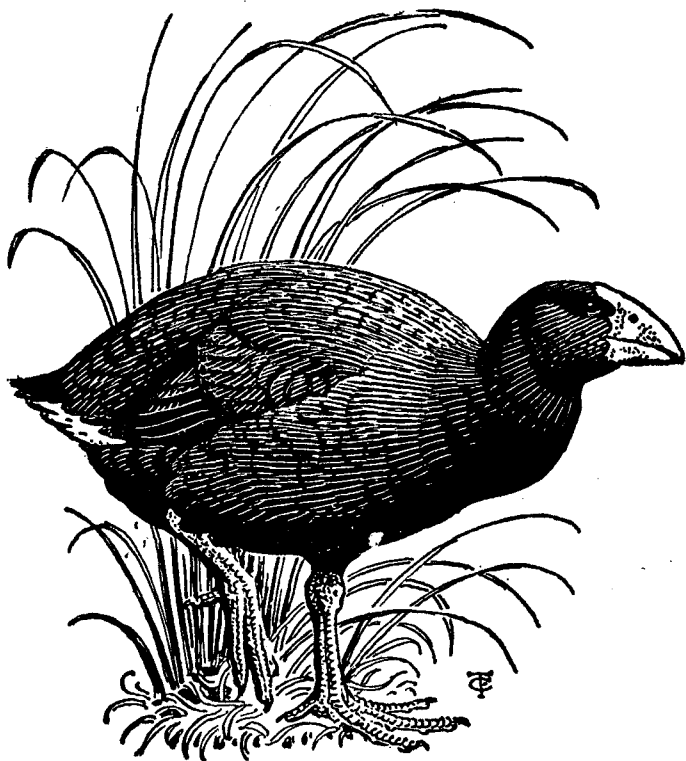


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FOODS AND FEEDING BEHAVIOUR OF SOME FOREST BIRDS ON HEN ISLAND IN MAY

By D. V. MERTON

*Conservation Section, Wildlife Branch
Department of Internal Affairs, Auckland*

INTRODUCTION

These observations were made during the period 11th to 21st May, 1965, on Hen Island, off the east coast of Northland Peninsula, and were obtained during a food and feeding station study of the North Island Saddleback (*Philesturnus carunculatus rufusater*), (Atkinson, 1966a). Little is known of the food or feeding stations of most native forest-inhabiting birds, and this paper may help to stimulate interest in further work on the subject.

A great many more feeding observations, made at different seasons on Hen Island are required, before it will be possible to tell whether an overlap exists between the feeding requirements of saddleback and other species.

The Wildlife Branch team, incorporating members from the Ornithological Society of New Zealand and officers of the Department of Scientific and Industrial Research consisted of the following members: Pamela J. Atkinson, Angela M. Campbell, Messrs. I. A. E. and K. C. Atkinson, D. J. Campbell, A. M. C. Davis, D. R. Ellis, J. L. Kendrick, N. J. Ledger, R. H. Sibson and the writer, all of whom contributed observations.

The method of recording is similar to that used previously when studying saddlebacks (see studies by Atkinson 1964 & 1966a, Merton 1966 and Blackburn in press) and is described by Atkinson (1966b). It is a modification of the method developed by Gibb (1961) to sample bird feeding stations in the Kaingaroa State forest.

More than half of the observations were made within a quarter of a mile of our camp at Dragon's Mouth Cove, in pohutukawa (*Metrosideros excelsa*), kanuka (*Leptospermum ericoides*), pohutukawa-puriri (*Vitex lucens*) or taraire (*Beilschmiedia taraire*)-tawa (*B. tawa*) forest types.

Both Bellbirds (*Anthornis m. melanura*) and Tui (*Prosthemadera n. novaeseelandiae*) are particularly numerous on Hen Island and are the most common passerines present (see Turbott 1940 & Skegg 1964), but White-eye (*Zosterops lateralis*) numbers tend to fluctuate, often being regarded as low, although during our visit there was a moderate number.

FOODS

A total of 157 observations involving five species of passerine and the pigeon (*Hemiphaga n. novaeseelandiae*) were made in which foods could be identified. By far the greater number of observations were of birds feeding from "flowers," presumably upon nectar, and it is probable that some of those recorded in "live foliage" may have in fact, also been feeding from flowers. It is not always possible to determine what a bird is feeding upon high in a dense forest canopy.

TABLE 1 — Foods of Various Forest Birds on Hen Is. — May 1965

	No. of Observations					
	Tui	Bellbird	White-eye	Fantail	Tit	Pigeon
Insects (unidentified) --- --- ---		3	7	14	6	
Diptera spp. --- --- ---		1				
Large Diptera spp. --- --- ---	1					
Scale insects --- --- ---		5				
Nectar of Puriri --- --- ---	43	20				
Karaka (<i>Corynocarpus laevigata</i>) ---	1	1				
Supplejack (<i>Ripogonum scandens</i>) ---	1					
Kohekohe (<i>Dysoxylum spectabile</i>) ---	20	22				
<i>Rhabdothermus solandri</i> --- ---		1				
Green fruit of Houpara (<i>Pseudopanax lessonii</i>)	1	1				
Ripe fruit of Inkweed (<i>Phytolacca octandra</i>)			1			
Tawapou (<i>Planchonella novo-zelandica</i>)						5
Sap from fissure in karaka bark ---		1				
Sap from fissure in Whau (<i>Entelea arborescens</i>) bark		1				
Water --- --- ---		1				
TOTALS	67	57	8	14	6	5

FEEDING BEHAVIOUR

A Fantail (*Rhipidura fuliginosa placabilis*) was seen feeding in the upper understorey of a pohutukawa forest and while perched, took an insect from the twig it was perched on. Another alighted on the litter of the forest floor and captured an insect from amongst leaves on the ground. According to Oliver (1955) food of the fantail consists almost entirely of small insects, which are taken on the wing.

The feeding observations of Pied Tits (*Petroica macrocephala toitoi*) were made of a male which frequented the chopping block at our camp. This bird would watch patiently for a grub to be exposed then dart down to claim it, often within a few feet of the axeman. It would then retreat to a safer distance before dealing with its morsel, after which it would return to survey proceedings once more. On one occasion the tit, which had possession of a large white grub, was pursued unsuccessfully by a Bellbird for some 20 yards.

Bellbird

Of a total of 96 feeding observations obtained, 57 were timed and involved approximately 2,186 minutes (see Tables II & III).

Both puriri and kohekohe were in full bloom and Bellbirds made good use of this food source. Insects appear to be an important food. Three instances of aerial feeding were noted. A Bellbird was recorded

hovering 10 to 15 feet above the ground, feeding on insects it disturbed from a karaka trunk and another was watched "hawking" insects in flight within 6 inches of a low pohutukawa canopy. One was seen in pursuit of an insect in flight, the chase ending when the bird overtook the insect after following its descending path 40 feet onto the ground. One instance of feeding on the ground was recorded when a bird captured an insect from the rock on which it was perched. Another bird fed briefly amongst litter.

Twenty-two observations were made of Bellbirds apparently hunting for insects on kanuka bark, the birds often ascending the tree trunks in a spiral. Two were seen taking insects on karaka bark. An observation was recorded of a bellbird feeding from a hole, and another from a fissure, in a puriri trunk. Of the birds feeding on insects in live foliage 11 were in kanuka where caterpillars were moderately plentiful, 5 were in karaka and 3 in five-finger (*Pseudopanax arboreum*).

Of interest are the two observations where Bellbirds were observed apparently drinking the sap exuded from wounds in bark. The first was when a bird was seen dabbing its tongue against the sap moistened bark of a whau 3 ft. above the ground and the second was of a bird 10 ft. up a young karaka trunk holding on in the manner of a woodpecker as it dabbed its tongue into the fresh sap flowing from a small fissure in the bark for over a minute. Honeydew, a sweet substance which forms on the bark of some trees, and is a valuable food of honeyeaters in southern New Zealand, has not been recorded on Hen Island. There was a single observation of drinking, when, after a shower, a bird in the canopy was seen to take a drop of water from the tip of a kohekohe leaf.

Fruit does not seem to be a significant source of food during May, the only observation being that of a bird picking, and endeavouring three times to swallow, houpara berries. Apparently they were too green or too large as they were dropped after each attempt.

TABLE II — Feeding Stations of Bellbirds on Hen Is. — May 1965

	No. of Observations	% of Total
Aerial Feeding: Above canopy	1	1
Below canopy	2	2
Live foliage of canopy (excluding tufted crowns and epiphytes)	13	14
Live foliage of lower branches and understorey	2	2
Flowers	44	46
Fruit	1	1
Twigs, living and dead	13	14
Holes and fissures	3	3
Bark of branches and limbs	10	10
Bark of trunks	5	5
Ground	2	2
TOTAL	96	100

TABLE III — Times Spent by Bellbirds in Three Groups of Feeding Stations on Hen Island in May 1965

	No. of Observations	Total time of observations (minutes)	% of Total
In foliage --- --- ---	32	1539	70
Flowers --- --- ---	4	23	1
Branches and Boles ---	21	624	29
TOTAL	57	2186	100

Tui

Ninety-three feeding station observations were recorded, 58 of which were timed, involving a total of 964 minutes. As can be seen by tables I, IV & V, Tui appeared entirely dependent upon nectar from puriri and kohekohe. At this time of year neither insects nor fruit appear to be important foods. However, three Tui were seen hunting insects in fivefinger foliage, one each in karaka and kanuka foliage and one on kanuka bark.

One instance of aerial feeding was noted when a Tui chased and caught a large fly, six feet above a low coastal pohutukawa canopy.

TABLE IX — Feeding Stations of Tui on Hen Is. — May 1965

	No. of Observations	% of Total
Aerial feeding: Above canopy --- ---	1	1
Live foliage of canopy (excluding tufted crowns & epiphytes) --- ---	22	24
Live foliage of lower branches and understorey --- --- ---	1	1
Flowers --- --- ---	60	65
Fruit --- --- ---	1	1
Twigs, living and dead --- ---	3	3
Bark of branches and limbs --- ---	5	5
TOTAL	93	100

TABLE V — Times Spent by Tui in Three Groups of Feeding Stations on Hen Island in May 1965

	No. of Observations	Total time of Observations (minutes)	% of Total
Flowers --- --- ---	53	936	97
In foliage --- --- ---	3	21	2
Branches and Boles ---	2	7	1
TOTAL	58	964	100

White-eye

A total of 56 feeding station observations were obtained, 55 of which were timed and involved 114 minutes. All these were of birds feeding from foliage or fine twigs. White-eyes at this time of year tended to move through the forest canopy in flocks of fifteen or more individuals. In seven instances, where positive identification could be

made, food consisted of insects and on one occasion fruit. Thirty observations of birds feeding in kanuka foliage were recorded and thirteen in *Coprosma macrocarpa*. Two were seen feeding among fine twigs of hangehange (*Geniostoma ligustrifolium*).

TABLE VI — Feeding Stations of White-eye on Hen Island — May 1965

Feeding Station	No. of Observations	% of Total
Live foliage of canopy ----	33	59
Live foliage of lower branches and understorey ----	15	27
Twigs, living and dead ----	8	14
TOTAL	56	100

DISCUSSION

These observations suggest that during May, competition for nectar might occur between the two honeyeaters although nectar may be so abundant at this time that competition is not operative.

Saddlebacks, as shown by Atkinson and Campbell (1966), are largely insectivorous and cover a very wide range of feeding stations within the forest; one of the more important being the ground. This station seems hardly utilized by other species examined here. Insects obtained over a less varied range of feeding stations seem to constitute an important part of the Bellbird's diet during May.

TABLE VII — Comparison of Feeding Stations used by Four Species of Passerine on Hen Island During 10 Days in May

Feeding Stations	% of Observations			
	*Saddleback	Bellbird	Tui	White-eye
Aerial feeding ----	0	3	1	0
Live foliage of vegetation canopy (excluding tufted crowns) ----	12	14	24	59
Live foliage of cabbage tree and epiphytic collospermum ----	1	0	0	0
Live foliage of lower branches and understorey ----	3	2	1	27
Dead foliage and vine stems ----	4	0	0	0
Flowers ----	4	46	65	0
Flower buds ----	1	0	0	0
Fruit ----	8	1	1	0
Twigs (living and dead) ----	10	14	3	14
Bark of branches and limbs ----	24	10	5	0
Branch axils, fissures, holes ----	7	3	0	0
Dead branches and limbs ----	7	0	0	0
Bark of trunks ----	4	5	0	0
Ground ----	15	2	0	0
	100	100	100	100
Number of Observations	242	96	93	56

* Saddleback data from Atkinson (1966a)

These results are far from conclusive and a mere beginning has been made in what could develop into a most useful and interesting ecological study. Many more observations taken throughout the year are needed before clear patterns can be expected to emerge.

ACKNOWLEDGEMENTS

Our thanks are conveyed to the Commissioner of Crown Lands, Auckland, for permission to visit the Hen and Chicken Islands Scenic Reserve, and to Dr. G. R. Williams of Research Section, Wildlife Branch, D.I.R., and Mr. I. A. E. Atkinson of Botany Div., D.S.I.R., for helpful criticism of this paper.

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SHORT NOTE

FIRST RECORD OF A TEREK SANDPIPER FROM THE SOUTH ISLAND

It is with a pleasant anticipation of excitement one always approaches the seal colony at Kaikoura. The scene is beautiful: at low tide the great rocky outcrop on which the seals peer at intruders; the rocky shelf covered with pools where herons probe and little flocks of Turnstones fossick; the blue lagoon fringed with sunlit yellow cotula, contrasting with the pink-legged nesting Stilts; the narrow ridge of salt-washed and startlingly white pebbles; and finally across the breaking surf, the snow-clad Kaikoura Mountains. Such was the scene on 5/10/66, and as usual the area did not fail me. While I was examining a flock of 40 or 50 Turnstones (*A. interpres*) in all plumages roosting on the white pebbles, a slightly smaller and slimmer bird caught my eye by the incessant bobbing of its tail, indeed the hind part of its body. Its overall greyness, white below, immediately marked it as different. As its strongly upcurved black bill came into view its rarity was confirmed and eventually its full beauty was revealed as the golden-yellow legs, with no trace of green, became visible.

It is clear the bird was a Terek Sandpiper (*T. cinerea*), the record extending its known southern range considerably. A very full description was taken on the spot. This was later compared with Witherby *et al.* (Handbook of British Birds) and other books and found to agree in all respects with that of a bird in winter plumage.

— J. M. CUNNINGHAM

NOTES ON BREEDING BEHAVIOUR OF THE NORTH ISLAND SADDLEBACK

By A. BLACKBURN

INTRODUCTION

On 9/11/65 a party visited Hen Island with the object of making a further study of the food and feeding stations of the Saddleback (*Philesturnus carunculatus refusater*), and if possible to make observations on breeding behaviour of the species, concerning which little seems to have been recorded in the literature. The party consisted of D. V. Merton (DVM), of Wildlife Division, leader, Dr. M. F. Soper (MFS) and Mrs. Soper (JS), G. H. Moon (GHM), N. J. Ledgard (NJL), R. T. Lawrence (RTL), and the writer (AB). The date of the visit had been arranged so that we would be on the island, as we hoped, at the peak of the Saddleback's breeding season; but in the event it became obvious that the first nesting was well over, for many pairs were noted with single fledglings, never more, some of which were reaching the stage of independence. The behaviour of many pairs seemed to indicate that a second nesting was contemplated, and we eventually found some in the process of building, and finally some with eggs. Other species were at the peak of nesting, for we found several nests, containing either eggs or young, of the Pigeon (*Hemiphaga novaeseelandiae*), Kaka (*Nestor meridionalis septentrionalis*), Morepork (*Ninox novaeseelandiae*), and Fantail (*Rhipidura fuliginosa placabilis*), and nests of Bellbird (*Anthornis m. melanura*), Tui (*Prosthemadera novaeseelandiae*), and Blackbird (*Turdus merula*) were numerous. Independent young of the Bellbird and Tui were particularly abundant. A pair of Pied Tit (*Petroica macrocephala toitoi*) near the campsite had flying young, and were rebuilding.

NEST BUILDING

It was not until the third day on the island that any indication of nesting was observed. DVM then noted a female on the ground tearing large strips of bark from a kanuka root, with which it flew directly into the dead detritus at the base of a large mass of the epiphytic *Collospermum hastatum*. This was situated on the bough of a pohutukawa, at about 50 feet from the base of the tree; but being on a steep slope, the nest was only 20 feet above eye level from the top of the slope. The bird was observed to take nesting material to the site at intervals of about six minutes, and to remain hidden in the dead growth for about a minute. The material was gathered from various situations close to the site, and this was later identified, at least in part, as consisting of the inner bark of the lacebark and shreds of dry astelia leaves; and at least twice of spider web gathered from knot holes. Building was observed each morning of the 11th, 12th and 13th, but never after about 1300 hrs. The approach to the site was invariably made from one side of the astelia clump, and the exit from the other. The male took no part in these operations, but usually accompanied the female whilst she was on the ground, and frequently fed her when she left the nest site. He made threat displays to Bellbirds within 40 feet, and drove off a Tui which had approached within 12

feet. On the afternoon of the 15th, JS observed that the female was on the nest for 40 minutes, when she left it, to return 8 minutes later. From subsequent observations at another nest, it can be assumed that the bird was now brooding, having laid the first egg on the 14th, and the second the following morning. The nest site was quite inaccessible.

A used nest containing eggshell remains was found on 11/11/65 by AB. The site was 2 feet from the ground, in a dense mass of coppice shoots at the base of a puriri tree. The foundation of the nest consisted of small kanuka twigs, the nest itself being wholly composed of strips of inner bark of the lacebark.

Early in the morning of the 12th, MFS and JS noted a female Saddleback looking very bedraggled, with a large piece of eggshell and fragments of nesting material adhering to her breast feathers. They watched her preening, during which she ate two breast feathers; and the fragment of shell was recovered, and identified as Saddleback egg. Later that morning, JS discovered in the vicinity a fresh unoccupied nest. It was placed in a cleft in the rock just below the top of a seaward cliff face, and a large number of feathers from the tail coverts of a Saddleback were found a few feet below the nest. The cause of the accident was unknown; but petrels in variety were coming in at night to their burrows, and one of these may have landed on the sitting bird. More probably, it happened during the early morning take-off, although the rock cleft gave adequate overhead cover to a sitting bird. The nest was constructed with a base mainly of kanuka twigs up to 8 inches long, with some rotted pieces of cabbage tree fibre and renga lily leaves, a few pieces of pohutukawa root, some dead leaves of mahoe and pohutukawa, and a substantial puriri twig. The nest itself was made entirely of the soft inner bark of the kanuka, except for a few strips of inner bark of the lacebark. The inner diameter measured 95 mm and the depth 40 mm.

On 14/11/65 another female was noted carrying material to a nest site in a hole in a large puriri tree, at 16 feet above ground level (DVM). When first observed, the female had just joined the male at 40 feet in a tall mahoe. He fed her three times, and then she flew to the ground and gathered a beakful of twigs, aerial rootlets of pohutukawa, and a large mahoe leaf. She dropped this material, and both birds flew to the nest hole, which she entered, while the male flew back and forth for a minute or so. She then set about gathering more material. During a watch at the site next morning, the female was seen to take material, mostly pohutukawa rootlets and a few skeleton leaves, to the nest at intervals of about two minutes. All material was gathered from an area of a few square feet, and the approach route to the nest did not vary. Although the site was extremely difficult of access, an inspection was made on the afternoon of the 16th, when building appeared complete, the nest being lined with inner bark of kanuka.

BROODING BEHAVIOUR

Also on the 14th, NJL and RTL kept watch on a male bird, and at times a pair, for three hours, and finally traced the female to a nest hole in the trunk of a pohutukawa on the coastline, the hole being only some 10 feet above high tide mark. During their watch, they had seen the male feeding the female at intervals, and the nesting place was revealed by the male flying to the hole, but not entering it.

A few minutes later the female flew straight into the hole, where she remained for 20 minutes, then reappeared, preened briefly, and flew off. Investigation on the 15th revealed that she was sitting on two eggs, and that the nest had the usual lining of inner kanuka bark. It was sited about 18 inches from the entrance. The same day a hide was erected 8 feet from the nesting hole, and from 0600 hours on 16/11/65 a continuous daylight-to-dark watch was kept.

An interesting rhythm of behaviour on the part of the female now began to reveal itself. Each member of the party kept a two-hour watch in turn, and reliefs were only effected when it was known that the female was firmly settled on the nest. Hatching occurred at about mid-day on the third day of observation, i.e. 18/11/65, after which the pattern of brooding naturally underwent a complete change.

Prior to hatching, the time of the female's first departure varied between 0543 and 0546 hours, and the last for the day between 1811 and 1816 hours. The periods of brooding on the 16th varied between 27 and 59 minutes, the average of 14 such periods during the day being 42 minutes. Times off the nest varied between 8 and 17 minutes, except for the final brief departure of 3 minutes at 1811 hours, giving an average of 12 minutes. During the next day the average period of brooding was 49 minutes, and time spent off the nest averaged 14 minutes. Both days were fine and mild; the next day, although colder with gale force wind, the rhythm remained unchanged until noon, 8 periods of brooding averaging 45 minutes and absences 10 minutes.

The hen's departure was almost invariably silent until she was clear of the immediate vicinity of the nest. On one occasion only, at 0543 hours on the 17th, she gave a succession of four sharp notes, being obviously disturbed by a flash unit used by the observer. On a number of occasions the male called the female off the nest, and several times approached the nest hole with food, when she would emerge to be fed. Typical entries in the field notes are as follows:

- 0739 hrs. Male gave one low note and appeared in taupata below nest, feeding briefly.
0740 hrs. Male came to point immediately above nest hole, and female emerged. He fed her here 5 times, and both flew into nearby foliage, male giving one brief territory call (AB).
1027 hrs. Male arrived on limb to right of nest hole with food, one green caterpillar obvious. He went to entrance and waited two seconds before female appeared. She begged for food, but he immediately returned to bough, female following. Male then flew off with female following. No calling throughout, and no feeding near nest (DVM).

Normally on emerging, the female would pause at the exit. This could hardly be precautionary, as predators are unknown in the Saddleback's world. It may possibly be to accustom her eyes to the light.

The return to the nest after periods of feeding and preening was extremely rapid compared with the rather more leisurely exit; in fact, it can only be described as darting. Also it was usually vocal, a single sharp note repeated at intervals announcing her return, and given on occasions right up to the point of entrance to the nest. A silent return probably indicated that she was accompanied by the male to the vicinity of the nest, as was demonstrated by several observations.

By midday on the 18th the wind was moderating, and rain showers were frequent. The eggs hatched at this time, and the pattern of brooding changed. Until observation ceased at 0710 hours on the 19th due to departure from the island, there were 21 periods of brooding, which varied between 6 and 28 minutes, and averaged $14\frac{1}{2}$ minutes. Times off the nest varied between 2 and 14 minutes, and averaged

7 minutes. There was no calling by the female on leaving or returning except on two occasions, when she gave a "chee-chee-chee" call, repeated seven times in one instance, the last being given as she entered the hole. Of course she brought food for the nestlings on her return, although rarely was this visible in her bill; but when identifiable, it was seen to consist of minute grubs and small beetles. Not so with the male, as the following extracts from the field notes will show:

- 1322 hrs. Male appeared on bough, paused, then went to nest opening. Had bill full of insects. After 10 seconds with head just inside hole, he flew off. Female emerged a second later (RTL).
- 1533 hrs. Without warning male appeared at nest hole with bill full of small insects. Female emerged and both stood at entrance. Female re-entered and male returned to branch, swallowed his insects, gave a low double note call twice, and flew off (JS).
- 0530 hrs. Male appeared on low taupata bush and gave a soft double note. He then hopped to branch, and facing nest hole gave three or four soft low calls. Female appeared, in crouched begging position, and male passed the food to her. This seemed a glutinous mass. She did not completely close her bill on this, and disappeared into hole. She re-appeared a few seconds later, and flew a short way up the face with male (AB).

No observation was made on the disposal of eggshell, which may have been placed deeper in the cavity.

DISCUSSION

Reischek (1) states that on Little Barrier Island both male and female shared the incubation of eggs and rearing of the young, but it is quite apparent from our observations that the male takes no part whatever in incubation, and that at least in the early stages the female takes full control of the feeding of the nestlings. It was unfortunate that our limited time prevented us from ascertaining at what stage, if any, the male takes a full share in the feeding of the young.

There is an almost complete lack of knowledge of the breeding habits and behaviour of the North Island race of the Saddleback. Breeding season, rhythm of laying, hatching and fledging periods, care of nestlings, and breeding success all remain to be recorded; although the breeding of birds in captivity at Mt. Bruce Native Bird Reserve should now have given a fair indication of hatching and fledging periods in the wild. At least our preliminary studies have established certain facts under the following headings:

1. *Selection of site.* A wide choice of nesting site is made, but the preferred one is a hollow limb or tree trunk.

2. *Nest building.* All work is done by the female, the functions of the male at this stage being to prevent intrusion by other species, to supply her with some food, and of course to provide the stimulating influence.

3. *Materials used.* These are selected from those near at hand. Kanuka is everywhere abundant, and so in most cases is used in the foundation, along with pohutukawa rootlets. Oliver (2) states that all four nests recorded from Hen Island were made of kanuka twigs and lined with grass or feathers, or both. We found that the bowl of the nest was in some cases built, not merely lined, with strips of easily obtained soft inner bark of kanuka or lacebark.

4. *Brooding.* This is restricted to the female, and there is no direct feeding of the nestlings by the male, at least in the early stages. During incubation, he frequently feeds the female both at the nest site and elsewhere in the pair's territory.

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SOME FURTHER OBSERVATIONS ON THE NESTING OF THE NORTH ISLAND FANTAIL

By A. BLACKBURN

SUMMARY

A record of the nesting sequence of two pairs of N.I. Fantails (*Rhipidura fuliginosa placabilis*) is given, seven nests being built by one pair, and six by the other. The effects of weather conditions on nesting, and of clutch size on the fledging period, are further discussed. The inhibiting effect of cold weather on nest-building and laying is demonstrated.

INTRODUCTION

It was not intended to make a detailed study during 1965/66 owing to projected absences during November and December; but as the season advanced, the sequence of nesting and the behaviour pattern became so interesting that more detailed field notes were kept. These records are intended to be complementary to my paper read at the Annual General Meeting of the Society in 1965 (*Notornis* 12, 127-137); and in some respects they seem to confirm my previous findings, in particular that heavy rainfall followed by mild weather induces very early nesting; that clutch size has a marked effect on the fledging period; and that there is normally a clear-cut division of labour between the sexes.

The nesting territories were described in some detail in my previous paper, and they remained substantially the same. Weather conditions in 1965 were most unusual, periods of warm weather alternating with cold and wet, and it was not until early December that settled summer conditions were experienced. The result was the abandonment of several completed nests by both pairs, behaviour which has not previously come within my experience. The sexes in each case were readily distinguishable, as the male on No. 1 territory, marked by song and behaviour prior to nesting, had a number of small dark flecks on the upper breast, whereas the female's breast was clear buff. In No. 2 territory, the central dark feathers of the female's tail carried uneven markings.

Although the 3-4-3 or 3-3-4-3 pattern for successive clutches clearly emerged from my earlier observations, there is a marked variation recorded in 1965, and the probable reason for this is discussed.

Effect of Weather Conditions on Nesting. Further evidence was obtained in August, 1965. There was a succession of wet days from 1/8/65, culminating in a fall of 5.45 inches on 14/8/65. The next day a fall of 1.37 inches was registered, after which the rain eased off, the 18th being fine and mild. Temperatures had been low early in the month, the maximum varying between 46° and 54° until the 7th. On 8/8/65, a rainless day, the maximum rose to 61°, and remained high (60° or more) until 22/8/65. On 18/8/65 I returned home after a fortnight's absence, to find that the pair on No. 1 territory had a nest almost completed. On No. 2 territory a pair was observed to be prospecting nesting sites, and on 20/8/65, a fine mild day with one

or two brief showers, they began to build. Oliver (1955) gives the nesting period as from August to January, but it now appears certain that failing the early rains and mild temperatures, the beginning of nesting is delayed for at least a month, until the second half of September. It would appear that even one cold day may inhibit the laying of a clutch for several days, and sometimes cause the abandonment of a completed nest; but once the first egg is laid, weather conditions have no effect.

Sequence of Nesting No. 1 Territory. First Nest. The birds were very active in lining a nest on 19/8/65, when 32 points of rain fell, and continued their activities on 20th and 21st, by which date the nest was completed. Building had apparently begun immediately following the heavy rain on 14/8/65. I have found in general that the building of the first nest of the season is a leisurely business, taking not less than seven days, compared with the urgent haste with which some subsequent nests are built. The material consisted of cobweb, and hair from one particular tree-fern (*Dicksonia squarrosa*). This nest was placed at 19 ft. in a karaka tree, and was unusual in that the conventional slender horizontal fork was not used. All nests built by this pair were supported in substantial cup-shaped forks, the situations precluding the making of a tail. On 23/8/65 the weather turned cold, the maximum temperature dropping to 53°, but subsequently rising by a few degrees daily. Laying had not taken place as expected, and no activity was observed at the nest after 22/8/65.

Second Nest. On 29/8/65 I found that the first nest had been abandoned, and the birds were building some 10 ft. away, at 23 ft. in a large totara tree. The base of the nest was completed, so they had been working at the new site for at least three days. On 30th and 31st the birds completed the walls, and lined the nest the following day. No activity was noted at the site from 2/9/65 onwards.

Third Nest. On 6/9/65 the pair had almost completed another nest in a young karaka tree, at 13 ft. A first egg was laid on 9/9/65, and a clutch of four completed in the early morning of 12/9/65. This was quite a departure from the usual clutch pattern, as all first clutches in my experience have consisted of three eggs only. It would seem that the long suppression of laying since building the first nest resulted in a larger clutch. All eggs hatched during 26/9/65, and three young fledged on the afternoon of 12/10/65, the remaining nestling having died at about four days, its flattened corpse being found in the nest after fledging. The fledging period of 16 days is interesting, as in no case in my observations of 1959 and 1964 did the period exceed 15 days exactly.

Fourth Nest. On 15/10/65 both birds were observed at a new site, 9 ft. high in a karaka tree, on the westernmost boundary of the territory. This was the only nest built outside the restricted part of the territory favoured by Fantails over several seasons of observation. The female only was working on the nest, the male feeding the recently fledged young. Construction was well advanced, with the walls almost finished. The next day the weather turned very wet and very cold, and no progress was made. On 17/10/65 there was no sign of adults or young anywhere on the territory, and although the 18th was fine and mild, they did not reappear. Towards the end of the month, one

independent young bird was seen, and on 30/10/65 at 9 a.m. the family of both adults and now two independent young reappeared. The male was noted to be mildly attempting to drive the young birds away. Much allopreening was noted in the two young.

Fifth Nest. On 2/11/65 both birds were busily engaged in building at 15 feet in a totara, and despite heavy rain showers and very low temperatures, they continued working, and had finished the nest by 5 p.m. on 4/11/65. The cold weather of 2nd and 3rd had suppressed laying, so that the first egg was not laid until the morning of the 7th, a clutch of four being completed on the 10th. Both sexes brooded, for the division of labour between them only operates when there are dependent fledged young, until hatching occurred early in the morning of 24/11/65. As the time for fledging approached, the situation was watched with considerable interest, as this was to be the first record of four young fledging over three seasons of observation. They left the nest at 5 p.m. on 6/12/65, giving a nestling period of 12 days 11 hours. Broods of three nestling were found to fledge in from 14 to 16 days, and single nestlings in as short a period as 11 days 17 hours (*Notornis* 12, 135). Now the maximum brood of four is also found to have a shorter fledging period, a fact confirmed by later observations, which discounts my previous suggestion that early fledging of single nestlings might be due to their more rapid development in the nest. Sheer lack of room is the cause of the early fledging of a brood of four. For three days prior to fledging, that is, from 9 to 10 days old, there is considerable movement in the nest, some young being forced to squat on the backs of others, and later standing on the rim of the nest. At 5 a.m. on the morning after fledging, the young were in the usual tight group, 30 feet up and 15 yards from the nest, with the male feeding them, while the female was engaged in building a new nest.

Sixth Nest. The female began building early in the morning of 6/12/65, some 12 hours before fledging of the young from the last nest. The site was most unusual, being at 15 feet in a whau, where an upright branch an inch thick divided into three branches about three-fourths of an inch thick. The large leaves of the whau gave excellent cover a few inches overhead. On 8/12/65 the female was gathering lining material from the usual tree-fern, and the nest was completed by 2 p.m. on the 9th. For the remainder of the day, and all the next, she was unemployed, but took no part in feeding the four fledged young. At this stage, these spent much of their time in the usual tightly knit group, but were on occasions seen to fly at high speed through and around a tree in small circles, with much jockeying for position when they gathered together again. On 11/12/65 the first egg was laid before 7 a.m., and on the three following mornings eggs were laid by 6.45, 6.50 and 7 a.m. respectively, again making a clutch of four. It thus appears that the species has a most regular cycle of laying, a fact confirmed by subsequent observations. After laying the third egg, the female returned to the nest at 9.30 a.m. and sat for most of the day because of persistent rain.

On 20/12/65 very heavy rain occurred, over an inch falling in 45 minutes, with a total of 1.58 inches in three hours. The four fledged young from the last nest, now two weeks old, were noted with the male on territory prior to the rain; but next day only one was

seen, and there was no further sign of any of them until 24/12/65, when the male returned alone; although the day before, two immature birds, probably from this brood, were seen moving very rapidly through No. 2 territory, then unoccupied, and flying away to the south. The first egg hatched at 6 p.m. on the 28th, and at 7.30 a.m. next day the male brought food and changed over on the nest. A few previous change-overs had been observed since the discharge of the male's responsibilities to the now independent young. On 6/1/66 the young at 9 days old were very active in the nest, and both birds were feeding them continuously until 7.40 p.m., at which time, with a heavily overcast sky, it was almost dark beneath the bush canopy. Both adults then fed actively outside the canopy for 10 minutes, and at 7.55 p.m. one of them settled on the nest, for the night was cold.

On 8/1/66 during several periods of observation, the female was seldom seen to take food to the nestlings, but sat and preened a few yards from the nest, or gathered food for herself. This behaviour quite clearly indicated to me that further breeding was in prospect; and the following day she was not seen to take any food to the nest, the male during this time being extremely active. On 10/1/66 from 4.35 a.m. both birds displayed to each other, with little flight and much quiet song, for 15 minutes, until 4.50 a.m. the male took the first food to the nest. At 7 a.m. the beginning of a new nest, on which the female had apparently worked for about two hours, was noted. Some of the young were on the rim of the nest during the morning, and at noon they flew, giving a fledging period of 12 days 18 hours.

Seventh Nest. The 10th was a cold day, the noon temperature being 61° compared with 81° the previous day, and this sudden change had a marked effect on the behaviour of the female, and on the nesting sequence. The nest, of which the beginning was noted at 7 a.m., was sited at 6½ feet in a kawakawa, hard-by the last nest, and was in the only conventional site chosen by this female, i.e. on a slender horizontal fork. There was no activity at the site after 7 a.m., and an hour or so later, the female was seen to feed the yet unfledged young occasionally, taking the odd minute insect to them, compared with the large beakfuls taken by the male. On 11/1/66 there was still no building, and both birds were feeding the now fledged young, although the female did so only intermittently, perhaps once to every twenty feeds by the male. At 5.30 a.m. mating was observed, so that a further brood was assured.

On 12/1/66 the male only fed the fledged young. Early in the morning, and later, the female was seen to gather tree-fern hair, which is used only as lining material. A high westerly wind made observation difficult, and it was not until 1.30 p.m. that I discovered what she was about. She was refurbishing the recently vacated nest. I have recorded a Fantail building its nests one above the other in a series of four (*Notornis* 10, 242), but the second use of a nest is quite exceptional for the species. The last food was taken to the fledged young at 7.42 p.m.

On 13/1/66 the female was on and off the nest continually from 5 a.m. for most of the day, settling down for two minutes at 5.35 a.m. as if to lay. It was amusing to observe how every visit by the male with food for the nearby young triggered off a visit to the nest by the female, where she would give a few brief shuffles. By human

standards, she was making a pretence of being busy, while the male was really so. At this stage the fledged young were still mainly in a closely packed group, with occasional rapid circular flights, and much low twittering, especially on the approach of the male with food. The following morning the female was on the nest at an early hour, leaving it at 5.55 a.m. immediately after laying the first egg. The young were now tending to follow the male for food, but were still grouped most of the time. On 15/1/66 the female again left the nest at 5.55 a.m., having laid a second egg. Next morning she did not go to the nest until 6 a.m., and sat until 6.15 a.m. without laying. She returned at 6.20 and departed at 6.27, leaving a third egg. A very regular 24 hour rhythm of laying was observed in the previous clutch, the weather during laying being warm and settled throughout. A marked drop in temperature certainly upsets this rhythm, for the noon reading on 14/1/66 was 77.6° and on 15/1/66 it was 64.5°. The female was on and off the nest all day on the 16th, but did not brood that night, so the expectation of a fourth egg was fulfilled when she left the nest at 6.30 next morning. At 5.30 a.m. on 17/1/66 the fledged young were extremely active and at times scattered throughout the territory calling vigorously. The call is reminiscent of the Kingfisher's (*Halcyon sancta vagans*) "kek kek kek" in a minor way, and is audible for over 50 yards. At other times a ventriloquial continuous twittering note is given. It was noted that the young froze to immobility on the close approach of a Tui (*Prosthemadera novaeseelandiae*).

From this point on, a marked variation from normal in the behaviour pattern of the adult birds was noted. At 6.36 a.m. on the 17th, just after the laying of the fourth egg, the male came to the nest and sat for a few seconds, and at 7 a.m. the female settled down to brood. With the dispersal of the young through the territory their calling became much louder, and even more Kingfisher-like. During the whole afternoon of the 17th the male and three young were away from the territory, returning at 6.30 p.m. with an impressive burst of activity and noise. The fourth young bird remained in the vicinity of the nest, calling persistently, and this behaviour continued until my observations ceased on 24/1/66. This resulted in the female quite frequently leaving the nest to feed it. Some of her absences were prolonged; but close brooding was probably undesirable, as the temperatures were daily well over 80°, remaining so from about 9 a.m. until the evening. Whilst the three young were still occasionally forming a loose group, most of the time they followed the male persistently and clamorously for food, behaviour quite a variation from normal; for at this age the young usually wait for the male to bring them food, which he has been permitted to gather in peace.

On 19/1/66 the male was seen to change over at the nest at 6 a.m., when the female came off to preen and feed, and changing over was noted on a number of occasions subsequently, although brooding by the male was always brief. It appeared that this behaviour by the male may have been actuated by a necessity to rest from the continuous importuning of the three young birds. For example, at 2 p.m. on 20/1/66 a noisy party of young following the male passed close by the nest, which the female immediately vacated. A minute later, the male left the young and brooded for three minutes. From this time there was no further sign of the three young on the territory.

The male was obviously away with them, but he reappeared briefly at 6.30 next morning, when he again departed apparently to rejoin the still dependent young. At 8.45 a.m. he returned and brooded briefly while the female was off feeding.

The selective advantage of the male leading the young far away from the territory, or perhaps the young leading the male, is apparent from some of the above observations. Food in the territory seemed abundant, but the continued disturbance of the female whilst brooding could be an important factor militating against successful breeding.

Early in the morning of 22/1/66 the single young remaining on the territory was noted feeding independently. Later it approached the nest giving the distinctive fledgling call, when the female flew off and mildly attempted to drive it away, then spent a brief period feeding, and giving food to the young bird. The male appeared while she was off the nest, called loudly, and she returned to the nest. He brooded briefly, and then twice attempted to mate. During the next two days the male frequently brooded, but there were long absences from the territory, when he possibly rejoined the three young, if they still survived. Observations then ceased until 18/2/66, but my wife recorded the hatching of three eggs late on 31/1/66, with a complete clutch of four the following morning. On my return on 18/2/66, the male was feeding two young, and these stayed on the territory for about a fortnight longer. The female had departed, and perhaps joined a male and immature bird remaining on No. 2 territory; but moulting had advanced so far that she was not recognisable.

Nesting Sequence No. 2 Territory. First Nest. This pair began to build on 20/8/65 at 20 feet in a karaka tree, plastering a few wisps of material on to a forked twig. There was no further activity at the site until the morning of 28/8/65, when the advent of mild temperature and some sunshine led to a day of fairly intense work. However, the site was abandoned, for the following morning the birds were found to be starting a new nest some 50 feet away.

Second Nest. This nest, begun on 29/8/65, was at 9 feet on a bare mahoe twig well under the shelter of a large nikau palm. It was noted that the second nests on both territories had a N.W. aspect, whereas the aspect of both first nests was S.E., whence all the August rain had come; but this may have been of no significance. The nest was well advanced on 3/9/65, and completed by 8 a.m. on the 5th. But the same conditions operated as those that caused the abandonment of the nest completed on No. 1 territory on 2/9/65, and this nest was also abandoned.

Third Nest. On the morning of the 7th the birds were observed to be building in a small karamu at 9 feet, and as the base of the nest was completed, they had obviously begun building immediately after abandoning the previous nest. By the morning of the 9th, the walls had been completed but were unlined, after which there was no further activity at the site. This was situated 48 yards from the second nest, and was in a part of the territory seldom favoured by nesting Fantails.

Fourth Nest. On 12/9/65 the pair was seen working on a partly finished nest at 24 feet in a totara tree, the site being quite inaccessible and observation impossible. It was on the extreme southern boundary of the territory, and 83 yards from the second nest. The female was seen leaving the nest at 7 a.m. on 18/9/65, obviously after laying. It was unfortunate that the size of the clutch could not be checked, to see whether long suppression of laying had also operated with this pair to produce a first clutch of four. Two young fledged from this nest.

Fifth Nest. Random observations only were made in No. 2 territory from this time on. On 2/11/65 a nest with four eggs was found at 6½ feet in a small matipo, the female sitting very closely, and the male feeding one surviving well-fledged young from the last nest. The female had in fact to be touched with the hand to make her vacate the nest on this and subsequent occasions. Three nestlings with primaries developing were in the nest on 22/11/65; but on the 27th the bowl of the nest was found to be almost full of pin feathers, an indication that the young had been taken by Mynas (*Acridotheres tristis*).

Sixth Nest. By 30/11/65 another nest had been built on a low branch of a karaka, at 13 feet. The first egg was laid next morning, and after the third egg on 3/12/65 the female brooded all day. However, she did not continue brooding overnight, and a clutch of four was completed next morning, brooding beginning immediately. I expected the eggs to hatch on the 19th and on visiting the nest at 5.30 a.m. found it empty, and a tail feather of the female adhering to the rim. Mynas were again the probable predators, as poison laid for rats had not been touched; so direct action has since been taken against the Mynas, reducing the number in the area from eight to two very wary birds. The female Fantail was possibly killed owing to her sitting so closely, for she was not seen again. For several days, in fact until 30/12/65, the male called a great deal, using a piercing disyllabic note, which, perhaps in imagination, had an urgent, pathetic tone about it. From 19/11/65 onwards he was always to be seen in close association with the single surviving young from the partnership.

A Note on Display. Few observations were made on display which might be described as epigamic in character. No particular display seemed to be given by either bird on those occasions when coition was observed. Little time is available to the male for nuptial display when he is feeding nestlings or fledged young, and it is only in the early morning, soon after daybreak, and again in the late evening, after the last food has been taken to the young, that much display is noted. This consists mainly of brief, rapid flights, interspersed with periods when they perch near each other, if such ceaseless movement can be described as perching. One is usually two or three feet above the other, and I have always observed the lower bird to be the male. In this situation, he sings with the well-known squeaky, disyllabic note, with at times a quivering of lowered wings. An attractive form of display is sometimes given, by either bird, when one of them, usually the male, returns from a foraging trip of longer duration than usual. The wings are fully expanded horizontally and rounded, the head lowered and the wings rapidly vibrated.

DISCUSSION

The abandonment of a series of nests at the beginning of the breeding season, and of single nests during it, has not previously been recorded for the species, and can be brought about by periods of mild weather alternating with wet and cold. Whilst bad weather causes the abandonment of both completed and unfinished nests, it does not necessarily inhibit building activity, for pairs were often found working on a new nest while the conditions causing abandonment still operated. A brood of three nestlings is recorded as taking 16 days to fledge, compared with a maximum of 15 in earlier observations; whereas broods of four took 12 days 11 hours and 12 days 18 hours respectively, due probably to lack of room in the nest; but early fledging does not prejudice the chances of survival to independence, all of a clutch of four surviving to this stage. Successful survival of single nestlings, one of which fledged in only 11 days 17 hours was recorded previously (*Notornis* 12, 135).

An exact 24 hourly cycle of laying is indicated by these observations; but if the rhythm is upset by a fall in temperature during the laying of a clutch, the cycle continues to operate, but at the later hour each day. The second use of the same nest is exceptional due probably to the almost invariable breeding of ectoparasites in the nest. All nests examined have been infested to some degree; and in the instance of second use recorded above, it is doubtful if the interval of less than four days between the fledging of one clutch and the laying of the first egg of the next was sufficiently long for the parasites to die.

One pair under observation laid four clutches of four eggs, from which probably 15 young fledged. This compares with a pair on the same territory in 1959 (*Notornis* 12, 129) which produced 16 eggs in five clutches, from which 15 young fledged, and draws attention to the extraordinary fecundity of the species under favourable conditions.



SHORT NOTE

WELCOME SWALLOWS TRYING TO NEST IN A BOAT
IN KAIPARA HARBOUR

On 29/8/66 a pair of Welcome Swallows was sent to the Auckland Museum for identification. In an accompanying letter details were given of the circumstances under which the birds were obtained.

Mr. L. W. Dudding, who sent the birds in, is the owner of a launch which he keeps moored at Port Albert, on the Oruawhara River, an arm of the Kaipara Harbour. During one of his trips out to the launch he found bird droppings in the cabin, and on a rack the beginnings of a nest. The droppings and nest were cleaned away and the porthole through which the birds had entered was closed. However, on returning to the launch a few days later more droppings were found, and also the pair of dead Welcome Swallows. They had apparently been in the cabin unknown to Mr. Dudding and had died of starvation after his departure.

Welcome Swallows have now been reported widely 'on the Kaipara' and are known to have been nesting successfully at Tapora since 1964, about 15 miles southwest of Pt. Albert.

— LOIS J. WAGENER

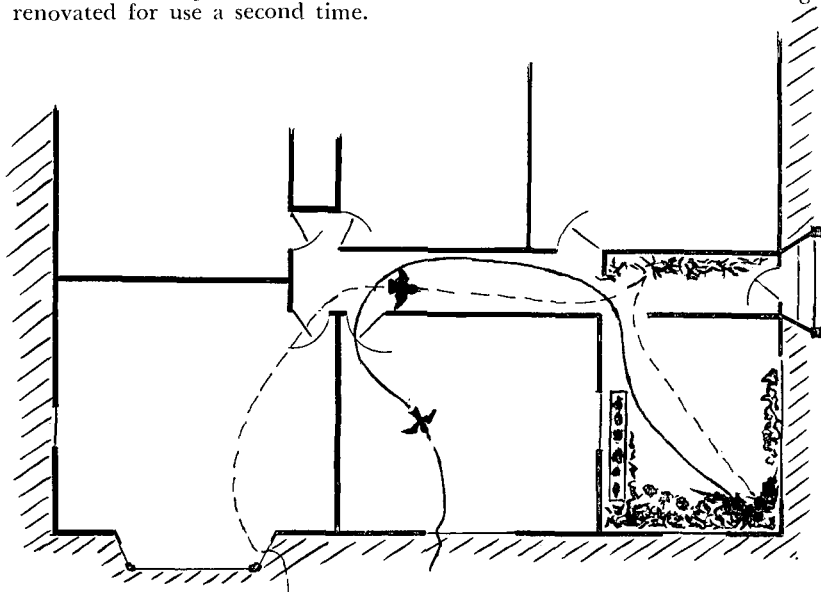
NESTING REPORT ON A PAIR OF SOUTH ISLAND PIED FANTAILS

By NIGEL F. COATES

On 10/8/65 a pair of Pied Fantails (*R.f. fuliginosa*) started to build a nest on an Angel Wing Begonia that is growing in a totally enclosed sunporch at my home in Rangiora. I have not heard of this occurring before. The nearest native bush is eight to ten miles away.

The birds worked continuously all the daylight hours, spending each night in the shelter of a lean-to shed nearby. Work on the nest was completed on September 1st and the first egg was discovered on September 2nd. By the 6th three eggs had been laid. On September 19th three young were discovered and the activity of the adult birds was increased to about one visit by each adult every two minutes. After the young had hatched, one of the adult birds always stayed inside, on or by the nest at night.

On September 22nd a southwest storm hit suddenly, bringing heavy rain and sleet. The temperature fell sharply. It was noticed that the adults were absent for very long periods, sometimes up to a half-hour. That night both adults remained outside. Sept. 23rd dawned fine but both adults appeared very upset. On investigation, all three young were found dead. They were removed. After I had removed the dead young, the adults began tearing at the nest, it was thought, to build a new nest; but on September 25th it became clear that the nest was being renovated for use a second time.



KEY

----- Flight In

———— Flight Out



The nest was re-lined with cob-web, cotton-wool and palm fibre; the sides were built-up with palm fibre over-laced with cob-web. On October 1st the first egg was laid, the second on October 2nd. No accurate dates are available for third and fourth eggs. But on October 17th four young were hatched. Activity was once again at fever pitch. All four young grew very rapidly and by October 24th were almost fully fledged. At this stage the four young were banded along with the male adult. Attempts to catch the female all failed, so a complete family banding was missed. The banding was done by Mr. Ken Rowe of Rangiora and his son. By November 1st the young were flying about the room very strongly and it was no surprise when they left the house for the outdoors. All four young survived and were observed in the area on many occasions. Last sighting in a group was on November 20th.

It was interesting to note that about fourteen days after the departure of the second hatching another nest was discovered in some willow trees about 100 yards from the second nest site. It contained two young, which were being fed by a banded adult, presumably one of the parent birds of the first and second hatchings, because there had been no other reported bandings of this species in this vicinity.

After four months since the second hatching the banded adult still visits the site of the first nest.

The fourth nest was built in the area in a pine tree belt 12ft. above the ground. After a week's work on this nest all activity stopped and it became clear that the nest had been abandoned.



NESTING OF WHITEHEADS ON LITTLE BARRIER ISLAND

By R. H. BLANSHARD

From 28/9/62 to 11/10/62 my daughter and I observed a pair of Whiteheads (*Mohoua albigilla*) constructing a nest in the fork of a young mahoe near the Te Waikohare Stream beside our house. It was in its earliest stages on the first date and was finished on the last. It was noted by constant observation that, as the nest grew, the birds behaved most affectionately, bringing presents to each other. They took little notice of our near presence. The nest was built of fibre from fan-palm trees, grass, cobwebs, feathers and small moss.

Oct. 13, 8 a.m.: First egg. Pale pink with small brown spots.

Oct. 14, 8.30 a.m.: Second egg.

Oct. 15, 8 a.m.: Third egg. A third bird appeared to take interest.

Oct. 18: Incubation began. At 1750 hrs. bird left nest for 8½ minutes to feed with mate.

Oct. 19 to 30: Incubation continued, sitting bird leaving nest once or twice for five to eight minutes at a time.

Nov. 1, 0834 hrs.: Weather overcast, windy and showery; the first inclement weather experienced. Female left nest, revealing that two eggs had hatched. Chicks very small and pink. Interior of nest appeared to have more down lining in it. 0930 hrs., female back on nest.

- Nov. 2: Still only two chicks. Weather fine and windy.
- Nov. 3, 0830 hrs.: Third egg hatched. First two chicks now twice hatching size; still naked.
- Nov. 4: Weather showery; passing thunderstorms. Apparently three adult birds feeding young. Adults not upset by observers standing on step-ladder at distance of six feet. Chicks now about twice size of eggs and sparsely covered with blue-grey down. The adults gathered insects from bark of pohutukawa, mahoe, Coprosma and fruit trees. Each chick seemed to be fed by one adult in fairly strict rotation at intervals of about 15-20 minutes. Sometimes a second bird waited close to the nest while the other bird was feeding chicks and removing faecal sacs. This continued for one and a half hours at a time.
- Nov. 5, 1330 hrs.: Fine, sunny. After feeding period was finished, two adults moved higher in trees and sang, while the third bird returned to nest to brood the young. No significant behaviour changes from to-day to Nov. 8.
- Nov. 8, 0830 hrs.: Only two chicks now in nest. Covered with blue-grey down, active, eager for food; bills well developed; eyes open and wing feathers showing.
- Nov. 11 to 13: Chicks well feathered and outgrowing nest. Adults absent most of the time gathering food. Observed four feedings of each chick in 45 min. period. 1400 to 1445 hrs. before female resumed nest.
- Nov. 13: No change in behaviour pattern.
- Nov. 14, 0730 hrs.: Fine, sunny, no wind. Nest askew, damaged and empty. One dead and partly eaten chick on ground below. No sign of other chick and parents distressed and hanging around the nest. 0930, Saw parents gathering insects. 0940 hrs., feeding surviving chick on ground on edge of opposite stream-bank about 15 yards from nest site. Chick unharmed and eager for food. 1010 hrs., chick moved to better cover under small fern amid debris. Still being fed by three adults.
- Nov. 15, 0900 hrs.: Chick back on nest side of stream in coprosma bush being fed by adults. Remained in same bush in sheltered position all day and was fed. Nov. 16: Not seen.
- Nov. 17, 1004 hrs.: Observed chick with three adults back in old nest site. Fed twice, then all flew to plum tree, the chick calling continually to the adults. There were no further sightings that could be identified as the same group of birds.
- It is thought that the nest was destroyed by Long-tailed Cuckoos which were numerous nearby at the time.

The method of settling on nest was closely observed:

- (1) The bird landed on the edge of the nest, feet somewhat apart.
- (2) Both feet moved further forward on each side of the nest, the bird falling forward and digging bill into far side of nest.
- (3) Feet moved further forward to about halfway along nest.
- (4) Bird now sinks gently down and backward until tail rests on rim of nest and the bill is lifted clear of nest edge.

Several writers have noted the presence of a third bird about a nest. In this case the association of the third bird was constant from at least the laying of the third egg to the feeding of the flying young.

SEASONAL AND ALTITUDINAL DISTRIBUTION OF KINGFISHERS IN THE NELSON DISTRICT

By R. H. TAYLOR, *Animal Ecology Division, D.S.I.R., Lower Hutt*

INTRODUCTION

It is generally held that the New Zealand Sacred Kingfisher (*Halcyon sanctus vagans*) displays marked seasonal movements, but apart from some early observations by Guthrie-Smith (1910) they have received scant attention. The scarcity of published data prompted the present study of the numbers and distribution of Kingfishers seen while regularly travelling along a route ranging from sea level to mountainous country in the Nelson district.

The Kingfisher's bright colours, characteristic stance and flight, and especially its habit of sitting in the open on stumps, poles and wires, make it easy to identify from a distance even from a moving vehicle.

I wish to thank Dr. J. E. C. Flux and Dr. P. C. Bull for providing records of Kingfishers seen at St. Arnaud and in the Travers Valley.

METHODS

The approximately 80 mile route (Fig. 1) was subdivided for counting into six sections of roughly equal length but varying in altitude and distance from the coast. For sixty-five miles south from Nelson (sections 1-5) the route followed the Nelson-St. Arnaud road and the birds were counted from a vehicle, usually travelling between 30 and 45 miles per hour. Lake Rotoiti was crossed by boat and the

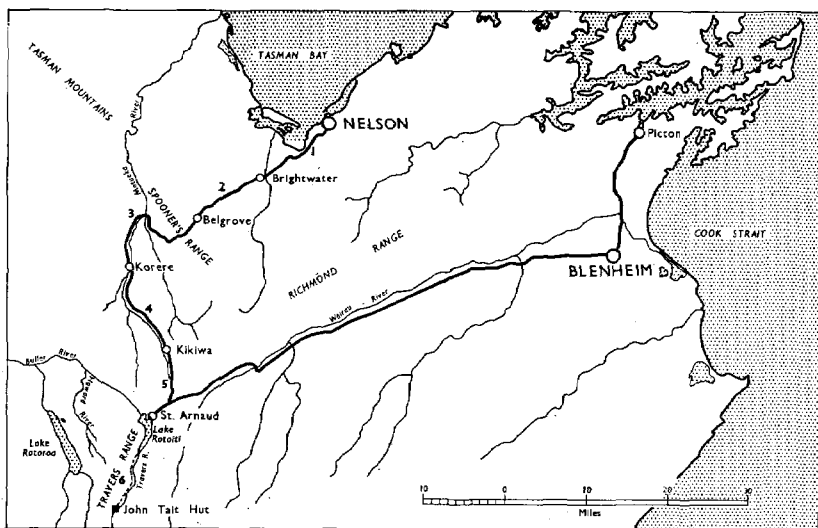


Fig. 1 — Nelson-Marlborough; showing the six sections of the route between Nelson and the John Tait Hut, and the road from St. Arnaud to Picton.

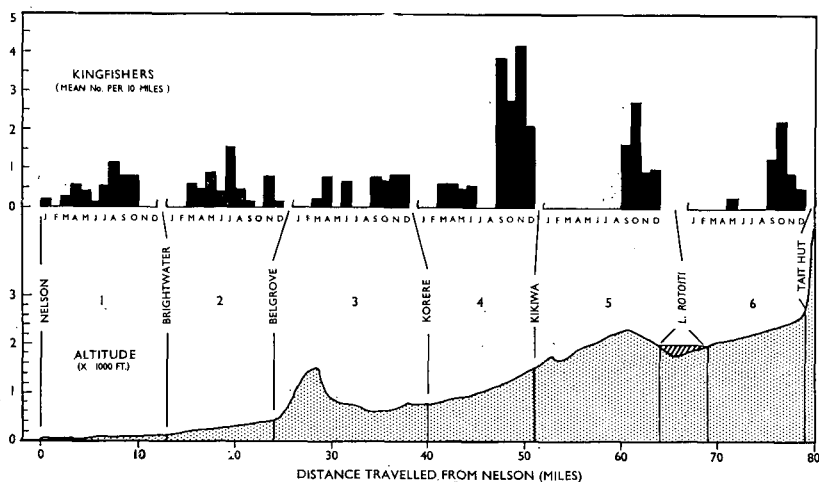


Fig. 2 — Seasonal abundance of Kingfishers, altitudinal range, and distance travelled from Nelson, for each section of the route.

final counts above the lake (Section 6) were made while walking up the Travers Valley to the John Tait Hut (2600 ft. a.s.l.). The track then climbed steeply into Cupola Basin, but no Kingfishers were ever seen above the 2600 ft. level.

The observations were made between May 1963 and May 1966 while the writer was living and working in the St. Arnaud district. Since counts each year indicated similar seasonal trends, all years have been considered together and the counts grouped by calendar month and section of the route only. Not all the sections were necessarily counted on the same day, and a few were counted more frequently than others in any one month. To allow for this, and for the different lengths of the sections, counts are expressed as the mean number of Kingfishers per 10 miles travelled each month.

RESULTS AND DISCUSSION

Table 1 gives the number of miles travelled each month, and the average number of Kingfishers counted per 10 miles travelled, for each of the six sections of the route. Fig. 2 also shows the altitude and distance from the coast of each section.

Within each section the numbers of Kingfishers showed marked fluctuations, individual counts ranging from 0 to 9 birds seen per 10 miles travelled. There is a well defined seasonal change in the distribution of Kingfishers, particularly marked at higher altitudes where large numbers occurred only in spring and early summer. No birds were counted above 500 ft. altitude during the midwinter months, when peak densities were recorded near the coast.

These seasonal trends are also apparent from general observations made in the Nelson-Marlborough area during the same three year

		Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov.	Dec	Totals
Section 1	Miles travelled	52	52	78	52	26	91	39	26	91	13	91	91	702
(0-100' a.s.l.)	Kingfishers per 10 miles	0.19	0	0.26	0.58	0.38	0.11	0.51	1.16	0.77	0.77	0	0	0.30
Section 2	Miles travelled	44	44	66	44	22	77	33	22	99	22	77	77	627
(100'-400' a.s.l.)	Kingfishers per 10 miles	0	0	0.61	0.45	0.91	0.39	1.52	0.45	0.10	0	0.78	0.15	0.40
Section 3	Miles travelled	64	64	96	64	32	112	48	32	144	32	112	112	912
(400'-1500' a.s.l.)	Kingfishers per 10 miles	0	0	0.21	0.78	0	0.63	0	0	0.76	0.63	0.80	0.80	0.49
Section 4	Miles travelled	33	44	66	33	22	77	33	22	99	22	77	77	605
(800'-1500' a.s.l.)	Kingfishers per 10 miles	0	0	0.61	0.61	0.49	0.52	0	0	3.84	2.73	4.16	2.08	1.70
Section 5	Miles travelled	39	52	78	39	26	91	39	26	117	26	91	91	715
(1500'-2500' a.s.l.)	Kingfishers per 10 miles	0	0	0	0	0	0	0	0	1.62	2.72	0.88	0.99	0.60
Section 6	Miles travelled	20	50	40	10	74	26	12	20	40	44	46	20	402
(2000'-2500' a.s.l.)	Kingfishers per 10 miles	0	0	0	0	0.27	0	0	0	1.25	2.27	0.87	0.50	0.55
Totals	Miles travelled	252	306	424	242	202	474	204	148	590	159	494	468	3963
	Kingfishers per 10 miles	0.04	0	0.28	0.50	0.30	0.32	0.35	0.27	1.20	1.62	1.20	0.77	0.65

TABLE 1

period. Occasionally Kingfishers were counted while travelling from St. Arnaud down the Wairau Valley to Picton, a total distance of 80 miles. During winter Kingfishers were never seen in the upper 34 miles of this route although counts of up to 16 birds were recorded in the lower areas below 800 ft. altitude. During September and October, Kingfishers were encountered over the entire journey but there appeared to be fewer in the lower country than in winter.

Although not indicated by the routine counts (Table 1), odd Kingfishers were seen about St. Arnaud from January through to June. However for more than two months during mid-winter, Kingfishers were completely absent from the district until numbers appeared suddenly in the spring. First occurrences were always earlier at St. Arnaud than in the more remote mountain valleys, an indication that the birds were gradually moving up into higher country at that time of year. In the springs of 1963 and 1964 the first birds arrived at St. Arnaud on 12 September, but in 1965 one was seen a fortnight earlier on 27 August although no more arrived until 11 September.

Notes for all three years show that at St. Arnaud, birds had established territories, pairs had formed and territorial calling had become common by 25 September. The first Kingfishers were seen in the Travers River valley one or two weeks later each spring than the first sightings at St. Arnaud. In the head of the Howard Valley they apparently returned still later in the season as none were seen earlier than mid-October, although they were regularly recorded there during November and December.

Thus, the pattern of seasonal distribution of Kingfishers in Nelson-Marlborough indicates a sudden influx into the higher country each spring when they are establishing breeding territories. During January and February they become inconspicuous at all altitudes, probably because they are moulting at this time. From March numbers gradually build up in the lower country to reach a peak there about July and August.

The winter distribution is not so well illustrated by the present data, since the route counted traversed relatively little of the coastline. Guthrie-Smith (1910), writing of the wintering habits of Kingfishers at Lake Tutira (500 ft. a.s.l.), Hawke's Bay, found that about ten birds would arrive in late autumn and remain about the lake during the

winter, but that practically all of them left again in the spring. During very cold spells the wintering birds would leave the lake, apparently driven further towards the coast. Stead (1932) remarked that during the autumn and winter, Kingfishers "are more widely distributed than for the rest of the year, odd birds turning up in unexpected places," but obviously he was not considering their national dispersal but referring only to local distribution at low altitudes.

The factors determining the overall seasonal shift in Kingfisher distribution will remain obscure until much more is known of the bird's ecology. However, this distribution almost certainly reflects the availability of food rather than being directly effected by temperature. Foods such as tadpoles, lizards, cicadas, grasshoppers and other insects are abundant in the higher country during spring and summer but disappear or become less available during winter. On the other hand, fish, crabs and other small marine animals, remain relatively active throughout the year in coastal areas.

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- GUTHRIE-SMITH, H., 1910: *Birds of the Water, Wood and Waste*. Whitcombe and Tombs, Wellington
 STEAD, E. F., 1932: *The Life Histories of New Zealand Birds*. Search Publishing Co., London.



SHORT NOTE

REPORTED SIGHTING OF SOUTH ISLAND KOKAKO

Late in January 1961 and early in the morning I entered the bush on the Nelson slope of the Mangatapu Saddle on the old road from the Maitai Valley to Pelorus Bridge. Shortly I was attracted by the loud calling of a bird which I located on the trunk of a large beech tree about 18 feet from the ground. The bird did not seem to notice me at all, so that I was able to watch it for some minutes before pouring rain drove me on. There was movement in an adjoining tree, and I was aware of what I think was a young bird; but it was the adult which interested me. It invariably moved upwards in short springing hops; and tapped its beak on the branch, left and right. I think it was urging the young bird to join it. It called loudly all the time I was within hearing distance.

It looked about the size of a Tui. I never saw its breast or under its wings. A yellowish colour was noticeable about its face; and its back which it kept in view even when it sprang on to a branch and proceeded up it, was, I think, brownish green. It was most active all the time I was watching it. I have tried to identify it on various occasions since, but it was only when I overheard a fellow-camper at a Forest and Bird Camp at Waikaremoana mention the characteristic upward springing climb of the Kokako that I had a clue to its identity. There is no doubt in my mind that the bird I watched below the Maungatapu Saddle was a South Island Kokako (*Callaeas c. cinerea*).

— H. E. READ

[Mrs. Read has discussed this incident with me. There seems to be no reason to doubt the accuracy of her identification; especially as the South Island Kokako has since been reported near Picton. — Ed.]

A PELICAN IN NEW ZEALAND

By R. J. SCARLETT

Canterbury Museum

ABSTRACT

The discovery of sub-fossil Pelicans in New Zealand is reviewed, and the conclusion reached that, owing to their larger size, the New Zealand birds were a distinct sub-species, which is here named *Pelecanus conspicillatus novaezealandiae*.

DISCUSSION

In November 1930 Dr. Gilbert Archey and others found a part skeleton of a Pelican in a cave in the Waikaremoana district. This was in "a steep earth slope formed by material fallen from the end wall of the cave." The Pelican bones "were about 18 inches below the surface, just above the Moa bones" also found there, "and slightly scattered through the downward movements of later accretion to the slope." The next finds occurred at Marfell Beach, Lake Grassmere, Marlborough, on the eastern side of the ponded lake of the saltwroks.

On the 23rd February 1947 Mr. P. Lovell-Smith found a weathered right coracoid in the sandhills, and in the following March Mr. J. R. Eyles picked up a worn right humerus, possibly of the same skeleton, also in the sandhills.

In March 1953 Mr. and Mrs. J. Britton found a left femur in the same area, and later in the same year the proximal end of a right humerus. This piece of humerus does not belong to the one found in 1947, and, from its colouration, the femur seems to come from the water-logged layer immediately above the old beach gravels. In this layer all the bones have a brown staining. Thus from Lake Grassmere we have representatives of two, probably three, individuals.

Ten years later, in the course of his archaeological excavations at Poukawa, Hawkes Bay, Mr. Russell Price found a large part of a single skeleton on the 2nd and 16th February 1963. These bones were in squares 18 and 19 of his layer 5, resting on the bottom of an old stream bed. The pelvis of this bird was surrounded by a considerable amount of greasy stain, still visible on the matrix. This stain shows clearly on the colour slides taken while the bones were in situ. A few fragments of another Pelican were found in 1954 by Mr. Price at the same site. I am indebted to Mr. Price for permission to examine and publish his material. I have had for comparison an almost complete skeleton of *Pelecanus conspicillatus* Temminck (Australian Museum No. S.728), now in the collection of the Auckland Institute and Museum (I am deeply indebted to Mr. Graham Turbott, Director of the Museum, for the opportunity to examine this skeleton), and some bones of *Pelecanus onocrotalus* Linne, cleaned from an old mounted skin. I have also utilized the measurements published by Dr. Archey (See Tables). In a few instances, in the dimensions of S.728, my measurements differ slightly from those given by Archey, and these I have indicated, but in one case of considerable discrepancy, I suspect an error in transcription. I have checked and re-checked my measurement.

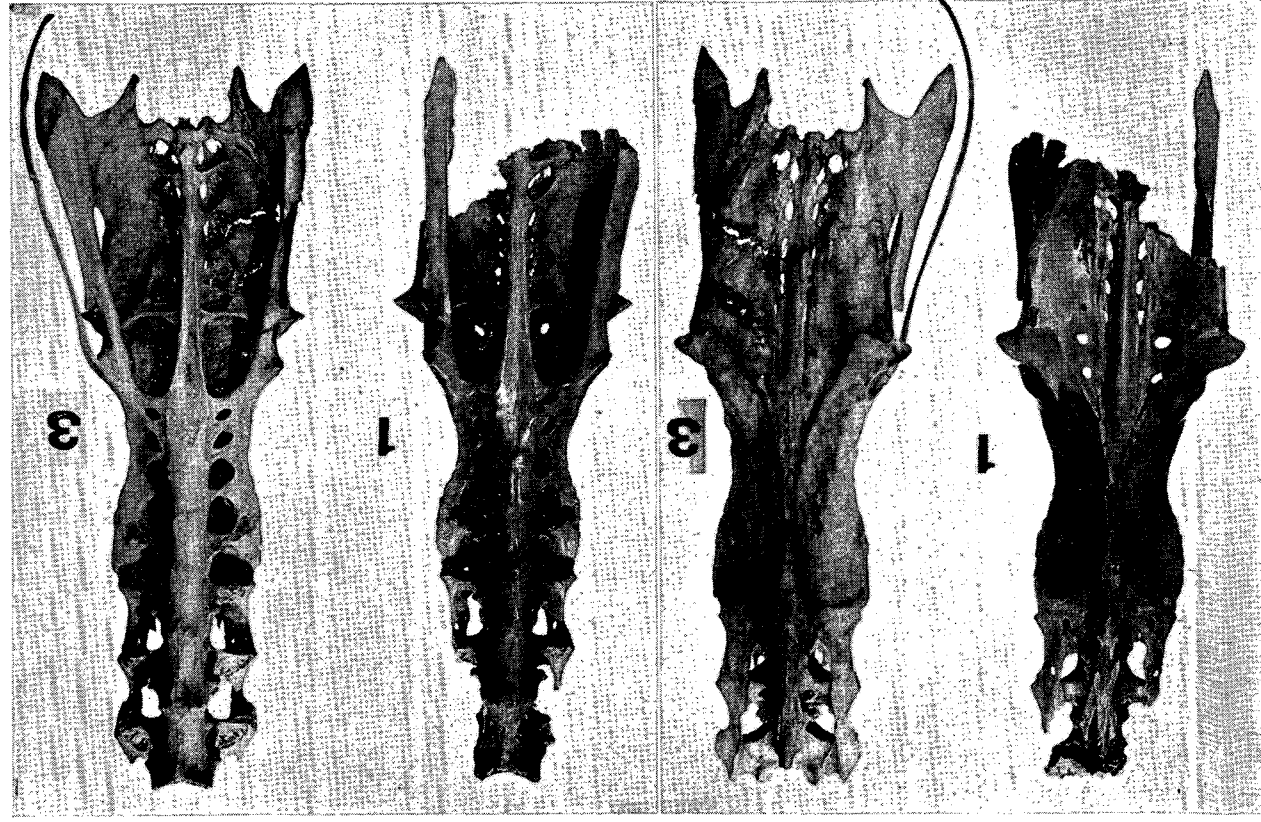


Fig. 1 — Pelvis, Dorsal View. 1 Holotype. 3 S.728.
Fig. 2 — Pelvis, Ventral view. 1 Holotype. 3 S.728.

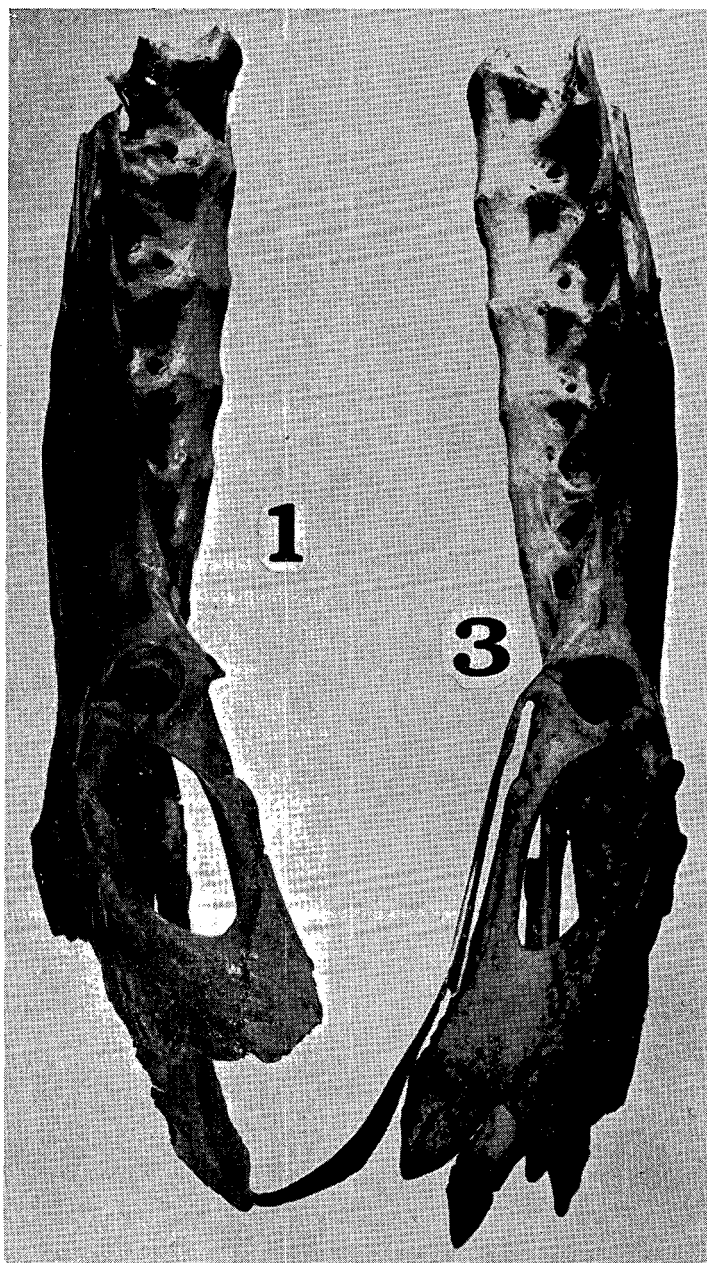


Fig. 3 — Pelvis. 1 Holotype. R. sid. 3 S.728. L. side.

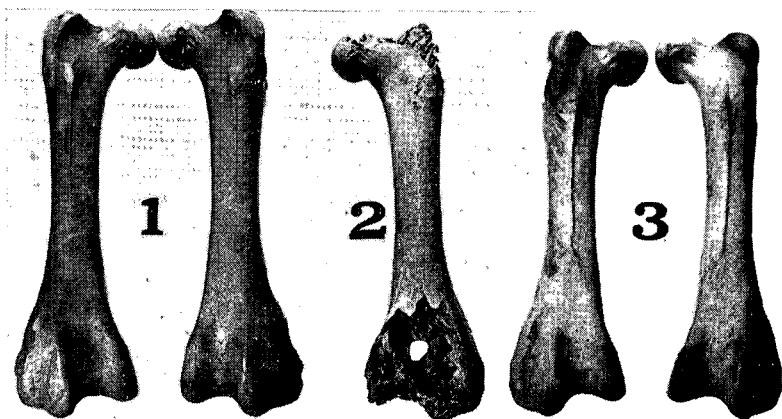


Fig. 4 — Femora. 1 Holotype. 2 AV. 12,482. 3 S.728.

Many kinds of birds very considerably in size within the species, and when *one* individual is found which is larger than those previously recorded, it is unwise to assume that it is a new form. Thus Dr. Archey was justified in assuming that his Waikaremoana skeleton was an exceptionally large form of the Australian Pelican. If, however, *several* specimens are found, all consistently larger than and geographically distinct from the known birds, it becomes clear that one is dealing with something new. I consider the New Zealand Pelican as a distinct subspecies, formerly indigenous to the country, of the Australian species.

The material from Poukawa consists of the following bones of an individual skeleton:

Mandible: Found in many fragments. I have largely reconstructed this, but some pieces are missing, so that it is not possible to obtain all the measurements which might be desired.

L. quadrate.

Pelvis: This lacks both pubes, the posterior extremity of the right ischium, ditto of the left ilium and the final fused caudal vertebra of the sacrum, but is otherwise complete. The first three thoracic vertebra (Nos. 21, 20 and 19) are fused to the sacrum, and partly covered by extensions of the ilia; as this is also the case with S.728 I assume that this condition is general in Pelicans.

R. humerus: Nearly complete.

L. humerus: With part of shaft missing.

R. ulna, R. and L. radii: (The latter had been broken and incorrectly restored.)

R. and L. carpo-metacarpi: (The latter lacks about 4.2 c.m. of the 3rd metacarpal, distally).

L. scapula: (Broken distally).

R. and L. coracoids.

R. and L. femora.

R. tibio-tarsus.

R. and L. fibulae: (Both with fragments missing distally).

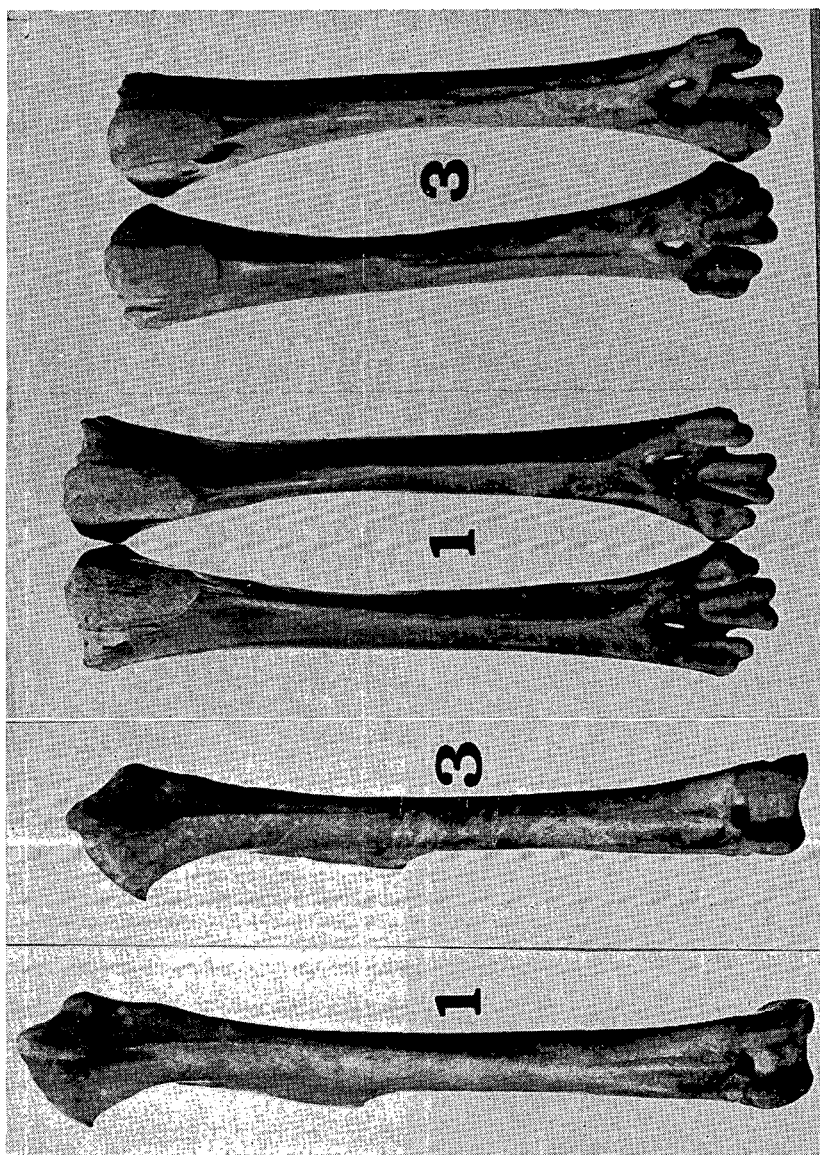


Fig. 5 — R. Tibio-tarsus.

Fig. 6 — Tarso-metatarsi. 1 Holotype. 3 S.728.
1 Holotype. 3 S.728

R. and L. tarso-metatarsi.

2 *phalanges.*

Fragments of a minimum of 7 *ribs.*

9 unfused *vertebrae*: (Numbered from the atlas downwards, they are Nos. 5, 6, 7, 11, 12, 13, 14, 16, 18).

1 *caudal vertebra*, and the *pygostyle*.

In general, these bones are in very good condition.

I nominate this skeleton as the Holotype of *Pelecanus conspicillatus novaezealandiae*. The Waikaremoana skeleton in the Auckland Museum, and the following bones from Marfell Beach, Lake Grassmere, Marlborough, in the Canterbury Museum: AV. 12,264, incomplete R. humerus, AV. 12,482, L. femur, AV. 13,095, proximal fragment of R. humerus, and AV. 15,089, R. coracoid, are Paratypes.

Fig. 7 — L. Posterior ramus
of mandible.

1 Holotype. 3 S.728.

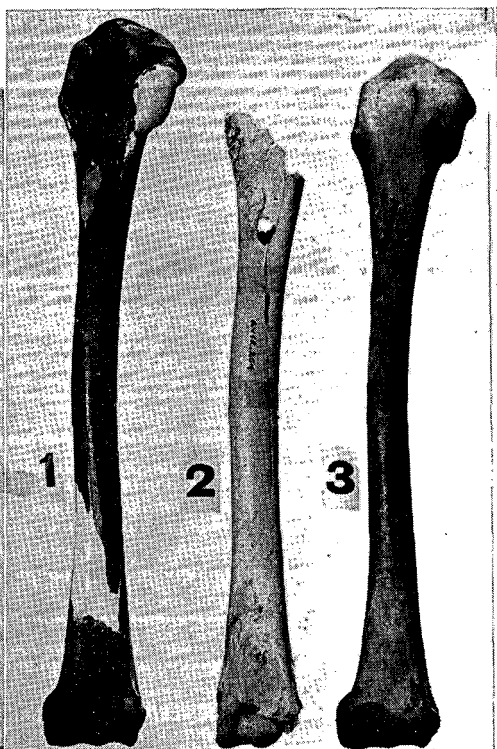
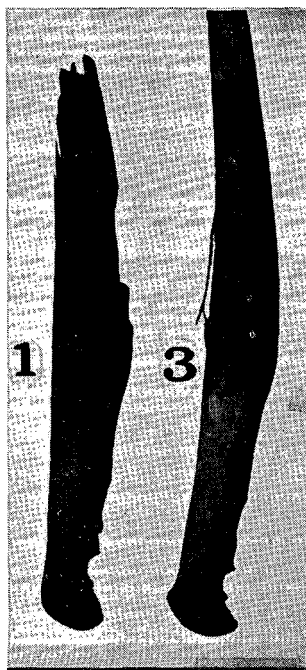


Fig. 8 — R. Humerus. 1 Holotype (joined accurately). 2 A.V. 12,264. 3 S.728.

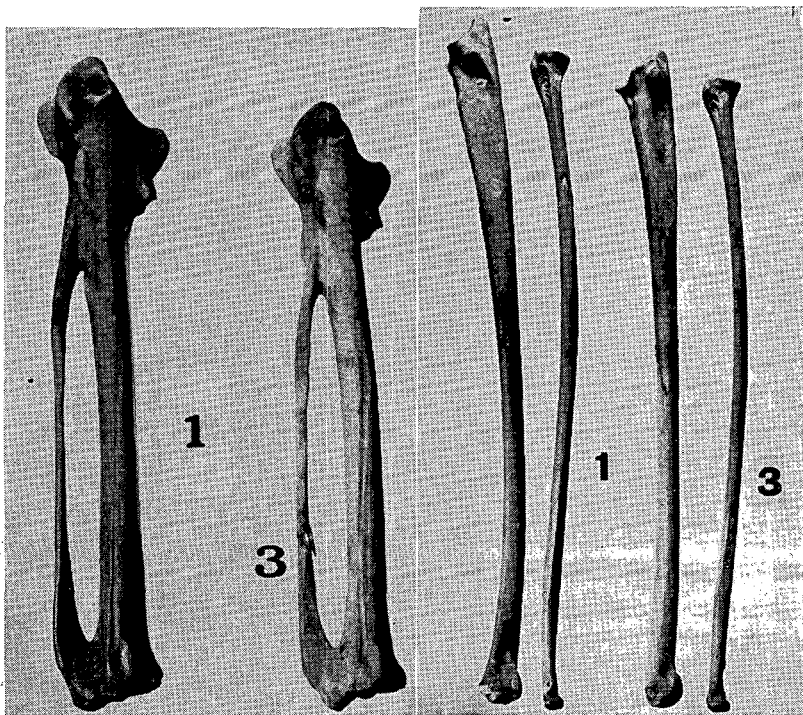


Fig. 9 — R. carpo-metacarpus.
1 Holotype. 3 S.728.

Fig. 10 — R. ulna and radius.
1 Holotype. 3 S.728.

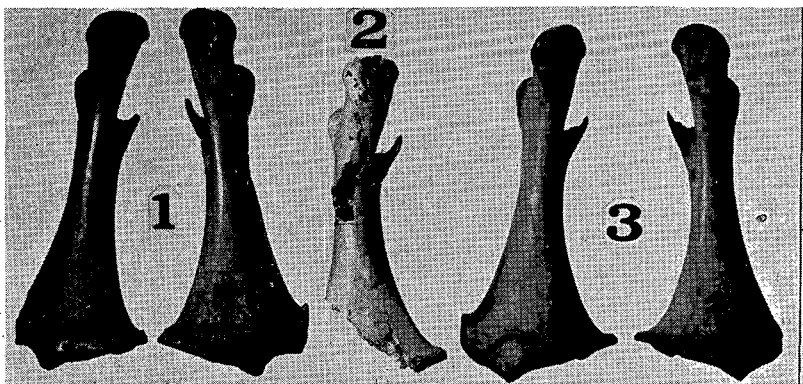


Fig. 11 — Coracoids. 1 Holotype. 2 AV. 15,039. 3 S. 728.

	<i>Pelvis</i>	<i>Holotype</i>	<i>S.728</i>
Length of body (without fused vertebrae and minus pubes)	---	20.6	20.7 c.m.
Length with 3 fused vertebrae	---	28.5	28.4
Anterior width	---	5.85+	5.85
Posterior width	---	9.0 \pm (estimated)	10.3 \pm
Sacral length	---	16.2+ estimated 5	17.4
Width of body across supratrochanteric processes	---	9.75	8.85
Width at acetabulum	---	6.1	5.65
Depth of acetabulum	---	1.8	1.8
Width of acetabulum	---	1.8	1.9
Narrowest width at "waist"	---	4.35	4.6
Greatest width of ilio-ischiac foramen	---	2.35	2.1
Length of ilio-ischiac foramen anterior to fused vertebrae	---	4.75	5.0
Length to posterior sacrum	---	25+ estimated 5	25.6

As will be apparent from the above figures, the two pelves are very similar in size in most respects. There are, however, five notable variations. Lacking a greater range of material, I do not know whether they are significant subspecifically. The Holotype is much wider (0.9 c.m.) across the supra-trochanteric processes than S.728, and narrower (0.25 c.m.) at the waist. Over all, from the anterior end of the three fused vertebrae to the posterior end of the sacrum (in the Poukawa pelvis I have estimated a length of 0.5 c.m. for the missing piece) there is no significant difference, but in the sacral length the Holotype is about 0.7 c.m. shorter than S.728. In S.728 the ilio-ischiac foramen is proportionately longer in relation to width, than in the Poukawa specimen. The latter has a much more oval appearance in this opening; that this is indeed a striking difference is best shown by comparing the width/length quotients, a ratio of 118 (Holotype) to 100 (S.728).

S.728 was shot (it was collected by W. D. Campbell in 1900) and some bones were broken, apparently by shot-gun pellets. The right ischium is cracked posteriorly, and there is room for about 1 m.m. error either way in the measurement.

The same bone in the Holotype has a piece missing and my estimated width there is obtained by measuring from the centre of the sacrum to the left ischium, and doubling the result. From this, the Holotype is at least 1 c.m. narrower than S.728, in this part of the body. It is very apparent, from comparing the two pelves, that the ischia in the Poukawa specimen diverge at a much lesser angle than they do in S.728, i.e. they are more nearly parallel.

Mandible: The only part which is measurable in the Holotype is the left posterior ramus: where the other fragments can be compared with S.728 they are stouter.

	Holotype	S.728	A.V. 16,045 <i>P. onocrotalus</i>
Width of posterior ramus	3.6	3.6	3.95
Height of posterior ramus	2.8	2.7	2.9
Greatest height of ramus	2.5	2.1	2.3

<u>Tibio-tarsus</u>	Length	Proximal	Mean	Distal
Waikaremoana*:	20.3	3.77	....	2.62
Holotype	R.20.7	3.9 }	1.5	2.5
Poukawa:		(2.8) (6)		
A.M. 1014*:	17.8	3.1	....	2.6
S.728:	R.19.2	3.91 }	11.4	2.45 (7)
		(2.7) (6)		
	L.19.3	3.9 }	1.35	2.45
		(2.65)		
A.M. 1207*:	17.8	3.1	....	2.2
S.A. individual*:	17.6	3.06	....	2.14
AV. 16,045	R.21.8	3.95 }	1.45	2.8
onocrotalus:		(2.9) (6)		
	L.21.8	3.95 }	1.4	2.8
		(2.9)		

Tarso-metatarsus

Waikaremoana*:	....	2.5	....	2.69
Holotype	R.13.8	2.5	1.05	2.6
Poukawa:	L.13.8	2.6	1.1	2.6
A.M. 1014*:	....	2.5	....	2.7
S.728:	R.12.95	2.4	1.05	2.45
	L.12.9	2.4	1.055	2.55
A.M. 1207*:	....	2.4	....	2.7
Q.M. individual*:	....	....	....	2.15
Q.M. maximum*:	....	....	....	2.4
S.A. individual*:	....	2.24	....	2.18
AV. 16,045	R.14.4	2.9	....	3.0
onocrotalus:	L.14.4	2.8+	1.4	3.0

Fibula

Holotype	R.	1.3	....	....
Poukawa:	L. 8.1+	1.3	....	....
	(tip absent)			
S.728:	R warped	1.3	....	....
	L. 11.5	1.3	....	....
AV. 16,045	R. 8.1	1.2	....	....
onocrotalus:	L. 8.1	1.2	.....	....

<u>Coracoid</u>	Length	Proximal	Mean (1)	Distal
Waikaremoana*:	14.5	....	....	....
Holotype	R.14.7	2.9	1.75	6.1+
Poukawa:	L.14.6+	2.9	1.8	....
AV. 15,039	Too worn to	2.7+	1.8	Too worn to
Lake Grassmere:	measure.			measure.
A.M. 1014*:	13.0	....	....	....
S.728:	R.13.9	2.35	1.7	6.2
	L.13.9	2.35	1.65	6.0+
			(Missing Piece)	
A.M. 1207*:	11.9	....	....	....
Q.M. individual*:	12.0	....	....	....
Q.M. maximum*:	14.3	....	....	....
S.A. individual:	11.7	....	....	....

Scapula

Holotype	
Poukawa:	L. distal end absent
	3.2
S.728:	R.12.9
	(cartilage not fused)
	L.13.2
	3.3

Pygostyle

	Length	Height	Width
Holotype			
Poukawa:	5.6	2.55+	1.15
S.728:	4.6+	2.8	1.0
	(tip missing)		

It will be seen that the difference in maximum height of the ramus between the Holotype and S.728 is 0.4 c.m. larger when the total measurement is considered, and 0.2 c.m. higher than the generally much larger *Pelecanus onocrotalus*.

The figures speak for themselves. Although some of the measurements of the larger Australian skeletons approach those of the New Zealand specimens, over-all the latter are much bigger. This is particularly shown in the length of the limb bones.

Because of their weathered nature, not all measurements are possible on the Lake Grassmere bones, but comparison with the Poukawa skeleton and S.728 shows that they also belong to the larger group. Measured from the distal end to the beginning of the scar for the acrocoraco-humeral ligament on the medial crest of the humerus, the results are: Holotype, 24.5, AV.12,264, Lake Grassmere, 24.0, S.728: 23.2 c.m.

Dr. Archey's paper discusses in detail the intraspecific variation in various species of Pelicans, which is indeed considerable, and concludes: "If the Pliocene and Pleistocene species (recorded by De Vis) are to be regarded as ancestral to the modern *P. conspicillatus* the New Zealand form might be regarded as indicating the general diminution in size reached by sub-Recent times."

Dr. Archey was supplied with the maximum and minimum measurements of skeletons in the Queensland and South Australian Museums, but it would, of course, be helpful if more material were available from both Australia and New Zealand.

RANGE OF VARIATION IN NEW ZEALAND AND AUSTRALIAN FORMS

	New Zealand	Australia
Femur:		
Length	12.2-12.8	9.8-11.8
Proximal	3.55-3.6	2.71-3.2
Mid-diameter	1.5-1.6	1.2-1.5
Distal	3.7-3.8	2.9-3.34
Tibio-tarsus:		
Length	20.3-2.07	17.6-19.3
Proximal	3.77-3.9	3.06-3.91
Mid-diameter	1.5(one individual)	1.35-1.4(one individual)
Distal	2.5-2.62	2.14-2.6
Tarso-metatarsus:		
Length	13.8-13.9(one individual)	12.9-12.95(one individual)
Proximal	2.5-2.6	2.24-2.5
Mid-diameter	1.05-1.1(one individual)	1.055(one individual)
Distal	2.6-2.69	2.15-2.7
Humerus:		
Length	35.5-35.7	29.2-34.0
Proximal	5.9-6.1	4.9-5.73
Mid-diameter	2.15-2.3	1.68-1.95
Distal	4.75-4.8	3.9-4.65
Ulna:		
Length	38.0(one individual)	36.4 [±] (one individual)
Proximal	3.3(one individual)	3.25(one individual)
Mid-diameter	1.5(one individual)	1.4(one individual)
Distal	2.4-2.5	2.1-2.35
Radius:		
Length	37.0-3.71	31.7-35.4
Proximal	2.25-2.3	1.4(?) - 2.25
Mid-diameter	1.0(one individual)	0.75(One individual)
Distal	1.5-1.55	1.4-2.0(?)
Coracoid:		
Length		117-143
Carpo-metacarpus:		
Length	16.7(one individual)	15.3(one individual)

<u>Humerus</u>	Length	Proximal	Mean (1)	Distal
Waikaremoana:	35.7	5.9	2.3	4.8
Holotype	R.35.5	6.1	2.15	4.7
Poukawa:	L.....	6.1	2.15	4.75
AV. 12,264				
L. Grassmere:	.....	....	2.2	....
A.M. 1014*:	33.5	5.4	1.7	4.4
S.728:	R.33.3 (*33.4) L.32.05	5.7 (*5.73) 5.7	1.9 (*mean1.95) 1.9	4.6 4.62
A.M. 1207*:	30.9	5.1	1.8	3.9
Q.M. individual*:	29.2	5.1	....	4.0
Q.M. maximum*:	34.0	6.0	....	....
S.A. individual*:	30.3	4.9	1.68	4.05
AV. 16,045				
India onocrotalus:	....	....	2.2	5.2

<u>Ulna</u>				
Waikaremoana*:	....	....	....	2.5
Holotype	R.38.0	3.3	1.5	2.4
Poukawa:				
A.M. 1014*:	....	....	....	2.2
S.728:	R.36.4± (2)	3.25	1.4	2.35
A.M. 1207*:	....	....	....	2.1
S.A. individual*:	....	....	.....	2.16
AV. 16,045	R.42.0	3.7	1.4	2.7
onocrotalus:	L..... (3)	3.65	1.4	2.7

The Waikaremoana skeleton, judging from its situation, is probably some thousands of years old. The Poukawa specimen was found in association with man (we are awaiting C.14 dates for this site), and three of the four bones from Lake Grassmere are from the sand above the Moa-hunter deposits there, although probably derived by wind action from them. The fourth, the femur, almost certainly ante-dates the human occupation at the site. As all the New Zealand bones so far discovered are considerably larger than the Australian form, although excepting the pelvis there is little difference otherwise between those from the two countries, as stated above, I conclude that the New Zealand bird is of sub-specific status.

<u>Radius</u>	Length	Proximal	Mean	Distal
Waikaremoana *:	37.1	2.25	....	1.55
Holotype	R.....	2.3	1.0	1.55
Poukawa	L.37.0	2.25	1.0	1.5
A.M. 1014*:	34.5	2.1	....	1.4
S.728:	R.35.4 (*35.5)	2.25	0.75	1.55
	L.35.25	2.15	0.75	1.6 (*1.47)
A.M. 1207*:	32.5	2.0	....	1.4
Q.M. individual*:	32.0	....	....	....
Q.M. maximum*:	35.2	....	....	....
S.A. individual*:	31.7	1.4(?)	....	2.0(?)
AV. 16,045	R.40.7	2.6	1.0	1.65
onocrotalus:	L.....(4)	2.6	1.0	1.65

<u>Carpometacarpus:</u>	Length	Proximal	Mean width of index metacarpal	Mean height of index metacarpal	Distal
Holotype	R.16.7	3.5	1.125	0.925	2.75
Poukawa:	L.16.6	3.5	1.125	0.925	2.75
S.728:	R.15.3	3.2	1.075	0.9	2.6
	L.15.3	3.3	1.075	0.875	2.6
AV. 16,075	R.17.25	3.5	1.3	1.1	3.0
onocrotalus	L.17.2	3.6	1.3	1.1	3.0

<u>Femur</u>	Length	Proximal	Mean	Distal
Waikaremoana*:	12.8	3.6	1.6	3.8
Holotype	R.12.2	3.55	1.5	3.7
Poukawa:	L.12.2	3.55	1.425	3.7
AV. 12,482	11.95+ (5)	3.3+	1.4	3.55+
L. Grassmere:				
A.M. 1014*:	11.8	3.2	1.4	3.3
S.728	R.11.6	3.5	1.4	3.34
	L.11.6	3.5	1.4	3.35
A.M. 1207*:	10.8	3.1	1.3	3.0
Q.M. individual*:	9.8	....	1.2	3.0
Q.M. maximum*:	11.6	....	1.4	3.5
S.A. individual*:	10.3	2.71	1.2	2.9

FOOTNOTES

* Quoted from Dr. Archey.

- (1) I measure the narrowest point of a shaft, which enables broken bones to be compared, but when the measurement is taken in the middle of a shaft, as by Dr. Archey, there is usually little, if any, significant difference.
- (2) Shaft broken by shot-gun pellet, but joined.
- (3) Shaft broken and healed before death of bird.
- (4) Ditto.
- (5) These figures were probably accidentally transposed in Dr. Archey's list. I have yet to see a radius in which the proximal end is smaller than the distal.
- (6) The bone is very worn at the extremities.
- (7) The bracketted measurements are taken across the anterior surface. Those given by Dr. Archey, and the first ones in my list, are taken diagonally across the head.
- (7) Dr. Archey's measurement is 2.38 c.m. I cannot get this measurement.

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I have included in the Bibliography some references which I have consulted, but which are not cited in the text.



SHORT NOTE

TEREK SANDPIPER AT MANAWATU ESTUARY

To the considerable list of transequatorial migrants recorded at Manawatu estuary may now be added the Terek Sandpiper (*Xenus cinereus*). An individual of this species was seen there on 29/1/66 and 27/2/66 during the only visits to the estuary which the writer made in the summer of 1965-66, and it was also seen, on the latter date, by a party of Wildlife Branch officers, including B. D. Bell. It was a very active bird, particularly on the first occasion, and associated primarily with Banded Dotterels, occasionally with Golden Plovers.

This record extends further southward the known range of this species.

— M. J. IMBER

[At least five Terek Sandpipers are known to have been in New Zealand during the summer of 1965-66. They were widely scattered and the dates overlap. Two spent that summer on the Karaka coast of Manukau Harbour and one on the Miranda coast of the Firth of Thames. On 12/2/66 one was watched by J. C. Davenport in the Ahuriri estuary, Napier. — Ed.]

ITEMS OF SPECIAL INTEREST FROM THE 14th ANNUAL REPORT ON BANDING

This report is concerned with banding activities during the year ending 31/3/64. Seventy-seven species were banded and nine new species were added to the N.Z. list of banded birds. They were:—

Black-winged Petrel, Black Shag, Campbell Island Shag, Common Noddy, Red-crowned Parakeet, Little Owl, S.I. Tomtit, Pipit and N.I. Saddleback. One hundred and twenty-three species totalling 143,240 birds have now been banded within the national scheme.

The three species of gull account for 41% of the total numbers banded and 50% of those recovered.

Valuable evidence on longevity and the strength of the homing instinct is now beginning to accumulate. A Lightmantled Sooty Albatross, banded on Campbell Island as a young bird in 1943, was caught and released there in 1963. Two Giant Petrels, banded at Heard Island were recovered eleven years later at the same place. A Cape Pigeon ringed at Tory Channel was captured at a whaling vessel, 5200 miles E.S.E. in the South Atlantic nearly five years later. Two adult Sooty Shearwaters ringed at Pipinui Pt. in December 1956 were recovered there in December 1963. Two Gannets at Cape Kidnappers were at least 13 years old and, having bred for some years, were still going strong. A Southern Skua banded as an adult on Campbell Island was recaptured there nearly six years later.

The spectacular crossing of the South Pacific by young Royal Albatrosses is becoming familiar news. Two more have now been found in Chile within a year of ringing; and two others on the Argentine coast in their second year.

Many more young Gannets from Cape Kidnappers, White Island, Bush Island and Horuhoru have been found on the coasts of Queensland, New South Wales, Victoria and South Australia, many within a few months of banding.

There is further confirmation of the northward movement of young Caspian Terns from and across Cook Strait to Auckland and Northland. From New South Wales comes another record of a White-fronted Tern in its first year.

Among the birds banded overseas and recovered in New Zealand a Little Eget is particularly noteworthy. It was banded near Balranald, N.S.W., on 15/12/62 and found dead — a victim of the shooting season? — on 9/5/63 near Oamaru.

Twelve Giant Petrels recovered in New Zealand between Ninety Mile Beach and Stewart Island had come from South Georgia, Heard Island, Fremantle and Macquarie Island.

The report concludes with a list of corrigenda to the 13th annual banding report.

— R.B.S.

SHORT NOTES

CHATHAM ISLAND MOLLYMAWK ON OHAU BEACH

The Chatham Island Mollymawk (*Diomedea cauta eremita*) is rarely recorded away from its nesting ground on Pyramid Rock, Chatham Islands. Five specimens have been collected on the coast of New Zealand: one on the east coast of the South Island and four on the west coast of the North Island (Fleming, 1939; Oliver, 1955). There have also been two sight records from off the east coasts of the North Island (Oliver, 1955) and of the South Island (*Notornis* 12, 85, 1965).

The finding of a fifth individual of this subspecies on the North Island coast is here recorded. On 27/12/61 the dried remains of a mollymawk, which had apparently died in November or early December, were found on Ohau beach, near Levin. The remains were skeletally incomplete, but the head was intact and was collected and sent to Dr. R. A. Falla, who replied: "The Mollymawk is a typical specimen, although somewhat faded in bill colour, of *Diomedea cauta eremita*" (*in litt.* 24/1/62).

The bill, with all plates intact, was uniformly pale yellowish-cream without any trace of darker areas. Measurement of culmen: 117 mm. The head was grey, paler on the forehead, with a blackish band from eye to top of bill. The bill colour indicates that the bird was an adult.

This specimen was included in the 1961 Beach Patrol Scheme records, but in the Report (*Notornis* 10, 265-277, 1963) the subspecies of *Diomedea cauta* have not been distinguished.

The previous four North Island specimens comprise two adults and two juvenals, of which the latter are of particular interest because the juvenal Chatham Island Mollymawk has apparently not been described from Pyramid Rock. These young birds were collected at Karekare Beach, Auckland west coast on 26/4/1936 and at Nukumarū, Wanganui on 3/5/1951. The former is described by Fleming (1939) and appears identical with the latter, briefly described by Oliver (1955), and which I have examined in the Wanganui Museum, where it is preserved as a study skin. Culmen measurements are 121 and 124 mm. respectively. The Wanganui specimen is a male. Both these birds were probably very recently fledged when they were wrecked. The stage of development of the chicks which Fleming observed when he visited Pyramid Rock on 16th December, 1937, indicates that the young Mollymawks would leave the nesting ground during March or April.

Thus slight doubt is implied in the identification of both these birds. Referring to the Karekare specimen, Fleming states: "A bird believed to be the juvenal of this race . . ."; whilst the Nukumarū specimen was identified by Dr. Falla as (from label): "*D. cauta* subsp., probably *eremita*." When a fully-fledged young *eremita*, ready for its first flight (i.e. juvenal), is collected and/or described from the breeding ground, these identifications can be confirmed, or revised.

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— M. J. IMBER

SPOTTED SHAGS ON THE COROMANDEL COAST

On 28/2/65 as we approached Motu Kahaua, the most northerly of the islands to the west of the Coromandel Peninsula, we were delighted to see a large group of Spotted Shags (*S. punctatus*) resting on the adjoining rocky islet. Conditions were ideal and as we rowed closer about 240 birds left their roost and settled down to fish less than a quarter of a mile away. From the sea 25 nests were visible. Of these two contained well grown chicks, two had birds apparently sitting, three were unoccupied, and the rest had a pair of birds in attendance. The islet is 150ft. high and most of the nests were on the northern and eastern sides, where the typical mushroom shaped formation provides good shelter.

During periodic visits to this coast over the last twelve years, our only other sightings of Spotted Shags have been single birds on three occasions and one group of nine, all near Hautapu Pt., some four miles away on the mainland.

— ANTHEA GOODWIN



A STARLING ROOST IN KAIPARA HARBOUR

Moturemu is a prominent island lying off the mouth of the Tauhoa Creek in the southern portion of Kaipara Harbour. It is of considerable interest to naturalists as Grey-faced Petrels (*P. macroptera*) breed there and the rare Kaka Beak (*Clanthus puniceus*) once grew there, though it now appears to have died out. The island for many years has been used as a roost by large numbers of Starlings (*S. vulgaris*).

On 20/9/61 Marcus Dill and I watched the Starlings arrive between sundown and nightfall. I made a rough calculation. About ten per second crossed a given point for fifteen minutes as the Starlings flew in from the direction of Hoteo. I averaged out the trickle and the surges as best I could. This gives a total of 9000 from one direction; but I would say that more came from the direction of Glorit. There were only two streams and their different heights were quite noticeable. The birds from the south crossed the harbour higher than the island and dived with a loud swooshing to settle, while the Hoteo birds from the north flew low and appeared to bounce up and over the shell-bank where we moor the boat. There was a light, cold south-west breeze. If my estimate is at all correct, perhaps 20,000 Starlings were roosting at that time on Moturemo.

We were unable to find as much as a seedling of Kaka Beak, although conditions appeared suitable. However, we did find two Karos growing well in the humus, and in flower, I should think, for the first time. Marcus Dill thinks there may be a tree of this species on Old Man's Nose, a high point a few miles north. If so, that is the only Karo we know on that side. It is amazing what the Starlings bring — blackberry, ivy, inkweed, privet, wattle (*Acacia lophantha*), wharangi, box thorn — which we managed to pull out — and a lot of other foreign stuff. The Starlings kill off pohutukawa thickets or make them decidedly sick and then move away, leaving the ground open to the light. There are many seedlings of totara and kahikatea.

— FRANK HUDSON

A FLOCK OF SOUTHERN SKUAS REPORTED

The Otago coastline is outside the breeding area of the Southern Skua (*C. skua lonnbergi*), and generally only lone birds are seen on this coast.

However, on 27/2/65, while taking part in a wader count, Mr. E. Sheat and four companions walked the coast from Anderson's Lagoon to the mouth of the Shag River. Here they found a flock of 24 dark, gull-like birds which they could not identify. They were positive that the birds were not juvenile Black-backed Gulls (*L. dominicanus*) and the whole party agreed that the birds were all of the same species. Two similar birds had been seen earlier.

The flock took off and flew out to sea, flying strongly with wings flapping, at which point Mr. Sheat was going to record them as unknown. But as he watched a bird dropped out of the group, swooped down and caught a White-fronted Tern (*S. striata*) in flight. "... it veered towards us and attacked the tern and landed, still at a fair distance . . . I could see through binoculars that it was not black but dark brown," writes Mr. Sheat. A second bird dropped out of the group and as it landed beside the first bird, the white under the wings was visible. As the observers moved up the birds took off again, carrying the tern with them.

Dr. R. A. Falla's comment on this report was:—

"The various details seem convincing enough, especially the incident of the killing of the tern which could hardly have been done by anything but a skua. . . . You are well within the range of wandering of the Brown Skua and the only surprising thing about the observation is the extraordinary number seen together."

A recent Australian report of Southern Skuas forming small flocks away from the breeding grounds was published by G. M. Storr in *Emu* 63:4 (Zonation and Seasonal Occurrence of Marine Birds) in which he states that "... in Fremantle Harbour it is thus characteristic of a winter day to find a dozen or more of these skuas sitting on the water patiently waiting for scraps and unperturbed by all the activity around them." Also under the notes on Pomarine Skuas he remarks that most of the birds of this species were seen by him on this survey "sitting on the sea in fairly compact groups. This last trait is shared with the Great Skua."

— G. HAMEL



SKUA ON THE SUMNER CLIFFS

The following are details of the sighting of a large skua at White-wash Head. On the morning of 21/7/66 I visited this wildlife refuge at Scarborough, Sumner, to see if the Spotted Shags (*S. punctatus*) had begun nesting. There were no shags in the refuge on this morning, but as soon as I breasted the hill, I sighted a large brown bird. It flew south out to sea, keeping low, but I held it in my glasses for some time and I am sure it was a Southern Skua (*C. skua lonnbergi*).

This is the first time I have seen this species actually on the Sumner coast, but I have recorded them out at sea from fishing vessels. I do not know why one should be ashore at this place, but the refuge is used extensively by Rock Pigeons (*C. livia*) which seem to breed right

through the year in holes on the cliff face and it is quite possible that the 'Sea-hawk' has found young pigeon an attractive addition to its normal diet.

Although I have kept a watch on the area since, I have been unable to record any return of this interesting visitor.

— BADEN NORRIS



PRESENTATION TO H.M.N.Z.S. LACHLAN

On 9th September, 1966, two members of the 1964 Kermadecs Expedition, D. V. Merton and M. J. Hogg, and the Editor, visited H.M.N.Z.S. Lachlan, which was looking very smart after her refit, to make a presentation on behalf of the Society and to express the Society's gratitude for help and kindness received from the Royal New Zealand Navy in the course of that unlucky and short-lived expedition.

Subsequently the following letter, which we have pleasure in publishing, was received from Commander I. S. Monroe:—

Dear Sir,

This is to record our deep appreciation of the magnificent gifts your Society has presented to this ship. We are a little overwhelmed by the splendour of both the silver cigarette box and the photograph, and would state that rarely, if ever, in its lifetime does a ship receive such gifts. For these we are most grateful.

To carry people, such as members of your Society, is our pleasure, for in such a small community new faces in the Mess are most welcome, and the diversion from the purely surveying routine can be a welcome break.

It has been our pleasure to be associated with your Society, and we trust that this contact will remain firm and that we will see more of your Society in the future.

Yours sincerely,

I. S. MONRO,

Commander, R.N.Z.N.,
Commanding Officer.



LETTER

Sir,

The article on Pukeko (*Notornis* 13, 133) makes no mention of eggs in their diet. To my knowledge they eat vast quantities of duck eggs as well as those of domestic geese and poultry who lay under farm-garden hedges. Eggs may be undetectable in the stomach contents.

In the article on the breeding of Song Thrushes and Blackbirds (pp. 142-149) the writer fails to mention the use of mud with which Song Thrushes plaster the inside of their nests. Blackbirds don't do this; but they use quite a lot of partly decayed leaves from cabbage trees, where available.

— MAURICE E. FITZGERALD

81 Beach Road, Tauranga

REVIEWS

A Naturalist in New Zealand. By Mary Gillham. A. H. & A. W. Reed, 35/-.

During a year spent as an exchange lecturer at Massey College, Dr. Mary Gillham gathered the material to write and illustrate this unusual book. She has the observant eye of the trained ecologist. Her pencil must have been very busy, for when she was not writing, she was often sketching; and she used her camera to good purpose, too.

It is remarkable what enthusiasm can achieve. Islands are her special love; and during Varsity vacations she seems to have met most of the right people to enable her to visit offshore islands from Stewart to Mokohinau. In the words of Dr. Falla: "This is the zestful account of a quite unorthodox itinerary"; and so evocatively does she write that many readers must be tempted to make the effort necessary to follow in her footsteps.

But even Homer's head nods sometimes; and our authoress seems to have slipped from her high standard of accuracy when on page 174 she comments that the Robins of Kapiti are of the South Island form. This is contrary to the Checklist; and a local authority, when consulted, stated that without doubt they are true North Islanders.

Mary Gillham enjoyed her odyssey in New Zealand; and in a book which is worthy to rank among our classics in the field of general natural history, she tells of her delight.

— R.B.S.



The Tuatara, Lizards and Frogs of New Zealand by Richard Sharell. Collins, 1966. 33/.

Although not a bird book, this will be a welcome addition to the shelves of ornithologists. It is the first popular work on this subject, and a very attractive one. The text is interesting, stimulating and informative; the 70 illustrations are lavish, often arresting. (The name *Archaeornis* given on p. 20 has, by the way, been abandoned; all three Jurassic fossil birds are *Archaeopteryx*.)

— B.D.H.



Australian Birds in Colour by Keith Hindwood. A. H. & A. W. Reed, 22/6d.

This is a companion volume to Dr. Gordon Williams' "New Zealand Birds in Colour," the type having been set up in N.Z., and the printing done by the Kyodo Company of Japan. I am much impressed by the sheer beauty and excellent reproduction of the 52 colour plates, for with a few exceptions, those colour mutations in reproduction which have disappointed the authors and irritated the readers of some books in recent years are noticeably absent. The photography is of the high standard one would expect from such experts as Norman Chaffer, Ellis McNamara, and the rest, and to me Graeme Chapman's picture of a male Satin Flycatcher at the nest is a gem of the first water. The page of text accompanying each picture is, of course, completely authoritative, and written in an interesting style designed to help popularise the study of birds.

— A.B.

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O.S.N.Z. Library Catalogue, 70 pp., at 5s.

Banding Reports, Nos. 8 - 14. 5/- each. (Nos. 1 - 7 are incorporated in early journals). Order from Mrs. H. R. McKenzie, Box 45, Clevedon.