a recent cage escape as these birds were only seen in the Suva area. A count of 110 was made on the lawn at Suva Point.

REFERENCES

ALEXANDER, W. B., 1954: "Birds of the Ocean."
BELCHER, W. J., 1929: "Fragmentary Notes on Bird Life in the Fijis." Condor, Vol. XXXI, (1).
BENT, A. C., 1927: "Life Histories of North American Shore Birds."
CAYLEY, N. W., 1959: "What Bird Is That."
MAYR, E., 1945: "Birds of the Southwest Pacific."
PETERSON, R. T., 1961: "A Field Guide to Western Birds."
POUGH, R. H., 1957: "Audubon Western Bird Guide."
———— 1951: "Audubon Water Bird Guide."
ROBINSON, H. C., 1927: "The Birds of the Malay Peninsula."

SEA BIRDS FOUND DEAD IN NEW ZEALAND IN 1963

ABSTRACT

Beach Patrols during 1963 covered a total distance of 852 miles and produced 1535 birds (64 species). Species are tabulated by month of occurrence and by the coastal zones in which they were found.

Unusual species include *Eudyptes pachyrhynchus atratus, Procellaria cinerea, P. parkinsoni, P. westlandica, Pterodroma hypoleuca nigripennis, Oceanites oceanicus, Fregetta tropica* (Campbell Island), *Phaethon rubricauda, Sterna vittata bethunei* (Campbell Island), and *S. paradisaea.*

INTRODUCTION

This account corrects and expands the brief preliminary report already published (Boeson, 1964), and follows the format of the 1962 report (Bull and Boeson, 1963).

Fifty members took part in this year's work and sent in 390 Beach Patrol cards covering 852 miles of coastline. The cards record the finding of 1535 birds (64 species); a further 22 specimens were found on Campbell Island.

There were no major "wrecks" during the year but even so the number of birds found is 168 more than in 1962.

RESULTS

Distribution of Patrols

Table 1 shows the length of beach patrolled each month for each of the 15 zones covered. However, in 4 of these zones, patrols covered less than 10 miles so the calculation of "Birds-per-mile" was unjustified. It is encouraging to see a marked increase in the South Island mileages; for example, this year 50 miles were patrolled in Southland compared with 8 miles in 1962, and again, 146 miles in Otago this year as against 90 in 1962. No patrols were reported from Hawke Bay, West Nelson or Fiordland. Patrols from Campbell Island are not included in Table 1 but the specimens are recorded in Tables 2 and 3. Bay of Plenty, North Canterbury and Otago were the only zones with patrols for every month of the year (Table 1). With only four months and a mileage of 17 miles, Auckland East provided the spectacular figure of 7.0 birds per mile.

Kinds of Birds Found

Species of penguins, albatrosses, petrels and shearwaters found in 1963 are shown on Table 2 which also records their monthly occurrence. *Puffinus griseus* (491) and *Pachyptila turtur* (233), were the most abundant species, with *Eudyptula minor* (94) and *Puffinus g. gavia* (91) coming a close third and fourth. Unusual species found were: *Eudyptes pachyrhynchus atratus, Procellaria cinerea, P. parkinsoni, P. westlandica, Pterodroma hypoleuca nigripennis* and *Oceanites oceanicus.*

"Miscellaneous species" consisted of the following; *Phaethon rubricauda* (1), *Sula bassana* (9), *Phalacrocorax carbo* (1), *P. varius* (4), *P. sulcirostris* (3), *P. chalconotus* (12), *P. punctatus* (36), *Notophoyx novaehollandiae* (1), *Branta canadensis* (1), *Cygnus atratus* (1), *Anas superciliosa* (1), *Circus approximans* (2), *Haematopus ostralegus* (3), *Himantopus h. leucocephalus* (3), *Stercorarius skua* (2), *Larus dominicanus* (147), *L. bulleri* (15), *L. novaehollandiae* (70), *Hydroprogne*

caspia (2), *Sterna vittata bethunei* (1), *S. striata* (26), *S. paradisaea* (1), *Columba livia* (4), *Alauda arvensis* (1), *Passer domesticus* (1), *Sturnus vulgaris* (1) and *Corvus species* (1). The skuas and the Antarctic Tern were found on Campbell Island as were two of the Black-backed Gulls and three of the Red-billed Gulls.

Seasonal Distribution

The autumn-early winter decline in birds-per-mile is again reflected in Table 1. It is most interesting to note that as in the 1939-59 Report (Bull and Boeson, 1961) and the 1962 Report (Boeson, 1964), the appearance, in large numbers, of *Puffinus griseus* in the November, December, January periods. The relatively high birds-per-mile figures in January (4.4) and November (3.4) were influenced by an increase in these species.

Differences Between Zones

Table 3 shows the zones in which the various species were found. The limits of the various zones are illustrated by Fig. 1, in Bull and Boeson, 1963. Auckland East, with only 17 miles patrolled produced 7.0 birds-per-mile while the 22 miles in South Canterbury produced 3.3 birds-per-mile, and again, the 61 miles in Wellington South produced 0.5 birds-per-mile compared with Taranaki with exactly the same mileage showed a return of 1.7 birds-per-mile. These differences are probably the effect of coastal aspect in relation to the weather experienced during the year.

Discussion

The mean number of birds found per mile in 1963 (1.8) is almost the same as that in 1962 (1.9) even though 121 more miles of beach were patrolled this year. The number of people taking part in the scheme exceeded that of 1962 by 9 patrollers. There were no major "wrecks" during the year and with this in mind the collection of 1535 specimens seems to be a very creditable effort.

It must be stressed once again that "nil" reports play a most important part in the overall picture.

ACKNOWLEDGEMENTS

Thanks are due to the following members who took part in this year's patrols: J. H. Allan, I. G. Andrew, J. W. Bain, C. E. Barlow, Mrs. M. L. Barlow, J. A. Bartle, B. D. Bell, A. Blackburn, B. W. Boeson, P. C. Bull, D. E. Calvert, C. N. Challies, D. E. Crockett, R. Crockett, N. Cudby, Miss M. Davis, D. G. Dawson, A. T. Edgar, B. M. Fitzgerald, R. A. Fordham, Miss A. J. Goodwin, P. C. Harper, B. D. Heather, M. Hodgkins, M. J. Imber, J. R. Jackson, J. Jenkens, J. L. Kendrick, S. R. Kennington, F. C. Kinsky, N. J. Ledgard, K. H. Miers, M. G. Macdonald, D. McGrath, Mrs. M. McGrath, Mrs. H. M. McKenzie, H. R. McKenzie, N. J. Nilsson, J. O'Brien, W. Pengelly, W. T. Popplewell, K. Rowe, R. B. Sibson, J. W. Sibson, R. Smart, C. R. Veitch, D. M. Walter, R. R. Wiblin, M. J. Williams and A. Wright.

Once again I am very grateful to Dr. P. C. Bull for his co-operation and help especially in reading the manuscript and making worthwhile suggestions.

BULL, P. C., BOESON, B. W., 1961: Preliminary Analysis of Records of "Storm-Killed Sea Birds from New Zealand, 1939-59. Notornis 9: 185-199.
BULL, P. C., BOESON, B. W., 1963: Sea Birds Found Dead in New Zealand in 1961. Notornis 10: 265-277.
BOESON, B. W., 1964: Sea Birds Found Dead in New Zealand in 1962. Notornis 10: 404-411.
BOESON, B. W.: Preliminary Report on Beach Patrol Scheme — for year 1963. Notornis 11: 52.

TABLE 1: Miles Patrolled and Birds Found on Different Coasts

Coastline			Number of Miles Patrolled Each Month — January - December												Total Miles	Total Birds	*Birds Per Mile
Name	Code No.	Code Letters	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.			
North Cape	1	NC	1												1	4	–
Auckland East	2	AE	7				2		7					1	17	119	7.0
Bay of Plenty	3	BP	10	6	10	10	7	6	11	8	4	11	10	12	105	50	0.5
East Cape	4	EC		3	3										6	–	–
Wairarapa	6	WA					3								3	–	–
Wellington South	7	WS	2		5	2	3	6	7	7	4	4	9	12	61	28	0.5
North Canterbury	8	CN	5	14	15	11	6	9	6	6	7	6	5	13	103	135	1.3
South Canterbury	9	CS	3	6	5	3				1				4	22	73	3.3
Otago	10	O	4	7	4	8	23	9	9	23	22	12	10	15	146	144	1.0
Auckland West	11	AW	9	7			1	1		7		1		2	28	146	5.2
Taranaki	12	T	10	5	6	5		1	1	1	3	1	10	18	61	102	1.7
Wellington West	13	WW	10	19	20	2	14	52	7	13	13		62		212	540	2.6
North Coast South Is.	14	NCS	2	4		7	4		5		3		4		29	82	2.8
Westland	16	W		2			1						5		8	1	–
Southland	18	S	19		8	10		3		3		4		3	50	111	2.2
Total Miles	—	—	82	73	76	58	64	87	53	69	56	39	115	80	852		
Total Birds	—	—	359	145	79	104	45	59	21	119	69	60	391	84		1535	
Birds per Mile	—	—	4.4	2.0	1.0	1.8	0.7	0.7	0.4	1.7	1.2	1.5	3.4	1.1			1.8

* The table is based on a total of 1535 birds; a further 22 birds were excluded from the table (see text).

TABLE 2: List of Species Found Each Month

Months Birds Found: / Species of Birds	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total Specimens
Megadyptes antipodes		1		6	1					1			9
Eudyptula minor	28	6	5	6		4	2	6	1	2	28	6	94
E. albosignata	1	2	4	1						1			9
Eudyptes crestatus		1											1
E. pachyrhynchus atratus	1												1
E. p. sclateri	1	1	1										3
Diomedea exulans					1								1
D. epomophora		1			1			1					3
D. melanophris									1		1		2
D. chrysostoma		1			1				1				3
D. bulleri					1		1						2
D. cauta		1											1
D. c. salvini			1					1					2
*Diomedea sp.**				1	1								2
Macronectes giganteus	3	1						1			2	1	8
Daption capensis	1		1				1	3	1		5		12
Pachyptila vittata	12	6	1						1		1	1	22
P. salvini	1					1	1						3
P. belcheri								2	1				3
P. turtur	11	24	8	3	1	5	2	37	7	2	123	10	233
*Pachyptila sp.**	11		2			2	1	1	10		7		34
Puffinus carneipes	6	1			2	1	1		1		3	3	18
P. bulleri	8	8	4		3	1				1	6	1	32
P. griseus	139	56	26	38	5	4		2	8	35	152	26	491

TABLE 2 (Continued)

Months Birds Found:	Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total Specimens
Species of Birds													
P. tenuirostris	33	12	5	4	4	4					2	1	6
P. gavia gavia	2			1			2	16	4	4	3		91
P. g. huttoni		3	1		1	1			2	1	7	2	18
P. assimilis	3	1	1							1	4		10
Procellaria cinerea								1					1
P. parkinsoni						1				1			2
P. westlandica	1												1
Pterodroma macroptera	16							1		1		1	19
P. lessoni						2			1		2		5
P. inexpectata	8	1	1									3	13
P. brevirostris						1							1
P. cooki	1	1											2
P. hypoleuca nigripennis			1										1
*Pterodroma sp.**						1							1
Oceanites oceanicus											1		1
Pelagodroma marina	2										1		3
Fregetta tropica		1											1
Pelecanoides urinatrix	13	3		1	2	1	1	7	2		8	2	40
Miscellaneous sp.†	57	28	18	44	22	30	9	40	32	10	35	27	352
TOTALS	359	160	80	105	46	59	21	119	73	60	391	84	1557

* Too fragmentary to allow specific identification.

† Other then petrels or penguins.

TABLE 3: List of Species Found on Different Coasts (Zones)

Index No. of Zone‡	1	2	3	7	8	9	10	11	12	13	14	16	18	
Index Letters of Zone	Campbell Island	NC	AE	BP	WS	CN	CS	O	AW	T	WW	NCS	W	S	Total Birds
Species of Birds															
Megadyptes antipodes	1					1	2	4						1	9
Eudyptula minor			6	4	2	3		2	8	9	42	3		15	94
E. albosignata						5	4								9
Eudyptes crestatus	1														1
E. pachyrhynchus atratus														1	
E. p. sclateri	1													2	3
Diomedea exulans	1														1
D. epomophora	1										2				3
D. melanophris						1		1							2
D. chrysostoma	1				1						1				3
D. bulleri					2										2
D. cauta								1							1
D. c. salvini								2							2
*Diomedea sp.**								1			1				2
Macronectes giganteus	1	1				1	1		2		2				8
Daption capensis			1		4		1	1		2	3				12
Pachyptila vittata						1	14	1			3			3	22
P. salvini					1						1			1	3
P. belcheri									1		2				3
P. turtur	1		1	2	2	12	2	3	40	8	148	8		6	34
*Pachyptila sp.**				1		1					23			9	18
Puffinus carneipes			7	7				1		3					233
P. bulleri			5	3	1		5		4	1	13				32
P. griseus	2	2	39	7	4	59	13	13	50	19	203	51		29	491

TABLE 3 (Continued)

Index No. of Zone‡	1	2	3	7	8	9	10	11	12	13	14	16	18	
Index Letters of Zone	Campbell Island	NC	AE	BP	WS	CN	CS	O	AW	T	WW	NCS	W	S	Total Birds
Species of Birds															
P. tenuirostris				1			1	1		1	2				6
P. gavia gavia			27	8	3	8	2		17	1	18	7			91
P. g. huttoni						4	3				10	1			18
P. assimilis			4								5	1			10
Procellaria cinerea									1						1
P. parkinsoni								1			1				2
P. westlandica									1						1
Pterodroma macroptera			15	1					2	1					19
P. lessoni					1				1		3				5
P. inexpectata									1		2			10	13
P. brevirostris											1				1
P. cooki			1						1						2
P. hypoleuca nigripennis											1				1
*Pterodroma sp.**											1				1
Oceanites oceanicus											1				1
Pelagodroma marina				2							1				3
Fregetta tropica	1														1
Pelecanoides urinatrix	3	1	4	8	2				6	4	12				40
Miscellaneous sp.†	8		9	6	5	39	25	112	11	53	38	11	1	34	352
TOTALS	22	4	119	50	28	135	73	144	146	102	540	82	1	111	1557

‡ See Table 1.

* Too fragmentary to allow specific identification.

† Other than petrels or penguins.

AVIAN REMAINS FROM NORTH OTAGO ARCHAEOLOGICAL SITES

By MICHAEL M. TROTTER

The principal purpose of this note is to list bird species, including the first archaeological record of *Cnemiornis calcitrans,* found in Moa-hunter sites in North Otago. The sites are Ototara, Tai Rua, and Waimataitai,* and they have been excavated by the present writer, or by volunteers under his direction, between 1954 and 1963. They were occupied between the 14th and 16th centuries by Maoris whose economy was to some extent based on the hunting and utilization of moas and other now extinct birds, and whose material culture forms a phase intermediate to "typical" Archaic Moa-hunter and Classic Maori in Otago. Artifacts of "greenstone" are rare or not present, adzes being made of greywacke or argillite, while numerous varieties of moa-bone fish-hooks, both with and without barbs, are a distinctive feature. Other bird bone was used for many artifacts, with use of mammal bone (whale and dog) less common, and human bone rare. All the bird species listed have been used for food, and their bones were found in middens on the sites referred to. The list is compiled in order of frequency of occurrence of individual bones, and numbers range from over fifty to single bones of some of the species at the bottom of the list. Because of the fragmentary nature of many specimens it has not always been possible to make specific identification, hence the genus only is given in some cases.

The site at Tai Rua (Trotter 1959: 12-13) had the most moa bones in proportion to other birds, and a broken moa egg was found in an area with a large number of body remains — vertebrae, pelves, ribs, and probable crop stones — and it was possibly an unlaid egg from a slaughtered bird. As on other sites the femora, tibiae, and tarso-metatarsi were usually broken, to extract the marrow, or facilitate shaping into artifacts, or both. Many bones had been gnawed by rats and dogs, and the latter were doubtless the cause of at least some of the breakage referred to above. Some necks and heads of *Euryapteryx* had the bones and tracheal rings in position of articulation, suggesting that this part of the body was discarded as being useless either for food or for manufacture of artifacts. On the other hand a cranium of the Giant Rail *Aptornis* (which is of similar size to that of some species of moa) from Waimataitai (Trotter 1955: 259-303) had been broken as if to remove the brain for food; in this case the left quadrate and the atlas vertebra were still in position. Apart from an unconfirmed reference by Haast in 1875, the finding of the Aptornis bones at Waimataitai in 1954 provided the first definite evidence of its contemporaneous existence with man, and this has now been supported by a number of finds on other sites in both Islands. Similarly there has not been, as far as can be ascertained by the writer, any previous record of the remains of the Flightless Goose *Cnemiornis calcitrans* being

* These sites are registered with the New Zealand Archaeological Association as numbers S.136/2, S.136/1, and S.146/2 respectively. I am indebted to Mr. R. J. Scarlett of the Canterbury Museum for identifying the bird bones excavated.

found associated with human occupation. While its occurrence at Ototara might suggest isolated late survival in North Otago, it seems probable that like *Aptornis* it will be found elsewhere as more work is done on midden remains. None of the other species is unexpected, though at Waimataitai the predominant moa is *Emeus crassus,* while the common Moa-hunters' moa, *Euryapteryx,* is represented by only one bone. At Ototara *Euryapteryx* was the only moa, and at Tai Rua there were three times as many bones of this species as of *Pachyornis.*

It is apparent from the list that the site at Ototara contained many more species than either of the other two (25 compared with 15 and 14), and in fact the total concentration of individual bones was greater, birds having formed a larger proportion of the occupants' diet. The reason for this is undoubtedly due at least in part to the location of the site, which is close to a fresh water creek one and a half miles from the coast. Both Tai Rua and Waimataitai were larger than Ototara but were situated close to lagoons in coastal sand-dunes where there would be a lesser range of land birds available (though oddly enough some sea-birds were found only at Ototara). There would also be a better supply of other foods such as fish and shell-fish on the coast, though these too were well represented at Ototara. A surprising fact is that of the 37 bird species only eleven are found on more than one site, and only six occur on all three.

A find of special archaeological importance from Tai Rua was a number of fragments of baked clay which had been moulded over a rounded surface. Although at least one object of baked clay has been found on another site (Murdock, 1963: 72), the general absence of pottery in New Zealand rules out the likelihood of the North Otago pieces being part of a crude bowl. An interesting possibility is that they may have been connected with the preservation of birds — damp clay being wrapped around the carcase prior to cooking to provide a receptacle for th preservatizing fat (cf Buck 1950: 99-100). This would explain the moulded curved surfaces and the baked nature of the fragments.†

As has been pointed out by Williams (1962: 17), finding remains of a species in a midden does not necessarily mean that it is native to that particular locality, as preserved carcases could have been traded over wide areas. This is a factor which must always be taken into account when studying archaeological remains.

SPECIES REPRESENTED

In order of frequency of occurrence

MOA **Euryapteryx gravis** (Owen)	O T W
GREY DUCK **Anus superciliosa superciliosa** Gmelin	O T
TEAL **Anas sp.**	O
SPOTTED SHAG **Phalacrocorax (Stictocarbo) p. punctatus** (Sparrman)	O T W
DUCK **(smaller than Anas superciliosa)**	O T W
HARRIER **Circus approximans gouldi** Bonaparte	O
MOA **(Emeus crassus** (Owen)	W
MOLLYMAWK **Thalassarche cauta subsp.**	O T W
SHOVELLER **Spatula rhynchotis**	O
BLACK SHAG **Phalacrocorax carbo novaehollandiae** Stephens	O T W
PIGEON **Hemiphaga novaeseelandiae** (Gmelin)	O T
STEWART IS. SHAG **Phalacrocorax carunculatus chalconotus** (Gray)	T
GIANT RAIL **Aptornis otidiformis** (Owen)	W
PARADISE DUCK **Tadorna variegata** (Gmelin)	O T W
MOA **Pachyornis elephantopus** (Owen)	T W

† [Is there a parallel here with the traditional gipsy method of baking a Hedgehog, after first wrapping it in a ball of clay? — Ed.]

PARAKEET **Cyanoramphus novaezelandiae** (Sparrman)	O W
YELLOW-EYED PENGUIN **Megadyptes antipodes** (Hombron & Jacquinot)	O
LAUGHING OWL **Sceloglaux albifacies** (Gray)	O W
QUAIL **Coturnix novaezealandiae** Quoy & Gaimard	O
LITTLE PENGUIN **Eudyptula sp.**	T
FLIGHTLESS GOOSE **Cnemiornis calcitrans** Owen	O
MOA **Megalapteryx didinus** (Owen)	W
EXTINCT SWAN **Chenopis sumnerensis** Forbes	O
TAKAHE **Notornis mantelli hochstetteri** Meyer	O
PUKEKO **Pophyrio melanotus** Temminck	O
MOREPORK **Ninox novaeseelandiae** Gmelin	O
FALCON **Falco novaeseelandiae** Gmelin	O
EXTINCT COOT **Palaeolimnas chathamensis** (Forbes)	T
PRIONS **Pachyptila sp.**	O
BLACK-BILLED GULL **Larus bulleri** Hutton	O
WHITE-FRONTED TERN **Sterna striata** (Gmelin)	O
DIVING PETREL **Pelecanoides urinatrix**	O
ALBATROSS **Diomedea sp.**	T
GULL **Larus dominicanus** Lichtenstein	W
EXTINCT HAWK **Circus eylesi** Scarlett	T
EXTINCT CROW **Palaeocorax moriorum** (Forbes)	T
SHEARWATER **Puffinus sp.**	W

Sites: O — Ototara; T — Tai Rua; W — Waimataitai.

R. J. SCARLETT det.

REFERENCES

BUCK, P., 1950: " The Coming of the Maori," 2nd ed., Whitcombe & Tombs.
HAAST, Julius, 1875: " Researches and Excavations carried on in and near the Moa-bone Point Cave . . ." Transactions of the New Zealand Institute, Vol. 7.
MURDOCK, R. T., 1963: " Oterewa Pa, Kopuaraki " New Zealand Archaeological Association Newsletter, Vol. 6, No. 1.
TROTTER, M. M., 1955: " First Excavation of a Moa-hunter Camp Site at Waimataitai Mouth, Katiki " Journal of the Polynesian Society, Vol. 64, No. 3.
———— 1959: " Archaeological Investigations in North Otago " New Zealand Archaeological Association Newsletter, Vol. 2, No. 3.
WILLIAMS, G. R., 1962: " Extinction and the Land and Freshwater-inhabiting Birds of New Zealand," Notornis X, 15-32.

★

SHORT NOTE

TEREK SANDPIPER, GREENSHANKS AND MARSH SANDPIPER NEAR GISBORNE

On 8/3/64 a Terek Sandpiper *(T. terek)* was found at Muriwai Lagoon, near Gisborne. Nearby ten Wrybills *(A. frontalis)* were scattered about the mud, feeding. Observation was perfect at fairly close range. Not only is this the southernmost record of a Terek Sandpiper in New Zealand, all other records so far being from Kaipara, Manukau or the Firth of Thames; but also at 178°E, 39°S, Muriwai Lagoon is the most southeasterly point which this palaearctic species is known to have reached in its vast range.

It was not far from the lagoon, in a partly tidal swamp now converted to farm land of a sort, that Stidolph recorded the Greenshank *(Tringa nebularia)* after a lapse of 78 years (*Notornis* V, 123). So it was gratifying to record two of this species present on 15/11/64.

On 13/12/64 my attention was drawn to a wader with long slim yellowish legs, and a long slender blackish bill, with plumage similar to a Greenshank, but generally lighter in appearance, and smaller and of slighter build. A closer scrutiny revealed a brownish base to the lower mandible, a dark patch about the carpal flexure, white rump, and a whitish tail, thinly barred with black. The bird's identity as a Marsh Sandpiper *(T. stagnatilis)* was established beyond any doubt when it was made to fly, and its call was a fairly loud " tew " repeated three or four times. Whilst the legs appeared at first sight a clear yellow, in other lights there was a distinct greenish tinge.

— A. BLACKBURN

KAKAS IN CAPTIVITY

By M. R. SKIPWORTH

For some twelve years the Dunedin City Corporation has maintained large aviaries at the Botanic Gardens for the display of both exotic and native birds. The greater portion of these aviaries is set aside for native species, a very large flight, some one hundred and fifty feet by one hundred and twenty feet and ten feet high, providing ample space for exercise. No attempt has been made to enclose native birds which can be seen in the city area or the surrounding bush of the Town Belt and neighbouring hills. Tuis, native pigeons and bellbirds are frequently seen in these areas and there is no need to keep them in captivity. There are thousands of New Zealanders, however, who have never seen or heard a native parakeet, a weka or a kaka, although most of them have read about them and are delighted to have the opportunity of actually seeing them, despite the fact that they are in captivity. Towards this object we have been greatly assisted and encouraged by the Wild Life Branch of the Department of Internal Affairs, without whose help the project would have been impossible.

It is essential that the birds should be kept under the best possible conditions and one of the indications of satisfactory conditions is that the birds should breed and rear healthy young. No breeding difficulties were experienced with the two species of parakeets or the wekas, but for some years no results were obtained from the three kakas which the Department of Internal Affairs had forwarded to us some eight years ago. These birds had been trapped on Stewart Island and forwarded to Dunedin immediately for release in the aviary. They settled into their new quarters very happily and ample supplies of sunflower seed, canary seed and oats were provided. Some brown bread was fed and ample supplies of greens, vegetables and apples were made available. The floor of the aviary was kept as a lawn — not too closely cut — and both kakas and parakets spend much of their time fossicking in the grass and pulling up the roots to eat.

For a number of seasons the Kakas were observed mating and busying themselves around the nesting sites but no eggs resulted. Nectar, made up from honey and water, was fed and greedily taken by the Kakas, and it was hoped that the stimulant of an additional favoured food supply might produce results, but we were still to be disappointed. While the writer was visiting Britain recently, the opportunity was taken to discuss the problem with Mr. Yealland, the Curator of Birds, at the London Zoological Society's Gardens. He recommended that we try the nectar feed provided for humming birds as a day time feed, made up as follows:—

To one pint of warm water mix:—

4 level tablespoons of invert sugar
2 level tablespoons Complan
½ teaspoon of Hepavite

This mixture was made available to the birds in August 1963 and within three weeks, by 5th September, three eggs had been laid in a hollow log of native cedar *(Libocedrus Bidwillii)*. It is not

suggested that the feeding of the new nectar mix was responsible for stimulating the hen bird to lay, as it is quite possible that eggs would have been produced without it. Several nesting sites had been provided to enable a selection to be made from the various cedar logs each about nine feet in length, and stood up on end. The upper core of each log had been hollowed out and then capped over with a metal cover, while an entrance hole of suitable size was bored through to the hollow core. The nest site selected was large enough to allow the two birds to remain inside at the one time, but as far as could be seen, the hen bird appeared to do all the incubation, the male feeding her regularly on the nest during the day. Each afternoon she left the nest for a short flight and to visit her keeper for a special tit-bit of food, during which time the male bird stood guard at the entrance to the nest.

On 30th September, there were two chicks in the nest, the third egg failing to hatch and proving infertile. Both parents were active in feeding the young, which grew rapidly through the nestling stage, with their covering of soft white down, to reach the fully feathered stage. The two young birds then appeared to remain in the nest for a particularly long time before finally emerging on 4th December. In comparison, three young Australian Galah parrots, in an adjoining aviary, left their nest a month before the kakas although they had been hatched from eggs which were laid at the same time as the kaka eggs. The young galahs were capable of flying immediately, whereas the kakas spent much of their time on the ground and it was some six weeks before they were capable of flying to the standard reached by the galahs as soon as they had left the nest. The parent birds were not satisfied with the young kakas being on the ground for they immediately commenced to harry them, intent on them evidently getting off the ground. They dragged them along the ground by the leg, the wing or the tail, and they were joined in this by the third adult bird (of unknown sex). This very rough treatment alarmed the aviary keeper so much that he frequently rescued the young birds and placed them up in the branches of trees, where they were less likely to be roughly treated by the three adult birds. One of the young birds became paralysed in the lower portion of the spine, but whether this was due to the harrying of the adults or not is uncertain. Perhaps the young bird had shown too much interest in the dish of shredded ox-heart placed out each evening for the kiwis, housed in the same aviary, and had received a kick from those powerful legs. The young bird was never able to fly and some months later was found drowned in the shallow drinking pool. The other young bird has grown into an active and healthy adult.

For the 1964 breeding season no artificial nectar was fed until the end of September, twenty-five days after the date the hen bird had laid in 1963. Several nectar feeds were given from the end of September and by 15th October four eggs had been laid, the pair choosing a new nesting site, instead of their former log, which it had been expected they would occupy again this season. The new nest was also in a hollowed out native cedar log, but this year's nest site did not have sufficient room to house the two adult birds at the one time. On 8th November there were four chicks in the nest and once again they made very rapid growth, although the cock bird was not

noticed to feed them in the early stages as was noted in the previous season. In the later nestling stage, however, he joined in general feeding, but the four young birds were not as plump as the two of the previous season. The first young bird left the nest on 8th January 1965, followed by the others at intervals of a few days, until the last bird left on 21st January. By the present date (29th January), the young birds are beginning to fly, and so far have not been subject to so much rough attention from the adult birds, which their predecessors received last season.

The successful breeding of any birds kept in captivity is always a great encouragement and it is hoped that this season's four young birds will grow to healthy maturity. Of the native birds kept in the aviary, the kaka are the most interesting, particularly that a pair is now breeding, and one forgets the nuisances they sometimes create, such as cutting large holes in the netting or destroying the native parakeets' nest at breeding time.

★

SHORT NOTES

PREY OF A FAMILY OF NEW ZEALAND FALCONS

There is little information available on the food of the New Zealand Falcon *(Falco novaeseelandiae)* (Pl. XXIII), Oliver (1955) states that birds of many species form most of its food but that rats, mice and lizards are also taken. Guthrie-Smith (1927) considered that New Zealand Pipits were the main food although Goldfinches, Yellowhammers, Starlings and Quail were also taken.

I watched a pair of Falcons feeding two fledged young at Ngatapa, Gisborne, from 30 December, 1962, to 4 January, 1963. They were observed for 12½ hours, mainly in the early morning and late afternoon. The young had left the nest, which was not found, and spent their time perched in scattered trees on a hillside. It is not known when they became independent of their parents. The surrounding country was steep farmland with some manuka scrub and stands of remnant bush.

The young birds flew well, but did not attempt to catch prey and were observed being fed twelve times at irregular intervals, averaging approximately once an hour. Guthrie-Smith (1927) recorded that nestlings three-quarters grown were fed, on average, once every ninety minutes. On six occasions one of the young birds flew high over the valley to meet the returning parent and flew in the same direction approximately three feet below the adult until the food was dropped. The young bird turned slightly on to its side and caught the food in its talons. On other occasions it did not leave its perch until the parent was quite near. It then flew towards the adult and when only a few feet apart both banked vertically and the adult tossed the food to the young. Once the parent returned with food, perched near the young and then flew off, leaving the food. When feeding occurred in flight the young always caught the food successfully and then settled

[J. E. C. Flux

XXIII — Adult male New Zealand Falcon.

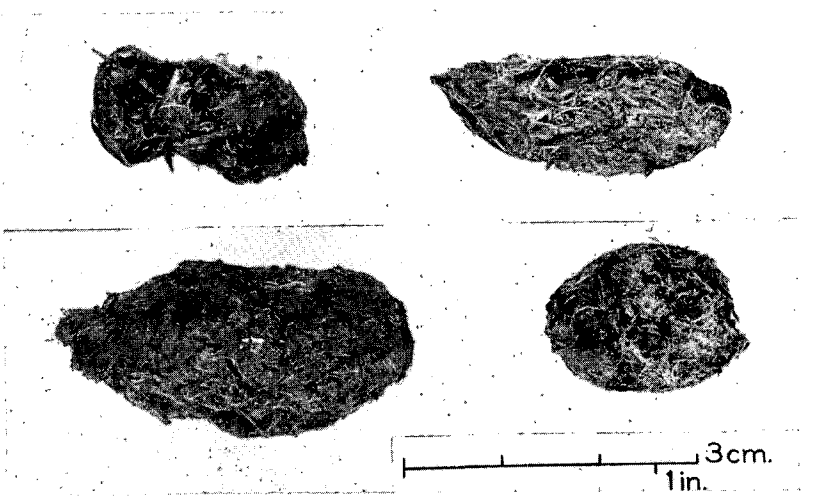
on the steep hillside to pluck and eat the prey. Sometimes the young bird with food was chased by the other one, but chasing also occurred at other times.

Feathers, occasional leg bones and beaks were found scattered at 34 sites on the hillside where the falcons had plucked their prey while feeding. No other predators were seen in the area although Harriers *(Circus approximans)* are present in the district. Four whole or part carcases of birds were also found. At least 26 individual birds of eight species were identified from these feathers and carcases (Table 1).

TABLE 1 — Prey Identified from Feathers

Species	*Total*	*Adult*	*Young*
Skylark *Alauda arvensis*	9	7	2
Song Thrush *Turdus ericetorum*	4 or 5	3 (1 moulting)	1 or 2
Blackbird *T. merula*	3		3 (2 fledglings, 1 fully fledged)
Greenfinch *Chloris chloris*	2	1	1
Goldfinch *Carduelis carduelis*	2	2 (1 moulting)	
Yellowhammer *Emberiza citrinella*	2	2 (1 moulting)	
House Sparrow *Passer domesticus*	3 or 4	1 male	2 or 3 adult females or young
Starling *Sturnus vulgaris*	1		1

Ten pellets (Fig. 1) examined all contained feathers and bird bones of the species identified from pluckings. The mean and extreme measurements of these pellets were: length 31.7mm. (21-42); width



[N. S. Beatus

Fig. 1 — Pellets of the New Zealand Falcon showing range in size and shape.

13.9mm. (11-17) and dry weight 1.04g. (0.24-1.91). In one pellet red Goldfinch head feathers were identified but in all others the feathers were broken down to unidentifiable grey fragments. Five also contained fine insect fragments or seed, probably derived from the crop of the prey. One pellet contained fragments of at least 14 green manuka beetles *(Pyronota festiva)*. These may have been derived from the crop of prey or may have been taken by the Falcon.

All the species of birds preyed on are common in the area and mostly frequent open farmland. Skylarks were taken more often than would be expected from their density in the area and they may be particularly vulnerable to a fast-flying bird of prey. Fantails *(Rhipidura fuliginosa)*, Grey Warblers *(Gerygone igata)* and Silvereyes *(Zosterops lateralis)* are the common small birds of manuka scrub and bush remnants but were not taken. One of the young Falcons was mobbed by a group consisting of two Fantails, two Silvereyes, two Grey Warblers and a male Chaffinch *(Fringilla coelebs)*. It sat for a minute or two before flying off with the birds following.

Young birds are generally more vulnerable to predation than adults and many of the prey taken by these Falcons were young or moulting birds. The latter may have been more vulnerable than non-moulting birds, but many birds may be in their post-breeding moult at this time of year. Of the Sparrows killed, one was half-eaten but the other two were almost intact; they may be relatively unpalatable. One uneaten juvenile Skylark was also found.

I would like to thank Mr. R. G. Ordish, Dominion Museum, for kindly identifying the insect fragments, and Dr. P. C. Bull, J. E. C. Flux, J. A. Gibb, K. Wodzicki and Mr. C. J. R. Robertson for helpful comments.

REFERENCES

GUTHRIE-SMITH, H., 1927: Birds of the Water, Wood and Waste, 2nd Edition. Whitcombe & Tombs, Wellington, 207 pp.

OLIVER, W. R. B., 1955: New Zealand Birds, 2nd edition Reed, Wellington, 661 pp.

—B. M. FITZGERALD
Animal Ecology Division, D.S.I.R.

★

NOTE ON THE FEEDING OF A YOUNG NEW ZEALAND FALCON

At the junction of the Snowflake Creek and the Kowhai, 15 miles west of Kaikoura township, on 20/2/65, I heard a strange plaintive call coming from some kanuka scrub, a half-dozen calls being repeated loudly every three minutes. After climbing around the hillside underneath the 20 feet tall kanuka for ten minutes without seeing the bird, it at last flew from the kanuka, and perched on a dead cabbage tree trunk only 10 feet from me. The bird was a fully grown Bush Hawk *(F. novaeseelandiae)* in immature plumage, not having the underparts streaked with dark brown. The young falcon was quite fearless of me, calling regularly during the 20 minutes the bird was nearby, in a long drawn-out plaintive cry, which was repeated about six times; one call after the other, and quite unlike the screaming chatter of the adult falcon. Suddenly the young falcon flew swiftly to the centre of the Kowhai riverbed climbing about 300 feet, where I noticed what I

thought was the parent. When the young bird was just under the parent, high above the valley, I noticed the latter drop something small, which was immediately caught by the talons of the young bird, in mid-air. The young falcon then dived down to settle on a log about a hundred feet up a small washout. I was able to reach this site only when the falcon had almost finished devouring the remaining part of what appeared to be a Pipit, holding the victim in one talon and ripping with the mandibles. Exactly four weeks later, within two hundred yards of the above incident I noted an adult falcon sitting motionless on a rock within three feet of the river.

— G. HARROW

★

CARING FOR WHITE FLIPPERED PENGUINS

The release of over 5000 gallons of fuel oil into Lyttelton harbour on 17th July, 1965, resulted in the loss of a great number of sea birds. Giant Petrels *(Macronectes giganteus),* Red-billed gulls *(Larus novaehollandiae),* Black-backed gulls *(Larus dominicanus)* all were affected but the worst hit were the diving birds, Spotted Shags *(Stictocarbo punctatus)* and the White-flippered penguins *(Eudyptula abbosignata).*

The oil drifted north from Lyttelton and dead and sick birds were reported from Port Cooper up to Amberley Beach, 30 miles from the release point.

Functioning as an Honorary Ranger, I patrolled the beaches near Christchurch and retrieved a number of penguins and also received others from the public.

With very little time to try out the Fuller's Earth method on the mineral oil, I adapted detergent as the best in the circumstances and treated 8 birds in the following fashion and did not lose one.

Stood the bird in 2 inches of tepid water to which I added a tablespoon of detergent and sponged the bird, gently rubbing down the full length only, then after the oil started to lift rinsed with fresh tepid water, avoiding, at all times, the eyes.

Rub the bird with a dry towel and keep in a warm place (70 degrees) for at least two days, then keep in a shed or similar place for at least two weeks, but a longer period is desirable to allow the full insulating qualities to return to the feathers.

Feeding:

The penguins must be fed on fish and although they will survive a long period without food I recommend that you should attempt to feed the bird on the second day with a little forced feeding, if necessary.

The fish must be cut into lengths about $\frac{1}{4}$ inch wide.

The following is a record of 4 birds that were in my care.

No. 1 —

Found at Taylor's Mistake 26/7/65, started to feed immediately after cleaning. Meals 3 times a day consisted of 3 ozs. of fish, two dipped in salt water and one mixed with half a teaspoon of cod liver oil.

Weight when found — 1 lb. 14 ozs.; on 5/8/65 — 2 lbs. 1 oz., and on release 11/8/65 — 2 lbs. 5 ozs.

No. 2 —

Found Lyttelton 27/7/65 — 1 lb. 10 ozs.; 30/7/65 — 1 lb. 14 ozs., and on release 11/8/65 — 2 lbs. 2 ozs.

This bird was force fed for the entire period.

No. 3 —

Found at Sumner 26/7/65 — 2 lb. 1 oz.; 30/7/65 — 2 lbs. 3 ozs., and on release 9/8/65 — 2 lbs. 4 ozs.

This bird started to feed after the third day.

No. 4 —

Found New Brighton, 27/7/65. Weight, 1 lb. 14 ozs.; 30/7/65 — 2 lbs. 1 oz., and on release 9/8/65 — 2 lbs. 2 ozs. Fed as No. 1.

As it can be seen all birds increased their weight and when released were in good condition to survive for a long period if they felt that return to the water was a little premature.

A number of other birds that were cared for by people throughout the province died, and in most cases this was due to more than one washing, which I am convinced is fatal to the bird.

Meat, I feel, is also undesirable as a food when the bird is in the recouping stage, but if fish is not available, then the meat should be dipped in salt water or cod liver oil.

— BADEN N. NORRIS

★

BROWN BOOBIES ASHORE AT RAGLAN AND IN FIRTH OF THAMES

When I was looking through some bird notes made by the late A. C. Hipwell, I came upon the following entry. "Brown Booby *(Sula leucogaster)* 28/2/61. 5.30 p.m. Raglan. One on beach near aerodrome. First seen resting on beach at distance of about 30 yds. Observed through binoculars. Dark brown plumage — very light underparts. Bill heavy; feet light colour. Heavy flight in taking off. Nearby a large flock of White-fronted Terns was wheeling and diving for sprats disturbed by kahawai. The Booby made no attempt to molest the terns. Head, bill and feet decided me to list the bird as a Brown Booby — an unusual sighting."

The time of this sighting coincides with the season when sea birds of tropical origin most commonly appear in northern New Zealand waters. It is not irrelevant to mention that in 1963 a Red-billed Tropic Bird was found ashore on the same coast, actually on Toreparu Beach, north of Aotea Harbour.

— R. B. SIBSON

On 8/2/65 a strange-looking bird with a 'Beatle haircut' was observed sitting on boulders at Whakatiwai, on the west coast of the Firth of Thames. It was successfully photographed in colour by Mr. Spencer Heath of Rotorua; and from the pictures it is easily identified as a Brown Booby *(S. leucogaster)*. The bird was actually caught and appeared extremely tame. It was examined for injury and subsequently released.

Since 1952 there have been several sightings of Brown Boobies in the Hauraki Gulf and one was known habitually to roost among the Gannets *(S. serrator)* on Horu Horu Is. (Notornis 6, 157-159). The specimen here reported may have been driven south and exhausted by the Fiji hurricane.

— R. M. WESTON

PLUMAGE OF BLACK FANTAIL

Dr. Soper's observation on the Black Fantail *(Rhipidura f. fuliginosa)* published in Notornis XI, No. 3, p. 195, in which he describes having observed a mated pair of black-phased birds in which both individuals had white earcoverts, reminded me of a specimen received at the Dominion Museum during 1963. This bird, killed on the road in Goose Bay, Marlborough on 26/3/63, had prominent white earcoverts and was proved to be a male by dissection.

Museum collections unfortunately contain only small series of black-phased birds, and most of these are of old origin and many insufficiently labelled. Nevertheless from the series studied at the Dominion Museum in Wellington and at the Canterbury Museum in Christchurch, the following table was drawn up.

Register Number	Date Collected	Sex	White Earcoverts	Uniformly Dark	Place Collected
DM-1700	March 1904	F		X	Nelson
DM-1701	Nov. 1904	F		X	Nelson
DM-1702	Apr. 1905	F	x inconspicuous and on left side only		Nelson
DM-1703	Nov. 1904	F		X	Nelson
DM-1704	Apr. 1905	F		X	Nelson
DM-10001	26/3/63	M	x		Goose Bay
Canterbury AV-923	1892	F		X	Otago
Av-260	3/4/1909	M	x inconspicuous and on left side only		

Other specimens, unfortunately not sexed, show a great variation in the amount of white feathering on the earcoverts, if present, which can occur either on the right or on the left side or, symmetrically on both sides of the head.

If the sexes marked on the old labels in collections can be relied upon, it seems that the white markings on the earcoverts are more likely to occur on the males than on the females, but they can occur on both sexes.

From the above it seems evident that Dr. Oliver's (N.Z. Birds, 1955, p. 495) statement "The female has a white spot over each ear covert" is not supported by the evidence of carefully sexed specimens.

— F. C. KINSKY

★

NOTICES

REPRINTS OF PAPERS

Commencing with this issue, contributors requiring reprints of their papers should, within 14 days of publication, order these direct from the printers, Te Rau Press Ltd., P.O. Box 195, Gisborne, who will render accounts for the cost direct to the contributors.

★

KERMADECS EXPEDITION 1964

Covered reprints of the story of the Expedition by A. T. Edgar, and ornithological findings by F. C. Kinsky and G. R. Williams, are now available from Mrs. H. M. McKenzie, P.O. Box 45, Clevedon, at 4/6d. per copy. Cash with order.

REQUEST FOR INFORMATION
CENSUS OF GANNET COLONIES

It is proposed to carry out a population census of the Australian Gannet *(Sula bassana serrator)* in New Zealand during the 1966/67 breeding season. To facilitate this, information is requested on population counts or estimates, and new colonies since the last census in 1946/47. Ornithologists near Gannet colonies are asked to make counts and estimates during the coming breeding season from October to January inclusive.

Information requested, if available:—

1. Total Breeding Pairs
2. Total empty nests
3. Total unattached birds
4. Stage of nesting — i.e. number or proportion of eggs or chicks to total population, or description of chicks present.
5. Photographs of as much of the nesting area as possible.

All information or queries should be forwarded to:

C. J. R. Robertson,
Dominion Museum,
Private Bag,
Wellington.

★

O.S.N.Z. LIBRARY CATALOGUE

A new catalogue, including the huge collection of reprints in the Deignan gift, has been compiled and will be available at the end of October, price 5/-, cash with order, from Mrs. H. M. McKenzie, P.O. Box 45, Clevedon.

★

QUESTIONS ABOUT WEKAS

An American scientist has carried out research work on various structures in the head of Wekas. She finds that there are features present which pose questions which she would like us to assist her in answering.

Do Wekas have accessory nests in association with water?

Do they swim and dive?

What special use, if any, do they make of their highly developed olfactory sense?

Have their lateral nasal (salt) glands been observed in use as excretory organs? i.e. have birds away from water on a hot day been seen to be dripping from the nose?

Would any person having information on these points please write to Mrs. G. L. K. Carroll, Wildlife Branch, Department of Internal Affairs, Wellington.

★